Stable iron isotopes as a tracer for the mantle components *'FOZO A and B'* at São Miguel, Azores.

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In Sr-Nd-Pb isotope space, ocean island basalts (OIB) exhibit signatures, which reflect the initial parent-daughter ratio of crustal material at time of recycling. The island of São Miguel in the eastern Azores archipelago displays a spatial range in Sr-Nd-Pb isotope compositions that varies systematically from a common Azores mantle source in western São Miguel lavas to elevated $^{86}Sr/^{87}Sr$ and $^{206}Pb/^{204}Pb$ isotopic composition in the East. Here, we combine published radiogenic isotope ratios with a set of new stable Fe isotope data of the primary melts ($\delta^{57}Fe_{prim}$). Our data display a co-variation between $^{143}Nd/^{144}Nd$ and $\delta^{57}Fe_{prim}$. The eastern São Miguel lavas show light $\delta^{57}Fe_{prim}$ values (+0.07 to +0.12‰) with relatively low $^{143}Nd/^{144}Nd$ indicating the influence of a metasomatising agent in form of a basaltic melt. Lavas from western São Miguel show instead an increasing trend in $^{143}Nd/^{144}Nd$ vs $\delta^{57}Fe_{prim}$, with higher radiogenic $^{143}Nd/^{144}Nd$ and $\delta^{57}Fe_{prim}$ ranging from 0.5128 to 0.5130 and up to +0.18‰, respectively. We interpret the isotopic signature from western São Miguel to reflect a mixing trend between FOZO-A (*australis*; the putative southern hemisphere plume matrix) and FOZO-B (*borealis*; the putative northern hemisphere plume matrix). Commonly, FOZO-A is associated with mantle melts derived from garnet peridotite and is in agreement with published trace element data and consistent with a lithospheric thickness of 70-80 km observed beneath São Miguel. Instead, FOZO-B compositions are interpreted to derive from pyroxenitic mantle. A mixing between the two mantle domains has not been recognised yet and questions the current model in which the distribution of FOZO-A vs -B is interpreted to reflect a geographical feature. Instead, the distribution in the Azores mantle suggests that the occurrence of these signatures can be an effect of different depth of melting preserved in the small-degree melting regime in the Azores as opposed to other intraplate environments in which the pyroxenitic signatures are overprinted by peridotite melts.