Central Indian Ridge versus Reunion hotspot : Do interaction processes account for on and off axis geochemical observations?

C. HEMOND[1], M. JANIN[1], B. MURTON[2] E. FÜRI[3,5], D. HILTON[3] AND J. DYMENT[4]

[1]Domaines Océaniques, IUEM, Université de Brest Plouzané, France (chhemond@univ-brest.fr)
[2]National Oceanography Centre, Southampton, UK
[3]Scripps Institution of Oceanography, La Jolla, CA, USA
[4]IPGP, Paris, France
[5]now at CRPG, Vandoeuvre lès Nancy, France.

We examine data produced on samples recovered along three cruises along the CIR axis segment supposedly involved in the interaction process, off axis along two sections up to 800ky on both sides of the axis and on several off axis volcanic features on the African plate between the CIR and the hotpsot present surface expression, La Réunion island.

Trace elements are enriched along the spreading axis from the central part of the segment and northward to the Marie-Celeste fracture zone. Enriched samples occur also symmetrically off axis as spikes along the northern section at 19°10”S with a wavelength of about 200 ky. This is not the case along the southern section at 19°30”S on which enriched samples are found only in the axial trench. All off axis ridges and seamounts are depleted in trace elements.

Isotopically, the picture is quite complex. On axis samples fall on isotope trends that are compatible with mixing material from both an heterogeneous Réunion plume and the local Indian upper mantle. Off axis samples along the northen sections fall on a similar mixing trend showing that if Cordier *et al*. (2010) were right, the enriched material is intrinsically part of the local mantle. The enriched trace element trend to the north does exist in Sr, Nd and Hf isotopes but Pb isotopes reveal that the northern most samples fall together with samples from the next northern short segment on a separate mixing line. That reveals the potential existence of a distinct local component that is not drastically different but only a bit more radiogenic in 208 at a given 206. He isotopes (Füri *et al*. 2011) revealed that some ^{3}He enriched material also exist to the North of the segment and and they attributed it to the trace of the Réunion hotspot left behing within the upper mantle.This northern Pb mixing line points to two enriched samples in Pb isotopes, one coming from the Marie Céleste fracture zone and the other from an off shore seamout built on the southern slop of the Piton de la Fournaise. They may reveal the existence of a discrete Reunion component that does not survive when melts pass through large magma plumbing and/or magma chambers but appears when small melt bacthes can be preserved.

Quantifying fluxes of metals to surface waters of the South-East Atlantic

G.M. HENDERSON[1]*, E.P. ACHTERBERG[2], A.R. BAKER[3], R. CHANCE[3], W. GEIBERT[4], W.B. HOMOKY[2], Y.-T. HSIEH[1], M.B. KLUNDER[2], M.C. LOHAN[5], P. MARTIN[2], R.A. MILLS[2], A. MILNE[5], M.R. PALMER[6], R.J. SANDERS[2], A.L. THOMAS[1], B.D. WAKE[2], E.M.S. WOODWARD[7] AND THE UK-GEOTRACES CONSORTIUM.

[1]Department of Earth Sciences, University of Oxford, Oxford, United Kingdom, (*correspondence: gideonh@earth.ox.ac.uk)
[2]National Oceanography Centre, Southampton
[3]University of East Anglia, [4]University of Edinburgh
[5]University of Plymouth
[6]National Oceanography Centre, Liverpool
[7]Plymouth Marine Laboratory

The UK-GEOTRACES Consortium aims to assess the balance of inputs of trace elements and isotopes from each of the four ocean boundaries (rivers, sediments, atmosphere, and volcanic) to the highly productive region along 40ºS in the Atlantic. Circumstances during the first UK-GEOTRACES cruise in late 2010 delayed completion of the full trans-Atlantic section, but allowed unexpected multiple occupation of key portions of the eastern third of the section, covering the Cape Basin. These multiple occupations significantly enhanced the realisation of one of the key objectives of the UK-GEOTRACES Consortium: observational quantification of the fluxes of trace metals to productive surface waters.

Vertical micro-profiler (VMP) measurements in the upper 500m of the water column provide constraints on both the vertical and off-shelf mixing of waters. Combined with measured gradients of trace elements, VMP data provide fluxes due to mixing. In the near-shelf, these can be compared with mixing derived from measurements of the Ra-isotope quartet in both surface and deeper waters.

Downward fluxes of trace elements were assessed using combined ^{234}Th and particle composition measurements, with repeat occupations allowing the commonly applied steady-state ^{234}Th approximation to be tested. Addition of trace elements from the atmosphere was also constrained by combining aerosol collection on ship, and relevant high resolution surface ocean chemistry (particularly ^{232}Th and Al concentrations).

In combination, these measurements provide an unusually firm set of constraints with which to quantify and balance the budget of trace elements, including the micronutrients, to the surface of a key open-ocean region.