

Early Neoproterozoic sedimentation and mafic magmatism in the North Lhasa Terrane, Tibet: transition from continental rift to embryonic oceanic crust

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The origin and evolution of the Precambrian North Lhasa Terrane in the central Tibetan Plateau remain enigmatic. Here we present U–Pb age and Hf isotopic data for detrital zircons from early Neoproterozoic quartzites in the North Lhasa Terrane, Tibet. An integrated petrological, geochronological, geochemical, and Sr–Nd–Hf isotopic study was also undertaken on amphibolites associated with the quartzites. The depositional age of the quartzites is constrained to be between ca. 931 Ma (youngest detrital igneous zircon core) and 869 Ma (oldest metamorphic zircon rim). The detrital zircons have a main age population from 1200 to 1000 Ma, and lack zircons with ages of 1000–900 Ma. Zircons from the amphibolites yield concordant ages of ca. 913–902 Ma, which are comparable to the depositional age of the quartzites. The amphibolites have N-MORB-like compositions and are characterized by high positive zircon $\epsilon_{\text{Hf}}(t)$ (+7.2 to +14.0) and whole-rock $\epsilon_{\text{Nd}}(t)$ (+5.5 to +6.0) values. Their compositions have been modified by crustal contamination. The formation of these quartzites and amphibolites was related to the transitional process from continental rift to embryonic oceanic crust, marking the opening of part of the Mozambique Ocean adjacent to the African side of the northern East African Orogen.