## Relics of subcontinental mantle in the Cape Verde oceanic lithosphere

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Mantle xenoliths from two Late Tertiary necks of Sal Island were investigated in order to define the petrological characteristics together with the compositional evolution of the Atlantic lithospheric mantle underneath Cape Verde Archipelago. They consist of mainly protogranular sp-bearing lherzolites and harzburgites. Whole rock and pyroxene trace element distribution, particularly HREE, suggest that compositional variation from lherzolites to harzburgites cannot be explained by a common progressive depletion process of a sp-bearing mantle peridotite. High Cr2O3, low CaO contents and upward-convex REE patterns in large protogranular clinopyroxenes (La<sub>N</sub>=3.6-5.3; Sm<sub>N</sub>= 8.3-12.8; Yb<sub>N</sub>=2.4-4.8), coupled with high Cr2O3 and low HREE contents in orthopyroxene, suggest in fact that lherzolites still preserve geochemical fingerprints consistent with a fertile gtbearing stability field. By contrast the majority of Cape Verde harzburgites, are quite comparable to highly refractory mantle lithologies commonly observed in the Atlantic Ocean generated after extensive MORB extraction. This is also in agreement with the occurrence of Late Jurassic MORB in the islands of Maio and Santiago. On the other hand the abundant presence of lherzolites-still recording equilibration in the garnet stability field-suggests that a significant portion of Cape Verde lithospheric mantle was not formed at mid-ocean ridge, but most probably represent a portion of sublithospheric continental mantle incorporated in the newly-formed oceanic lithosphere. A few lherzolites and harzburgites show textural evidences of metasomatic enrichments. Metasomatic fluids react with the original paragenesis causing the formation of secondary minerals, such as clinopyroxenes after orthopyroxene and primary clinopyroxene destabilization and, in few cases, k-feldspar and K2O-rich glass (K2O up to 8.78wt%). These agents were reconstructed using major and trace element mass balance calculations between primary and secondary parageneses. The resulting compositions have geochemical features comparable to those of kimberlite (on dry basis, MgO:17-27 wt%; K<sub>2</sub>O/Na<sub>2</sub>O:1.6-3.2 molar; (K2O+Na2O)/Al2O3:1.1-3.0 molar; Rb:91-165 ppm; Zr:194-238ppm). These magmas may result from very low partial melting degree of deeper SCLM portions, left behind by drifting of the African Plate during the Central Atlantic opening.

## Fluid-rock interaction in convergent margins: Evidence from stable isotopic studies of veins

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Measurements of the oxygen isotope ratios of veins and their coexisting host rocks from the Lachlan Fold Belt (Australia), the Ouachita and Appalachian Orogens (United States), the Otago Schist (New Zealand) and the Oman Mountains constrain the styles of fluid-rock interaction in the crust at different levels during crustal convergence. The ratio of the fluid flux rate (u) to the isotopic exchange rate (k) is the dominant parameter effecting oxygen isotope distribution.

Modeling of the isotopic exchange shows that for many geologic environments the isotopic composition of the fluid reaches a quasi-steady state that can be approximated by a mixing equation of a rock-buffered fluid ( $u/k \rightarrow 0$ ) and an externally derived fluid ( $u/k \rightarrow \infty$ ); in a fluid + rock binary



system, any natural system generates a spectrum of fluid compositions that range from fluidbuffered to rockbuffered. The primary controls on this critical u/k ratio are permeability (for u) and temperature (for k). Mechanical limits

on permeability at depth permit the preservation of surfacederived isotopic heterogeneities to significant depths and for geologically extensive time scales. When u/k <<1, the fluid isotopic composition is buffered by the local host rocks on time scales of thousands of years while mineral heterogeneities will persist for millions of years. Secondary phases grown in the presence of this rock-buffered fluid will reflect isotopic equilibrium with the local fluid environment and exhibit non-equilibrium fractionations with the remaining partially-exchanged phases. The time scales for this style of fluid-rock interaction are comparable to the time scales for metamorphism in convergent margin settings.