



Mobility of Os and Re during basalt weathering: the Bidar laterite profile, India

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The isotopic composition of osmium in seawater reflects a balance of input from radiogenic continental material, and an unradiogenic signal from seafloor weathering and cosmic dust. Thus, changes in seawater Os isotopes over time often reflect a change in flux from continental weathering. One third of exposed continental crust is covered by laterites, which are iron rich, sub aerial weathering products that evolve under intense tropical climate conditions. Once formed laterites are highly susceptible to weathering and erosion, and 50% of continental drainage passes through lateritic terrain before flowing to the oceans (Tardy, 1997). Consequently, the weathering of laterites potentially contributes significantly to continental derived Os in the oceans. This study presents Re-Os isotope data for a highly weathered laterite profile developed on Deccan basalt that extends to a depth of ~ 50 m to unaltered basalt (Kisakurek et al., 2004).

Unaltered basalt has Re and Os concentrations of 718 and 4 ppt, respectively, and a present-day $^{187}\text{Os}/^{188}\text{Os}$ ratio of 0.98. Both Re and Os concentrations increase towards the laterite cap to a maximum of 10520 and 1409 ppt, respectively, at 5m depth. However, the increase in Os is always greater than that of Re, thus the $^{187}\text{Re}/^{188}\text{Os}$ ratios is always lower than that of the parent basalt, and hence also the present-day $^{187}\text{Os}/^{188}\text{Os}$ ratio. At 11m depth from the laterite cap there is a drop in both Re and Os concentration that coincides with zone of Fe enrichment, this is thought to be the level of a paleowatertable, and hence marking a change from sub-oxic to oxic conditions. Os concentrations closely correlate with Mn, and the Mn maxima is slightly

higher in the profile than that of Fe.

The high concentrations of both Re and Os in the upper part of the laterite profile cannot be explained by a straightforward contribution from the parent basalt or by local aeolian input. Rather they require concentration of both elements in weathering resistant basalt phases or aeolian phases, and also dissolution, mobilization and precipitation of both elements in groundwater. The systematic isotope and elemental variations seen at this locality are similar to those observed elsewhere (Sharma et al. 1998). If representative, these studies suggest that laterites possess a much higher Os concentration and much less radiogenic Os isotope composition than that of their parent rock (or average continental crust) and their weathering and erosion may have a significant effect on the composition of seawater.

Kisakurek, B., Widdowson, M., and James, R.H., 2004, Behaviour of Li isotopes during continental weathering: the Bidar laterite profile, India: *Chemical Geology*, v. 212, p. 27-44

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