



Investigating the proposed linkage between Eastern Himalayan syntaxial evolution and river capture of the Yarlung Tsangpo by the Brahmaputra River

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It has been proposed that the rapid exhumation and anomalously young metamorphism of the Namche Barwa eastern Himalayan syntaxis in the Plio-Pleistocene resulted from river capture of the Yarlung Tsangpo by the Brahmaputra (the “tectonic aneurysm” model; e.g. Zeitler et al. GSA Today 2001). In order to test this hypothesis, the occurrence of river capture, and its timing, must be ascertained.

Today, the Yarlung Tsangpo flows east along the Indus-Yarlung suture before taking a 180° turn at the eastern Himalayan syntaxis to flow south across the Himalaya as the Brahmaputra. Whether this river pattern results from river capture, or whether the river is antecedent to orogenesis, is much debated, yet robust constraints on the occurrence of the proposed river capture and an independent time-frame for such an event are lacking.

The Yarlung Tsangpo drains the Jurassic-Paleogene Trans-Himalayan arc of the Asian plate north of the suture and the Tethyan Himalaya of the Indian plate to the south of the suture, while the Brahmaputra prior to any capture would have drained the southern Himalayan slopes composed only of Precambrian-Palaeozoic Indian crust, much of which metamorphosed to high grade during the Oligo-Miocene. Hence, the first occurrence of Trans-Himalayan arc detritus which is distinctive of the Yarlung Tsangpo, in the Neogene palaeo-Brahmaputra deposits in the Bengal Basin, Bangladesh, is key to date the river capture. We have applied a multi-disciplinary provenance study to these sediments and identify the earliest occurrence of detritus from the arc in the Early Miocene.

Dating the time of river capture has implications both for the timing of uplift of Tibet and models of tectonic-erosion interactions:

- Whilst some workers propose an early uplift of the plateau, others propose a later independent uplift event, at least for the east of the plateau, caused by an additional mechanism. This late uplift event has been invoked by previous workers as the cause of the river capture of the Yarlung Tsangpo by the Brahmaputra due to effective lowering of base level. If this cause and effect correlation is correct, this uplift event must have occurred prior to the Early Miocene.
- These data allow us to explore the proposed interaction between the Namche Barwa syntaxial evolution and the timing of river capture. Given we have now dated the time of this river capture at ~18 Ma, the modelled coupling between capture and onset of rapid exhumation (dated at Plio-Pleistocene) would need to accommodate a lag time of ~8 Ma for this hypothesis to hold true.