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Cenozoic Continental Subduction in the NW-Himalaya: from steep to sub-horizontal configuration of the Indian Plate

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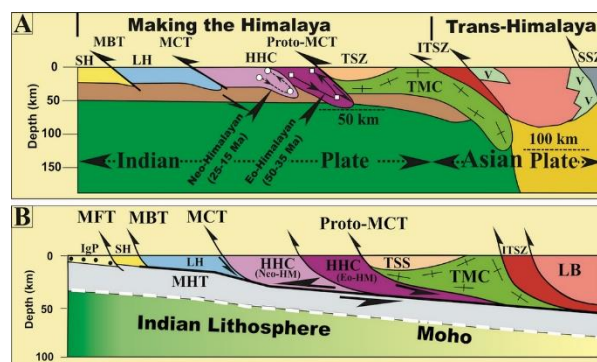
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The Neo-Tethyan Ocean, separating the Indian and Asian Plates with an intervening calc-alkaline intra-oceanic Shyok–Dras Volcanic Arc, closed along the Shyok and Indus-Tsangpo Suture Zones (SSZ and ITSZ) during late Mesozoic; hence these plates did not initially collide with each other. Instead, the Tethyan oceanic lithosphere subducted and partially melted first beneath the Asian Plate and subsequently beneath the Shyok–Dras Volcanic Arc to produce the calc-alkaline Karakoram Batholith (KB) and the Ladakh Batholith (LB).

The Indian continental lithosphere (ICL) approached the trench of the ITSZ and subducted steeply for the first time to undergo the ultra-high pressure (UHP) metamorphism at ~53 Ma (Fig. 1A). Bulk ages from subducted UHP metamorphosed Tso Morari Crystallines (TMC) and the LB across the ITSZ provided constraints on the India-Asia convergence at ~58 Ma. Deeply-exhumed UHP terrane indicated the first Himalayan emergence between 53 and 50 Ma. Repeated sequential subduction and imbrication of the ICL followed at ~45-35 and ~25-15 Ma to produce the Eo- and Neo-Himalayan metamorphism in the Higher Himalayan Crystallines (HHC) and associated exhumation episodes during rise of the Himalayan from north to the south.

Geological and geophysical evidences from the Himalaya and nearby mountains bespeak about steep subduction and imbrication of the ICL since ~58 Ma. Present-day subhorizontal subduction of the



Indian Plate and its episodic northward push along the Main Himalayan Thrust (MHT), even beneath Tibet, has rotated these imbricates so that these follow the present-day geometry of the ICL (Fig. 1B). Overriding scrapped imbricated sequences thrust southwards and deform into the Himalayan crustal wedge. The Bangong-Nujiang Suture (BNS) in Central Tibet witnesses true “collisional” signatures of large-scale opposing vergence of the India-Asia Plates.

Figure 1: Continental subduction in the NW-Himalaya. (A) Deep and steep subduction of the ICL and different metamorphic phases at ~53.1 Ma, ~48-45 Ma (pre-MCT)

and ~25 Ma. (B) Rotation of imbricated slices of the Himalayan Metamorphic Belt (HMB) to gently-dipping crustal wedges by northward push from the subducting Indian continental lithosphere along the Main Himalayan Thrust (MHT) since post-15 Ma.

