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Himalayan Orogenic Channel: when did it start?

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The tectonic evolutionary models of Himalayan Metamorphic Belt (HMB) have been visualized as (i) an intracontinental ductile shear zone of regional dimension or (ii) an extruding channel flow. The latter tectonic model has emanated from INDEPTH Project in southern Tibet and emphasizes the extrusion of Partial Molten Crust (PMC) into a ductile channel with trailing end reaching to the surface in the Higher Himalayan Metamorphic Belt (HHMB). This PMC has displaced upward towards south and represents progressively older frozen snapshots of the partial molten mid crustal layer lying at depth. Elaborating these concepts through thermo-mechanical numerical modeling, it has been opined that the Himalayan Metamorphic Belt (HMB) behaves as a low viscosity orogenic channel with flow in mid-to lower-crust including ductile extrusion of high grade metamorphic rocks and coeval normal faulting and thrusting. Geological evidences originating from this concept of Channel Flow are still scanty. To characterize phenomenon, this narrow zone of migmatite exhibiting extreme flowage in high grade metamorphics along the Bhagirathi Valley has been selected to constrain the age of initiation of channel flow. Zircons were separated from migmatites and *in situ* tourmaline-bearing leucogranite for CL imaging and SHRIMP U-Pb dating. Zircons from melanosome show no indication of overgrowth, whereas leucosome show some zircon overgrowth. Zircons from *in situ* TBL melt are of varied shapes from a few tens of µm to ~ 400 µm. CL images show that almost all the grains have somewhat rounded cores with three distinct zones – an inner core, a spongy middle portion and clear rim. Since the principal interest was to determine the possible age of initiation of melt generation, analyses were concentrated mainly on the rims. Data from rim analyses reveal Th/U ratios < 0.1 and zircon overgrowths range between 46 and 20 Ma with an episodic pattern. These ages indicate that zircon growth persisted over protracted time span during the M2 metamorphism of the HHC. Decompression and exhumation leads to squeezing of melt from rocks along shear fabric, which may have been accentuated by the presence of melt. Because the analyses have been carried out on rim that appear clear in CL images, we believe that the wide range in ages is real and indicate episodic events between 46 Ma and 20 Ma. The repetition of episodic patterns from two samples of *in situ* TBL, each indicating regional and consistent events, give a good estimate for the age of initiation of the Great Himalayan Channel with its persistent nature and partial melting. Our data indicate that peak metamorphism occurred at about 46 Ma caused widespread partial melting during exhumation of terrain. Formation of this hot, low-viscous, mid-crustal migmatite leads to the initiation of channel causing outward flow of material. This outflow material is the first evidence of initiation of magmatic fluids in the Himalayan Orogenic Channel around 46 Ma in association with exhumation – controlled development of migmatite zone.