



Transitional evolutionary stages revealed from a submarine crustal profile in the Azores Archipelago

Bettina Storch, Christoph Beier, Karsten Haase, and René Romer

Friedrich-Alexander Universität Erlangen Nürnberg, GeoZentrum Nordbayern, Endogene Geodynamik, Germany
(bettina.storch@fau.de)

The Azores represent a unique geodynamic setting in which a tectonically dominated region interacts with a small low-velocity anomaly in the mantle. The presence of an active, ultraslow spreading axis, opening deep non-volcanic basins between the volcanically active islands and seamounts has resulted in the exposure of steep graben shoulders which allowed the first stratigraphic sampling of a 1.2 km thick crustal profile at the northern wall of the Hirondelle Basin. The new major, trace element and isotope geochemical data reveal that the profile exclusively consists of alkaline mafic to intermediate samples. The isotope (e.g. $^{87}\text{Sr}/^{86}\text{Sr}$, $^{208}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{206}\text{Pb}/^{204}\text{Pb}$) and trace element (e.g. Nb/Zr, Zr/Sm) compositions are bimodally distributed through the profile. A relatively heterogeneous and, in terms of trace element ratios, less enriched lower (ranging from 2510 m to 1438 m waterdepth) and a more homogeneous and more enriched upper series (ranging from 1390 m to 1308 m waterdepth) are observed throughout the profile. We note however, that the radiogenic isotope ratios are relatively heterogeneous and enriched in the lower series as opposed to more homogenous and less enriched signature in the upper series. This implies a decoupling of the trace element and isotope signature in the northern Hirondelle Basin lavas. We can show that our data neither resemble the surrounding, active subaerial or submarine volcanic edifices nor any of the early oceanic plateau phases that have previously been sampled in the western Azores Plateau. Thus, we develop a new model in which we propose that the lavas from the Hirondelle Basin may reflect a transitional evolutionary stage between a late plateau building and an early islands building phase. We suggest that the preservation of these transitional phases may result from the presence of a small-scale low-velocity anomaly in the upper mantle as compared to other larger oceanic plateaus. The low degrees of partial melting (1-4 %) and the relatively slow plate motions combined with the presence of a rift movement may preserve these transitional volcanic stages in the Azores when being compared with other oceanic plateaus.