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Thermobarometry of CO_2-rich, silica-undersaturated melts constrains cratonic lithosphere thinning through time in areas of kimberlitic magmatism

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Abstract

Cratonic lithosphere is believed to have been chemically buoyant and mechanically resistant to destruction over billions of years. Yet the absence of cratonic roots at some Archean terrains casts doubt on the craton stability and longevity on a global scale. As unique mantle-derived melts at ancient continents, silica-poor, kimberlitic melts are ideal tools to constrain the temporal variation of lithosphere thickness and the processes affecting the lithosphere root. However, no reliable thermobarometer exists to date for strongly silica-undersaturated, mantle-derived melts. Here we develop a new thermobarometer for silica-poor, CO_2-rich melts using high-temperature, high-pressure experimental data. Our barometer is calibrated based on a new observation of pressure-dependent variation of Al_2O_3 in partial melts saturated with garnet and olivine, while our thermometer is calibrated based on the well-known olivine-melt Mg-exchange. For applications to natural magmas, we also establish a correction scheme to estimate their primary melt compositions.

Applying this liquid-based thermobarometer to the estimated primary melt compositions for a global kimberlite dataset, we show that the equilibration depths between primary kimberlite melts and mantle peridotites indicate a decrease of up to ~150 km in cratonic lithosphere thickness globally during the past ~2 Gyr. Together with the temporal coupling between global kimberlite frequency and cold subduction flux since ~2 Gyr ago, our results imply a causal link between lithosphere thinning and supply of CO_2-rich melts enhanced by deep subduction of carbonated oceanic crusts. While hibernating at the lithosphere root, these melts chemically metasomatize and rheologically weaken the rigid lithosphere and consequently facilitate destruction through convective removal in the ambient mantle or thermo-magmatic erosion during mantle plume activities.

Keywords

Geothermobarometry; silica-undersaturated melt; kimberlite; lithosphere thickness; cratonic evolution; deep carbon cycle

1. Introduction

Cratons, the keels of continents, established their thick lithosphere in the convecting mantle by extensive melt extraction and subsequent cooling and thickening in the Archean and/or Proterozoic Eons (e.g., Lee et al., 2011). This formation process distinguishes the cratonic lithosphere from the surrounding mantle by its highly refractory compositions and high viscosity (e.g., Griffin et al., 2003; Lee, 2003), which leads to the conventional view of buoyant and stable cratons. Inconsistent with this classic view are the Archean Wyoming (e.g., Carlson and Irving, 1994; Dave and Li, 2016) and North China cratons (e.g., Griffin et al., 1998; Gao et al., 2002) with evidence of lithosphere removal. Although lithosphere removal has not been demonstrated for most other cratons, these destruction events raise two fundamental questions on the cratonic lithosphere stability: Does lithosphere destruction/thinning occur as singular events locally or as a repeatable process for cratons globally? What may be the mechanism of lithosphere thinning for cratons on a local or global scale? Answering these questions requires an appraisal of cratonic lithosphere thickness through time.

Despite much effort from geophysical (e.g., Eaton et al., 2009; Fischer, 2015) and petrological studies (e.g., Hasterok and Chapman, 2011; Lee et al., 2011), the thickness of cratonic lithosphere and its temporal variations remain elusive. Geophysical constraints on the present-day cratonic lithosphere thickness are often conflicting (Eaton et al., 2009; Fischer, 2015) because of the weak and gradual transition of seismic velocity (Eaton et al., 2009; Fischer, 2015) and the strong dependence of electrical conductivity on partial melts and water (Caricchi et al., 2011). As an independent validation, peridotite xenoliths have been widely used to infer lithosphere thickness through palaeogeotherms defined by mineral-based thermobarometry (e.g., Lee et al., 2011). A major source of uncertainties in this xenolith approach arises from thermo-chemical perturbations (Grütter, 2009). After such perturbations, mineral-based thermobarometers tend to record temperatures (*T*) and pressures (*P*) inconsistent with the lithosphere geotherms due to various extents of diffusive resetting (Sun and Liang, 2015). In addition, a limited number of mantle xenoliths also hinder understanding temporal variations in lithosphere thickness.

As a unique type of mantle-derived melts that erupt rapidly through cratonic lithosphere (Wilson and Head, 2007; Russell et al., 2012) over a wide range of ages (~0–2.85 Ga; Jelsma et al., 2009; Tappe et al., 2018), kimberlite magmas may provide key information on the thickness of global cratonic lithosphere. Primary kimberlites are CO_2-rich partial melts of garnet-peridotites, which generally contain <40 wt% SiO_2 and coexist with olivine + garnet ± pyroxenes (Mitchell, 1986; Kopylova et al., 2007; Stamm and Schmidt, 2017; Sun and Dasgupta, 2019). The generation of kimberlite melts could proceed through various mechanisms (Sun and Dasgupta, 2019; and references therein) including (1) partial melting of prior metasomatized, carbonated garnet peridotites, (2) redox melting of graphite/diamond-bearing garnet peridotites, and (3) reactive melting of ambient mantle peridotites fluxed by carbonatite liquids derived from subducted slabs or recycled crustal materials or other mantle lithologies. It is important to note that these processes are not restricted to particular depths in the asthenosphere or lithosphere. Although primary kimberlites have been suggested to initially form in deeper mantle sources such as the asthenosphere or mantle plume (e.g., Mitchell, 1986; Le Roex et al., 2003; Stamm and Schmidt, 2017; Tappe et al., 2018; Sun and Dasgupta, 2019), their final equilibration with peridotites in major element compositions is expected to occur at the transitional lithosphere-asthenosphere boundary (LAB). With relevant liquid-based thermobarometers, one can constrain the lithosphere thickness and thermal-magmatic processes at the lithospheric roots using kimberlites that do not record significant lithospheric modification on the final-equilibration P-T.

Previous liquid-based barometers and thermometers (Lee et al., 2009; Putirka, 2009; Plank and Forsyth, 2016), however, were constructed only for basaltic melts with ≥~45 wt% SiO_2 based on the olivine-pyroxene buffered melt silica-activity and olivine-melt equilibrium, respectively. As their fundamental assumption is the coexistence of olivine and pyroxene with the melt of interest, these barometers are not applicable for magmas undersaturated with residual pyroxene, which is exactly the case for many kimberlite melts produced in phase-equilibria experiments (see reviews in Sun and Dasgupta, 2019). Applied to experimental melts from garnet-peridotites with coexisting olivine and pyroxene (Supplementary Table S1), these thermobarometers generate considerable errors for low-SiO_2 melts with variable contents of dissolved

$CO_2 \pm H_2O$ (Fig. 1). The failure of these barometers results from the lack of a significant *P*-dependent variation of SiO_2 in garnet-peridotite partial melts (Fig. 2a) and is particularly due to the primary control of dissolved CO_2 on melt SiO_2 (e.g., Dasgupta et al., 2007, 2013; Ghosh et al., 2014; Sun and Dasgupta, 2019). Thus, the assessment of global cratonic lithosphere stability through kimberlites necessitates a new liquid-based thermobarometer for silica-poor and CO_2-rich melts.

This study contains two parts. First, we construct a new liquid composition-based thermobarometer for garnet-peridotite partial melts with variable amounts of dissolved $CO_2 \pm H_2O$ using a comprehensive compilation of phase-equilibria experiments from the literature. Distinct from the existing melt silica-activity barometers, our new barometer is based on the *P*-dependent variation of Al_2O_3 in the melt coexisting with garnet + olivine ± other phases, which is especially applicable for $CO_2 \pm H_2O$ -rich, low-SiO_2 melts parental to wide range of silica-poor natural magmas such as carbonatites, kimberlites, melilitites, nephelinites, basanites, and alkali basalts (e.g., Hirose, 1997; Dasgupta et al., 2007; Mallik and Dasgupta, 2014; Sun and Dasgupta, 2019). Second, applying our new thermobarometer to a global kimberlite dataset, we determine the final equilibration *P*-*T* of kimberlitic melts in the mantle. Our results of kimberlitic melt-mantle equilibration *P*-*T* show that lithosphere destabilization appears to be a normal mode for global cratons. Combining our thermobarometry results with the temporal variations of kimberlite frequency and subduction style, we suggest that the observed destabilization of global cratonic lithosphere in areas of kimberlitic magmatism could be aided by deep carbon subduction into the convecting mantle, which would provide additional CO_2-rich fluids to kimberlite source regions.

2. Developing a new thermobarometer for CO_2-rich, SiO_2-poor melts

2.1. Experimental database

We compiled high-*T* and high-*P* experiments in garnet-peridotite systems from the literature according to the following criteria: (1) partial melts have well-characterized major element compositions coexisting with garnet and olivine (± other phases); (2) an approach of chemical equilibrium could be demonstrated for the experiments; (3) the compositions of volatiles (CO_2 and H_2O), if present, were reported or can be estimated through a mass-balance approach; and (4) the starting compositions are similar to natural systems including typical major oxides (e.g., SiO_2, Al_2O_3, FeO, MgO, CaO, and others). The first criterion is made according to our new observation that the increase of pressure lowers Al_2O_3 in melts saturated with garnet and olivine (Fig. 2a; Section 2.2). Because Al_2O_3 in the melt is the key compositional factor for our new barometer, experiments with large uncertainties in the Al_2O_3 contents of melts were excluded.

The compiled dataset includes 202 experiments that cover a broad range of *T* (900–1968 °C), *P* (1.6–10 GPa), melt compositions (e.g., SiO_2 = 6.6–48.8 wt%, Al_2O_3 = 0.3–18.3 wt%, CO_2 = 0–45 wt%, and H_2O = 0–57 wt%) (Supplementary Table S1). Among the compiled experiments, 90 were run under nominally volatile-free conditions. The volatile-bearing experiments include 57 runs with only CO_2, 3 with only H_2O, and 52 with both CO_2 and H_2O. As volatile abundances in most of the quenched melts were constrained by the mass-balance method, they are expected to have large uncertainties, especially for experiments with both CO_2 and H_2O. Overall, these experiments represent the state-of-the-art phase equilibria of partially molten garnet-peridotites relevant to natural compositional systems and provide the essential parameter space for the thermobarometer calibration.

2.2. Barometer calibration

We found that Al_2O_3 contents of experimental melts derived from garnet-peridotites decrease systematically with the increase of *P* (Fig. 2a). This provides a new basis for barometer calibration distinct from the existing silica-activity based barometers. As the major alumina-bearing phase in deep mantle sources, garnet presumably buffers Al_2O_3 in the melt through exchange reactions involving other phases. To describe the pressure dependence of Al_2O_3 in garnet-peridotite partial melts, we considered the equilibrium reaction between melt, garnet, and olivine

$$\left[\mathrm{MgAl_{2/3}(SiO_4)}\right]_{\mathrm{garnet}} + \left[\mathrm{MgO}\right]_{\mathrm{melt}} = \left[\mathrm{Mg_2SiO_4}\right]_{\mathrm{olivine}} + \left[\mathrm{Al_{2/3}O}\right]_{\mathrm{melt}}, \tag{1}$$

where $[MgAl_{2/3}(SiO_4)]$ and $[Mg_2SiO_4]$ are the pyrope and forsterite components in garnet and olivine, respectively. This reaction follows the generic thermodynamic expression

$$\ln K_e = \ln\left[\left(\frac{a^{\text{melt}}_{\text{Al}_{2/3}\text{O}}}{a^{\text{melt}}_{\text{MgO}}}\right)\left(\frac{a^{\text{olivine}}_{\text{Forsterite}}}{a^{\text{garnet}}_{\text{pyrope}}}\right)\right] = \ln\left[\left(\frac{X^{\text{melt}}_{\text{Al}_{2/3}\text{O}}}{X^{\text{melt}}_{\text{MgO}}}\right)\left(\frac{\gamma^{\text{melt}}_{\text{Al}_{2/3}\text{O}}}{\gamma^{\text{melt}}_{\text{MgO}}}\right)\left(\frac{a^{\text{olivine}}_{\text{Forsterite}}}{a^{\text{garnet}}_{\text{pyrope}}}\right)\right] = A + \frac{B + f(P)}{T}, \quad (2)$$

where K_e is the equilibrium constant; X, a and γ denote the mole fractions, activities, and activity coefficients of individual components in olivine, garnet and melt; A and B are constants related to the thermodynamic parameters, i.e., changes in entropy and enthalpy, respectively; $f(P)$ is a function of pressure corresponding to the product of pressure and volume change; T is temperature; and P is pressure. Because the composition of mantle garnet is sensitive to pressure (e.g., Beyer et al., 2018), the pyrope activity in garnet can be approximated as a function of pressure and incorporated into f (P) (and perhaps A and B as well). Given the small variations of forsterite contents in mantle olivine, the forsterite activity in olivine could be approximated by a constant. Accordingly, the ratio between $Al_{2/3}O$ and MgO in the melt could be simplified as a function of T, P, and melt compositions.

Through multiple linear regression analysis (Street et al., 1988) of the compiled experimental melts (N = 202; Supplementary Table S1), we took an extensive search of various permutations and found that the following expression best fits the experimental data

$$\begin{aligned} &\ln\left(\frac{\text{Al}_{2/3}\text{O}}{\text{MgO}}\right) = \Theta + \frac{\Phi}{T} + 45.90(\pm 1.33)\frac{P}{T}(P - 26) \\ &\Theta = 4.70(\pm 0.39) + 3.91(\pm 0.19)\ln(\text{Si}_{1/2}\text{O}) + 1.19(\pm 0.17)\left(\frac{\text{K}_2\text{O} + \text{Ti}_{1/2}\text{O}}{\text{MgO}}\right), \\ &\Phi = 2412(\pm 493) + 9.20(\pm 0.72)\left(\frac{\text{CO}_2}{\text{Si}_{1/2}\text{O}}\right) + 11.19(\pm 1.10)\left(\frac{\text{H}_2\text{O}}{\text{Si}_{1/2}\text{O}}\right) \end{aligned} \quad (3)$$

where P is pressure in GPa; T is temperature in Kelvin; $Al_{2/3}O$, MgO, FeO, $Si_{1/2}O$, K_2O, and $Ti_{1/2}O$ are oxide molar contents per unit oxygen on a volatile-free basis; CO_2 and H_2O are in weight percentages; Θ and Φ are collected compositional variables for simplifying the expression and vary from –6.8 to 0.4 and from 2412 to 2417, respectively, in the experimental dataset; and numbers in parentheses are 1σ errors of the coefficients from the regression analysis. A second order P term appears to better fit the experimental data, likely due to the *P*-dependent volume changes in the exchange reaction (Eq. 1). Note that our normalization scheme for the melt composition is different from the molar fractions of metal cations or oxides. This scheme was chosen because we found it could better fit the experimental data.

Re-arranging Eq. (3), we obtained a new *T*-dependent barometer based on Reaction (1) to quantify melting *P* of garnet-peridotite partial melts with various amounts of dissolved volatiles ($CO_2 \pm H_2O$),

$$P = 13 - \sqrt{\frac{T}{45.90}\left[\ln\left(\frac{Al_{2/3}O}{MgO}\right) - \Theta\right] - \frac{\Phi}{45.90} + 169} \ . \tag{4}$$

Fig. 2b shows that our new barometer (Eq. 4) well reproduces the experimental *P* with 1σ of ±0.5 GPa. Although CO_2 and H_2O are incorporated in the barometer, their uncertainties (e.g., ~4 wt%) only appear to have small effects (e.g., <0.5 GPa) on the pressure estimations (Supplementary Fig. S1).

A major source of uncertainties in this barometer comes from its fundamental assumption, i.e., the coexistence of melts with garnet and olivine. This assumption is generally valid for natural silica-poor melts such as kimberlite parental melts as they are believed to be low-degree melts from garnet-peridotite sources (e.g., Mitchell, 1986). For partial melts in equilibrium with spinel-peridotites, this barometer predicts melting *P* with systematic errors (i.e., by up to 2 GPa) that appear to strongly depend on melt compositions (Supplementary Fig. S2). To better constrain the melt compositions for appropriate use of our barometer, we constructed a silica-alumina index, SAI = $SiO_2 + 2/3Al_2O_3 - TiO_2 - 2\,(Na_2O + K_2O) - 50$, where oxides are in molar percentages (mol%) on a volatile-free basis. The SAI values for partial melts from our compilation vary from –68 to 0 and thus set the recommended compositional range of this barometer at SAI ≤ 0. Assuming that experimental partial melts of spinel-peridotites are unknown natural magmas, this barometer can still predict melting *P* to well within ±0.5 GPa for those with negative SAI values (Fig. 3a), lending additional confidence to application of this barometer.

2.3. Thermometer calibration

To account for the *T* effect on this barometer, we also formulated a new *P*-dependent thermometer for determining the melting *T* of garnet-peridotite partial melts using the same experimental dataset

(Supplementary Table S1). The fundamental basis of this new thermometer is the well-known olivine-melt equilibrium (Roeder and Emslie, 1970) that governs the variations of MgO abundances in the melt as a function of *T*. This new *P*-dependent thermometer was calibrated through the following expression,

$$\begin{aligned}\frac{10^4}{T} &= \Omega - 0.34(\pm 0.06)\sqrt{P} - 1.26(\pm 0.10)\ln(\mathrm{MgO}) \\ \Omega &= 2.59(\pm 0.40) + 3.50(\pm 0.38)(\mathrm{CaO} - 2\mathrm{K_2O}) + 4.85(\pm 1.45)\mathrm{Ti_{1/2}O} + 1.40(\pm 0.23)\frac{\mathrm{MgO}}{\mathrm{MgO}+\mathrm{FeO}}, \\ &+ 0.50(\pm 0.04)\mathrm{MgO}\sqrt{\mathrm{CO_2}} + 0.057(\pm 0.001)\mathrm{H_2O}\end{aligned} \quad (5)$$

where *P* and *T* are in GPa and Kelvin, respectively; and all compositional parameters are the same as those in Eq. (3). To directly calculate *T*, we re-arranged Eq. (5) as

$$T = \frac{10^4}{\Omega - 0.34\sqrt{P} - 1.26\ln(\mathrm{MgO})} \ . \quad (6)$$

Fig. 2b shows that our new thermometer (Eq. 6) well reproduce the experimental *T* with 1σ of ±49 °C, indicating significant improvement over the previous models (cf. Fig. 1b).

The absolute uncertainties of this thermometer are also affected by the knowledge of *P* and volatile compositions. However, through sensitivity analyses (Supplementary Fig. S1), we found that the calibration uncertainty (±49 °C) of our new thermometer remains when we can determine *P* to within ±1 GPa, melt H_2O abundances to within ±3 wt%, or melt CO_2 contents to within ±5 wt%. Notably, the fundamental basis of our new thermometer is the olivine-melt chemical equilibrium, and thus this thermometer should also be applicable for partial melts of spinel-peridotites as well as differentiated melts at olivine saturation. To further test this, we also compiled a set of experimental melts from the literature (Supplementary Table S2). As shown in Fig. 3b, we found that our thermometer can also well reproduce the experimental *T* with 1σ error of ±34 °C for these olivine-saturated melts. Combining this new *P*-dependent thermometer (Eq. 6) with our *T*-dependent barometer (Eq. 4), we can iteratively solve the final-stage mantle equilibration *T* and *P* for primary melts that meet the compositional criterion (SAI ⩽ 0). For convenience of interested users, a simple Excel® spreadsheet is provided in the online Supplementary Material to implement the thermobarometry calculations with different choices of primary melt corrections (Section 2.4).

2.4. Primary melt corrections

It has been well known that natural primitive magmas (e.g., ≥8 wt%) derived from the mantle have undergone compositional modifications by various extents of olivine fractionation/accumulation and volatile degassing in addition to contamination and post-emplacement alteration (e.g., Becker and Le Roex, 2006). Thus, application of this new thermobarometer to natural magmas derived from the mantle requires constraints on primary melt compositions. As shown in Fig. 4a, olivine fractionation (accumulation) would result in systematic underestimation (overestimation) of the equilibrium *P*-*T*, while volatile degassing (CO_2 in particular) can lead to underestimation of *P* but overestimation of *T*. Importantly, the composition of mantle olivine (Fo = 100×Mg/(Mg+Fe) in mole) in equilibrium with the primary melts can also influence the corrected compositions of primary melts and hence the results of *P*-*T* calculations. As shown in Fig. 4b, the increase in Fo contents of mantle olivine can systematically shift the *P*-*T* results to higher values.

Following previous studies (Lee et al., 2009; Putirka, 2009), we could estimate the primary melt compositions by adding equilibrium olivine increments back into the differentiated magma or by subtracting accumulated/assimilated olivine from the primitive magma, until the magma achieves chemical equilibrium with a mantle composition. The key criterion of olivine correction is the chemical equilibrium between the melt and mantle source, which is commonly assessed using the Fe-Mg exchange coefficient (K_D) between the mantle olivine and the adjusted melt (Lee et al., 2009; Matzen et al., 2011). However, for magmatic systems with variable amounts of dissolved CO_2, a generalized model has not been developed to describe olivine-melt K_D. Although Dalton and Wood (1993) constructed a model to describe Fe-Mg K_D for olivine and carbonate minerals (instead of carbonate melts), their model generates olivine-melt K_D systematically larger than the experimentally determined values (Supplementary Fig. S3) and therefore is not applicable for olivine–carbonated melt equilibria.

Using the experimental dataset for our thermobarometer calibration (K_D = 0.28–0.66), we constructed a new parameterization of olivine-melt K_D for a wide range of peridotite-derived partial melts

$$\ln K_D = \left(\frac{X_{\mathrm{Fe^*}}^{\mathrm{ol}}}{X_{\mathrm{Mg}}^{\mathrm{ol}}}\right)\left(\frac{X_{\mathrm{Mg}}^{\mathrm{melt}}}{X_{\mathrm{Fe^*}}^{\mathrm{melt}}}\right) = -1.65(\pm 0.03) + 1.22(\pm 0.08)\sqrt{\mathrm{MgO}} + 2.45(\pm 0.24)\mathrm{Na_2O} + 0.54(\pm 0.06)\frac{\mathrm{H_2O}}{100}, \quad (7)$$

where X_{Mg} and $X_{\mathrm{Fe^*}}$ denote the molar abundances of Mg and total Fe (Fe*) cations, respectively, in olivine (ol) or melt. Equation (7) can predict the experimentally determined K_D values not only for the calibration dataset but also for partial melts of spinel-peridotites and differentiated melts at olivine saturation (Supplementary Table S2), with an overall 1σ error of ±0.03 (Fig. 5a). Note that the latter data serve as an independent validation of our K_D parameterization.

Accurate determination of volatile (CO_2 and H_2O) abundances in primary CO_2-rich melts remains a challenge. A complete solution requires precise measurements of volatile contents in natural CO_2-rich glasses and well-calibrated models for volatile solubility in CO_2-rich melts. The former remains impractical as natural CO_2-rich melts are rarely quenched into glasses; the latter has been experimentally investigated in recent studies (Moussallam et al., 2016; Morizet et al., 2017) but a generalized model has not been established for natural magma compositions. As shown in several experimental studies on CO_2-bearing peridotite systems (Dasgupta et al., 2007, 2013; Ghosh et al., 2014; Stamm and Schmidt, 2017; Sun and Dasgupta, 2019), CO_2 abundances in the melts manifest a robust inverse correlation with SiO_2 contents in the melts. Using the experimental dataset for our thermobarometer calibrations, we found that the following expression can empirically predict CO_2 contents in the garnet-peridotite partial melts with ≤48.6 wt% SiO_2 to well within ±4 wt%

$$\mathrm{CO_2} = 43.77(\pm 0.54) - 0.90(\pm 0.02)\mathrm{SiO_2}, \quad (8)$$

where CO_2 and SiO_2 are both in wt% on a H_2O-free basis. The 1σ error is ±2 wt% (Fig. 5b) and does not appear to have appreciable effects on the calculated *P-T* (Fig. 4a and Supplementary Fig. S1). In peridotite-derived partial melts with high SiO_2 (>48.6 wt%), CO_2 contents can be effectively taken as zero. Although H_2O in the primary melt is a free parameter, the expected uncertainties in the thermobarometry results are <0.25 GPa and <50 °C for an uncertainty of ±3 wt% in the primary H_2O content (Fig. 4a and Supplementary Fig. S1).

3. Application to natural kimberlites

3.1. Data compilation and filtering criteria

For application of our new thermobarometer to parental kimberlitic melts, we constructed a global dataset of natural kimberlite compositions from the literature using the online GEOROC database (http://georoc.mpch-mainz.gwdg.de/georoc/) as an initial guideline together with several recent studies (see Supplementary Table S3-S4). Only volcanic kimberlites with information of locations, eruption ages, and major element compositions were used. Comparing with the original references, we corrected typographic errors and added information of eruption ages and cratonic settings that were missing in the GEOROC database. Following the recent modification of kimberlite nomenclature (Mitchell, 1986; Pearson et al., 2019), we excluded orangeites (previously named as Group II kimberlites) from the compilation. In addition, we also screened out kimberlite samples that were recently re-named as lamproites, lamprophyres, or aillikites. Kimberlite samples with high SiO_2 contents (>45 wt% on the volatile-free basis) were excluded as they should not belong to kimberlites (i.e., silica-undersaturated). Because highly evolved kimberlites likely have undergone extensive fractionation of other phases (e.g., perovskite) in addition to olivine, they are not suitable for estimating primary melt compositions through the approach outlined above, and accordingly we excluded those with low MgO contents (i.e., <8 wt%).

Crustal contamination has been considered as a major concern in previous studies on natural kimberlites. To screen for uncontaminated kimberlites, the contamination index (C.I.) of Clement (1982) has been widely used (e.g., C.I. ≤ 1 by Kjarsgaard et al. (2009)). However, applying C.I. to our compiled experimental melts that are not subject to any "crustal contamination", we obtained a wide range of C.I. values (= 0.4–6.1; Supplementary Fig. S4), which erroneously indicate that most experimental melts (C.I. > 1) should have experienced extensive "crustal contamination". As shown by the experimental melts (Supplementary Fig. S4), the calculated C.I. values are strongly dependent on SiO_2 (or CO_2), and hence this C.I. filter (e.g., ⩽1) would yield a much smaller subset of "uncontaminated" kimberlites biased towards systematically lower SiO_2 (or higher CO_2). To avoid such a biased filtering, we relied mainly on the petrographic assessments in the original references and accordingly excluded samples that were severely altered or contaminated by crustal materials and/or fragments of mantle xenoliths.

Post-emplacement serpentinization and assimilation of orthopyroxene have also been considered as important processes influencing the major element compositions of natural kimberlites (e.g., Mitchell, 1986). However, the extents of serpentinization and orthopyroxene assimilation remain ambiguous as their estimations postulate prior knowledge of primary kimberlite melt compositions. According to a recent study on oceanic peridotites (Malvoisin, 2015), extensive serpentinization could systematically decrease MgO/SiO_2 of ultramafic rocks by ~5% relative to unaltered ones, which may be taken as an independent estimation of the extent of serpentinization for natural kimberlites. Assimilation of orthopyroxene, if any, appears to be limited to < 7 wt% (Brett et al., 2009) when coupled with olivine crystallization. Taking these numbers as a rough reference, we found that the uncertainties associated with serpentinization and assimilation of orthopyroxene are rather small (e.g., ±0.1–0.5 GPa and ±5–35 °C; Supplementary Fig. S5). With this notion, we argue that after filtering, post-emplacement serpentinization and orthopyroxene assimilation have negligible influences on the thermobarometry results of our compiled global kimberlites.

We noted that the oldest kimberlite cluster (1.92 Ga) with major element compositions was reported at Kimozero, Baltic shield (Priyatkina et al., 2014). Although Kimozero kimberlites have been metamorphosed extensively, they were still included here for comparison with younger clusters. As experimental partial melts of garnet-peridotites with various amounts of dissolved volatiles generally have MgO ≥10 wt% (Sun and Dasgupta, 2019), we adopted a conservative screening approach and also excluded the corrected primary melts with MgO < 10 wt% (see Section 3.2 for corrections). The aforementioned filtering approach resulted in a global dataset of 1435 kimberlite samples with eruption ages of 0.009–1920 Ma. These samples are from 97 clusters/fields including 56 clusters from cratonic regions and 41 from off-cratonic regions (Supplementary Fig. S6 and Tables S3–S4). Each cluster/field contains one or multiple adjacent kimberlite pipes with the same or similar eruption ages.

3.2. Primary melt compositions

Through adjusting olivine fractionation/accumulation, previous studies (e.g., Le Roex et al., 2003; Kopylova et al., 2007) have estimated primary kimberlite compositions but have not reached a consensus mainly due to different criteria of olivine corrections and the lack of quantitative constraints on volatile degassing. With our new generalized model for olivine-melt Fe-Mg exchange coefficients (Eq. 7) for CO_2-rich magmas, we could then estimate the primary melt compositions of natural kimberlites on a CO_2-free basis by adjusting olivine fractionation and/or olivine accumulation/assimilation until the magma achieves chemical equilibrium with a mantle composition. To reduce potential uncertainties from the selection of mantle compositions (Fig. 4b), we statistically examined the olivine compositions from global cratonic peridotite xenoliths. As shown in Supplementary Fig. S7, olivine with 92 mol% forsterite could well represent the cratonic mantle at final equilibration of major elements with the primary kimberlite melts and thus was used in our thermobarometry calculations for global kimberlites. The *P*-*T* uncertainties for the global compilation are less than 0.5 GPa and 50 °C for a ±0.5 mol% uncertainty in olivine Fo of the mantle source (Supplementary Fig. S8).

To correct for CO_2 degassing, we estimated CO_2 contents in primary kimberlites using the experimentally defined empirical relation between CO_2 and SiO_2 in garnet-peridotite partial melts (Eq. 8). Given the small effect of H_2O on the thermobarometry results (Fig. 4a and Supplementary Fig. S1), we selected the median value (4 wt%) of the previously suggested H_2O range (0–9 wt%; see Stamm and Schmidt, 2017; and references therein) as the nominal value for primary kimberlitic melts. To further test the H_2O effect, we also performed thermobarometry calculations for our global compilation by varying the primary H_2O content from 0 to 10 wt%. As shown in Supplementary Fig. S9, the expected uncertainties in the global thermobarometry results are only ~±50 °C and ±0.25 GPa for an uncertainty of ±3 wt% in the primary H_2O content.

Applying the aforementioned correction scheme, we estimated the primary melt compositions of all kimberlite samples in our global compilation (Fig. 6). The estimated primary melt compositions manifest considerable variations (e.g., SiO_2 = 4.5–55.8 wt%, MgO = 10.8–42.0 wt%, FeO = 5.5–15.2 wt%, CaO =

0.3–47.8 wt%, and Al_2O_3 = 0.5–15.3 wt% on a volatile-free basis), indicating that natural kimberlite magmas evolve from diverse primary melts with different final equilibration *P*-*T* in the mantle. Nevertheless, the estimated primary melts are compositionally comparable with the experimental partial melts derived from garnet-peridotites with variable amounts of $CO_2 \pm H_2O$ at 900–1968 °C and 1.6–10 GPa (Fig. 6). Such a compositional similarity suggests that the generation of primary kimberlite melts also took place under comparable *P*-*T* conditions.

3.3. Temperatures and pressures of global kimberlites

Applying our thermobarometer to the corrected primary melts, we iteratively calculated the final-equilibration *P*-*T* for the compiled samples (N = 1435; Supplementary Table S4). The global *P*-*T* results mostly fall within 1130–1730 °C and 2.5–9.5 GPa, i.e., below the volatile-free peridotite solidus (see probability density curves in Fig. 7a). Among the global kimberlites, less than 4% samples fall within the *P*-*T* range defined by cratonic mantle xenoliths (light green region in Fig. 7a), likely at final equilibration within the lithosphere or directly derived from melting of lithosphere fluxed by volatiles. In addition, ~16% samples also show *T* lower than the present-day ambient mantle but greater than the cratonic xenoliths at similar depths (Fig. 7a), indicating incomplete re-equilibration with the lithosphere during transport or alternatively melting of a thermally perturbed lithosphere. More than 80% samples appear to have *T* comparable with or greater than the present-day ambient mantle. Given the wide range of kimberlite eruption ages (0.009–1920 Ma), estimation of their *T* relative to the ambient mantle has to take into account the progressive cooling of the ambient mantle, which has been demonstrated by several lines of evidence from petrology and thermal modeling (e.g., Richter, 1984; Korenaga, 2006; Herzberg et al., 2010). To do so, we plotted the *P*-*T* results for individual clusters together with the ambient mantle potential *T* (T_p) adjusted for secular cooling (see Appendix A) in Supplementary Fig. S10. As two representative examples, the *P*-*T* results of Letseng and Premier kimberlite clusters are shown in Fig. 7b-c together the mantle xenoliths from the same locations.

Among the global dataset, kimberlite samples from 49 clusters manifest *T* greater than those of cratonic mantle xenoliths (light green region in Fig. 7 and Supplementary Fig. S10) but within or greater than the time-corrected ambient mantle values (e.g., Letseng in Fig. 7b). This indicates that their last-stage equilibrium depths are not within the lithosphere but instead at the LAB atop the convecting, ambient mantle or mantle plumes. Accordingly, their average *P* could approximate the lithosphere thickness, while their average *T* can be used to calculate the mean mantle T_P (Appendix A) for individual kimberlite clusters. However, kimberlite samples from 48 clusters appear to have *T* extended below the ambient mantle T_p (e.g., Premier in Fig. 7c), suggesting evident lithospheric imprints in their final-stage mantle equilibration *P*-*T*. In this case, we excluded samples below the reference T_p of the ambient mantle (i.e., labelled as "lithosphere-modified" in Fig. 7c) to minimize the effect of lithospheric modification on the estimation of lithosphere thickness and T_p of kimberlite mantle sources.

In addition, among the 48 clusters, 3 appear to have samples all below the ambient mantle T_p and hence can only provide minimum bounds of the lithosphere thickness. Overall, we successfully calculated the lithosphere thickness and kimberlite mantle T_p for 94 clusters including 53 clusters from 21 cratons and 41 clusters from off-cratonic regions (see results in Supplementary Table S3). Using these results, we could then examine (1) the temporal-spatial variations of lithosphere thickness and (2) thermal-magmatic processes affecting the lithosphere root at cratonic and off-cratonic settings.

4. Implications for cratonic lithosphere stability

4.1. Temporal-spatial variations of lithosphere thickness

We found that 6 cratons with multiple clusters display significant decreases in lithosphere thickness at various time intervals, including Wyoming, Rae, Slave, Baltic, Dharwar, and Kalahari cratons (Fig. 8a). Wyoming craton appears to have undergone a removal of ~40 km thick lithospheric root (~240–200 km) during 408–48 Ma, consistent with the destruction event inferred from xenoliths (Carlson and Irving, 1994) and seismic velocities (Dave and Li, 2016). Although the lithosphere thicknesses of Rae and Slave cratons are thinner than that of Wyoming craton by ~50 km, they also manifest decreases from ~540 to ~50–90 Ma.

With the largest time interval of kimberlite magmatism (1920–360 Ma), Baltic craton shows a lithosphere thinning by up to ~100 km. Similar extents of thinning were also observed at Dharwar and Kalahari cratons. Dharwar lithosphere appears to be thinned from ~230–270 km at 1097–1400 Ma to 165 km at 90 Ma, while Kalahari lithosphere depicts thinning by up to ~70 km from 1152 to 106 Ma.

Notably, the lithosphere thicknesses of Kalahari craton were highly variable (~170–240 km) at 80–106 Ma, suggesting heterogeneous rates of thinning at local regions. Local variabilities also appear at 4 other cratons with multiple kimberlite clusters (West African, Congo, Superior, and North Atlantic cratons; Fig. 8b). West African craton shows a negligible variation in lithosphere thickness (256–251 km) at 830–143 Ma and thus likely has been stable until 143 Ma. In contrast, Congo lithosphere thickness increased from ~170 km at 372 Ma to ~190 km at 32 Ma, while Superior lithosphere was thickened from ~180 km at 638 Ma to ~220 km at 522 Ma. In addition, North Atlantic craton at selected regions also likely underwent lithosphere thickening or at least lack of evident thinning in that the local lithosphere is much thicker (~305–310 km) than coeval cratonic regions (<~250 km at 583–160 Ma).

Taken collectively, the depths of kimberlite-mantle equilibration reveal a systematic decrease in cratonic lithosphere thickness by up to ~150 km over the past 1.9 Gyr and an increasing thickness variation at localized cratonic regions through time (Fig. 8a-b). The observed thinning and dispersion of cratonic lithosphere thickness through time are also supported by the North China craton with two coeval kimberlite clusters (Fig. 8a) and 10 other cratons with single kimberlite clusters (Kimberley, Amazonian, Rio de la Plata, Sao Francisco, West Australian, Tanzania, Ukrainian, Aravalli, Bastar and Siberian cratons; Fig. 8b). The estimated lithosphere thicknesses of off-cratonic regions agree with the global trend defined by cratonic lithosphere (Fig. 8b), suggesting that the observed lithosphere thinning at cratons likely has also been operating at non-cratonic continental roots.

4.2. Thermal-magmatic processes and lithosphere destabilization

Because mantle melts at cratons is restricted to volatile-induced magmatism, kimberlite magmas from the lithosphere root can be argued to carry unique insight into the destabilization of cratonic lithosphere (Foley, 2008; Jelsma et al., 2009; Foley and Fischer, 2017). In addition to the secular thinning of lithosphere (Fig. 8a-b), we also observed large variations of mantle T_p responsible for kimberlite magmatism at LAB (Fig. 8c-d). Of the 94 kimberlite clusters, 51 have T_p within the range of ambient mantle, whereas the other 43 show excess T_p of ≤130 °C, indicating ambient mantle and plume origins, respectively. For some "young" kimberlites (<160 Ma) with excess T_p, plume-related thermal anomalies could also be tested by their locations relative to known hotspot tracks. For instance, the 158-Ma kimberlite cluster at Superior craton is along Great Meteor hotspot track (Heaman and Kjarsgaard, 2000), and many kimberlite clusters (≤150 Ma) at the southern African area can be linked to South Atlantic hotpots (Hu et al., 2018). The ambient mantle origin of some kimberlite clusters is also supported by the lack of location overlaps with hotspot tracks (e.g., Jericho kimberlite at Slave craton; Kjarsgaard et al., 2017). These two origins indeed have been proposed previously (Mitchell, 1986; Jelsma et al., 2009; Stamm and Schmidt, 2017; Dasgupta, 2018; Tappe et al., 2018; Sun and Dasgupta, 2019) as competing hypotheses, while our results here demonstrate that both are equally important. Another notable observation is the striking temporal correlation between the kimberlite frequency and lithosphere thickness since ~2 Ga (Fig. 9a). Secular cooling of the ambient mantle (Fig. 8c-d) has been proposed to enhance the kimberlite magmatism through incipient mantle melting with a constant cratonic lithosphere lid (Tappe et al., 2018). However, this hypothesis is challenged by the observed secular thinning of cratonic lithosphere and excess T_p of many kimberlite clusters (Fig. 8).

A frequently proposed model for cratonic lithosphere destruction, based on the apparent link between kimberlite locations and hotspots, is the thermal-magmatic erosion (Foley, 2008) or its recent equivalent, plume-triggered delamination (Hu et al., 2018), which involves plume activities, kimberlite magmatism, and subsequent delamination of compositionally densified lithosphere roots. Without involving mantle plume activities, other mechanisms have also been hypothesized for lithosphere destruction, such as convective removal (Conrad and Molnar, 1997) and water-induced rheological weakening (Li et al., 2008). Our new findings of secular lithosphere thinning (Fig. 8a-b), global kimberlite T_p variations (Fig. 8c-d), and the temporal correlation between kimberlite frequency and lithosphere thickness (Fig. 9) are not inconsistent with any of these hypotheses. However, our observations likely shed more nuanced light on the modification process at the lithosphere root.

Considering the isotopic evidence of recycled oceanic materials in kimberlite sources (Nowell et al., 2004; Gaffney et al., 2007), our findings suggest that the flux of asthenosphere-derived CO_2-rich melts at the lithosphere root, as indicated by the kimberlite frequency, could be enhanced by deep subduction of carbonated oceanic crusts (Fig. 9a). During deep subduction, carbonated oceanic crusts release carbonatite melts (Thomson et al., 2016) that can initiate kimberlitic melt generation through reactive flux melting in the ambient mantle, and/or via carbonation or redox freezing and later re-melting of metasomatized peridotites (Sun and Dasgupta, 2019) in the ambient or plume mantle. When migrating to the thick lithosphere root, these liquids remain as incipient melts enriched in CO_2 and H_2O. The source of CO_2-rich fluid at the kimberlite source region does not have to entirely derive from subducting crusts; however, as informed from the diverging bimodal distribution of metamorphic thermal gradients (Holder et al., 2019), cold subduction becomes gradually dominant since ~2 Ga (Fig. 9a), which should facilitate deep subduction of carbonated oceanic crusts (Dasgupta, 2013) and further enhance the total flux of CO_2-rich melts at the lithosphere root.

Subsequent migration of proto-kimberlite melts directly from the deep upper mantle to surface, however, is hindered by the carbonation freezing front (Sun and Dasgupta, 2019) at the cold, thick lithosphere root (cf. CFF in Fig. 7a). When transient fractures or suture zones are activated by tectonic processes or mantle plume activities, through these channels, primary kimberlite melts can rapidly migrate across CFF, and some may successfully reach the surface. Such a multi-stage process for kimberlite magmatism is also supported by studies on polymineralic inclusions in kimberlite megacrysts (Bussweiler, 2019). Importantly, due to CFF, most kimberlite melts from the deeper mantle likely hibernate and accumulate as carbonates or in localized melt pockets at the base of the lithosphere (Fig. 9b). These hibernating kimberlites can chemically metasomatize and more importantly weaken the lithosphere rheologically by water (Hirth and Kohlstedt, 1996) and perhaps as well by facilitating grain boundary sliding. Such a weakened, metasomatized lithosphere root is then readily subject to destruction by convective removal (Conrad and Molnar, 1997) in the ambient mantle and/or plume-driven thermo-magmatic erosion (Foley, 2008). Depending on local tectonics and plume activities, these destabilization processes could generate regional variations of lithosphere thickness. Given the strong temporal coincidence between global kimberlite frequency and lithosphere thickness (Fig. 9a), proto-kimberlite magmas most likely serve as an essential destabilization agent and thereby govern the first-order erosion of the lithosphere root at cratonic and off-cratonic settings.

Although we prefer a causal link between CO_2-rich melt induced weakening of the LAB regions and gradual erosion of the lithosphere through time, it is certainly possible that the final depth of kimberlite-mantle equilibration simply tracks the lithospheric thickness that is modulated by independent processes. In fact, an increased frequency of kimberlite eruption in more recent geologic history may also be facilitated by a thinner lithospheric cap. Even in such a case, our thermobarometry results of kimberlitic melts yield an independent and unique record of lithospheric thickness through time globally and open investigations about other processes of lithospheric destruction and their temporal link to kimberlite magmatism.

5. Concluding remarks

Our newly developed thermobarometer for silica-poor and CO_2-rich, mantle-equilibrated melts enables a quantitative constraint on the temperature and depth of silica-undersaturated magmas during their generation and/or at their final equilibration in the mantle. The first application of this new thermobarometer to global kimberlite clusters reveals that the equilibration depths of older kimberlitic mantle melts are mostly deeper than those of the younger ones. These results can be interpreted as evidence supporting destabilization of lithosphere root at cratonic and off-cratonic mantle globally since ~2 Ga with an extent of thinning by up to ~150 km. Combined with the concurrent increases of kimberlite volcanism frequency and cold subduction flux, our results suggest that the asthenosphere-derived CO_2-rich melt, enhanced by deeply subducted carbonated oceanic crusts, is a key factor modulating the erosion of thick lithosphere over the ambient mantle or mantle plumes through time. We emphasize that this does not imply an immediate link between subduction and kimberlite eruption at the surface. Instead, due to carbonation freezing (Sun and Dasgupta, 2019), these proto-kimberlite melts mostly hibernate and accumulate at the cold lithosphere root, while waiting to erupt through transient channels activated by (later) tectonic processes or plume activities. With abundant volatiles (CO_2 and H_2O), these hibernating kimberlite melts can destabilize the lithosphere through rheological weakening and enable efficient thinning by convective removal and/or thermal-magmatic erosion. Furthermore, such CO_2-rich liquids, hibernating as carbonates or localized melts, at the lithospheric root may also establish a significant carbon reservoir that could cause an immediate impact on the atmospheric CO_2 budget during later formation of large igneous provinces.

In closing, several points are worth noting for the kimberlite thermobarometry and its constraints on lithosphere thickness. As natural kimberlites are likely subject to various extents of alteration and contamination in addition to the processes considered here for primary melt corrections (olivine fractionation/accumulation and volatile degassing), the accuracy of our thermobarometry results depends on the available information of petrography and geochemistry of kimberlite samples in the literature. Given our cautious data screening and the large body of filtered samples (N = 1435), we consider that our thermobarometry results for global kimberlites remain robust in the first order. Additional uncertainties on estimation of lithosphere thickness come from the filtering of samples with lithosphere imprints in the equilibration *P*-*T*. Here, we took the widely used ambient mantle T_p as a reference (see Appendix A) to identify samples with lithosphere-like equilibration *P*-*T* (i.e., below the ambient mantle T_p). Using a 50 °C cooler reference T_p, however, would not alter our results of cratonic lithosphere thickness variations. Finally, we suggest that future tests of the spatial-temporal variations of cratonic lithosphere thickness should involve systematic investigations of both kimberlites and peridotite xenoliths from the same kimberlite location. Yet, peridotite xenoliths should be examined with caution because the disequilibrium effect can significantly alter their apparent equilibrium *P*-*T*.

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Appendix A. Potential temperature calculation

The mantle potential temperatures (T_p) were calculated for individual kimberlite clusters using the expression (Mckenzie and Bickle, 1988)

$$T_p = T_i \exp\left(-\frac{\alpha H}{\rho C_p} P_i\right), \tag{A.1}$$

where T_i and P_i are the temperatures (in K) and pressures (GPa) of mantle sources at individual kimberlite clusters; α is the thermal expansion coefficient of the solid mantle (= 3×10^{-5} K^{-1}); ρ is the mantle density (= 3.3×10^{3} kg m^{-3}); C_p is the specific heat of the mantle (= 1200 J kg^{-1} K^{-1}); and H is the conversion factor (= 10^9) for pressure (P) in GPa. Here, it is unnecessary to correct the heat of fusion in Eq. (A.1) for kimberlites, as they are incipient melts well below the dry peridotite solidus (Fig. 7a). The potential temperatures derived from Eq. (A.1) are similar to those calculated using a previous method (Putirka, 2009).

The potential temperature of ambient mantle was adjusted for secular cooling from 1550–1650 °C at 2 Ga (Herzberg et al., 2010) to 1300–1400 °C at present (Lee et al., 2009) by a linear rate of 0.125 °C/Myr. According to Eq. (A.1), the adiabatic T profile (T_{ad}) of the ambient mantle was then calculated at a given time (t in Ga) through

$$T_{ad} = \left(T_{p0} + 0.125 \cdot t\right) \exp\left(\frac{\alpha H}{\rho C_p} P\right), \tag{A.2}$$

where $t = 0$ denotes the present-day and T_{p0} indicates the present-day mantle adiabat.

Appendix B. Supplementary Material

Supplementary material related to this article can be found online.

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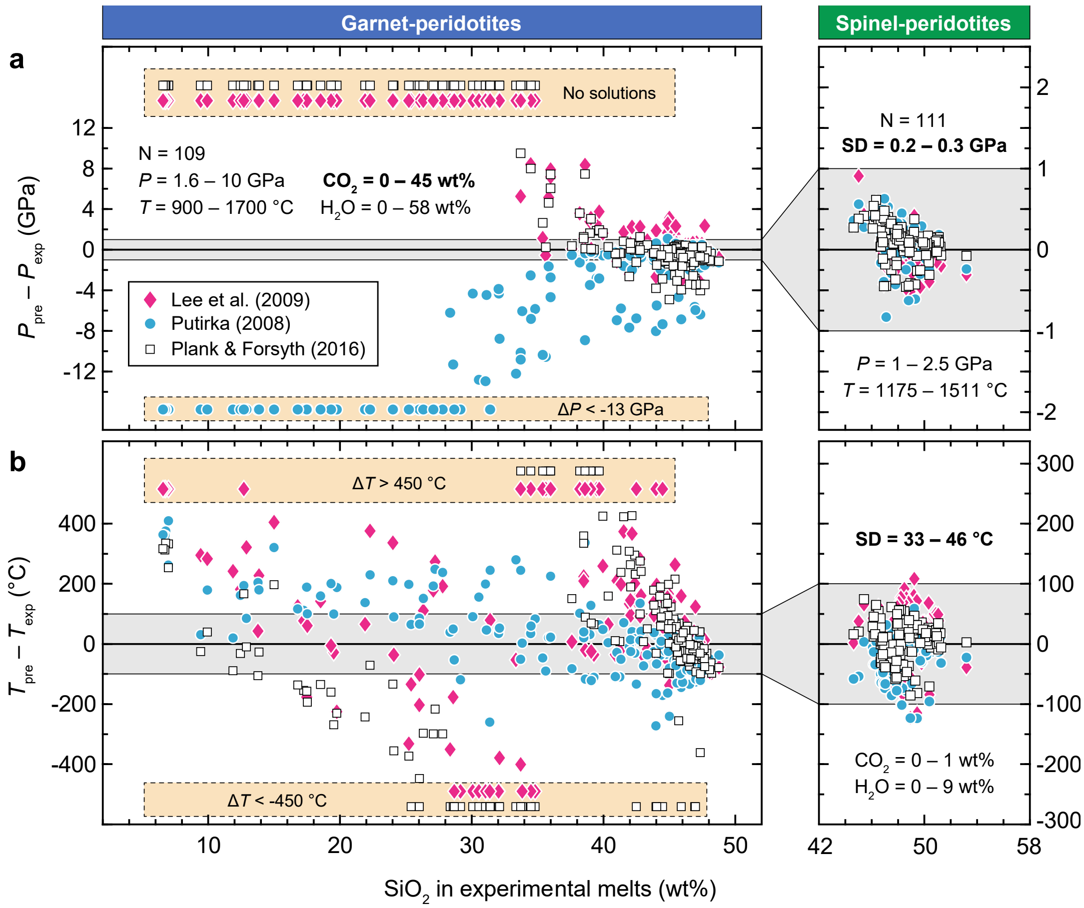

Figure 1. Tests of existing liquid-based thermobarometers. (a-b) The differences (Δ) in pressures and temperatures between thermobarometer (Lee et al., 2009; Putirka, 2009; Plank and Forsyth, 2016) predictions (P_{pre} and T_{pre}) and experimental values (P_{exp} and T_{exp}) are plotted against melt SiO_2 on a volatile-free basis. As the previous barometers are based on the melt silica activity buffered by olivine and pyroxene, we only used the experimental melts saturated with both olivine and pyroxene (± other phases). Solid horizontal lines indicate the perfect agreement between the model calculations and experimental values, while grey bands mark the ±1 GPa and ±100 °C uncertainties. Note that solutions of pressures and temperatures do not exist or become seriously erroneous for melts with <40 wt% SiO_2. Melting experiments for garnet-peridotites are listed in Supplementary Table S1, while those for spinel-peridotites are listed in Supplementary Table S2. The standard deviations (SD) between the predicted and measured values mark the 1σ errors of previous models.

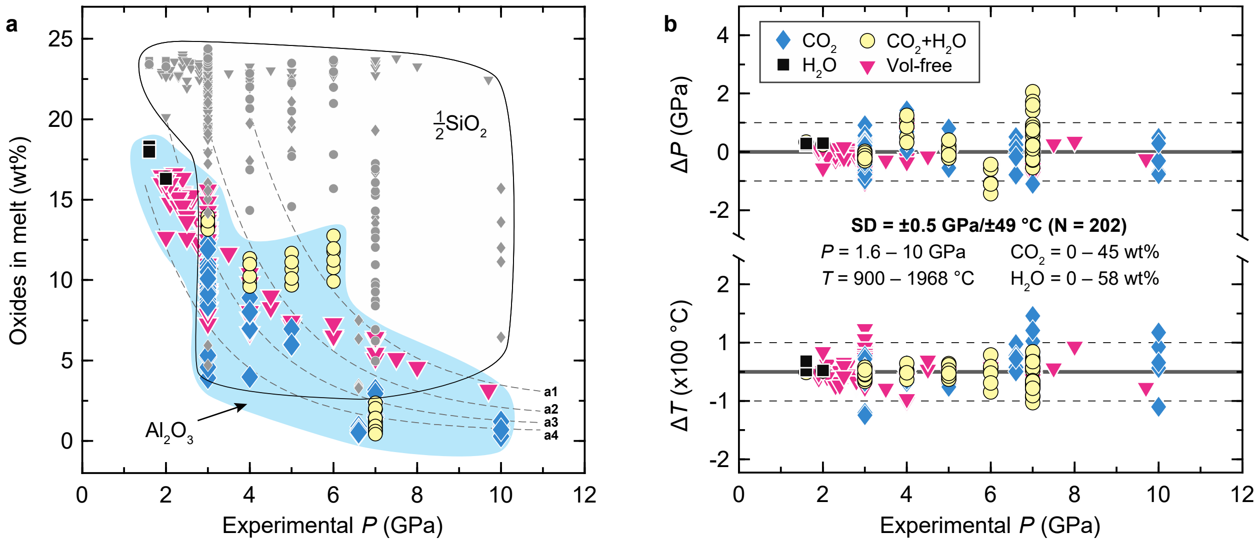

Figure 2. A new thermobarometer for silica-poor mantle melts. (a) Al_2O_3 and SiO_2 contents in experimental melts (Supplementary Table S1) are shown as functions of experimental pressures (P). (b) P and T differences (ΔP and ΔT) between thermobarometer predictions and experimental values are plotted against experimental P. Inset in (b) shows the 1σ uncertainties (mean standard deviations, SD, ±0.5 GPa and ±49 °C) of the thermobarometer, experimental conditions, and volatile contents in experimental melts. Dashed lines labeled *a1-a4* in (a) show results of calculations using Eq. (5) and parameters listed in Supplementary Table S5.

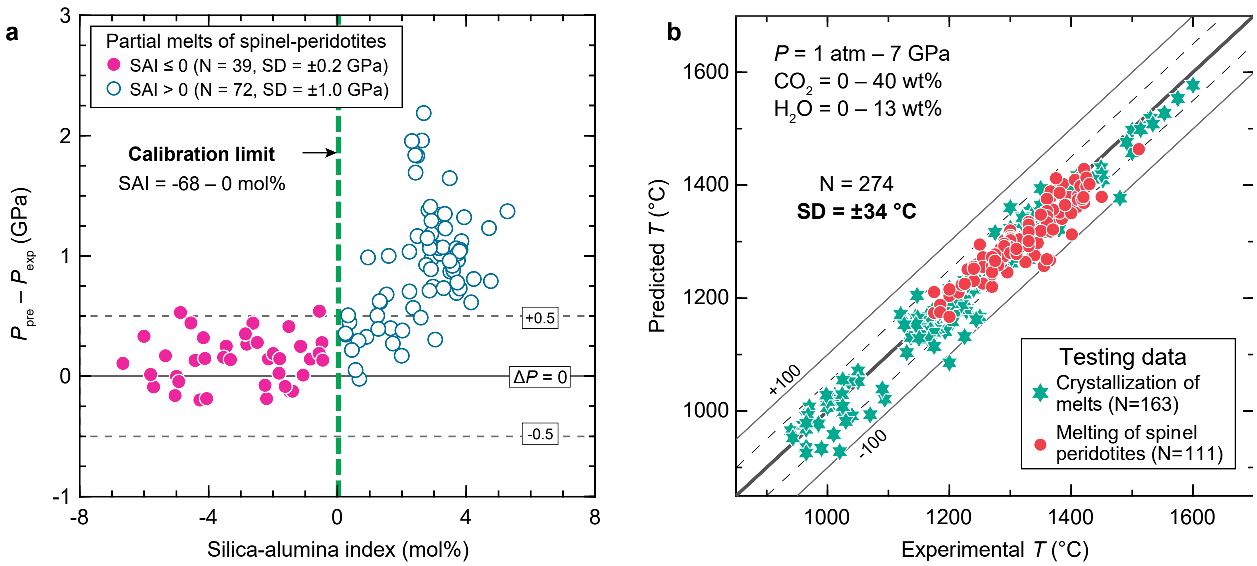

Figure 3. Tests of the new barometer and thermometer using independent experimental data. (a) The differences between the predicted pressures (P_{pre}) and experimental values (P_{exp}) are shown as functions of silica-alumina index (SAI) of the experimental partial melts from spinel-peridotites. See details of the experiments in Supplementary Table S2. Dashed green lines indicate the upper limits of SAI (-68–0 mol%) in the experimental partial melts from garnet-peridotites used for barometer calibration (Supplementary Table S1). Note that the SAI criterion is a clear cutoff for the validity of this barometer. (b) The predicted temperatures (T) are compared with the experimental values for melt crystallization or multiple-phase saturation and spinel-peridotite partial melting (Supplementary Table S2). The experimental melts shown in (a-b) cover a wide range of P (1 bar – 7 GPa) and volatile contents (CO_2 = 0–40 wt%, and H_2O = 0–13 wt%). The standard deviation (SD) between the predicted and experimental T indicates that the 1σ error of this new thermometer is ±34 °C for these experiments.

