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Timing of the end of motion along the South Tibet Detachment shear zone. An important constraint on collision models.

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The South Tibet detachment system (STDS) is a major normal fault system that runs parallel to the Himalayan range for more than 1500km, and that is fundamental to the major models proposed the belt tectonic evolution. The STDS is a fossil structure, as it has no clear morphological expression, is crosscut by perpendicular (N-S) active normal faults (Gurla Mandata, Thakhola, Ama Drime, Yadong), and no crustal earthquake indicative of ∼N-S extension has ever been documented in the South Tibetan crust. It has long been proposed that the STDS and the MCT slips where coeval during the Miocene, however the timing of the STDS all along its length has rarely been investigated.

Near Dinggye (∼ 28°10'N, 87°40'E), the South Tibet Detachment, main branch of the STDS, dips ∼10±5° to the North and separates Paleozoic Tethyan series from Upper Himalayan Crystalline Series (UHCS). Immediately below the STD, the UHCS is highly deformed in the STD shear zone, stretching lineations trend NNE and the shear senses are top to the NE. In micaschist, P-T path constrained by pseudosection and garnet chemistry, shows successive metamorphic conditions of ∼0.6 GPa and ∼550°C and 0.5 GPa and 625°C. U/Pb dating of Monazite and zircons in deformed and undeformed leucogranites suggest that ductile deformation lasted until at least ∼16 Ma but ended prior to ∼15Ma in the STD shear zone ∼100 meters below the detachment. Ar/Ar micas ages in the footwall span between ∼14.6 and 13.6 Ma, indicating rapid cooling down to ∼320°C, and suggesting persistence of normal faulting, at that time. The STDS is cut and offset by the N-S trending Dinggye active normal fault which initiated prior to 11Ma thus providing a minimum bound for the end of STDS motion. These data are interpreted as reflecting 0.3 GPa (11km) to 0.6 GPa (22km) of exhumation along the STDS starting prior to ∼16 Ma and ending between 13.6 and 11 Ma.

On both side of the Ama Drime, analysis of structural and geochronological constraints available from the literature allows us to propose a time interval for the end shearing on the STDS in 11 other sections along the Himalayan arc. It appears that the STDS stopped first in the west, at ∼17 Ma in Zanskar but only after 13Ma east of the Gurla Mandata. This timing difference could be related to interactions with the Karakorum fault zone that shows a strong bent at the level of the Gurla Mandata. The 1000 km long stretch of the STDS east of the Gurla Mandata probably stopped almost synchronously between 13 and 11 Ma ago. This generalized stop appears coeval to a sudden switch from NNE-SSW to E-W extension at the top of the accretionary prism, with jump of the major thrust from the lower Main Central Thrust (MCTl) to the Main the Boundary Thrust (MBT), and with change in India and Asia convergence direction. This synchronism is probably better explain in the frame of a thrust wedge or thrust system model than a lower channel flow model.