# The initial collision between Indian and Asian continental

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The vast Tibetan Plateau, with high altitude and intense uplift, is like a holy land for Earth science researchers. It has earned a reputation as "the third pole of the world," relative to the Arctic Pole and Antarctic Pole. A recent study reveals processes of the India-Eurasia continental collision, which led to the eventual formation of the Tibetan Plateau.

The relevant review paper has been published in the journal *Science China-Earth Sciences*, No.3, 2017. As the first and corresponding author in this paper, Ding Lin, from the Institute of Tibetan Plateau Research, Chinese Academy of Sciences, has reviewed dozens of research approaches on the initial collision between the Indian and Asian plates, and concluded that the tectono-sedimentary response in the peripheral foreland basin provides the most sensitive index of this event, and that paleomagnetism presents independent evidence as an alternative, reliable, and quantitative research method. Based on the systematic overviews of the previous studies, it suggests that the initial collision first occurred in the center of the Yarlung Tsangpo suture zone (YTSZ) between ca. 65 Ma and 63 Ma and then spreading both eastwards and westwards.

Collision between India and Asia was perhaps the most spectacular geological event to occur over the last 500 million years. Although there are numerous records of ocean closures and continental collisions in geological history, only the Indian-Asian collision has aroused extensive surface uplift. The ongoing processes of collision have also affected Tibet as well as central and southeast Asia. Thus, collision between India

and Asia as the resultant formation of the Tibetan Plateau likely includes a number of unique processes of both continental collision and mechanisms of intracontinental deformation. During the 1980s and 1990s, geoscientists first proposed that the Indian and Asian continents initially collided along western syntaxis ca. 55 Ma, then diachronously suturing eastwards.

In recent years, the earliest peripheral foreland basin related to the collision has been recognized, which developed much closer to the suture zone on the Indian subcontinent and in which the earliest detrital material sourced from the Eurasian continent had been identified. This represents the initial timing of the continental collision. Integrated with tectonic deformation, foreland basins, provenance analysis and paleomagnetism, an alternative model was first proposed suggesting that the collision between India and Asia first occurred in the central section of the YTSZ between ca. 65 Ma and 63 Ma, then progressed both eastwards and westwards.

This new model, suggesting an earlier collision between India and Asia, predicts that: (1) large-scale continental subduction occurred within the Tibetan Plateau along main suture zones in order to accommodate additional shortening of about 1300 km; (2) resultant large-scale continental subduction would have generated far-reaching deformation effects across central Asia, and; (3) post-collisional igneous rocks and mineral deposits would have formed as a result within continental subduction belts. Moreover, along with the continental collision, the Himalayas grew southward. When the elevation of the Himalayas exceeded the proto-Tibetan Plateau, it caused intense aridity in the inland climate on the plateau, which eventually modified the south Asian monsoon to current pattern.

**More information:** Lin Ding et al, Processes of initial collision and suturing between India and Asia, *Science China Earth Sciences* (2017).

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