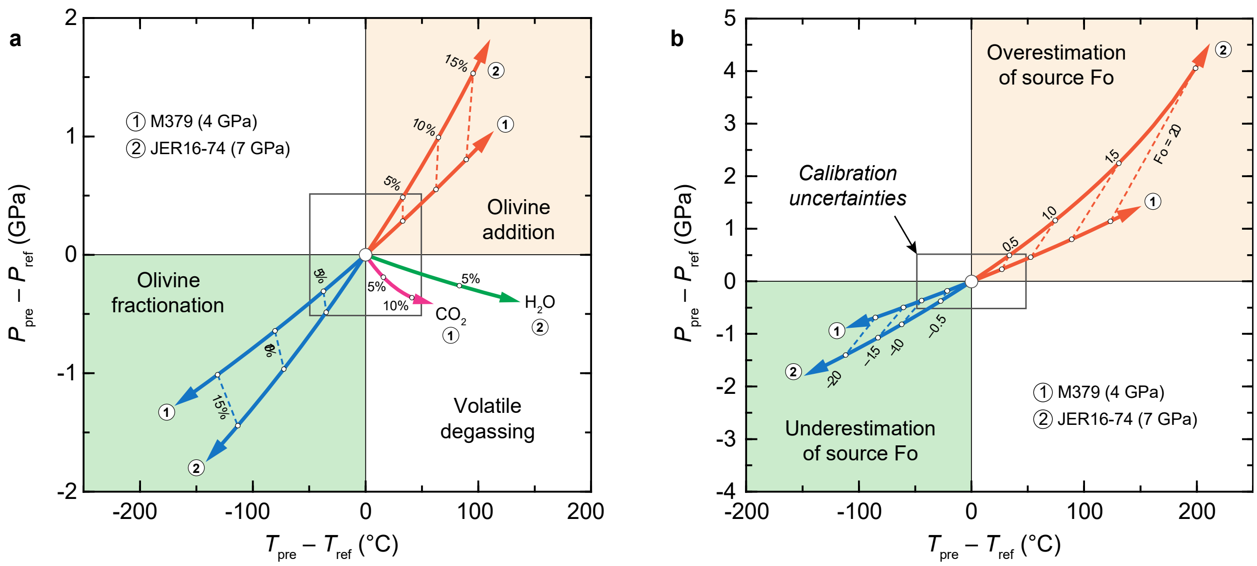

Figure 4. Sensitivity tests of the new thermobarometer for fractionation/addition of olivine, degassing of volatiles, and uncertainties in mantle source compositions. (a) Deviations of the predicted P (P_{pre}) and T (T_{pre}) from the reference values (P_{ref} and T_{ref}; see Supplementary Table S6) are shown for different extents of olivine fractionation, olivine addition, or volatile degassing. The addition (i.e., accumulated or assimilated) of olivine in (a) was assumed to have 92 mol% Fo, while the fractionated olivine in (a) was assumed to be in equilibrium with the melts following a fixed Fe-Mg exchange coefficient (K_D = 0.3). (b) Uncertainties of the predicted P and T are shown for over- or under-estimations of olivine Fo in the mantle source. Results in (b) were calculated using melt composition dependent K_D (Eq. 7).

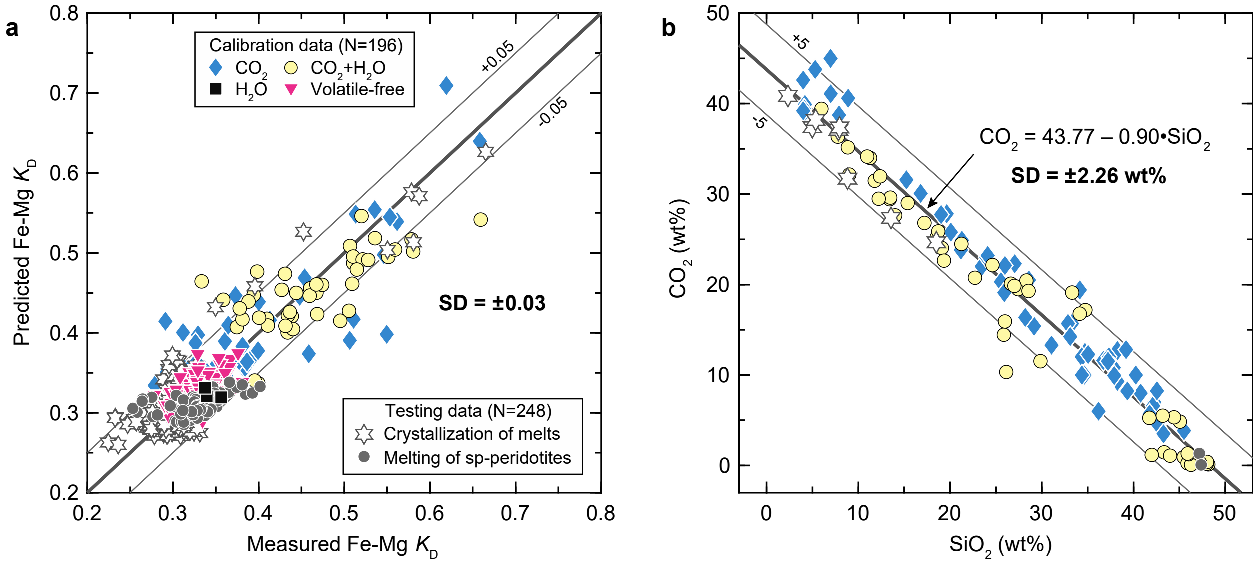

Figure 5 Generalized models for primary melt corrections of olivine fractionation/addition and CO_2 degassing. (a) The new olivine-melt Fe-Mg equilibrium model (Eq. 7) predicts K_D values in good agreement with the experimentally measured values. (b) The empirical expression (Eq. 8) well predicts CO_2 contents in the experimental melts according to melt SiO_2 contents on a H_2O-free basis. Standard deviations (SD) between the predicted and measured values mark the 1σ errors of the two models. The new K_D model (Eq. 7) can also be independently tested using experimental data on melt crystallization and spinel-peridotite partial melting (Supplementary Table S2). Because some experiments were not reported with olivine compositions, the total number of calibration experimental data (N = 196) is less than that (N = 202) shown in Fig. 2, and the total number of testing experiments (N = 248) is less than that (N = 274) shown in Fig. 3b.

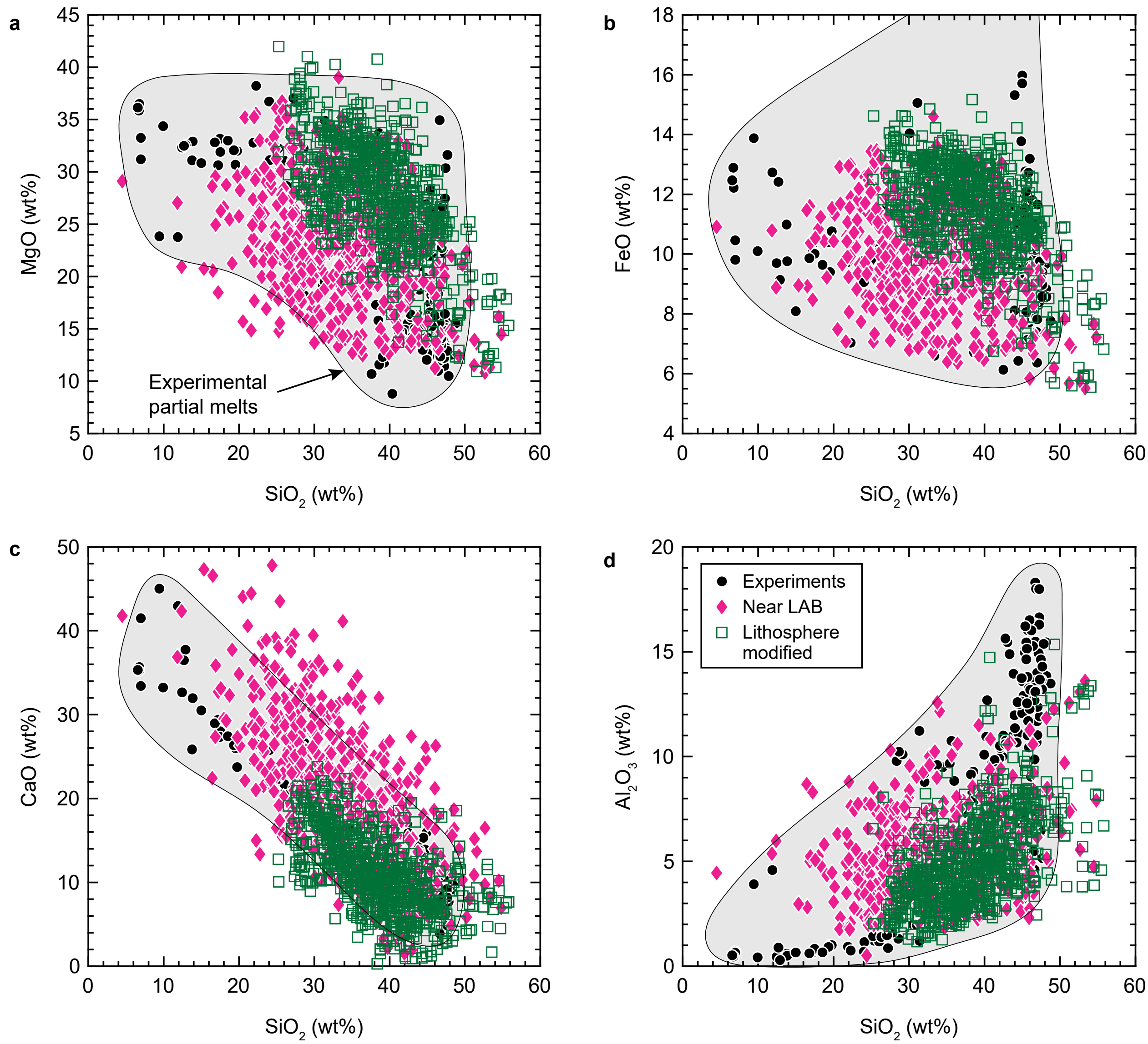

Figure 6. Estimated compositions of primary kimberlite melts. (a-d) MgO, FeO, CaO, and Al_3O_3 contents in the primary kimberlite melts are plotted as functions of SiO_2. The primary kimberlite melts are divided into two groups according to their T_p differences with the reference ambient mantle values (see Appendix A). "Near LAB" denotes kimberlite samples with $T_p \geq$ the reference mantle value, whereas "Lithosphere modified" indicates samples with $T_p <$ the reference mantle value. The experimental data (black dots outlined by grey shaded field) from our thermobarometer calibration (Supplementary Table S1) are also shown for comparison. The major oxides in primary kimberlite melts and experimental partial melts are normalized on a volatile-free basis.

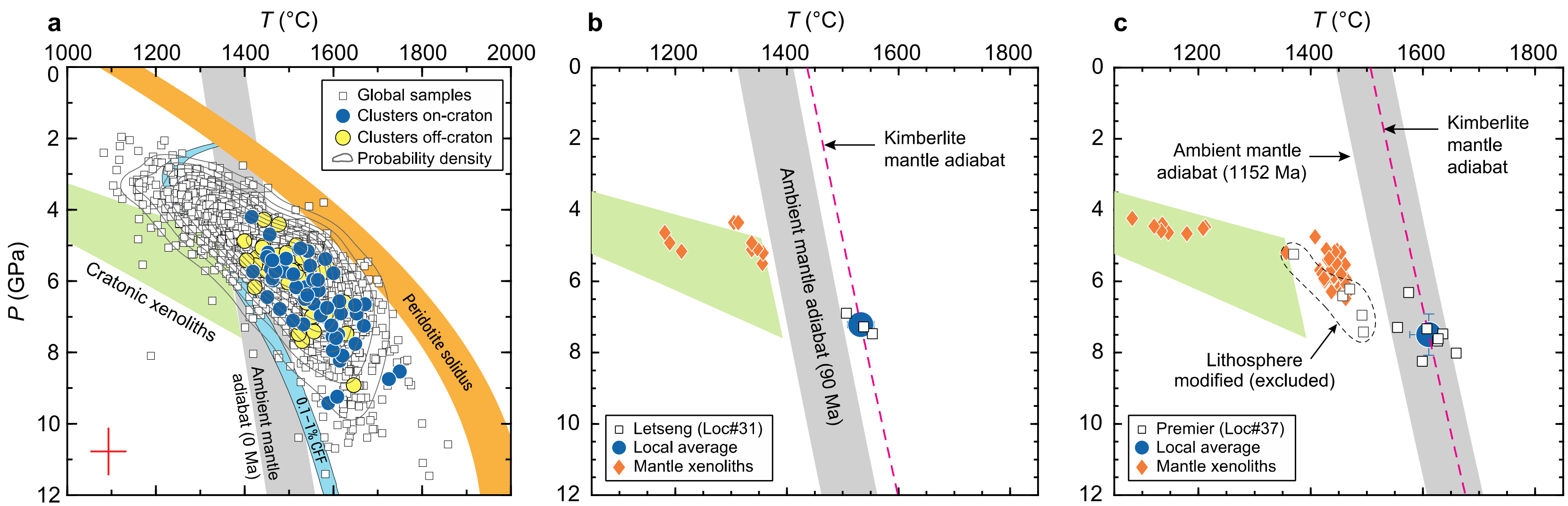

Figure 7. Thermobarometry results of global kimberlites. Temperatures (*T*) are shown as a function of pressures (*P*) for the global kimberlite dataset (a) and two representative kimberlite clusters (Letseng and Premier; b-c). Orange band in (a) indicates the nominally volatile-free peridotite solidus (Zhang and Herzberg, 1994; Herzberg et al., 2000; Hirschmann, 2000), and light blue band in (a) show the carbonation freezing fronts (CFF; Sun and Dasgupta, 2019) for 0.1–1 wt% carbonatite melts in an averaged cratonic mantle composition (Supplementary Table S7). Light green regions in (a-c) outline the *P*-*T* ranges of cratonic peridotite xenoliths, corresponding to geotherms (Hasterok and Chapman, 2011) with surface heat fluxes of 37–45 mW/m^2. The ambient mantle adiabats in (a-c) are corrected for secular cooling (Appendix A). Blue and yellow markers in (a) indicate the average mantle *P*-*T* of individual clusters from on- and off-cratonic regions, respectively. Red error bars in (a) denote the representative standard deviations of the averaged *P*-*T* for individual clusters. Red dashed line in (b-c) displays the mantle adiabat derived from the averaged *P*-*T* of local kimberlites. Mantle xenoliths in (b-c) are taken from the same kimberlite fields (Viljoen et al., 2009; Lock and Dawson, 2013). Note that our kimberlite thermobarometry results define LAB at depths greater than the maximum values derived from mantle xenolith thermobarometry.

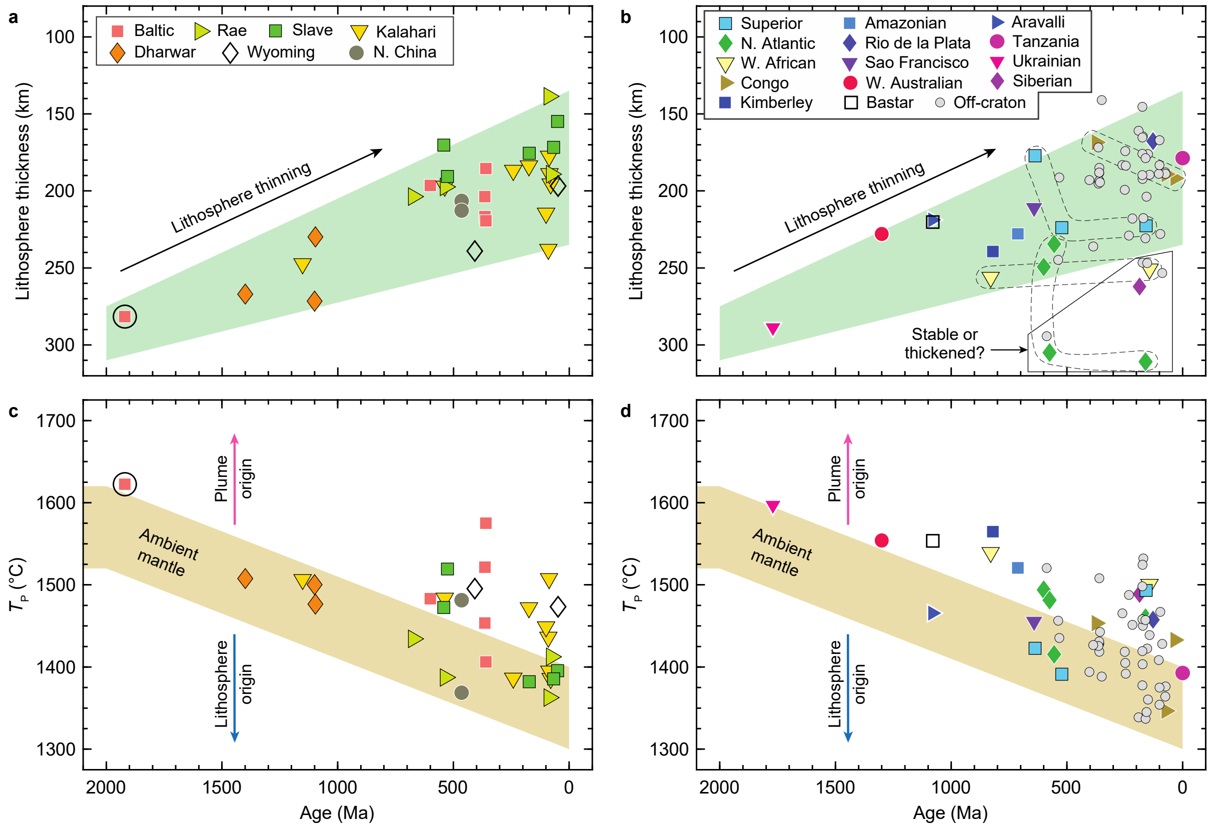

Figure 8. Temporal and spatial variations of lithosphere thicknesses and kimberlite mantle potential temperatures. (a-b) Lithosphere thicknesses constrained by kimberlite-mantle equilibration are plotted against kimberlite eruption ages for individual cratons and off-cratonic regions. (c-d) Potential temperatures (T_p; Appendix A) are shown for individual kimberlite clusters from cratonic and off-cratonic continental mantles. Light green regions in (a-b) indicate the overall variation of cratonic lithosphere thickness defined in (a). Dark yellow regions in (c-d) show the overall range of ambient mantle T_p (Lee et al., 2009; Herzberg et al., 2010). The oldest kimberlite cluster (Kimozero, Baltic shield; hollow circles in a and c) likely has been altered extensively but is consistent with the global trend defined by other clusters.

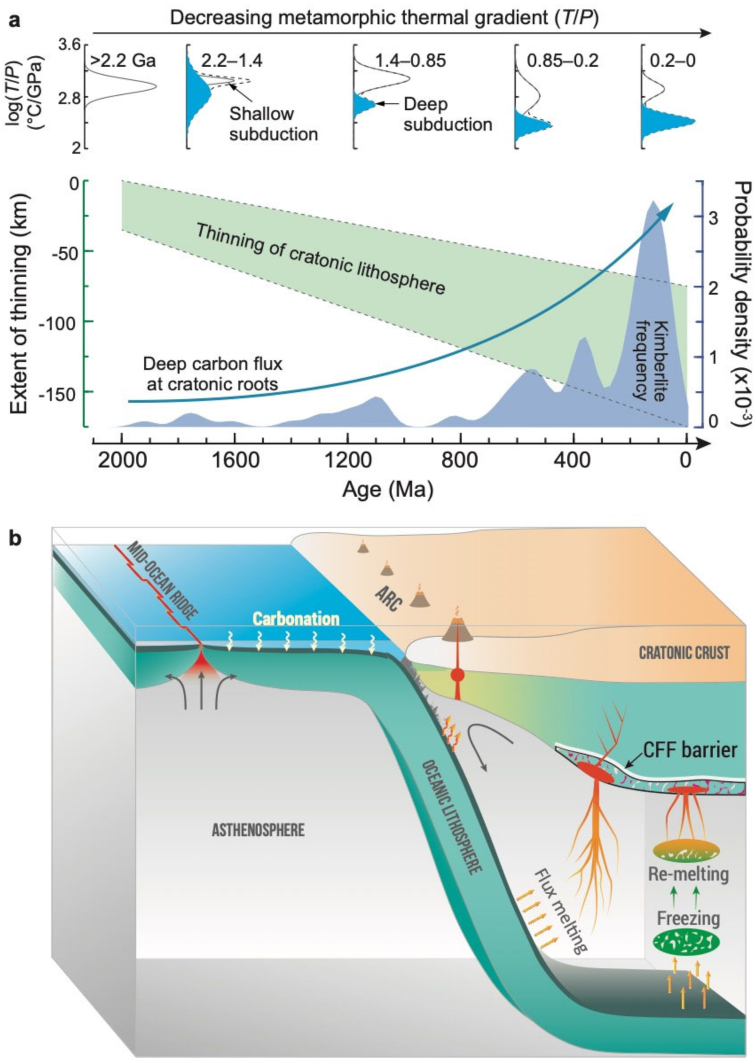

Figure 9. Kimberlite magmatism and its role in lithosphere destabilization. (a) The probability density of global kimberlite clusters is compared with the temporal variations of metamorphic thermal gradient (*T*/*P*) distributions (Holder et al., 2019) and cratonic lithosphere thicknesses over the past ~2 Gyr. Blue curved arrow schematically indicates the deep carbon flux at cratonic roots inferred from the kimberlite frequency. The emerging and growing bimodal distributions of metamorphic conditions indicate the gradual changes from warm (shallow) to cold (deep) subduction, likely due to secular mantle cooling (Holder et al., 2019). Increased frequency of kimberlite magmatism is consistent with enhanced deep subduction of carbonates through time caused by decreased thermal vigor of the mantle. (b) Schematic illustration of kimberlitic melt generation by deep subduction of carbonated oceanic crusts and kimberlite hibernation by carbonation freezing or melt accumulation at the base of the lithosphere. CFF barrier indicates the carbonation freezing front (Sun and Dasgupta, 2019) in the lithosphere mantle, which limits the reactive segregation of CO_2-rich kimberlitic melt from the base of the lithosphere to shallower depths. The hibernating kimberlites (either as carbonates or as localized melts) provides the necessary preconditioning to destabilize the thick lithosphere at cratons and off-cratonic regions.

Supplementary Materials

Thermobarometry of CO_2-rich, silica-undersaturated melts constrains cratonic lithosphere thinning through time in areas of kimberlitic magmatism

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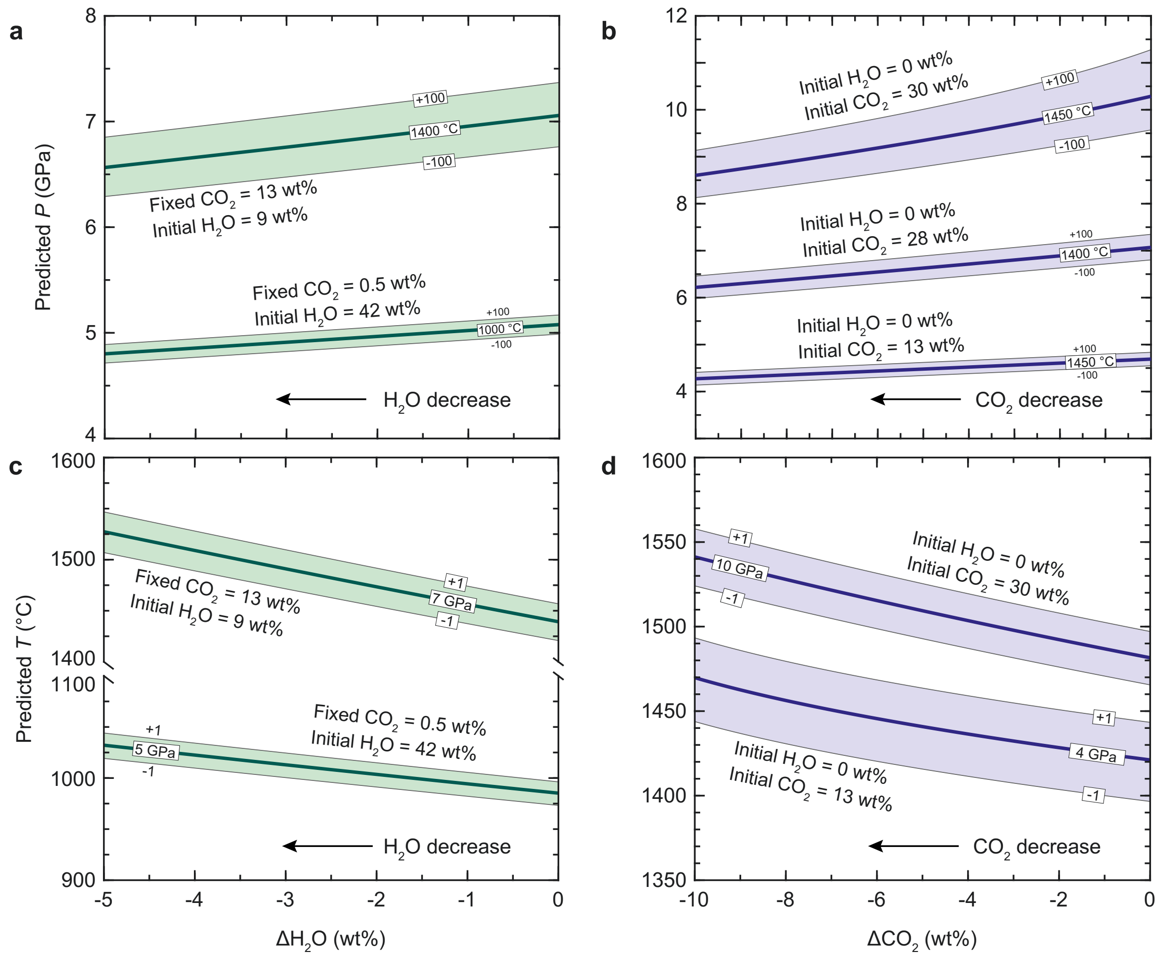
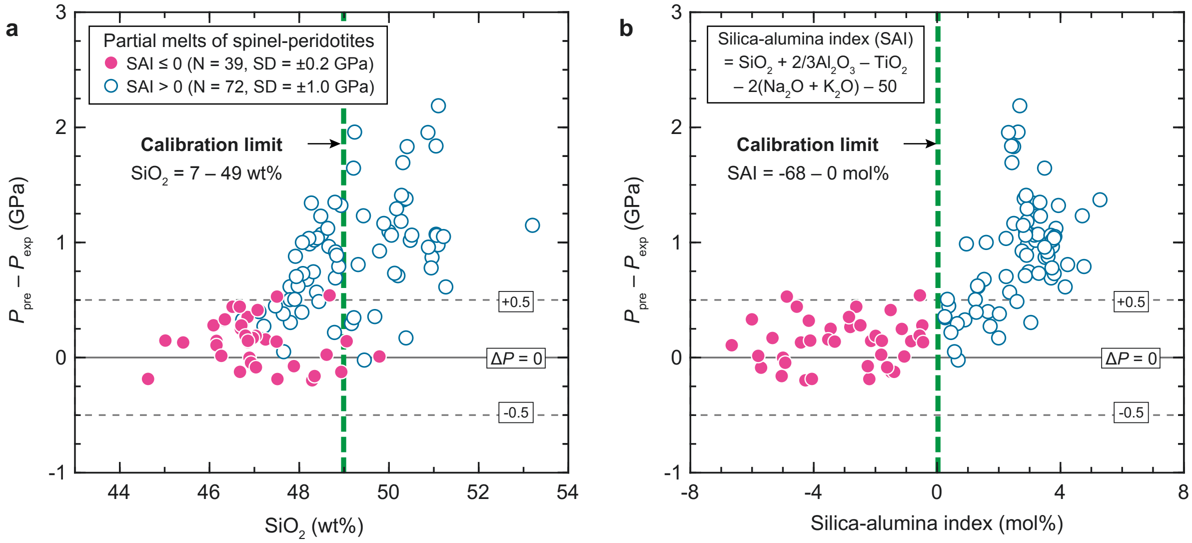
Excel® Calculator for thermobarometry calculations is provided in a separate file.

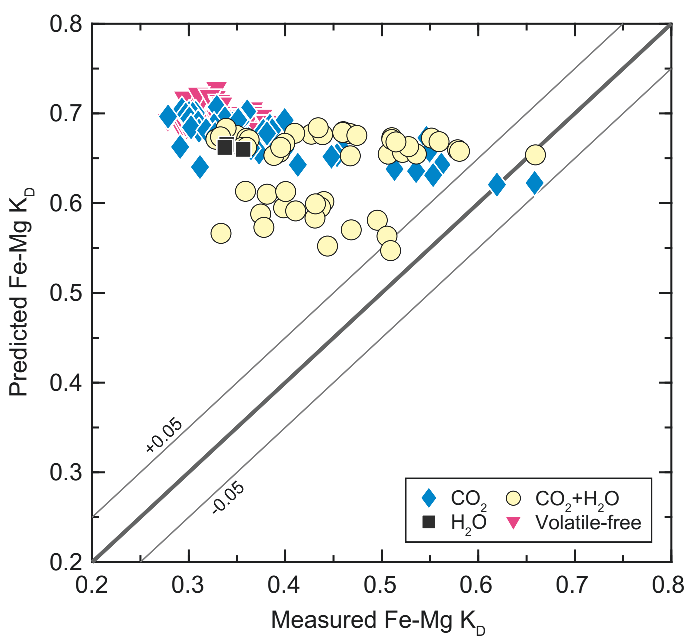
Earth and Planetary Science Letters



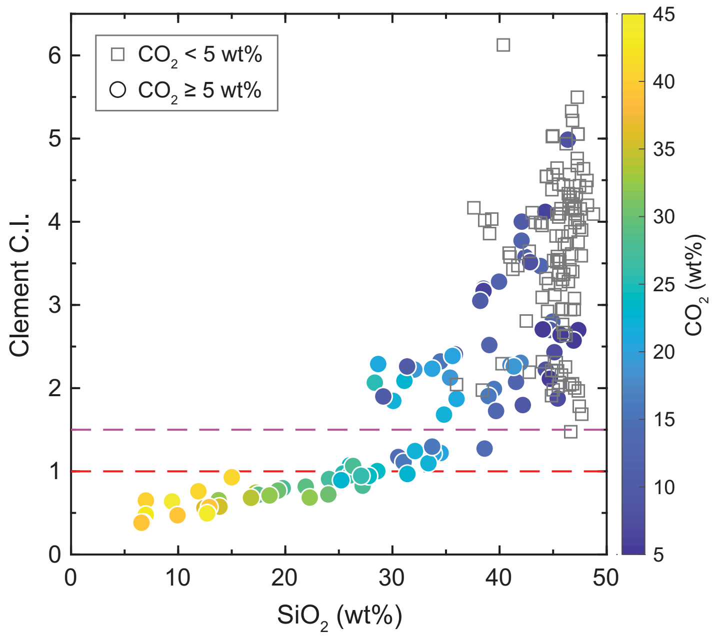
Supplementary Figure S1 Sensitivities of the new barometer and thermometer to changes in volatile contents. **a-b**, the predicted pressures (*P*) at selected temperatures (*T*) are plotted as functions of H_2O and CO_2 losses from the melts. **c-d,** the predicted *T* at selected *P* are shown as functions of variable H_2O and CO_2 losses from the melts. The initial melt compositions, *T* and *P* were taken from five experiments in the literature, JER16-74[1] with 13 wt% CO_2 and 9 wt% H_2O, od101[2] with 0.5 wt% CO_2 and 42 wt% H_2O, MA181[3] with 30 wt% CO_2 and 0 wt% H_2O, MA192[3] with 28 wt% CO_2 and 0 wt% H_2O, M379[4] with 13 wt% CO_2 and 0 wt% H_2O. Light green and purple bands denote the changes in *T* (±100 °C) and *P* (±1 GPa) for individual melt compositions.



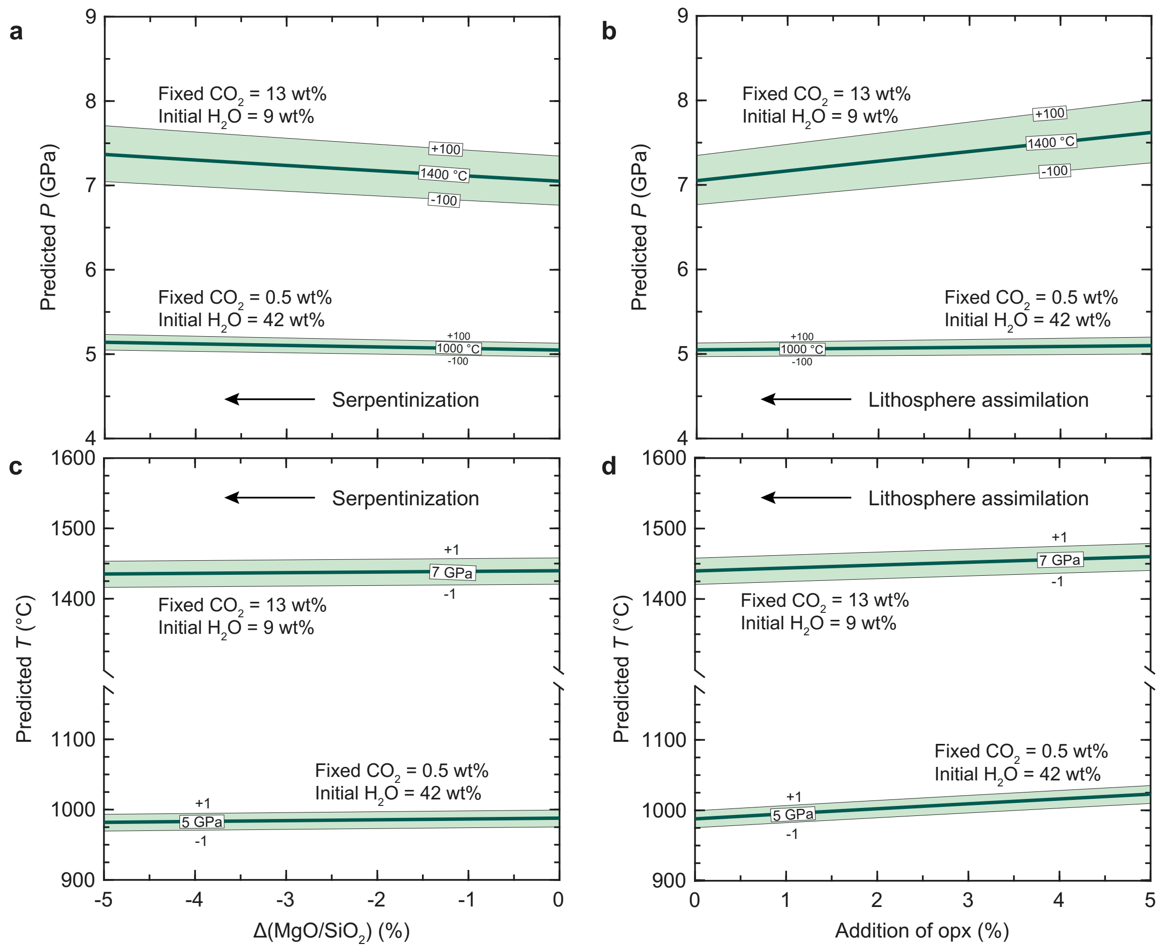
Supplementary Figure S2 Compositional criteria for barometer applications. **a-b**, the differences between the predicted pressures (P_{pre}) and experimental values (P_{exp}) are shown as functions of SiO_2 contents and silica-alumina index (SAI), respectively, of the experimental partial melts from spinel-peridotites. Dashed green lines indicate the upper limits of SiO_2 contents (7–49 wt% on a volatile-free basis) or SAI (-68–0 mol%) in the experimental partial melts from garnet-peridotites used for our barometer calibration (Supplementary Table S1). Note that here **b** is copied from Fig. 3b for comparison.



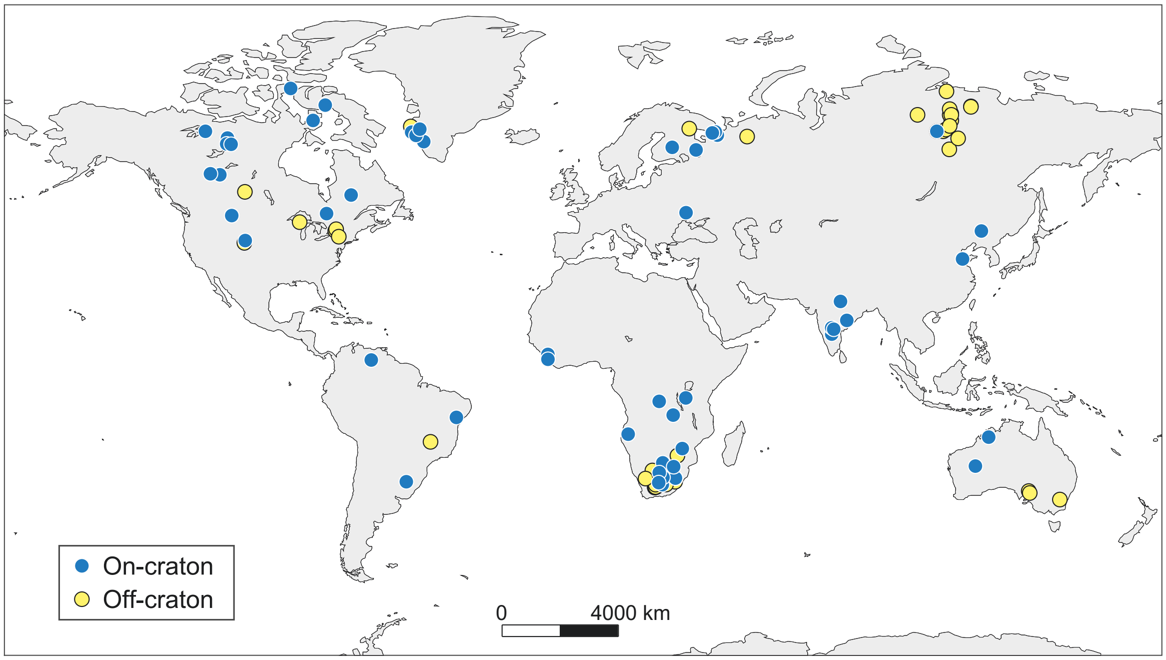
Supplementary Figure S3 Comparison of olivine-melt Fe-Mg K_D from high-T experiments and the model of Dalton and Wood[5]. See Supplementary Table S1 for the experimental dataset.



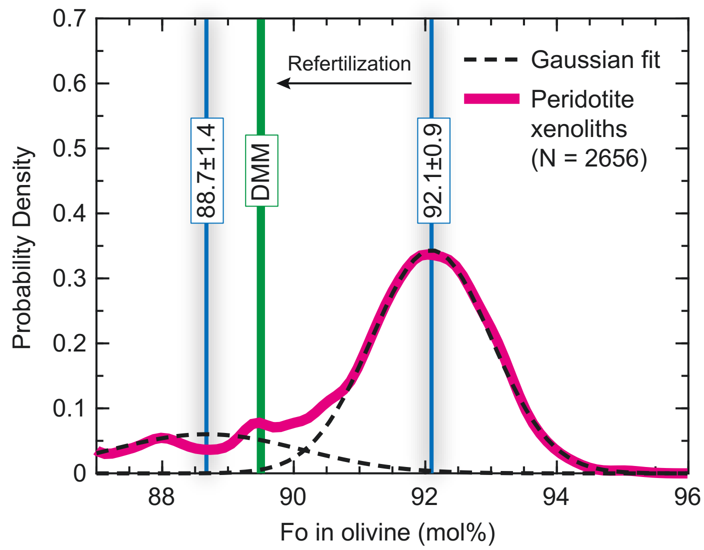
Supplementary Figure S4 Tests of the contamination index. The calculated contamination index (C.I.) of Clement [6] is shown as a function of SiO_2 contents in the experimental melts used for our thermobarometer calibration. SiO_2 abundances were normalized for a volatile-free basis. Open squares indicate experimental melts with <5 wt.% dissolved CO_2, and circles filled with color show melts with ≥5 wt.% dissolved CO_2. Color bar denotes the amount of CO_2 dissolved in the melt. See details of experimental melts in Supplementary Table S1. Dashed lines denote the maximum C.I. values chosen by previous studies[7,8] for uncontaminated samples. Note that these C.I. cut-off values mistakenly define many of the experimentally derived CO_2-rich melts as "contaminated samples".



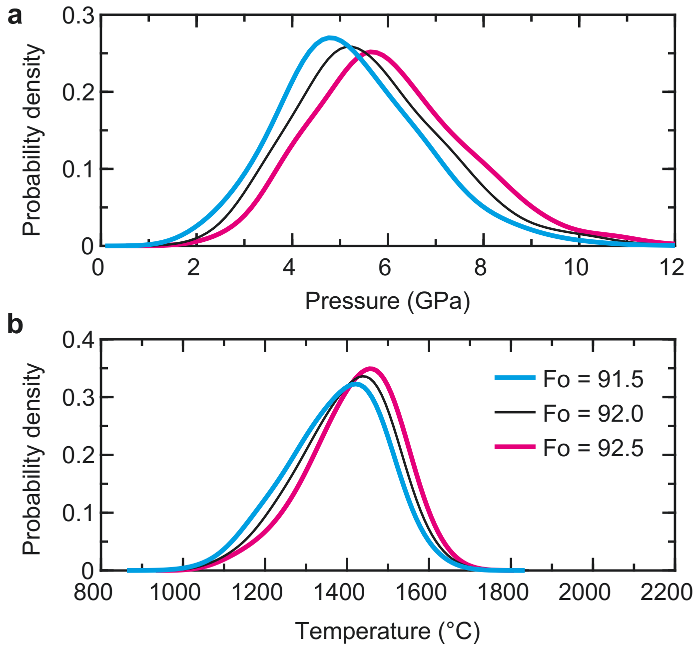
Supplementary Figure S5 Sensitivities of our barometer and thermometer to changes in melt compositions by post-emplacement serpentinization and assimilation of orthopyroxene in the lithosphere. **a-b**, the predicted pressures (*P*) at selected temperatures (*T*) are plotted as functions of changes in MgO/SiO_2 of the melts by serpentinization and addition of orthopyroxene (opx, $Mg_2Si_2O_6$). **c-d,** the predicted *T* at selected *P* are shown as functions of changes in MgO/SiO_2 of the melts and addition of opx. The initial melt compositions, *T* and *P* were taken from two experiments in the literature, JER16-74[1] (13 wt% CO_2 and 9 wt% H_2O) and od101[2] (0.5 wt% CO_2 and 42 wt% H_2O). Light green bands denote the changes in *T* (±100 °C) and *P* (±1 GPa) for individual melt compositions. According to a recent study on abyssal peridotites from oceanic lithosphere[9], serpentinization could systematically decrease MgO/SiO_2 of ultramafic rocks by ~5% relative to unaltered ones. As shown in **a**, such an extent of serpentinization does not appear to significantly influence the calculated *P* and *T* for kimberlite melts.



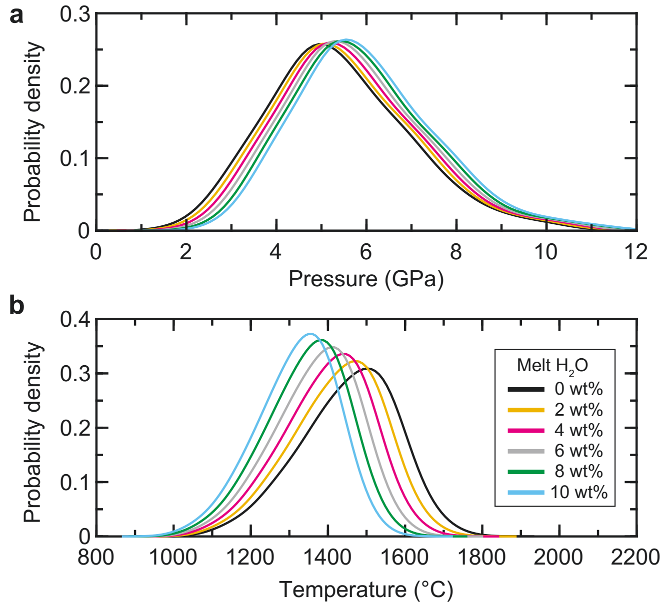
Supplementary Figure S6 Global map of the compiled kimberlite samples. Blue and yellow markers show cratonic and non-cratonic kimberlites, respectively. Details of the kimberlite locations are listed in Supplementary Table S3.



Supplementary Figure S7 Olivine compositions from the lithospheric mantle beneath cratons. Probability distribution function (thick red curve) is shown for forsterite (Fo) contents in olivine from 2656 peridotite xenoliths at cratons. Dashed curves are the Gaussian fits to the probability density. Vertical blue lines indicate the peaks and their standard errors calculated from the Gaussian fits. The broad peak at 88.7 can be attributed to melt refertilization of the peridotite xenoliths. The olivine compositions were downloaded from the online GEOROC database (http://georoc.mpch-mainz.gwdg.de/georoc/). The olivine composition from the depleted mantle beneath mid-ocean ridges (DMM)[10] is also shown for comparison.

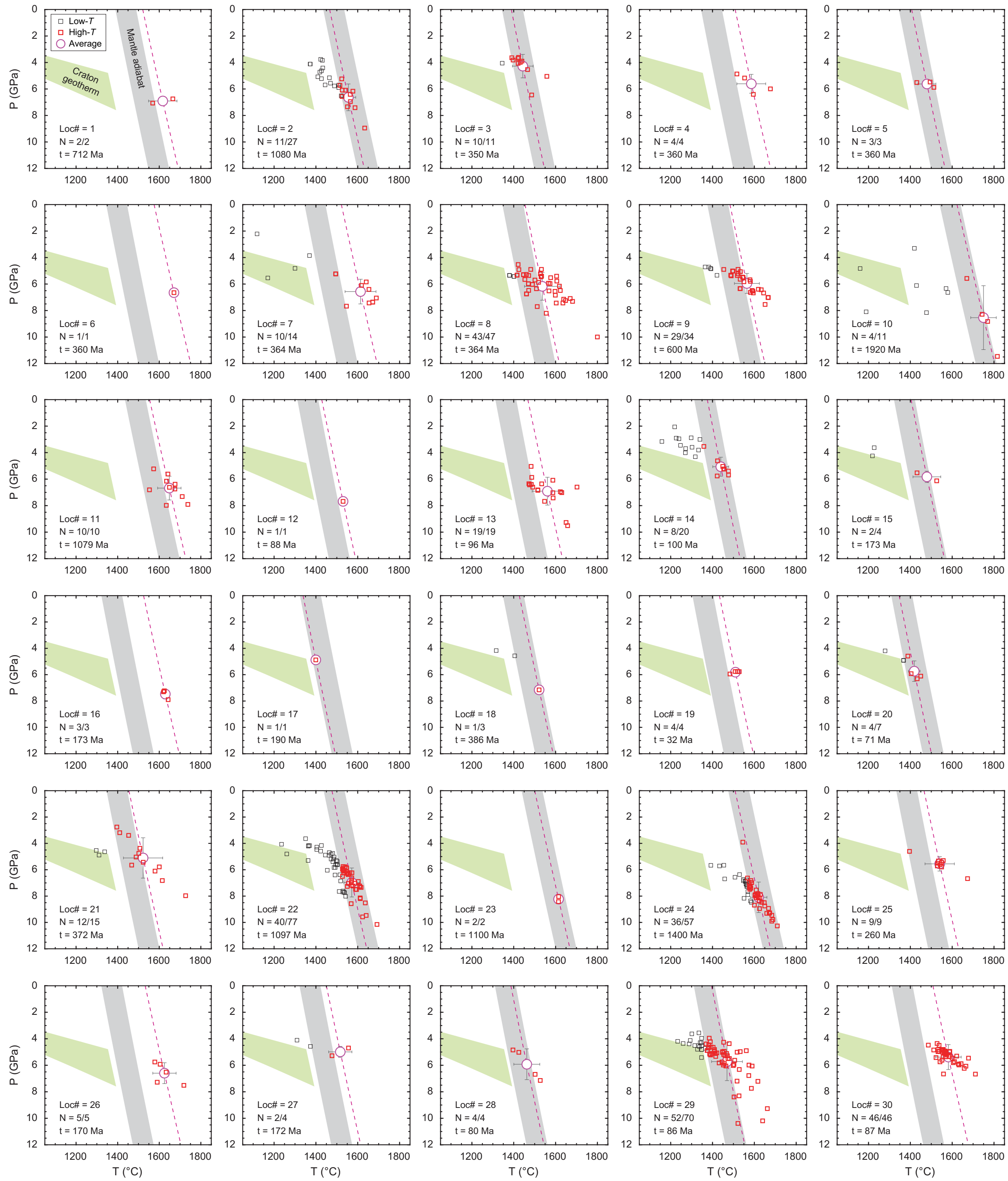


Supplementary Figure S8 Sensitivity of the thermobarometry results to forsterite contents in the mantle olivine. **a-b,** equilibrium pressures and temperatures of global primary kimberlite melts with 4 wt% H_2O are shown as probability distribution functions for three choices of forsterite contents (Fo = 91.5, 92, and 92.5) in olivine at final equilibrium of major elements with the primary kimberlite melts.

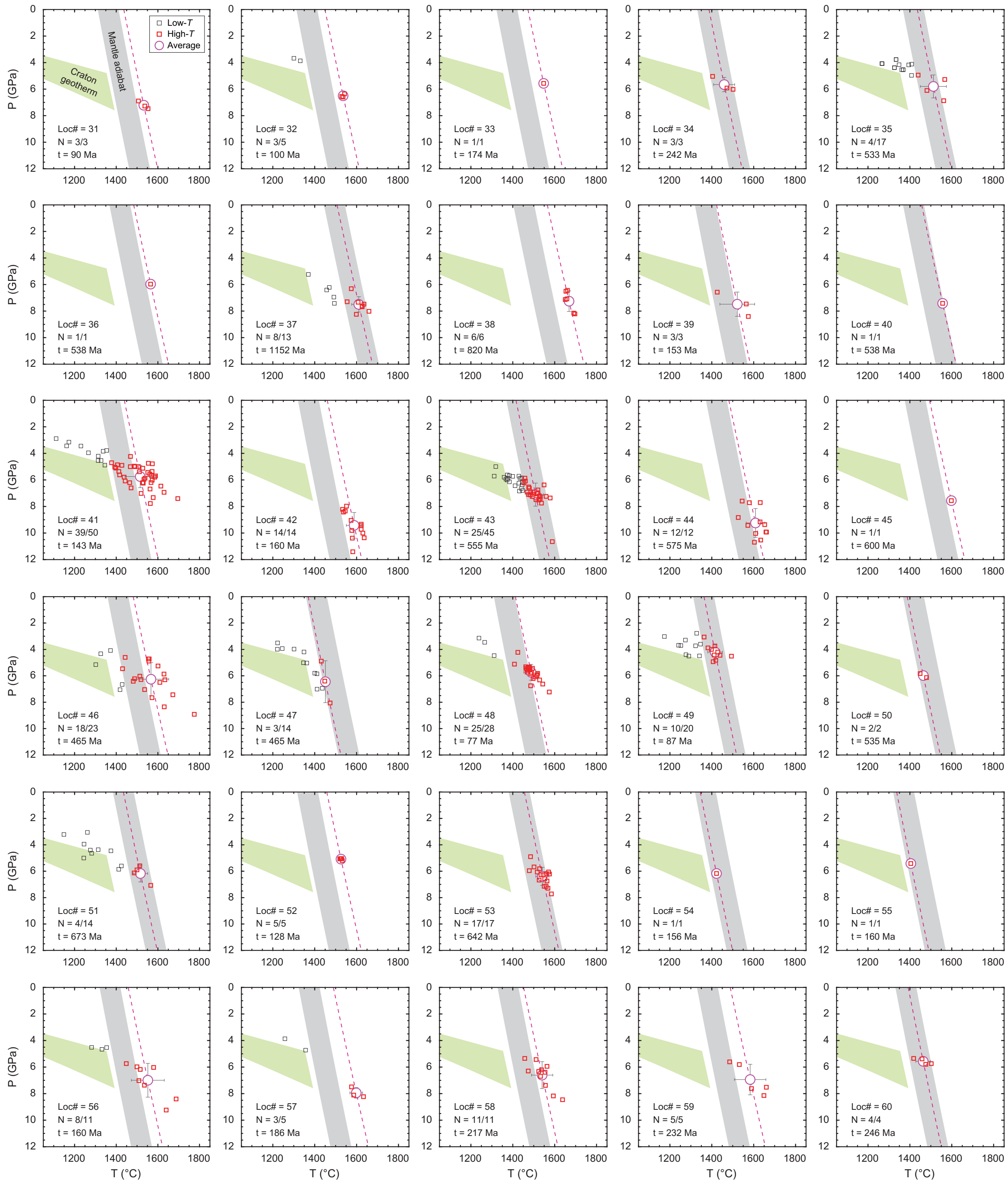


Supplementary Figure S9 Sensitivity of thermobarometry results to the primary H_2O contents of global kimberlites. **a-b,** equilibrium pressures and temperatures of global kimberlites are shown as probability distribution functions for different choices of H_2O contents in the primary melts. The averaged olivine composition (92 mol% forsterite; Fig. S6) of the cratonic mantle is taken as the olivine at final equilibrium of major elements with the primary kimberlite melts.

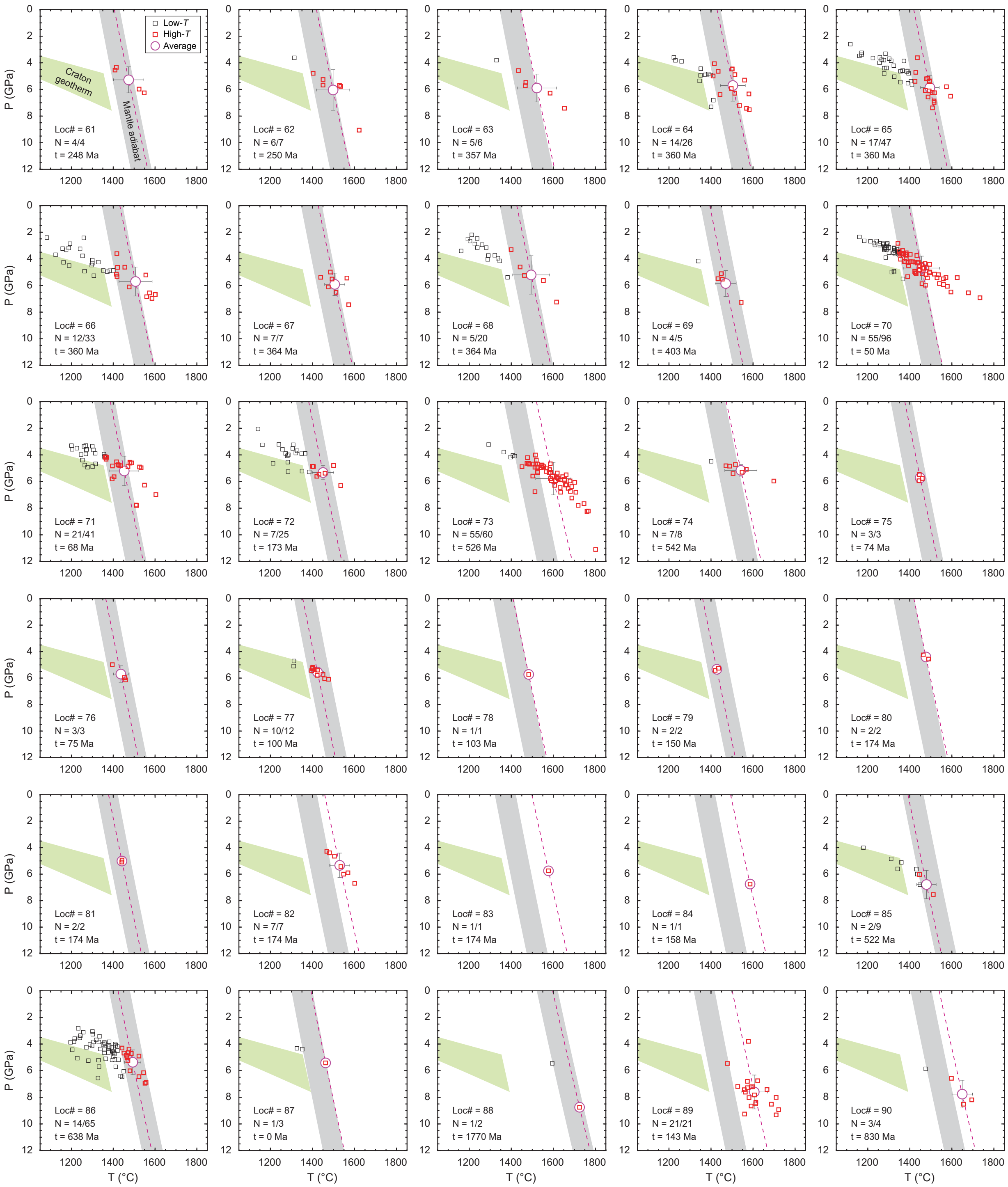
Supplementary Figure S10-1



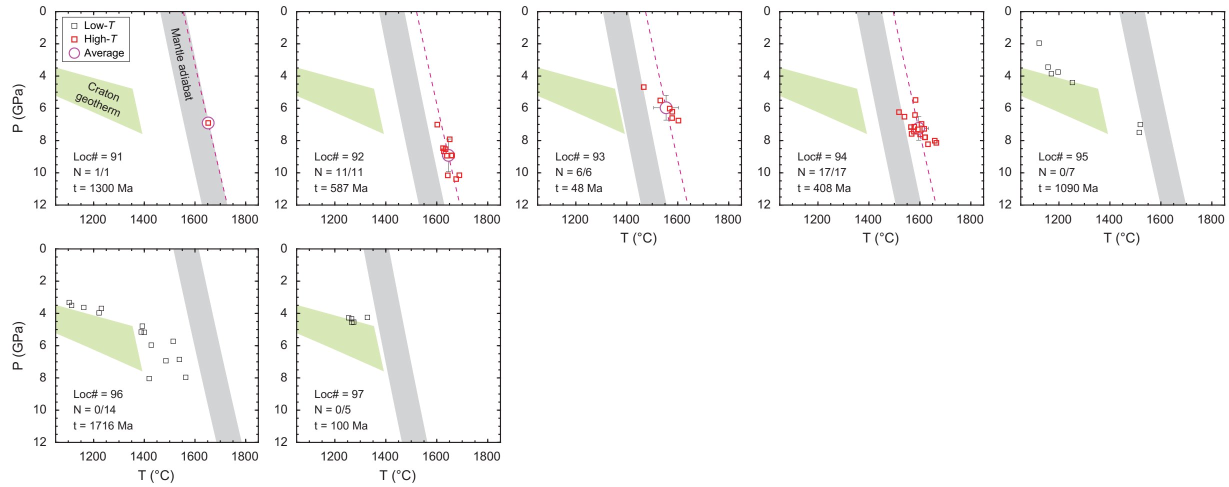
Supplementary Figure S10-2



Supplementary Figure S10-3



Supplementary Figure S10-4



Supplementary Figure S10 Thermobarometry results of individual kimberlite clusters/fields. The solid mantle adiabat (grey band) is corrected for secular cooling of the convecting mantle at the time (*t*) of kimberlite eruption (see details in Appendix A). The cratonic geotherms[11] (light green field) correspond to typical surface heat fluxes of 37–45 mW/m^2. Red dashed line displays the kimberlite mantle adiabat derived from the averaged depths and temperatures. "Loc#" indicates the location number of kimberlite cluster/province as listed in Supplementary Table S3. "N = 11/27" denotes the high-*T* samples (N = 11; T_p ≥ ambient mantle values) and the total number (N = 27) of samples from a kimberlite cluster/field. Note that the high-*T* samples were used to calculate the averaged depths and temperatures.

