



Upper Triassic turbidites of the northern Tethyan Himalaya (Langjiexue Group): the terminal of a sediment-routing system sourced in the Gondwanide Orogen

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The Upper Triassic Langjiexue Group, exposed south of the Yarlung-Zangbo suture zone in south Tibet, shows sedimentary features different from typical Tethyan Himalayan successions. Firstly, southward sediment transport was suggested by paleocurrent analysis (Li X.H. et al., 2003); secondly, petrographic and geochemical composition is different from typical passive-margin deposits sourced from a cratonic block (Li X.H. et al., 2004, in chinese); thirdly, Nd isotopic data of the Langjiexue Group indicate a more juvenile source than for Tethyan Himalayan sediments (Dai J.G. et al., 2008, in chinese); finally, U–Pb age spectra of detrital zircons from the Langjiexue Group include a cluster at 400–200 Ma with a peak at 280–220 Ma (Li G.W. et al., 2010; Cai F.L. et al., 2016; Li X.H. et al., 2016), whereas zircons of this age are scarce in Tethyan Himalayan strata and throughout the Indian subcontinent. Based on these differences, the Langjiexue Group was proposed to represent an exotic domain independent from the Tethys Himalaya and incorporated in the Yarlung-Zangbo suture zone during Paleocene collision (Li G.W. et al., 2010). Several depositional models have been proposed for the Langjiexue Group, but none of them is supported by solid provenance evidence.

We carried out a detailed provenance study on the Langjiexue Group, combining sedimentologic, petrologic and isotopic approaches. These middle to distal deep-sea-fan turbidites are cross-cut by Lower Cretaceous diabase sills and dykes generated during rifting of India from Gondwana, indicating that the Langjiexue Group was originally deposited along or adjacent to the northern passive continental margin of India. Flute casts at the base of turbidite beds indicate mostly WNW-ward paleocurrents, rather than southward as supposed previously, pointing to provenance from a source located east of the depositional area. Common volcanic fragments and plagioclase grains together with the cluster of 400–200-Ma-aged magmatic zircons with uniform $\epsilon_{\text{Hf}}(t)$ values from -5 to +10 are incompatible with any nearby source, including the Qiantang Block, the Lhasa Block or the India subcontinent, and indicate instead supply from a long-lived magmatic-arc terrane. Considering what is known about Late Triassic paleogeography, a plausible source for Langjiexue sediments is represented by the Gondwanide Orogen, generated during subduction of the pan-Pacific oceanic lithosphere beneath southeastern Gondwana. This scenario is supported by the age range and Hf isotopic signatures of Late Paleozoic–Early Mesozoic zircons contained in Langjiexue turbidites as in coeval turbidites exposed in western Myanmar (Sevastjanova et al., 2016). New data are needed to confirm/falsify the existence of a thousands-km-long sediment-routing system similar to the modern Amazon, which - sourced in a cordillera-type orogen rising along the southeastern margin of Gondwana - crossed an entire continent to feed turbiditic fans now exposed from western Myanmar to the northern Tethys Himalaya.