Geophysical Research Abstracts
Vol. 16, EGU2014-8782, 2014
EGU General Assembly 2014

The Development of the Cameroon Volcanic Line: Evidence from Broadband Seismology

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The Cameroon Volcanic Line (CVL) straddles the continent-ocean boundary in west Africa, but exhibits no clear age progression. This renders it difficult to explain by traditional plume/plate-motion hypotheses; thus there remains no consensus on the processes responsible for its development. To understand better the nature of asthenospheric flow beneath the CVL, and the effects of hotspot tectonism on the overlying lithosphere, we analyse mantle seismic anisotropy, bulk crustal seismic structure, and seismicity. Cameroon is relatively aseismic compared to hotspots elsewhere, with little evidence for magmatism-related crustal deformation away from Mt. Cameroon, which last erupted in 2000. Low crustal Vp/Vs ratios ($\sim$1.74) and a lack of evidence for seismically anisotropic aligned melt within the lithosphere both point towards a poorly developed magmatic plumbing system beneath the CVL. Null SKS splitting observations dominate the western continental portion of the CVL; elsewhere, anisotropic fast polarization directions parallel the Precambrian Central African Shear Zone (CASZ). The nulls may imply the CVL convecting upper mantle is isotropic, or characterized by a vertically oriented olivine LPO fabric, perhaps due to a mantle plume or the upward limb of a small-scale convection cell. Precambrian CASZ fossil lithospheric fabrics along the CVL may have been thermomechanically eroded during Gondwana breakup $\sim$130Ma, with an isotropic lower lithosphere subsequently re-forming due to cooling of the slow-moving African plate. Small-scale lithospheric delamination during the 30Ma-Recent development of the line may also have contributed to the erosion of the CASZ lithospheric fossil anisotropy, at the same time as generating the low-volume alkaline basaltic volcanism along the CVL.