Constraining the enigmatic source of Vesteris Seamount volcanism

Session/Theme

Theme 05: Magmatism and Volcanism

2eU - Non-Live Abstracts and Presentations in Session 2e

5dU - Non-Live Abstracts and Presentations in Session 5d

2e - Mantle heterogeneity: origins and contribution to magmatism and implications for mantle dynamics

5d - Strange and extreme melts and unusual volcanoes

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PDF/PPT e-presentation available

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Abstract

Most seamounts related to intraplate volcanism form linear chains with an age progression. Less commonly, seamounts are scattered on the ocean floor, showing no apparent link to stationary mantle thermal anomalies. Several of these appear on the NE Atlantic crust, and Vesteris seamount (13 Ma -10 ka; [1]), situated in the Greenland Basin ca. 280 km N of Jan Mayen Island, is the most

prominent one. Vesteris is considered an intraplate volcano, a single isolated feature far-removed from the active mid-ocean ridge, the Iceland plume and fracture zones. Isotope geochemistry indicates that the mantle source of this volcanism is relatively similar to that of Jan Mayen and differs from the Iceland plume [2]. However, a clear picture of the Vesteris mantle source remains elusive. Here, we report on a new suite of samples dredged in 2012. Many centimetric clasts of vesicular lava were recovered. While some are covered by brownish altered crusts, others include exceptionally pristine porphyritic lava with millimetric spherical or elongated vesicles and occasional fluidal textures. The lavas classify chemically as alkali-basalts, phonotephrites and benmoreitic trachyandesites, suggesting that different lava flows were sampled by dredging. The absence of mugearitic lavas, the youngest products of Vesteris, is in agreement with sampling from a valley on the flank of the volcano. We report for the first time the occurrence of hauyne-phyric trachyandesites from Vesteris. Kaersutite, olivine, clinopyroxene, plagioclase and Ti-magnetite phenocrysts are present in a dominantly glassy matrix with micro-phenocrysts of clinopyroxene, plagioclase and oxides. Many phenocrysts contain apatite, sulphide and melt inclusions. Zoning, resorbed textures, and inclusions in the phenocrysts reveal a complex history of magma mixing and disequilibrium, while broken phenocrysts suggest a fast ascent of these magmas upon eruption. Whole-rock Rare Earth Elements are used to model mantle melting dynamics. Further analyses will target Sr-Nd-Pb-Hf isotopes to constrain the Vesteris mantle source in the context of compositional heterogeneities and geodynamic evolution of the NE Atlantic.

[1] Haase and Devey (1994), J. Pet 35, 295.

[2] Mertz and Renne (1995), J. Geodyn. 19, 79.

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