Estimating the Viscosity of the Tso Morari Gneiss Dome, Western Indian Himalaya

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The Tso Morari Gneiss dome in the Indian Himalaya extruded from a depth of ~200 km through an inclined channel of elliptical cross-section at the leading edge of the Indian plate by means of Poiseuille flow with a Newtonian rheology. The velocity profile of this gneiss dome is derived after *(i)* finding the "best fit" of the outcrop of the gneiss dome to an ellipse; *(ii)* taking the three different lithologies at the top of the extruding gneiss to have acted as a single plug; and *(iii)* taking the extrusion to have been driven by the buoyant push of the denser mantle beneath the lighter gneiss. Fitting the known rates of extrusion of this gneiss dome to its velocity profile constrains its maximum viscosity to be ~ 8×10^{23} Poise. The maximum value is higher than the previous estimates for gneisses elsewhere (e.g. 2.8×10^{21} Poise, 8×10^{19} to $<1.66\times10^{22}$ Poise, and 10^{20} Poise). We use geological arguments to justify neglecting in our calculations the geothermal gradient, erosion, gravitational spreading and the compositional heterogeneity of the dome. Our approach to constraining the viscosity of an extruding rock mass could be applied to many other terrains.

Oral Presentation Requested

SESSION: RESEARCH IN PROGRESS CONTRIBUTION