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Small scale inhomogeneity in the mantle source of the Cape Verde hotspot is probably related to plume complexity: implications from Sr, Nd and high precision Pb isotopes and geochemistry

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The volcanic rocks of one of the major islands of the Cape Verde hotspot have been investigated in order to test mantle plume models. From the centre of the Cape Verde Rise an array of islands trend west, the northern HIMU-type Cape Verde Islands. Of these, São Nicolau (SN) is the easternmost and Santo Antão the westernmost. Sixty samples of primitive (MgO = 9-14 wt%) basanitic composition from SN that represent the four volcanic stages of the 9 – 0.1 Ma evolution of the island have been analysed for Sr, Nd and high precision Pb isotopic composition. Pb ranges to a less radiogenic composition than on SA [1] and has lower [U+F029]8/4 than the rocks of the southern EM1-type Cape Verde islands. Most SN lavas have a young HIMU character with negative [U+F029]7/4. The most radiogenic Pb at SN is less thorogenic than Pb at SA. Temporal variation is also evident: An intermediate age group of samples have particularly low La/Nb = 0.4 - 0.5 and the least LREE-enrichment for SN. The youngest group of rocks has the lowest Zr/Nb = 2.5 – 3.0 and the most unradiogenic Sr and radiogenic Nd in the archipelago. At least four of the mantle source components for the SN magmas are different from any found in the SA magmas. High precision Pb data allow identification of parallel trends for northern SN and the southern island Santiago, which therefore must have unrelated source components. For the northern Cape Verde islands source compositions vary from E to W as well as with time. This cannot be explained by stationary enriched lithosphere components. The derivation of melts from a complex plume source is modelled.

[1] Holm P.M., Wilson J.R., Christensen B.P., Hansen S.L., Hein K.M., Mortensen A.K., Pedersen R., Plesner S., and Runge M.K. (2006) JPetrol 47, 145-189.