Origin of the Jan Mayen Hotspot: An $^{187}Os/^{188}Os$ and PGE perspective.

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Jan Mayen is a volcanic island located north of Iceland. Previous studies have shown that basalts from both Jan Mayen Island and Jan Mayen platform display an enriched isotopic signature, with a continuous gradient in Sr-Nd-Pb isotopes across the Jan Mayen Platform and further along the Mohns Ridge. It is at present unclear whether Jan Mayen Island can be explained by preferential melting of enriched continental material left over from the opening of the Atlantic Ocean and dispersed in the upper mantle, or instead is related to a mantle plume, and possibly associated with the Iceland mantle plume.

In order to assess the origin of the Jan Mayen hotspot, 22 basalts from Jan Mayen and the Icelandic volcanic flank zones (VFZ) have been analyzed for Os isotope compositions and highly siderophile element concentrations (Re, Pt, Ir, Pd, Os). The samples are primitive and olivine-phyric alkaline to transitional tholeiitic basalts with MgO ranging from 5.2 to 12.4 wt%. The Iceland VFZ samples range in $^{187}Os/^{188}Os$ from 0.12117 to 0.17581. Jan Mayen samples have a more restricted range from 0.12431 to 0.13436. The Os concentrations range from 7 to 365 ppt and correlate negatively with $^{187}Os/^{188}Os$. All the $^{187}Os/^{188}Os$ variation range is shown at lower concentrations (<100 ppt). The large range in $^{187}Os/^{188}Os$ is displayed by one heterogeneous sample from the Iceland Eastern VFZ, which also has the lowest concentration in Os and MgO and hence would have been likely contaminated by high $^{187}Os/^{188}Os$ material during AFC processes, and by samples from the Iceland Southern VFZ. All other samples from both Iceland and Jan Mayen, show no evidence for shallow level contamination processes from ancient subcontinental lithospheric mantle (low $^{187}Os/^{188}Os$), nor by fragments of continental crust disseminated in the mantle (high $^{187}Os/^{188}Os$), except in the unlikely possibility of a mixing of these two extreme components in the precisely adequate proportions to result in the medium $^{187}Os/^{188}Os$ of Jan Mayen lavas.

We propose that $^{187}Os/^{188}Os$ variations are related to intrinsic Iceland plume heterogeneities and thus that Jan Mayen hotspot would not be related to subcontinental lithospheric fragments present within the upper mantle. PGE concentration ratios and Sr-Nd-Pb-isotope systematics will be used to investigate the deep mantle plume model and the precise melting conditions beneath Jan Mayen Island.