Rare gases on off-axis seamounts: Constraints on the marble-cake model

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Noble gases were analyzed in glassy margins from pillows dredged on seamounts located off-axis of the Pacific-Antarctic Ridge between 50.5°S and 41.5°S. Samples were dredged during the PacAntarctic 2 cruise of the R/V L'Atalante in December 2004-January 2005. Helium isotopic ratios are between the local mean MORB value ($^4He/^3He$=95,300; R/Ra=7.6) and a relatively radiogenic ratio ($^4He/^3He$=130,420; R/Ra=5.54). This radiogenic component cannot derive from post-eruption U-Th decay because of the high helium content of the samples (few 10^{-6} ccSTP/g). Moreover, the gas was extracted by crushing avoiding radiogenic helium from the matrix. This radiogenic signature either derives from crustal contamination or from the preferential melting of pyroxenite veins. In order to distinguish between these two extreme scenarios, neon and argon isotopes were also analyzed in selected samples presenting radiogenic helium. Neon shows a MORB-like signature, without detectable ^{21}Ne excess. $^{20}Ne/^{22}Ne$ ratios are high (up to 11.79) and $^{40}Ar/^{36}Ar$ show values up to 13,350, compatible with a MORB source origin. Using He and Ne systematics, the crustal contamination hypothesis can be eliminated because the crust proportion would be 100%. Therefore the data show that the recycled material in a marble-cake type mantle has a radiogenic helium signature and a close to MORB neon signature. This can achieved by mixing during melting or can reflect long-term homogenization by diffusion between the recycled component and the ambient mantle as suggested recently by Hart et al. [1].

[1] Hart S., *et al*. (2008), Scale length of mantle heterogeneities: Constraints from helium diffusion, *Earth and Planetary Science Letters*, **269**, 508-517.

Human impact recorded in intertidal sediments, Moreton Bay, Australia

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Sediment cores from estuarine and coastal intertidal areas in Moreton Bay, Australia, are used to assess the temporal evolution of inorganic contaminants levels during the past 200 years. The long – term depositional history of sediments and their relationship with the human impact are defined combining the historical fluxes of trace metals and sediments variability (grain size, organic content and mineralogy) with ^{210}Pb dating and other radionuclides signals along the sediment cores.

Heavy metal concentrations in cores from different impacted areas show various level of pollution. A ^{210}Pb dated sediment core shows higher levels of Cu, Co, Pb, Ni, Zn concentration in the first 60 cm corresponding to the last 100 years (with unsupported ^{210}Pb values variable form 11.72 to 1.24 Bq/Kg). ^{137}Cs activities from the same core supports the ^{210}Pb chronology, with detectable activities in the first 33 cm, indicating a depositional age for sediments below prior of the nuclear test of the 1960. To further constrain sediments depositional history, variations of Pb isotopic values and metal fluxes will be linked with known flood events. The combined use of those different proxies provide a complete historic record of anthropogenic impact in the sediments and allows the definition of a natural "geochemical background" for the selected sites to assess all the post-depositional processes that may disturb the original geochemical signal. This results in a powerful approach to correctly distinguish human pollution in similar geological archives from background values. Specifically, this study will develop a clearer picture of what further environmental changes are to be expected in the future for Moreton Bay.