The Age of India-Asia Collision: Biostratigraphic, Sedimentological and Paleomagnetic Constraints

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Determining the timing of India-Asia collision is critical for understanding crustal deformation processes, and for evaluating the potential influence of Himalayan orogenesis on global climate and ocean geochemistry (e.g. Raymo and Ruddiman, 1998; Richter and others, 1992). The majority of published work dates collision between ~55-50 Ma, with some younger and some older ages proposed (e.g. Garzanti and others, 1987; Jaeger and others, 1989; Klootwijk and others, 1992; De Sigoyer and others, 2000; Aitchison and others, 2007, to quote just a few of the numerous references), the range to some extent being the result of different definitions of collision and methods used to date it. In this paper we use three approaches to date collision: the time of cessation of marine facies in the suture zone; the time of first arrival of Asian detritus on the Indian plate; and paleomagnetic constraints on the positions of Indian and Asian continents through time. In the Qumiba sedimentary section in southern Tibet, our biostratigraphic data indicates the youngest marine facies preserved at this locality to be of 50.6-52.8 Ma age. First arrival of Asian material on the Indian plate occurs at this time at this location, as determined by petrography, U-Pb and fission-track dating of detrital zircons. Our reconstructions of the relative positions of India and Asia using a compilation of published paleomagnetic data indicates initial contact between the continents at 55-50 Ma. Both our biostratigraphic data and our paleomagnetic interpretations contradict a recent assertion that proposes that collision could not have occurred before ~34 Ma (Aitchison and others, 2007), based on the view that paleomagnetic data show the continents to be a considerable distance apart at 55 Ma, that marine facies at the Qumiba section persisted until ca. 35 Ma and that these data, coupled with a number of other lines of geological evidence, "demand" that collision occurred no earlier than the Oligocene. We discuss each of these lines of evidence and conclude that the assertion that geological and paleomagnetic evidence "demand" an Oligocene age of collision is overstated: whilst it may be a viable theory, the quoted evidence is not incompatible with collision at 55-50 Ma as Aitchison and others (2007) propose.

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Cite as: Najman, Y., Appel, E., Boudagher-Fadel, M., Bown, P., Carter, A., Garzanti, E., Godin, L., Han, J., Liebke, U., Oliver, G., Parrish, R. and Vezzoli, G., 2010, The Age of India-Asia Collision: Biostratigraphic, Sedimentological and Paleomagnetic Constraints, *in* Leech, M.L., and others, eds., Proceedings for the 25th Himalaya-Karakoram-Tibet Workshop: U.S. Geological Survey, Open-File Report 2010-1099, 1 p. [http://pubs.usgs.gov/of/2010/1099/najman/].