New advisement of tectonic model in south Tibet

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New field tectono-sedimentary investigations crossing the Yarlung Zangpo ophiolite zone show a geological features different from the subduction-collision models. A tectonic window exists within the Bailang ophiolite body. Conformable contact lies between the ophiolite deep sea sequence and country flysch layers, without shear zone in north-south orientation. Intrusion-like ophiolite bodies outcroped in Renbu, where country layers maintain sub-concordant contact to the ultramafic bodies with contact metamorphic aureole. The ophiolite zone diverges westward into branches, separated by country flysch. In the Lhasa region, sedimentary facies are similar between both north and south sides of the Zangpo Valley, recording of an intact basin system (Hsu et al., 1995; 1998; Liu et al., 2009; 2010). Li et al. (2010) reported that the north portion of Tethyan Himalaya sequence yield U–Pb detrital zircon age probability spectra and εHf values that are in stark contrast with Tethyan sequence strata of known Indian affinity. We conclude thus the Zangpo ophiolite zone has tectonic affinity of back-arc basin with its spasmodical juvenile oceanic crust. Some new petrological and geochemical studies on the ophiolite rocks reveal similar conclusions (Zheng et al., 2003; Pan and Ding, 2004; Geng et al., 2004; Bédard et al., 2009). The Zangpo back-arc basin developed due to the large amount of Neotethys oceanic crust subducted under the Himalaya-Tibet lithosphere. The collapse of this back-arc basin, with limited subduction and mélange, occurred subsequent to about the Eocene. The ophiolite of the Zangpo back-arc basin became exposed during regional uplifting and rifting in a north-south direction since Middle Miocene.

The real Indian-Asia suture, the Neotethys more likely corresponds to the High Himalayan Central Gneiss belt, supported by its strong shear system with unique vergence, protracted history (Paleocene to middle Miocene) of re-mobilized high pressure metamorphism in middle to lower crust (e.g., Baig, 1990; Ding and Zhong, 1999; Ding et al., 2001; Catlos, 2001; Kaneko et al., 2003; Leech et al., 2005; Liu et al., 2007; Zhang et al. 2008, 2010a; Cottle et al., 2009b; Xu et al. 2010), and the shear activities migrated progressively younger southward, with bulk of shear slip absorbing the Indian and south Tibet crust. Total amount of crust uplift in Himalayan gneiss belt yielded of 30-40 km, mich more than that in Zangpo back-arc basin where the Cenozoic deposits (Kailas conglomerate, Liuqu conglomerate, Linzizong volcanic layers, etc) exist well.

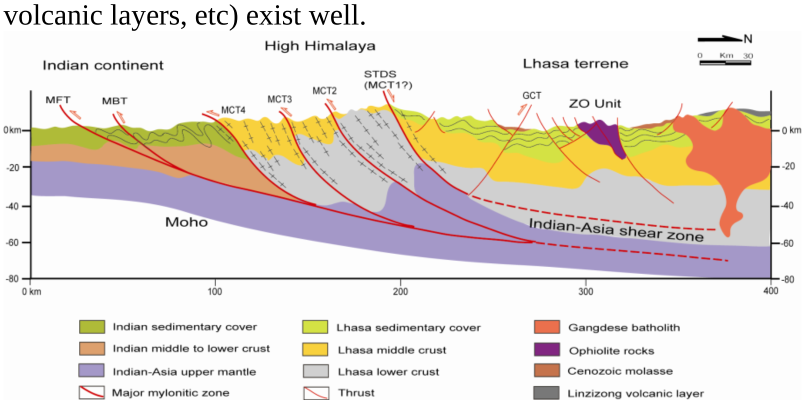

Figure 1: Tectonic model of south Tibet

The Indian sub-continent collided against the Himalayan frontal arc and underthrusted under the arc, proceeding behind the Neotethys oceanic crust at probably the location of the South Tibet Detachment System (STDS). This collision resulted in crust thickening and local uplift. The stress concentration resulted from such continent-arc collision then migrated younger southward and produced second collision shear plane, while the gravity gradient led to the change of the STDS from a compressive thrust to extension. This process was then repeated southward, producing next mylonitic zones step by step, till to the Main Frontal Thrust. The estimation of the amount of N-S uniform slip shearing based on analysis of microstructural mechanisms on major mylonitic zones, with whole shear gneiss and pelitic shale outcropping in the High Himalaya Central Gneiss could exceed hundreds of kilometers, absorbing the Indian crust. Recent geophysical studies reveal that the main Himalayan shear system extends from a shallow depth under Nepal to the mid-crust under southern Tibet. The crust/mantle interface beneath Tibet is anisotropic, and the dipping mantle fabric suggests that the Indian mantle is subducting in a diffuse fashion along some sub-parallel structures (J. Nabelek et al., 2009). This feature supports to our tectonic model of south Tibet.

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