The K/Ar system for tracing fine-grained terrigenous sediments: A survey of Atlantic clay fractions

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The provenance of terrigenous sediments provides important constraints on the processes that bring them to their depositional sites in the ocean. Terrigenous sediments are formed by weathering and are delivered to the ocean by wind, water, and ice, and are redistributed within the ocean by currents. The mineralogical content and geochemical composition of sediments reflect the source rock types, weathering style and intensity, as well as sedimentary sorting evidence for sedimentary transport and delivery mechanisms. Radiogenic isotopes provide a measure of the temporal geologic history of sediments that is different depending on the geochemical characteristics of the parent and daughter isotopes. The K/Ar system in fine-grained terrigenous sediments reflects the latest stages of the geologic history of the sediments' sources. Thus the K/Ar "age" of fine-grained sediments provides a useful measure of sediment provenance, previously demonstrated by several studies (e.g., Hurley *et al*, 1961, GSAB, 1963a, GCA, 1963b, GCA; Jantshik and Huon, 1992, Eclogae Geol. Helv.; Huon and Ruch, 1992, Mar. Geol.; Pettke *et al*, 2000, EPSL; Hemming *et al*, 2002, Chem. Geol.; vanLaningham *et al*, 2006, JGR, 2008, QSR, 2009, EPSL; vanLaningham and Mark, 2011, GCA).

An initial survey of the <2 μm fractions of samples from the Biscaye (1965, GSAB) clay mineral study, demostrates that in contrast to the strong latitudinally-controlled distribution of kaolinite/chlorite in Atlantic sediments, K/Ar model ages trend from oldest in the NW Atlantic to youngest in the SW Atlantic. Intermediate ages are found in the tropical belt as well as off the coast of Europe. Though the data are still sparse, the general trends are well matched to the known distribution of geologic ages of continental sources around the Atlantic basin, with extreme old ages in Canada and Greenland and extreme young ages in active tectonic settings like the southern tip of South America and the Scotia Arc.

This study will produce a map of sediment distribution that serves as a benchmark to explore ocean circulation of sediment transport questions over a variety of timescales.

The Central Indian Upper Mantle 50 MY ago: Continental crust versus oceanic crust recycling contributions within the Central Indian Basin MORB

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The central Indian Ocean Basin (CIOB) results from the activity of both the Central and Southeast Indian Ridges and carries also the tracks of the Rodrigues triple junction and the Reunion Hotspot 53 Ma ago.

We discuss the composition of the Indian upper mantle 50 Ma ago i.e. its level of isotope heterogeneities within a model in which the breakup of the Gondwana has introduced continental derived material in it. The potential input of Reunion hotspot derived material is also investigated.

All samples dredged in an area comprised between 72-80°E and 9-15°S. They are on axis MORBor off axis MORB seamounts and are tholeiitic in composition and slightly depleted in incompatible trace elements.

Isotopes (Sr,Nd, Hf and Pb) lead to class samples in four groups: 1) very depleted in Sr-Nd and Hf isotopes including amongst the least radiogenic Pb isotope sof the Indian MORBs regarded as the depleted Indian MORB mantle 50Ma ago. 2 and 3) Similar low ^{206}Pb for higher ^{208}Pb and intend to have even lower ^{206}Pb than the previous group but very radiogenic Sr and unradiogenic Nd or DUPAL signature. The last group has more radiogenic Pb isotopes, and slightly lower Nd for identical Sr isotopes of the DMM group. This is clearly regarded as representative of recycled oceanic crust material such as seen in Ocean Island Basalts (C, Fozo, HIMU).

Mixing models suggest three components and two stages of mixing to account for the results. The local DMM is first contaminated by African Lower Continental Crust (LCC) material such as granulites during continental breakup.

In conclusion, the very depleted local DM and the extreme DUPAL compositions support the concept of LCC contamination of the upper mantle during the Gondwana breakup as 50Ma ago, the mixing and assimilation of the LCC being less advanced than in today Indian upper mantle. This leads to more extreme resulting isotope composition than today

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