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Paper No. 5-21

Presentation Time: 9:00 AM-1:00 PM

**RECONSTRUCTING THERMOBAROMETRIC GRADIENTS IN THE  
NORTHWESTERN TETHYAN HIMALAYA: TESTING THE LITHOSTATIC  
PRESSURE PARADIGM**

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Here, we use multi-method thermobarometric analyses (thermodynamic modelling, quartz in garnet barometry, Raman spectroscopy of carbonaceous material (RSCM) thermometry, and titanium in biotite thermometry) from samples throughout two transects in the Northwestern Tethyan Himalaya (TH) to constrain the pressure-temperature conditions of the basal TH. Peak metamorphic conditions from the basal TH indicate anomalously high pressures relative to the paleogeothermal gradients recorded along the two transects, suggesting non-lithostatic pressure conditions at the base of the Tethyan Himalaya.

The TH fold-thrust belt comprises a deformed Neoproterozoic-Cretaceous section of sedimentary rocks that record the early stages of deformation of the Himalayan orogen. In the northwestern Himalaya, rocks at the base of the TH are metamorphosed and are useful for reconstructing the thermal evolution of the Himalaya during initial stages of crustal thickening.

RSCM thermometry on samples along the Pin Valley and Sutlej Valley transects of the TH suggest a continuous ~1500 °C/GPa thermobarometric gradient through the entire TH section. These samples are from a continuous ~10-12 km-thick TH section in which the stratigraphically highest units are undeformed, fossil-bearing sedimentary rocks. Assuming lithostatic pressure, the basal TH is expected to record peak pressure-temperature (P-T) conditions of ~0.4-0.5 GPa and ~600 °C. However, quartz-in-garnet (QuiG) barometry and titanium-in-biotite thermometry of samples from the basal TH indicate peak P-T conditions of  $0.94 \pm 0.25$  GPa and ~600°C, suggesting a paleo-geothermal gradient of 870-500 °C/GPa. These data constitute unexpectedly high peak pressure conditions along the basal TH.

Possible explanations for these anomalously high basal TH pressures include pre-Himalayan metamorphic assemblages preserved in the TH resulting in erroneous Himalayan peak P-T estimates, or regional non-lithostatic pressure along the basal TH during Himalayan orogenesis. Thermobarometric work on samples from different stratigraphic levels of the basal TH in the Sutlej Valley is in progress to determine paleo-geothermal gradient continuity both across- and along-strike of the orogen.

Session No. 5--Booth# 42

[D1. General Geology \(Posters\)](#)

Sunday, 17 March 2024: 9:00 AM-1:00 PM

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