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Sub-mantle $\delta^{18}O$ Zircons in Malani rhyolites: Clues for a Rodinia Linkage between South China and NW India

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Abstract

The Malani Igneous Suite (MIS) in NW India represents one of the largest and well-preserved Precambrian felsic igneous provinces, with minor mafic volcanics and dykes. The SIMS (Secondary Ion Mass Spectrometric) zircon U-Pb geochronology yielded 776.8 ± 4.5 to 758.5 ± 6.9 Ma ages for rhyolites from Jodhpur region and Sindreth Basin while dacite sample from Punagarh Basin was dated to 760.5 ± 10 Ma. Zircons from rhyolitic and dacitic lavas have oxygen isotopic compositions that can be grouped into low $\delta^{18}O$V-SMOW (4.12 to -1.11‰) and high ($\delta^{18}O$ = 8.23-5.12‰) categoroes, respectively. The low $\delta^{18}O$ zircons have highly radiogenic Hf isotopic compositions ($\varepsilon_{Hf}(t)$= +13.0 to +3.6) suggesting high temperature bulk cannibalization of upper level juvenile crust as the essential process for magma generation. Older than 800 Ma xenocrystic zircons in dacite have high $\delta^{18}O$ values whereas 795 Ma ones have mantle-like Hf-O isotopic compositions, reflecting a significant shift in tectono-thermal regime in NW India during 800-780 Ma. A synchronous transition in the South China Block and Madagascar suggests a spatially and temporally linked geodynamic system. Geochemical data in combination with the new isotopic results point towards an overall convergent plate margin setting undergoing localized lithospheric extension. The NW India and South China blocks together with Madagascar and the Seychelles lay either along the periphery of Rodinia or off the supercontinent with the age of convergent plate margin magmatism coinciding with breakup of the supercontinent.

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