The 2014 Fogo eruption (Cape Verde): constraints on the short-term geochemical evolution and plumbing system

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Magmas erupted in 2014 are alkaline with somewhat evolved compositions (Mg# < 56), ranging from tephrites to phonotephrites. They carried to the surface clinopyroxene and kaersutite phenocrysts and cognate megacrysts, which indicate the existence of magma chambers within the mantle at depths incompatible with the existence of a neutral buoyancy level. After this stagnation at mantle depths, where the main differentiation occurred (clinopyroxene and kaersutite fractionation), magmas stalled at crustal levels by a short period before eruption. The 2014 vents are located 200 m from those of the 1995 eruption, and less than 2000 m from those of the 1951 event. 2014 magmas have more unradiogenic Sr and more radiogenic Nd compositions, and for most of the samples, more radiogenic Pb signatures than those of the previous 1951 and 1995 eruptions.These isotopic differences, in such a short-time interval and close locations, reflect the small-scale heterogeneity of the underlying mantle source and the lack of subsequent significant mixing/homogeneization. The lid effect of an old and thick lithosphere, limiting the degree of partial melting, is considered a key factor to preserve the source heterogeneity by the magmas. The low magma suply rates constrain the plumbing system which is characterized by multiple small and ephemeral magma reservoirs.

Nb/U ratios of the 2014 lavas are similar, within 2σ, to the mean value of OIB, but significantly lower than those reported for the 1995 and 1951 eruptions. Such differences, in Nb/U, and also on Dy/Dy*, are interpreted as caused by assimilation of lithospheric melts by the 1951 and 1995 magmas, a process that probably did not occurr during the ascent of the 2014 magmas.

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