Geophysical Research Abstracts
Vol. 14, EGU2012-3381, 2012
EGU General Assembly 2012

Channel flow extrusion model to constrain viscosity and Prandtl number of the Higher Himalayan Shear Zone

S Mukherjee

Indian Institute of Technology Bombay, Indian Institute of Technology Bombay, Earth Sciences, Mumbai, India (soumyajitm@gmail.com, +91-022-2576-7253)

The channel flow extrusion of the Higher Himalayan Shear Zone (HHSZ) involved a top-to-SW simple shear in combination with a pressure gradient induced flow against gravity. Presuming a Newtonian incompressible rheology of the HHSZ with parallel inclined boundaries- the Main Central Thrust-Lower (MCT_L) and the South Tibetan Detachment System-Upper ($STDS_U$), the viscosity of the HHSZ along the entire Himalayan chain within India, Nepal and Bhutan is estimated to vary between $\sim 10^{16}$-10^{23}Pa s, and its Prandtl number within $\sim 10^{21}$-10^{28}. The parameters specifically for the HHSZ in the Sutlej section (India) are calculated to be $\sim$$10^{17}$-$10^{23}$ Pa s and $\sim$ 10^{22}-10^{28}. These estimates utilized ranges of known thickness (6-58 km) of the HHSZ, and that of its top sub-zone of reverse ductile shear ($STDS_U$: 0.35-9.4 km), total rate of slip of its two boundaries (0.7-0.69 mm y^{-1}), pressure gradient (0.2-6 kb km^{-1}), density (2.2-3.1 g cm^{-3}) and thermal diffusivity (0.5×10^{-6}-2.1×10^{-6}m s^{-2}) along the studied orogenic trend. The deduced magnitudes are in conformity with a strong Tibetan mid-crust, and range within those for its constituent main rock types, partly for the superstructure and partly for the infrastructure. The estimated magnitude of viscosity will help to build dynamically-scaled analogue models of the evolution of the Himalaya.