Supplementary Table S1. Compiled experiments for thermometer and barometer calibrations

No.	&Run Name	#P (GPa)/T (°C)	$Melt compositions (wt%) SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	†CO_2/H_2O	Melt *Mg#	Olivine *Mg#	K_D	^Phase
	Balta et al. (2011)																	
1	R389	3\1375	48.21	0.72	13.84	0.15	8.57	0.16	15.00	10.32	2.62	0.40	0.01	0.11\6.00	75.7	88.6	0.40	melt+ol+grt+pyx
2	R385	3\1375	48.07	0.85	13.46	0.08	9.66	0.16	14.19	9.59	3.42	0.52	0.00	0.18\5.53	72.4	88.2	0.35	melt+ol+grt+pyx
3	R390	3\1375	46.49	0.76	13.30	0.11	11.00	0.17	14.26	10.46	2.95	0.47	0.02	0.21\5.37	69.8	87.2	0.34	melt+ol+grt+pyx
4	R395	3\1375	48.76	0.74	13.48	0.13	7.76	0.15	15.52	10.18	2.88	0.40	0.00	0.36\5.31	78.1	90.0	0.40	melt+ol+grt+pyx
5	R396	3\1375	46.98	0.80	13.99	0.10	9.31	0.15	15.00	10.24	3.08	0.37	0.00	0.24\4.78	74.2	88.9	0.36	melt+ol+grt+pyx
6	R398	3\1375	47.45	0.71	13.24	0.13	9.09	0.16	15.73	10.11	2.93	0.46	0.00	0.28\5.41	75.5	90.4	0.33	melt+ol+grt+pyx
7	R380OC	3\1375	47.29	0.68	13.15	0.12	10.00	0.15	15.43	9.85	3.00	0.34	0.00	0.45\4.00	73.3	89.2	0.33	melt+ol+grt+pyx
8	R393OC	3\1375	47.54	0.77	13.66	0.11	9.19	0.16	15.06	10.01	3.07	0.41	0.02	0.08\4.10	74.5	89.0	0.36	melt+ol+grt+pyx
	Dasgupta and Hirschmann (2007)																	
9	M172	6.6\1230	15.00	0.86	0.66	0.00	8.09	0.76	30.83	30.50	13.14	0.17	0.00	40.60\-	87.2	91.2	0.66	melt+ol+grt+pyx
10	M165	6.6\1260	12.70	1.81	0.89	0.00	12.41	0.53	32.49	36.48	2.54	0.15	0.00	45.00\-	82.3	91.2	0.45	melt+ol+grt+pyx
11	M265	6.6\1200	6.98	1.40	0.70	0.05	9.81	0.33	33.25	33.42	13.97	0.10	0.00	39.90\-	85.8	90.7	0.62	melt+ol+grt+pyx
12	M278	6.6\1230	6.97	1.29	0.64	0.10	10.46	0.40	31.20	41.49	7.32	0.12	0.00	42.60\-	84.2	90.4	0.56	melt+ol+grt+pyx
13	M282	6.6\1230	6.77	1.57	0.46	0.25	12.22	0.33	36.49	35.66	6.24	0.02	0.00	39.40\-	84.2	90.6	0.55	melt+ol+grt+pyx
14	M289	6.6\1245	6.71	1.72	0.46	0.25	12.89	0.33	35.87	35.21	6.55	0.02	0.00	39.00\-	83.2	90.6	0.51	melt+ol+grt+pyx
15	M295	6.6\1245	6.57	1.63	0.53	0.20	12.47	0.34	36.14	35.32	6.73	0.08	0.00	39.20\-	83.8	90.6	0.54	melt+ol+grt+pyx
	Dasgupta et al. (2007)																	
16	A471	3\1300	9.43	1.62	3.91	0.00	13.88	0.30	23.84	45.01	1.92	0.09	0.00	43.79\-	75.4	90.3	0.33	melt+ol+grt+pyx
17	A472	3\1325	11.88	2.05	4.58	0.00	12.73	0.29	23.77	42.95	1.66	0.08	0.00	41.09\-	76.9	90.2	0.36	melt+ol+grt+pyx
18	A482	3\1350	28.35	1.61	9.78	0.11	11.88	0.23	19.67	25.66	2.64	0.07	0.00	24.90\-	74.7	90.6	0.31	melt+ol+grt+pyx
19	A500	3\1360	32.06	1.44	8.79	0.00	11.88	0.22	19.27	23.97	2.30	0.07	0.00	20.30\-	74.3	90.8	0.29	melt+ol+grt+pyx
20	A483	3\1375	32.04	1.42	9.21	0.00	11.91	0.22	19.32	23.93	1.87	0.07	0.00	19.10\-	74.3	90.8	0.29	melt+ol+grt+pyx
21	A486	3\1400	34.47	1.25	9.49	0.09	11.59	0.20	19.58	21.68	1.60	0.05	0.00	15.40\-	75.1	90.9	0.30	melt+ol+grt+pyx
22	A488	3\1425	35.84	1.15	10.18	0.13	11.38	0.17	19.66	20.06	1.40	0.03	0.00	13.30\-	75.5	91.0	0.30	melt+ol+grt+pyx
23	A509	3\1350	42.37	1.86	9.99	0.16	10.39	0.17	15.29	16.99	2.73	0.05	0.00	19.40\-	72.4	89.8	0.30	melt+ol+grt+pyx
24	A510	3\1400	43.81	1.36	11.00	0.16	10.70	0.13	16.30	14.30	2.11	0.11	0.00	12.70\-	73.1	90.0	0.30	melt+ol+grt+pyx
	Dasgupta et al. (2013)																	
25	M363	4\1400	34.82	1.69	3.98	0.00	11.94	0.25	23.87	21.88	1.49	0.08	0.00	22.30\-	78.1	90.3	0.38	melt+ol+grt+pyx
26	M365	4\1450	39.48	1.09	6.91	0.00	10.86	0.25	23.69	16.78	0.89	0.07	0.00	15.70\-	79.5	91.0	0.38	melt+ol+grt+pyx
27	M377	4\1500	41.54	0.79	8.90	0.00	10.88	0.25	24.73	11.87	0.99	0.06	0.00	11.60\-	80.2	92.0	0.35	melt+ol+grt+pyx
28	M368	4\1600	45.43	0.50	7.07	0.00	9.79	0.21	28.27	8.08	0.61	0.05	0.00	7.00\-	83.7	93.0	0.39	melt+ol+grt+pyx
29	M343	5\1450	35.99	1.60	6.00	0.00	12.00	0.30	22.99	19.99	1.10	0.04	0.00	20.50\-	77.4	89.9	0.38	melt+ol+grt+pyx
30	M346	5\1500	38.96	1.00	5.99	0.00	12.99	0.24	23.98	15.99	0.80	0.05	0.00	15.70\-	76.7	90.3	0.35	melt+ol+grt+pyx
31	M350	5\1550	39.67	0.79	5.95	0.00	11.90	0.26	26.78	13.89	0.69	0.06	0.00	12.50\-	80.0	91.4	0.38	melt+ol+grt+pyx
32	M358	5\1600	42.17	0.70	6.02	0.00	11.04	0.25	27.11	12.05	0.60	0.05	0.00	9.30\-	81.4	91.9	0.39	melt+ol+grt+pyx
33	M379	4\1450	44.93	1.30	6.99	0.29	9.99	0.22	18.97	15.98	1.30	0.04	0.00	12.80\-	77.2	90.8	0.35	melt+ol+grt+pyx
34	M380	4\1500	44.71	0.99	7.95	0.28	10.93	0.22	19.87	13.91	1.09	0.04	0.00	1-\-	76.4	91.5	0.30	melt+ol+grt+pyx
35	M381	4\1550	45.12	0.60	8.02	0.28	11.03	0.21	22.06	12.03	0.60	0.04	0.00	6.60\-	78.1	92.0	0.31	melt+ol+grt+pyx
36	M367	5\1600	44.31	0.81	6.04	0.00	11.08	0.25	23.16	13.09	1.21	0.04	0.00	8.00\-	78.8	91.7	0.34	melt+ol+grt+pyx
37	M370	5\1650	44.70	0.50	6.95	0.00	10.93	0.24	24.83	10.93	0.89	0.04	0.00	4.50\-	80.2	92.0	0.35	melt+ol+grt+pyx
38	M376	5\1700	44.85	0.50	5.98	0.00	10.96	0.22	26.91	9.97	0.60	0.02	0.00	3.50\-	81.4	92.6	0.35	melt+ol+grt+pyx
39	G221	3\1375	38.50	10.86	9.28	0.17	10.86	0.11	15.80	10.86	3.36	0.21	0.00	1-\-	72.2	89.3	0.31	melt+ol+grt+pyx
40	G222	3\1375	38.50	12.83	8.59	0.10	10.86	0.09	15.80	9.87	3.26	0.10	0.00	6.00\-	72.2	88.6	0.33	melt+ol+grt+pyx
	Davis et al. (2011)																	
41	Step 1	3\1430	42.77	2.37	15.63	0.07	9.44	0.13	16.39	10.83	2.15	0.22	0.00	-\-	75.6	90.6	0.32	melt+ol+grt+pyx
42	Step 2	3\1430	45.27	2.43	13.67	0.12	9.29	0.15	15.75	10.10	2.83	0.38	0.00	-\-	75.1	90.2	0.33	melt+ol+grt+pyx
43	Step 3	3\1430	45.35	2.23	12.81	0.15	9.57	0.15	16.57	10.20	2.36	0.62	0.00	-\-	75.5	90.3	0.33	melt+ol+grt+pyx
44	Step 4	3\1430	45.05	2.10	13.59	0.13	9.59	0.15	16.23	10.32	1.94	0.91	0.00	-\-	75.1	90.2	0.33	melt+ol+grt+pyx
45	Step 5	3\1430	45.52	2.32	12.75	0.13	9.71	0.16	15.81	10.55	1.88	1.16	0.00	-\-	74.4	89.8	0.33	melt+ol+grt+pyx
	Davis et al. (2013)																	
46	A740	3\1445	47.63	1.95	13.21	0.18	8.58	0.14	14.81	9.21	1.69	2.60	0.00	-\-	75.5	90.1	0.34	melt+ol+grt+pyx
47	A756	3\1440	47.66	2.26	14.29	0.12	8.97	0.15	12.89	8.19	1.97	3.50	0.00	-\-	71.9	89.8	0.29	melt+ol+grt+pyx
48	A790	3\1440	45.70	2.16	13.80	0.15	9.80	0.13	14.80	8.40	1.16	3.90	0.00	-\-	72.9	90.0	0.30	melt+ol+grt+pyx
49	A828	3\1440	45.88	2.24	13.26	0.12	9.10	0.14	14.89	9.60	1.37	3.40	0.00	-\-	74.5	90.1	0.32	melt+ol+grt+pyx
50	A893	3\1430	46.83	2.53	13.19	0.08	9.52	0.11	13.40	8.07	1.56	4.71	0.00	-\-	71.5	89.6	0.29	melt+ol+grt+pyx
51	A900	3\1435	45.17	2.62	12.89	0.05	9.15	0.11	14.11	8.85	1.94	5.10	0.00	-\-	73.3	89.9	0.31	melt+ol+grt+pyx
52	A915	3\1430	46.57	2.41	13.27	0.08	9.53	0.12	13.70	8.74	1.38	4.18	0.00	-\-	71.9	89.7	0.29	melt+ol+grt+pyx
53	A987	3\1450	44.57	2.63	12.50	0.08	10.59	0.14	15.79	9.29	2.04	2.37	0.00	-\-	72.7	90.0	0.30	melt+ol+grt+pyx
54	A989	3\1450	44.33	3.18	12.60	0.04	10.71	0.14	14.81	9.01	2.19	3.00	0.00	-\-	71.1	89.0	0.30	melt+ol+grt+pyx
	Dvir and Kessel (2017)																	
55	od109	6\1100	41.96	0.74	9.92	0.10	11.47	0.00	22.80	12.13	0.82	0.07	0.00	12.66\26.32	78.0	89.1	0.43	melt+ol+grt+pyx
56	od109	6\1100	47.35	0.55	11.79	0.16	8.50	0.00	22.19	8.58	0.85	0.05	0.00	3.25\32.89	82.3	92.5	0.37	melt+ol+grt+pyx
57	od108	6\1000	35.61	0.98	10.75	0.10	11.48	0.00	19.96	19.65	1.41	0.06	0.00	13.31\34.87	75.6	89.0	0.38	melt+ol+grt+pyx
58	od108	6\1000	45.90	0.79	12.75	0.11	7.71	0.00	20.32	10.86	1.52	0.05	0.00	0.52\43.58	82.5	92.6	0.38	melt+ol+grt+pyx
59	od111	6\900	31.37	0.91	11.22	0.12	11.32	0.00	19.50	23.91	1.60	0.05	0.00	4.82\53.39	75.4	88.5	0.40	melt+ol+grt+pyx
60	od111	6\900	43.98	1.21	11.97	0.05	8.12	0.00	18.73	13.80	2.09	0.05	0.00	0.62\57.36	80.4	92.5	0.33	melt+ol+grt+pyx

Supplementary Table S1 continued

No.	&Run Name	#P (GPa)/T (°C)	§Melt compositions (wt%) SiO$_2$	TiO$_2$	Al$_2$O$_3$	Cr$_2$O$_3$	FeO	MnO	MgO	CaO	Na$_2$O	K$_2$O	P$_2$O$_5$	†CO$_2$/H$_2$O	Melt *Mg#	Olivine *Mg#	K_D	^Phase
	Dvir and Kessel (2017)																	
61	od103	5\1100	41.02	0.81	9.69	0.08	12.00	0.00	22.62	12.81	0.91	0.05	0.00	12.13\27.69	77.1	88.4	0.44	melt+ol+grt+pyx
62	od103	5\1100	46.92	0.85	10.68	0.14	7.39	0.00	22.73	10.23	1.00	0.05	0.00	3.50\34.25	84.6	91.7	0.50	melt+ol+grt+pyx
63	od101	5\1000	35.38	1.13	9.67	0.11	10.97	0.00	21.84	19.41	1.45	0.04	0.00	12.71\34.12	78.0	89.1	0.44	melt+ol+grt+pyx
64	od101	5\1000	46.97	1.07	11.68	0.09	6.37	0.00	20.39	11.86	1.54	0.03	0.00	0.52\42.29	85.1	91.9	0.51	melt+ol+grt+pyx
65	od102	5\900	29.15	1.03	10.10	0.13	11.59	0.00	21.69	24.21	2.05	0.04	0.00	5.35\48.22	76.9	88.6	0.43	melt+ol+grt+pyx
66	od102	5\900	44.48	1.14	11.12	0.06	6.43	0.00	19.58	15.33	1.80	0.06	0.00	0.53\51.23	84.4	92.4	0.44	melt+ol+grt+pyx
67	od110	4\1100	41.33	0.94	9.83	0.09	11.62	0.00	22.97	12.18	0.96	0.09	0.00	13.63\28.70	77.9	89.1	0.43	melt+ol+grt+pyx
68	od110	4\1100	45.70	0.80	11.01	0.56	7.83	0.00	21.86	11.03	1.16	0.06	0.00	3.72\32.26	83.3	92.4	0.41	melt+ol+grt+pyx
69	od107	4\1000	33.71	1.26	9.60	0.07	11.45	0.00	20.09	22.02	1.72	0.07	0.00	13.37\32.66	75.8	88.6	0.40	melt+ol+grt+pyx
70	od107	4\1000	44.03	1.35	11.36	0.14	7.03	0.00	20.98	13.49	1.57	0.07	0.00	3.26\38.01	84.2	91.9	0.47	melt+ol+grt+pyx
71	od104	4\900	28.67	1.72	10.23	0.10	11.50	0.00	18.19	26.63	2.90	0.06	0.00	12.83\38.19	73.8	88.7	0.36	melt+ol+grt+pyx
72	od104	4\900	42.50	1.70	11.00	0.08	6.13	0.00	20.00	15.89	2.68	0.02	0.00	0.59\49.49	85.3	91.9	0.51	melt+ol+grt+pyx
	Elardo et al. (2011)																	
73	TWM-2.011	4\1800	44.87	0.53	8.07	0.32	13.77	0.19	24.00	7.98	0.22	0.02	0.01	-\-	75.6	91.0	0.31	melt+ol+grt+pyx
74	TWM-2.013	4\1750	44.00	0.78	6.74	0.24	15.32	0.20	22.00	10.38	0.31	0.03	0.01	-\-	71.9	88.7	0.33	melt+ol+grt+pyx
75	LPUM-2.018	4\1750	45.49	0.37	7.65	0.41	12.09	0.19	26.33	7.17	0.23	0.05	0.02	-\-	79.5	92.2	0.33	melt+ol+grt+pyx
	Elthon and Scarfe (1984)																	
76	164	2.5\1470	47.33	0.89	13.67	0.00	9.75	0.17	16.43	10.75	0.94	0.06	0.00	-\-	75.0	89.5	0.35	melt+ol+grt+pyx
	Falloon and Green (1988)																	
77	T-2087	3.5\1600	45.79	1.08	11.69	0.42	9.03	0.00	19.97	10.65	1.36	0.00	0.00	-\-	79.8			melt+ol+grt
	Gaetani and Grove (1998)																	
78	B359	1.6\1260	46.73	0.70	18.30	0.09	7.83	0.09	12.55	11.07	2.52	0.13	0.00	-\4.90	74.1	89.4	0.34	melt+ol+grt+pyx
79	B277	1.6\1255	46.82	0.63	18.00	0.09	7.87	0.17	12.77	11.23	2.32	0.10	0.00	1.19\5.00	74.3	89.0	0.36	melt+ol+grt+pyx
80	B366	1.6\1230	47.26	0.71	17.99	0.13	8.31	0.14	12.22	10.54	2.59	0.12	0.00	-\4.80	72.4	88.0	0.36	melt+ol+grt+pyx
81	B365	2\1290	46.52	0.68	16.34	0.16	8.70	0.13	14.16	10.87	2.33	0.11	0.00	1.25\5.30	74.4	89.0	0.36	melt+ol+grt+pyx
82	B399	2\1275	47.25	0.70	16.29	0.08	8.39	0.12	13.76	10.66	2.61	0.13	0.00	-\6.80	74.5	89.7	0.34	melt+ol+grt+pyx
	Grove et al. (2013)																	
83	C278	2.2\1400	47.25	1.03	16.64	0.10	9.17	0.19	11.43	8.52	2.83	2.84	0.00	-\-	69.0	87.2	0.33	melt+ol+grt+pyx
84	C272	2.4\1440	48.16	0.95	15.45	0.12	8.83	0.17	12.52	9.12	2.49	2.18	0.00	-\-	71.6	88.4	0.33	melt+ol+grt+pyx
85	C286	2.4\1415	46.75	0.98	15.48	0.11	9.16	0.17	12.71	9.15	2.77	2.71	0.00	-\-	71.2	88.4	0.33	melt+ol+grt+pyx
86	C282	2.4\1410	46.59	1.21	16.35	0.09	8.23	0.16	11.97	8.37	3.52	3.50	0.00	-\-	72.2	89.3	0.31	melt+ol+grt+pyx
87	C271	2.4\1400	47.84	1.25	15.37	0.07	10.02	0.17	10.48	7.70	3.25	3.85	0.00	-\-	65.1	85.4	0.32	melt+ol+grt+pyx
88	C284	2.6\1430	47.17	1.16	14.92	0.13	8.43	0.19	12.21	8.76	3.99	3.06	0.00	-\-	72.1	88.9	0.32	melt+ol+grt+pyx
89	C277	2.6\1400	46.42	1.34	15.27	0.05	9.58	0.18	10.96	7.77	4.20	4.22	0.00	-\-	67.1	86.4	0.32	melt+ol+grt+pyx
	Herzberg and Zhang (1996)																	
90		5\1726	46.00	0.44	7.47	0.59	13.19	0.25	21.04	8.15	2.68	0.00	0.19	-\-	74.0	89.6	0.33	melt+ol+grt+pyx
91		9.7\1968	45.00	0.65	3.18	0.35	15.97	0.21	25.40	6.91	2.11	0.00	0.21	-\-	73.9	89.6	0.33	melt+ol+grt+pyx
	Hirose (1997)																	
92	53	3\1400	35.99	0.74	8.84	0.19	10.40	0.05	22.94	18.54	2.23	0.09	0.00	-\-	79.7	91.5	0.37	melt+ol+grt+pyx
93	54	3\1450	38.39	1.11	8.28	0.29	9.24	0.06	24.30	16.67	1.55	0.10	0.00	-\-	82.4			melt+ol+grt
94	55	3\1475	40.23	0.61	10.95	0.31	10.49	0.01	23.08	12.39	1.87	0.05	0.00	-\-	79.7			melt+ol+grt
95	56	3\1525	42.78	0.60	10.59	0.17	10.43	0.06	24.87	9.34	1.16	0.01	0.00	-\-	81.0	92.1	0.36	melt+ol+grt+pyx
	Kinzler (1997)																	
96	L69	1.9\1416	45.97	0.49	16.50	0.03	9.06	0.06	14.48	11.14	2.19	0.08	0.00	-\-	74.0	89.6	0.33	melt+ol+grt+pyx
97	L92	1.9\1396	45.73	0.65	16.03	0.14	7.13	0.00	15.42	11.82	2.93	0.14	0.00	-\-	79.4	91.3	0.37	melt+ol+grt+pyx
98	L82	2.1\1415	45.52	0.59	14.80	0.18	10.38	0.00	15.41	10.03	2.93	0.17	0.00	-\-	72.6	88.9	0.33	melt+ol+grt+pyx
99	L115	2.1\1440	45.53	0.79	15.44	0.16	10.66	0.07	14.25	9.40	3.48	0.23	0.00	-\-	70.4	87.8	0.33	melt+ol+grt+pyx
100	L101	2.3\1465	45.37	0.89	15.09	0.16	11.54	0.00	13.57	9.13	3.95	0.29	0.00	-\-	67.7	86.7	0.32	melt+ol+grt+pyx
101	L105	2.3\1480	45.35	0.68	14.95	0.22	10.66	0.00	15.25	9.90	2.82	0.17	0.00	-\-	71.8	88.6	0.33	melt+ol+grt+pyx
102	L109	2.3\1496	45.62	0.62	15.14	0.21	10.43	0.00	15.34	9.74	2.74	0.16	0.00	-\-	72.4	88.3	0.35	melt+ol+grt+pyx
103	L112	2.1\1410	46.22	0.92	16.02	0.00	9.01	0.06	13.47	9.13	5.02	0.15	0.00	-\-	72.7	89.0	0.33	melt+ol+grt+pyx
104	L48	2\1465	45.40	0.21	16.21	0.24	9.78	0.06	17.43	9.69	0.94	0.03	0.00	-\-	76.1	90.0	0.35	melt+ol+grt+pyx
105	L128	2.3\1511	45.54	0.27	14.63	0.26	8.05	0.00	18.22	11.87	1.14	0.03	0.00	-\-	80.1	92.2	0.34	melt+ol+grt+pyx
	Kogiso et al. (1998)																	
106	KH-22	3\1500	43.04	3.32	15.45	0.06	11.50	0.00	14.26	7.82	3.68	0.87	0.00	-\-	68.9	86.5	0.35	melt+ol+grt+pyx
107	KH-49	3\1525	45.98	1.65	12.27	0.10	10.57	0.00	17.66	8.82	2.55	0.39	0.00	-\-	74.9	88.7	0.38	melt+ol+grt+pyx
108	KH-41	3\1500	43.32	2.94	14.88	0.04	11.54	0.00	14.99	6.64	4.84	0.80	0.00	-\-	69.8	86.5	0.36	melt+ol+grt+pyx
109	KH-26	3\1525	46.63	1.97	12.68	0.08	10.50	0.00	15.57	9.40	2.75	0.42	0.00	-\-	72.6	87.4	0.38	melt+ol+grt+pyx
	Kushiro (1996)																	
110	KH3	3\1470	45.63	2.00	12.54	0.28	11.20	0.19	15.24	8.98	2.06	1.88	0.00	-\-	70.8			melt+ol+grt
111	KH4	3\1460	46.73	2.23	13.09	0.13	10.14	0.13	12.35	7.74	2.55	4.91	0.00	-\-	68.5			melt+ol+grt
	Lambart et al. (2013)																	
112	Run 16-A3	2\1300	40.36	1.70	12.69	0.03	23.37	0.35	8.79	10.99	1.60	0.13	0.00	-\-	40.1	66.7	0.33	melt+ol+grt+pyx
	Longhi (1995)																	
113	TB992-1	3\1475	37.60	6.18	7.30	0.53	28.60	0.41	10.69	7.62	0.79	0.28	0.00	-\-	40.0	69.3	0.30	melt+ol+grt+pyx
114	TB992-4	3\1510	39.27	4.81	8.22	0.65	25.91	0.40	11.75	8.02	0.75	0.21	0.00	-\-	44.7	71.6	0.32	melt+ol+grt+pyx

Supplementary Table S1 continued

No.	&Run Name	#P (GPa)/T (°C)	$Melt compositions (wt%) SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	†CO_2/H_2O	Melt *Mg#	Olivine *Mg#	K_D	^Phase
	Longhi (1995)																	
115	TB393-1	3\1545	40.98	3.72	8.98	0.60	23.25	0.27	13.93	8.21	0.02	0.04	0.00	-\-	51.6	77.2	0.31	melt+ol+grt
116	TB593-1	3\1505	38.62	5.33	7.91	0.43	26.63	0.26	11.59	8.62	0.51	0.12	0.00	-\-	43.7	71.4	0.31	melt+ol+grt+pyx
117	TB593-2	3\1523	39.07	4.61	8.27	0.54	25.84	0.26	12.31	8.55	0.47	0.08	0.00	-\-	45.9	72.5	0.32	melt+ol+grt+pyx
118	TB593-3	3\1545	41.71	2.95	9.41	0.52	22.23	0.22	14.68	8.21	0.02	0.04	0.00	-\-	54.1	78.0	0.33	melt+ol+grt
119	TB693-1	3\1545	41.24	3.11	9.25	0.53	23.04	0.29	14.71	7.81	0.01	0.02	0.00	-\-	53.2	77.4	0.33	melt+ol+grt+pyx
120	TB693-2	3\1535	40.89	3.50	8.92	0.53	23.77	0.29	13.70	8.21	0.10	0.08	0.00	-\-	50.7	75.6	0.33	melt+ol+grt+pyx
	Longhi (2002)																	
121	RD1097-2	2.8\1573	46.43	0.69	12.71	0.33	10.35	0.04	18.35	8.86	1.98	0.28	0.00	-\-	76.0	90.4	0.34	melt+ol+grt+pyx
122	TM694-5	2.8\1495	45.00	2.11	12.06	0.16	15.71	0.10	12.67	6.70	4.65	0.84	0.00	-\-	59.0	80.4	0.35	melt+ol+grt+pyx
123	TM295-2	2.8\1545	45.84	2.11	12.52	0.20	12.72	0.12	15.14	7.38	3.07	0.90	0.00	-\-	68.0	86.3	0.34	melt+ol+grt+pyx
124	TM295-4	2.8\1540	46.32	1.68	12.73	0.24	11.81	0.10	15.98	7.51	3.00	0.62	0.00	-\-	70.7	87.7	0.34	melt+ol+grt+pyx
125	MO695-4	2.8\1510	47.04	1.49	12.37	0.21	11.66	0.17	14.90	6.11	4.85	1.21	0.00	-\-	69.5	87.0	0.34	melt+ol+grt+pyx
126	MO1295-5	2.8\1518	47.07	1.76	13.43	0.11	9.63	0.13	14.04	6.06	5.67	2.11	0.00	-\-	72.2	89.1	0.32	melt+ol+grt+pyx
127	MO1295-6	2.8\1508	46.78	1.83	13.60	0.09	9.92	0.13	13.70	6.09	5.65	2.20	0.00	-\-	71.1	88.3	0.32	melt+ol+grt+pyx
128	MO1295-8	2.4\1485	47.46	1.83	14.63	0.14	9.18	0.11	13.20	6.25	5.22	1.98	0.00	-\-	71.9	88.6	0.33	melt+ol+grt+pyx
	Mallik and Dasgupta (2012)																	
129	G177	2.5\1375	43.97	4.10	13.99	0.13	8.99	0.17	14.99	10.99	2.40	0.27	0.00	-\-	74.8	89.8	0.34	melt+ol+grt+pyx
130	G145	2.5\1375	44.89	6.61	12.63	0.06	9.92	0.14	13.63	7.72	4.01	0.40	0.00	-\-	71.0	86.8	0.37	melt+ol+grt+pyx
131	G137	3\1375	46.88	3.23	13.11	0.11	9.07	0.18	14.11	11.09	2.02	0.20	0.00	-\-	73.5	89.7	0.32	melt+ol+grt+pyx
132	G175	3\1375	43.83	3.79	13.95	0.12	8.97	0.16	14.94	10.96	2.99	0.30	0.00	-\-	74.8	89.6	0.34	melt+ol+grt+pyx
133	G150	3\1375	44.93	6.12	13.74	0.06	10.33	0.16	12.03	8.42	3.81	0.40	0.00	-\-	67.5	88.2	0.28	melt+ol+grt+pyx
134	G132	3\1375	44.38	6.70	12.60	0.10	11.00	0.14	12.99	7.80	3.90	0.40	0.00	-\-	67.8	87.4	0.30	melt+ol+grt+pyx
135	G160	3\1440	46.05	2.24	13.19	0.13	9.59	0.18	16.28	10.19	2.00	0.15	0.00	-\-	75.2	90.1	0.33	melt+ol+grt+pyx
	Mallik and Dasgupta (2013)																	
136	G217	3\1375	30.08	6.32	5.21	0.80	14.04	0.21	21.05	18.05	4.01	0.23	0.00	22.00\-	72.8	89.1	0.33	melt+ol+grt+pyx
137	G227	3\1375	31.12	4.62	5.32	0.20	15.06	0.22	19.07	20.08	4.02	0.30	0.00	23.00\-	69.3	85.0	0.40	melt+ol+grt+pyx
138	G239	3\1375	39.04	2.80	8.41	0.13	11.01	0.15	20.32	14.02	4.00	0.11	0.00	12.00\-	76.7	87.8	0.46	melt+ol+grt+pyx
139	G240	3\1375	38.20	3.42	9.15	0.10	12.36	0.17	17.29	13.07	6.03	0.21	0.00	1-\-	71.4	86.7	0.38	melt+ol+grt+pyx
140	B222	3\1375	42.42	6.46	10.60	0.20	10.10	0.12	15.55	10.10	4.04	0.40	0.00	12.00\-	73.3	88.4	0.36	melt+ol+grt+pyx
141	B223	3\1375	47.32	5.90	11.91	0.20	9.91	0.11	12.21	7.90	4.20	0.34	0.00	4.00\-	68.7	87.9	0.30	melt+ol+grt+pyx
	Mallik and Dasgupta (2014)																	
142	G150	3\1375	44.98	6.11	13.72	0.06	10.32	0.16	12.02	8.42	3.81	0.40	0.00	-\-	67.5	88.2	0.28	melt+ol+grt+pyx
143	B208	3\1375	44.27	6.64	10.67	0.10	10.06	0.10	14.08	8.95	4.73	0.40	0.00	5.69\-	71.4	88.2	0.33	melt+ol+grt+pyx
144	B222	3\1375	42.42	6.46	10.61	0.20	10.10	0.12	15.55	10.10	4.04	0.40	0.00	10.81\-	73.3	88.4	0.36	melt+ol+grt+pyx
145	B219	3\1375	42.07	7.41	10.41	0.10	11.02	0.11	13.72	11.12	3.71	0.32	0.00	9.93\-	68.9	88.8	0.28	melt+ol+grt+pyx
146	B209	3\1375	42.85	5.18	10.77	0.10	9.67	0.11	16.14	10.96	3.99	0.25	0.00	8.23\-	74.9	89.2	0.36	melt+ol+grt+pyx
147	G132	3\1375	44.38	6.70	12.59	0.10	11.00	0.14	12.99	7.80	3.90	0.40	0.00	-\-	67.8	87.4	0.30	melt+ol+grt+pyx
148	B212	3\1375	46.38	6.30	12.29	0.07	9.80	0.09	12.29	7.79	4.60	0.39	0.00	8.25\-	69.1	87.5	0.32	melt+ol+grt+pyx
149	B223	3\1375	47.32	5.91	11.91	0.20	9.90	0.11	12.21	7.90	4.20	0.34	0.00	3.85\-	68.7	87.9	0.30	melt+ol+grt+pyx
150	B215	3\1375	42.05	5.71	10.51	0.31	11.02	0.14	14.92	10.01	5.01	0.34	0.00	11.52\-	70.7	88.4	0.32	melt+ol+grt+pyx
151	B211	3\1375	39.95	6.00	10.09	0.10	10.99	0.11	16.48	10.99	4.99	0.30	0.00	12.27\-	72.8	89.1	0.33	melt+ol+grt+pyx
	Stamm and Schmidt (2017)																	
152	JER15-63	7\1400	13.77	4.26	0.60	0.15	10.99	0.42	31.10	25.84	8.67	4.18	0.02	31.69\1.44	83.5	90.7	0.52	melt+ol+grt+pyx
153	JER15-51	7\1500	26.03	4.09	1.42	0.26	10.33	0.37	27.82	20.66	5.78	3.17	0.08	23.77\1.09	82.8	91.8	0.43	melt+ol+grt+pyx
154	JER16-74	7\1400	30.54	2.80	1.99	0.48	10.61	0.35	29.25	17.99	4.01	1.94	0.04	13.18\8.74	83.1	92.6	0.39	melt+ol+grt+pyx
155	JER15-57	7\1500	19.53	3.20	1.01	0.26	9.40	0.34	30.69	25.99	6.31	3.23	0.04	29.16\0.92	85.3	91.9	0.51	melt+ol+grt+pyx
156	JER15-60	7\1550	25.40	2.86	1.21	0.39	9.94	0.36	30.09	22.08	5.11	2.48	0.08	25.00\0.77	84.4	92.1	0.46	melt+ol+grt+pyx
157	JER16-75	7\1400	19.76	3.04	1.00	0.28	10.76	0.37	32.00	23.74	6.64	2.36	0.06	26.43\4.43	84.1	91.3	0.51	melt+ol+grt+pyx
158	JER15-73	7\1400	31.05	2.19	1.95	0.54	10.65	0.33	31.05	17.45	3.21	1.54	0.05	14.80\7.08	83.9	93.0	0.39	melt+ol+grt+pyx
159	JER15-62	7\1550	26.03	2.44	1.18	0.42	10.08	0.31	31.07	21.69	4.48	2.24	0.07	25.71\0.66	84.6	92.2	0.47	melt+ol+grt+pyx
160	JER15-68	7\1600	28.59	2.21	1.31	0.51	9.15	0.33	32.25	19.65	4.20	1.76	0.05	24.33\0.64	86.3	93.2	0.46	melt+ol+grt+pyx
161	JER15-43	7\1400	12.45	2.64	0.45	0.18	9.70	0.34	32.33	32.65	6.63	2.59	0.05	36.04\0.85	85.6	91.1	0.58	melt+ol+grt+pyx
162	JER15-48	7\1450	17.24	2.65	0.66	0.23	10.16	0.35	30.63	29.40	6.46	2.15	0.06	33.73\0.77	84.3	91.3	0.51	melt+ol+grt+pyx
163	JER15-53	7\1500	17.52	2.71	0.78	0.27	10.03	0.33	31.90	28.01	6.14	2.25	0.06	31.25\0.72	85.0	91.1	0.55	melt+ol+grt+pyx
164	JER15-54	7\1525	24.08	2.39	1.15	0.41	9.79	0.31	31.12	23.66	4.93	2.11	0.04	26.65\0.62	85.0	92.3	0.47	melt+ol+grt+pyx
165	JER15-37	7\1550	32.11	1.82	2.37	0.62	8.65	0.25	29.23	19.79	3.67	1.44	0.05	22.05\0.50	85.8	93.2	0.44	melt+ol+grt+pyx
166	JER15-39	7\1600	34.50	1.68	1.96	0.62	8.86	0.27	31.08	16.68	3.03	1.26	0.06	19.42\0.44	86.2	93.9	0.41	melt+ol+grt+pyx
167	JER15-67	7\1650	33.83	1.74	2.03	0.69	8.55	0.24	31.02	17.23	3.32	1.28	0.08	2-\0.46	86.6	93.7	0.43	melt+ol+grt+pyx
168	JER15-65	7\1400	19.32	2.50	0.92	0.28	10.39	0.34	32.06	26.35	5.85	1.90	0.09	28.97\2.17	84.6	91.3	0.52	melt+ol+grt+pyx
169	JER15-64	7\1400	17.48	2.46	0.84	0.28	10.01	0.30	33.16	27.34	6.57	1.49	0.06	28.24\4.24	85.5	91.7	0.54	melt+ol+grt+pyx
170	JER15-55	7\1400	25.22	2.07	1.43	0.45	9.79	0.29	32.25	22.33	4.00	2.07	0.10	21.43\5.36	85.5	92.6	0.47	melt+ol+grt+pyx
171	JER15-69	7\1450	18.53	2.32	0.66	0.26	9.64	0.32	32.99	27.41	5.72	2.11	0.05	31.76\0.64	85.9	92.0	0.53	melt+ol+grt+pyx
172	JER15-61	7\1500	21.90	2.10	0.93	0.37	9.74	0.31	32.78	24.48	5.44	1.86	0.07	28.84\0.58	85.7	92.1	0.51	melt+ol+grt+pyx
173	JER15-59	7\1400	13.85	2.36	0.50	0.20	9.76	0.36	32.90	31.96	5.82	2.20	0.06	34.94\0.65	85.7	91.2	0.58	melt+ol+grt+pyx
174	JER15-56	7\1480	16.79	1.93	0.62	0.28	9.86	0.35	32.81	28.96	6.32	2.00	0.08	33.94\0.62	85.6	91.4	0.56	melt+ol+grt+pyx
175	JER15-36	7\1400	9.93	1.95	0.42	0.18	10.10	0.33	34.36	33.22	7.00	2.44	0.05	39.18\0.61	85.8	90.2	0.66	melt+ol+grt+pyx

Supplementary Table S1 continued

			$Melt compositions (wt%)												Melt	Olivine		
No.	&Run Name	#P (GPa)/T (°C)	SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	†CO_2/H_2O	*Mg#	*Mg#	K_D	^Phase
	Sun and Dasgupta (2019)																	
176	MA165	10\1450	12.90	1.17	0.29	0.04	9.14	0.21	32.56	37.75	5.55	0.38	0.02	38.74\-	86.4	92.1	0.55	melt+ol+grt+pyx
177	MA166	10\1450	27.22	1.03	0.87	0.10	9.27	0.20	37.04	21.31	2.71	0.18	0.07	27.82\-	87.7	95.0	0.37	melt+ol+grt+pyx
178	MA167	10\1450	22.28	1.03	0.75	0.08	7.03	0.21	38.22	26.46	3.44	0.46	0.04	31.57\-	90.6	95.5	0.45	melt+ol+grt+pyx
179	MA180	10\1450	31.40	0.93	1.21	0.12	10.37	0.33	34.89	19.12	1.36	0.19	0.09	23.21\-	85.7	95.4	0.29	melt+ol+grt+pyx
180	MA181	10\1450	24.02	1.12	0.69	0.06	9.06	0.28	36.72	25.76	1.98	0.25	0.06	30.07\-	87.8	94.7	0.40	melt+ol+grt+pyx
181	MA185	7\1400	27.79	1.09	1.60	0.09	9.58	0.29	32.50	25.36	1.45	0.18	0.05	23.82\-	85.8	94.3	0.36	melt+ol+grt+pyx
182	MA188	7\1400	38.60	0.66	3.17	0.21	6.71	0.23	33.70	15.20	1.32	0.14	0.05	14.24\-	90.0	96.6	0.31	melt+ol+grt+pyx
183	MA190	7\1400	33.36	0.76	2.43	0.14	6.60	0.24	34.21	20.10	1.95	0.17	0.04	22.11\-	90.2	95.7	0.41	melt+ol+grt+pyx
184	MA192	7\1400	26.33	1.54	1.40	0.08	11.39	0.27	28.64	27.12	3.00	0.23	0.00	27.73\-	81.8	89.8	0.51	melt+ol+grt+pyx
185	MA193	7\1400	33.71	0.96	2.94	0.21	11.16	0.27	29.26	19.87	1.47	0.13	0.01	16.37\-	82.4	90.2	0.51	melt+ol+grt+pyx
186	MA200	7\1400	27.08	1.01	1.47	0.09	11.56	0.30	31.01	26.38	0.93	0.15	0.01	25.80\-	82.7	89.7	0.55	melt+ol+grt+pyx
	Takahashi (1986)																	
187	43	3\1550	46.99	0.90	11.02	0.40	7.82	0.20	19.24	12.22	1.20	0.00	0.00	-\-	81.4	92.6	0.35	melt+ol+grt+pyx
188	63	7.5\1900	47.68	0.20	5.15	0.51	9.39	0.10	31.62	4.85	0.51	0.00	0.00	-\-	85.7	94.1	0.38	melt+ol+grt+pyx
189	78	8\1900	46.65	0.20	4.60	0.40	8.81	0.20	34.93	3.90	0.30	0.00	0.00	-\-	87.6			melt+ol+grt
	Walter (1998)																	
190	40.06	4\1590	46.63	1.46	9.86	0.33	10.71	0.20	18.68	10.36	0.93	0.83	0.00	-\-	75.7	90.4	0.33	melt+ol+grt+pyx
191	40.07	4\1610	45.88	1.28	10.43	0.25	10.73	0.19	20.05	9.38	1.09	0.71	0.00	-\-	76.9	90.3	0.36	melt+ol+grt+pyx
192	45.03	4.5\1620	46.21	1.67	8.31	0.34	11.78	0.21	20.12	9.25	1.12	1.00	0.00	-\-	75.3	90.7	0.31	melt+ol+grt+pyx
193	45.02	4.5\1650	46.16	0.49	9.04	0.46	10.15	0.19	24.45	8.19	0.58	0.29	0.00	-\-	81.1	92.3	0.36	melt+ol+grt+pyx
194	50.01	5\1680	45.30	1.27	7.23	0.31	12.02	0.20	22.54	9.65	0.87	0.61	0.00	-\-	77.0	90.5	0.35	melt+ol+grt+pyx
195	60.01	6\1710	45.42	1.02	6.43	0.35	12.77	0.21	23.49	9.14	0.81	0.36	0.00	-\-	76.6	90.7	0.34	melt+ol+grt+pyx
196	60.07	6\1740	45.78	0.92	6.55	0.41	11.86	0.22	24.06	8.72	0.87	0.61	0.00	-\-	78.3	91.4	0.34	melt+ol+grt+pyx
197	60.05	6\1755	46.81	0.49	7.32	0.43	10.31	0.19	26.37	7.38	0.45	0.23	0.00	-\-	82.0	92.6	0.36	melt+ol+grt+pyx
198	70.07	7\1790	45.58	1.24	5.14	0.36	12.65	0.23	24.13	8.70	1.05	0.92	0.00	-\-	77.3	91.2	0.33	melt+ol+grt+pyx
199	70.02	7\1810	46.53	0.67	5.48	0.37	11.72	0.20	25.52	8.57	0.64	0.30	0.00	-\-	79.5	91.4	0.37	melt+ol+grt+pyx
200	70.05	7\1820	47.02	0.58	6.26	0.49	10.58	0.20	26.65	7.42	0.56	0.25	0.00	-\-	81.8	92.5	0.37	melt+ol+grt+pyx
201	70.09	7\1835	47.35	0.43	6.30	0.47	9.69	0.19	27.46	7.30	0.64	0.15	0.00	-\-	83.5	93.4	0.35	melt+ol+grt+pyx
202	70.08	7\1850	47.44	0.28	6.46	0.50	8.63	0.18	30.36	5.62	0.41	0.11	0.00	-\-	86.2	94.7	0.35	melt+ol+grt

& References for the experiments: Balta et al. (2011)[12], Dasgupta & Hirschmann (2007)[13], Dasgupta et al. (2007)[14], Dasgupta et al. (2013)[4], Davis et al. (2011)[15], Davis et al. (2013)[16], Dvir & Kessel (2017)[1], Elardo et al. (2011)[17], Elthon & Scarfe (1984)[18], Falloon & Green (1988)[19], Gaetani & Grove (1998)[20], Grove et al. (2013)[21], Herzberg & Zhang (1996)[22], Hirose (1997)[23], Kinzler (1997)[24], Kogiso et al. (1998)[25], Kushiro (1996)[26], Lambart et al. (2013)[27], Longhi (1995)[28], Longhi (2002)[29], Mallik & Dasgupta (2012)[30], Mallik & Dasgupta (2013)[31], Mallik & Dasgupta (2014)[32], Stamm & Schmidt (2017)[2], Sun & Dasgupta (2019)[3], Takahashi (1986)[33], and Walter (1998)[34]

Experimental pressures and temperatures: "3\1375" should read as 3 GPa and 1375 °C

$ Experimental melt compositions in wt% on a volatile-free basis

† Volatile contents in the experimental melts: "0.11\6.00" should read as 0.11 wt% CO_2 and 6.00 wt% H_2O

* Mg# = 100×MgO/(MgO + FeO) in mole

^ Major phases present in the experimental products, ol = olivine, grt = garnet, and pyx = pyroxene

Supplementary Table S2. Compiled experiments[§] for independently testing the new thermometer and olivine-melt K_D model

No.	[&]Run Name	[#]P (GPa)/T (°C)	[$]Melt compositions (wt%) SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	[†]CO_2/H_2O	Melt *Mg#	Olivine *Mg#	K_D
Spinel-peridotite partial melts coexisting with olivine and pyroxene																	
	Baker and Stolper (1994)																
1	26	1\1390	51.10	0.35	12.12	0.58	7.41	0.17	15.73	11.52	1.00	0.00	0.00	-\-	79.1	92.1	0.32
2	13	1\1360	50.87	0.37	12.79	0.52	7.00	0.13	14.99	11.99	1.34	0.00	0.00	-\-	79.3		
3	22	1\1360	50.40	0.42	12.98	0.50	7.29	0.15	14.47	12.68	1.12	0.00	0.00	-\-	78.0	91.5	0.33
4	21	1\1350	50.31	0.42	13.38	0.44	7.09	0.14	13.88	13.08	1.28	0.00	0.00	-\-	77.7	91.4	0.33
5	28	1\1330	51.05	0.42	12.79	0.48	6.99	0.10	13.79	12.89	1.50	0.00	0.00	-\-	77.8		
6	18	1\1330	50.38	0.43	14.82	0.32	6.71	0.13	12.92	12.62	1.66	0.00	0.00	-\-	77.4		
7	19	1\1330	50.17	0.48	15.09	0.33	6.80	0.13	12.59	12.79	1.62	0.00	0.00	-\-	76.8		
8	24	1\1330	50.28	0.47	14.69	0.34	6.70	0.13	13.09	12.79	1.50	0.00	0.00	-\-	77.7	91.3	0.33
9	10	1\1270	51.27	0.64	18.62	0.11	5.71	0.12	9.51	11.01	3.00	0.00	0.00	-\-	74.8		
10	16	1\1300	50.00	0.54	16.10	0.24	6.50	0.12	12.10	12.50	1.90	0.00	0.00	-\-	76.8	90.9	0.33
11	15	1\1280	50.88	0.69	16.99	0.16	6.10	0.09	11.10	11.60	2.40	0.00	0.00	-\-	76.4	90.8	0.33
12	20	1\1270	50.94	0.66	17.91	0.12	5.90	0.14	10.41	11.21	2.70	0.00	0.00	-\-	75.9	90.7	0.32
13	55T	1\1270	50.20	0.67	18.10	0.11	6.10	0.12	10.50	11.40	2.80	0.00	0.00	-\-	75.4	90.8	0.31
14	44R	1\1310	50.06	0.54	16.32	0.19	6.41	0.16	12.01	12.31	2.00	0.00	0.00	-\-	77.0		
15	43R	1\1310	49.89	0.48	15.70	0.27	6.60	0.18	12.40	12.60	1.90	0.00	0.00	-\-	77.0		
	Falloon and Green (1988)																
16	T-1989	1.5\1360	50.38	0.82	17.96	0.82	6.98	0.00	9.98	9.58	3.49	0.00	0.00	-\-	71.8		
17	T-2029	1.8\1370	47.88	1.52	17.36	0.00	9.05	0.00	10.91	9.47	3.67	0.14	0.00	-\-	68.3		
18	T-2031	1.8\1450	47.90	0.66	15.17	0.36	8.12	0.00	14.59	11.64	1.56	0.00	0.00	-\-	76.2		
19	T-1515	2\1420	47.03	1.00	16.62	0.00	9.67	0.00	12.99	9.93	2.63	0.12	0.00	-\-	70.5		
20	T-1501	2\1430	46.86	0.70	15.41	0.20	9.81	0.00	14.21	10.51	2.30	0.00	0.00	-\-	72.1		
	Gaetani and Grove (1998)																
21	B333	1.2\1245	48.17	0.64	17.94	0.09	7.23	0.15	12.03	11.47	2.14	0.14	0.00	-\3.30	74.8	89.9	0.33
22	B305	1.2\1230	48.23	0.58	16.90	0.18	7.59	0.13	13.20	11.06	2.08	0.05	0.00	1.27\4.50	75.6	90.0	0.34
23	B304	1.2\1215	47.79	0.63	18.69	0.05	7.34	0.09	11.48	11.48	2.37	0.09	0.00	-\5.99	73.6	88.9	0.35
24	B330	1.2\1200	48.39	0.64	18.91	0.12	7.42	0.13	11.01	10.96	2.31	0.11	0.00	-\5.06	72.5	88.4	0.35
25	B329	1.2\1185	48.44	0.68	19.46	0.09	7.80	0.15	10.16	10.60	2.50	0.13	0.00	-\6.26	69.9	87.4	0.34
26	B303	1.2\1345	47.80	0.66	17.93	0.17	8.15	0.10	11.87	11.05	2.18	0.08	0.00	-\0.71	72.2	88.9	0.32
27	B292	1.2\1330	48.06	0.68	18.31	0.13	8.30	0.16	11.16	10.57	2.50	0.12	0.00	-\-	70.6	88.1	0.32
28	B287	1.2\1315	47.47	0.67	18.12	0.07	8.51	0.12	11.55	10.84	2.53	0.12	0.00	0.07\0.98	70.7	88.4	0.32
29	B348	1.6\1245	46.71	0.69	18.08	0.10	7.84	0.16	12.65	11.30	2.43	0.05	0.00	-\5.30	74.2	89.4	0.34
30	B394	1.6\1370	46.80	0.61	17.26	0.18	8.71	0.16	13.13	10.78	2.24	0.12	0.00	-\-	72.9	89.4	0.32
31	B302	1.6\1355	46.85	0.69	17.37	0.13	8.99	0.11	12.62	10.86	2.31	0.07	0.00	-\-	71.5	88.7	0.32
32	B432	1.2\1185	48.68	1.34	19.27	0.02	7.41	0.18	9.31	9.47	3.82	0.51	0.00	-\6.20	69.1	87.8	0.31
	Kinzler (1997)																
33	L59	1.7\1366	47.01	1.10	16.62	0.02	11.22	0.09	9.55	8.98	4.91	0.49	0.00	-\-	60.3	84.7	0.28
34	L50	1.7\1381	46.69	0.72	16.41	0.00	9.85	0.08	13.67	9.43	3.01	0.14	0.00	-\-	71.2	86.6	0.38
35	L47	1.7\1396	46.16	0.57	16.85	0.04	9.23	0.01	13.79	10.72	2.53	0.10	0.00	-\-	72.7	88.7	0.34
36	L44	1.7\1411	46.69	0.49	17.03	0.01	7.67	0.05	14.78	11.01	2.20	0.07	0.00	-\-	77.5	91.2	0.33
37	L62	1.7\1366	46.33	0.76	15.72	0.01	9.29	0.06	13.69	10.75	3.22	0.17	0.00	-\-	72.4	87.8	0.37
38	L63	1.7\1381	46.51	0.60	15.77	0.10	8.65	0.06	15.07	10.65	2.43	0.15	0.00	-\-	75.6	88.8	0.39
39	L129	1.5\1365	49.45	0.76	17.72	0.09	9.88	0.09	8.58	9.53	3.67	0.23	0.00	-\-	60.8	85.7	0.26
40	L130	1.5\1380	46.70	0.73	16.72	0.03	10.20	0.04	11.83	9.93	3.62	0.20	0.00	-\-	67.4	86.5	0.32
41	L134	1.5\1395	46.85	0.80	16.58	0.10	10.42	0.04	12.41	9.30	3.28	0.23	0.00	-\-	68.0	86.3	0.34
42	L138	1.5\1410	47.07	0.67	16.63	0.07	9.18	0.01	13.20	10.38	2.64	0.14	0.00	-\-	71.9	88.1	0.35
43	L76	1.9\1386	45.41	0.68	15.65	0.09	8.98	0.11	14.83	11.33	2.75	0.16	0.00	-\-	74.6	89.8	0.34
44	L116	1.9\1401	48.94	1.12	16.75	0.16	10.13	0.00	9.55	9.01	3.75	0.60	0.00	-\-	62.7	84.9	0.30
45	L120	1.9\1416	46.67	0.86	14.78	0.10	8.77	0.00	15.29	10.23	3.06	0.24	0.00	-\-	75.7	89.2	0.37
46	L88	1.9\1421	46.09	0.51	15.57	0.10	9.55	0.00	15.67	10.31	2.11	0.10	0.00	-\-	74.5	89.2	0.36
47	L125	1.5\1355	48.29	0.99	18.34	0.00	9.05	0.04	8.39	9.07	5.62	0.21	0.00	-\-	62.3	86.2	0.26
48	L127	1.5\1370	47.25	0.76	17.35	0.03	9.50	0.00	11.34	9.44	4.21	0.12	0.00	-\-	68.0	87.5	0.30
49	L132	1.5\1385	47.03	0.65	17.66	0.05	8.62	0.09	12.40	10.12	3.30	0.07	0.00	-\-	71.9	88.6	0.33
50	L95	1.7\1366	47.50	0.88	15.06	0.00	9.58	0.03	13.66	9.12	4.03	0.13	0.00	-\-	71.8	86.4	0.40
51	L97	1.7\1381	46.34	0.86	15.65	0.09	9.43	0.00	13.71	9.61	4.18	0.12	0.00	-\-	72.2	87.2	0.38
52	L107	1.7\1381	46.89	0.90	17.23	0.00	9.69	0.04	11.72	8.74	4.64	0.15	0.00	-\-	68.3	86.3	0.34
53	L124	1.7\1411	46.97	0.85	16.57	0.00	10.00	0.00	12.50	8.35	4.58	0.17	0.00	-\-	69.0	86.6	0.34

