Seasonal and interannual change in mercury sequestration at Dome Fuji, Antarctica

YEONGCHEOL HAN[1*], YOUNGSOOK HUH[1], SUNGMIN HONG[2], SOON DO HUR[3], HIDEAKI MOTOYAMA[4]

[1]Seoul National University, Korea, hanlove7@snu.ac.kr (* presenting author), yhuh@snu.ac.kr
[2]Inha University, Korea, smhong@inha.ac.kr
[3]Korea Polar Research Institute, Korea, sdhur@kopri.re.kr
[4]National Institute of Polar Research, Japan, motoyama@nipr.ac.jp

The total mercury concentration (Hg_T) was determined with high precision in snow pit samples collected every 2.5 cm down to 2 m, covering ~27 years (1983-2010), at Dome Fuji in East Antarctica. This high-resolution data provide new information on seasonal and interannual change in mercury sequestration rate and factors affecting it.

The Hg_T ranged between 0.20 (±0.02, 2σ) and 5.20 (±0.05) pg g^{-1} with variations at seasonal and interannual time scales. The mean mercury sequestration rate was estimated to be 3.1 ± 0.1 pg cm^{-2} yr^{-1}, slightly higher than the previous estimate at Dome Fuji [1]. By comparison with sulfate concentration, $\delta^{18}O$-δD and deuterium excess profiles, the seasonality was characterized by summertime maxima in Hg_T, even though the peaks were not always exactly in phase. The enhanced mercury sequestration may be related to the active photochemical dynamics of mercury in summer [2]. We ascribe the interannual change to the variation in the atmospheric circulation over Antarctica that regulates the meridional transport of aerosols containing oxidant precursors, continental dust, moisture and heat, each of which is thought to play a role in the mercury dynamics on the Antarctic Plateau [3].

[1] Han et al. (2011) *Mineral. Mag.* **75**, 972. [2] Brooks et al. (1998) *Atmos. Environ.* **42**, 2877-2884. [3] Han et al. (2011) *Bull. Korean Chem. Soc.* **32**, 4258-4264.

The Southeast Indian Ridge: Scale of Source Heterogeneity and Origin of the DUPAL Anomaly

B. HANAN[1]*, J. BLICHERT-TOFT[2], K. SAYIT[1], A. AGRANIER[3], C. HEMOND[3], A. BRIAIS[4], M. MAIA[3], D. GRAHAM[5], F. ALBARÈDE[2]

[1]San Diego State University, San Diego, CA 92182-1020, USA (*correspondence:Barry.Hanan@sdsu.edu)
[2]Ecole Normale Supérieure, 69007 Lyon, France
[3]University of Brest-CNRS, IUEM, 29280 Plouzané, France
[4] CNRS-OMP, BGI, 31400 Toulouse, France
[5] COAS, Oregon State University, Corvallis, OR 97331, USA

Results

Pb and Hf isotope ratios from 139 basalt glasses sampled at < 10 km intervals along 2000 km of the Southeast Indian Ridge (SEIR) between 86°E and 110°E show bimodal distributions. The bimodality in both Pb and Hf isotope ratios confirms the presence of ancient compositional streaks in the Indian Ocean upper mantle [1]. The density of streaks is well described by a Poisson distribution having a characteristic thickness of ~25 km.

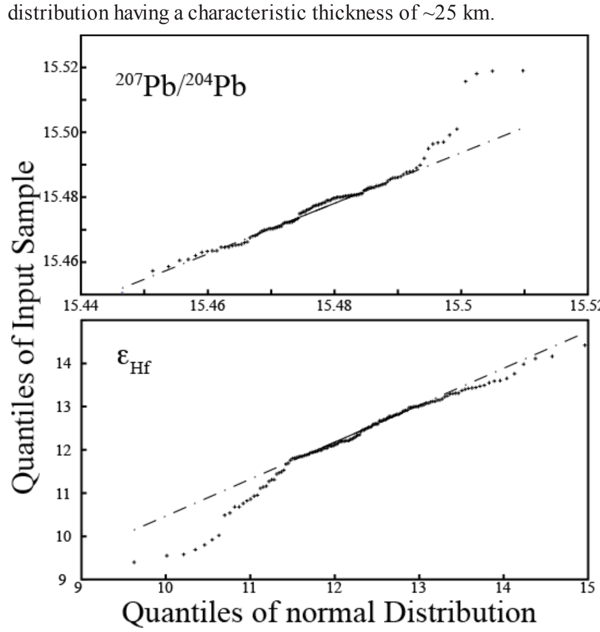

Figure 1: QQ plots for Pb and Hf isotopes for 139 SEIR glasses [this work; 1, 2] show that these MORB melts reflect a mantle source in which the isotope compositions are bimodal rather than a single gaussian population.

Implications

Pb isotopes in SEIR basalts all carry a DUPAL [3] isotope signature. Two possible origins for the bimodality and DUPAL signature are: (1) ancient melting that involved garnet fractionation, with subsequent pollution of the upper mantle by continental material during Gondwana breakup; (2) inherited heterogeneity from the early Earth.

[1] Graham et al. (2006) *Nature* **440**, 199-202.
[2] Mahoney et al. (2002) *J. Petrology* **43**, 1155-1176.
[3] Hart (1984) *Nature* **309**, 753-757.