Contrasting Dome Formation along the Southern Margin of the Tibetan Plateau: Leo Pargil Dome and Ama Drime Massif, India/Tibet

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Domes that record the onset of orogen-parallel extension (e.g. Murphy and others, 2002) along the southern margin of the Tibetan plateau were exhumed in different kinematic settings and provide windows into processes at various depths in the middle-crust. Exposure of mid-crustal rocks provided by these domes enables detailed field and lab-based investigations to test the role of melting and strain partitioning during mid-crustal flow and exhumation. Data from these domes are critical for deriving kinematic and thermomechanical models for dome formation and evolving mid-crustal flow along the southern margin of the plateau. To test for along strike variability in mechanisms of dome formation and extent of mid-crustal flow we integrate kinematic analysis, P-T paths and geothermochronology on samples from the Ama Drime Massif (ADM), Tibet, and the Leo Pargil dome (LPD), NW India (Thiede and others, 2006).

The ADM and LPD were both exhumed by oppositely dipping, normal-sense shear zones. The NNE-striking shear zones bounding the ADM record a progression in deformation mechanisms from early distributed shear zones to discrete detachments. The Ama Drime detachment juxtaposes upper amphibolite facies Greater Himalayan series in the hanging wall with granulite facies orthogneiss and paragneiss in the footwall and records at least 21-42 km down-dip displacement (Langille and others, in review). In contrast, the NE-striking Leo Pargil shear zone records top-down-to-the-northwest sense of shear (Thiede and others, 2006) at high temperature (>550ºC), does not develop a discrete detachment, and juxtaposes an injection complex in the footwall with greenschist facies Tibetan Sedimentary series in the hanging wall.

Our data suggest that in the ADM and LPD, in-situ anatexis and mobilization of melt into dikes and sills plays a major role in controlling the effective viscosity of the crust by weakening different structural positions in the mid-crust. Melting at granulite facies (0.7-0.8 GPa; 750ºC) in the ADM initiated at 12-13 Ma and was followed by post-kinematic dikes at 11-12 Ma in a kinematic setting that was dominated by orogen-parallel extension. Injection of multiple generations of leucogranites in the footwall of the Leo Pargil shear zone occurred during a protracted event ~26-16 Ma (Lederer and others, 2010) at intermediate structural positions. Toward deeper structural positions the injection complex transitions into migmatitic gneiss. Both domes record a transition between melt-present deformation in the core to solid-state fabric development on the margins.

References

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