Partitionning of Pt-Re-Os between solid and liquid metal in the Fe-Ni-Si system

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The Earth evolved into a layered body early in its history with silicates and oxides forming the mantle while molten metal was gravitationally segregated to form the core. Cooling of the Earth causes the liquid core to crystallize. In the meantime, small amount of liquid outer core material could be remixed by dynamical entrainment in the deep mantle. This mechanism was proposed as responsible for the Os isotopic anomalies observed in some mantle-plume derived lavas (OIBs). In that model, a radiogenic Os signature would be produced in the outer core as a result of inner core crystallization, and would then be remixed with the mantle and imprint the isotopic composition of some OIBs.

Here we investigate the solid-liquid fractionation of Os, Re and Pt in the metal at high pressure. As these partition coefficients depend on metal composition, we choose to study the most realistic candidate for core composition, the Fe-Ni-Si system, for which no data exist so far.

He-Pb lead evidence for marble cake under the Pacific-Antarctic ridge

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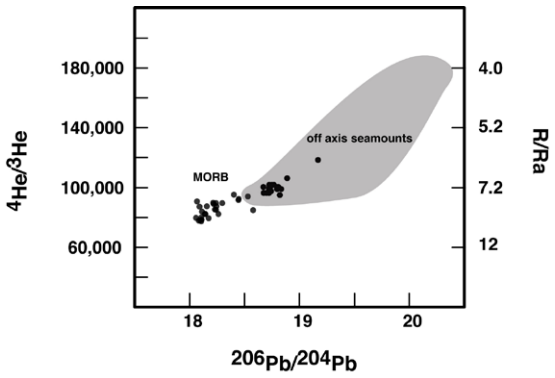
Lead isotopes and Helium isotopes were analyzed in glass samples from 10 seamounts located off-axis of the Pacific-Antarctic Ridge between 50.5°S and 41.5°S. Samples were dredged during the Pacantarctic 2 cruise of the R/V L'Atalante in Dec. 2004-Jan. 2005. Helium isotopic ratios vary between the local mean MORB value ($^4He/^3He$=95, 300; R/Ra=7.58) and more radiogenic values ($^4He/^3He$=182, 460; R/Ra=3.96) associated with high He abundances (~10μccSTP/g). The $^{206}Pb/^{204}Pb$ ratio goes up to 20.2. $^4He/^3He$ ratio and $^{206}Pb/^{204}Pb$ ratios are correlated in samples from the pacific ridges [1] and off-axis seamounts (figure). Clearly, this correlation between helium and lead isotopes reflects the marble-cake structure of the mantle where the fertile component carries the radiogenic signatures. Because of a thicker off-axis lithosphere, this fertile component is more likely to be sampled off-axis as it melts preferentially to the peridotitic mantle.



[1] Hamelin *et al*. (2011) *Earth & Planetary Science Letters* **302**, 154–162.