Supplementary Table S2 continued

No.	[&]Run Name	[#]P (GPa)/T (°C)	[$]Melt compositions (wt%) SiO2	TiO2	Al2O3	Cr2O3	FeO	MnO	MgO	CaO	Na2O	K2O	P2O5	[†]CO2/H2O	Melt *Mg#	Olivine *Mg#	K_D
	Kinzler (1997)																
54	L108	1.9\1406	46.16	0.96	15.93	0.00	10.15	0.00	13.77	8.38	4.46	0.20	0.00	-\-	70.8	86.9	0.37
55	L121	1.9\1415	46.26	0.95	16.27	0.00	10.37	0.00	13.22	8.50	4.26	0.17	0.00	-\-	69.4	86.9	0.34
56	L104	1.9\1421	46.68	0.55	17.43	0.00	8.23	0.00	13.52	10.92	2.60	0.06	0.00	-\-	74.5	90.0	0.33
57	L118	2.1\1418	48.61	1.02	15.66	0.00	10.04	0.06	12.23	8.87	3.35	0.16	0.00	-\-	68.5	87.0	0.33
58	L119	2.3\1511	45.02	0.42	14.18	0.14	8.29	0.00	18.09	12.13	1.67	0.06	0.00	-\-	79.5	91.8	0.35
	Kinzler and Grove (1992)																
59	H162	1.3\1295	49.06	1.40	17.76	0.00	10.23	0.10	7.96	9.16	4.12	0.21	0.00	-\-	58.1	81.6	0.31
60	H200	1.6\1340	47.51	1.43	17.88	0.03	9.96	0.16	8.94	9.98	3.88	0.22	0.00	-\-	61.5	86.3	0.25
61	H199	1.6\1325	48.34	1.78	17.69	0.03	10.45	0.11	7.87	7.73	5.64	0.36	0.00	-\-	57.3	83.6	0.26
62	B32	1.2\1285	47.65	0.61	18.21	0.00	11.74	0.09	8.26	10.15	3.12	0.18	0.00	-\-	55.6	81.9	0.28
63	B30	1.2\1300	47.21	0.50	18.22	0.00	10.01	0.11	10.57	11.27	2.00	0.10	0.00	-\-	65.3	85.0	0.33
64	B52	1.2\1315	47.64	0.47	17.79	0.12	9.26	0.10	10.86	11.76	1.88	0.12	0.00	-\-	67.6	86.9	0.31
65	B54	1.2\1285	49.17	0.42	18.79	0.02	7.82	0.11	9.92	9.86	3.77	0.12	0.00	-\-	69.3	87.6	0.32
66	B55	1.2\1270	48.79	0.44	19.09	0.00	7.91	0.13	9.74	10.00	3.78	0.13	0.00	-\-	68.7	87.4	0.32
67	B59	1.2\1285	49.22	0.42	18.44	0.00	8.14	0.06	9.96	9.73	3.88	0.14	0.00	-\-	68.6	86.5	0.34
68	B56	1.2\1255	49.79	0.49	19.23	0.00	8.80	0.11	7.55	8.46	5.38	0.19	0.00	-\-	60.5	83.7	0.30
	Kushiro (1996)																
69	475	1\1225	50.13	1.67	18.29	0.15	7.66	0.27	8.30	10.24	2.03	1.17	0.10	-\-	65.9		
70	469	1\1200	53.20	1.79	18.94	0.07	5.71	0.13	5.91	7.82	3.18	3.17	0.09	-\-	64.9		
71	459	1.5\1275	49.68	1.65	17.75	0.12	7.81	0.19	8.86	9.55	2.93	1.43	0.03	-\-	66.9		
72	465	2\1350	47.50	1.91	16.36	0.09	9.24	0.19	10.43	9.55	2.49	2.18	0.07	-\-	66.8		
73	471	2.5\1425	46.93	1.90	14.77	0.14	9.91	0.14	12.28	9.34	2.41	2.07	0.12	-\-	68.8		
	Laporte et al. (2004)																
74	21	1\1220	51.09	0.58	19.31	0.05	5.41	0.07	7.94	10.13	2.10	3.32	0.00	-\-	72.3		
75	2	1\1240	49.79	0.51	18.15	0.04	6.02	0.15	9.80	11.86	1.61	2.07	0.00	-\-	74.4	90.6	0.30
76	18	1\1255	48.32	0.53	17.94	0.11	6.82	0.14	11.24	12.97	1.30	0.64	0.00	-\-	74.6		
77	5	1\1285	48.66	0.46	16.65	0.15	7.09	0.15	12.33	13.49	0.79	0.23	0.00	-\-	75.6		
78	11	1\1290	48.50	0.45	16.22	0.18	6.96	0.14	12.98	13.46	0.84	0.27	0.00	-\-	76.9		
79	8	1\1300	48.48	0.33	15.37	0.31	7.44	0.12	13.76	13.63	0.43	0.13	0.00	-\-	76.7	90.8	0.33
80	17	1\1330	48.93	0.26	15.25	0.30	7.79	0.14	14.19	12.71	0.36	0.06	0.00	-\-	76.5		
81	6	1\1360	49.21	0.23	14.27	0.38	8.21	0.16	15.81	11.40	0.28	0.05	0.00	-\-	77.4	90.7	0.35
82	19	1\1300	50.33	0.27	15.21	0.28	6.93	0.20	13.38	12.88	0.41	0.11	0.00	-\-	77.5		
83	20	1\1300	49.43	0.30	15.61	0.27	7.02	0.14	13.30	13.46	0.36	0.11	0.00	-\-	77.2		
84	22	1\1300	48.63	0.33	15.87	0.26	7.14	0.10	13.25	13.84	0.47	0.10	0.00	-\-	76.8		
85	rev2a	1\1270	50.48	0.57	18.19	0.09	6.02	0.12	9.75	10.83	1.64	2.31	0.00	-\-	74.3	90.3	0.31
86	rev2b	1\1280	50.51	0.55	17.83	0.09	5.91	0.11	10.04	11.19	1.59	2.18	0.00	-\-	75.2	90.4	0.32
87	rev2c	1\1295	50.27	0.47	17.01	0.18	6.26	0.14	10.96	11.38	1.39	1.94	0.00	-\-	75.7	90.9	0.31
88	rev2d	1\1255	51.05	0.54	18.22	0.06	5.85	0.13	9.32	10.42	1.81	2.60	0.00	-\-	74.0	90.3	0.30
89	rev2e	1\1270	51.07	0.51	18.17	0.10	5.82	0.06	9.57	10.62	1.68	2.40	0.00	-\-	74.6	90.4	0.31
90	rev2f	1\1240	50.96	0.59	19.41	0.04	5.67	0.11	8.38	10.07	2.09	2.68	0.00	-\-	72.5	89.4	0.31
91	rev2g	1\1240	51.21	0.58	18.05	0.08	5.96	0.16	9.39	10.57	1.75	2.25	0.00	-\-	73.7	90.0	0.31
92	rev6a	1\1375	49.23	0.21	13.21	0.59	8.44	0.17	17.42	10.41	0.27	0.04	0.00	-\-	78.6	91.3	0.35
93	rev6b	1\1360	48.27	0.28	15.23	0.34	8.03	0.19	14.94	12.29	0.35	0.08	0.00	-\-	76.8	90.6	0.34
94	rev8a	1\1300	47.92	0.36	16.95	0.16	7.52	0.14	12.64	13.54	0.62	0.16	0.00	-\-	75.0	90.0	0.33
95	rev8b	1\1315	48.33	0.39	16.33	0.24	7.41	0.13	12.97	13.52	0.54	0.13	0.00	-\-	75.7	90.4	0.33
96	rev8c	1\1330	48.79	0.34	14.98	0.39	7.52	0.15	14.13	13.11	0.46	0.12	0.00	-\-	77.0	90.8	0.34
97	rev8d	1\1300	48.41	0.37	16.19	0.19	7.42	0.15	12.91	13.73	0.50	0.14	0.00	-\-	75.6	90.2	0.34
	Parman and Grove (2004)																
98	W.9	1.5\1200	49.31	0.61	17.63	0.07	6.91	0.14	12.86	11.19	1.12	0.13	0.02	-\8.96	76.8	90.8	0.33
99	W.11	1.5\1175	48.81	0.65	17.37	0.08	8.51	0.12	12.04	11.05	1.23	0.09	0.04	-\8.34	71.6	88.0	0.34
100	W.12	1.5\1175	47.80	0.71	18.92	0.04	8.43	0.12	10.52	11.67	1.73	0.05	0.01	-\8.69	69.0	86.9	0.34
101	W.20	1.5\1400	46.74	0.69	16.87	0.08	8.89	0.12	13.36	11.93	1.26	0.06	0.00	-\-	72.8		
102	W.22	2\1250	47.10	0.57	16.81	0.11	8.98	0.13	15.31	10.03	0.87	0.08	0.00	-\8.10	75.2	89.7	0.35
103	W3.34	2\1425	44.63	1.06	15.62	0.06	11.16	0.06	13.68	11.28	2.23	0.08	0.14	-\-	68.6	87.0	0.33
	Wasylenki et al. (2003)																
104	22	1\1300	48.08	0.39	17.73	0.17	7.07	0.18	12.02	13.32	0.96	0.08	0.00	-\-	75.2	90.4	0.32
105	17T	1\1300	48.81	0.39	16.89	0.19	7.28	0.14	12.14	12.85	1.14	0.17	0.00	-\-	74.8	90.0	0.33
106	12	1\1290	48.88	0.41	17.61	0.19	6.84	0.16	11.72	13.21	0.84	0.14	0.00	-\-	75.3	90.3	0.33
107	27C	1\1290	48.22	0.48	15.95	0.12	7.30	0.09	12.75	13.89	1.12	0.09	0.00	-\-	75.7	90.1	0.34

Supplementary Table S2 continued

No.	[&]Run Name	[#]P (GPa)/T (°C)	[$]Melt compositions (wt%) SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	[†]CO_2/H_2O	Melt *Mg#	Olivine *Mg#	K_D
	Wasylenki et al. (2003)																
108	28C	1\1290	48.07	0.58	15.92	0.15	7.54	0.15	12.35	13.72	1.38	0.14	0.00	-\-	74.5	89.9	0.33
109	33C	1\1275	47.97	0.63	17.78	0.09	7.29	0.10	10.35	13.19	2.08	0.51	0.00	-\-	71.7	90.0	0.28
110	34C	1\1275	48.83	0.50	16.87	0.11	7.19	0.18	11.51	13.04	1.43	0.33	0.00	-\-	74.1	89.8	0.32
111	42C	1\1270	47.93	0.59	17.54	0.11	7.28	0.13	11.42	13.25	1.60	0.14	0.00	-\-	73.7	90.0	0.31
Crystallization or muti-saturation experiments																	
	Barr et al. (2009)																
1	Com1-1	0.0001\1410	53.52	0.09	9.96	0.37	6.41	0.13	23.31	5.81	0.35	0.00	0.04	-\-	86.6	95.1	0.33
2	Com1-2	0.0001\1350	55.82	0.10	11.55	0.23	6.14	0.12	18.98	6.70	0.33	0.00	0.03	-\-	84.6	94.4	0.33
3	Com1-4	0.0001\1300	54.88	0.12	13.82	0.14	6.14	0.13	15.94	8.36	0.41	0.00	0.04	-\-	82.2	93.5	0.32
4	Com1-5	0.0001\1500	51.38	0.06	8.03	0.39	6.11	0.11	28.94	4.69	0.21	0.00	0.08	-\-	89.4	96.3	0.33
5	Com1-7	0.0001\1275	54.83	0.15	15.06	0.13	5.79	0.14	14.46	9.02	0.38	0.00	0.03	-\-	81.6	93.5	0.31
6	Com1-11	0.0001\1530	50.25	0.10	7.53	0.51	6.18	0.14	30.39	4.57	0.24	0.00	0.10	-\-	89.8	96.6	0.31
7	Com1-12	0.0001\1320	54.75	0.20	13.49	0.20	6.21	0.18	16.18	8.29	0.46	0.00	0.04	-\-	82.3	94.0	0.29
8	Com1-13	0.0001\1340	54.68	0.15	12.52	0.29	6.45	0.16	17.63	7.65	0.42	0.00	0.05	-\-	83.0	94.5	0.29
9	ComW-1	0.21\1275	55.29	0.11	11.79	0.22	4.79	0.14	20.43	6.93	0.29	0.00	0.01	-\5.04	88.4	95.7	0.34
10	ComW-7	0.18\1125	57.03	0.09	16.74	0.05	4.46	0.10	11.20	9.89	0.42	0.00	0.02	-\4.48	81.7	93.4	0.32
	Grove and Bryan (1983)																
11	ALV-528-1-1-6	0.0001\1228	49.61	0.73	16.13	0.06	10.02	0.08	9.27	12.28	1.69	0.11	0.00	-\-	62.3	85.2	0.29
12	ALV-528-1-1-36	0.0001\1215	49.46	0.68	16.35	0.10	9.68	0.15	9.73	12.07	1.69	0.10	0.00	-\-	64.2	84.7	0.32
13	ALV-528-1-1-35	0.0001\1211	49.11	0.66	16.07	0.09	10.58	0.15	9.56	12.08	1.60	0.10	0.00	-\-	61.7	86.1	0.26
14	ALV-528-1-1-37	0.0001\1199	49.71	0.80	15.50	0.06	10.80	0.15	8.80	12.30	1.77	0.11	0.00	-\-	59.2	83.5	0.29
15	ALV-528-1-1-3	0.0001\1196	50.31	1.03	14.62	0.05	10.79	0.19	8.22	13.01	1.67	0.12	0.00	-\-	57.6	82.5	0.29
16	ALV-528-1-1-38	0.0001\1192	50.73	0.80	14.94	0.09	10.43	0.17	8.63	12.33	1.77	0.10	0.00	-\-	59.6	83.7	0.29
17	ALV-528-1-1-2	0.0001\1187	49.91	1.09	14.42	0.05	11.90	0.16	7.53	12.81	2.00	0.14	0.00	-\-	53.0	79.9	0.28
18	ALV-528-1-1-30	0.0001\1176	51.68	1.14	14.04	0.08	10.89	0.19	7.94	12.41	1.49	0.14	0.00	-\-	56.5	81.7	0.29
19	ALV-528-1-1-15	0.0001\1167	51.68	1.67	13.35	0.03	12.64	0.10	7.40	11.53	1.41	0.18	0.00	-\-	51.1	76.3	0.32
20	ALV-528-1-1-11	0.0001\1166	52.01	1.28	13.93	0.05	11.62	0.18	7.64	11.72	1.42	0.14	0.00	-\-	53.9	78.9	0.31
21	ALV-528-1-1-17	0.0001\1193	50.18	0.76	14.25	0.09	10.04	0.15	9.04	13.85	1.51	0.13	0.00	-\-	61.6	84.8	0.29
22	ALV-525-4b-6	0.0001\1228	50.24	0.81	16.04	0.11	9.24	0.05	9.39	12.28	1.71	0.13	0.00	-\-	64.4	86.4	0.29
23	ALV-525-4b-5	0.0001\1224	48.98	0.84	15.75	0.07	11.18	0.16	9.44	11.89	1.56	0.12	0.00	-\-	60.1	83.8	0.29
24	ALV-525-4b-25	0.0001\1215	49.57	0.71	15.65	0.10	10.20	0.16	9.66	11.91	1.92	0.12	0.00	-\-	62.8	85.5	0.29
25	ALV-525-4b-24	0.0001\1211	49.23	0.72	15.94	0.11	10.29	0.16	9.72	11.80	1.91	0.12	0.00	-\-	62.8	85.5	0.29
26	ALV-525-4b-26	0.0001\1199	50.33	0.77	15.60	0.08	10.47	0.14	8.88	11.78	1.83	0.12	0.00	-\-	60.2	84.0	0.29
27	ALV-525-4b-3	0.0001\1196	51.23	1.09	14.61	0.09	9.91	0.17	8.46	12.48	1.83	0.14	0.00	-\-	60.3	84.1	0.29
28	ALV-525-4b-27	0.0001\1192	51.42	0.81	14.85	0.11	9.86	0.17	8.63	12.12	1.88	0.14	0.00	-\-	60.9	84.3	0.29
29	ALV-525-4b-2	0.0001\1187	51.26	1.25	14.18	0.12	10.94	0.19	7.51	12.46	1.91	0.17	0.00	-\-	55.0	80.7	0.29
30	ALV-525-4b-15	0.0001\1167	51.89	2.47	13.10	0.01	11.68	0.13	7.41	11.58	1.49	0.23	0.00	-\-	53.1	78.0	0.32
31	AII-32-12-6-11	0.0001\1214	50.63	1.14	14.89	0.09	9.29	0.17	9.30	11.95	2.17	0.37	0.00	-\-	64.1	86.4	0.28
32	AII-32-12-6-4	0.0001\1205	51.09	1.28	15.42	0.08	8.65	0.15	8.68	12.29	1.96	0.40	0.00	-\-	64.1	86.1	0.29
33	AII-32-12-6-8	0.0001\1193	53.64	1.42	14.45	0.10	7.95	0.18	8.21	11.92	1.71	0.41	0.00	-\-	64.8	87.2	0.27
34	AII-32-12-6-2	0.0001\1176	51.82	1.83	14.22	0.03	10.57	0.19	7.12	11.58	2.14	0.49	0.00	-\-	54.6	80.8	0.29
35	AII-32-12-6-3	0.0001\1174	52.35	1.60	14.10	0.06	9.82	0.16	7.82	11.97	1.71	0.39	0.00	-\-	58.7	83.1	0.29
36	AII-32-12-6-1	0.0001\1166	53.25	2.10	13.99	0.04	10.27	0.20	6.97	10.87	1.81	0.49	0.00	-\-	54.7	80.8	0.29
37	AII-32-12-6-5	0.0001\1165	52.50	1.96	13.99	0.04	9.78	0.21	7.30	11.55	2.13	0.55	0.00	-\-	57.1	82.4	0.28
38	AII-32-12-6-6	0.0001\1137	51.74	2.39	13.01	0.09	13.32	0.19	6.33	10.57	1.83	0.53	0.00	-\-	45.9	74.3	0.29
39	II-96-6-42-10	0.0001\1181	52.49	1.52	14.87	0.10	9.63	0.20	7.77	11.13	2.06	0.23	0.00	-\-	59.0	83.0	0.29
40	II-96-6-42-2	0.0001\1176	51.37	1.77	13.91	0.06	11.78	0.17	7.16	11.47	2.09	0.23	0.00	-\-	52.0	79.6	0.28
41	II-96-6-42-3	0.0001\1174	52.30	1.76	14.29	0.04	10.14	0.17	7.49	11.55	2.04	0.21	0.00	-\-	56.8	82.8	0.27
42	II-96-6-42-1	0.0001\1166	52.77	2.36	14.11	0.01	10.35	0.20	6.91	11.16	1.82	0.30	0.00	-\-	54.3	80.2	0.29
43	II-96-6-42-6	0.0001\1137	52.19	2.71	12.84	0.02	13.05	0.21	6.28	10.19	2.16	0.35	0.00	-\-	46.2	74.2	0.30
	Grove et al. (1992)																
44	ALV2-4	0.2\1176	50.72	1.97	14.59	0.00	10.92	0.22	7.34	10.82	3.24	0.18	0.00	-\-	54.5	79.7	0.30
45	ALV2-5	0.2\1163	50.39	2.38	13.76	0.00	12.35	0.25	6.78	10.63	3.27	0.19	0.00	-\-	49.5	76.5	0.30
46	ALV2-8	0.2\1152	50.64	2.50	13.87	0.00	11.85	0.19	6.68	10.63	3.40	0.22	0.00	-\-	50.1	76.1	0.32
47	ALV2-10	0.2\1148	50.42	2.33	13.87	0.00	12.15	0.22	6.76	10.83	3.22	0.19	0.00	-\-	49.8	77.4	0.29
48	ALV2-7	0.2\1145	50.56	3.37	13.10	0.00	13.10	0.27	6.17	10.01	3.16	0.25	0.00	-\-	45.7	73.3	0.31
49	ALV2-9	0.2\1126	49.90	3.77	12.73	0.00	13.85	0.25	6.02	9.84	3.35	0.29	0.00	-\-	43.6	71.2	0.31
50	H51	0.8\1240	50.74	1.42	15.97	0.05	9.58	0.14	8.10	10.71	3.16	0.12	0.00	-\-	60.1	84.2	0.28

Supplementary Table S2 continued

			[$]Melt compositions (wt%)												Melt	Olivine	
No.	[&]Run Name	[#]P (GPa)/T (°C)	SiO_2	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	[†]CO_2/H_2O	*Mg#	*Mg#	K_D
	Grove et al. (1992)																
51	H50	0.8\1230	49.57	1.84	15.75	0.03	11.31	0.19	7.71	9.86	3.60	0.14	0.00	-\-	54.9	80.7	0.29
52	H60	0.8\1215	49.58	1.93	15.58	0.08	11.71	0.09	7.40	9.79	3.68	0.15	0.00	-\-	53.0	80.1	0.28
53	H62	0.8\1265	49.35	0.91	16.42	0.11	9.86	0.13	9.19	11.58	2.35	0.11	0.00	-\-	62.4	83.9	0.32
54	H57	0.8\1250	49.73	0.90	16.04	0.08	10.19	0.15	8.53	12.00	2.25	0.12	0.00	-\-	59.9	83.8	0.29
55	H32	0.8\1235	49.38	1.02	15.66	0.11	11.14	0.27	8.35	11.64	2.29	0.14	0.00	-\-	57.2	83.9	0.26
56	H35	0.8\1225	49.01	1.72	15.43	0.08	11.93	0.22	7.90	10.42	3.13	0.16	0.00	-\-	54.1	79.8	0.30
57	H59	0.8\1240	49.43	1.12	16.07	0.11	8.67	0.50	9.54	11.85	2.62	0.08	0.00	-\-	66.2	86.7	0.30
58	H38	0.8\1225	48.93	2.80	14.51	0.08	11.61	0.30	7.90	10.21	3.39	0.27	0.00	-\-	54.8	79.6	0.31
59	H58	0.8\1210	49.01	3.06	14.00	0.06	14.10	0.23	6.47	9.58	3.22	0.26	0.00	-\-	45.0	73.8	0.29
60	H258	1\1250	49.48	1.23	17.48	0.00	9.13	0.25	8.23	10.16	3.90	0.13	0.00	-\-	61.6	85.3	0.28
61	H137	1\1235	48.66	1.59	17.22	0.06	10.21	0.15	8.53	10.21	3.19	0.16	0.00	-\-	59.8	83.5	0.29
	Grove et al. (2003)																
62	85-41-1	0.0001\1250	56.95	0.69	14.92	0.08	6.36	0.08	9.08	8.04	3.10	0.70	0.00	-\-	71.8	90.5	0.27
63	85-41-2	0.0001\1225	57.44	0.75	15.52	0.07	5.96	0.07	7.84	8.29	3.33	0.74	0.00	-\-	70.1	89.0	0.29
64	85-41-3	0.0001\1200	57.37	0.75	16.59	0.04	5.57	0.06	6.29	8.83	3.69	0.80	0.00	-\-	66.8	88.1	0.27
65	85-41-4	0.0001\1175	57.03	0.93	15.66	0.06	6.74	0.07	6.92	8.51	3.34	0.73	0.00	-\-	64.7	88.1	0.25
66	85-41-5B	0.2\1040	60.59	0.66	17.36	0.00	4.63	0.11	4.45	7.38	3.82	0.95	0.03	-\5.59	63.1	86.2	0.27
67	85-41-7B	0.2\1020	61.87	0.70	18.45	0.00	4.19	0.09	3.08	6.35	4.14	1.09	0.04	-\6.55	56.7	81.7	0.29
68	85-44-7	0.2\1090	54.21	0.70	19.00	0.01	6.31	0.15	5.64	10.30	3.24	0.43	0.01	-\5.16	61.4	84.6	0.29
69	85-44-6	0.2\1070	56.99	0.80	19.00	0.02	5.98	0.11	4.16	8.19	4.17	0.58	0.01	-\5.37	55.4	80.1	0.31
70	85-44-3	0.2\1030	56.81	0.86	18.84	0.04	6.36	0.16	4.06	8.21	4.08	0.59	0.00	-\6.58	53.2	79.2	0.30
71	85-44-4	0.2\1010	58.09	0.92	18.63	0.03	6.02	0.20	3.52	7.32	4.63	0.64	0.00	-\6.81	51.0	76.0	0.33
72	85-44-5	0.2\990	59.66	0.96	18.35	0.07	5.70	0.14	2.87	6.29	5.21	0.75	0.00	-\6.46	47.3	75.5	0.29
	Holbig and Grove (2008)																
73	B890	1.2\1337	47.15	1.32	13.86	0.00	9.58	0.16	8.53	11.37	3.82	4.22	0.00	-\-	61.4	85.0	0.28
74	B904	1.2\1315	47.44	1.31	13.64	0.00	9.74	0.16	8.66	11.10	3.85	4.09	0.00	-\-	61.3	84.5	0.29
75	B891	1.4\1350	46.85	1.24	13.00	0.00	9.59	0.12	9.75	11.87	3.68	3.89	0.00	-\-	64.5	86.5	0.28
76	B894	1.4\1335	46.45	1.45	14.21	0.00	10.22	0.17	8.42	10.68	4.00	4.40	0.00	-\-	59.5	84.1	0.28
77	B900	1.6\1335	46.50	1.52	13.74	0.00	10.15	0.11	9.43	10.85	3.64	4.05	0.00	-\-	62.4	84.9	0.30
78	B907	1.6\1320	46.36	1.43	14.43	0.00	10.64	0.15	8.46	10.03	3.96	4.52	0.00	-\-	58.6	82.9	0.29
79	B899	1.8\1335	46.40	1.45	15.06	0.00	10.96	0.18	7.70	8.70	4.55	4.99	0.00	-\-	55.6	80.4	0.31
80	B905	2\1335	45.78	1.48	15.09	0.00	11.60	0.12	7.49	8.35	4.75	5.34	0.00	-\-	53.5	79.7	0.29
81	B908	2\1320	45.49	1.58	15.58	0.00	11.35	0.18	7.32	7.91	4.96	5.64	0.00	-\-	53.5	79.6	0.29
82	B909	2.2\1320	45.50	1.50	15.68	0.00	11.87	0.22	6.71	7.25	5.27	6.01	0.00	-\-	50.2	77.5	0.29
	Matzen et al. (2011)																
83	26	0.0001\1500	45.95	1.48	8.73	0.19	12.21	0.17	23.71	7.30	0.09	0.00	0.18	-\-	77.6	92.3	0.29
84	24	0.0001\1451	46.98	1.63	9.84	0.21	12.21	0.17	20.60	8.07	0.16	0.00	0.14	-\-	75.0	91.2	0.29
85	21	0.0001\1452	46.85	1.66	9.91	0.19	11.74	0.16	20.93	8.14	0.29	0.00	0.15	-\-	76.1	91.4	0.30
86	17	0.0001\1401	47.59	1.79	10.68	0.21	12.23	0.18	17.93	8.77	0.51	0.00	0.11	-\-	72.3	90.1	0.29
87	27	0.0001\1398	47.80	1.80	10.63	0.23	11.99	0.16	18.38	8.80	0.08	0.00	0.13	-\-	73.2	89.9	0.31
88	28	0.0001\1350	48.23	1.94	11.43	0.18	12.41	0.17	15.89	9.60	0.05	0.00	0.11	-\-	69.5	88.8	0.29
89	15	0.0001\1349	48.28	1.95	11.77	0.19	12.10	0.16	15.24	9.63	0.59	0.00	0.09	-\-	69.2	88.8	0.28
90	6	0.0001\1302	49.56	2.17	13.08	0.15	10.80	0.16	13.13	10.52	0.35	0.00	0.09	-\-	68.4	88.0	0.30
91	8	0.0001\1302	48.83	2.19	12.65	0.16	11.57	0.16	13.27	10.61	0.48	0.00	0.08	-\-	67.2	87.3	0.30
92	46	0.0001\1300	48.64	2.14	12.66	0.16	11.86	0.17	13.85	10.39	0.07	0.00	0.07	-\-	67.6	87.4	0.30
	Medard and Grove (2008)																
93	B1042	1\1330	47.91	0.66	18.48	0.03	8.17	0.13	10.52	11.74	2.28	0.08	0.00	-\-	69.7	88.0	0.31
94	82-72f#23	0.01\1220	48.12	0.54	18.63	0.01	8.21	0.13	10.23	11.84	2.22	0.08	0.00	-\0.58	69.0	88.1	0.30
95	82-72f#11	0.025\1204	47.89	0.54	18.68	0.03	8.25	0.14	10.41	11.69	2.30	0.07	0.00	-\1.15	69.2	88.1	0.30
96	82-72f#8	0.05\1190	48.51	0.59	18.81	0.03	7.17	0.15	10.62	11.77	2.26	0.09	0.00	-\2.19	72.5	89.5	0.31
97	82-72f#7	0.1\1173	47.97	0.59	18.68	0.02	7.77	0.16	10.73	11.70	2.30	0.08	0.00	-\3.24	71.1	89.5	0.29
98	82-72f#13	0.2\1147	48.01	0.59	18.73	0.05	7.73	0.17	10.68	11.64	2.33	0.07	0.00	-\4.82	71.1	89.1	0.30
99	82-72f#5	0.2\1144	48.27	0.60	18.73	0.03	7.56	0.15	10.68	11.67	2.24	0.09	0.00	-\4.76	71.6	88.5	0.33
100	85-41c#14	0.0001\1244	58.16	0.62	14.42	0.06	5.58	0.11	9.26	8.09	3.04	0.65	0.00	-\-	74.7	91.4	0.28
101	85-41c#127	0.198\1150	57.76	0.56	14.78	0.05	5.60	0.10	9.18	8.24	3.07	0.66	0.00	-\5.14	74.5	90.9	0.29
102	85-41c#126	0.198\1130	58.53	0.56	15.12	0.03	5.38	0.08	8.17	8.37	3.07	0.69	0.00	-\5.12	73.0	90.4	0.29
103	B1054	0.8\1320	47.10	1.18	12.53	0.00	9.08	0.13	9.74	12.31	3.32	3.27	1.33	-\-	65.7	86.9	0.29
104	Bb107#1	0.199\1147	47.03	1.19	12.61	0.00	8.94	0.16	10.23	11.98	3.19	3.24	1.43	-\4.96	67.1	87.4	0.30
105	85-41c#111b	0.485\1025	60.44	0.67	16.52	0.02	5.06	0.12	5.85	7.87	2.80	0.62	0.02	-\9.81	67.3	87.6	0.29

Supplementary Table S2 continued

No.	&Run Name	#P (GPa)/T (°C)	§Melt compositions (wt%) SiO$_2$	TiO$_2$	Al$_2$O$_3$	Cr$_2$O$_3$	FeO	MnO	MgO	CaO	Na$_2$O	K$_2$O	P$_2$O$_5$	†CO$_2$/H$_2$O	Melt *Mg#	Olivine *Mg#	K_D
	Parman et al. (1997)																
106	BK3	0.0001\1435	49.77	0.49	4.81	0.44	11.73	0.24	21.57	10.59	0.22	0.00	0.15	-\-	76.6	91.5	0.31
107	BK1	0.0001\1420	50.11	0.48	4.98	0.44	11.73	0.21	20.60	11.04	0.27	0.00	0.16	-\-	75.8	91.1	0.31
108	BK5	0.0001\1400	50.35	0.46	5.12	0.35	11.38	0.17	20.87	11.08	0.22	0.00	0.00	-\-	76.6	91.0	0.32
109	BK6	0.0001\1300	52.28	0.56	6.14	0.27	11.43	0.19	15.53	13.32	0.29	0.00	0.00	-\-	70.8	88.2	0.32
110	BK12	0.0001\1286	52.90	0.58	6.35	0.21	11.29	0.19	14.11	14.01	0.36	0.00	0.00	-\-	69.0	88.0	0.30
111	BK10	0.0001\1275	52.99	0.61	6.74	0.20	11.46	0.23	13.27	14.08	0.41	0.00	0.00	-\-	67.4	87.2	0.30
112	BK15	0.0001\1275	51.83	0.70	7.78	0.20	11.72	0.23	13.44	13.94	0.13	0.00	0.03	-\-	67.1	87.3	0.30
113	BK7	0.0001\1250	52.17	0.69	7.68	0.19	11.66	0.21	12.96	14.16	0.29	0.00	0.00	-\-	66.4	86.1	0.32
114	BK13	0.0001\1250	52.06	0.80	9.21	0.22	11.41	0.18	11.71	14.22	0.16	0.00	0.03	-\-	64.7	86.0	0.30
115	BK11	0.0001\1237	52.13	0.84	9.46	0.14	12.18	0.24	10.92	13.69	0.40	0.00	0.00	-\-	61.5	84.2	0.30
116	BK8	0.0001\1225	52.37	0.91	10.39	0.10	12.01	0.16	10.19	13.42	0.44	0.00	0.00	-\-	60.2	83.3	0.30
117	TZM-BK18	0.1\1150	54.36	0.78	8.74	0.15	11.72	0.19	10.77	13.00	0.29	0.00	0.00	-\6.18	62.1	85.5	0.28
118	TZM-BK5	0.2\1200	53.19	0.63	6.31	0.12	10.70	0.12	14.34	14.24	0.32	0.00	0.02	-\6.57	70.5	88.9	0.30
119	TZM-BK4	0.2\1163	53.80	0.69	7.27	0.22	10.63	0.22	11.82	15.08	0.27	0.00	0.00	-\7.81	66.5	87.3	0.29
120	TZM-BK1	0.2\1120	53.61	0.78	8.59	0.12	11.45	0.29	11.41	13.35	0.41	0.00	0.00	-\7.10	64.0	86.0	0.29
121	TZM-BK15	0.2\1094	56.58	1.19	16.99	0.00	9.59	0.18	4.99	9.90	0.57	0.00	0.00	-\7.03	48.1	80.5	0.22
122	TZM-BK10	0.2\1026	57.39	1.04	16.44	0.09	8.83	0.11	4.66	11.03	0.38	0.00	0.04	-\7.54	48.5	80.0	0.24
	Sisson and Grove (1993)																
123	79-35g#6	0.2\1050	48.22	0.65	19.41	0.00	8.37	0.16	6.96	13.21	2.89	0.12	0.00	-\6.20	59.7	86.4	0.23
124	79-35g#4	0.2\1050	49.46	0.72	19.22	0.06	8.29	0.15	6.59	12.62	2.77	0.12	0.00	-\7.20	58.6	84.7	0.25
125	79-35g#11	0.2\1035	49.03	0.72	19.71	0.00	8.70	0.16	6.37	12.11	3.08	0.11	0.00	-\7.20	56.6	84.9	0.23
126	79-35g#10	0.2\1025	49.13	0.73	19.51	0.00	8.78	0.17	6.37	12.21	2.99	0.11	0.00	-\6.90	56.4	83.6	0.25
127	79-35g#12	0.2\1000	52.55	0.98	19.22	0.00	8.05	0.20	4.99	9.65	4.15	0.21	0.00	-\6.30	52.5	79.4	0.29
128	82-62#3	0.2\1012	51.55	1.19	19.22	0.00	8.71	0.19	4.99	10.01	3.72	0.42	0.00	-\6.40	50.5	77.6	0.29
129	82-62#4	0.2\1000	51.89	1.28	19.43	0.00	8.63	0.17	4.57	9.61	3.97	0.45	0.00	-\7.30	48.5	76.9	0.28
130	82-66#3	0.2\1012	52.98	1.08	19.13	0.00	7.91	0.17	4.81	9.68	3.42	0.82	0.00	-\7.00	52.0	78.2	0.30
131	82-66#5	0.2\1000	52.80	1.06	19.33	0.00	7.76	0.14	4.84	9.82	3.45	0.80	0.00	-\6.70	52.6	78.3	0.31
132	82-66#7	0.2\965	59.26	0.54	19.15	0.00	5.23	0.19	3.26	7.47	4.01	0.88	0.00	-\7.50	52.6	77.0	0.33
133	87S35a-#3	0.2\970	52.33	1.28	19.38	0.00	8.39	0.15	4.16	8.81	4.51	1.00	0.00	-\6.30	46.9	76.2	0.28
134	87S35a-#11	0.2\965	53.58	1.11	19.34	0.00	7.68	0.16	3.69	8.64	4.57	1.24	0.00	-\5.80	46.1	73.2	0.31
135	85S52b-#11	0.2\1024	55.09	1.09	17.96	0.00	7.86	0.16	4.58	7.14	4.04	2.08	0.00	-\6.80	50.9	78.4	0.29
136	85S52b-#12	0.2\998	55.16	1.13	18.05	0.00	7.72	0.18	4.43	7.08	4.05	2.19	0.00	-\6.40	50.6	76.3	0.32
137	85S52b-#13	0.2\968	55.58	1.15	18.36	0.00	7.67	0.13	3.71	7.44	4.00	1.95	0.00	-\6.80	46.3	75.9	0.27
138	85S52b-#14	0.2\940	56.46	1.09	18.65	0.00	7.27	0.13	3.10	7.24	4.10	1.95	0.00	-\6.60	43.2	72.4	0.29
139	85S52b+An80#1	0.2\965	53.85	0.93	20.05	0.00	6.86	0.16	3.76	8.79	3.99	1.60	0.00	-\13.30	49.4	78.5	0.27
140	85S52b+An80#14	0.2\960	56.65	1.04	18.85	0.00	6.84	0.17	3.28	7.44	3.69	2.05	0.00	-\6.00	46.1	73.5	0.31
141	85S52b+An80#9	0.2\943	57.30	0.70	19.17	0.00	6.92	0.16	2.81	6.61	4.18	2.14	0.00	-\6.60	42.0	72.2	0.28
142	82-66+Ab#1	0.2\965	55.94	0.83	20.22	0.00	6.38	0.14	3.52	7.36	4.85	0.76	0.00	-\6.40	49.6	78.1	0.28
143	82-66+NaOH#2	0.2\985	54.96	0.62	20.16	0.00	6.60	0.16	3.33	7.65	5.58	0.94	0.00	-\4.90	47.4	77.2	0.26
144	82-66+NaOH#1A	0.2\965	55.49	0.60	19.93	0.00	6.81	0.17	3.65	7.68	4.65	1.02	0.00	-\6.40	48.8	77.7	0.27
	Sossi and O'Neill (2016)																
145		0.0001\1362.5	51.74	0.42	7.44	0.56	11.64	0.17	17.29	10.41	0.24	0.02	0.08	-\-	72.6	89.3	0.32
146		0.0001\1391.5	51.34	0.40	6.58	0.61	11.90	0.17	18.99	9.80	0.13	0.01	0.08	-\-	74.0	89.8	0.32
147		0.0001\1420	50.93	0.37	6.22	0.62	12.20	0.17	20.26	9.02	0.11	0.01	0.10	-\-	74.7	90.5	0.31
148		0.0001\1449	50.02	0.35	5.84	0.60	12.24	0.17	21.95	8.68	0.05	0.01	0.09	-\-	76.2	90.9	0.32
149		0.0001\1491	48.78	0.31	5.20	0.61	12.30	0.17	24.78	7.78	0.03	0.00	0.05	-\-	78.2	92.3	0.30
150		0.0001\1514	48.96	0.28	4.63	0.59	11.60	0.17	26.61	7.13	0.00	0.00	0.03	-\-	80.4	92.9	0.31
151		0.0001\1534	47.23	0.29	4.98	0.62	12.25	0.17	27.01	7.38	0.01	0.00	0.06	-\-	79.7	93.0	0.29
152		0.0001\1553	47.44	0.26	4.48	0.59	11.88	0.17	28.39	6.69	0.01	0.00	0.09	-\-	81.0	93.5	0.30
153		0.0001\1575	46.93	0.24	4.22	0.51	11.41	0.15	30.08	6.14	0.01	0.22	0.10	-\-	82.4	93.9	0.30
154		0.0001\1600	46.53	0.22	3.82	0.50	11.03	0.15	31.48	5.67	0.00	0.49	0.13	-\-	83.6	94.4	0.30
155		0.0001\1450	47.24	0.44	9.12	0.52	10.81	0.13	21.84	9.57	0.02	0.27	0.05	-\-	78.3	92.3	0.30
	Stamm and Schmidt (2017)																
156	JER15-28	7\1300	13.30	3.47	0.72	0.06	8.88	0.35	19.26	38.37	11.16	4.43	0.00	31.25\1.44	79.4	89.5	0.45
157	JER14-17	7\1380	19.27	4.34	1.14	0.12	9.10	0.30	18.55	35.09	8.49	3.60	0.00	27.03\1.24	78.4	90.2	0.40
158	JER14-15	7\1480	24.97	3.71	1.49	0.18	10.10	0.33	19.65	29.75	6.96	2.87	0.00	24.39\1.12	77.6	90.8	0.35
159	JER15-42	7\1300	4.00	2.09	0.24	0.05	9.04	0.47	28.68	38.58	11.30	5.56	0.00	40.10\1.84	85.0	89.5	0.67
160	JER15-27	7\1300	8.15	3.49	0.38	0.08	10.32	0.35	28.62	33.95	9.82	4.83	0.00	36.70\1.84	83.2	89.5	0.58
161	JER14-16	7\1330	12.55	3.52	0.61	0.11	10.14	0.35	31.05	32.01	6.76	2.90	0.00	36.60\1.31	84.5	90.4	0.58
162	JER14-20	7\1350	12.82	3.75	0.84	0.15	9.25	0.32	29.37	32.78	6.82	3.89	0.00	37.04\0.85	85.0	91.1	0.55
163	JER15-47	7\1350	8.79	3.82	0.35	0.07	11.94	0.38	30.86	30.36	9.29	4.15	0.00	37.80\1.00	82.2	88.7	0.59

§ Experimental data on melt crystallization or multiple-phase saturation were taken from the studies of Grove and Bryan[35], Grove et al.[36], Sisson and Grove[37], Parman et al.[38], Grove et al.[39], Barr et al.[40], Matzen et al.[41], Holbig and Grove[42], Medard and Grove[43], Sossi and O'Neill[44], and Stamm and Schmidt[2]. Experimental data on spinel-peridotite partial melting were taken from the studies of Falloon and Green[19], Kinzler and Grove[45], Kinzler[24], Baker and Stolper[46], Kushiro[26], Gaetani and Grove[20], Wasylenki et al.[47], Parman and Grove[48], and Laporte et al.[49].

Supplementary Table S3. Thermobarometry results for individual kimberlite clusters

No.	Craton/location	Kimberlite cluster/fields	On-craton	Age (Ma)	#Samples	*T* (°C)	*P* (GPa)	&Depth (km)	T_P (°C)	$\$T_{AM}$ (°C)	Plume-related
1	Amazonian	Guaniamo	Yes	712	2/2	1617	6.91	228	1521	1389-1489	Yes
2	Aravalli	Vindhyan Basin	Yes	1080	11/27	1555	6.63	219	1466	1435-1535	No
3	Baltic	Terskii	No	350	10/11	1443	4.27	141	1388	1344-1444	No
4	Baltic	Central Timan	No	360	4/4	1586	5.61	185	1508	1345-1445	Yes
5	Baltic	Mela	Yes	360	3/3	1479	5.62	185	1406	1345-1445	No
6	Baltic	Shochta	Yes	360	1/1	1671	6.65	219	1575	1345-1445	Yes
7	Baltic	Kepino-Pachuga	Yes	364	10/14	1613	6.57	217	1522	1346-1446	Yes
8	Baltic	Zolotitsa (Zimniy Bereg)	Yes	364	43/47	1537	6.17	204	1454	1346-1446	Yes
9	Baltic	Kaavi-Kuopio	Yes	600	29/34	1564	5.95	196	1483	1375-1475	Yes
10	Baltic	Kimozero	Yes	1920	4/11	1750	8.54	282	1622	1540-1640	No
11	Bastar	Tokapal	Yes	1079	10/10	1648	6.67	220	1554	1435-1535	Yes
12	Botswana	Malogong Sill	No	88	1/1	1530	7.68	253	1428	1311-1411	Yes
13	Brazil	Alto Paranaiba	No	97	19/19	1561	6.91	228	1467	1312-1412	Yes
14	Canada	Glennie Domain	No	100	8/20	1440	5.06	167	1375	1312-1412	No
15	Canada	Picton Lake	No	173	2/4	1479	5.83	192	1403	1322-1422	No
16	Canada	Varty Lake	No	173	3/3	1629	7.47	247	1524	1322-1422	Yes
17	Canada	Lake Ellen	No	190	1/1	1399	4.88	161	1339	1324-1424	No
18	Colorado	State Line	No	386	1/3	1521	7.15	236	1427	1348-1448	No
19	Congo	Kundelungu	Yes	32	4/4	1510	5.81	192	1433	1304-1404	Yes
20	Congo	Mbuji Mayi	Yes	71	4/7	1419	5.73	189	1347	1309-1409	No
21	Congo	Sw Angola	Yes	372	12/15	1522	5.11	169	1453	1346-1446	Yes
22	Dharwar	Anantapur District	Yes	1097	40/77	1571	6.97	230	1476	1437-1537	No
23	Dharwar	Cuddapah Basin	Yes	1100	2/2	1614	8.23	272	1500	1438-1538	No
24	Dharwar	Mahbubnagar Large	Yes	1400	36/57	1621	8.09	267	1508	1475-1575	No
25	Eastern Australia	New South Wales	No	260	9/9	1540	5.55	183	1465	1332-1432	Yes
26	Gawler	Terowie	No	170	5/5	1625	6.6	218	1532	1321-1421	Yes
27	Gawler	South Australia	No	172	2/4	1516	4.99	165	1450	1322-1422	Yes
28	Kalahari	Hanover-Phillipstown	Yes	80	4/4	1462	5.92	195	1386	1310-1410	No
29	Kalahari	Kimberley	Yes	86	52/70	1469	5.72	189	1395	1311-1411	No
30	Kalahari	Mothae	Yes	87	46/46	1582	5.38	178	1508	1311-1411	Yes
31	Kalahari	Letseng-La Terai	Yes	90	3/3	1532	7.21	238	1436	1311-1411	Yes
32	Kalahari	Barkly West	Yes	100	3/5	1536	6.5	215	1449	1312-1412	Yes
33	Kalahari	Sweetput-Soutput	Yes	174	1/1	1547	5.57	184	1472	1322-1422	Yes
34	Kalahari	Jwaneng	Yes	242	3/3	1459	5.66	187	1386	1330-1430	No

Supplementary Table S3 continued

No.	Craton/location	Kimberlite cluster/fields	On-craton	Age (Ma)	#Samples	T (°C)	P (GPa)	&Depth (km)	T_P (°C)	$^{\$}T_{AM}$ (°C)	Plume-related
35	Kalahari	Venetia	No	533	4/17	1512	5.8	191	1435	1367-1467	No
36	Kalahari	Sese	Yes	538	1/1	1565	5.97	197	1484	1367-1467	Yes
37	Kalahari	Premier	Yes	1152	8/13	1610	7.49	247	1506	1444-1544	No
38	Kimberley	Aries	Yes	820	6/6	1669	7.25	239	1565	1402-1502	Yes
39	Lesotho	East Griqualand	No	153	3/3	1522	7.48	247	1422	1319-1419	Yes
40	Namibia	Ondermatje	No	538	1/1	1556	7.42	245	1456	1367-1467	No
41	New York	Central-New Yorks	No	143	39/50	1515	5.75	190	1439	1318-1418	Yes
42	North Atlantic	Tikiusaaq	Yes	160	14/14	1588	9.42	311	1460	1320-1420	Yes
43	North Atlantic	Manitsoq	Yes	555	25/45	1509	7.11	235	1415	1369-1469	No
44	North Atlantic	Sarfartoq Region	Yes	575	12/12	1609	9.24	305	1481	1372-1472	Yes
45	North Atlantic	Kangamiut Dike Swarm	Yes	600	1/1	1598	7.56	249	1494	1375-1475	Yes
46	North China	Liaoning Province	Yes	465	18/23	1567	6.26	207	1481	1358-1458	Yes
47	North China	Shandong Province	Yes	465	3/14	1451	6.45	213	1369	1358-1458	No
48	Rae	Birch Mountains	Yes	77	25/28	1487	5.73	189	1412	1310-1410	Yes
49	Rae	Buffalo Head Hills	Yes	87	10/20	1416	4.2	139	1363	1311-1411	No
50	Rae	Churchill Province	Yes	535	2/2	1464	5.98	197	1387	1367-1467	No
51	Rae	Churchill Province	Yes	673	4/14	1516	6.17	204	1434	1384-1484	No
52	Rio de la Plata	Rosario Do Sul	Yes	128	5/5	1525	5.08	168	1458	1316-1416	Yes
53	Sao Francisco	Brauna	Yes	642	17/17	1541	6.39	211	1455	1380-1480	No
54	Siberian	Upper Molodo	No	156	1/1	1423	6.17	204	1345	1320-1420	No
55	Siberian	Staraya Rechka	No	160	1/1	1404	5.42	179	1337	1320-1420	No
56	Siberian	Kuoika	No	160	8/11	1552	6.99	231	1457	1320-1420	Yes
57	Siberian	Anabar Block	Yes	186	3/5	1598	7.94	262	1489	1323-1423	Yes
58	Siberian	Luchakan	No	217	11/11	1540	6.6	218	1451	1327-1427	Yes
59	Siberian	Ary-Mastakh	No	232	5/5	1583	6.94	229	1488	1329-1429	Yes
60	Siberian	Middle Kuonamka	No	246	4/4	1464	5.57	184	1392	1331-1431	No
61	Siberian	Kuranakh	No	248	4/4	1474	5.28	174	1405	1331-1431	No
62	Siberian	Kharamai	No	250	6/7	1498	6.04	199	1418	1331-1431	No
63	Siberian	Upper Muna	No	357	5/6	1522	5.89	194	1443	1345-1445	No
64	Siberian	Alakit-Markha	No	360	14/26	1504	5.71	188	1428	1345-1445	No
65	Siberian	Daldyn	No	360	17/47	1495	5.86	193	1419	1345-1445	No
66	Siberian	Malaya Botuoba (Mirninskoe)	No	361	12/33	1507	5.7	188	1431	1345-1445	No
67	Siberian	Chomurdakh	No	364	7/7	1506	5.92	195	1428	1345-1445	No
68	Siberian	Nakyn	No	364	5/20	1495	5.21	172	1426	1346-1446	No
69	Siberian	Ogoner-Yuryakh (Chomurdakh)	No	403	4/5	1470	5.85	193	1394	1350-1450	No

Supplementary Table S3 continued

No.	Craton/location	Kimberlite cluster/fields	On-craton	Age (Ma)	#Samples	*T* (°C)	*P* (GPa)	&Depth (km)	T_P (°C)	$^{\$}T_{AM}$ (°C)	Plume-related
70	Slave	Lac De Gras	Yes	50	55/96	1456	4.69	155	1395	1306-1406	No
71	Slave	Lac De Gras	Yes	68	21/41	1453	5.2	172	1386	1308-1408	No
72	Slave	Northern Slave (Jericho)	Yes	173	7/25	1450	5.32	176	1382	1322-1422	No
73	Slave	Snap Lake Dike System	Yes	526	55/60	1600	5.78	191	1519	1366-1466	Yes
74	Slave	Gahcho Kue	Yes	542	7/8	1542	5.16	170	1472	1368-1468	Yes
75	South Africa	Klipgatsfontein	No	74	3/3	1449	5.73	189	1376	1309-1409	No
76	South Africa	Hebron (Hartebeesfontein)	No	75	3/3	1436	5.7	188	1364	1309-1409	No
77	South Africa	Uintjiesberg	No	100	10/12	1424	5.55	183	1354	1312-1412	No
78	South Africa	Pampoenport	No	103	1/1	1483	5.73	189	1408	1313-1413	No
79	South Africa	Griqualand East	No	150	2/2	1428	5.34	176	1360	1319-1419	No
80	South Africa	Droogfontein	No	174	2/2	1477	4.41	146	1419	1322-1422	No
81	South Africa	Melton Wold	No	174	2/2	1441	5.01	165	1378	1322-1422	No
82	South Africa	Silvery Home	No	174	7/7	1530	5.33	176	1458	1322-1422	Yes
83	South Africa	Skietkop	No	174	1/1	1577	5.75	190	1498	1322-1422	Yes
84	Superior	Kirkland Lake	Yes	158	1/1	1586	6.75	223	1493	1320-1420	Yes
85	Superior	Foxtrot	Yes	522	2/9	1479	6.78	224	1391	1365-1465	No
86	Superior	Foxtrot	Yes	638	14/65	1493	5.37	177	1423	1380-1480	No
87	Tanzania	Igwisi Hills Volcanoes	Yes	0	1/3	1463	5.42	179	1393	1300-1400	No
88	Ukrainian	Kirovograd Complex	Yes	1770	1/2	1725	8.75	289	1597	1521-1621	No
89	West African	Koidu	Yes	143	21/21	1606	7.6	251	1501	1318-1418	Yes
90	West African	Liberia	Yes	830	3/4	1649	7.76	256	1539	1404-1504	Yes
91	West Australian	Jewill Subprovince	Yes	1300	1/1	1652	6.91	228	1554	1462-1562	No
92	West Greenland	West Greenland Mafic Dikes	No	587	11/11	1646	8.92	294	1520	1373-1473	Yes
93	Wyoming	Missouri Breaks	Yes	48	6/6	1554	5.97	197	1473	1306-1406	Yes
94	Wyoming	Iron Mountain	Yes	408	17/17	1595	7.24	239	1495	1351-1451	Yes
Anomalous kimberlite sites											
95	Dharwar	Siddanpalle (Siddanpalli)	Yes	1090	0/7	1276	4.6	152	1222	1436-1536	No
96	Kalahari	Kuruman	Yes	1716	0/14	1354	5.3	175	1288	1515-1615	No
97	Rae	Somerset Island	Yes	100	0/5	1278	4.4	145	1227	1312-1412	No

Sample numbers (e.g., “11/27”) indicate the number of adopted samples (= 11) versus the total number of samples (= 27) from individual kimberlite clusters. The adopted samples have $T_P \geq$ the ambient mantle values and are used to calculate the lithosphere thickness and mantle T_P for individual kimberlite clusters.

& Depths of the lithosphere-asthenosphere boundary (i.e., lithosphere thickness) derived from the mean pressures (*P*) of adopted samples for individual kimberlite clusters.

$ Potential temperatures of the ambient mantle at the time of kimberlite eruption (see details in Appendix A).

