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Fine-scale heterogeneity measured in basaltic samples from Sao Nicolau Island, Cape Verde: insights into modification of mantle source fingerprints during magma ascent.

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Systematic measurement of Sr, Nd, Pb isotopic compositions (and, at a lesser extent, Os, Hf, He) in Oceanic Island Basalts (OIB) has shown, for thirty years now, the complexity of the nature of the mantle sources. Measured variations in oceanic basaltic samples can be related either to variable proportions of the components present in the deep source of the basalts, or to interactions between the pristine melts and the environments encountered during their ascent to the surface during partial melting, plume-lithosphere interaction, Assimilation and Fractional Crystallization (AFC) and post-eruption seawater interaction processes. Consequently, it is important to determine the importance of the shallow-level processes in the modification of the source fingerprint, in order to give insights into mantle chemical dynamics. For this purpose, fine scale studies, at a single island or archipelago scale, are still mandatory.

Hence, we performed a major, trace elements and isotopes (Sr, Nd, Pb, He) study on basaltic samples from the São Nicolau Island, Cape Verde archipelago to investigate ways to decipher the source information from the global measured variations. We also used Principal Component Analysis (PCA) to reveal the diversity of reservoirs involved in the geochemical signature of the Cape Verde Islands.

The results show that most of the measured variations are due to mixing of plume-derived melts with shallow level reservoirs. Therefore the real source heterogeneity is much smaller than the one “sampled” in the basalts. This observation, made on a single archipelago, indicates that caution is required when interpreting global OIB data

in terms of mantle topology (endmembers and common components) without filtering them from the contribution of shallow-level reservoirs.