Noble gases in basalt glasses from Bouvet Triple Junction

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To get insight into the sources of fluid phases and the nature of geochemical variability in Bouvet Triple Junction (BTJ) we have studied He, Ne, Ar isotope compositions and their elemental ratios in basalt glasses applying stepwise crushing extraction of noble gases. Chilled glasses from several dredging stations situated at different segments of BTJ have been investigated: Spiess Ridge, Mid Atlantic Ridge (MAR) and in a valley of the Southwest Indian Ridge (SWIR). The data reflect a complex geochemical history of the fluid phase and different geochemical features of MAR, Spiess and SWIR segments. Helium data confirm the conclusions by Kurz et al. (1998) about both long and small scale heterogeneity in helium concentrations and isotope composition. He and Ne isotope compositions indicate that the plume is currently centered beneath Bouvet Island. The Ne data of one SWIR sample are well correlated and plot along a mixing line which corresponds to a $^{21}Ne/^{22}Ne$ ratio of the mantle endmember of 0.0465±0.0075 (1σ) – almost indistinguishable from the Kerguelen plume mixing line (Valbracht et al., 1996). No plume contribution to MAR or Spiess segments was observed. He-Ne-Ar systematic suggests shallow level degassing processes (probably in the magma chamber) followed by post magmatic He loss in some SWIR and Spiess samples. The mantle component in the investigated samples is elementally fractionated and depleted in Ar relative to Ne. All samples show strong contribution of at least two atmospheric components: unfractionated air + deep sea water for one MAR sample and unfractionated air + a clay-like component for the other samples. The presence of the last component suggests involvement of slivers of ancient lithosphere or oceanic crust within the magma chamber. The observed global and small scale isotopic heterogeneity could be the result of complex geodynamic evolution of the region.

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References: Kurz et al. (1998) // *Geochim. Cosmochim. Acta*. **62,** 841–852.; Valbracht et al. (1996) // *Earth Planet. Sci. Lett.* **138**, 29-38.