Supplementary Table S4. Major element compositions and thermobarometry results of compiled global kimberlites

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
	Loc# =1																
1	DDH97-64/2 [12167]	No	1665	6.7	32.64	0.87	2.40		9.93	0.20	36.05	3.49	0.27	1.68	0.02	6.02	4.72
2	DDH97-65/3 [12167]	No	1569	7.1	33.49	0.56	1.38		8.91	0.19	37.25	5.10	0.47	0.42	0.12	6.75	4.11
	Loc# =2																
3	M [19110]	No	1565	7.0	34.82	5.70	2.88		9.44	0.19	25.73	3.63	0.26	0.81	2.47		
4	MG-6 [19076]	No	1525	6.6	36.29	5.11	2.63		8.07	0.14	26.20	3.10	0.05	0.55	1.89	0.24	14.77
5	MG-8 [19076]	No	1526	6.1	35.17	4.84	3.08		8.56	0.15	26.26	3.24	0.04	0.39	2.13	0.25	14.62
6	UG-3 [19076]	No	1633	8.9	34.90	5.51	2.19		9.18	0.16	23.70	3.58	0.21	0.89	1.54	0.45	14.66
7	UG-13 [19076]	No	1564	6.4	35.65	5.22	3.42		8.74	0.15	24.54	3.28	0.21	1.66	2.44	0.11	13.37
8	UG-45 [19076]	No	1577	6.2	36.55	4.75	3.89		9.52	0.13	26.32	2.85	0.18	0.96	2.13	0.17	11.63
9	UG-71 [19076]	No	1551	7.3	35.48	5.08	3.33		9.48	0.14	22.51	4.50	0.24	0.67	2.25	1.04	14.45
10	UG-136 [19076]	No	1542	6.1	35.36	5.36	3.42		8.74	0.23	25.82	3.27	0.17	1.46	2.43	0.18	12.08
11	80 [15441]	No	1515	5.7	36.09	5.10	3.81		8.74	0.15	24.71	3.50	0.20	0.14	2.31	0.72	13.05
12	81 [15441]	No	1523	5.2	35.35	0.94	3.57		8.54		29.50	6.16	0.30	0.78	1.14	2.34	8.86
13	UG 11A [14070]	No	1587	7.4	34.90	5.51	2.79		9.18	0.16	23.73	3.58	0.21	0.89	2.45	0.45	14.66
14	MG 6 [14070]	Yes	1521	6.5	36.29	5.11	2.63		8.07	0.14	26.29	3.10	0.05	0.55	1.89	0.24	14.77
15	M1 [19110]	Yes	1470	5.6	34.75	5.69	3.03		7.91	0.13	26.88	3.32	0.05	1.11	2.42		
16	MG-2 [19076]	Yes	1419	4.7	35.25	5.04	3.42		7.54	0.08	28.16	3.17	0.05	0.59	2.19	0.14	13.62
17	MG-16 [19076]	Yes	1509	5.9	36.08	4.81	3.14		8.03	0.18	26.02	3.20	0.06	0.82	2.17	0.15	14.27
18	MG-21 [19076]	Yes	1426	5.2	35.64	4.73	2.60		7.48	0.17	29.65	2.87	0.05	0.32	2.03	0.14	13.94
19	MG-24 [19076]	Yes	1509	5.7	35.95	4.41	3.04		8.09	0.10	28.21	2.85	0.06	0.79	2.04	0.11	13.27
20	MG-32 [19076]	Yes	1409	5.1	35.84	5.21	3.01		7.24	0.14	27.32	3.38	0.06	0.61	2.34	0.02	13.99
21	MG-31 [19076]	Yes	1372	4.1	34.82	4.62	3.93		7.04	0.19	27.20	3.67	0.06	0.73	2.28	0.39	14.01
22	MG-36 [19076]	Yes	1433	4.4	35.28	4.76	4.32		7.76	0.07	27.02	3.41	0.06	0.71	2.42	0.16	13.27
23	MG-38 [19076]	Yes	1465	5.2	36.03	4.19	3.03		7.66	0.16	29.38	2.63	0.06	0.62	2.01	0.15	13.02
24	MG-39 [19076]	Yes	1444	5.7	36.13	5.42	2.82		7.29	0.15	26.10	3.42	0.11	0.73	1.93	0.18	14.66
25	MG-47 [19076]	Yes	1426	4.6	35.47	5.27	3.94		7.61	0.10	27.05	3.12	0.06	0.68	2.18	0.08	13.68
26	UG-84 [19076]	Yes	1489	5.8	36.92	5.83	3.58		7.94	0.08	24.08	3.50	0.20	1.05	2.36	2.37	11.96
27	UG-191 [19076]	Yes	1431	3.8	36.50	3.76	6.07		7.33	0.14	25.45	3.40	0.18	1.21	1.37	0.74	12.70
28	MG 50 [14070]	Yes	1373	4.1	34.82	4.62	3.93		7.04	0.19	27.28	3.67	0.06	0.73	2.28	0.39	14.01
29	UG 191 [14070]	Yes	1423	3.8	36.50	3.76	6.07		7.33	0.14	25.45	3.40	0.18	1.21	1.87	0.74	12.70
	Loc# =3																
30	K25-1 [15124]	No	1486	6.5	28.48	1.76	3.04		11.23	0.24	25.33	16.78	0.31	0.77	0.22		
31	T1-28-1 [15124]	No	1391	3.6	27.87	1.17	4.67		8.02	0.20	23.95	12.59	0.22	2.11	3.33		
32	1 [15452]	No	1558	5.0	33.51	1.21	4.84		9.20	0.27	26.65	6.63	0.16	2.24	1.38	3.52	
33	2 [15452]	No	1439	3.9	29.48	1.15	5.51		8.32	0.26	23.75	11.30	0.18	2.45	1.91	7.04	
34	3 [15452]	No	1423	3.6	28.28	1.14	5.64		8.23	0.27	24.15	11.58	0.28	2.45	1.65	8.58	

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
35	4 [15452]	No	1420	3.7	28.90	1.16	5.38		8.63	0.28	24.98	11.35	0.21	1.77	2.82	5.15	
36	5 [15452]	No	1431	4.0	36.34	1.14	6.03		7.00	0.17	22.35	8.51	0.61	4.06	3.49	3.30	
37	6 [15452]	No	1466	4.5	29.98	1.05	4.53		8.23	0.28	24.24	11.44	0.52	2.70	1.20	7.70	
38	7 [15452]	No	1421	4.1	28.42	1.12	4.77		8.54	0.27	23.60	12.66	0.24	1.83	2.67	6.38	
39	8 [15452]	No	1397	3.8	29.10	1.13	4.86		8.08	0.25	24.05	12.43	0.16	1.75	2.20	6.60	
40	T1-28-2 [15124]	Yes	1345	4.1	35.13	0.97	4.48		6.15	0.19	23.99	9.97	0.32	2.75	0.65		
	Loc# =4																
41	436/231 [13073]	No	1553	5.2	35.24	2.79	5.46		9.55	0.21	25.68	5.29	0.07	1.07	0.48	2.95	10.76
42	615/103 [13073]	No	1677	6.0	42.22	1.47	6.96		9.20	0.12	16.59	4.08	0.19	0.64	0.29	2.67	
43	425/331 [13073]	No	1517	4.9	41.50	2.14	6.15		7.68	0.15	20.36	6.20	0.28	0.58	0.37	3.54	11.17
44	427/157 [13073]	No	1595	6.4	37.39	3.02	5.02		10.18	0.22	24.22	4.05	0.11	1.12	0.57	2.16	10.92
	Loc# =5																
45	11/27 2 [14069]	No	1494	5.5	27.97	1.02	4.01		10.31	0.36	23.83	12.12	0.16	0.36	0.99	9.77	7.35
46	13/6-1 [14069]	No	1513	5.9	27.58	1.09	4.13		10.67	0.41	21.76	13.34	0.21	0.46	0.87	10.00	7.42
47	Z11-24-1 [14068]	No	1431	5.5	27.95	0.96	3.73		9.45	0.30	22.89	14.17	0.18	0.35	1.02		
	Loc# =6																
48	Z9-18-1 [14068]	No	1671	6.6	34.43	2.67	3.74		10.60	0.22	30.80	1.80	0.29	1.38	0.90		
	Loc# =7																
49	3215/160 [14069]	No	1654	7.4	35.47	2.75	2.07		9.07	0.29	34.08	1.25	0.10	0.39	0.34		12.60
50	65-AP [13073]	No	1618	6.1	34.00	2.38	4.30		10.44	0.21	27.37	4.19	0.22	1.38	1.63	1.10	13.14
51	Z8-15-1 [14068]	No	1689	7.1	43.56	4.23	5.41		10.72	0.10	22.21	2.73	0.39	1.40	0.69		
52	Z9-20-1 [14068]	No	1654	6.4	34.61	2.90	4.31		10.60	0.21	28.41	2.91	0.14	1.76	0.73		
53	Z9-21-1 [14068]	No	1641	5.8	34.19	2.21	4.06		10.10	0.19	31.73	2.00	0.16	1.23	0.55		
54	ANOMALIYA 687 [15352]	No	1671	7.4	37.40	3.12	3.95		10.76	0.21	25.18	3.68	0.34	1.59	1.24	3.80	7.24
55	ZVEZDOCHKA1 [15352]	No	1495	5.2	30.30	2.67	4.65		9.99	0.25	23.83	10.52	0.72	1.06	1.05	4.62	8.54
56	107/302 [13073]	No	1546	7.7	40.31	1.15	1.51		7.02	0.14	33.07	2.49	0.17	0.41	0.11	1.10	12.43
57	64-AP [13073]	No	1671	7.4	37.40	3.12	3.95		10.76	0.21	25.18	3.68	0.34	1.59	1.24	3.80	8.53
58	40-AP [13073]	No	1495	5.2	30.30	2.67	4.65		9.99	0.25	23.83	10.52	0.72	1.06	1.05	4.62	9.82
59	748D/122 [17254]	Yes	1170	5.5	10.20	2.50	2.00		6.48	0.61	23.19	18.80	0.16	0.44	0.46	31.53	3.96
60	748D/123 [17254]	Yes	1300	4.8	19.37	2.32	2.53		6.63	0.65	13.96	20.10	0.15	0.55	0.58		
61	748-3/131 [17254]	Yes	1119	2.2	15.00	2.41	2.68		5.79	0.25	21.04	18.98	0.22	0.84	0.53		
62	ZVEZDOCHKA2 [15352]	Yes	1369	3.8	29.30	2.77	4.60		7.76	0.26	24.95	10.87	0.53	1.00	0.85	6.97	8.39
	Loc# =8																
63	106/606 [18799]	No	1461	6.7	40.81	1.39	1.72		6.80	0.15	31.83	3.70	0.38	0.31	0.22	0.54	11.91
64	106/590 [18799]	No	1489	6.0	36.51	0.97	1.30		7.35	0.12	36.35	3.25	0.10	0.07	0.16	0.56	10.97

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
65	106/628A [18799]	No	1416	5.3	32.88	2.33	2.18		7.71	0.15	30.49	7.14	0.16	0.24	0.47	4.14	11.45
66	106/630A [18799]	No	1446	5.3	33.81	1.96	2.58		7.76	0.15	29.70	6.63	0.15	0.33	0.42	3.77	11.27
67	106/690A [18799]	No	1470	6.0	35.07	1.95	1.69		7.52	0.16	33.11	4.45	0.15	0.27	0.37	2.45	10.37
68	13GR1-749-1 [20911]	No	1555	8.2	40.23	1.11	1.49		6.88	0.12	30.73	3.48	0.59	0.41	0.10	1.16	
69	13GR1-759-3 [20911]	No	1512	7.7	39.08	1.17	1.38		6.75	0.11	30.76	4.20	0.42	0.44	0.12	2.29	
70	13PN-1490/1042 [20911]	No	1532	4.9	36.06	1.09	3.02		7.63	0.17	33.92	4.36	0.09	2.35	0.32	1.20	
71	13PN-1490/1050 [20911]	No	1481	4.9	36.64	0.92	2.66		7.23	0.15	34.11	4.92	0.41	2.16	0.32	0.97	
72	1490/940 [17443]	No	1606	5.8	36.71	1.10	3.19	0.24	7.96	0.17	31.92	4.23	0.75	2.89	0.48	1.99	8.11
73	1490/1017 [14069]	No	1530	5.5	35.44	1.08	3.10		8.21	0.15	31.00	6.64	0.41	2.05	0.65	2.37	7.29
74	1490/942 [14069]	No	1471	5.4	39.41	0.94	2.75		6.89	0.14	29.67	5.60	0.37	1.13	0.46	1.39	10.00
75	433/146.3 [14069]	No	1519	5.9	36.65	1.12	2.61		7.85	0.14	30.27	5.75	0.38	0.71	0.54	3.10	9.28
76	81/172.7 [14069]	No	1800	10.0	42.02	0.95	2.22		8.37	0.14	29.11	2.54	0.58	1.44	0.88	0.62	9.92
77	66/247.3 [14069]	No	1460	5.3	42.35	0.85	3.50		6.64	0.14	29.46	2.99	0.71	1.17	0.47	0.75	9.60
78	56-AP [13073]	No	1566	5.9	41.30	0.52	3.10		7.02	0.12	29.82	3.68	2.79	0.49		0.29	10.14
79	1 [11663]	No	1681	7.3	37.03	3.37	3.23		9.87	0.17	30.02	1.34	0.25	1.01	0.62	0.49	11.83
80	2 [11663]	No	1670	7.1	36.42	3.84	3.45		10.18	0.18	30.13	1.10	0.24	0.92	0.59	0.34	11.65
81	3 [11663]	No	1623	6.5	35.41	3.45	3.52		9.55	0.17	29.24	2.58	0.26	1.05	0.62	0.92	12.25
82	4 [11663]	No	1471	6.5	31.08	2.47	1.85		7.64	0.26	27.29	7.22	0.31	0.33	0.30	8.86	10.79
83	5 [11663]	No	1635	7.4	32.97	4.89	3.34		11.27	0.30	27.45	2.83	0.30	0.34	0.51	2.48	13.49
84	6 [11663]	No	1599	6.8	34.46	2.97	2.56		8.97	0.21	30.40	3.01	0.35	0.30	0.44	2.68	12.97
85	7 [11663]	No	1603	7.4	34.66	2.75	2.36		8.84	0.23	28.51	4.20	0.37	0.29	0.39	3.97	13.65
86	8 [11663]	No	1648	7.2	34.32	4.28	3.19		10.68	0.21	30.38	1.68	0.27	0.45	0.59	0.94	12.59
87	Z1-2-1 [14068]	No	1639	7.1	42.66	1.06	2.83		7.56	0.13	29.97	2.35	0.65	1.41	0.67		
88	Z1-2-2 [14068]	No	1605	5.4	35.88	0.94	2.57		7.95	0.15	35.34	2.57	0.14	1.67	0.46		
89	Z1-3-3 [14068]	No	1453	5.7	43.85	0.64	3.11		6.60	0.12	29.24	3.56	1.89	0.60	0.32		
90	Z1-4-1 [14068]	No	1509	6.4	41.65	1.00	4.61		8.24	0.21	18.65	9.40	1.09	0.98	0.71		
91	Z3-8-1 [14068]	No	1533	5.4	40.55	1.33	3.83		7.32	0.14	26.65	5.68	0.70	1.36	0.75		
92	Z3-8-2 [14068]	No	1421	4.5	39.61	1.08	4.04		6.73	0.20	26.69	5.77	0.66	2.96	3.51		
93	LOMONOSOVSKAYA1 [15352]	No	1425	4.9	41.00	0.73	3.39		6.79	0.13	27.68	7.37	1.37	0.56	0.34	0.73	9.10
94	LOMONOSOVSKAYA2 [15352]	No	1501	5.7	41.60	0.56	3.02		6.84	0.13	29.22	3.75	1.36	0.42	0.37	0.75	8.25
95	KARPINSKAYA-2_2 [15352]	No	1576	5.5	37.40	0.67	2.19		7.05	0.12	35.36	1.76	1.68	1.17	0.41	0.20	10.71
96	PIONERSKAYA1 [15352]	No	1597	6.5	36.80	1.06	2.11		8.34	0.16	35.21	4.54	0.96	1.80	0.46	0.99	7.11

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
97	PIONERSKAYA2 [15352]	No	1573	6.0	36.20	1.06	2.08		8.13	0.16	36.15	4.35	0.63	1.87	0.40	1.45	5.37
98	106/606 [17474]	No	1461	6.7	40.81	1.39	1.72		6.80	0.15	31.83	3.70	0.38	0.31	0.22	0.54	11.91
99	106/590 [17474]	No	1489	6.0	36.51	0.97	1.30		7.35	0.12	36.35	3.25	0.10	0.07	0.16	0.56	10.97
100	106/628A [17474]	No	1416	5.3	32.88	2.33	2.18		7.71	0.15	30.49	7.14	0.16	0.24	0.47	4.14	11.45
101	106/630A [17474]	No	1446	5.3	33.81	1.96	2.58		7.76	0.15	29.70	6.63	0.15	0.33	0.42	3.77	11.27
102	106/690A [17474]	No	1470	6.0	35.07	1.95	1.69		7.52	0.16	33.11	4.45	0.15	0.27	0.37	2.45	10.37
103	TUFFISITE [15420]	No	1618	6.2	37.16	0.88	2.00		7.21	0.14	33.52	1.83	0.20	0.23	0.17	1.47	14.66
104	AUTOLITH [15420]	No	1527	5.2	33.95	2.10	2.80		7.90	0.17	31.94	3.16	0.22	0.73	0.45	2.23	12.60
105	105-AP [13073]	No	1569	6.5	38.50	0.95	2.15		7.69	0.15	33.66	4.84	1.17	2.10	0.56	0.81	6.15
106	106/612A [18799]	Yes	1401	5.4	33.78	1.90	1.84		7.40	0.14	31.45	6.84	0.13	0.27	0.43	3.91	11.12
107	106/627A [18799]	Yes	1380	5.3	33.52	1.65	1.96		7.04	0.15	29.46	8.37	0.19	0.68	0.41	4.94	10.67
108	106/612A [17474]	Yes	1401	5.4	33.78	1.90	1.84		7.40	0.14	31.45	6.84	0.13	0.27	0.43	3.91	11.12
109	106/627A [17474]	Yes	1380	5.3	33.52	1.65	1.96		7.04	0.15	29.46	8.37	0.19	0.68	0.41	4.94	10.67
	Loc# =9																
110	5621 [21451]	No	1498	5.0	35.28	2.39	5.02		8.63	0.19	24.19	8.30	0.21	1.57	0.58		10.14
111	5611 [21451]	No	1666	7.0	34.96	2.84	3.48		10.34	0.19	29.96	3.78	0.14	2.27	0.34		9.68
112	5596 [21451]	No	1546	5.5	32.08	2.34	5.43		10.61	0.26	22.58	10.09	0.10	1.95	0.60		8.96
113	5603 [21451]	No	1533	6.3	35.99	1.31	2.74		8.52	0.17	28.39	7.27	0.14	0.31	0.27		10.50
114	5599 [21451]	No	1487	5.3	29.69	2.29	4.88		10.16	0.35	20.89	12.59	0.11	0.63	0.69		10.50
115	5604 [21451]	No	1589	6.5	39.43	1.95	3.62		8.39	0.15	26.95	6.19	1.05	2.44	0.34		9.36
116	1.113 19.9 [15375]	No	1522	5.2	29.18	0.99	3.43		7.98	0.17	25.28	9.71		3.29	0.43	7.17	8.76
117	2.150 11.6 [15375]	No	1544	5.5	32.08	2.34	5.43		10.61	0.26	22.58	10.09	0.10	1.95	0.60	3.69	8.96
118	2.151 12.4 [15375]	No	1518	5.4	32.88	2.33	5.27		10.79	0.26	24.08	10.29	0.09	0.75	0.71	1.32	9.49
119	2.151 13.1 [15375]	No	1579	5.7	33.66	2.42	5.49		10.87	0.36	23.67	7.69	0.10	1.86	0.78	1.57	8.77
120	3.096 28.1 [15375]	No	1490	5.4	29.69	2.29	4.88		10.16	0.35	20.89	12.59	0.11	0.63	0.69	6.95	10.50
121	3.096 35.13 [15375]	No	1454	4.9	29.18	2.18	5.24		9.71	0.35	20.08	13.99	0.11	0.85	0.73	7.83	9.51
122	3.108 28.8 [15375]	No	1532	5.6	40.18	1.73	6.24		9.44	0.17	16.69	11.59	0.45	1.25	0.51	1.50	9.57
123	5.04 39.08 [15375]	No	1651	7.5	36.98	1.42	2.27		9.26	0.18	32.58	3.34	0.05	0.05	0.27	0.37	13.67
124	5.08 79.45 [15375]	No	1532	6.3	35.99	1.31	2.74		8.52	0.17	28.39	7.27	0.14	0.31	0.27	4.65	10.50
125	9.02 16.45 [15375]	No	1593	6.5	39.43	1.95	3.62		8.39	0.15	26.95	6.19	1.05	2.44	0.34	0.37	9.36
126	9.02 22.13 [15375]	No	1595	6.7	39.75	1.79	3.45		8.36	0.15	27.07	6.37	0.97	2.51	0.33	0.40	9.12
127	9.02 25.52 [15375]	No	1619	6.4	38.39	1.81	3.81		8.51	0.15	27.39	5.24	0.59	2.80	0.36	0.59	10.05
128	9.02 30.9 [15375]	No	1581	6.6	39.46	2.08	3.52		8.35	0.15	26.17	6.80	1.08	2.39	0.31	0.48	9.56
129	10.01 43.75 [15375]	No	1522	4.9	36.06	2.43	5.44		8.52	0.23	24.87	6.26	0.11	1.79	0.46	2.19	11.32
130	10.19 48.5 [15375]	No	1534	5.1	36.97	2.40	5.49		8.82	0.19	24.98	6.49	0.30	1.86	0.48	1.54	10.08
131	10.02 36.22 [15375]	No	1496	5.0	35.28	2.39	5.02		8.63	0.19	24.19	8.30	0.21	1.57	0.58	2.71	10.14
132	14.01 16.94 [15375]	No	1633	6.4	36.37	2.83	4.06		9.89	0.19	28.27	4.51	0.11	2.33	0.36	0.37	10.52

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
133	14.05 39.05 [15375]	No	1665	7.0	34.96	2.84	3.48		10.34	0.19	29.96	3.78	0.14	2.27	0.34	1.72	9.68
134	14.07 34.55 [15375]	No	1644	6.7	35.27	2.99	3.69		10.34	0.20	29.97	4.08	0.10	2.16	0.37	0.40	10.67
135	14.07 58.77 [15375]	No	1550	5.8	39.43	2.22	4.71		8.40	0.15	23.96	7.64	1.27	2.61	0.32	0.04	8.90
136	14.07 62.6 [15375]	No	1581	5.8	36.04	2.39	4.29		9.16	0.18	27.45	5.95	0.16	2.30	0.31	1.35	10.20
137	2.150/11.6-12.0 [18236]	No	1546	5.5	32.08	2.34	5.43		10.61	0.26	22.58	10.09	0.10	1.95	0.60		
138	14.05/39.05-39.32 [18236]	No	1666	7.0	34.96	2.84	3.48		10.34	0.19	29.96	3.78	0.14	2.27	0.34		
139	PIPE 1 [21666]	Yes	1382	4.7	25.37	1.40	3.17		10.06	0.23	28.46	17.43	0.18	0.48	0.60	6.00	6.48
140	1.106 8.15 [15375]	Yes	1421	5.3	26.80	1.45	3.09		10.26	0.23	27.40	16.00	0.12	0.13	0.40	5.31	7.43
141	1.107 16.95 [15375]	Yes	1390	4.8	25.56	1.52	3.07		10.15	0.23	29.05	16.07	0.13	0.11	0.60	4.75	6.51
142	1.11 21.45 [15375]	Yes	1365	4.7	25.67	1.47	2.92		9.80	0.23	28.56	17.28	0.07	0.08	0.64	4.75	6.31
143	1.107/16.95 [18236]	Yes	1393	4.8	25.56	1.52	3.07		10.15	0.23	29.05	16.07	0.13	0.11	0.60		
	<u>Loc# =10</u>																
144	660-01 [Kargin, 2014]	No	1670	5.6	39.19	0.85	5.05		9.99	0.23	31.17	1.15	0.08	0.02	0.52		
145	hole 8/60.8 [Kargin, 2014]	No	1743	8.3	38.91	3.05	4.30		12.31	0.21	25.54	1.60	0.08	0.08	0.36		
146	700-01 [Kargin, 2014]	No	1816	11.5	31.57	3.09	3.85		16.89	0.79	29.59	0.44	0.05	0.03	0.31		
147	106/1 [Priyatkina et al., 2014]	No	1769	8.8	36.90	1.22	3.08		11.97	0.15	32.60	0.99	0.16	0.04	0.70		
148	826-04 [Kargin, 2014]	Yes	1429	6.1	29.50	1.58	4.22		9.63	0.23	11.42	25.32			1.33		
149	865-01 [Kargin, 2014]	Yes	1579	6.6	31.54	1.16	2.56		10.36	0.21	32.03	6.04	0.10	0.07	1.08		
150	814-01 [Kargin, 2014]	Yes	1477	8.2	41.65	1.49	2.28		8.57	0.27	15.66	18.37			1.54		
151	226/6 [Priyatkina et al., 2014]	Yes	1419	3.3	24.70	1.38	11.40		11.25	0.28	17.50	16.30		0.03	1.41		
152	209/1 [Priyatkina et al., 2014]	Yes	1571	6.3	37.00	0.86	6.77		11.52	0.22	13.50	15.50	0.11	0.04	0.38		
153	101/2 [Priyatkina et al., 2014]	Yes	1189	8.1	19.30	0.18	0.32		5.89	0.17	16.60	29.20	0.10				
154	201/1 [Priyatkina et al., 2014]	Yes	1160	4.8	25.70	0.50	2.13		5.38	0.15	9.75	33.00	0.06	0.03	0.11		
	<u>Loc# =11</u>																
155	T [19110]	No	1553	6.8	35.12	2.41	3.07		10.05	0.16	27.35	8.27	0.01	0.02	0.59		
156	U1 [19110]	No	1649	6.6	34.64	1.79	2.38		9.78	0.20	36.73	0.97	0.02	0.01	0.44		
157	U2 [19110]	No	1635	6.2	34.71	1.74	2.39		9.40	0.20	37.28	0.67	0.01	0.01	0.41		
158	U3 [19110]	No	1573	5.2	35.06	1.89	2.30		8.58	0.20	37.94	0.71	0.01	0.01	0.40		
159	A1 [12158]	No	1710	7.3	36.21	2.22	3.81		11.42	0.21	30.93	0.77			0.51		
160	B1 [12158]	No	1642	5.6	37.42	1.89	3.91		9.14	0.19	32.35	0.64			0.42		
161	C1 [12158]	No	1737	7.9	36.88	2.03	3.50		11.33	0.21	30.71	0.74			0.51		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
162	D1 [12158]	No	1675	6.7	36.84	2.15	3.43		10.05	0.17	31.61	1.12			0.58		
163	E1 [12158]	No	1676	6.4	37.92	1.98	3.51		9.35	0.22	31.69	0.72	0.01		0.51		
164	G1 [12158]	No	1634	8.0	37.04	2.10	2.83		9.78	0.12	25.15	6.32	0.03		0.52		
	<u>Loc# =12</u>																
165	CKP-9 [13070] [18134]	No	1530	7.7	19.92	3.20	2.30		13.31	0.26	25.28	15.64	0.22	0.20	2.73	8.77	5.85
	<u>Loc# =13</u>																
166	PAN [16685]	No	1658	9.5	32.71	3.92	2.86		12.08	0.23	21.93	11.74	1.08	2.97	0.92		1.54
167	D-4 [14235]	No	1534	6.4	29.33	1.96	2.46		8.61	0.18	25.71	9.59	0.78	2.49	1.85		
168	TR-72 [14235]	No	1483	5.0	30.12	2.49	3.35		9.59	0.21	31.30	8.85	0.70	1.39	0.90		
169	SR-16 [14235]	No	1515	6.8	31.88	2.34	3.05		10.68	0.19	27.23	10.87	0.78	0.27	0.85		
170	D-1 [14235]	No	1486	5.9	25.12	2.08	2.34		8.80	0.18	25.66	11.47	0.74	1.95	1.45		
171	SR-4 [14235]	No	1702	6.6	33.83	2.19	3.74		8.84	0.19	27.95	2.76	0.72	3.77	0.42		
172	TRES RANCHOS [9656]	No	1587	7.0	35.13	1.35	2.27		8.78	0.20	30.12	5.43	0.48	0.57	1.01		
173	91SB29 [14241]	No	1587	6.1	40.00	1.55	3.11		10.32	0.22	37.38	4.43	0.22	0.67	1.07		
174	TR [16685]	No	1588	7.4	31.90	0.94	2.01		8.76	0.20	26.96	8.26	0.86	2.19	2.69		
175	IND [16685]	No	1476	6.4	25.28	2.28	2.44		10.56	0.23	23.43	15.39	0.51	0.85	3.24		
176	TRES RANCHOS [14240]	No	1630	7.0	34.47	1.25	2.57		9.82	0.24	31.62	4.63	0.09	0.93	1.21		1.07
177	LIMEIRA [14240]	No	1547	7.7	29.74	2.41	1.85		10.98	0.22	29.88	10.84	0.02	1.05	2.57		0.69
178	TRX [14388]	No	1630	7.0	34.47	1.25	2.57		9.82	0.24	31.62	4.63	0.09	0.93	1.21		1.07
179	LIMI-3 [17617]	No	1491	6.6	29.20	2.50	2.00		9.63	0.20	27.60	11.00	0.10	1.00	2.70		
180	LEM [17617]	No	1484	6.4	26.70	2.30	2.50		10.26	0.20	23.60	14.80	0.30	1.50	3.10		
181	IN I-1 [17617]	No	1472	6.3	25.30	2.30	2.50		10.53	0.20	23.40	15.40	0.40	0.80	3.30		
182	IN I-6 [17617]	No	1650	9.3	32.30	4.00	3.10		12.15	0.20	20.80	12.00	1.40	2.60	1.00		
183	PANT-1 [17617]	No	1623	7.0	40.70	4.00	6.80		10.98	0.20	13.00	10.60	2.50	2.60	1.10		
184	LIM [16685]	No	1515	6.8	27.92	2.04	2.18		10.44	0.23	27.82	12.52	0.24	1.41	2.40		0.69
	<u>Loc# =14</u>																
185	120-17G [20835]	No	1422	5.8	29.80	2.08	1.10		8.10	0.12	35.20	5.90	0.00	0.12	0.28		
186	168-1A [20835]	No	1454	5.2	28.50	2.41	2.15		8.46	0.16	31.50	6.10	0.00	0.00	0.22		
187	168-1B [20835]	No	1424	4.6	29.30	2.32	1.97		8.10	0.15	34.00	4.80	0.00	0.00	0.21		
188	168-1D [20835]	No	1359	3.5	28.10	2.60	1.79		7.47	0.16	34.90	3.48	0.00	0.01	0.24		
189	168-1G [20835]	No	1449	5.0	28.00	2.09	1.56		8.19	0.16	34.40	4.31	0.00	0.01	0.24		
190	168-1H [20835]	No	1476	5.4	28.40	2.61	1.84		8.55	0.16	33.40	4.36	0.00	0.01	0.26		
191	179-1F [20835]	No	1456	5.2	28.70	1.71	1.56		8.01	0.19	33.50	4.70	0.00	0.00	0.48		
192	179-1G [20835]	No	1477	5.7	29.60	1.56	1.46		8.19	0.18	34.00	4.80	0.00	0.00	0.41		
193	120-17A [20835]	Yes	1240	3.0	28.20	1.36	0.97		7.02	0.16	36.50	5.30	0.00	0.10	0.25		
194	120-17B [20835]	Yes	1270	4.0	28.20	1.90	1.24		7.38	0.16	33.90	8.70	0.00	0.11	0.48		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
195	120-17C [20835]	Yes	1158	3.2	28.20	1.58	1.13		6.84	0.15	34.20	9.80	0.00	0.11	0.33		
196	120-17D [20835]	Yes	1271	3.7	27.60	2.06	1.44		7.56	0.16	34.20	8.80	0.00	0.15	0.53		
197	120-17E [20835]	Yes	1226	2.9	26.30	2.00	1.60		7.29	0.16	33.80	9.00	0.00	0.24	0.60		
198	120-17/F [20835]	Yes	1247	3.5	28.60	1.89	1.38		7.29	0.14	34.80	8.10	0.00	0.15	0.45		
199	120-17H [20835]	Yes	1333	3.8	28.60	1.97	1.70		7.47	0.13	34.20	6.20	0.00	0.18	0.34		
200	120-17I [20835]	Yes	1318	4.3	28.00	2.13	1.28		7.56	0.14	34.00	7.60	0.00	0.21	0.34		
201	168-1C [20835]	Yes	1219	2.1	27.30	2.17	1.78		6.93	0.16	35.40	4.60	0.00	0.00	0.20		
202	168-1E [20835]	Yes	1298	2.9	28.43	2.72	1.76		7.20	0.15	35.60	3.46	0.00	0.01	0.23		
203	168-1F [20835]	Yes	1340	3.0	28.00	2.29	1.88		7.47	0.15	35.80	3.37	0.00	0.01	0.25		
204	179-1E [20835]	Yes	1302	3.6	26.90	1.54	1.49		7.20	0.17	33.20	6.70	0.00	0.00	0.44		
	Loc# =15																
205	P1 [16743]	No	1526	6.1	26.70	1.82	3.33		10.72	0.17	25.40	10.80	0.19	0.60	0.58	9.40	8.60
206	P2 [16743]	No	1432	5.5	26.00	1.52	2.94		9.08	0.15	23.40	14.50	0.02	0.34	0.65	11.20	9.60
207	P4 [16743]	Yes	1219	4.2	21.10	2.03	2.99		6.22	0.17	12.30	28.20	0.03	1.44	0.98	21.80	2.80
208	P13 [16743]	Yes	1227	3.6	22.70	1.49	3.51		6.72	0.15	17.80	22.30	0.02	0.26	1.06	16.40	5.90
	Loc# =16																
209	V1 [16743]	No	1624	7.2	29.80	3.34	4.55		13.64	0.22	23.80	8.80	0.04	1.14	1.24	3.20	8.40
210	V2 [16743]	No	1643	7.9	29.20	3.26	4.08		13.50	0.23	23.60	9.21	1.16	1.44	1.28	3.70	6.99
211	V3 [16743]	No	1621	7.3	26.80	3.83	4.84		14.58	0.24	24.20	8.79	1.10	0.40	1.13	3.60	9.09
	Loc# =17																
212	S910-K [17001]	No	1399	4.9	25.90	2.54	4.04		8.19	0.17	17.40	17.70		2.39	0.94		
	Loc# =18																
213	ED1-1 [16829]	No	1521	7.2	29.60	5.20	2.70	0.19	10.04	0.25	23.10	10.20	0.03	0.94	0.09	5.80	
214	NX3S-1 [16829]	Yes	1316	4.2	24.80	1.40	3.10	0.10	7.60	0.15	22.20	16.20	0.07	0.16	1.40	10.50	
215	NX4-16 [16829]	Yes	1405	4.6	34.20	0.95	2.70	0.16	7.26	0.14	30.70	6.80	0.09	0.42	0.30	2.20	
	Loc# =19																
216	KUN1 [14164]	No	1528	5.8	32.84	1.78	2.40		9.77	0.22	35.80	5.37		0.24	0.46	1.43	8.86
217	KUN15C [14164]	No	1484	5.9	29.00	1.74	1.85		9.75	0.21	34.51	8.41		0.51	0.41	2.02	9.67
218	KUNM1 [14164]	No	1508	5.8	29.63	2.92	3.30		10.39	0.23	29.28	8.02		0.02	0.69	4.00	10.75
219	KUNM2 [14164]	No	1519	5.8	31.25	2.58	3.01		9.74	0.20	30.67	6.22			0.63	3.45	11.15
	Loc# =20																
220	NOD1 [14164]	No	1433	6.3	33.46	1.06	3.01		7.63	0.14	15.35	16.11	0.15	0.20	0.78	12.11	9.37
221	NOD2 [14164]	No	1388	4.6	35.94	0.59	5.20		6.38	0.13	14.62	13.46	0.25	1.05	0.10	11.01	9.25
222	NOD4 RIM [14164]	No	1450	6.1	31.78	3.27	3.95		8.64	0.18	13.41	16.23	0.14	0.26	1.39	11.89	7.40
223	NOD5 [14164]	No	1404	5.9	40.63	1.64	3.67		6.15	0.18	10.00	16.55	0.06	1.27	1.83	13.91	2.89
224	NOD3 [14164]	Yes	1279	4.2	31.70	0.62	4.04		6.43		16.63	18.83	0.10		0.62		20.80
225	NOD6 [14164]	Yes	1367	4.9	30.25	1.41	3.81		6.76	0.19	15.92	15.28	0.06	0.98	0.87	14.28	9.26

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
226	NOD14 [14164]	Yes	1368	4.9	17.21	2.56	4.10		9.15	0.15	11.67	25.70	0.08	0.32	3.08	17.43	7.43
	Loc# =21																
227	401/42 [18234]	No	1453	3.4	35.78	2.38	10.22		8.63	0.10	21.83	6.36	1.35	0.62	0.24	0.77	10.93
228	401/35 [18234]	No	1507	4.4	30.68	4.62	10.50		11.12	0.12	17.13	9.14	1.97	0.59	0.25	3.42	8.96
229	401/280 [18234]	No	1396	2.8	35.42	1.52	10.90		7.80	0.10	22.12	7.08	1.15	0.58	0.20	0.88	11.69
230	401/302 [18234]	No	1410	3.2	34.67	1.53	9.85		7.99	0.10	20.79	8.78	1.83	0.52	0.27	1.63	10.64
231	452/55 [18234]	No	1489	5.0	35.78	2.70	5.08		9.14	0.12	24.94	8.20	0.22	0.43	0.45	2.53	10.18
232	452/47.5 [18234]	No	1502	4.8	35.48	2.40	5.73		8.81	0.10	23.80	6.56	0.38	0.27	0.44	1.84	12.30
233	452/104 [18234]	No	1600	5.8	42.08	1.82	5.75		7.99	0.10	18.87	5.98	0.84	1.40	0.30	1.65	12.18
234	454/60 [18234]	No	1580	6.1	41.46	2.54	5.03		7.57	0.06	18.48	5.48	0.20	1.38	0.26	2.56	13.58
235	SH-301 [18234]	No	1615	6.8	37.44	5.24	6.57		11.88	0.21	14.60	9.13	0.41	1.53	0.90	0.11	10.67
236	SH-320 [18234]	No	1467	5.6	31.98	4.01	5.70		9.38	0.18	12.30	17.36	0.50	1.31	0.82	6.16	9.00
237	2938/25 [18234]	No	1727	8.0	43.38	5.34	5.12		10.44	0.15	15.23	3.49	0.08	0.68	1.30		13.39
238	2315 [18234]	No	1523	5.4	43.57	1.75	5.55		6.91	0.12	20.48	3.04	1.19	0.60	0.36	0.12	14.59
239	2937/11 [18234]	Yes	1297	4.5	30.56	2.42	4.10		6.42	0.13	14.31	18.48	0.17	0.54	0.58	11.66	9.70
240	6224 [18234]	Yes	1337	4.6	30.94	1.97	3.89		6.40	0.12	16.95	14.33	0.21	0.92	0.51	12.27	10.24
241	2935/12 [18234]	Yes	1311	4.9	31.87	1.64	3.30		6.18	0.09	16.53	16.24	0.26	0.47	0.35	12.76	9.59
	Loc# =22																
242	P-13A [17971]	No	1692	10.2	41.32	4.56	2.61		10.95	0.15	25.65	7.13	0.10	2.70	1.01		
243	P3/5 [7740]	No	1536	6.1	37.13	1.64	3.36		9.21	0.16	28.73	7.90	0.19	0.79	0.50		
244	P11/2C [7740]	No	1554	6.4	39.29	2.29	4.19		10.49	0.17	26.70	9.49	0.33	0.71	0.47		
245	ATK2/1 [20390]	No	1616	7.3	39.53	4.69	6.09		11.41	0.13	11.85	11.73	0.54	1.16	0.89		
246	ATK2/2 [20390]	No	1609	7.2	39.71	4.50	6.02		11.10	0.13	11.88	11.69	0.56	1.17	0.90		
247	ATK2/3 [20390]	No	1611	7.3	38.61	4.66	5.90		11.16	0.13	11.66	11.66	0.49	1.10	0.88		
248	KL-3 [18873]	No	1550	7.3	27.61	4.71	3.07	0.14	12.11	0.21	24.39	12.07		1.17	0.72		
249	FTP-17 [21176]	No	1623	9.6	29.40	3.76	3.77		11.95	0.21	9.67	18.96	0.14	0.05	0.90		
250	FTP-18 [21176]	No	1569	8.6	30.28	4.18	3.64		10.92	0.13	10.01	19.31	0.11	0.04	0.95		
251	82031 [13838]	No	1563	6.2	33.99	2.52	5.79	0.10	11.69	0.21	19.39	13.75	1.17	2.08	0.73	0.46	7.27
252	82041 [13838]	No	1568	7.0	35.32	2.51	3.54	0.15	11.35	0.20	28.02	8.84		0.61	0.59	0.78	7.14
253	8204B2 [13838]	No	1603	6.9	35.45	2.54	3.63	0.15	10.93	0.19	27.77	6.94		0.81	0.72	0.51	9.37
254	8304 [13838]	No	1555	7.0	35.93	4.66	4.59	0.12	11.83	0.17	18.60	13.33		0.76	0.72	0.53	7.75
255	8304B [13838]	No	1612	8.2	32.95	4.87	3.40	0.13	12.19	0.19	21.54	10.91		1.98	0.97	2.26	6.86
256	8308 [13838]	No	1587	7.0	36.06	2.72	3.36	0.17	10.64	0.17	27.56	8.08		1.06	0.67	0.64	7.67
257	8308B [13838]	No	1577	7.2	35.99	2.80	3.19	0.17	10.88	0.18	27.59	9.51	0.22	1.08	0.71	0.27	6.50
258	83P13 [13838]	No	1640	9.5	29.75	4.93	2.66	0.13	12.82	0.20	22.85	11.11		1.92	0.91	4.38	6.88
259	P2 [12905]	No	1539	5.8	35.29	2.54	6.45		11.21	0.20	18.63	14.33	1.46	2.20	0.78		
260	P2A [12905]	No	1571	6.8	31.81	3.06	4.76		12.93	0.24	21.88	12.24	0.01	0.05	0.54		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
261	3/PR2B [7740]	No	1529	5.9	33.70	2.58	5.79		11.32	0.22	18.60	15.60	0.39	2.26	0.93		
262	4/PR2 [7740]	No	1572	6.2	33.22	2.68	5.60		11.94	0.24	20.31	12.88	0.17	2.47	0.78		
263	8/PR2A [7740]	No	1535	6.1	33.10	2.59	5.38		11.61	0.22	19.69	15.79	0.62	2.16	0.69		
264	P3B [7740]	No	1528	6.0	36.86	1.69	3.45		9.19	0.16	28.40	8.16	0.26	0.84	0.52		
265	P3A [7740]	No	1527	6.0	37.15	1.59	3.35		9.05	0.15	28.93	7.80	0.26	0.74	0.50		
266	P3 [7740]	No	1531	6.0	36.45	1.61	3.37		9.03	0.16	28.00	8.00	0.24	0.77	0.50		
267	P4/7 [7740]	No	1547	5.9	38.32	1.47	3.51		9.00	0.15	30.23	6.93	0.17	1.31	0.48		
268	P4/A [7740]	No	1530	5.8	38.14	1.52	3.62		9.01	0.16	29.43	7.67	0.21	1.28	0.54		
269	G/P5 [7740]	No	1594	7.5	34.65	4.11	4.22		12.14	0.19	20.02	11.82	0.34	1.37	1.16		
270	P-5/7 [7740]	No	1589	7.5	35.18	4.36	3.99		11.77	0.18	21.01	11.28	0.37	1.59	0.85		
271	P5 [7740]	No	1612	8.1	32.28	5.36	3.68		12.90	0.19	22.08	11.01	0.27	1.49	0.53		
272	P-5/A [7740]	No	1527	6.5	35.47	4.43	4.53		10.87	0.15	19.60	12.99	0.29	1.30	0.80		
273	P5/10 [7740]	No	1636	8.5	33.86	4.47	3.97		13.16	0.21	19.88	11.46	0.41	1.19	0.92		
274	P6/5 [7740]	No	1570	7.2	36.60	4.13	4.63		12.58	0.19	20.74	13.32	0.17	0.62	0.55		
275	P6/1 [7740]	No	1546	5.8	35.13	2.45	6.20		11.27	0.21	19.54	13.55	1.17	2.07	0.80		
276	CH-10 [7740]	No	1557	6.4	39.24	2.22	4.09		9.74	0.16	25.38	8.75	0.35	0.94	0.46		
277	CH-8 [7740]	No	1571	6.6	38.34	2.29	3.98		9.74	0.16	23.95	8.67	0.37	0.99	0.42		
278	P11/5 [7740]	No	1533	6.2	38.22	2.26	3.99		10.25	0.16	26.58	10.13	0.27	0.64	0.59		
279	P11/2A [7740]	No	1549	6.3	39.35	2.29	4.39		10.50	0.16	26.01	9.80	0.28	0.69	0.46		
280	P11/1 [7740]	No	1548	6.3	38.90	2.33	4.32		10.45	0.16	25.84	9.89	0.28	0.78	0.46		
281	P11/2 [7740]	No	1555	6.3	39.37	2.19	4.14		10.37	0.16	27.13	9.18	0.36	0.66	0.47		
282	CC-2 [17971]	Yes	1454	6.0	42.32	2.81	3.12		8.35	0.14	27.49	9.41	0.21	0.58	0.61		
283	P-12 [17971]	Yes	1363	5.3	44.07	2.15	3.51		6.96	0.13	22.60	13.04	0.17	1.04	0.86		
284	7/PR2 [7740]	Yes	1495	5.6	35.38	2.29	6.07		10.76	0.21	17.30	16.50	0.45	0.92	0.90		
285	P8/10 [7740]	Yes	1484	5.2	41.23	1.60	4.83		8.38	0.14	24.39	8.92	0.35	0.53	0.52		
286	ATK3/1 [20390]	Yes	1534	7.7	30.36	3.84	3.87		10.37	0.13	10.60	19.06	0.27	0.06	0.96		
287	ATK3/2 [20390]	Yes	1537	7.7	30.03	3.89	3.84		10.37	0.13	10.51	18.90	0.27	0.06	0.95		
288	ATK3/3 [20390]	Yes	1529	7.6	30.01	3.66	3.82		10.11	0.13	10.52	18.99	0.27	0.06	0.95		
289	ATK4/1 [20390]	Yes	1364	4.2	40.69	1.75	6.02		6.46	0.13	18.57	11.27	0.18	1.48	0.42		
290	ATK4/2 [20390]	Yes	1364	4.2	41.26	1.67	5.91		6.34	0.13	17.94	11.82	0.20	1.47	0.46		
291	ATK4/3 [20390]	Yes	1370	4.2	41.23	1.77	6.05		6.51	0.13	18.91	11.09	0.17	1.51	0.42		
292	CG-2 [18872]	Yes	1426	4.2	38.00	2.03	6.29		8.83		26.35	10.31	0.20	0.80	0.17		
293	FTP-14 [21176]	Yes	1511	7.6	28.56	4.03	3.50		9.74	0.11	9.66	20.02	0.15	0.05	0.99		
294	FTP-15 [21176]	Yes	1542	8.0	28.06	3.34	3.74		10.29	0.11	8.97	20.98	0.15	0.05	0.87		
295	FTP-16 [21176]	Yes	1529	7.7	30.08	3.84	3.91		10.23	0.12	9.61	20.38	0.16	0.05	0.97		
296	WK-2/7 [14070]	Yes	1463	4.9	33.67	3.05	6.52		10.48	0.18	20.02	15.27	0.55	1.42	0.80	0.27	7.07
297	WK-2/9 [14070]	Yes	1480	4.8	33.77	2.02	7.38		10.37	0.18	19.20	15.35	1.07	2.14	0.70	0.26	6.72

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
298	LM-3/5 [14070]	Yes	1404	4.5	29.72	1.94	3.36		8.45	0.18	28.66	9.40	0.05		0.40	4.61	12.88
299	LM-4/6 [14070]	Yes	1423	4.6	38.05	1.32	4.14		7.83	0.16	28.41	8.80	0.31	1.07	0.54	2.26	6.27
300	LM-4/9 [14070]	Yes	1404	4.3	38.42	1.32	4.07		7.49	0.16	30.10	7.53	0.28	1.37	0.71	1.07	6.69
301	82032 [13838]	Yes	1503	5.6	33.10	2.55	5.56	0.12	11.19	0.21	20.26	16.00	0.21	1.88	0.61	0.32	7.10
302	83021 [13838]	Yes	1498	5.3	37.40	1.45	3.67	0.16	8.35	0.14	28.97	7.10		1.01	0.48	1.71	8.95
303	83022 [13838]	Yes	1473	5.2	36.54	1.41	3.55	0.15	8.36	0.14	28.84	8.20		0.92	0.49	2.41	8.28
304	8310 [13838]	Yes	1487	5.8	29.26	2.42	3.01	0.18	10.01	0.19	27.56	10.13		0.14	1.16	2.60	11.42
305	8310B [13838]	Yes	1492	5.8	28.85	2.54	2.80	0.19	10.01	0.21	28.63	8.93		0.16	1.45	3.18	11.61
306	8312B1 [13838]	Yes	1518	6.9	26.98	2.38	2.21	0.18	10.01	0.18	26.84	10.60		0.72	0.73	8.44	9.21
307	8312B2 [13838]	Yes	1491	6.4	26.94	2.29	2.50	0.16	9.67	0.17	25.04	11.56		0.49	0.79	8.48	10.89
308	KL4 [12905]	Yes	1481	5.4	28.83	2.28	3.01		9.39	0.17	28.79	9.41	0.03	0.95	0.54		
309	6/PR1-B [7740]	Yes	1261	4.8	43.90	1.34	4.40		6.53	0.16	11.57	25.97	0.17	0.03	0.70		
310	P3/7 [7740]	Yes	1445	4.9	33.37	1.56	3.18		7.96	0.16	29.02	8.15	0.05	0.97	0.56		
311	P4 [7740]	Yes	1501	5.6	38.15	1.35	3.45		8.76	0.15	29.77	8.33	0.25	0.99	0.53		
312	G/P7/1 [7740]	Yes	1351	3.6	33.79	0.81	4.01		7.13	0.14	28.50	8.87	0.31	0.79	0.80		
313	P8/5 [7740]	Yes	1502	5.4	39.70	1.83	4.66		8.81	0.14	25.16	8.48	0.29	0.52	0.47		
314	P8 [7740]	Yes	1487	5.0	42.04	1.71	5.39		8.35	0.22	23.07	8.75	0.31	0.52	0.51		
315	G/P8/1 [7740]	Yes	1472	4.8	42.20	1.55	5.43		8.12	0.14	24.16	8.66	0.34	0.63	0.38		
316	G/P8 [7740]	Yes	1464	4.7	40.30	1.50	5.41		8.16	0.14	24.52	8.54	0.34	0.58	0.34		
317	P9/1 [7740]	Yes	1236	4.1	34.53	0.79	3.91		5.74	0.10	16.16	18.55	0.07	0.33	0.86		
318	CH-5 [7740]	Yes	1515	6.4	40.65	2.09	4.53		9.25	0.14	21.13	10.35	0.39	0.87	0.32		
	Loc# =23																
319	98MA119BO [7991]	No	1615	8.0	36.70	5.33	4.18		13.43	0.21	22.43	12.08	0.40	2.04	1.00		
320	98MA123 [7991]	No	1614	8.4	38.37	4.84	3.60		12.74	0.20	22.99	11.85	0.35	1.67	1.05		
	Loc# =24																
321	CH-23 [18872]	No	1659	9.3	39.10	2.51	3.74		13.65	0.18	21.20	13.40	0.02	0.74	0.63		
322	CH-24 [18872]	No	1650	8.8	38.30	1.39	3.80		13.85	0.17	23.90	12.85	0.08	0.30	0.65		
323	CH-36 [18872]	No	1689	9.8	39.64	1.40	3.70		13.77	0.18	21.50	13.01	0.09	0.76	0.64		
324	CH-37 [18872]	No	1671	9.3	39.80	1.58	3.82		13.76	0.16	22.00	13.30	0.13	0.78	0.67		
325	CH-25 [18872]	No	1684	9.5	36.50	0.68	3.20		12.95	0.19	23.90	11.17	0.11	0.69	0.60		
326	CH-26 [18872]	No	1683	9.9	38.20	0.73	2.70		12.52	0.21	26.30	11.20	0.19	1.11	0.75		
327	CH-38 [18872]	No	1674	9.3	36.10	0.82	3.25		12.85	0.19	23.50	11.50	0.13	0.69	0.62		
328	CH-39 [18872]	No	1710	10.3	37.00	0.87	3.25		13.87	0.19	24.01	11.32	0.12	0.67	0.64		
329	CH-30 [18872]	No	1600	8.7	36.29	1.02	2.21		11.49	0.16	30.35	11.17	0.11	0.14	0.59		
330	CH-27 [18872]	No	1647	8.5	38.10	0.74	2.62		11.22	0.16	30.10	9.10	0.10	1.10	0.79		
331	CH-28 [18872]	No	1619	8.0	38.12	0.76	2.52		10.55	0.17	30.23	9.16	0.11	1.07	0.82		
332	CH-29 [18872]	No	1629	7.9	37.57	0.78	2.89		11.33	0.18	30.47	9.27	0.11	1.15	0.72		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
333	CH-40 [18872]	No	1626	8.2	38.10	0.82	2.60		10.84	0.17	30.03	9.24	0.12	1.07	0.85		
334	CH-41 [18872]	No	1619	8.1	39.05	0.79	2.48		10.45	0.17	30.30	9.16	0.17	1.08	0.76		
335	1 [13838]	No	1584	6.8	32.68	3.84	4.17	0.12	11.72	0.21	23.63	9.67		1.62	0.62	0.34	9.41
336	2 [13838]	No	1578	7.5	31.25	3.57	3.31	0.15	11.81	0.19	23.46	12.03		1.70	0.71	3.58	7.12
337	5 [13838]	No	1635	8.5	32.16	3.31	2.72	0.19	12.13	0.20	26.87	7.84		0.90	0.86	0.80	10.18
338	6 [13838]	No	1617	7.8	33.00	3.11	3.06	0.17	11.66	0.18	26.17	8.28		1.14	0.79	0.78	9.52
339	8 [13838]	No	1609	7.5	32.51	3.58	3.58	0.15	12.06	0.19	24.37	9.78		1.75	0.72	1.98	7.79
340	9 [13838]	No	1612	8.0	31.83	3.63	3.19	0.17	12.22	0.20	24.58	9.74		1.08	0.64	0.96	9.13
341	13 [13838]	No	1587	7.0	36.55	2.86	4.16	0.15	11.65	0.18	24.20	9.38		0.37	0.55	0.74	7.99
342	15 [13838]	No	1623	8.4	31.64	3.95	2.91	0.19	12.44	0.20	25.90	8.89		0.95	0.43	0.61	9.57
343	X116/H1/65 [13838]	No	1545	3.9	42.42	1.51	10.04	0.11	8.78	0.17	20.53	4.13		0.54	0.30	1.10	10.13
344	080/22 [13838]	No	1581	7.2	35.86	2.70	3.49	0.18	11.18	0.18	26.94	8.32		1.01	0.62	0.56	7.84
345	080/38-41 [13838]	No	1567	6.6	37.25	2.51	4.26	0.18	10.40	0.17	24.32	8.59		1.71	0.67	0.59	8.54
346	X114/H3/47 [13838]	No	1575	6.9	39.55	3.67	4.14	0.13	9.54	0.12	19.65	8.74		1.52	0.69	3.54	8.08
347	X114/H2/37 [13838]	No	1668	8.9	34.23	4.32	3.29	0.16	12.93	0.19	24.58	7.94		1.50	0.55	0.59	8.72
348	X114/H3/57 [13838]	No	1625	8.9	31.86	4.17	2.65	0.18	12.66	0.21	25.95	10.46		1.29	0.25	0.69	7.76
349	NP [7740]	No	1604	7.9	32.69	5.40	3.75		12.75	0.21	22.62	10.08	0.09	1.01	0.56		
350	MD/11 [7740]	No	1576	7.3	36.62	4.27	4.53		12.87	0.20	21.20	12.96	0.14	0.37	0.57		
351	KK11 [7740]	No	1578	7.3	31.89	3.77	3.89		12.50	0.21	23.15	11.85	0.04	0.94	0.68		
352	KK4 [7740]	No	1583	7.4	32.23	3.80	3.72		12.54	0.22	23.81	11.30	0.09	0.86	0.79		
353	PDF/1B [7740]	No	1609	8.1	31.91	4.40	3.50		12.97	0.20	22.89	11.18	0.06	1.05	0.88		
354	PDF/1A [7740]	No	1603	8.0	32.19	4.55	3.60		12.92	0.21	22.90	11.15	0.04	1.04	0.79		
355	PDF/1 [7740]	No	1603	7.9	32.02	4.45	3.55		12.72	0.21	23.04	10.94	0.13	1.03	0.76		
356	KK10 [7740] [12755]	No	1619	7.9	32.26	3.72	3.31		12.54	0.22	25.78	9.05	0.04	1.07	0.46		
357	NK-8C [17971]	Yes	1458	6.7	40.78	4.02	3.07		8.94	0.14	23.16	12.96	0.09	0.98	0.90		
358	NK-10C [17971]	Yes	1433	5.7	42.36	2.99	3.54		7.15	0.13	27.92	7.37	0.06	3.09	0.57		
359	NK-1A [17971]	Yes	1507	6.6	41.21	3.94	3.39		9.19	0.13	26.50	9.32	0.06	1.30	0.62		
360	MK-5A [17971]	Yes	1392	5.7	38.04	3.23	2.67		8.98	0.12	30.71	12.16	0.06	0.11	0.61		
361	KK-1 [17971]	Yes	1454	5.7	39.48	2.81	2.81		8.47	0.14	32.95	7.90	0.06	1.62	0.50		
362	NP/10 [7740]	Yes	1556	6.9	31.94	5.13	4.11		12.28	0.19	23.29	10.58	0.09	0.51	0.45		
363	KK7A [7740]	Yes	1547	6.8	32.46	3.76	3.71		11.67	0.19	24.02	11.54	0.05	0.74	0.86		
364	KK-2 [18873]	Yes	1529	6.4	32.89	3.61	4.42	0.16	11.99	0.19	23.60	13.60		1.06	0.48		
365	CH-31 [18872]	Yes	1586	8.5	36.51	1.04	2.12		11.11	0.16	30.83	11.10	0.14	0.18	0.81		
366	CH-32 [18872]	Yes	1551	8.2	38.22	2.99	2.23		10.98	0.16	30.49	11.11	0.12	0.17	0.64		
367	3 [13838]	Yes	1563	6.8	34.31	3.56	4.23	0.15	11.80	0.19	23.32	11.42		1.17	0.58	0.34	7.67
368	4 [13838]	Yes	1569	7.7	30.44	4.75	3.46	0.13	12.90	0.21	22.89	12.69		0.59	0.87	0.24	8.46
369	10 [13838]	Yes	1582	8.4	29.90	3.98	2.84	0.14	12.42	0.20	22.65	13.43		0.84	0.71	3.72	7.16

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
370	11 [13838]	Yes	1565	7.3	33.05	5.15	3.68	0.16	12.20	0.19	24.11	10.76		0.89	0.56	0.16	7.17
371	16 [13838]	Yes	1564	7.3	35.48	4.33	4.21	0.13	12.50	0.19	21.77	13.08		0.49	0.56	0.39	5.55
372	X116/H1/37 [13838]	Yes	1565	7.2	41.94	3.69	4.01	0.15	9.91	0.11	18.77	10.00		0.12	0.82	1.35	8.43
373	NP/5 [7740]	Yes	1558	6.9	31.74	5.01	4.11		12.11	0.19	22.72	10.60	0.03	0.48	0.42		
374	NP/7 [7740]	Yes	1548	6.7	32.50	5.02	4.20		11.97	0.19	23.10	10.90	0.11	0.55	0.41		
375	MD-7 [7740]	Yes	1560	7.1	34.90	4.36	4.41		12.33	0.19	21.17	12.96	0.14	0.55	0.50		
376	MD-5 [7740]	Yes	1561	7.1	35.99	4.05	4.47		12.30	0.19	20.93	13.49	0.20	0.59	0.53		
377	PDF/10 [7740]	Yes	1569	7.9	30.76	4.28	3.15		12.71	0.21	23.63	12.60	0.02	0.10	0.71		
	Loc# =25																
378	75210041 [16836]	No	1549	5.4	42.86	1.96	7.42		9.55	0.15	17.06	9.40	2.19	0.97	0.76	2.20	3.88
379	75210047 [14023]	No	1534	5.3	36.13	3.18	9.86		10.24	0.15	9.64	14.51	3.11	0.91	1.33	5.05	4.91
380	75210055 [14023]	No	1557	5.3	41.93	1.96	8.69		10.09	0.16	15.26	10.29	2.16	1.99	0.92	3.65	3.36
381	75210067A [14023]	No	1550	5.8	40.30	2.22	6.94		9.19	0.14	12.38	11.32	1.36	1.11	0.93	6.00	5.80
382	75210067B [16836]	No	1530	5.5	38.27	2.25	7.23		9.09	0.13	12.26	11.78	1.39	1.13	0.88	7.55	5.86
383	75210067C [14023]	No	1529	5.7	38.30	2.10	6.33		8.78	0.12	12.73	11.70	1.21	1.09	0.82	8.65	6.36
384	75210102 [16836]	No	1542	5.6	37.41	2.07	6.25		9.61	0.17	18.51	9.68	2.56	0.91	0.81	7.65	3.10
385	75210419 [16836]	No	1674	6.7	35.83	2.93	8.14		13.08	0.16	16.83	5.00	2.14	1.32	1.04	2.24	9.89
386	75210021 [16836]	No	1396	4.6	23.51	1.76	5.56		8.00	0.16	11.27	20.73	0.44	1.49	0.98	15.80	7.95
	Loc# =26																
387	TRWIB [5530]	No	1579	5.8	42.75	3.13	7.15		9.52	0.18	17.14	8.51	1.02	3.83	1.12		
388	TRWIC [5530]	No	1633	6.5	44.51	3.11	7.14		10.10	0.18	14.81	8.66	1.46	4.27	0.91		
389	TRWID [5530]	No	1604	5.9	44.03	2.90	7.31		9.35	0.20	16.71	7.83	1.19	4.59	0.94		
390	TRWIA [5530]	No	1590	7.3	32.51	2.84	3.49		9.84	0.20	24.40	6.60	0.83	2.18	0.51		
391	0090 [10059]	No	1718	7.5	36.39	4.48	6.62		13.01	0.17	17.16	2.52	0.49	2.02	1.26		
	Loc# =27																
392	75210434 [16836]	No	1556	4.7	32.65	3.40	7.66		10.49	0.17	20.25	6.01	0.17	2.70	2.88	1.89	10.35
393	75210468 [16836]	No	1477	5.3	26.92	4.71	4.47		8.59	0.18	17.96	11.32	0.11	2.92	0.93	14.64	5.06
394	75210081 [16836]	Yes	1374	4.6	21.99	1.83	3.40		9.35	0.22	22.23	17.03	0.03	0.10	1.72	11.20	
395	75210469 [14023]	Yes	1310	4.1	24.60	4.48	3.83		6.34	0.16	18.12	13.93	0.07	2.18	0.69	20.17	4.14
	Loc# =28																
396	ADF 1 [12199]	No	1424	5.0	26.78	1.75	2.69	0.18	8.99	0.17	25.63	12.67	0.31	0.99	4.18	5.50	8.72
397	ADF 2 [12199]	No	1396	4.8	25.91	1.73	2.46	0.18	8.60	0.14	25.07	13.67	0.32	1.11	4.40	6.28	8.06
398	JJG-4282 [12199]	No	1527	7.1	26.10	3.25	2.54	0.17	11.83	0.23	25.82	12.27	0.27	0.23	2.11	6.30	7.02
399	JAR-30012 [12199]	No	1502	6.7	25.64	2.95	2.53	0.15	11.45	0.23	26.67	12.65	0.38	0.22	1.73	6.87	6.80
	Loc# =29																
400	S30 [19971]	No	1468	5.1	30.45	1.69	2.91	0.26	8.61	0.17	29.50	9.44	0.46	1.58	0.93	5.68	7.79
401	S30_APHANITIC [19971]	No	1390	4.2	24.99	2.69	4.38	0.41	9.42	0.24	24.76	15.63	0.87	1.08	1.30	5.87	7.77

