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Dissimilar age and provenance of the Nindam and Jurutze volcanoclastic formations, Zaskar Gorge, Ladakh (India)

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Pre-early Eocene volcanoclastic rocks exposed in the Indus Suture Zone (Ladakh, India) are key to deciphering the complex magmatic and tectonic evolution of the convergent margins that existed between India and Eurasia. Several hypotheses exist regarding the provenance of the middle Cretaceous to early Cenozoic Jurutze and Nindam formations yet there is presently no consensus. Leading models propose that: (a) they were either formed in neighbouring sub-basins at one convergent margin consisting of the Kohistan-Ladakh-Dras arc; or (b) they became stratigraphically superposed after the collision between the Kohistan-Ladakh and Dras arcs. Here we present new U-Pb detrital zircon, major and trace element geochemical, and petrographic datasets from the Nindam and Jurutze formations that support a disparate provenance and thus necessitate an alternative model. The Jurutze Fm. has a geochemical composition typical of arcs built on continental crust, whereas the Nindam Fm. presents a geochemical signature compatible with that of an intraoceanic arc. The significant age gap between these formations (>20 m.y.) in the Zaskar Gorge further precludes the possibility that the Jurutze Fm. was deposited on top of the Nindam Fm. We propose that the Nindam and Jurutze formations were deposited in distinct forearc basins and explore scenarios for their formation at separate convergent margins, i.e. the separate Kohistan-Ladakh and Dras arcs, respectively.