Is it eolian dust? Contributions to the fine silicate fraction of deep sea sediments on Shatsky Rise, 58Ma

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Orbitally paced sedimentary cycles have been identified and correlated in Paleogene age sediments recovered from Walvis Ridge, Blake Nose and Shatsky Rise [1]. The relationship between insolation changes and cyclic sedimentation is poorly understood for greenhouse intervals. The observed sedimentary cycles likely reflect a combination of changes in terrigenous and carbonate content. Carbonate mass accumulation rates exhibit a small range of .54 to .79 g/cm^2/kyr. During the study interval (~58Ma), Shatsky Rise was in the central tropical Pacific, situated far from any existing shoreline, thus any terrigenous silicate material that reached the location was windblown dust. Eolian mass accumulation rates vary on a ~100 kyr cycle, indicating aridity in the dust source region changed in response to eccentricity forcing. Grain size changes show only subtle variations in wind intensity that do not correlate to accumulation. Some controversy exists over the effectiveness of traditional chemical extraction techniques in isolating the purely eolian component from seafloor sediments [2]. Extractions are effective at removing biogenic sediments as well as oxy-hydroxides, but it is likely that in addition to eolian dust, volcanogenic and authigenic aluminosilicate minerals remain [2, 3]. Using rare earth element profiles and Pb, Nd and Sr isotopes we assess the relative contributions of eolian, volcanic and authigenic sources to the fine silicate fraction chemically isolated from Shatsky Rise sediments. Fish debris $\varepsilon Nd_{(t)}$ values, ranging from -3.9 to -2.9, reflect the Nd isotopic value of bottom seawater and thus, can be used to constrain the authigenic mineral contribution. Preliminary geochemical data suggest that the extracted fine silicates fraction is comprised primarily of continentally sourced material.

[1] Westerhold *et al*. (2008) *Palaeogeo., Palaeoclim., Palaeoecol.* **257**, 377-403. [2] Zeigler *et al.* (2008) *Earth Planet. Sci. Lett.* **254**, 416-432. [3] Weber *et al.* (1996) *Paleoceanography* **11**, 115-127.

Isotopic and elemental imaging by laser ablation ICPMS

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Laser ablation ICPMS is ideally suited to the production of high resolution 2- and 3-D images. Compared to other methods, LA-ICPMS offers rapid analysis (in terms of area covered per unit time), an extremely wide dynamic range, a relatively clean mass spectrum, imaging at a variety of scales (from μm to cm), and multi-element/isotopic capability. A thorough understanding of system behaviour is essential prior to initiating any such analyses but this can be easily accomplished by reference to simple ablation experiments. In this presentation we will consider a number of examples highlighting the utility of laser ablation imaging studies in the earth and environmental sciences. We will also demonstrate the latest additions to the 'Iolite' laser ablation freeware package that allows relatively straightforward construction of isotopic and elemental images from multiple line-scan ICPMS data.

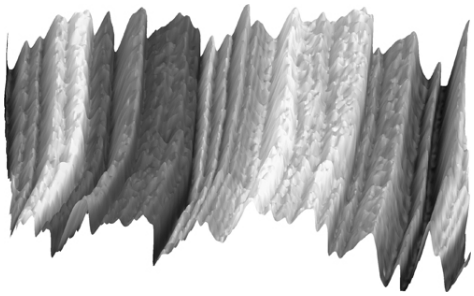

Figure 1: A 11 x 16 mm section of speleothem showing variation in Sr, Ba and U contents in a 3-D visualisation.