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
402	82 [15441]	No	1415	5.3	25.19	1.89	2.27		10.07	0.22	29.69	13.59	0.01	0.15	2.20	12.83	1.15
403	83 [15441]	No	1561	4.9	37.80	1.02	5.79		8.88	0.04	26.35	5.68	0.43	1.72	0.61	1.03	9.62
404	84 [15441]	No	1574	6.0	39.00	0.95	5.52		9.31	0.05	22.65	6.30	1.59	1.22	0.45	2.04	9.72
405	K6/10 [12744]	No	1503	8.4	30.52	0.88	0.75		8.63	0.16	33.44	8.30	0.17	0.16	1.54	4.70	9.02
406	C01 [12744]	No	1481	5.5	30.93	2.19	2.46		9.16	0.17	31.68	8.86	0.36	1.45	1.63	4.34	0.34
407	C05 [12744]	No	1448	5.0	32.69	1.98	2.29		8.28	0.16	33.53	7.23	0.04	1.35	0.93	2.84	0.51
408	K4/1226 [12744]	No	1410	4.8	28.76	2.33	2.43		8.70	0.17	30.61	10.48	0.08	1.09	1.34	6.30	5.87
409	C04 [12744]	No	1403	4.6	29.42	1.99	2.29		8.16	0.15	30.47	8.96	0.11	0.88	2.00	3.57	1.72
410	C06 [12744]	No	1410	5.0	30.80	2.41	2.52		8.56	0.17	30.53	10.27	0.07	0.97	1.22	1.96	0.34
411	C08 [12744]	No	1409	4.9	32.19	1.94	2.14		8.32	0.16	33.32	8.96	0.18	1.08	1.10	4.86	0.37
412	C10 [12744]	No	1456	4.9	30.41	2.07	2.51		8.54	0.16	31.37	8.49	0.11	1.64	1.44	2.48	0.55
413	C12 [12744]	No	1393	4.6	30.08	1.97	2.31		8.44	0.17	31.38	9.63	0.14	0.66	2.17	3.61	0.54
414	C19 [12744]	No	1471	5.3	31.36	2.42	2.41		8.85	0.17	32.50	8.18	0.15	1.64	0.99	4.74	0.59
415	C02 [12744]	No	1421	5.1	32.81	1.89	2.38		8.12	0.15	31.17	9.74	0.39	1.68	1.49	3.53	0.45
416	C14 [12744]	No	1460	5.3	32.67	1.69	2.42		8.06	0.15	30.46	8.17	0.39	1.59	1.59	3.69	0.70
417	C15 [12744]	No	1640	10.2	35.75	1.64	0.99		8.06	0.14	33.46	4.93	0.19	1.32	0.41	2.76	1.11
418	C17 [12744]	No	1448	5.0	32.74	1.87	2.34		8.31	0.16	32.27	8.35	0.35	1.81	2.09	2.89	0.52
419	K3/161 [12744]	No	1376	4.9	30.17	1.99	1.90		8.13	0.16	31.78	9.99		0.73	1.25	9.11	0.39
420	K3/459 [12744]	No	1391	5.2	30.20	1.86	1.89		7.99	0.15	30.20	10.66	0.00	1.01	1.18	10.24	0.54
421	COL1 [12744]	No	1456	5.9	29.57	2.29	2.08		8.89	0.16	29.72	10.36	0.11	1.08	1.16	6.36	0.65
422	COL5 [12744]	No	1445	5.7	29.07	2.23	2.05		8.66	0.16	29.05	10.46	0.14	1.05	1.13	6.36	0.91
423	COL7 [12744]	No	1432	5.8	28.74	2.21	1.91		8.36	0.15	28.42	10.63	0.09	0.81	1.03	6.60	0.73
424	K119/4 [12744]	No	1374	4.9	29.72	1.48	1.72		7.40	0.14	30.02	9.15	0.00	0.88	1.58	5.15	1.46
425	K119/5 [12744]	No	1474	5.5	32.00	1.65	1.84		8.37	0.16	33.46	7.14	0.03	1.34	1.42	0.99	0.66
426	K5/94 [12744]	No	1586	7.7	25.45	3.85	3.54		12.57	0.26	17.96	15.06	0.33	2.30	3.09	6.50	6.28
427	K5/88 [12744]	No	1499	6.0	23.92	4.30	4.08		11.09	0.22	18.52	16.56	0.13	2.53	1.74	8.80	5.80
428	KK-3 [12199]	No	1502	5.9	32.10	2.30	3.07	0.22	9.03	0.16	26.28	9.68	0.11	1.43	0.97	4.96	7.54
429	KK-5 [12199]	No	1386	5.2	33.29	1.32	1.87	0.24	7.25	0.13	30.32	7.95	0.06	0.73	1.34	4.20	9.79
430	JJG2151 [12199]	No	1384	4.0	31.91	1.04	2.24	0.27	7.68	0.17	33.25	6.97	0.38	0.82	2.78		0.45
431	K8/115 [12744]	No	1521	10.4	27.72	0.69	0.70		7.92	0.16	26.37	11.19	0.31	0.26	1.07	12.10	9.47
432	K8/17 [12744]	No	1381	4.7	20.31	3.69	3.99		10.01	0.26	20.83	19.20	1.24	0.32	1.72	6.00	10.52
433	KM-6 [17378]	No	1382	4.5	31.81	1.12	2.86	0.26	7.21	0.13	27.94	10.56	0.30	1.98	1.30	4.56	7.43
434	C07 [12744]	No	1414	5.1	29.25	2.25	2.12		8.84	0.17	31.96	10.01	0.19	0.65	1.05	4.30	0.63
435	KM-8 [17378]	No	1453	5.2	34.11	1.93	3.32	0.21	7.59	0.15	26.11	8.70	0.24	1.92	0.88	4.75	8.74
436	KM-9 [17378]	No	1518	5.0	39.89	1.89	5.84	0.18	7.79	0.13	21.42	6.43	1.71	1.17	0.45	2.03	9.60
437	173/33/K18 [18134]	No	1662	9.3	18.04	5.98	4.25		18.22	0.34	23.48	11.58	0.14	0.79	1.73		0.25
438	BFK-1 [13070]	No	1527	8.3	28.79	1.47	0.96		10.34	0.18	35.86	8.80	0.07	0.09	1.34	7.85	3.71

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
439	KM-2 [17378]	No	1517	7.2	29.54	1.58	1.57	0.14	10.47	0.21	33.90	9.28	0.08	0.11	1.20	7.06	4.18
440	JAG-K10 [13070]	No	1370	4.4	35.34	0.88	2.43		6.66	0.13	31.39	5.70	0.03	0.87	0.55	2.86	12.32
441	JAG-K4 [13070]	No	1532	5.0	37.48	0.38	2.31		6.89	0.11	34.43	2.13	0.03	0.65	0.21	1.65	13.85
442	JAG-K9 [13070]	No	1453	4.3	34.55	4.66	4.31		7.69	0.15	31.72	4.38	0.11	3.08	0.16	1.54	6.27
443	K5/1 [12744]	No	1506	5.6	25.66	3.49	5.14		10.99	0.23	17.42	16.13	0.14	2.68	1.77	7.40	6.46
444	K6/55 [12744]	No	1398	5.1	27.32	1.63	2.08		8.12	0.17	27.16	12.55	0.06	1.41	2.14	8.60	6.68
445	COL6 [12744]	No	1464	6.1	28.87	2.41	2.07		8.98	0.16	28.56	11.33	0.12	1.48	1.30	6.84	0.77
446	COL9 [12744]	No	1452	6.0	29.16	2.37	2.04		8.72	0.16	28.21	10.39	0.10	0.81	1.20	6.56	0.68
447	KM-10 [17378]	No	1573	6.8	34.77	2.30	3.37	0.24	9.93	0.15	25.53	8.33	0.15	1.11	0.77	1.49	10.01
448	KM-11 [17378]	No	1480	4.4	41.66	0.98	6.24	0.12	6.78	0.13	22.59	5.15	1.66	0.90	0.21	0.37	11.62
449	BD1621 [12201]	No	1528	6.3	17.54	4.34	5.01		14.90	0.32	19.80	17.05	0.32	0.07	5.11	6.33	8.04
450	KLIP3 [13070]	No	1589	6.1	40.22	1.18	3.41		7.74	0.11	30.08	4.80	0.19	3.43	0.93	0.99	4.94
451	KM-7 [17378]	No	1617	7.2	34.65	2.34	2.34	0.23	9.17	0.17	30.92	4.61	0.11	1.51	0.68	1.15	10.53
452	K8/10 [12744]	Yes	1347	5.4	21.13	2.42	1.95		9.48	0.23	22.87	19.90	0.10	0.14	4.10	7.30	8.37
453	K4/1122 [12744]	Yes	1341	4.3	25.31	3.31	3.31		9.35	0.22	26.57	16.19	0.05	0.10	1.85	4.50	6.90
454	K3/158 [12744]	Yes	1315	4.5	30.58	0.92	1.35		7.85	0.16	34.25	10.70		0.46	1.63	9.82	0.34
455	K119/1 [12744]	Yes	1332	4.5	28.46	1.40	1.71		7.09	0.14	29.00	10.08	0.01	0.80	1.59	9.35	1.13
456	K119/6 [12744]	Yes	1328	4.8	28.63	1.50	1.71		7.34	0.14	28.88	11.48	0.18	0.51	1.08	7.61	0.48
457	KK-6 [12199]	Yes	1338	4.6	31.35	1.33	1.83	0.26	7.26	0.13	30.32	9.39		0.56	1.81	5.50	9.05
458	JJG2152 [12199]	Yes	1335	3.6	29.71	1.07	2.45	0.30	7.47	0.18	31.28	9.32	0.41	0.92	2.71	4.14	8.42
459	AJE198 [17472]	Yes	1349	4.5	29.21	1.72	2.35	0.21	8.51	0.17	30.24	12.42	0.10	0.13	1.79		0.95
460	AJE199 [17472]	Yes	1301	3.6	31.85	1.03	1.57	0.24	7.49	0.15	36.00	7.87	0.17	0.60	1.58		0.58
461	WIMB 1 [16680]	Yes	1293	4.1	29.21	0.92	1.88	0.25	6.64	0.16	27.98	11.26	0.03	1.18	2.18	8.79	7.08
462	WIMB 2 [16680]	Yes	1348	4.0	30.13	0.95	2.18	0.28	6.83	0.17	29.74	8.10	0.27	1.16	2.13	9.99	6.12
463	C16 [12744]	Yes	1346	4.3	31.11	1.75	2.37		7.76	0.15	30.88	11.58	0.12	1.60	1.68	4.14	0.35
464	K3/608 [12744]	Yes	1288	4.4	25.40	1.30	1.41		8.09	0.18	30.34	14.76	0.05	0.21	2.63	5.10	9.21
465	KM-5 [17378]	Yes	1260	4.4	21.80	1.23	2.02	0.14	6.70	0.17	17.84	20.08	0.46	0.14	4.67	15.23	7.97
466	JAG-K7 [13070]	Yes	1233	4.2	30.49	0.73	1.27		6.47	0.15	29.94	10.79	0.10	0.48	2.38	6.20	9.93
467	K119/2 [12744]	Yes	1348	4.8	25.89	2.40	2.62		7.90	0.20	21.80	16.22	0.21	0.89	3.13	8.34	1.54
468	K119/3 [12744]	Yes	1348	4.8	28.25	1.49	1.76		7.19	0.14	27.59	10.70	0.01	0.78	1.77	9.83	1.10
469	BD1613 [12201]	Yes	1366	4.7	28.63	1.07	2.01		9.00	0.14	34.02	11.92	0.20	0.05	0.27	8.99	2.98
	Loc# =30																
470	14/01/3002 [13829]	No	1554	4.9	39.30	1.23	6.51	0.11	9.00	0.14	22.90	5.73	0.20	0.23	0.32		
471	14/01/3003 [13829]	No	1554	5.0	38.20	1.51	6.27	0.13	9.36	0.15	23.80	5.86	0.32	0.33	0.40		
472	14/01/3004 [13829]	No	1566	5.1	38.20	1.30	6.15	0.12	9.41	0.14	24.10	5.46	0.27	0.23	0.34		
473	14/01/3005 [13829]	No	1568	5.2	38.90	1.54	6.50	0.14	9.59	0.15	21.70	5.94	0.30	0.21	0.44		
474	14/01/3007 [13829]	No	1600	5.5	40.50	1.30	6.39	0.10	9.59	0.15	21.00	5.78	0.27	0.23	0.36		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
475	14/01/3008 [13829]	No	1557	4.8	38.10	1.28	6.65	0.11	8.92	0.13	22.40	5.27	0.22	0.23	0.37		
476	14/01/3010 [13829]	No	1537	4.5	38.60	1.31	7.94	0.11	9.14	0.15	20.10	6.04	0.24	0.25	0.36		
477	14/01/3011 [13829]	No	1587	5.0	39.80	1.25	7.23	0.10	9.14	0.14	19.40	5.39	0.20	0.20	0.31		
478	14/01/3014 [13829]	No	1566	4.9	39.40	1.23	6.96	0.10	9.14	0.14	21.50	5.70	0.26	0.26	0.34		
479	14/01/3017 [13829]	No	1633	6.0	38.80	1.83	6.17	0.17	10.08	0.15	19.30	4.85	0.20	0.20	0.59		
480	14/01/3020 [13829]	No	1622	5.3	41.20	1.45	7.88	0.11	9.68	0.16	16.95	5.44	0.21	0.30	0.31		
481	14/01/3021 [13829]	No	1657	6.2	37.70	1.79	7.38	0.19	11.34	0.17	16.25	5.15	0.18	0.16	0.45		
482	14/01/3024 [13829]	No	1678	5.5	39.70	1.65	10.70	0.13	10.98	0.18	12.70	2.65	0.16	0.88	0.10		
483	14/01/3027 [13829]	No	1542	5.7	39.60	1.30	6.04	0.14	9.23	0.17	21.50	5.32	0.24	0.19	0.37		
484	14/01/3028 [13829]	No	1528	4.4	38.30	1.21	6.58	0.13	8.66	0.14	25.30	4.72	0.11	0.19	0.31		
485	14/01/3031 [13829]	No	1590	5.3	38.90	1.47	6.59	0.10	9.23	0.54	19.00	5.61	0.23	0.28	0.30		
486	14/01/3032 [13829]	No	1559	6.7	34.80	1.66	2.70	0.23	9.32	0.16	29.10	6.78	0.11	0.21	0.45		
487	14/01/3033 [13829]	No	1584	5.4	38.20	1.49	6.50	0.10	9.59	0.46	20.20	5.86	0.21	0.24	0.32		
488	14/01/3034 [13829]	No	1858	10.6	40.30	1.37	7.30	0.10	15.84	0.14	12.95	2.10	0.03	0.16	0.05		
489	14/01/3035 [13829]	No	1537	4.9	37.50	1.21	6.04	0.12	8.79	0.14	22.30	6.65	0.16	0.28	0.32		
490	14/01/3036 [13829]	No	1551	5.6	38.60	1.35	6.17	0.13	9.86	0.20	23.20	5.41	0.22	0.30	0.36		
491	14/01/3037 [13829]	No	1486	4.5	36.70	1.16	6.15	0.10	8.40	0.14	22.60	7.78	0.15	0.31	0.31		
492	14/01/3038 [13829]	No	1512	4.8	37.20	1.19	5.16	0.14	8.31	0.14	24.70	6.59	0.18	0.45	0.33		
493	14/01/3039 [13829]	No	1558	4.8	38.50	1.21	6.23	0.11	8.96	0.17	24.60	5.03	0.14	0.33	0.28		
494	14/01/3040 [13829]	No	1569	5.2	38.60	1.18	5.45	0.13	8.90	0.15	25.30	5.03	0.18	0.26	0.34		
495	14/01/3041 [13829]	No	1561	5.1	38.20	1.24	5.55	0.13	8.47	0.14	22.80	5.32	0.21	0.19	0.38		
496	14/01/3042 [13829]	No	1563	5.0	39.00	1.28	6.22	0.13	8.87	0.21	22.30	5.50	0.21	0.14	0.34		
497	14/01/3045 [13829]	No	1630	5.9	38.90	1.35	6.19	0.14	9.77	0.18	18.70	5.53	0.24	0.26	0.38		
498	14/01/3046 [13829]	No	1569	5.1	39.60	1.20	6.08	0.14	8.63	0.14	22.00	5.71	0.17	0.26	0.38		
499	14/01/3047 [13829]	No	1563	4.9	39.10	1.07	5.74	0.14	8.70	0.14	25.10	4.88	0.17	0.19	0.31		
500	14/01/3048 [13829]	No	1550	4.8	38.00	1.18	6.42	0.12	8.86	0.16	22.30	5.77	0.12	0.24	0.34		
501	14/01/3049 [13829]	No	1532	5.0	36.10	1.43	6.56	0.10	9.81	0.29	21.50	8.07	0.25	0.25	0.32		
502	14/01/3050 [13829]	No	1574	5.2	39.20	1.57	6.76	0.10	9.86	0.15	21.50	6.04	0.22	0.21	0.32		
503	14/01/3051 [13829]	No	1589	5.0	37.30	1.49	7.42	0.10	9.99	0.15	21.50	4.49	0.18	0.36	0.31		
504	14/01/3053 [13829]	No	1532	4.8	37.60	1.38	6.48	0.10	9.18	0.14	22.90	6.85	0.20	0.30	0.32		
505	14/01/3054 [13829]	No	1568	5.1	38.00	1.46	6.07	0.13	9.45	0.15	24.10	5.35	0.28	0.18	0.39		
506	14/01/3057 [13829]	No	1711	6.7	40.00	1.46	7.73	0.10	11.52	0.39	14.60	3.98	0.07	0.24	0.28		
507	14/01/3058 [13829]	No	1666	6.1	40.00	1.42	7.18	0.12	10.53	0.56	16.90	4.60	0.18	0.21	0.24		
508	14/01/3060 [13829]	No	1556	5.4	38.40	1.64	6.04	0.12	9.59	0.32	21.20	7.18	0.26	0.23	0.33		
509	14/01/3061 [13829]	No	1523	5.4	37.50	1.66	6.16	0.13	9.81	0.17	22.80	6.46	0.21	0.19	0.37		
510	14/01/3062 [13829]	No	1605	5.8	37.50	1.48	5.60	0.17	9.68	0.19	20.70	5.56	0.18	0.19	0.43		
511	14/01/3063 [13829]	No	1567	5.4	38.70	1.33	5.83	0.13	8.95	0.15	21.10	6.46	0.23	0.13	0.38		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
512	14/01/3065 [13829]	No	1552	4.8	38.40	1.39	7.00	0.10	9.23	0.15	21.70	5.90	0.20	0.18	0.27		
513	14/01/3068 [13829]	No	1554	4.9	38.70	1.16	6.18	0.11	9.05	0.14	24.20	5.50	0.15	0.17	0.29		
514	14/01/3070 [13829]	No	1642	5.9	39.10	1.69	7.47	0.12	10.76	0.15	16.90	5.18	0.16	0.21	0.33		
515	14/01/3071 [13829]	No	1611	5.7	39.20	1.27	5.49	0.16	9.14	0.15	21.90	5.27	0.23	0.14	0.34		
	Loc# =31																
516	KB14-01 [22382]	No	1553	7.5	27.90	3.00	2.50	0.10	11.00	0.14	24.60	13.10	0.02	2.10	1.00	6.50	6.70
517	KB14-01 [22382]	No	1507	6.9	27.50	3.00	2.40	0.10	10.50	0.14	25.30	14.10	0.05	1.80	1.00	6.30	6.40
518	KB14-01 [22382]	No	1537	7.3	25.90	3.20	2.60	0.10	11.00	0.17	22.70	14.50	0.07	2.20	1.10	8.90	6.00
	Loc# =32																
519	FS-K1 [13070] [18134]	No	1529	6.6	32.64	1.96	1.89		8.88	0.18	31.91	5.86	0.05	0.38	1.32	2.64	12.23
520	K61/35 [13070]	No	1542	6.4	29.06	4.68	4.20		10.38	0.23	19.07	12.04	0.18	3.05	1.38	8.15	5.49
521	KM-4 [17378]	No	1535	6.6	32.68	2.24	2.48	0.24	8.71	0.16	27.23	8.44	0.25	1.81	0.99	3.81	9.92
522	JJG 4326 [16680]	Yes	1301	3.7	27.04	1.97	2.85	0.29	7.60	0.18	26.95	13.83	0.09	0.97	2.77	9.79	4.48
523	NEWLS [13070]	Yes	1331	3.9	34.79	0.58	1.99		6.87	0.16	34.94	5.94	0.05	1.19	1.20	4.00	6.96
	Loc# =33																
524	K40/13 [16680]	No	1547	5.6	35.50	2.27	5.43	0.16	8.20	0.17	19.69	9.63	1.30	4.42	0.82	5.23	5.97
	Loc# =34																
525	K7/10 [13070]	No	1501	6.0	30.05	1.79	1.43		8.85	0.18	35.84	4.83	0.03	0.22	0.51	2.68	13.12
526	K7/11 [13070]	No	1472	5.9	31.97	1.86	1.77		8.03	0.18	31.99	6.62	0.04	0.72	0.58	5.54	10.56
527	K7/12 [13070]	No	1404	5.0	31.67	1.13	1.87		7.87	0.17	32.70	7.97	0.06	0.33	0.49	5.80	9.43
	Loc# =35																
528	K1/137 [17810]	No	1440	4.9	35.84	1.08	3.74		7.13	0.23	24.84	8.79	0.63	1.41	0.66		
529	K1/203 [17810]	No	1567	5.3	35.90	0.95	3.70		7.82	0.15	29.40	4.85	0.15	2.25	0.51		
530	K2/10 [17810]	No	1562	6.9	36.73	1.32	2.34		8.09	0.33	28.40	6.05	0.51	0.73	0.79		
531	K2/82 [17810]	No	1481	6.1	32.39	1.13	1.93		7.89	0.17	30.27	7.43	0.66	0.39	0.39		
532	K1/135 [17854]	Yes	1368	4.5	25.30	1.46	5.10		8.14	0.18	13.20	22.70	0.38	1.58	1.25		
533	K9/3 [17854]	Yes	1326	4.4	28.40	1.30	1.77		7.46	0.17	30.90	9.80	0.02	0.08	0.65		
534	K9/4 [17854]	Yes	1266	4.1	27.20	1.07	1.58		6.84	0.17	29.40	11.20	0.31	0.09	0.79		
535	K4/38 [17854]	Yes	1361	4.5	30.50	1.05	1.48		7.46	0.16	34.40	8.28	0.44	0.83	0.46		
536	K4/32 [17854]	Yes	1334	3.8	29.50	1.03	1.43		7.84	0.17	35.80	8.27	0.27	0.67	2.09		
537	K4/27 [17854]	Yes	1394	4.2	30.30	1.01	2.25		7.34	0.16	31.80	8.44	0.66	1.61	1.24		
538	K1/53 [17810]	Yes	1408	5.0	34.95	1.07	3.51		6.95	0.38	23.40	10.54	0.22	1.65	0.63		
539	K1/135 [17810]	Yes	1369	4.5	25.26	1.46	5.10		8.14	0.18	13.24	22.67	0.38	1.58	1.25		
540	K4/19 [17810]	Yes	1348	4.2	29.20	0.78	1.99		7.07	0.17	30.75	9.51	0.94	0.90	1.20		
541	K4/32 [17810]	Yes	1334	3.8	29.48	1.03	1.43		7.84	0.17	35.78	8.27	0.27	0.67	2.09		
542	K9/3 [17810]	Yes	1326	4.4	28.36	1.30	1.77		7.46	0.17	30.85	9.77	0.02	0.08	0.65		
543	K9/4 [17810]	Yes	1268	4.1	27.24	1.07	1.58		6.84	0.17	29.44	11.15	0.31	0.09	0.79		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
544	K11/30 [17810]	Yes	1408	4.1	34.84	1.01	4.63		7.01	0.12	25.99	9.04	0.36	2.28	0.57		
	Loc# =36																
545	D2 40.6M [12154]	No	1565	6.0	32.15	1.12	3.12		9.53	0.17	29.78	7.37	0.12	1.51	0.93		
	Loc# =37																
546	5 [17645]	No	1626	7.7	40.96	2.21	2.87		8.81	0.10	27.25	6.02	0.71	1.22	0.19	0.15	8.57
547	PREM-B [17616]	No	1607	7.3	39.27	2.01	3.16		9.69	0.13	27.09	7.23	0.24	0.96	0.56		
548	PREM-C [17616]	No	1659	8.0	40.34	2.16	2.90		9.78	0.14	28.85	5.38	0.29	0.83	0.19		
549	PREM-D [17616]	No	1636	7.5	42.63	2.40	3.66		9.65	0.15	25.47	6.49	0.85	0.91	0.31		
550	PREM-E [17616]	No	1575	6.3	40.99	1.85	3.76		9.02	0.13	27.54	6.34	0.46	0.39	0.15		
551	SHR202 [17896]	No	1627	7.6	39.69	2.89	2.37		11.47	0.18	39.38	3.56		0.03	0.46		
552	P10 [21451]	No	1599	8.2	39.81	1.96	2.11		8.42	0.14	27.31	7.16	0.06	1.04	0.33		
553	P11 [21451]	No	1555	7.3	37.72	2.00	2.46		8.67	0.15	27.06	8.24	0.01	1.07	0.42		
554	6 [17645]	Yes	1491	6.9	29.50	2.08	1.61		9.65	0.18	32.00	10.30		0.66	0.22	5.16	6.64
555	7 [17645]	Yes	1494	7.4	30.60	2.13	1.50		10.59	0.19	33.00	11.60		0.27	1.54	4.34	2.08
556	PREM-A [17616]	Yes	1457	6.4	35.65	1.73	2.64		8.66	0.20	25.64	13.01	0.23	0.61	0.18		
557	SHR206 [17896]	Yes	1470	6.2	34.36	2.56	2.06		10.85	0.22	37.68	11.02		0.73	0.55		
558	SHR207 [17896]	Yes	1370	5.2	33.33	2.52	2.18		10.24	0.20	36.69	14.42		0.22	0.24		
	Loc# =38																
559	AP 5/93.5 [17102]	No	1659	7.1	40.09	1.35	4.76		9.84	0.20	23.06	6.21	0.63	3.28	0.26	2.37	
560	AP 2/67-76 [17102]	No	1691	8.2	41.06	1.07	3.75		9.96	0.14	21.45	7.32	0.69	1.50	0.29	6.01	
561	AN5-168.12 [17832]	No	1661	6.4	41.10	1.08	5.00		9.65	0.18	24.50	5.45	0.06	2.03	0.41		
562	AN15-185.73 [17832]	No	1654	6.5	37.50	1.36	5.15		10.98	0.17	24.20	5.93	0.05	1.77	0.52		
563	AP 5/93.5 [17832]	No	1650	7.1	40.10	1.35	4.76		9.84	0.20	23.10	6.21	0.63	3.28	0.26		
564	AP 2/67-76 [17832]	No	1697	8.2	41.10	1.07	3.75		9.96	0.14	21.40	7.32	0.69	1.50	0.29		
	Loc# =39																
565	PHN3084 [18055]	No	1426	6.6	21.60	2.64	2.59	0.15	9.89	0.20	16.11	23.78	0.12	1.08	1.00	16.51	4.62
566	MZ(AP) [13070]	No	1574	8.4	21.89	3.33	2.95		12.89	0.32	18.25	17.49	0.04	0.93	1.35	12.48	6.24
567	MZ(PO) [13070]	No	1565	7.5	26.37	3.40	3.23		11.80	0.30	20.90	13.43	0.05	1.21	0.93	9.54	7.36
	Loc# =40																
568	OND [12164]	No	1556	7.4	26.06	4.04	3.70	0.09	12.94	0.18	20.05	16.58	0.01	1.46	0.84	8.68	3.33
	Loc# =41																
569	GL-1 [19133]	No	1533	6.0	32.56	2.79	3.98		9.52	0.16	24.22	10.77	0.12	2.70	0.35		
570	PO-1 [19133]	No	1578	7.3	40.29	3.25	3.60		8.93	0.14	20.80	9.45	0.15	2.31	0.36		
571	PO-3 [19133]	No	1564	7.8	39.75	3.36	2.81		8.79	0.15	22.58	9.18	0.10	1.20	0.30		
572	W1 [19133]	No	1614	6.5	35.63	2.73	4.16		10.51	0.20	27.54	6.55	0.06	2.40	0.65		
573	W2 [19133]	No	1526	6.2	32.05	2.42	3.09		9.14	0.17	26.38	9.81	0.11	1.94	0.41		
574	W2R [19133]	No	1530	6.2	32.65	2.41	3.17		9.28	0.17	26.48	10.00	0.09	2.00	0.40		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
575	FC-2 [19133]	No	1490	5.0	34.60	1.89	3.82		8.77	0.20	28.71	6.53	0.05	0.44	1.21		
576	T1 [19133]	No	1465	6.2	27.34	1.53	2.89		8.42	0.21	17.81	15.29	0.16	1.37	1.13		
577	T5C [19133]	No	1443	6.1	29.32	1.63	3.41		8.18	0.22	19.24	13.81	0.21	1.70	1.20		
578	T5C2 [19133]	No	1393	5.0	28.15	1.65	3.57		7.74	0.23	18.54	16.53	0.18	1.62	1.37		
579	10069 [19133]	No	1573	6.0	34.40	1.55	3.26		8.75	0.21	28.52	5.95	0.08	1.50	0.57		
580	CC-2 [19133]	No	1567	6.2	34.02	1.47	3.11		8.88	0.18	27.97	6.92	0.08	1.56	0.67		
581	IRX-99 [19133]	No	1438	5.8	27.55	1.37	2.59		8.33	0.18	22.62	13.97	0.14	0.93	0.97		
582	BG30 [19133]	No	1538	5.9	27.25	1.30	4.20		9.82	0.14	21.91	11.78	1.97	1.76	0.60		
583	TL-2 [19133]	No	1413	5.4	24.94	2.02	3.97		8.90	0.18	15.50	19.28	0.12	0.52	0.64		
584	TW-2 [19133]	No	1398	5.1	25.05	2.07	3.93		8.87	0.19	17.09	18.51	0.07	0.44	0.74		
585	C3 [19133]	No	1416	5.6	27.40	1.95	3.72		8.57	0.16	15.28	18.88	0.69	0.54	0.93		
586	IRX-100 [19133]	No	1468	4.2	34.55	1.58	6.37		7.86	0.22	21.47	8.46	0.07	2.09	0.77		
587	10065 [19133]	No	1561	5.6	37.70	1.39	4.33		8.28	0.14	26.86	6.79	0.11	2.88	0.40		
588	10070 [19133]	No	1506	5.0	32.74	1.28	3.74		7.98	0.16	27.45	7.45	0.09	2.02	0.36		
589	15315 [19133]	No	1552	5.4	36.13	1.27	3.96		8.45	0.14	28.67	7.03	0.10	2.62	0.41		
590	10292 [19133]	No	1589	5.7	34.59	1.35	3.53		8.43	0.18	29.17	4.97	0.06	1.96	0.33		
591	10311 [19133]	No	1427	4.9	31.34	1.41	4.17		7.58	0.17	21.00	13.61	0.12	2.50	0.39		
592	IRX-98 [19133]	No	1487	5.0	39.67	1.50	5.94		8.34	0.16	23.26	11.15	1.64	3.18	0.50		
593	GS1 [19133]	No	1585	5.8	34.25	1.27	3.46		8.87	0.17	29.48	5.25	0.07	1.43	0.39		
594	15333 [19133]	No	1528	5.1	37.41	1.72	4.96		8.45	0.15	26.46	8.03	0.17	3.20	0.44		
595	EA1 [19133]	No	1511	5.4	36.99	1.13	3.71		8.13	0.16	28.16	7.68	0.12	1.86	0.34		
596	EC9 [19133]	No	1630	6.9	32.40	3.07	6.15		10.92	0.15	12.03	10.59	0.11	2.17	0.48		
597	BN1 [19133]	No	1406	4.9	30.63	1.19	3.50		7.61	0.12	22.90	12.27	0.08	0.79	0.62		
598	11430 [19133]	No	1574	4.8	31.62	2.33	7.67		11.44	0.30	23.70	5.73	0.07	1.37	0.40		
599	E1 [19252]	No	1468	5.0	34.24	1.45	3.90	0.24	9.01	0.17	28.91	10.13	0.09	1.20	0.39	2.06	7.10
600	E9 [19252]	No	1572	5.4	35.37	1.60	4.64	0.25	9.20	0.17	27.94	6.38	0.15	2.41	0.45	2.18	8.00
601	J1 [19252]	No	1554	4.7	34.81	1.15	4.80	0.24	8.35	0.15	28.27	4.95	0.12	2.03	0.36	3.46	9.98
602	C1 [19252]	No	1378	4.7	25.30	1.43	4.31	0.23	8.02	0.26	15.60	18.99	0.13	1.10	0.74	13.78	8.16
603	M1 [19252]	No	1696	7.4	35.35	2.25	6.10		13.28		20.40	7.40	0.70	2.88			10.15
604	1 [19252]	No	1570	5.7	33.38	2.52	5.09		10.09	0.17	23.78	9.06	0.44	3.19	0.44	3.41	7.61
605	4 [19252]	No	1562	6.7	33.00	2.65	3.75		10.35	0.18	23.60	12.00	0.37	2.87		6.34	3.40
606	5 [19252]	No	1519	7.0	27.00	1.78	3.72		9.54	0.31	12.70	19.00	0.24	1.68		14.64	7.61
607	6 [19252]	No	1471	6.6	30.00	1.72	2.90		8.87	0.21	21.40	14.30	0.23	1.08		9.70	9.21
608	FC-1 [19133]	Yes	1314	4.2	26.97	1.78	4.58		6.88	0.29	13.97	20.34	0.12	1.48	1.29		
609	T1B [19133]	Yes	1313	4.5	24.53	1.85	3.50		6.95	0.22	14.71	21.12	0.21	1.49	1.41		
610	T2 [19133]	Yes	1267	4.0	19.77	1.50	2.80		6.33	0.37	16.94	20.09	0.17	1.31	1.06		
611	T6 [19133]	Yes	1173	3.1	17.27	1.60	3.38		5.40	0.53	13.32	25.38	0.21	1.57	1.08		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
612	T7A [19133]	Yes	1111	2.9	15.42	1.33	3.16		4.83	0.73	11.43	28.51	0.19	1.28	0.99		
613	TC-3 [19133]	Yes	1346	4.9	28.45	1.61	3.94		6.89	0.35	13.03	19.83	0.14	1.37	1.14		
614	C1 [19133]	Yes	1231	3.4	17.67	1.89	4.51		6.29	0.24	10.00	25.87	0.24	0.29	1.68		
615	C2 [19133]	Yes	1327	4.5	28.47	1.15	3.21		6.76	0.15	20.02	15.49	0.08	0.82	0.60		
616	IRX-106 [19133]	Yes	1337	3.8	27.98	1.45	4.20		7.02	0.42	21.93	14.10	0.06	1.62	0.72		
617	10296 [19133]	Yes	1162	3.4	28.21	1.12	3.83		5.30	0.12	15.84	21.43	0.15	0.30	0.37		
618	2 [19252]	Yes	1354	3.8	26.37	1.98	6.14		7.59	0.19	16.19	16.01	1.46	0.46	1.12	10.70	11.42
	Loc# =42																
619	488528 [20907]	No	1623	9.4	26.27	3.66	2.76		13.67	0.22	21.92	15.79	0.13	1.77	0.49	6.89	4.31
620	488547 [20907]	No	1636	10.4	32.47	3.36	1.83		11.72	0.16	28.01	10.25	0.22	0.94	0.34	4.54	4.16
621	488550 [20907]	No	1622	9.7	31.27	3.93	2.33		12.00	0.18	23.10	12.06	0.15	1.02	0.53	6.37	5.03
622	488520 [20907]	No	1546	8.3	20.97	4.43	3.76		13.51	0.33	12.87	27.10	0.15	0.92	0.73	8.43	4.57
623	488546 [20907]	No	1577	9.8	20.12	3.74	2.40		13.07	0.22	16.45	22.71	0.11	1.14	0.98	13.28	3.62
624	488548 [20907]	No	1622	9.3	30.58	3.70	2.57		12.12	0.18	22.29	12.57	0.17	1.41	0.60	6.53	5.27
625	488522 [20907]	No	1574	9.0	26.21	4.29	2.74		13.96	0.25	20.95	20.02	0.08	1.19	1.42	4.23	2.37
626	488538 [20907]	No	1538	8.4	22.25	2.86	2.24		12.11	0.20	20.25	19.34	0.12	1.12	1.04	12.01	4.29
627	488539 [20907]	No	1582	11.4	16.31	2.90	1.85		12.66	0.29	14.33	26.30	0.11	0.86	1.74	16.98	3.32
628	488549 [20907]	No	1630	10.0	30.95	4.02	2.33		12.62	0.18	23.79	13.08	0.14	1.44	0.57	5.75	3.05
629	488556 [20907]	No	1580	10.4	18.54	3.56	2.19		12.76	0.21	14.76	24.04	0.10	1.02	1.62	15.59	3.41
630	488562 [20907]	No	1622	9.5	27.63	4.26	2.83		12.98	0.23	19.79	15.68	0.10	2.12	0.60	7.62	3.98
631	459144 [20907]	No	1552	8.0	24.94	3.88	2.86		12.69	0.25	19.45	18.10	0.08	1.75	3.18	5.76	2.28
632	493334 [20907]	No	1533	8.2	22.00	2.79	2.43		12.29	0.21	20.42	19.24	0.15	0.59	0.69	13.71	2.66
	Loc# =43																
633	265421 [18092]	No	1530	7.4	28.43	3.32	1.27		10.72	0.20	37.76	5.88	0.18	0.21	0.27	6.86	4.51
634	483843 [15411]	No	1549	6.4	24.52	2.19	2.73		12.15	0.23	33.14	7.44	0.08	0.54	0.17	10.30	
635	483844 [15411]	No	1458	5.9	26.69	2.28	1.52		9.00	0.17	33.09	8.50	0.13	0.87	0.31	13.40	
636	483845 [15411]	No	1589	10.6	30.27	2.19	0.57		9.35	0.15	37.69	4.87	0.06	0.10	0.27	10.50	
637	483847 [15411]	No	1515	7.0	26.22	1.78	0.75		8.65	0.15	36.36	3.73	0.08	0.20	0.04	17.90	
638	483849 [15411]	No	1579	7.4	23.77	1.18	1.73		10.60	0.21	31.57	6.89	0.06	0.54	0.35	16.50	
639	483857 [15411]	No	1520	6.8	26.88	1.01	1.47		10.43	0.21	36.00	7.58	0.02	0.12	0.40	10.30	
640	483863 [15411]	No	1559	7.2	29.01	1.18	1.35		10.58	0.19	38.65	5.52	0.07	0.10	0.07	6.40	
641	481851 [13912]	No	1460	6.1	24.20	2.14	1.40		8.40	0.16	29.60	8.75	0.26	0.84	0.30		
642	477426 [13912]	No	1510	7.5	25.79	4.14	1.33		11.07	0.19	35.38	7.46	0.14	0.02	0.45		
643	481858B [13912]	No	1532	7.3	29.08	4.88	2.06		11.00	0.16	31.90	8.06	0.26	0.53	0.22		
644	491709 [13912]	No	1476	6.5	26.86	3.66	1.76		10.36	0.19	32.64	10.15	0.12	0.67	0.45		
645	491711 [13912]	No	1527	7.2	27.99	3.76	1.50		10.77	0.20	35.73	6.60	0.08	0.38	0.38		
646	491721 [13912]	No	1524	7.5	26.44	4.28	1.40		10.83	0.19	34.89	6.94	0.09	0.34	0.13		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
647	491722 [13912]	No	1475	7.1	26.13	3.77	1.40		10.62	0.18	33.59	9.97	0.08	0.13	0.35		
648	491728 [13912]	No	1487	6.9	26.48	3.73	1.47		10.73	0.20	34.93	8.35	0.09	0.04	0.47		
649	491737 [13912]	No	1493	7.2	27.17	3.89	1.46		10.88	0.19	34.46	9.06	0.08	0.05	0.40		
650	491740 [13912]	No	1496	6.9	26.77	3.73	1.41		10.54	0.20	35.29	7.35	0.09	0.20	0.43		
651	514260 [13912]	No	1479	6.6	29.87	1.92	1.04		9.30	0.17	37.73	6.59	0.06	0.31	0.36		
652	491718 [13912]	No	1469	6.9	25.21	3.53	1.40		10.44	0.20	32.95	10.42	0.09	0.29	0.55		
653	483838 [15411]	No	1453	6.2	29.03	2.52	1.50		9.66	0.17	34.97	9.65	0.10	0.64	0.30	7.10	
654	483840 [15411]	No	1520	7.0	29.46	2.62	1.63		9.57	0.18	32.74	7.12	0.06	0.36	0.27	12.20	
655	483860 [15411]	No	1537	7.7	26.88	2.36	1.15		10.40	0.18	35.20	7.43	0.10	0.51	0.77	9.90	
656	491712 [13912]	No	1500	7.1	27.18	3.85	1.50		10.79	0.19	35.02	8.22	0.10	0.28	0.30		
657	491725 [13912]	No	1483	7.1	27.05	3.48	1.40		10.67	0.19	34.86	9.27	0.07	0.05	0.11		
658	257604 [18092]	Yes	1446	6.2	27.03	2.54	1.37		9.87	0.20	35.37	8.93	0.10	0.13	0.54	10.27	2.99
659	483848 [15411]	Yes	1384	5.7	23.19	1.92	1.09		9.05	0.18	32.89	11.10	0.18	0.09	0.87	14.30	
660	488582 [15411]	Yes	1435	5.9	27.76	2.15	1.14		9.23	0.19	36.65	7.47	0.02	0.29	0.29	9.90	
661	491417 [13912]	Yes	1443	5.8	26.74	2.34	1.39		9.57	0.18	35.59	8.05	0.13	0.14	0.32		
662	483858 [13912]	Yes	1319	5.0	19.41	2.15	1.26		7.89	0.17	26.21	15.37	0.09	0.73	0.60		
663	481858A [13912]	Yes	1359	5.8	16.75	4.06	1.31		9.81	0.18	27.70	16.35	0.16	0.10	0.78		
664	491703 [13912]	Yes	1374	5.6	24.13	2.66	1.41		9.42	0.19	31.71	13.26	0.08	0.13	0.55		
665	491710 [13912]	Yes	1384	6.1	23.77	3.62	1.33		9.78	0.18	30.92	14.25	0.08	0.14	0.78		
666	491713 [13912]	Yes	1411	6.4	24.66	3.41	1.29		9.98	0.18	32.43	12.54	0.06	0.07	0.46		
667	483862 [15411]	Yes	1367	5.9	16.70	1.70	1.32		9.50	0.19	26.43	17.76	0.15	0.05	0.35	20.30	
668	491720 [13912]	Yes	1447	6.8	25.73	3.76	1.35		10.35	0.18	33.39	10.86	0.08	0.13	0.33		
669	483842 [15411]	Yes	1429	5.7	25.33	2.63	1.57		9.59	0.18	33.34	10.03	0.11	0.49	0.33	12.30	
670	483850 [15411]	Yes	1400	5.7	25.06	2.34	1.38		9.26	0.18	32.59	11.73	0.10	0.50	0.27	12.10	
671	483861 [15411]	Yes	1377	5.9	26.71	1.88	1.09		8.84	0.16	33.75	11.37	0.06	0.17	0.45	10.60	
672	491702 [13912]	Yes	1373	6.0	23.65	3.10	1.32		9.21	0.18	29.51	14.60	0.12	0.21	0.86		
673	491708 [13912]	Yes	1429	6.2	25.46	3.33	1.55		9.93	0.18	31.59	11.87	0.10	0.30	0.81		
674	491741 [13912]	Yes	1441	6.6	24.62	4.01	1.34		10.27	0.19	32.98	10.45	0.11	0.06	0.40		
675	477412 [13912]	Yes	1431	6.8	25.83	4.19	1.39		10.32	0.18	32.27	12.22	0.10		0.34		
676	491716 [13912]	Yes	1311	5.7	21.52	3.15	1.13		8.82	0.17	27.77	18.18	0.10	0.18	0.93		
677	491745 [13912]	Yes	1444	6.4	26.27	3.64	1.43		10.17	0.19	34.15	9.77	0.11	0.20	0.61		
	Loc# =44																
678	265427 [18092]	No	1653	9.4	29.30	3.63	2.40		13.53	0.21	29.32	9.70	0.05	1.81	0.51	6.19	2.61
679	KIM 3 [12788]	No	1572	9.4	24.54	2.26	1.63		11.96	0.23	25.35	15.08	0.03	0.83	0.93		
680	KIM 4 [12788]	No	1609	10.0	24.76	2.60	1.51		12.23	0.24	28.18	11.40	0.03	0.57	0.62		
681	KIM 5 [12788]	No	1604	10.7	24.11	3.07	1.62		12.04	0.20	22.64	15.27		0.89	0.98		
682	KIM 6 [12788]	No	1630	9.2	32.83	2.08	1.45		10.12	0.17	33.66	6.49	0.08	0.95	0.25		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
683	KIM 7 [12788]	No	1659	9.9	32.06	1.70	1.28		9.89	0.18	33.44	5.62	0.08	0.67	0.26		
684	KIM 9 [12788]	No	1633	10.5	27.83	2.19	1.47		12.10	0.21	29.83	11.26	0.06	1.18	0.71		
685	KIM 10 [12788]	No	1631	7.7	30.42	2.62	2.63		11.64	0.23	31.23	7.11	0.05	1.76	0.25		
686	KIM 14 [12788]	No	1545	7.6	24.79	3.12	2.13		11.16	0.19	25.48	12.91	0.05	1.67	0.95		
687	KIM 17 [12788]	No	1526	8.8	18.44	3.07	2.02		12.33	0.22	17.74	22.77		0.85	1.87		
688	KIM 1 [12788]	No	1579	7.7	28.79	2.04	2.31		12.00	0.22	30.03	11.30	0.05	1.43	0.71		
689	KIM 12 [12788]	No	1661	9.9	23.93	2.69	2.87		15.26	0.30	24.45	13.89	0.06	1.34	0.85		
	Loc# =45																
690	NCR 29 [19853]	No	1598	7.6	27.10	2.87	2.61		11.16	0.22	25.70	10.75	0.17	2.78	0.47		
	Loc# =46																
691	L42-03 [14143]	No	1519	6.3	34.70	1.73	3.10		9.63	0.23	27.80	9.87	0.05	0.58	0.53		
692	L42-06 [14143]	No	1629	5.9	36.60	2.11	3.57		9.18	0.20	32.40	2.08	0.06	1.25	0.63		
693	L42-07 [14143]	No	1513	6.0	34.00	1.96	3.25		9.72	0.25	28.40	8.94	0.05	0.17	0.42		
694	L42-11 [14143]	No	1775	8.9	36.00	2.38	3.66		12.87	0.12	28.90	2.12	0.09	2.08	0.55		
695	L50-2003 [14143]	No	1430	5.5	35.10	1.21	2.94		7.61	0.09	25.40	10.40	0.09	0.69	0.59		
696	L50-2006 [14143]	No	1488	6.2	31.80	1.40	2.20		8.53	0.12	28.60	9.27	0.08	0.69	0.71		
697	L50-01 [14143]	No	1536	7.0	31.50	1.43	2.18		9.27	0.11	27.70	9.59	0.08	0.70	0.81		
698	L50-04 [14143]	No	1672	7.4	37.90	1.57	2.40		8.87	0.09	32.30	2.71	0.08	0.54	0.31		
699	L50-05 [14143]	No	1572	7.7	35.10	1.39	2.13		8.85	0.10	27.30	8.54	0.08	1.08	0.63		
700	L50-08 [14143]	No	1482	6.4	31.80	1.39	2.45		8.54	0.10	24.80	11.90	0.09	1.04	0.82		
701	L50-10 [14143]	No	1610	6.5	35.70	1.06	2.86		8.76	0.27	29.60	4.59	0.05	0.85	0.66		
702	L50-17 [14143]	No	1631	8.4	33.80	1.37	2.12		9.81	0.11	28.70	7.51	0.08	1.10	0.43		
703	1 [16701]	No	1554	4.7	35.57	0.45	4.18	0.20	9.05	0.14	31.14	3.25	0.04	0.03	2.11	0.38	12.26
704	2 [16701]	No	1557	4.9	34.46	0.56	4.31	0.22	9.67	0.13	30.62	3.89	0.04	0.03	2.54	0.22	12.35
705	3 [16701]	No	1558	4.7	33.49	0.75	4.77	0.18	10.30	0.16	31.85	3.70	0.21	0.06	2.33	0.20	11.24
706	4 [16701]	No	1443	4.6	34.10	0.56	3.19		8.01	0.10	29.25	7.04	0.05	0.06	2.24	8.05	5.67
707	5 [16701]	No	1634	6.3	35.51	0.40	4.75	0.35	12.20	0.15	26.56	4.79	0.03	0.06	3.50	1.29	9.12
708	6 [16701]	No	1601	5.3	36.04	0.37	5.23	0.27	10.29	0.20	28.00	3.62	0.08	0.06	2.31	2.03	10.20
709	L50-2004 [14143]	Yes	1429	6.7	36.50	1.29	1.59		6.72	0.16	26.90	8.18	0.09	0.74	0.57		
710	7 [16701]	Yes	1373	4.1	31.55	0.44	3.05	0.17	7.46	0.09	28.08	9.01	0.07	0.13	1.97	9.75	7.47
711	8 [16701]	Yes	1326	4.3	30.89	0.38	2.80	0.16	6.94	0.14	25.16	11.94	0.07	0.01	0.86	14.54	4.16
712	9 [16701]	Yes	1302	5.2	27.94	0.35	3.00	0.17	6.94	0.17	11.64	25.05	0.09	0.02	2.28	17.51	3.39
713	10 [16701]	Yes	1418	7.1	35.20	0.41	2.50	0.17	6.34	0.16	8.37	19.34	0.13	0.55	1.57	23.30	1.18
	Loc# =47																
714	SL-2001 [14143]	No	1474	8.1	36.60	0.83	0.82		7.00	0.10	32.30	5.95	0.06	0.10	0.41		
715	95-4-4 [16617]	No	1448	6.4	33.67	0.94	1.20		7.53	0.09	33.19	6.26	0.05	0.11	0.50	3.74	11.34
716	96-1 [16617]	No	1431	4.9	35.27	1.12	2.45		7.34	0.11	31.65	5.99	0.02	0.89	0.78	2.89	10.86

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
717	SV1S-01 [14143]	Yes	1411	5.8	31.90	1.74	1.76		7.64	0.10	29.10	9.46	0.07	0.51	0.69		
718	SV1S-04 [14143]	Yes	1347	5.0	31.80	1.60	1.67		7.22	0.15	30.80	8.61	0.07	0.25	0.68		
719	SV1S-06 [14143]	Yes	1245	3.9	33.80	1.08	2.00		6.29	0.13	31.20	7.68	0.06	0.60	0.56		
720	SV1S-08 [14143]	Yes	1411	7.0	30.40	1.03	0.94		7.45	0.12	30.10	9.38	0.05	0.03	0.43		
721	SV1B-02 [14143]	Yes	1223	3.5	35.10	0.87	2.10		6.33	0.10	31.30	7.35	0.16	0.42	2.45		
722	SV1B-05 [14143]	Yes	1436	6.9	36.30	1.39	1.50		7.20	0.12	27.20	8.99	0.08	0.36	0.97		
723	SV1B-06 [14143]	Yes	1222	4.0	33.20	1.87	1.93		6.42	0.11	29.80	9.40	0.09	0.36	1.68		
724	95-1-1 [16617]	Yes	1362	5.0	30.99	2.00	2.01		7.26	0.13	28.90	10.28	0.05	1.25	0.67	5.94	9.18
725	95-2·2 [16617]	Yes	1301	4.0	31.37	1.11	1.91		6.87	0.09	32.01	8.34	0.05	0.71	0.80	5.46	10.07
726	96-3 [16617]	Yes	1349	4.2	35.96	0.95	2.43		6.60	0.13	32.60	5.04	0.05	0.66	0.06	3.22	11.13
727	96-5 [16617]	Yes	1400	5.8	31.55	1.85	1.66		7.58	0.12	28.41	10.23	0.03	1.09	1.81	5.33	9.29
	Loc# =48																
728	ABK51 [12166]	No	1424	4.2	37.77	1.32	7.78	0.05	6.39	0.24	12.25	11.28	0.41	3.06	0.51		
729	ABK52 [12166]	No	1408	5.1	21.33	2.65	2.70	0.12	9.04	0.18	23.79	13.66	0.15	0.33	0.70		
730	ABK53 [12166]	No	1515	5.9	31.87	2.08	3.50	0.20	8.81	0.17	23.41	8.86	0.19	0.61	0.43		
731	ABK54 [12166]	No	1515	6.0	32.33	2.11	3.46	0.21	8.67	0.17	23.37	8.71	0.18	0.56	0.43		
732	ABK56 [12166]	No	1543	6.6	29.20	2.24	3.76	0.19	10.60	0.19	20.29	12.38	0.25	0.75	0.66		
733	ABK57 [12166]	No	1469	5.7	28.86	3.34	2.86	0.14	9.24	0.18	26.76	9.56	0.08	0.52	0.52		
734	ABK58 [12166]	No	1473	5.6	28.08	3.32	2.93	0.14	9.15	0.18	26.76	9.04	0.07	0.63	0.55		
735	ABK59 [12166]	No	1463	5.4	27.50	3.54	2.74	0.15	9.13	0.18	28.06	8.36	0.04	0.53	0.55		
736	ABK60 [12166]	No	1468	5.5	27.42	3.53	2.74	0.15	9.22	0.19	28.04	8.54	0.03	0.58	0.54		
737	ABK61 [12166]	No	1474	5.4	29.32	3.38	3.16	0.14	9.21	0.16	28.07	8.18	0.10	0.59	0.51		
738	ABK62 [12166]	No	1474	5.4	29.08	3.46	3.07	0.14	9.29	0.17	28.02	8.23	0.05	0.48	0.54		
739	ABK64 [12166]	No	1482	5.5	25.83	2.87	2.68	0.13	8.34	0.15	25.37	7.37	0.10	0.56	0.45		
740	ABK65 [12166]	No	1462	5.3	28.67	3.11	2.78	0.14	8.52	0.16	27.86	7.24	0.11	0.32	0.44		
741	ABK66 [12166]	No	1494	5.4	29.97	3.12	2.90	0.14	8.91	0.15	29.60	5.87	0.11	0.34	0.46		
742	ABK67 [12166]	No	1480	5.3	29.02	3.27	2.90	0.14	8.96	0.17	29.18	6.39	0.11	0.24	0.50		
743	ABK68 [12166]	No	1519	5.8	25.06	2.87	2.53	0.12	8.15	0.15	25.09	5.32	0.48	0.39	0.40		
744	ABK71 [12166]	No	1497	6.2	24.24	3.56	3.55	0.14	11.29	0.24	21.73	13.47	0.09	0.09	0.88		
745	ABK72 [12166]	No	1574	7.2	22.89	4.76	4.43	0.17	13.48	0.32	18.83	12.87	0.12	0.04	0.56		
746	ABK73 [12166]	No	1485	5.8	25.59	3.57	3.46	0.16	10.86	0.21	24.74	11.43	0.12	0.05	0.53		
747	ABK74 [12166]	No	1507	6.1	25.31	3.68	3.59	0.16	11.45	0.20	24.66	11.19	0.12	0.06	0.53		
748	ABK75 [12166]	No	1479	5.4	19.71	4.06	3.50	0.16	11.45	0.23	25.54	10.97	0.11	0.46	0.70		
749	ABK76 [12166]	No	1474	5.3	22.49	3.54	3.32	0.15	10.59	0.20	26.05	10.47	0.13	0.55	0.66		
750	ABK77 [12166]	No	1528	6.3	24.25	3.96	3.44	0.18	12.19	0.22	26.30	10.47	0.13	0.42	0.70		
751	ABK78 [12166]	No	1490	5.7	24.33	3.64	3.51	0.16	11.12	0.20	25.16	11.19	0.13	0.32	0.83		
752	ABK79 [12166]	No	1485	6.8	25.80	2.85	2.50	0.14	10.57	0.19	27.23	10.37	0.21	0.16	0.74		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
753	ABK63 [12166]	Yes	1311	4.5	15.79	3.07	2.85	0.13	7.59	0.22	18.81	15.64	0.07	0.47	0.46		
754	ABK69 [12166]	Yes	1266	3.5	13.07	3.15	2.62	0.13	7.05	0.19	19.14	16.02	0.18	0.19	0.46		
755	ABK70 [12166]	Yes	1238	3.1	12.76	3.10	2.65	0.13	6.71	0.19	19.15	16.15	0.19	0.20	0.41		
	Loc# =49																
756	ABK04 [12166]	No	1411	4.4	29.59	1.20	2.03	0.22	8.00	0.15	33.83	6.57	0.06	0.30	0.22		
757	ABK05 [12166]	No	1398	4.0	29.72	0.90	2.77	0.16	8.04	0.16	32.30	7.54	0.04	0.20	0.50		
758	ABK06 [12166]	No	1406	4.9	22.29	1.24	3.47	0.09	8.17	0.17	18.03	15.48	0.40	0.46	0.63		
759	ABK09 [12166]	No	1494	4.5	32.93	0.47	2.13	0.14	8.07	0.14	36.91	3.58	0.08	0.23	0.25		
760	ABK11 [12166]	No	1439	4.4	33.52	0.57	1.61	0.13	7.52	0.13	37.18	3.64	0.08	0.15	0.41		
761	ABK16 [12166]	No	1415	3.7	28.12	0.54	2.70	0.15	7.50	0.14	31.45	6.08	0.11	0.36	0.44		
762	ABK17 [12166]	No	1363	3.1	29.47	0.48	2.54	0.15	7.76	0.14	35.41	6.02	0.09	0.22	0.41		
763	ABK21 [12166]	No	1382	3.9	28.36	1.40	2.62	0.20	8.13	0.19	32.23	7.82	0.11	0.23	0.89		
764	ABK24 [12166]	No	1428	4.2	38.87	1.05	8.61	0.06	6.15	0.09	11.20	11.86	2.38	3.86	0.64		
765	ABK30 [12166]	No	1419	4.8	32.52	0.77	2.02	0.16	7.07	0.13	31.26	5.73	0.10	0.32	0.49		
766	ABK07 [12166]	Yes	1252	3.7	12.66	1.44	2.99	0.10	6.87	0.17	14.02	23.09	0.21	0.17	0.70		
767	ABK10 [12166]	Yes	1346	3.6	31.87	0.63	1.95	0.14	7.05	0.12	34.77	5.42	0.03	0.32	0.43		
768	ABK12 [12166]	Yes	1277	4.4	28.89	0.80	1.63	0.14	6.89	0.11	29.11	11.76	0.09	0.15	0.47		
769	ABK13 [12166]	Yes	1290	4.5	28.92	0.84	1.62	0.15	6.99	0.10	29.34	11.48	0.09	0.14	0.51		
770	ABK15 [12166]	Yes	1323	3.7	29.93	0.86	1.86	0.18	7.35	0.15	33.47	8.19	0.06	0.48	0.93		
771	ABK18 [12166]	Yes	1328	2.8	30.49	0.45	1.95	0.15	7.69	0.14	38.06	5.41	0.07	0.15	0.38		
772	ABK20 [12166]	Yes	1241	3.7	25.55	1.03	3.36	0.14	5.97	0.12	19.66	19.81	0.37	2.47	0.64		
773	ABK22 [12166]	Yes	1274	3.3	27.47	1.32	2.81	0.18	7.36	0.17	29.45	12.03	0.14	0.25	0.96		
774	ABK28 [12166]	Yes	1174	3.0	26.75	0.62	2.53	0.11	6.36	0.12	26.72	15.31	0.03	0.25	0.28		
775	ABK29 [12166]	Yes	1341	4.5	29.76	0.77	2.47	0.14	7.25	0.15	27.33	11.78	0.15	0.34	0.37		
	Loc# =50																
776	KIA12-AV-1A [22633]	No	1449	5.8	28.82	3.18	2.14	0.25	8.51	0.17	27.35	9.97	0.11	1.27	1.65	5.53	9.07
777	KIA12-AV-1B [22633]	No	1480	6.1	30.17	3.43	2.04	0.23	8.69	0.13	28.93	8.29	0.07	1.40	1.69	4.18	8.82
	Loc# =51																
778	A2 [18834]	No	1486	6.1	36.46	2.49	3.32		8.44	0.12	23.00	9.85	0.10	0.72	0.98	8.90	
779	A9 [18834]	No	1513	5.6	28.90	2.83	3.80		9.83	0.15	25.02	8.90	0.09	0.93	1.21	9.40	
780	B5 [18834]	No	1566	7.1	32.52	1.87	1.68		8.67	0.13	33.02	4.27	0.02	0.07	0.09	6.20	
781	B7 [18834]	No	1500	5.9	29.13	2.47	3.68		9.15	0.13	20.72	10.91	0.09	0.85	0.45	15.10	
782	A10 [18834]	Yes	1282	4.6	34.80	2.17	2.92		6.08	0.12	22.00	11.86	0.11	0.46	0.87	12.70	
783	A8 [18834]	Yes	1425	5.6	23.21	1.90	2.24		8.72	0.17	24.29	13.20	0.06	0.56	0.85	18.00	
784	A4 [18834]	Yes	1375	4.5	22.59	2.97	3.00		8.31	0.17	23.57	12.89	0.09	0.64	1.39	16.20	
785	A6 [18834]	Yes	1313	4.4	30.28	3.46	2.60		6.88	0.12	27.12	8.34	0.04	0.16	0.45	10.80	
786	A7 [18834]	Yes	1245	3.9	13.15	2.08	2.79		7.61	0.26	15.03	27.19	0.06	0.57	1.06	24.60	

