Cretaceous - Tertiary carbonate platform evolution and the age of India - Asia collision along the Ladakh Himalaya (NW India)

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The India – Asia collision resulted in the formation and uplift of the Himalaya and enhanced uplift of the Tibetan plateau. The transition from marine to continental facies within the Indus – Yarlung Tsangpo suture zone and along the northern margin of the Indian plate provides the most accurate method of dating the closure of Tethys Ocean separating the Indian and Asian plates. The use of shallow water, carbonate platform-dwelling larger benthic foraminifera provides the means for defining 20 shallow benthic zones (SBZ) ranging from the base of the Paleocene up to the Eocene-Oligocene boundary (Serra-Kiel, et al. 1998), and is applied to Cretaceous-Tertiary rocks of the Ladakh Himalaya. Indirect methods of dating the collision such as palaeomagnetism (Zhu et al. 2005), dating the UHP metamorphism along the north margin of India (Leech et al. 2005), dating the youngest subduction-related granites along the southern margin of Asia (Weinberg and Dunlap 2000) or dating the post-orogenic Indus Molasse Group deposits within the suture zone (Aitchison et al. 2007), cannot provide such a precise or reliable age of collision. Ophiolite obduction onto the Indian passive margin occurred during the latest Cretaceous and pre-dated initial collision of the two continental plates (Corfield et al. 1999). Unconformities occur beneath the Late Maastrichtian Marpo Formation, and beneath the Danian Stumpata Formation on the shelf and beneath the Upper Paleocene Sumda Formation in the suture zone. Stratigraphic and structural data from the Indian plate continental margin in the Ladakh and Zanskar Himalaya, NW India, suggest that the final marine sediments were shallow marine limestones containing a diverse assemblage of larger benthic foraminifera (Figure 1) deposited during the planktonic zone P8/shallow benthic zone SBZ10, corresponding to the Cusian stage of the late Lower Eocene (Ypresian), 50.5 Ma. A regional unconformity across shelf and suture zone above these rocks marks the beginning of continental red-bed deposition (Chulung-La and Nurla Formations). The age of the final marine sediments is similar in Waziristan (NW Pakistan) to the west, and the southern Tibet region to the east, suggesting that there was no significant diachronicity along the Indus – Yarlung Tsangpo suture zone. South of the Himalaya in the Hazara syntaxis, Pakistan, the youngest marine sediments correspond to Nummulite bearing limestones of the shallow benthic zone SBZ10, and planktonic foraminifera P7 zone (52-51 Ma). The timing of closure of Neo-Tethys between India and Asia corresponds closely to the ending of subduction-related granodiorite - granite magmatism along the Ladakh – Gangdese batholith (southern, Andean-type margin of the Asian plate) and precedes the drastic slowing of the northward drift of India. Continental fluvial – deltaic red-beds unconformably overlie all marine sediments, both in the suture zone and along the north Indian plate margin.