



The timing of India-Asia collision onset – facts, theories, controversies

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The timing of initial collision between India and Asia has remained grossly and windingly controversial for half a century. This paper attempts to review this crucial and hotly debated argument, describing first the different methods used to constrain the age of collision and discussing next the rationale, results, inferences and problems associated with each. We conclude that stratigraphy represents the best direct way to unravel collision chronology. Other methods focusing on the magmatic, metamorphic or paleomagnetic record provide additional fundamental constraints, but cannot provide a robust direct estimate of collision onset.

Initial collision in the central-eastern Himalaya is dated directly at the Middle Paleocene (59 ± 1 Ma) by the abrupt change in sediment provenance recorded in trench settings (Hu et al., 2015). The quasi-synchronous unconformities documented along both Tethyan passive margin of India and active margin of Asia from Tibet to Zaskar-Ladakh confirm that orogeny was underway at the close of the Paleocene (56 Ma) (Garzanti et al., 1987; Li et al., 2015; Hu et al., 2016), well before the disappearance of marine seaways in the Himalaya during the Eocene ($[U+F07E]$ 50 Ma) (Najman et al., 2010). Sedimentary evolution and provenance changes in marine to fluvio-deltaic successions are recorded synchronously within error from the western to the central-eastern Himalaya, failing to provide evidence for diachronous collision.

These coherent observations are hard to reconcile with three widely cited hypotheses invoking either earlier events of arc-continent collision or ophiolite obduction, or the protracted existence of a Greater India Basin, which should be all rejected after discussing the geological evidence. A scenario no more complex than the one involving solely the passive continental margin of India and the active continental margin of Asia is needed to explain the geological evolution of the nascent Himalaya. The collision between the Tethys Himalaya and the Transhimalayan arc-trench system does represent the collision between India and Asia. Because the Yarlung Zangbo ophiolite is the forearc basement of the Asian active margin, its obduction onto India could not have preceded the initial closure of Neo-Tethys. Ophiolite obduction began when collision began, in the middle Paleocene.

References

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