

What collided with India at 50 Ma in the western (Ladakh) Himalaya?

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The timing of India-Asia collision is critical to the understanding of crustal deformation processes, since, for example, it impacts on calculations regarding the amount of convergence that needs to be accommodated by various mechanisms. In the NW Himalaya, a number of workers have proposed a ca 55-50 Ma age for collision along the Indus suture zone which separates India from the Kohistan-Ladakh Intraoceanic Island arc (KLA) to the north. This is based on a number of factors including the age of youngest marine sediments in the Indus suture (e.g. Green et al. 2008), age of eclogites indicative of onset of Indian continental subduction (e.g. de Sigoyer et al. 2000), and first evidence of detritus from north of the suture zone deposited on the Indian plate (e.g. Clift et al. 2002). Such evidence can be interpreted as documenting the age of India-Asia collision if one takes the KLA to have collided with the Asian plate prior to its collision with India (e.g. Petterson 2010 and refs therein). However, an increasing number of workers propose that the KLA collided with Asia subsequent to its earlier collision with India, dated variously at 85 Ma (Chatterjee et al. 2013), 61 Ma (Khan et al. 2009) and 50 Ma (Bouilhol et al. 2013). This, plus the questioning of earlier provenance work (Clift et al. 2002) regarding the validity of that data for constraining the timing of material north of the suture arriving on the Indian plate (Henderson et al. 2011) suggests that the time is right for a reappraisal of this topic. We use a provenance-based approach here, using combined U-Pb and Hf on detrital zircons, along with petrography and biostratigraphy, to identify first arrival of material from north of the Indian plate to arrive on the Indian continent, to constrain the time of collision. With the recent discovery that the Indus Group sediments in the suture zone cannot be used for this purpose as previously proposed (Henderson et al. 2011) we turn to the 50 Ma Kong and Chulung La Formation youngest Tethyan sediments on the Indian margin (Garzanti et al. 1987) to investigate whether we can identify such material, and whether it be Spong arc (Fuchs and Willems 1990), KLA or Trans-Himalayan derived, thus determining what collided with India at 50 Ma.

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