Deep mantle H_2O recycling at 3.3Ga?

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Knowledge of water in the Earth's interior and its evolution through time is of great importance for understanding global geodynamics. MgO-rich ultramafic magmas – komatiites - result from high-degree mantle melting at high pressures and thus are excellent probes of H_2O contents in the deep mantle. Recently, a significant excess of H_2O over elements of similar behaviour in magmatic processes (e.g. Ce) was found in melt inclusions in Mg-rich olivine from 2.7 Ga komatiites (Sobolev et al, Nature 2016; Asafov et al, Chem. Geol. 2018). These data were interpreted as the evidence of a deep hydrated mantle reservoir, probably at the transition zone, at the Neoarchean time. In this paper we confirm the mantle origin of elevated H_2O in komatiites using H isotope compositions of the melt inclusions and present similar data for 3.3 Ga old Weltevreden komatiites (S. Africa). The reconstructed initial hydrogen isotope composition of komatiites ($\delta D < -110‰$) is significantly more depleted in deuterium than surface reservoirs and typical mantle and argues that dehydrated subducted lithosphere was the source of H_2O accumulated in the transition zone by ringwoodite or wadsleyite (Bercovici & Karato, Nature, 2003). This interpretation is supported by a significant Cl excess and the temporal trend of Pb/Ce in the mantle sources of komatiites. These results argue that subduction occurred on the Earth well before 3.3 Ga.