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
787	A12 [18834]	Yes	1276	4.4	25.30	2.54	2.53		7.03	0.14	21.83	16.98	0.10	0.43	0.85	12.90	
788	B1 [18834]	Yes	1244	5.0	37.89	2.15	1.82		5.84	0.10	29.01	5.40	0.15	0.10	0.35	6.80	
789	B3 [18834]	Yes	1149	3.2	29.59	2.66	4.02		5.50	0.13	19.44	16.65	0.09	0.06	0.35	12.20	
790	B4 [18834]	Yes	1412	5.9	29.34	2.79	2.43		8.22	0.17	23.76	12.54	0.04	0.28	0.54	9.30	
791	B6 [18834]	Yes	1262	3.1	23.58	2.81	3.96		6.55	0.13	22.32	13.84	0.10	1.30	1.01	18.70	
	Loc# =52																
792	CAR-1 [22876]	No	1529	5.0	31.71	2.37	7.07		11.50	0.19	21.06	12.33	0.07	2.20	0.98		
793	CAR-2 [22876]	No	1525	5.0	31.75	2.29	6.82		11.07	0.18	20.52	12.00	0.06	1.99	0.94		
794	CAR-3 [22876]	No	1520	5.1	32.40	2.40	6.94		11.38	0.19	20.86	12.90	0.07	2.01	1.02		
795	CAR-4 [22876]	No	1522	5.1	31.93	2.24	6.63		11.13	0.18	21.19	12.31	0.12	2.05	0.94		
796	CAR-5 [22876]	No	1532	5.2	31.22	2.37	6.60		11.22	0.19	20.41	12.22	0.04	2.17	0.95		
	Loc# =53																
797	B4D1-75.55 [17620]	No	1545	6.3	34.67	3.37	2.46	0.42	8.13	0.13	31.13	4.84	0.12	2.17	0.04		
798	B7D15-30.00 [17620]	No	1571	6.1	37.61	3.26	4.00	0.29	8.54	0.10	26.80	5.70	0.05	2.90	0.04		
799	B7D15-45.00 [17620]	No	1561	6.2	34.76	4.38	3.66	0.39	8.66	0.18	26.30	5.90	0.10	3.00	0.07		
800	B3D34-37.50 [17620]	No	1535	6.3	35.59	2.23	2.86	0.34	7.83	0.14	27.04	7.48	0.08	3.09	0.81		
801	B3D34-85.40 [17620]	No	1575	6.2	36.24	2.47	2.97	0.32	8.41	0.13	29.85	5.60	0.08	3.10	1.17		
802	B3D34-132.30 [17620]	No	1517	6.1	33.67	2.88	2.09	0.43	7.89	0.12	32.03	5.04	0.11	1.80	0.21		
803	B3D34-186.60 [17620]	No	1563	6.7	35.64	2.88	3.10	0.31	8.40	0.15	24.76	8.51	0.15	3.74	1.21		
804	B3D54-40.60 [17620]	No	1526	6.7	39.35	2.59	3.25	0.22	7.95	0.09	22.88	8.89	0.40	2.15	0.82		
805	B8D1-77.35 [17620]	No	1559	7.2	38.49	3.50	3.25	0.20	8.83	0.10	22.14	8.93	0.15	2.69	1.70		
806	B8D1-79.70 [17620]	No	1485	4.9	36.01	3.57	3.12	0.45	7.64	0.19	32.62	2.41	0.03	1.60	0.65		
807	B8D2-17.95 [17620]	No	1528	5.8	35.87	1.92	1.96	0.30	7.59	0.13	34.12	2.88	0.02	0.99	0.58		
808	B8D2-20.45 [17620]	No	1552	6.6	35.51	3.73	2.14	0.33	8.26	0.16	32.13	3.16	0.02	1.41	0.73		
809	B16D1-82.30 [17620]	No	1568	7.3	40.66	4.10	4.00	0.35	9.35	0.13	18.57	10.82	0.19	3.08	0.48		
810	B21D1-20.15 [17620]	No	1584	7.7	38.23	3.83	3.26	0.20	9.39	0.14	20.12	9.73	0.23	2.80	1.44		
811	B21D1-21.93 [17620]	No	1479	6.0	36.46	4.04	3.72	0.21	7.86	0.12	23.00	10.02	0.17	3.51	0.74		
812	B21D3-20.25 [17620]	No	1501	5.7	34.76	3.08	2.74	0.34	7.86	0.18	29.37	5.45	0.04	2.16	1.20		
813	B21D3-23.20 [17620]	No	1550	7.1	38.47	3.71	3.25	0.22	8.61	0.13	22.85	9.56	0.18	3.19	0.48		
	Loc# =54																
814	ME-5211 [9803]	No	1423	6.2	28.16	5.25	2.92		11.94	0.21	27.01	20.91	0.33	1.24	0.69	18.90	
	Loc# =55																
815	90-60-1 [18819]	No	1404	5.4	20.24	3.10	4.16		8.89	0.15	11.40	25.04	0.22	2.02	1.05	18.06	5.00
	Loc# =56																
816	7-191 [18819]	No	1448	5.7	22.11	4.20	3.25		10.71	0.20	22.14	16.32	0.13	1.12	0.92	10.00	6.59
817	7-483 [18819]	No	1640	9.2	24.55	4.07	2.90		15.56	0.26	27.90	10.30	0.06	0.14	0.77	7.05	4.51
818	7-487 [18819]	No	1509	7.0	28.58	2.46	2.20		10.79	0.18	29.40	11.50	0.05	0.07	0.54	7.66	5.53

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
819	7-388 [18819]	No	1580	6.0	32.34	4.75	3.72		9.73	0.12	28.71	4.56	0.15	2.28	0.17	3.58	8.62
820	7-93 [18819]	No	1515	6.2	24.73	4.09	3.80		11.90	0.22	24.79	11.84	1.13	0.40	0.75	4.85	9.92
821	7-473 [18819]	No	1500	6.0	30.57	3.76	4.40		12.13	0.23	24.70	14.40	0.25	0.65	0.70	1.18	4.63
822	1/30 [10359]	No	1688	8.4	33.87	1.75	1.92		9.63	0.15	33.22	2.48	0.10	0.26	0.10	3.29	1.14
823	73-113 [10359]	No	1535	7.4	31.77	1.58	2.25		9.03	0.15	25.09	10.33	0.18	0.47	0.11	8.05	1.25
824	7-78 [18819]	Yes	1331	4.7	25.06	1.03	2.12		7.46	0.17	25.17	15.24	0.11	0.87	0.76	14.97	5.87
825	7-384 [18819]	Yes	1354	4.5	24.56	1.35	2.65		8.16	0.26	25.25	16.52	0.15	1.35	0.83	12.98	4.61
826	7-276 [18819]	Yes	1282	4.5	24.59	0.93	1.97		7.11	0.24	24.13	18.00	0.11	1.03	0.47	14.00	6.25
	Loc# =57																
827	78-1003 [18819]	No	1633	8.2	29.57	2.90	2.52		10.62	0.20	24.72	7.57	0.09	1.59	0.42	5.03	10.13
828	78-1215 [18819]	No	1576	7.5	30.18	2.25	2.35		9.46	0.14	24.74	8.78	0.07	1.30	1.09	5.64	9.97
829	2 [21526]	No	1586	8.1	29.95	4.45	2.98		12.09	0.17	23.25	10.76	0.06	0.35	0.31		
830	90-67 [18819]	Yes	1356	4.7	25.10	1.18	2.70		7.39	0.19	22.34	14.55	0.06	0.60	0.42	12.78	12.02
831	1 [21526]	Yes	1258	3.9	24.51	2.17	3.03		6.56	0.15	20.94	18.13	0.06	1.51	0.59		
	Loc# =58																
832	78-1380 [18819]	No	1563	5.9	32.26	3.87	4.83		9.59	0.17	22.91	7.62	0.15	3.49	0.41	4.93	6.84
833	78-1395 [18819]	No	1556	7.4	29.86	4.16	3.18		11.68	0.21	23.58	12.42	0.13	1.22	0.32	4.62	7.68
834	99-3 [18819]	No	1594	8.2	25.42	3.97	2.90		13.13	0.22	23.99	12.08	0.10	0.98	0.93	6.78	7.20
835	99-14 [18819]	No	1474	6.3	22.43	2.03	3.19		11.03	0.21	18.40	19.06	0.10	0.68	3.30	11.59	6.31
836	23-N [17417]	No	1457	5.3	31.01	1.37	2.86		7.99	0.15	26.65	10.23	0.10	1.56	0.47	6.58	0.89
837	P-88 [17417]	No	1537	6.2	33.14	3.64	4.12		10.26	0.15	24.44	10.20	0.27	2.67	0.68	2.36	0.82
838	P-14088 [9803]	No	1554	6.4	37.18	4.11	4.42		11.49	0.16	26.20	11.20	0.26	2.80	0.91	2.35	
839	21-05 [10359]	No	1638	8.5	31.67	5.68	3.44		12.58	0.18	22.30	9.69	0.22	2.70	0.75	3.67	0.57
840	138-17 [10359]	No	1533	6.7	28.72	4.60	3.60		10.77	0.16	20.87	13.35	0.11	2.46	0.62	6.95	0.57
841	20-05 [10359]	No	1511	5.4	33.99	1.75	3.91		8.54	0.15	25.96	8.80	0.10	1.94	0.43	4.58	0.77
842	00-02 [10359]	No	1524	6.3	30.82	2.91	3.35		9.72	0.16	24.14	11.06	0.13	1.66	0.55	5.65	0.78
	Loc# =59																
843	90-21 [18819]	No	1649	8.1	33.50	5.07	4.60		13.81	0.19	20.95	11.10	0.61	2.92	0.77	1.06	4.91
844	90-56 [18819]	No	1531	5.8	30.00	3.44	5.20		11.28	0.21	20.95	12.60	0.14	1.87	0.56	5.54	7.11
845	KN-1545 [21475]	No	1590	7.6	32.59	3.51	2.66		10.98	0.16	28.53	8.52	0.13	1.37	0.50		
846	OR-1562/2 [21475]	No	1660	7.5	32.32	3.68	3.73		11.82	0.26	25.37	5.16	0.11	1.98	0.91		
847	3 [21526]	No	1485	5.6	27.11	3.31	4.26		10.83	0.16	22.43	13.64	0.05	0.93	0.63		
	Loc# =60																
848	NB-4 [10359]	No	1418	5.3	23.73	3.75	3.37		10.07	0.14	22.58	15.37	0.06	0.14	0.65	9.46	0.97
849	178 [10359]	No	1502	5.7	31.44	3.44	5.00		10.27	0.16	19.00	14.58	0.13	2.42	0.52	5.36	1.37
850	2297 [10359]	No	1476	5.8	30.12	2.75	3.24		8.73	0.15	23.60	11.92	0.09	1.90	0.43	7.78	1.22
851	5311 [10359]	No	1458	5.4	27.29	2.79	2.95		9.23	0.17	27.26	11.03	0.09	1.15	0.44	7.53	0.53

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
	Loc# =61																
852	78-1185 [18819]	No	1524	6.0	30.64	1.86	2.78		9.17	0.18	28.27	9.11	0.16	1.78	1.14	4.93	7.40
853	78-1166 [18819]	No	1548	6.3	31.69	1.80	2.75		9.49	0.18	29.18	8.38	0.17	1.74	1.14	4.79	6.87
854	78-1316 [18819]	No	1408	4.5	25.98	1.87	4.69		8.50	0.17	19.69	15.35	0.15	2.10	1.15	10.00	6.94
855	3430 [10359]	No	1415	4.3	25.53	2.24	4.73		8.84	0.17	21.45	15.53	0.08	2.25	1.10	8.78	0.58
	Loc# =62																
856	KHR-10 [18819]	No	1622	9.1	33.53	1.42	1.20		8.38	0.13	31.86	5.60	0.06	1.17	0.42	3.98	10.74
857	KHR-8 [18819]	No	1535	5.8	36.52	1.99	4.80		9.65	0.16	23.94	11.10	0.15	2.43	0.20	0.37	7.57
858	KHR-11 [18819]	No	1450	5.7	30.14	2.04	2.60		8.76	0.17	27.22	12.90	0.24	1.92	0.98	5.48	7.68
859	111-830 [17417]	No	1529	5.7	33.19	3.10	4.22		10.49	0.16	27.95	11.36	0.11	3.03	0.32	0.72	0.10
860	ES-12/42 [9803]	No	1403	4.8	33.31	1.96	3.43		9.90	0.21	31.65	15.29	0.14	1.56	1.44	8.57	
861	90-1360 [10359]	No	1450	5.3	31.20	1.87	2.24		8.80	0.16	32.96	9.51	0.19	1.48	0.84	3.83	0.10
862	110-1770 [10359]	Yes	1314	3.6	27.39	1.07	1.64		8.48	0.16	35.28	11.41	0.09	0.76	2.36	6.07	0.10
	Loc# =63																
863	9-200 [18819]	No	1585	6.3	35.98	5.16	7.10		12.25	0.20	16.55	10.30	0.77	1.45	0.63	0.77	7.61
864	102 [17417]	No	1434	4.6	33.48	1.62	2.98		7.62	0.14	30.93	5.91	0.09	0.46	0.32	3.91	0.86
865	62/106 [17417]	No	1469	5.5	30.12	1.73	2.31		8.51	0.16	30.77	8.16	0.37	0.82	0.53	4.95	1.00
866	NV-4/4 [9803]	No	1467	5.7	35.27	1.90	2.23		9.88	0.19	36.79	10.24	0.15	1.41	0.85	6.27	
867	101 [10359]	No	1653	7.4	32.16	2.70	2.21		9.81	0.17	32.98	2.96	0.17	1.44	0.57	0.89	1.13
868	79 [15441]	Yes	1330	3.8	30.00	1.52	2.33		7.16	0.13	31.55	7.86	0.13	0.47	0.64	6.00	11.20
	Loc# =64																
869	29-580 [10359]	No	1501	4.5	29.31	1.83	2.64		8.22	0.19	33.25	4.33	0.18	1.19	0.47	1.92	0.74
870	Alakit-Markha 1 [15618]	No	1536	7.2	29.57	2.79	1.98		9.52	0.19	28.87	7.62	0.03	0.18	0.35	7.04	10.68
871	Alakit-Markha 2 [15618]	No	1569	7.4	29.42	2.41	1.92		9.88	0.17	30.79	6.29	0.11	0.18	0.37	4.33	12.24
872	Alakit-Markha 12 [15618]	No	1496	5.9	28.99	1.88	1.73		8.64	0.12	32.74	5.49	0.06	0.13	0.41	6.39	12.15
873	Alakit-Markha 16-1 [15618]	No	1434	4.6	30.51	2.08	1.87		7.81	0.05	34.49	4.04	0.02	0.13	0.30	3.13	14.25
874	Alakit-Markha 17-2 [15618]	No	1560	5.3	32.71	1.38	1.67		7.77	0.12	36.53	1.37	0.03	0.33	0.38	1.18	15.36
875	Alakit-Markha 18 [15618]	No	1580	6.3	31.35	2.31	2.79		9.58	0.28	30.50	5.12	0.03	0.96	0.45	3.41	11.46
876	Alakit-Markha 22 [15618]	No	1513	6.3	30.69	1.45	1.75		8.74	0.07	33.05	6.11	0.04	0.21	0.28	4.45	11.89
877	Alakit-Markha 25-1 [15618]	No	1443	6.4	30.26	1.64	1.80		8.26	0.08	27.93	10.64	0.03	0.22	0.17	7.60	10.15

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
878	Alakit-Markha 27-2 [15618]	No	1501	4.5	29.31	1.83	2.64		8.22	0.19	33.25	4.33	0.18	1.19	0.47	1.92	15.75
879	Alakit-Markha 31 [15618]	No	1514	4.9	33.42	1.44	2.51		8.05	0.25	34.47	2.79	0.07	0.09	0.35	1.87	13.22
880	Alakit-Markha 32 [15618]	No	1416	4.1	36.99	1.17	3.38		7.65	0.09	33.97	5.13	0.03	0.52	0.29	3.02	10.94
881	Alakit-Markha 38 [15618]	No	1410	5.0	28.46	1.44	1.81		8.06	0.13	32.15	7.79	0.27	0.12	0.48	5.05	12.62
882	Alakit-Markha 47 [15618]	No	1582	7.5	28.93	1.99	1.90		10.12	0.10	30.95	7.01	0.05	0.69	0.43	4.13	11.39
883	77 [15441]	Yes	1260	3.9	27.03	1.47	2.46		6.69	0.11	25.53	13.56	0.12	0.34	0.46	11.12	10.15
884	407-775 [10359]	Yes	1352	4.4	29.88	1.17	1.34		7.15	0.14	33.99	6.34	0.30	0.27	0.37	3.71	0.77
885	UB96/318 [13069]	Yes	1346	5.4	28.40	1.08	1.55		7.33	0.17	27.92	12.01	0.07	0.18	0.42		
886	G10 [13069]	Yes	1223	3.6	22.53	1.14	2.30		7.01	0.13	24.50	18.70	0.02	0.48	0.40		
887	Alakit-Markha 4 [15618]	Yes	1373	4.9	29.95	1.41	1.76		7.23	0.31	30.71	7.39	0.02	0.02	0.07	5.89	14.39
888	Alakit-Markha 25-2 [15618]	Yes	1387	4.8	32.68	2.04	1.99		7.18	0.11	31.91	5.73	0.16	0.32	0.39	4.18	11.47
889	Alakit-Markha 26 [15618]	Yes	1401	7.3	27.66	0.68	0.97		7.01	0.05	25.31	11.88	0.03	0.08	0.17	14.43	9.84
890	Alakit-Markha 28-1 [15618]	Yes	1352	4.4	29.88	1.17	1.34		7.15	0.14	33.99	6.34	0.30	0.27	0.37	3.71	15.04
891	Alakit-Markha 29 [15618]	Yes	1231	3.8	26.71	1.60	2.14		6.70	0.08	26.83	14.57	0.13	0.54	0.24	10.02	9.30
892	Alakit-Markha 33 [15618]	Yes	1350	4.9	28.51	1.27	1.70		7.35	0.06	29.41	10.28	0.03	0.31	0.32	8.07	11.22
893	Alakit-Markha 42 [15618]	Yes	1411	6.8	29.44	1.74	1.27		7.79	0.10	27.88	11.19	0.03	0.15	0.23	8.16	10.55
894	Alakit-Markha 46 [15618]	Yes	1398	4.9	25.52	1.79	1.83		8.43	0.16	30.92	9.08	0.15	0.09	0.63	6.53	13.62
	Loc# =65																
895	90-15 [18819]	No	1518	6.3	23.78	2.00	4.60		10.68	0.21	14.02	19.20	0.28	2.28	1.71	14.33	5.65
896	110 [17417]	No	1494	5.4	32.10	1.37	1.77		7.91	0.15	34.65	3.89	0.06	0.24	0.43	3.23	0.53
897	K24/04A [22470]	No	1425	5.4	25.88	1.75	2.27		9.86	0.20	31.54	13.96	1.08	0.86	0.82	9.85	0.56
898	K2-03 [22470]	No	1506	6.2	29.95	1.33	2.03		8.53	0.15	32.66	9.54	3.94	1.61	0.45	6.32	0.42
899	UV-K1-15 [22470]	No	1515	6.9	27.28	0.87	1.52		7.53	0.13	30.95	9.74	6.07	1.75	0.35	7.71	0.23
900	US-217-170 [9803]	No	1493	5.4	36.86	1.56	2.68		10.00	0.17	38.31	7.77	0.10	0.95	0.48	4.33	
901	103 [10359]	No	1574	5.8	33.78	1.33	2.42		8.38	0.16	33.43	3.42	0.04	0.71	0.33	1.40	1.01
902	UV31K-05 [13543]	No	1436	3.6	32.36	5.24	5.36	0.26	7.85	0.13	31.07	5.96	1.47	3.79	0.14		
903	UV301 [13069]	No	1478	5.2	30.87	1.56	3.02		9.65	0.16	32.21	9.34	0.09	0.81	0.44		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
904	UV95/93 [13069]	No	1428	4.7	29.40	1.26	2.34		8.29	0.15	31.97	8.78	0.04	0.97	0.40		
905	K24/04B [22470]	No	1474	6.1	27.84	1.40	1.84		9.45	0.18	33.86	10.86	2.26	0.95	0.63	9.22	0.39
906	UV-K1-05 [22470]	No	1492	6.1	27.26	1.03	1.80		7.07	0.12	29.92	9.44	6.23	1.88	0.34	7.67	0.17
907	Daldyn 28-2 [15618]	No	1487	6.6	29.13	1.44	1.93		8.43	0.26	27.02	9.76	0.04	0.47	0.37	7.37	11.89
908	Daldyn 35 [15618]	No	1594	6.5	31.92	2.47	3.13		9.97	0.21	29.10	4.44	0.08	0.25	0.49	2.80	13.95
909	Daldyn 38 [15618]	No	1516	7.0	25.35	3.35	2.77		11.57	0.21	24.35	13.06	0.03	0.03	0.48	2.67	16.62
910	Daldyn 42 [15618]	No	1485	5.2	32.53	1.93	2.97		8.50	0.17	30.76	5.66	0.04	0.02	0.29	3.59	12.28
911	Daldyn 44-2 [15618]	No	1508	7.4	29.64	2.23	1.91		8.84	0.12	24.81	10.65	0.06	0.42	0.52	7.13	12.06
912	9-154 [18819]	Yes	1394	4.8	26.36	1.70	2.70		8.74	0.18	28.74	12.60	0.56	0.41	0.22	5.14	11.11
913	Z-141 [17417]	Yes	1410	5.7	28.84	2.02	2.04		8.23	0.18	27.95	11.06	0.07	0.28	0.31	6.90	0.10
914	7-20 [17417]	Yes	1356	4.6	29.13	2.14	2.47		7.53	0.16	27.94	10.93	0.09	0.71	0.29	6.66	0.15
915	O-16 [17417]	Yes	1171	3.3	27.60	1.25	2.56		6.03	0.15	25.50	14.77	0.09	0.46	0.34	10.01	0.16
916	67 [15441]	Yes	1258	3.6	26.67	1.10	2.29		7.00	0.12	28.50	12.88	0.12	0.38	0.30	9.96	9.12
917	68 [15441]	Yes	1256	4.0	27.80	1.45	2.30		6.92	0.10	26.93	14.12	0.10	0.33	0.24	10.50	8.78
918	74 [15441]	Yes	1324	4.2	27.57	1.90	3.04		7.48	0.13	25.38	13.31	0.08	0.28	0.30	10.22	9.39
919	75 [15441]	Yes	1311	3.8	25.98	1.82	2.96		7.36	0.12	26.30	12.46	0.08	0.35	0.32	11.50	11.46
920	78 [15441]	Yes	1277	3.8	27.03	1.88	2.94		6.90	0.11	24.99	13.46	0.11	0.45	0.44	10.77	9.94
921	225-376 [10359]	Yes	1366	4.6	29.29	1.23	2.07		8.25	0.17	32.57	12.10	0.56	1.11	0.36	7.50	0.10
922	Z-13 [10359]	Yes	1289	4.4	26.66	1.94	2.49		7.16	0.14	24.28	15.40	0.08	0.42	0.34	10.17	0.10
923	Daldyn 2 [15618]	Yes	1366	4.6	29.29	1.23	2.07		8.25	0.17	32.57	12.10	0.56	1.11	0.36	7.50	4.26
924	Daldyn 3 [15618]	Yes	1391	4.6	26.84	2.31	3.53		8.67	0.22	24.92	12.65	0.03	0.05	0.57	8.06	11.02
925	Daldyn 4 [15618]	Yes	1170	3.4	29.59	0.78	2.82		5.53	0.05	23.28	14.57	0.03	0.84	0.74	10.10	10.37
926	Daldyn 8 [15618]	Yes	1224	3.6	27.34	1.76	3.04		6.26	0.06	22.61	14.96	0.02	0.15	0.33	11.50	10.89
927	Daldyn 10 [15618]	Yes	1405	5.4	27.39	2.26	2.55		8.10	0.13	24.53	12.02	0.03	0.24	0.39	8.66	12.35
928	Daldyn 15 [15618]	Yes	1326	5.0	30.85	1.54	1.82		6.97	0.05	28.06	10.27	0.03	0.07	0.23	8.42	9.82
929	Daldyn 17 [15618]	Yes	1278	4.8	24.76	1.97	1.53		7.15	0.12	25.95	14.95	0.02	0.29	0.47	10.41	10.72
930	Daldyn 21 [15618]	Yes	1372	3.9	32.08	1.18	5.95		6.27	0.06	17.54	11.03	0.06	1.93	0.25	13.22	9.34
931	Daldyn 24 [15618]	Yes	1266	3.8	27.47	1.72	2.52		7.09	0.15	27.74	12.73	0.04	0.24	0.20	8.93	10.17
932	Daldyn 27 [15618]	Yes	1355	5.4	25.78	1.08	1.61		7.56	0.12	26.08	13.69	0.04	0.38	0.29	10.42	10.94
933	Daldyn 28-1 [15618]	Yes	1171	3.3	27.60	1.25	2.56		6.03	0.15	25.50	14.77	0.09	0.46	0.34	10.01	10.72
934	Daldyn 34 [15618]	Yes	1279	4.4	27.59	1.75	2.77		6.29	0.08	20.77	15.10	0.03	0.57	0.24	15.39	8.34
935	Daldyn 39 [15618]	Yes	1117	2.6	28.07	1.64	3.26		5.78	0.09	25.56	13.88	0.03	0.05	0.28	10.95	9.61
936	Daldyn 41 [15618]	Yes	1386	4.7	32.28	1.51	2.87		7.29	0.07	27.73	8.58	0.03	0.28	0.25	5.40	12.56
937	Daldyn 45 [15618]	Yes	1284	3.3	27.53	1.80	2.99		7.29	0.11	29.40	10.37	0.09	0.07	0.37	7.37	11.31
938	Daldyn 49 [15618]	Yes	1160	3.5	28.80	1.03	2.51		5.67	0.07	24.00	14.98	0.03	0.68	0.29	10.72	10.25
939	Daldyn 51-1 [15618]	Yes	1356	4.6	29.13	2.14	2.47		7.53	0.16	27.94	10.93	0.09	0.71	0.29	6.66	9.52
940	Daldyn 51-2 [15618]	Yes	1302	3.7	29.23	2.32	3.22		7.06	0.12	27.71	11.00	0.11	0.99	0.31	7.41	10.40

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
941	Daldyn 54-2 [15618]	Yes	1391	5.5	29.86	3.32	2.16		7.62	0.06	26.44	9.47	0.09	0.24	0.48	6.84	12.25
	Loc# =66																
942	01-163 [18819]	No	1560	6.8	31.28	2.41	2.73		9.68	0.16	26.39	8.73	0.20	1.41	1.05		
943	70 [15441]	No	1476	6.1	32.90	0.97	2.40		7.68	0.16	25.97	9.32	0.12	0.70	0.24	9.15	9.87
944	71 [15441]	No	1415	5.1	33.55	1.29	2.94		7.19	0.10	25.40	9.18	0.13	0.47	0.29	8.50	9.68
945	MX1 [22629]	No	1601	6.7	36.60	0.80	2.20		7.88	0.14	31.02	4.12	0.11	0.45	0.22		
946	M-1110 [22629]	No	1418	5.3	31.57	1.32	1.99		7.61	0.13	30.35	8.39		0.62	0.25		
947	M51/SV [22629]	No	1574	6.6	32.85	1.33	3.33		9.84	0.14	25.99	9.45		1.73	0.70		
948	M-56-M [22629]	No	1585	7.0	35.27	1.73	3.07		9.58	0.14	26.55	7.47		0.48	0.17		
949	M-29/210 [22629]	No	1417	3.6	29.30	1.79	3.00		7.86	0.15	33.18	5.16		0.65	0.25		
950	M-29/339 [22629]	No	1455	4.6	30.11	1.85	2.84		7.96	0.15	30.35	6.87		1.22	0.48		
951	M-29/140 [22629]	No	1556	5.2	32.19	1.88	3.18		8.98	0.16	32.65	3.61		0.74	0.46		
952	TJ-3/05 [22629]	No	1420	4.6	27.97	1.08	1.51		7.72	0.14	33.78	5.53		0.21	0.29		
953	MX1 [13069]	No	1601	6.7	36.60	0.80	2.20		7.88	0.14	31.02	4.12	0.11	0.45	0.22		
954	69 [15441]	Yes	1372	5.0	33.56	1.12	2.77		6.73	0.16	24.90	10.07	0.11	0.62	0.31	8.40	10.31
955	INT 073 [22629]	Yes	1259	2.4	29.99	0.38	2.30		6.15	0.13	33.33	5.75	0.92	0.81	0.41	6.52	13.12
956	IN-130/15 [22629]	Yes	1263	4.9	29.14	0.57	1.64		6.35	0.13	23.97	14.68		0.09	0.58		
957	PSK-2/05 [22629]	Yes	1174	3.3	24.57	0.58	2.44		6.22	0.12	23.16	18.68		0.20	0.58		
958	PSK-1/05 [22629]	Yes	1158	3.2	24.84	0.66	2.55		6.02	0.11	22.47	19.00		0.23	0.54		
959	M-58/1126 [22629]	Yes	1193	2.9	30.71	1.10	2.40		6.11	0.13	31.40	7.65		0.64	0.20		
960	M-4/170 [22629]	Yes	1082	2.4	21.23	1.75	2.77		5.62	0.15	21.97	19.32		0.13	0.57		
961	DK-1/04 [22629]	Yes	1187	3.2	21.31	0.82	2.36		6.18	0.14	22.26	18.38		0.55	0.71		
962	DK-2/05 [22629]	Yes	1253	3.8	23.32	0.77	2.74		6.69	0.14	21.57	17.87		0.37	0.66		
963	DK-07 [22629]	Yes	1329	4.2	25.14	1.61	3.11		7.37	0.14	22.27	15.90	0.06	1.07	0.61		
964	TJ 075 [22629]	Yes	1124	3.7	24.65	0.79	1.50		5.79	0.14	23.54	18.92	0.19	0.14	0.79	14.40	9.08
965	TJ-2/05 [22629]	Yes	1307	5.3	25.33	0.75	1.85		7.01	0.14	20.93	17.97		0.13	0.71		
966	AM 19/55 [22629]	Yes	1297	4.5	15.15	3.09	3.22		8.55	0.14	15.07	26.11	0.06	0.30	0.78	19.57	
967	M-4-P [22629]	Yes	1352	4.9	28.03	2.70	3.10		7.54	0.15	21.47	15.48	0.29	0.98	0.64		
968	AM 4/60 [22629]	Yes	1384	4.9	40.12	1.51	4.20		6.00	0.14	21.33	7.72	0.28	1.51	0.40	6.25	
969	AM 4/62 [22629]	Yes	1300	4.3	18.37	2.74	3.19		8.29	0.14	17.67	22.75	0.06	0.47	0.74		
970	AN-21/32 [22629]	Yes	1189	4.5	9.49	2.53	2.04		6.55	0.14	8.54	37.03		0.06	0.91		
971	M14-127 [13069]	Yes	1300	4.1	30.03	1.34	2.44		6.81	0.12	27.78	10.29	0.01	0.21	0.43		
972	M14-121 [13069]	Yes	1241	3.2	27.79	1.37	2.41		6.86	0.13	29.66	10.74	0.07	0.05	0.45		
973	R-19-K [9803] [10359]	Yes	1401	4.9	40.75	1.97	2.66		8.57	0.12	37.65	6.71	0.05	0.25	0.31	6.38	0.99
974	TZH-1 [15245]	Yes	1162	4.3	23.12	1.20	2.02		5.44	0.29	14.94	24.92	0.05	0.25	1.26	12.98	1.42
	Loc# =67																
975	7-460 [18819]	No	1475	6.1	30.36	2.11	2.39		8.66	0.11	26.90	10.81		1.26	0.54		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
976	CH-10 [17417]	No	1439	5.4	30.65	2.47	3.04		8.86	0.16	26.93	11.16	0.14	0.63	0.50	4.94	0.10
977	73-129 [17417]	No	1512	6.5	28.17	2.68	2.38		9.71	0.18	27.50	10.13	0.06	1.06	0.62	6.53	0.74
978	UR-2 [17417]	No	1572	7.4	26.59	4.24	2.69		11.64	0.19	26.03	9.74	0.09	1.41	0.56	6.47	0.90
979	2031 [17417]	No	1485	5.0	24.55	3.85	3.78		10.23	0.13	27.68	8.09	0.07	0.83	0.49	8.85	0.97
980	6 [10359]	No	1493	5.5	32.33	1.98	3.05		8.38	0.15	28.14	8.79	0.14	1.88	0.47	4.51	0.23
981	71-02 [10359]	No	1564	5.4	33.03	2.83	3.40		9.28	0.17	31.97	3.99	0.10	1.51	0.74	1.93	0.53
	Loc# =68																
982	24/7-229 [17417]	No	1616	7.2	33.67	0.36	3.10		11.12	0.12	29.66	8.77	0.24	0.90	0.33	6.33	0.09
983	24/7-240 [17417]	No	1553	5.6	33.27	0.42	4.29		9.92	0.13	27.25	8.84	0.35	0.94	0.36	6.01	0.33
984	334 [12721]	No	1399	3.3	34.99	0.55	4.32		6.98	0.13	31.51	5.13		1.40	0.54		
985	NB-1 [15245]	No	1463	5.2	33.54	0.38	2.62		7.85	0.06	29.59	7.56	0.08	0.14	0.44	4.40	0.65
986	H-32/222-440 [15885]	No	1442	4.6	34.14	0.76	4.26		7.27		24.59	10.16	0.39	2.56	0.72		
987	E-408 [17100]	Yes	1239	3.2	28.25	0.61	3.12		6.36	0.12	26.41	13.69		1.32	0.70		
988	E-412 [17100]	Yes	1238	2.5	31.96	0.63	3.72		6.27	0.12	30.86	7.45		1.10	0.73		
989	E-413 [17100]	Yes	1227	2.9	32.82	0.54	3.48		6.08	0.14	29.85	8.57		1.36	0.59		
990	16/4/310 [17100]	Yes	1193	2.5	27.62	0.52	2.81		6.02	0.08	28.66	11.69	0.08	1.51	0.78		
991	16/4/320 [17100]	Yes	1288	4.0	30.90	0.54	2.18		6.39	0.07	28.26	9.91	0.05	0.70	0.62		
992	G-880 [17100]	Yes	1204	2.7	25.47	0.41	4.27		5.75	0.14	21.17	15.17		0.62	0.48		
993	G-882 [17100]	Yes	1212	2.2	30.40	0.46	3.97		6.23	0.13	29.45	8.22		0.17	0.43		
994	G-887 [17100]	Yes	1337	4.0	36.35	0.53	4.43		5.89	0.13	23.60	8.73		2.03	0.38		
995	24/168-266 [17417]	Yes	1345	4.2	33.00	0.41	3.04		6.53	0.13	27.06	9.06	0.25	0.88	0.38	10.86	0.68
996	204 [12721]	Yes	1281	3.2	32.39	0.39	3.47		6.25	0.13	29.70	8.75		1.74	0.41		
997	259 [12721]	Yes	1261	2.9	33.73	0.38	3.89		6.15	0.15	29.68	7.74	0.04	1.32	0.36		
998	420 PK [12721]	Yes	1322	3.7	34.18	0.61	4.04		6.57	0.12	26.01	10.46		1.34	0.61		
999	16/4-350 [10359]	Yes	1162	3.4	29.79	0.56	1.37		5.92	0.15	30.63	8.93	0.16	0.24	0.63	7.50	0.43
1000	B-5-101 [15885]	Yes	1382	5.4	32.77	0.31	2.25		6.71		24.07	11.03	0.11	0.29	0.54		
1001	H-24/168-266 [15885]	Yes	1291	3.7	33.00	0.41	3.04		6.11		27.06	9.06	0.25	0.88	0.38		
	Loc# =69																
1002	AG-5/14 [17417]	No	1433	5.5	33.14	3.76	2.97		8.99	0.15	28.91	9.22	0.08	0.04	0.35	1.49	0.39
1003	AG-3/75 [17417]	No	1543	7.3	32.30	5.03	2.93		11.78	0.15	27.84	9.46	0.11	0.04	0.33	0.73	0.28
1004	19/1-1 [17417]	No	1449	5.1	28.96	3.91	3.24		9.01	0.14	27.78	9.23	0.09	1.13	0.43	4.86	0.42
1005	127 [10359]	No	1454	5.5	30.51	3.62	2.50		9.11	0.17	31.15	7.31	0.08	0.09	0.35	3.05	0.24
1006	12/5-5 [10359]	Yes	1339	4.2	29.35	4.84	5.62		6.70	0.14	16.65	15.64	0.15	3.92	0.66	9.68	1.14
	Loc# =70																
1007	AN-3 [12787]	No	1377	4.2	36.23	0.28	2.16		6.66	0.13	35.75	4.48	0.19	1.68	0.34	3.13	7.94
1008	LP 22 [12994]	No	1354	3.7	44.25	0.42	8.46		5.43	0.09	19.55	4.82	1.74	2.60	0.23		
1009	LP 62 [12994]	No	1350	3.5	43.55	0.42	8.06		5.70	0.09	21.15	5.31	1.70	1.87	0.24		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1010	LP 63 [12994]	No	1386	3.7	44.69	0.37	8.28		5.82	0.09	21.27	4.28	2.06	2.19	0.19		
1011	LP 64 [12994]	No	1343	2.8	42.63	0.46	11.21		5.43	0.07	17.13	6.60	2.88	2.51	0.26		
1012	LP 65 [12994]	No	1365	3.4	41.05	0.40	6.87		6.01	0.11	24.96	6.26	1.36	2.42	0.30		
1013	LP 66 [12994]	No	1402	3.7	44.03	0.47	8.58		5.91	0.09	20.56	4.65	2.04	2.32	0.22		
1014	LP 68 [12994]	No	1371	3.6	44.76	0.39	8.22		5.90	0.10	21.63	5.10	1.89	2.16	0.22		
1015	LP 71 [12994]	No	1383	3.5	39.54	0.43	6.99		5.92	0.10	21.59	6.99	0.55	2.48	0.32		
1016	LP 72 [12994]	No	1434	3.7	40.30	0.49	7.41		6.47	0.12	20.16	7.50	0.77	1.72	0.30		
1017	LP 56 [12994]	No	1363	3.6	42.47	0.34	6.98		5.74	0.10	22.69	4.85	1.69	1.69	0.21		
1018	LP 57 [12994]	No	1402	4.2	41.47	0.35	6.99		5.51	0.09	21.28	5.29	1.12	4.03	0.22		
1019	A154 11-1 [13835]	No	1560	5.5	36.80	0.36	2.60		7.10	0.13	30.20	3.90		0.24	0.17		
1020	A154 11-2 [13835]	No	1678	6.6	37.90	0.42	2.13		7.71	0.13	34.80	2.28		1.42	0.30		
1021	A154 11-3 [13835]	No	1596	6.5	37.90	0.42	2.00		7.53	0.13	32.20	4.35		0.54	0.23		
1022	KIA92-KPL-4 [13835]	No	1414	4.2	33.00	0.46	2.48		8.42	0.19	35.90	6.90	0.12	0.08	0.73	2.02	6.43
1023	KIA92-KPL-5 [13835]	No	1437	4.3	32.90	0.45	2.51		8.53	0.19	36.10	6.46	0.11	0.22	0.75	1.66	6.19
1024	DD39-5 44.2 [13835]	No	1430	5.1	33.50	0.57	1.55		8.17	0.19	36.90	6.38	0.07	0.22	0.55		
1025	DD39-5 47.5 [13835]	No	1458	5.9	33.60	0.55	1.44		8.52	0.21	36.30	7.03	0.05	0.07	0.59		
1026	KIA96-HL-10-1 [13835]	No	1461	4.7	31.00	0.68	2.50		8.22	0.18	33.00	6.77	0.13	0.64	0.59	5.47	8.40
1027	KIA96-HL-10-2 [13835]	No	1459	5.1	31.20	0.64	2.14		8.29	0.17	33.00	7.31	0.11	0.44	0.50	5.81	8.40
1028	KIA96-HL-10-3 [13835]	No	1478	5.2	31.10	0.66	2.16		8.38	0.18	33.20	6.66	0.10	0.45	0.51	5.38	8.20
1029	KIA96-HL-12-1 [13835]	No	1625	5.4	37.80	0.38	2.25		7.64	0.15	37.30	1.70	0.09	1.31	0.41	1.11	6.50
1030	KIA96-HL-12-2 [13835]	No	1517	5.1	36.40	0.33	1.95		7.44	0.14	36.50	3.78	0.08	1.26	0.40	2.89	5.40
1031	KIA96-HL-12-3 [13835]	No	1495	5.0	36.20	0.36	2.09		7.34	0.15	35.60	4.21	0.09	1.33	0.41	3.35	5.80
1032	KIA96-LESLIE-B-1 [13835]	No	1374	4.2	32.00	0.54	1.43		7.89	0.16	38.00	6.10	0.09	0.23	0.41	4.73	6.10
1033	KIA96-LESLIE-B-2 [13835]	No	1383	4.0	32.00	0.56	1.56		7.96	0.17	38.30	5.67	0.10	0.25	0.42	4.46	6.50
1034	KIA96-LESLIE-B-3 [13835]	No	1391	4.3	31.90	0.55	1.55		7.96	0.16	37.60	6.03	0.14	0.25	0.40	4.78	6.40
1035	T35-1 82.6 [13835]	No	1361	3.6	33.50	0.48	2.39		7.97	0.19	37.00	6.48	0.08	0.07	0.72		
1036	TR107-3 82.1 [13835]	No	1380	3.7	33.60	0.48	2.44		8.06	0.20	37.00	6.14	0.06	0.10	0.76		
1037	KIA96-HL-11-1 [13835]	No	1560	5.9	31.10	1.43	3.56		9.72	0.27	27.40	6.85	0.14	0.50	0.60	4.44	8.40
1038	KIA96-HL-11-2 [13835]	No	1578	6.1	31.00	1.39	3.49		9.90	0.26	28.20	6.07	0.19	0.56	0.74	3.72	8.00

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1039	KIA96-HL-11-3 [13835]	No	1541	5.9	30.90	1.38	3.51		9.72	0.25	27.10	7.82	0.20	0.42	0.80	5.18	8.00
1040	T21-1 113.5 [13835]	No	1447	4.5	31.00	0.62	3.50		7.58	0.17	27.20	9.15	0.27	1.62	0.58		
1041	T21-1 114.9 [13835]	No	1494	4.4	32.30	0.70	3.88		7.84	0.18	29.50	6.61	0.24	1.67	0.24		
1042	T21-1 127.3 [13835]	No	1444	4.8	31.40	0.62	3.91		7.28	0.19	22.70	12.40	0.21	3.04	0.63		
1043	T237-1 61.3 [13835]	No	1493	5.0	28.30	1.01	4.18		9.54	0.26	25.00	9.88	0.15	0.40	1.23		
1044	T237-1 89.3 [13835]	No	1467	4.7	28.70	1.04	3.95		9.81	0.24	28.90	10.60	0.08	0.67	1.13		
1045	T36-1 18.5 [13835]	No	1536	5.2	31.90	1.25	4.36		8.91	0.20	25.90	8.53	0.32	2.25	0.49		
1046	T36-1 19.0 [13835]	No	1572	5.4	32.50	0.99	3.91		8.41	0.19	27.20	6.75	0.30	2.60	0.29		
1047	T36-1 41.5 [13835]	No	1472	4.3	32.70	0.93	4.40		7.97	0.20	27.50	8.38	0.28	2.13	0.89		
1048	T36-1 67.2 [13835]	No	1458	4.4	31.10	1.07	4.31		8.56	0.20	27.30	8.87	0.15	0.87	0.88		
1049	DDH97-54@311.82 [13835] [12120]	No	1482	4.7	36.60	0.41	3.80	0.16	6.75	0.13	29.25	5.70	0.01	3.07	0.35	3.60	9.30
1050	DDH97-54@312.12 [13835] [12120]	No	1441	4.2	35.30	0.43	4.20	0.20	6.75	0.13	28.38	7.33	0.01	3.15	0.35	4.80	8.80
1051	L001 [12204]	No	1734	6.9	41.23	0.43	4.76	0.16	8.82	0.12	22.34	3.26	0.21	0.90	0.31		
1052	DDH96-13@233.25 [13835] [12120]	No	1427	5.0	29.80	1.17	2.00	0.30	8.28	0.18	32.26	9.74	0.10	1.28	0.52	8.20	5.90
1053	DDH96-13@234.5 [13835] [12120]	No	1356	4.0	27.50	1.34	2.20	0.38	8.01	0.18	31.94	10.33	0.10	0.85	0.62	8.30	7.90
1054	DDH96-13@237.3 [13835] [12120]	No	1423	4.9	27.40	1.70	2.10	0.39	8.91	0.21	32.09	9.42	0.01	0.61	0.71	7.80	8.60
1055	DDH96-13@238.6 [13835] [12120]	No	1390	5.3	31.30	1.10	1.60	0.27	8.10	0.17	32.88	10.79	0.01	1.08	0.51	8.00	4.00
1056	DDH97-57@74.8 [13835] [12120]	No	1425	4.2	35.80	0.30	1.90	0.25	7.38	0.15	37.57	4.36	0.01	0.90	0.35	2.70	7.80
1057	KWDC-01@100.5 [13835] [12120]	No	1529	5.4	26.70	1.64	3.50	0.25	10.98	0.25	30.45	9.11		1.41	0.96	5.50	7.80
1058	KWDC-01@52.25 [13835] [12120]	No	1474	6.0	28.20	1.23	2.80	0.21	9.27	0.20	24.29	12.82	0.01	0.59	1.11	8.50	8.50
1059	KWDC-01@81.5 [13835] [12120]	No	1484	5.4	29.10	1.27	3.20	0.21	9.27	0.22	26.59	11.12	0.01	1.26	1.03	7.30	7.60
1060	KWDC-01@89.9 [13835] [12120]	No	1447	4.8	28.30	1.10	3.40	0.18	8.46	0.21	25.55	12.38	0.10	2.02	1.15	8.30	7.80
1061	KWDC-01@92.1 [13835] [12120]	No	1394	4.5	24.50	1.35	3.60	0.21	8.73	0.20	22.86	16.16	0.10	1.44	1.39	10.90	6.80
1062	LS-4 [12787]	Yes	1242	2.7	33.98	0.45	1.62		7.33	0.15	39.87	6.41	0.25	0.56	0.39	2.61	5.37
1063	LS-5 [12787]	Yes	1340	3.3	34.04	0.44	2.53		6.80	0.13	35.77	5.82	0.18	1.76	0.34	4.05	6.99
1064	LP 67 [12994]	Yes	1343	3.5	44.83	0.37	8.30		5.72	0.09	22.11	4.99	1.92	2.31	0.21		
1065	LP 70 [12994]	Yes	1347	3.5	43.97	0.45	9.39		5.32	0.09	16.02	7.00	1.54	2.69	0.31		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1066	LP 73 [12994]	Yes	1339	3.3	38.92	0.38	7.06		5.59	0.11	20.20	8.05	0.71	1.95	0.28		
1067	LP 19 [12994]	Yes	1347	3.6	40.27	0.46	7.67		5.19	0.10	18.13	6.65	1.46	2.64	0.31		
1068	KIA92-KPL-1 [13835]	Yes	1323	3.5	32.00	0.48	2.22		7.74	0.20	35.50	8.17	0.26	0.09	0.92	1.91	7.59
1069	KIA92-KPL-2 [13835]	Yes	1329	3.6	31.90	0.48	2.23		7.69	0.20	34.90	8.17	0.26	0.10	0.97	2.30	7.70
1070	KIA92-KPL-3 [13835]	Yes	1351	3.7	32.40	0.48	2.29		7.71	0.20	35.10	7.32	0.31	0.10	0.90	1.72	8.58
1071	DD39-5 37.0 [13835]	Yes	1367	5.5	34.10	0.41	1.47		7.08	0.17	31.80	9.35	0.10	0.85	0.36		
1072	DD39-5 38.8 [13835]	Yes	1325	5.0	35.40	0.45	2.25		6.16	0.20	26.60	10.00	0.15	1.52	0.39		
1073	DD39-5 69.4 [13835]	Yes	1324	4.9	31.30	0.48	1.64		7.26	0.20	30.30	11.70	0.13	0.46	0.54		
1074	DD39-5 71.4 [13835]	Yes	1314	5.0	29.50	0.49	1.45		7.40	0.19	30.30	13.00	0.14	0.44	0.50		
1075	92-02 X3 [13835]	Yes	1298	3.2	34.30	0.44	1.96		7.80	0.17	39.30	7.47	0.14	0.54	0.48		
1076	92-02 X4 [13835]	Yes	1279	3.2	33.80	0.43	1.86		7.49	0.15	38.30	7.99	0.08	0.85	0.43		
1077	92-02 X5 [13835]	Yes	1326	3.2	33.80	0.43	2.15		7.59	0.17	38.20	7.21	0.16	1.08	0.42		
1078	92-02 X6 [13835]	Yes	1257	2.8	33.30	0.39	1.82		7.45	0.16	38.70	7.30	0.19	0.42	0.43		
1079	92-02 X8 [13835]	Yes	1274	2.9	33.50	0.42	1.93		7.50	0.16	38.70	7.06	0.21	0.46	0.41		
1080	92-02 X10 [13835]	Yes	1288	2.9	33.10	0.41	1.96		7.51	0.16	38.30	7.25	0.18	0.64	0.45		
1081	92.02 X12 [13835]	Yes	1293	2.8	33.30	0.42	1.95		7.55	0.16	38.90	7.06	0.13	0.83	0.45		
1082	92.02 X16 [13835]	Yes	1283	3.1	33.70	0.42	2.31		7.15	0.15	36.10	8.16	0.27	1.12	0.56		
1083	92.02 X21 [13835]	Yes	1292	2.9	34.10	0.42	2.07		7.62	0.15	39.30	7.03	0.14	0.78	0.42		
1084	92.02 X26 [13835]	Yes	1326	3.2	33.80	0.42	1.97		7.59	0.17	38.70	6.85	0.12	0.97	0.42		
1085	A154N_8_PET02 [13833]	Yes	1301	3.5	33.28	0.88	1.70	0.31	7.91	0.16	38.75	7.46		0.30	0.32	5.75	1.77
1086	A154N_10_12 [13833]	Yes	1285	3.9	29.62	1.10	1.53	0.38	7.61	0.16	34.50	9.90	0.05	0.36	0.44	8.83	2.61
1087	A154N_09_07 [13833]	Yes	1183	2.6	30.39	0.75	1.29	0.31	7.57	0.16	38.51	8.83		0.03	0.39	4.76	3.70
1088	A154_35_03 [13833]	Yes	1213	2.7	29.92	0.85	1.48	0.31	7.47	0.16	37.52	8.23	0.02	0.08	0.43	7.47	3.46
1089	A21_GT03_01 [13833]	Yes	1160	2.4	26.66	1.27	1.68	0.35	7.77	0.19	36.80	11.54	0.03	0.05	0.64	6.12	4.65
1090	DDH92-02@306.75 [13835] [12120]	Yes	1329	3.4	32.10	0.48	2.30	0.30	7.29	0.16	34.88	8.60	0.01	1.56	0.58	5.30	6.20
1091	DDH92-02@307.84 [13835] [12120]	Yes	1278	3.0	31.70	0.48	2.30	0.26	7.29	0.16	35.08	9.38	0.01	1.10	0.55	5.00	6.60
1092	DDH92-02@312.34 [13835] [12120]	Yes	1258	3.0	32.00	0.54	2.10	0.30	7.65	0.17	36.75	9.72	0.01	0.62	0.68	4.80	4.90
1093	DDH92-02@313.5 [13835] [12120]	Yes	1290	3.1	32.90	0.54	2.20	0.30	7.74	0.18	37.42	8.46	0.01	0.67	0.70	4.60	4.40
1094	DDH92-02@320.55 [13835] [12120]	Yes	1290	3.3	33.00	0.50	2.00	0.29	7.74	0.17	37.47	9.10	0.10	0.81	0.49	4.10	4.40
1095	DDH92-02@327.75 [13835] [12120]	Yes	1325	3.2	33.30	0.55	2.50	0.30	7.74	0.17	36.81	8.42	0.01	1.13	0.54	3.80	4.70
1096	LDC-09@15.0 [13835] [12120]	Yes	1234	3.0	31.40	0.58	1.60	0.29	7.38	0.16	37.20	9.14	0.10	0.64	0.42	4.90	5.90

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1097	LDC-09@20.5 [13835] [12120]	Yes	1280	3.2	32.20	0.57	1.50	0.29	7.74	0.17	38.79	7.84	0.10	0.45	0.41	3.50	6.50
1098	LDC-09@21.35 [13835] [12120]	Yes	1278	3.3	30.30	0.62	1.60	0.29	7.74	0.17	36.83	9.40	0.10	0.56	0.45	3.70	7.80
1099	LDC-09@26.45 [13835] [12120]	Yes	1273	2.9	30.70	0.58	1.70	0.30	7.56	0.17	37.36	7.71		0.47	0.63	3.10	9.00
1100	LDC-09@28.9 [13835] [12120]	Yes	1229	2.8	30.10	0.61	1.40	0.30	7.74	0.17	38.41	9.16	0.10	0.33	0.54	2.90	7.40
1101	DDH97-57@62.6 [13835] [12120]	Yes	1325	3.3	34.60	0.39	2.00	0.29	7.47	0.16	38.25	6.67	0.01	1.08	0.42	3.80	5.20
1102	DDH97-57@63.3 [13835] [12120]	Yes	1301	3.1	34.70	0.36	1.80	0.30	7.65	0.16	39.75	6.10	0.01	0.40	0.33	3.50	5.20
	Loc# =71																
1103	BH001 [12120]	No	1396	4.8	40.73	0.46	4.05	0.16	6.24	0.17	23.16	8.35	0.23	1.55	0.32		
1104	MDC-1:40.2 [12120]	No	1423	4.7	35.40	0.32	2.60	0.27	7.29	0.16	31.41	7.31		1.18	0.52	4.90	8.90
1105	MDC-1:42.33 [12120]	No	1480	4.5	37.50	0.34	3.00	0.26	7.20	0.16	32.49	4.07		0.97	0.51	2.40	10.70
1106	MDC-1:43.59 [12120]	No	1526	4.9	37.30	0.36	2.70	0.27	7.65	0.17	34.20	3.48		0.86	0.65	2.00	10.00
1107	MDC-1:44.2 [12120]	No	1364	4.1	34.40	0.33	2.40	0.25	7.20	0.15	32.93	7.10		0.46	0.46	4.90	9.40
1108	MDC-1:50.35 [12120]	No	1509	7.8	33.00	0.32	1.80	0.22	8.55	0.25	24.59	12.58		0.32	0.43	9.60	7.70
1109	DDH94-08:272.8 [12120]	No	1550	6.3	43.40	0.68	4.20	0.09	6.57	0.09	25.34	3.69	0.20	3.38	0.14	4.50	7.70
1110	MDC-1@40.2 [13835]	No	1427	4.8	35.40	0.32	2.60		7.28	0.16	31.41	7.31	0.01	1.18	0.52	4.90	8.90
1111	MDC-1@42.33 [13835]	No	1488	4.6	37.50	0.34	3.00		7.20	0.16	32.49	4.07	0.01	0.97	0.51	2.40	10.70
1112	MDC-1@43.59 [13835]	No	1533	5.0	37.30	0.36	2.70		7.64	0.17	34.20	3.48	0.01	0.86	0.65	2.00	10.00
1113	MDC-1@44.2 [13835]	No	1368	4.2	34.40	0.33	2.40		7.20	0.15	32.93	7.10	0.01	0.46	0.46	4.90	9.40
1114	MDC-1@50.35 [13835]	No	1511	7.8	33.00	0.32	1.80		8.55	0.25	24.59	12.58	0.01	0.32	0.43	9.60	7.70
1115	04 42,2 [14133]	No	1604	7.0	34.59	2.57	3.01		9.33	0.15	27.14	6.50		2.02	0.55		
1116	DDH94-08@257.75 [13835] [12120]	No	1395	5.8	27.90	1.32	1.50	0.24	8.37	0.19	29.99	12.22	0.01	0.53	0.41	13.30	3.70
1117	DDH94-08@269.40B [13835] [12120]	No	1404	5.6	28.80	1.51	1.70	0.25	8.64	0.20	31.12	11.61	0.01	0.46	0.43	11.50	4.00
1118	DDH93-13@14.9 [13835] [12120]	No	1470	4.9	36.00	0.40	2.40	0.24	7.38	0.15	33.67	5.48	0.01	1.61	0.66	3.50	8.00
1119	DDH93-13@17 [13835] [12120]	No	1480	4.6	36.40	0.37	2.70	0.22	7.20	0.16	33.82	4.51	0.10	1.68	0.57	2.90	9.10
1120	DDH93-13@36.35 [13835] [12120]	No	1366	4.3	33.80	0.39	2.30	0.24	6.93	0.15	32.10	8.30	0.01	1.82	0.59	5.70	7.60
1121	DDH93-13@8.4 [13835] [12120]	No	1416	4.5	35.10	0.39	2.10	0.25	7.29	0.16	34.63	5.81	0.10	1.00	0.61	3.60	8.80
1122	DDH94-11@87.7 [13835] [12120]	No	1435	4.8	30.40	1.06	4.00	0.20	8.01	0.19	22.81	13.31	0.10	2.23	0.86	7.60	8.70

