

Establishing the eruption ages and plutonic–volcanic connection of the Keetley Volcanic deposits and the Wasatch Intrusive Belt, UT with zircon petrochronology

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The Keetley Volcanic (KV) deposits, Snyderville Basin, UT, are thought to be the extrusive equivalents of the Wasatch Intrusive Belt (WIB), but the connection to specific intrusions remains unclear. The WIB includes Clayton Peak, Alta, six Eastern, and Bingham stocks and the Cottonwood suite. Most of the WIB and KV now crop out in a 20° eastward tilted crustal section ranging from ~11 km depth adjacent to the Wasatch Fault to the paleosurface and were emplaced from ~39–25 Ma. Previous U-Pb zircon dates from the KV (36–34 Ma) are concurrent with the Eastern, Clayton Peak, and Alta stocks and Corner Canyon phase of the Cottonwood Suite. New U-Pb zircon petrochronology from six KV samples from the basal contact through the structurally highest preserved lava flow, spanning basalt to dacite, yielded 41–32.5 dates. Interpreted eruption ages are 37.1, 34.3, 33.1, 33.2, 32.7, and 32.3 Ma (± 1.0 Ma). Ti-in-zircon thermobarometry records two groupings of apparent temperatures: 650–850 °C (lower four samples) and 850–950 °C (upper basalt flows). These new eruption dates record ~7 Myr of volcanic activity associated with the WIB, ~2 Myr older and younger than previously known. The stratigraphically lowest basal tuff predates the majority of the WIB intrusions except the most distal Bingham stock (~38 Ma). The 33.1 Ma Coyote Canyon flow is consistent in age and bulk composition with the Alta and Eastern stocks. The 32.3 and 32.7 Ma Neel Hollow and Francis lava flows are younger than the Eastern stocks, and although they overlap in age with the Alta and the earliest Cottonwood suite, neither the lava bulk or zircon compositions match the chemistry of those units. The 37.1 Ma basal tuff is interpreted to have erupted from Bingham stock. Importantly, there is no preserved KV sample that overlaps with the Cottonwood Suite, the most voluminous (minimum ~750 km³) and long lived (~11 Myr) intrusion in the WIB. The lack of extrusive equivalent suggests a tenuous connection between large silicic intrusive suites and transmission of magma to the surface of the Earth. Zircon petrochronology from a wide range of compositions records protracted eruptions from ~37 to 32.5 Ma, which have complex relationships to the intrusive rocks of the WIB.