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1123	DDH94-11@96.25 [13835] [12120]	No	1361	4.2	26.60	0.94	3.60	0.16	7.65	0.18	23.09	15.91	0.10	1.90	0.87	10.40	7.20
1124	R10 [21671]	Yes	1300	3.3	28.15	0.88	4.25		8.54	0.22	27.89	16.34	0.07	0.12	1.40	4.28	8.62
1125	R11 [21671]	Yes	1356	3.9	28.92	0.87	3.40		8.95	0.22	30.22	13.74	0.07	0.33	1.56	3.43	8.50
1126	DDH96-17@162.65 [13835] [12120]	Yes	1315	4.7	26.90	1.23	1.70	0.27	7.83	0.17	29.55	13.29	0.01	0.21	0.61	12.30	5.00
1127	DDH96-17@163.75 [13835] [12120]	Yes	1252	4.4	27.80	1.11	1.70	0.27	7.11	0.16	27.94	15.20	0.01	0.33	0.54	11.50	5.10
1128	DDH96-17@170.4 [13835] [12120]	Yes	1203	3.6	24.60	1.09	1.80	0.24	6.84	0.16	27.24	15.83	0.01	0.20	0.61	15.10	4.70
1129	DDH96-17@170.9 [13835] [12120]	Yes	1200	3.3	29.20	0.88	1.70	0.22	6.84	0.17	32.24	11.66	0.01	0.48	0.47	11.10	3.80
1130	DDH96-17@171.2 [13835] [12120]	Yes	1226	3.5	26.60	1.05	1.90	0.25	6.93	0.15	29.37	13.38	0.01	0.41	0.58	13.30	4.90
1131	DDH96-17@174.7 [13835] [12120]	Yes	1246	4.0	28.50	1.06	2.00	0.25	6.93	0.17	28.33	14.10	0.01	0.58	0.57	11.50	4.90
1132	DDH96-17@174.9 [13835] [12120]	Yes	1277	4.9	29.10	1.02	1.40	0.24	7.20	0.16	29.15	13.99	0.01	0.41	0.39	11.30	5.00
1133	DDH96-17@175.27 [13835] [12120]	Yes	1264	4.8	28.20	1.02	1.40	0.26	7.11	0.16	28.66	14.58	0.01	0.45	0.44	12.60	4.40
1134	DDH96-17@177 [13835] [12120]	Yes	1301	4.9	27.50	1.08	1.50	0.26	7.56	0.16	29.09	14.10	0.01	0.42	0.47	13.10	4.00
1135	DDH93-13@10.95 [13835] [12120]	Yes	1269	3.9	32.50	0.33	2.10	0.22	6.66	0.14	31.17	11.34	0.01	1.65	0.66	8.20	4.60
1136	DDH93-13@25.75 [13835] [12120]	Yes	1273	3.6	31.60	0.36	2.70	0.21	6.30	0.13	29.32	10.57	0.10	1.88	0.48	7.30	8.80
1137	DDH93-13@36 [13835] [12120]	Yes	1314	3.9	32.80	0.39	2.20	0.24	6.93	0.15	32.68	9.52	0.01	1.66	0.61	6.50	5.80
1138	DDH94-11@81.1 [13835] [12120]	Yes	1271	3.6	24.90	0.89	3.60	0.14	6.57	0.17	20.67	19.92	0.10	2.52	0.72	13.80	6.10
1139	DDH94-11@97.1 [13835] [12120]	Yes	1358	4.2	27.10	0.91	3.40	0.17	7.38	0.17	23.59	15.28	0.10	2.15	1.01	10.30	7.20
1140	DDH94-11@106.8 [13835] [12120]	Yes	1358	4.1	29.00	0.94	3.70	0.16	7.74	0.19	24.93	14.11	0.10	1.16	1.00	7.50	8.50
1141	DDH94-17@131.9 [13835] [12120]	Yes	1305	3.6	27.30	0.91	3.80	0.18	8.01	0.21	25.27	16.19	0.01	0.28	1.50	6.50	8.20
1142	DDH94-17@134.1 [13835] [12120]	Yes	1268	3.3	26.60	0.91	3.90	0.20	8.01	0.22	26.03	17.93	0.01	0.16	1.32	4.50	8.70
1143	DDH94-17@139.7 [13835] [12120]	Yes	1260	3.4	25.40	0.92	3.50	0.21	7.74	0.21	25.03	18.16	0.01	0.22	1.28	7.00	8.60
	Loc# =72																

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1144	HK1-lgs 09 [Kopylova & Hayman, 2008]	No	1460	5.4	33.97	1.79	1.56	0.31	8.43	0.17	37.90	4.53	0.09	0.22	0.42	2.24	6.93
1145	HK1-lgs 10 [Kopylova & Hayman, 2008]	No	1431	5.4	34.95	0.60	1.44	0.28	8.00	0.17	36.80	6.18	0.14	0.20	0.51	4.36	4.79
1146	HK1-lgs 7 [Kopylova & Hayman, 2008]	No	1400	4.9	34.07	0.91	1.46	0.28	7.84	0.16	37.40	5.68	0.17	0.22	0.40	4.00	6.04
1147	HK1-jd 11 [Kopylova & Hayman, 2008]	No	1500	4.8	34.95	1.23	1.90	0.30	8.13	0.18	38.40	2.27	0.05	0.09	0.54	1.06	9.36
1148	HK1-jd 35 [Kopylova & Hayman, 2008]	No	1404	4.9	34.18	1.22	1.88	0.34	7.89	0.17	35.40	6.62	0.18	0.39	0.35	5.06	4.86
1149	HK1-jd 14 [Kopylova & Hayman, 2008]	No	1421	5.6	32.19	1.28	1.67	0.33	8.26	0.17	33.40	8.42	0.20	0.18	0.49	5.98	5.28
1150	HK1-jd 48 [Kopylova & Hayman, 2008]	No	1534	6.3	34.87	1.18	2.43	0.37	8.97	0.20	31.30	6.53	0.14	0.20	0.65	4.22	7.97
1151	2006-J-03 [15312]	Yes	1285	4.0	41.68	0.81	2.62		7.51	0.12	38.30	7.46		1.14	0.22		
1152	JD51 [12205]	Yes	1213	4.6	20.77	0.89	1.82		6.39	0.19	16.65	25.45	0.10	0.17	0.85		
1153	JD82-2 [12205]	Yes	1284	5.3	28.13	0.71	1.61		6.59	0.16	23.09	16.66	0.19	0.46	0.78		
1154	HK1-jd 61 [Kopylova & Hayman, 2008]	Yes	1326	3.7	30.86	1.11	1.58	0.31	8.11	0.18	38.00	6.94	0.07	0.05	0.53	4.29	6.53
1155	HK1-jd 10 [Kopylova & Hayman, 2008]	Yes	1348	3.9	33.50	0.78	1.71	0.27	7.57	0.15	37.40	5.53	0.11	0.11	0.35	3.67	7.47
1156	HK1-lgs 09 [Kopylova & Hayman, 2008]	Yes	1162	3.2	30.65	0.79	1.45	0.21	6.82	0.15	34.00	10.90	0.07	0.10	0.32	8.21	5.21
1157	HK1-jd 10 [Kopylova & Hayman, 2008]	Yes	1141	2.0	31.65	0.64	2.00	0.24	6.93	0.15	36.90	8.30	0.10	0.12	0.32	6.23	5.18
1158	HK1-jd 69 [Kopylova & Hayman, 2008]	Yes	1257	3.6	32.43	0.82	1.69	0.22	7.19	0.13	35.50	8.16	0.09	0.14	0.36	6.09	5.75
1159	HK1-lgs 011 [Kopylova & Hayman, 2008]	Yes	1306	3.5	32.55	0.78	1.79	0.22	7.64	0.15	37.30	6.82	0.10	0.07	0.39	4.99	5.72
1160	HK1-jd 14 [Kopylova & Hayman, 2008]	Yes	1240	3.2	31.42	0.95	2.04	0.24	7.10	0.15	34.30	8.93	0.13	0.19	0.40	6.49	6.27
1161	HK1-jd 10 [Kopylova & Hayman, 2008]	Yes	1308	3.2	33.36	0.80	2.08	0.27	7.62	0.14	37.80	6.13	0.10	0.10	0.39	4.29	5.39
1162	MPK2-jd 28 [Kopylova & Hayman, 2008]	Yes	1281	4.1	33.86	0.85	1.39	0.22	7.06	0.13	36.40	6.39	0.06	0.16	0.14	5.06	7.41
1163	WBPK-jd 67 [Kopylova & Hayman, 2008]	Yes	1365	3.9	35.36	0.62	2.03	0.47	7.17	0.12	36.50	4.15	0.11	0.17	0.13	3.15	8.09
1164	MPK2/WBPK-lgs 07 [Kopylova & Hayman, 2008]	Yes	1321	3.9	33.40	0.73	1.54	0.24	7.03	0.14	36.50	5.18	0.24	0.24	0.28	3.85	11.00

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1165	296E-A [Kopylova et al., 2007]	Yes	1385	5.3	29.47	1.35	1.82	0.36	7.36	0.17	28.35	11.28	0.09	1.46	0.61	8.27	
1166	296E-B [Kopylova et al., 2007]	Yes	1283	4.5	26.64	1.38	1.73	0.28	6.80	0.17	26.10	15.08	0.12	1.43	0.80	11.35	
1167	296G-A [Kopylova et al., 2007]	Yes	1272	3.9	26.45	1.64	2.33	0.38	6.71	0.17	25.77	14.92	0.11	1.85	0.94	11.16	
1168	296G-C [Kopylova et al., 2007]	Yes	1350	5.2	28.54	1.62	1.60	0.37	7.38	0.18	28.68	12.16	0.09	1.19	0.37	9.29	
	Loc# =73																
1169	SL-5 [12522]	No	1618	5.7	36.01	0.73	2.82		8.47	0.16	34.01	2.17		0.29	0.40	1.77	
1170	SL-6 [12522]	No	1545	4.8	35.58	0.67	2.88		7.73	0.16	34.24	2.87		0.79	0.32		
1171	SL-7 [12522]	No	1587	5.8	34.38	0.76	2.64		8.58	0.16	33.18	3.30		0.19	0.34		
1172	SL-8 [12522]	No	1567	5.2	35.29	0.78	2.90		8.16	0.16	33.29	3.41		0.81	0.47		
1173	SL-9 [12522]	No	1525	5.3	32.26	0.71	2.49		8.25	0.17	32.30	5.50		0.84	0.37		
1174	SL2/1 [12522]	No	1671	6.5	35.58	0.84	2.79		9.24	0.16	33.49	2.04		0.67	0.67		
1175	SL2/2 [12522]	No	1554	4.9	35.24	0.86	3.21		7.68	0.16	32.22	3.28		1.26	0.37		
1176	SL2/3 [12522]	No	1645	5.6	36.54	0.85	3.14		8.31	0.14	33.50	2.01		1.27	0.34		
1177	SL2/5 [12522]	No	1661	5.5	36.60	0.92	3.75		8.62	0.14	32.91	1.71		1.57	0.27	1.64	
1178	SL2/6 [12522]	No	1547	4.8	36.30	0.87	3.20		7.40	0.14	32.71	2.93		1.47	0.37	2.69	
1179	SL2/7 [12522]	No	1583	5.1	34.23	0.86	2.99		8.05	0.15	33.28	3.00		1.26	0.32	3.99	
1180	SL2/7` [12522]	No	1612	5.9	34.93	0.79	2.85		8.47	0.15	31.97	3.67		1.11	0.38		
1181	SL2/8 [12522]	No	1580	5.3	34.51	0.84	3.30		8.40	0.16	31.64	4.03		1.18	0.38		
1182	SL2/9 [12522]	No	1587	5.3	34.53	0.83	3.51		8.45	0.16	30.96	3.86		1.15	0.38		
1183	19 [12522]	No	1513	6.8	40.35	0.68	2.32		6.93	0.14	26.54	5.90		0.70	0.44		
1184	21 [12522]	No	1760	8.2	36.15	0.76	2.92		10.73	0.17	32.38	1.85		0.79	0.22		
1185	22 [12522]	No	1801	11.1	33.67	0.76	2.59		13.25	0.18	31.26	3.06		0.32	0.40		
1186	23 [12522]	No	1707	6.8	35.55	0.75	2.61		9.04	0.15	34.27	1.44		0.77	0.20		
1187	24 [12522]	No	1591	5.9	35.30	0.73	2.51		8.10	0.15	32.36	3.44		0.50	0.34		
1188	25 [12522]	No	1568	5.0	34.75	0.88	3.60		8.05	0.16	30.81	3.87		1.62	0.80		
1189	26 [12522]	No	1517	4.7	34.22	0.85	3.13		7.83	0.16	31.92	4.50		1.45	1.22	2.43	
1190	27 [12522]	No	1635	6.8	34.62	0.78	2.66		9.01	0.14	30.62	4.48		0.94	0.47		
1191	30 [12522]	No	1586	4.7	35.58	0.76	3.14		7.77	0.15	34.65	1.80		1.07	0.33		
1192	31 [12522]	No	1619	5.4	35.88	0.75	3.07		8.43	0.15	34.17	1.72		0.40	0.48		
1193	32 [12522]	No	1718	7.8	34.91	0.74	2.63		10.62	0.15	34.24	1.94		0.26	0.40		
1194	33 [12522]	No	1623	5.8	34.70	0.80	3.38		9.37	0.17	32.60	2.91		0.50	0.58		
1195	34 [12522]	No	1519	4.4	35.36	0.72	3.06		7.66	0.16	34.15	2.65		0.49	0.54		
1196	35 [12522]	No	1477	4.2	36.04	0.85	3.11		6.98	0.15	33.28	2.98		1.50	0.59		
1197	36 [12522]	No	1688	7.2	35.09	0.73	2.97		10.38	0.17	32.42	2.91		0.45	0.54		

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1198	37 [12522]	No	1767	8.2	36.74	0.67	2.61		9.74	0.15	32.34	2.01		1.19	0.25		
1199	38 [12522]	No	1634	5.9	35.62	0.84	2.92		8.49	0.16	32.95	2.40		0.83	0.46		
1200	39 [12522]	No	1525	4.7	35.90	0.79	2.76		7.49	0.16	33.64	2.44		0.30	0.50	1.38	
1201	43 [12522]	No	1525	5.2	37.91	0.78	2.98		6.73	0.14	29.98	3.29		1.30	0.45		
1202	46 [12522]	No	1451	4.9	32.55	0.66	2.89		7.37	0.15	27.77	7.59		0.96	0.89		
1203	47 [12522]	No	1702	6.1	37.72	0.73	2.95		7.95	0.15	33.15	1.33		1.23	0.22		
1204	48 [12522]	No	1746	7.7	36.25	0.76	3.07		10.26	0.16	32.20	1.75		0.94	0.32		
1205	51 [12522]	No	1502	5.6	34.11	0.64	2.82		7.75	0.18	27.72	7.29		0.87	0.53		
1206	54 [12522]	No	1653	5.9	39.93	0.85	3.43		7.28	0.14	31.80	0.64		1.45	0.04		
1207	55 [12522]	No	1487	4.7	35.62	0.82	3.23		7.26	0.15	30.52	4.81		1.36	0.62		
1208	57 [12522]	No	1500	4.7	34.89	0.69	2.72		7.43	0.15	32.93	4.01		1.04	0.70		
1209	58 [12522]	No	1515	4.0	35.67	0.83	4.28		7.56	0.16	32.06	3.07		1.27	0.30		
1210	59 [12522]	No	1688	6.4	35.54	0.76	3.17		9.27	0.15	33.07	2.18		1.35	0.28	3.21	
1211	60 [12522]	No	1663	6.3	34.70	0.78	2.99		9.25	0.15	33.23	2.74		1.27	0.40		
1212	61 [12522]	No	1597	5.6	35.96	0.74	2.92		8.20	0.14	32.34	3.19		1.00	0.71		
1213	63 [12522]	No	1475	4.6	32.86	0.77	3.35		7.82	0.15	28.60	6.90		1.38	1.80		
1214	64 [12522]	No	1607	6.3	32.94	0.70	3.02		9.04	0.16	29.55	5.57		1.15	0.14		
1215	SL-00-1 [12522]	No	1681	6.7	36.30	0.70	2.53		8.90	0.14	34.07	2.21		0.76	0.26	1.90	
1216	SL-00-2 [12522]	No	1658	6.3	35.31	0.77	2.76		8.83	0.15	33.69	2.36		0.84	0.26		
1217	SL-00-3 [12522]	No	1632	6.4	34.36	0.72	2.53		9.10	0.16	33.38	2.94		0.23	0.43	2.04	
1218	SL-00-4 [12522]	No	1513	4.9	33.30	0.81	2.85		7.96	0.18	32.11	4.95		0.87	0.38		
1219	SL-00-5 [12522]	No	1481	4.6	33.69	0.82	2.81		7.62	0.17	32.36	4.95		0.83	0.37		
1220	SL-00-6 [12522]	No	1653	5.8	38.54	0.71	2.58		7.50	0.15	34.04	1.85		1.02	0.30		
1221	SL-00-6L [12522]	No	1680	6.0	39.71	0.74	3.11		7.73	0.14	33.01	1.55		1.31	0.34	0.86	
1222	SL-00-7 [12522]	No	1522	4.9	34.36	0.75	2.65		7.87	0.18	33.66	3.71		0.50	0.31		
1223	SL-31 [12522]	No	1543	4.9	35.56	0.68	2.68		7.64	0.16	34.11	3.03		0.81	0.31	3.21	
1224	28 [12522]	Yes	1417	4.1	30.44	0.72	2.72		7.59	0.15	31.51	7.52		1.06	0.61		
1225	29 [12522]	Yes	1397	4.2	28.28	0.66	2.64		7.46	0.15	28.97	8.79		0.77	0.81		
1226	44 [12522]	Yes	1292	3.2	33.90	0.82	3.48		6.16	0.15	29.95	5.91		1.31	0.89		
1227	53 [12522]	Yes	1364	3.8	29.65	0.72	3.21		6.87	0.18	27.90	8.82		1.03	0.14		
1228	56 [12522]	Yes	1408	4.0	36.48	0.79	2.93		6.51	0.14	33.13	3.17		1.43	0.41		
	Loc# =74																
1229	15-K1A [16916]	No	1548	5.3	34.44	1.63	4.25	0.51	9.15	0.24	27.49	5.45	0.28	0.83	1.14	0.95	11.87
1230	21-K2 [16916]	No	1489	4.8	37.22	0.83	2.98	0.26	8.22	0.16	35.04	6.04	0.16	1.57	0.36	0.37	5.59
1231	48-K1 [16916]	No	1471	4.8	35.15	1.46	4.31	0.49	8.84	0.20	28.30	8.76	0.19	0.88	0.41	0.29	9.61
1232	AK2006 [16916]	No	1699	6.0	37.79	0.70	2.94	0.32	7.67	0.12	32.06	1.50	0.21	0.95	0.30	0.81	13.27
1233	AK2E138 [16916]	No	1505	5.4	39.93	0.59	3.45	0.23	6.68	0.14	26.96	5.79	0.92	1.85	0.38	0.44	10.85

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1234	AK2E179 [16916]	No	1516	4.7	38.86	0.61	3.63	0.25	6.96	0.13	30.61	3.71	0.52	1.62	0.38	0.40	11.34
1235	AK2E466 [16916]	No	1568	5.1	38.38	0.68	3.57	0.25	7.46	0.14	32.04	3.22	0.74	2.04	0.37	0.62	8.30
1236	AK2E347 [16916]	Yes	1401	4.5	36.93	0.67	2.69	0.29	7.91	0.15	34.69	7.38	0.27	0.51	0.49	0.77	6.14
	Loc# =75																
1237	KGF-1 [12199]	No	1445	5.5	25.07	2.87	3.42	0.11	10.34	0.18	22.96	15.01	0.01	0.60	1.78	11.72	4.03
1238	JJG-4323 [12199]	No	1459	5.8	24.96	2.95	3.11	0.12	10.73	0.19	24.33	14.23	0.08	0.39	1.71	10.79	4.83
1239	JAR 31012 [12199]	No	1444	5.9	23.58	2.79	2.62	0.15	10.50	0.19	24.04	15.20	0.07	0.20	1.64	11.19	5.59
	Loc# =76																
1240	HEB-1A [12199]	No	1459	6.1	27.53	3.47	2.90	0.13	10.40	0.16	24.21	14.46	0.15	0.53	1.03	10.09	7.29
1241	HEB-1B [12199]	No	1454	6.0	24.66	3.43	2.83	0.13	10.20	0.17	23.49	13.95	0.08	0.47	1.04	10.09	7.12
1242	JJG-4295 [12199]	No	1395	5.0	26.25	2.21	2.27	0.23	8.71	0.17	28.29	12.52	0.01	0.89	1.37	11.19	4.56
	Loc# =77																
1243	UB-01 [16909]	No	1396	5.4	22.98	3.29	2.35	0.22	9.28	0.20	23.94	16.51		1.12	1.88	10.26	6.04
1244	UB-01B [16909]	No	1423	5.4	27.69	2.17	2.08	0.18	8.74	0.17	29.11	11.07		0.88	1.23	7.00	7.62
1245	UB-02 [16909]	No	1398	5.2	27.31	2.07	1.93	0.21	8.59	0.17	29.58	11.97		0.94	1.30	7.87	6.22
1246	UB-04 [16909]	No	1450	5.7	29.08	2.88	2.39	0.19	8.78	0.16	26.93	11.08		1.44	1.58	5.65	8.62
1247	UB-05B [16909]	No	1402	5.2	27.61	2.95	2.41	0.21	8.64	0.17	25.93	12.84		1.28	2.99	5.94	7.84
1248	UB-06 [16909]	No	1401	5.3	26.99	3.16	2.29	0.22	9.20	0.17	28.24	13.47	0.06	1.01	1.86	7.00	4.33
1249	UB-07 [16909]	No	1412	5.4	27.90	1.95	1.81	0.20	8.63	0.16	30.49	10.94		0.88	1.36	7.19	6.34
1250	UB-08 [16909]	No	1477	6.1	29.33	2.53	2.43	0.20	8.99	0.17	26.08	10.93		1.29	1.53	6.42	7.97
1251	UIN-1 [13070]	No	1458	6.1	24.99	3.80	2.30		10.67	0.25	28.26	12.30	0.20	0.39	2.44	6.53	6.38
1252	UIN-2 [13070]	No	1423	5.8	23.87	3.41	2.49		9.81	0.21	23.95	15.31	0.06	1.06	1.76	9.87	6.67
1253	UB-03 [16909]	Yes	1312	4.7	19.10	3.50	2.19	0.18	9.08	0.19	22.81	21.18	0.07	0.44	3.09	12.80	3.35
1254	UB-05 [16909]	Yes	1310	5.1	19.21	4.07	2.01	0.18	8.73	0.21	17.88	23.69		0.86	5.58	11.06	5.45
	Loc# =78																
1255	K16/6W [12199]	No	1483	5.7	30.23	1.95	2.34	0.23	8.92	0.16	30.67	8.81	0.41	1.08	0.81	6.22	6.55
	Loc# =79																
1256	JJG-3118 [12199]	No	1420	5.4	23.45	2.63	3.19	0.13	10.25	0.20	23.29	16.70	0.17	0.20	0.79	10.19	7.03
1257	JJG-1906 [12199]	No	1436	5.3	24.80	2.54	3.43	0.15	10.33	0.20	25.31	14.31	0.03	0.26	0.33	10.49	5.03
	Loc# =80																
1258	K19/3 [16680]	No	1464	4.3	36.33	3.10	6.85	0.19	8.71	0.17	22.85	8.40	0.11	2.26	1.69		0.92
1259	K19/10 [16680]	No	1490	4.6	36.91	3.02	6.31	0.17	8.75	0.17	23.47	7.66	0.12	2.48	1.52		1.44
	Loc# =81																
1260	MLW 1 [16680]	No	1441	5.1	32.85	0.79	1.86	0.27	7.34	0.13	32.70	6.44		1.16	0.49	4.57	9.26
1261	MLW 3 [16680]	No	1442	4.9	33.64	1.02	2.40	0.25	7.16	0.14	31.08	6.84		1.82	0.46	4.10	9.01
	Loc# =82																
1262	JAR 21022 [16680]	No	1601	6.7	34.69	1.69	2.32	0.24	8.25	0.14	30.82	4.91	0.18	2.24	0.77	3.20	8.71

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1263	SLH 1 [16680]	No	1505	4.6	35.23	1.43	3.19	0.26	7.60	0.14	32.48	3.87	0.04	1.59	0.56	1.60	9.96
1264	SLH 3 [16680]	No	1569	5.9	40.39	1.62	4.11	0.24	7.42	0.10	25.94	5.64	0.05	3.22	0.16	3.20	6.23
1265	SLH 7 [16680]	No	1535	5.4	39.26	1.96	4.28	0.24	8.30	0.14	28.28	6.22	0.37	2.41	0.47		1.82
1266	SLH 9 [16680]	No	1548	6.0	39.97	2.61	3.95	0.23	8.47	0.15	27.80	6.92	0.26	3.00	0.27	0.26	4.74
1267	SLH 10 [16680]	No	1468	4.3	35.05	1.64	3.71	0.27	7.58	0.14	31.49	4.51	0.19	1.40	0.56	1.50	10.87
1268	SLH 11 [16680]	No	1481	4.4	34.30	1.61	3.47	0.28	7.45	0.14	31.28	4.23	0.26	1.56	0.57	2.25	10.63
	Loc# =83																
1269	K23/3 [16680]	No	1577	5.7	31.98	2.55	3.87	0.35	9.10	0.18	25.68	6.35	0.39	3.03	1.90	3.86	9.59
	Loc# =84																
1270	1 [16815]	No	1586	6.7	34.66	3.37	3.26	0.29	9.67	0.17	27.40	6.62	0.34	1.99	0.46		
	Loc# =85																
1271	L184-1 [13832]	No	1447	6.0	29.87	2.04	1.42	0.29	7.94	0.14	31.86	6.65	0.02	0.27	0.26	8.82	
1272	L230-4 [13832]	No	1512	7.5	30.40	1.51	1.34	0.23	8.58	0.11	30.46	8.28	0.04	0.33	0.24	12.67	
1273	L221-1 [13832]	Yes	1342	5.6	28.58	1.84	1.49	0.25	7.37	0.11	27.20	12.51	0.01	0.45	0.48	9.49	
1274	L221-5 [13832]	Yes	1436	6.0	29.65	1.70	1.71	0.30	8.16	0.28	29.63	9.31	0.04	0.36	0.22	7.42	
1275	L221-6 [13832]	Yes	1179	4.0	28.69	1.98	1.52	0.28	6.17	0.27	28.34	12.07	0.05	0.38	0.26	9.52	
1276	L221-8 [13832]	Yes	1311	4.8	31.88	2.01	1.49	0.28	6.78	0.18	31.59	7.29	0.05	0.35	0.29	5.99	
1277	L230-2 [13832]	Yes	1431	5.6	27.68	2.32	2.13	0.35	8.69	0.17	28.41	10.30	0.05	0.37	0.47	8.63	
1278	L230-3 [13832]	Yes	1448	6.8	28.71	1.59	1.34	0.21	8.28	0.12	29.15	10.40	0.05	0.42	0.25	6.49	
1279	L230-5 [13832]	Yes	1360	5.1	23.25	2.37	2.42	0.38	8.44	0.20	23.18	16.59	0.06	0.42	0.39	8.81	
	Loc# =86																
1280	RD-11646 [21051]	No	1486	4.7	33.56	1.14	2.40	0.28	7.86	0.11	34.72	4.56	0.07	1.03	0.35	2.64	
1281	R2-6 [13832]	No	1552	6.9	31.75	1.26	1.77	0.31	9.07	0.19	32.62	6.44	0.02	0.47	0.24	4.72	
1282	R2-10 [13832]	No	1523	6.4	31.58	1.15	2.01	0.30	8.79	0.18	31.01	6.96	0.08	0.18	0.36	5.32	
1283	R2-17 [13832]	No	1470	5.2	32.73	1.21	2.73	0.28	8.05	0.16	29.83	7.75	0.06	1.01	0.45	5.15	
1284	R3-6 [13832]	No	1472	4.6	32.69	1.28	2.65	0.29	8.01	0.13	33.27	5.91	0.04	1.30	0.51	3.81	
1285	R3-14 [13832]	No	1451	4.7	34.49	0.91	2.38	0.26	7.28	0.11	33.30	5.00	0.06	1.10	0.35	3.51	
1286	R3-15 [13832]	No	1523	4.9	34.51	1.21	3.20	0.27	8.03	0.14	32.24	4.61	0.09	1.31	0.23	3.09	
1287	R5-1 [13832]	No	1466	5.0	31.64	0.90	2.64	0.26	8.08	0.14	30.64	7.90	0.03	1.07	0.45	5.48	
1288	R7-2 [13832]	No	1557	6.9	31.51	0.68	2.06	0.30	9.13	0.12	30.31	7.91	0.03	0.76	0.32	5.99	
1289	R7-3 [13832]	No	1463	4.8	31.90	0.74	2.11	0.30	7.85	0.13	33.60	6.03	0.02	0.84	0.34	4.37	
1290	R9-2 [13832]	No	1545	6.2	33.87	1.03	2.06	0.29	8.44	0.12	33.22	4.78	0.03	0.30	0.21	3.51	
1291	R9-3 [13832]	No	1480	6.0	30.76	1.13	2.02	0.30	8.40	0.13	29.98	8.76	0.02	0.70	0.36	6.46	
1292	R2-13 [13832]	No	1475	4.4	37.55	0.84	4.56	0.22	6.92	0.16	28.16	5.08	0.19	2.45	0.33	3.09	
1293	R6-1 [13832]	No	1442	4.3	42.34	0.90	7.23	0.18	6.97	0.13	22.19	9.21	0.54	4.55	0.57	0.40	
1294	RD-R2-3 [21051]	Yes	1405	4.7	30.54	1.09	1.79	0.26	7.97	0.12	34.02	7.34	0.07	0.42	0.35	5.10	
1295	RD-R3-07 [21051]	Yes	1302	3.3	30.51	0.86	2.34	0.25	6.75	0.12	32.62	7.34	0.07	0.88	0.26	5.42	

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1296	RD-H5 [21051]	Yes	1435	6.4	28.93	2.05	1.55	0.29	8.40	0.23	28.96	10.50	0.02	0.38	0.38	7.77	
1297	R1-1 [13832]	Yes	1420	4.2	33.52	0.73	2.44	0.29	8.08	0.15	35.75	6.65	0.07	0.84	0.48	2.71	
1298	R1-2 [13832]	Yes	1380	3.8	34.61	0.77	2.70	0.29	7.92	0.15	36.37	7.66	0.15	1.16	0.16	0.40	
1299	R1-3 [13832]	Yes	1412	4.1	31.73	0.74	2.47	0.27	7.63	0.14	33.75	7.81	0.05	1.62	0.25	4.99	
1300	R2-3 [13832]	Yes	1396	4.5	30.46	1.08	1.74	0.27	8.04	0.12	34.96	7.04	0.02	0.34	0.36	5.57	
1301	R2-4 [13832]	Yes	1399	5.0	30.36	1.08	1.73	0.27	7.58	0.21	32.45	7.68	0.08	0.50	0.04	7.03	
1302	R2-5 [13832]	Yes	1204	4.4	26.53	1.18	1.85	0.27	6.12	0.10	21.71	19.06	0.04	0.52	0.48	13.86	
1303	R2-7 [13832]	Yes	1377	4.3	34.02	0.89	2.13	0.24	6.99	0.11	33.65	5.55	0.05	0.68	0.22	4.04	
1304	R2-8 [13832]	Yes	1425	5.2	31.34	1.54	2.44	0.35	7.99	0.17	29.25	8.83	0.04	0.45	0.36	6.40	
1305	R2-09 [13832]	Yes	1272	4.2	33.16	1.17	2.05	0.28	6.32	0.11	29.73	8.45	0.06	0.76	0.36	6.48	
1306	R2-11 [13832]	Yes	1195	3.9	31.19	1.13	1.82	0.31	6.13	0.10	28.92	10.84	0.06	0.44	0.35	7.91	
1307	R2-12 [13832]	Yes	1359	4.0	35.00	0.94	2.83	0.25	6.77	0.14	31.66	5.80	0.07	0.89	0.52	3.79	
1308	R2-16 [13832]	Yes	1409	4.0	33.42	0.93	2.99	0.24	7.27	0.13	32.29	6.30	0.08	1.38	0.47	4.36	
1309	R2-19 [13832]	Yes	1301	3.1	32.13	0.80	2.47	0.24	6.53	0.17	33.85	5.28	0.07	0.86	0.11	4.52	
1310	R3-1 [13832]	Yes	1243	3.4	26.98	2.10	1.63	0.25	6.95	0.18	32.02	9.09		0.42	0.35	7.42	
1311	R3-2 [13832]	Yes	1358	4.4	29.35	1.01	1.57	0.26	7.77	0.17	34.14	8.56		0.53	0.24	7.15	
1312	R3-3 [13832]	Yes	1381	4.2	28.97	1.21	1.91	0.28	7.81	0.13	33.63	7.82	0.02	0.73	0.34	5.67	
1313	R3-4 [13832]	Yes	1420	4.5	31.90	1.13	2.39	0.27	7.52	0.13	32.24	6.97	0.03	1.10	0.36	4.92	
1314	R3-5 [13832]	Yes	1364	5.1	31.73	1.10	2.02	0.26	7.15	0.15	28.12	10.39	0.04	0.75	0.54	8.06	
1315	R3-07 [13832]	Yes	1232	2.8	30.55	0.88	2.25	0.27	6.42	0.12	32.92	7.59	0.06	0.94	0.34	6.08	
1316	R3-08 [13832]	Yes	1257	3.1	28.84	0.89	1.83	0.26	6.84	0.13	33.22	8.31	0.08	0.51	0.19	7.09	
1317	R3-09 [13832]	Yes	1358	3.9	32.00	0.88	2.53	0.25	7.11	0.12	32.30	7.19	0.06	0.78	0.19	6.05	
1318	R3-10 [13832]	Yes	1212	3.8	30.59	1.11	1.90	0.26	6.31	0.10	28.56	11.41	0.10	0.39	0.93	8.06	
1319	R3-11 [13832]	Yes	1289	4.0	34.79	1.11	2.69	0.25	6.36	0.13	29.43	8.00	0.08	1.02	0.47	5.44	
1320	R3-17 [13832]	Yes	1334	3.4	33.97	0.96	1.96	0.32	6.96	0.07	36.95	4.18	0.11	0.72	0.19	3.12	
1321	R4-2 [13832]	Yes	1358	4.7	30.59	1.10	2.17	0.26	7.39	0.10	29.58	10.35	0.06	0.69	0.51	7.10	
1322	R4-4 [13832]	Yes	1394	5.2	25.03	1.59	2.44	0.37	8.46	0.23	25.22	14.58	0.03	0.87	0.07	12.47	
1323	R4-5 [13832]	Yes	1405	4.7	29.84	1.05	1.63	0.26	7.75	0.14	34.08	7.07	0.01	0.66	0.24	8.78	
1324	R4-7 [13832]	Yes	1400	4.6	31.32	0.64	2.16	0.22	7.35	0.16	31.19	8.02	0.06	0.83	0.51	6.25	
1325	R4-8 [13832]	Yes	1408	5.2	29.39	1.12	1.81	0.27	7.94	0.14	31.32	8.84	0.05	0.39	0.27	7.07	
1326	R4-9 [13832]	Yes	1376	4.6	29.76	1.04	1.87	0.25	7.57	0.15	31.51	8.56	0.05	0.42	0.69	6.56	
1327	R4-10 [13832]	Yes	1337	4.4	28.00	1.06	1.72	0.26	7.39	0.16	31.04	9.71	0.05	0.47	0.43	8.63	
1328	R4-11 [13832]	Yes	1352	4.0	28.20	1.27	2.72	0.28	7.12	0.21	27.84	10.34	0.20	1.11	0.60	11.76	
1329	R5-2 [13832]	Yes	1299	4.1	27.51	0.92	2.32	0.21	7.22	0.11	27.15	13.44	0.03	0.40	0.67	9.92	
1330	R5-3 [13832]	Yes	1392	4.3	31.00	1.13	3.10	0.29	7.72	0.14	29.33	9.59	0.07	1.05	0.54	6.53	
1331	R8-2 [13832]	Yes	1450	6.0	31.56	0.92	2.28	0.28	8.31	0.10	26.67	11.43	0.05	0.37	0.42	8.26	
1332	R9-1 [13832]	Yes	1329	5.2	30.46	0.85	1.61	0.28	7.06	0.15	28.37	11.46	0.01	0.26	0.24	8.82	

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1333	H-1 [13832]	Yes	1215	3.6	25.74	1.45	2.17	0.20	6.53	0.12	25.99	15.31	0.15	0.61	0.70	13.22	
1334	H-2 [13832]	Yes	1240	3.5	24.71	1.70	1.84	0.25	7.13	0.14	29.10	13.48	0.10	0.55	0.63	14.34	
1335	H-3 [13832]	Yes	1394	4.5	27.28	1.58	1.95	0.23	7.20	0.13	29.87	7.64	0.10	0.99	0.07	15.00	
1336	H-4 [13832]	Yes	1306	3.8	28.41	1.60	2.40	0.23	7.09	0.14	29.27	10.79	0.19	0.90	0.49	11.42	
1337	H-5 [13832]	Yes	1442	6.5	28.56	1.86	1.57	0.28	8.51	0.23	28.85	10.71	0.06	0.36	0.38	8.63	
1338	R2-1 [13832]	Yes	1281	5.2	35.92	1.21	2.13	0.30	6.01	0.25	22.35	13.07	0.06	0.59	0.61	9.34	
1339	R2-14 [13832]	Yes	1412	5.7	35.00	0.84	2.58	0.23	6.81	0.24	23.58	11.18	0.16	1.69	0.56	7.96	
1340	R2-15 [13832]	Yes	1332	5.7	32.15	1.01	2.02	0.22	6.44	0.19	21.62	15.11	0.12	1.34	0.60	10.88	
1341	R3-12 [13832]	Yes	1319	3.7	40.97	0.81	6.61	0.18	6.10	0.12	23.86	9.62	0.27	3.52	0.51	0.99	
1342	R4-1 [13832]	Yes	1327	6.6	35.81	0.78	1.53	0.22	6.28	0.09	21.09	15.18	0.09	0.43	0.32	11.03	
1343	R4-3 [13832]	Yes	1228	5.1	31.38	1.21	2.08	0.26	5.71	0.19	18.72	18.90	0.07	1.01	0.37	13.81	
1344	R5-4 [13832]	Yes	1331	3.8	33.69	1.01	5.04	0.23	6.33	0.12	20.79	12.20	0.24	1.94	0.70	7.95	
	Loc# =87																
1345	BD 857 [12200]	No	1463	5.4	26.82	1.67	2.65		11.08	0.24	33.16	11.03	0.05	0.01	1.68	4.42	5.43
1346	BD 864 [12200]	Yes	1352	4.4	19.88	1.86	3.20		9.81	0.25	23.33	18.93	0.04	0.03	2.20	14.24	4.62
1347	BD 853 [12200]	Yes	1326	4.3	17.38	1.78	2.87		9.73	0.23	22.76	21.27		0.01	2.19	14.51	5.92
	Loc# =88																
1348	4095-16 [19486]	No	1725	8.7	41.81	3.49	3.85		11.83	0.18	24.55	3.67	0.13	0.02	0.21	3.66	5.90
1349	4095-X [19486]	Yes	1595	5.5	36.86	3.36	7.44		10.76	0.18	20.83	7.99	0.53	4.20	0.22	2.55	4.60
	Loc# =89																
1350	KD-79 DZA [14071]	No	1591	7.2	32.21	1.59	2.77		10.02	0.19	26.63	8.84	0.08	1.51	0.97	4.03	9.17
1351	KD-79 DZB-1 [14071]	No	1687	8.5	31.35	2.20	2.69		12.75	0.22	31.51	5.52	0.11	1.65	0.81	2.36	7.03
1352	KD-79 DZB-2 [14071]	No	1622	6.8	32.44	2.31	3.77		11.46	0.19	27.01	8.97	0.12	3.62	1.70	2.61	4.12
1353	KD-79 DZB-3 [14071]	No	1710	8.0	32.51	1.67	2.45		10.39	0.14	32.28	3.40	0.06	1.91	0.17	2.92	10.14
1354	KD-80 1 [14071]	No	1558	7.4	29.48	2.52	2.20		9.77	0.20	26.70	9.47		1.22	0.52	4.89	10.44
1355	KD-80 7 [14071]	No	1581	8.0	30.06	1.78	2.13		9.94	0.27	25.35	10.13		1.07	0.79	5.33	11.23
1356	KD-80 8 [14071]	No	1722	8.9	31.80	2.09	2.23		11.06	0.16	32.40	3.25		1.45	0.08	2.75	10.57
1357	KD-80 14-1 [14071]	No	1560	9.3	30.41	1.89	1.17		8.88	0.17	28.44	9.76		0.99	0.43	6.98	8.70
1358	KD-80 14-2 [14071]	No	1613	8.4	31.42	1.87	1.77		9.38	0.17	28.84	6.84		1.00	0.47	5.74	8.71
1359	KD-81 DP-1 [14071]	No	1591	8.7	31.46	2.21	1.75		9.79	0.16	27.98	8.95		0.93	0.43	4.87	9.34
1360	KD-81 BS-1 [14071]	No	1599	7.2	29.94	1.47	2.03		9.31	0.14	30.04	6.27		1.26	0.48	5.75	10.70
1361	KD-81 DP-2 [14071]	No	1613	8.5	30.91	2.07	1.83		9.69	0.17	28.49	7.92		1.38	0.25	7.05	8.74
1362	KD-81 DP-3 [14071]	No	1574	7.3	29.42	1.96	1.98		10.05	0.17	31.03	8.22	0.05	1.48	0.38	8.57	8.59
1363	KD-81 DP-4 [14071]	No	1607	7.8	30.96	2.76	2.43		10.11	0.21	26.73	8.43		2.01	0.42	6.85	7.24
1364	KD-81 DZB [14071]	No	1710	9.3	31.54	1.75	1.77		10.68	0.17	33.49	3.84		1.23	0.24	2.52	10.96
1365	KD-79 KIA [14071]	No	1563	7.6	36.26	1.79	2.21		8.15	0.15	25.53	7.82	0.14	0.94	0.24	3.38	10.58
1366	KD-79 KIR [14071]	No	1666	7.4	32.24	1.93	3.02		10.89	0.17	30.29	6.08	0.17	2.71	0.27	2.80	7.31

Supplementary Table S4 continued

Sample No.	Sample ID with citation[$]	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1367	KD-81 BLOW-1 [14071]	No	1573	6.8	30.50	1.56	2.23		9.23	0.18	29.89	6.86	0.13	1.17	0.51	5.11	10.35
1368	KD-81 2-3 [14071]	No	1527	7.2	31.02	1.62	2.04		9.50	0.16	27.88	10.62	0.10	0.89	0.97	5.10	8.12
1369	OYE [14071]	No	1478	5.5	28.45	1.04	2.45		8.65	0.15	28.91	9.66	0.89	1.10	1.66	5.81	8.93
1370	KD-79 KINBA [14071]	No	1578	3.8	40.01	0.36	9.10		8.70	0.01	24.67	2.09	0.46	0.25	0.34	0.12	16.47
	Loc# =90																
1371	W K1 48015 [12163]	No	1655	8.5	32.41	2.58	2.77		11.11	0.37	24.54	7.24		1.18	0.60		
1372	W K1 48024 [12163]	No	1598	6.6	34.91	2.56	4.25		10.14	0.22	22.67	7.87	0.01	1.84	0.40		
1373	W K3 48067 [12163]	No	1695	8.2	36.31	3.16	4.44		12.83	0.38	22.24	5.91		1.25	0.56		
1374	W K2 48025 [12163]	Yes	1476	5.9	33.06	1.85	2.93		8.14	0.21	25.29	10.20		1.35	0.36		
	Loc# =91																
1375	63 [12703]	No	1652	6.9	37.94	3.86	5.42		10.51	0.14	19.34	6.59	1.09	4.19	1.10		
	Loc# =92																
1376	LI5974 [18092]	No	1689	10.2	32.37	4.59	2.44		13.69	0.19	30.33	7.26	0.28	1.58	0.32	2.94	3.52
1377	LI5962 [18092]	No	1676	10.4	30.88	4.72	2.43		13.51	0.19	26.98	9.55	0.24	1.79	0.49	4.20	3.66
1378	211383 [18092]	No	1625	8.5	30.06	3.91	3.52		13.54	0.13	22.14	13.83	0.21	2.42	0.86	6.56	0.88
1379	5508 [16833]	No	1602	7.0	31.18	2.57	3.38		11.03	0.18	26.00	9.78	0.28	2.84	0.44	8.29	3.59
1380	5607 [16833]	No	1651	7.9	32.42	3.88	3.77		13.25	0.19	26.63	8.04	0.26	2.10	0.25	5.88	3.16
1381	5699 [16833]	No	1628	8.7	31.33	3.80	2.47		12.48	0.18	28.91	9.44	0.12	1.88	0.49	5.31	3.34
1382	5932 [16833]	No	1643	10.2	30.30	3.36	1.72		12.27	0.27	30.84	9.49	0.11	1.40	0.32	6.67	3.82
1383	5966 [16833]	No	1640	8.9	29.98	3.82	2.37		12.06	0.18	27.49	8.34	0.25	1.58	0.41	9.61	3.29
1384	5973 [16833]	No	1635	8.5	32.98	4.07	3.50		13.30	0.20	23.24	12.02	0.17	2.27	0.91	2.72	3.86
1385	5997 [16833]	No	1660	8.9	30.78	4.67	2.64		12.94	0.18	29.33	7.09	0.35	2.00	0.34	6.10	3.51
1386	5999A [16833]	No	1657	8.9	33.06	4.36	3.34		13.58	0.20	25.01	10.16	0.31	2.12	0.50	3.78	3.12
	Loc# =93																
1387	1 [16888]	No	1568	6.0	31.56	2.10	4.92		10.85	0.21	21.36	11.79	0.11	3.16	1.16	4.44	6.67
1388	2 [16888]	No	1579	6.2	33.80	1.80	4.40		10.39	0.21	23.40	10.20	0.14	2.80	1.00	3.90	6.40
1389	3 [16888]	No	1578	6.6	36.40	3.31	4.50		8.98	0.20	20.70	8.09		3.70	0.70	4.90	7.80
1390	4 [16888]	No	1531	5.5	32.22	1.63	3.42		9.23	0.17	27.98	8.52	0.10	2.33	2.15	3.70	7.17
1391	5 [16888]	No	1603	6.8	32.70	1.60	3.40		9.44	0.17	24.30	9.00	0.09	3.10	0.96	6.40	7.37
1392	H009A [15208]	No	1466	4.7	36.89	0.48	4.53		8.52	0.15	29.27	9.62	1.52	1.18	0.61	1.25	4.87
	Loc# =94																
1393	IM8-98 [17821]	No	1583	5.5	31.67	2.83	3.90		10.69	0.28	33.31	2.37	0.12	0.16	0.54		
1394	IM16-98 [17821]	No	1581	6.4	30.86	3.11	3.81		11.54	0.24	27.62	6.82	0.06	0.65	0.75		
1395	IM21A-98 [17821]	No	1565	7.2	30.20	2.62	2.49		10.57	0.18	29.26	8.76	0.15	0.91	0.16		
1396	IM21B-98 [17821]	No	1577	7.4	30.93	2.89	2.94		11.17	0.21	28.91	8.28	0.11	1.33	0.14		
1397	IM21C-98 [17821]	No	1592	7.3	30.44	2.77	2.71		10.85	0.18	28.95	8.04	0.12	1.23	0.22		
1398	IM28-98 [17821]	No	1578	7.1	30.08	2.76	2.69		10.85	0.19	29.11	8.62	0.10	1.24	0.20		

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1399	IM60-97 [17821]	No	1621	7.8	31.76	2.60	2.62		10.77	0.19	28.42	6.46		0.58	0.33		
1400	IM16-5 [17821]	No	1665	8.1	33.80	3.00	2.80		10.82	0.18	28.60	5.10	0.05	1.40	0.35	1.70	
1401	IM21-1 [17821]	No	1518	6.2	29.90	4.00	4.00		11.16	0.19	23.10	13.20	0.07	1.80	0.30	13.00	
1402	IM15-97 [17821]	No	1568	7.6	30.20	2.36	2.34	0.20	10.13	0.23	25.92	10.11		1.21	0.78		
1403	IM16-97 [17821]	No	1606	7.0	33.48	2.56	3.08	0.20	10.40	0.22	29.12	5.28		0.40	0.41		
1404	IM21-98 [17821]	No	1601	7.6	31.93	2.56	2.54	0.20	10.64	0.18	28.82	7.72		1.04	0.21		
1405	IM24-98 [17821]	No	1617	7.3	33.01	2.64	2.91	0.21	10.71	0.29	29.28	5.32		0.52	0.58		
1406	IM27-98 [17821]	No	1620	7.8	33.20	2.64	3.18	0.23	11.27	0.21	28.54	5.20		0.91	0.36		
1407	IM47-98 [17821]	No	1632	8.2	32.36	2.40	2.85	0.20	11.04	0.20	27.89	5.72		1.48	0.63		
1408	IM51-98 [17821]	No	1539	6.5	33.29	2.57	3.80	0.18	11.16	0.21	27.59	8.88		0.45	0.32		
1409	IM16-5 [16829]	No	1658	8.0	33.60	3.00	2.80	0.14	10.73	0.18	28.40	5.10	0.05	1.40	0.35	1.70	
	Loc# =95																
1410	SK-3 [18873]	Yes	1515	7.5	28.27	2.44	1.73	0.17	10.15	0.18	28.86	10.51	0.21	0.05	1.27		
1411	SK-1C [17047]	Yes	1253	4.4	35.05	1.21	1.75		7.10	0.12	32.34	10.75	0.01	0.14	1.05		
1412	SK-1D [17047]	Yes	1196	3.7	32.76	1.53	1.53		7.28	0.13	34.17	11.74	0.01	0.03	1.58		
1413	SK-1E [17047]	Yes	1170	3.9	32.49	1.54	1.48		6.86	0.14	32.40	12.61	0.02	0.05	1.33		
1414	SK-2B [17047]	Yes	1157	3.4	34.17	1.41	2.58		6.39	0.11	28.67	13.73	0.01	0.04	0.93		
1415	SK-1-1(H) [18934]	Yes	1122	2.0	26.18	3.72	3.13		6.96	0.14	31.26	12.34	0.01	0.13	1.58		
1416	SK-1 [17617] [17619]	Yes	1519	7.0	28.40	2.00	2.20		10.44	0.20	27.50	12.70	1.00	1.20	2.30		
	Loc# =96																
1417	K3-2 [15288]	Yes	1231	3.7	24.61	0.61	1.59		6.77	0.17	27.35	14.00		0.15	1.52		
1418	K4-5-1 [15288]	Yes	1400	5.2	30.28	1.16	1.77		7.24	0.23	30.50	10.10	0.11	1.93	0.06		
1419	K5-463 [15288]	Yes	1392	4.8	32.09	0.66	1.83		6.61	0.33	30.70	6.82		1.43	0.71		
1420	K6-10-2 [15288]	Yes	1538	6.9	30.55	4.64	2.32		9.15	0.51	28.10	7.54		2.17			
1421	K6-15-5 [15288]	Yes	1514	5.7	28.48	3.09	3.22		9.64	0.37	26.92	9.96	0.12	2.24	0.77		
1422	K10-10-2 [15288]	Yes	1427	6.0	26.93	2.42	2.38		7.85	0.19	21.27	15.06		2.27	0.56		
1423	K11-2-2 [15288]	Yes	1485	6.9	27.93	1.05	1.67		8.29	0.20	25.47	11.49		0.91	0.71		
1424	K12-13-1 [15288]	Yes	1113	3.5	21.83	1.10	0.96		6.14	0.29	27.01	15.85		0.02	0.16		
1425	K12-12-1 [15288]	Yes	1104	3.3	21.61	1.11	1.00		6.17	0.29	27.28	16.00		0.01	0.16		
1426	K13-13-1 [15288]	Yes	1221	4.0	23.02	1.39	1.17		6.92	0.33	28.82	13.27	0.10	0.03	0.40		
1427	K14-11 [15288]	Yes	1161	3.6	28.75	0.78	1.02		6.44	0.15	32.12	10.44		0.01	0.63		
1428	K4-2 [15288]	Yes	1388	5.2	30.91	1.27	1.71		7.37	0.23	31.48	10.29	0.14	1.88	0.03		
1429	K10-8-7 [15288]	Yes	1563	8.0	28.78	2.82	2.40		10.22	0.19	25.20	9.29		1.84	0.62		
1430	K13-3-1 [15288]	Yes	1419	8.0	31.40	1.53	0.45		7.00	0.21	34.27	5.17		0.08	0.02		
	Loc# =97																
1431	NK3-K1 [12232]	Yes	1254	4.3	19.85	2.06	2.20		7.06	0.14	19.97	21.58	0.19	1.00	0.64	22.78	1.43
1432	NK3-K2 [12232]	Yes	1328	4.2	25.05	2.15	2.81		8.13	0.16	26.12	15.34	0.14	0.66	0.64	12.68	5.00

Supplementary Table S4 continued

Sample No.	Sample ID with citation$	Lithosphere modified*	T (°C)	P (GPa)	SiO_2 (wt%)	TiO_2	Al_2O_3	Cr_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	CO_2	H_2O
1433	NK3-K3 [12232]	Yes	1266	4.3	23.21	1.62	2.03		6.99	0.15	23.07	17.57	0.06	0.55	0.92	17.10	5.07
1434	NK3-K4 [12232]	Yes	1267	4.6	22.72	1.73	1.90		7.32	0.14	23.03	18.90	0.09	0.30	0.83	13.19	8.55
1435	NK3-K5 [12232]	Yes	1274	4.5	23.62	1.51	1.64		7.26	0.15	25.59	16.61	0.10	0.59	0.85	20.96	

$ Contents in brackets are citation ID's from GEOROC, except for those with specific references[50–53]

* Lithosphere modification with respect to major element compositions of kimberlite samples

Supplementary Table S5. Conditions for contour calculations (a1-a4) shown in Figure 2 of the main text

Name	Θ$	MgO (wt%)	Φ$	*T* (°C)
a1	0.5	25	2300	1600
a2	0.5	15	2300	1600
a3	-0.5	25	2300	1600
a4	-0.5	15	2300	1600

$ Θ and Φ are parameters in equation (3)

Supplementary Table S6. Conditions and sources of the reference experiments shown in Figure 4 of the main text

				Melt composition$ (wt%)					
Reference	**Run No.**	***P*** **(GPa)**	***T*** **(°C)**	**SiO_2**	**Al_2O_3**	**CO_2**	**H_2O**	**Melt Mg#**	**Olivine Mg#**
Dasgupta et al. (2013)[4]	M379	4	1450	44.93	6.99	12.8	0.0	77.2	90.8
Stamm & Schmidt (2017)[2]	JER16-74	7	1400	30.54	1.99	13.2	8.7	83.1	92.6

$ SiO_2 and Al_2O_3 contents in the experimental melts are on the volatile-free basis

Supplementary Table S7. Average compositions of slab-derived carbonatites and cratonic peridotites

Oxide (wt%)	Slab carbonatite$	Cratonic mantle#
SiO_2	5.17	44.25
TiO_2	0.8	0.11
Al_2O_3	0.99	1.26
Cr_2O_3	0.03	0.48
FeO	8.29	7.70
MnO	0.3	0.1
MgO	8.2	44.8
CaO	28.7	1.1
Na_2O	4.3	0.1
K_2O	1.1	0.16
NiO	0	0.45
CO_2	42.13	0
H_2O	0	0
P_2O_5	0.72	0.041

$ Averaged composition of partial melts derived from carbonated eclogites in experimental studies[54–57]

Averaged composition of peridotite xenoliths at cratonic settings from GEOROC ((http://georoc.mpch-mainz.gwdg.de/georoc/)

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