He and Ne isotopic ratios from the Terceira Rift (Azores): Constraints on the boundary between Eurasia and Nubia mantle sources

PEDRO MADUREIRA[1,4], MANUEL MOREIRA[2], JOÃO CARLOS NUNES[3], NUNO LOURENÇO[4], CÉCILE GAUTHERON[5], ROSÁRIO CARVALHO[6], JOÃO MATA[6] AND MANUEL PINTO DE ABREU[4]

[1]Univ. Évora, CGE, Dep. Geociências, Rua Romão Ramalho, 59, 7000-671 Évora, Portugal (pedro@uevora.pt)

[2]Equipe de Géochimie et Cosmochimie, IPGP, Sorbonne Paris Cité, CNRS (UMR 7154), 1 rue Jussieu, 75238 Paris Cedex, France (moreira@ipgp.fr)

[3]Univ. dos Açores, Dep. Geociências, R. Mãe de Deus, Apartado 1422, 9501-801 Ponta Delgada, Açores, Portugal (jcnunes@uac.pt)

[4]EMAM, Rua Costa Pinto, 165, 2770-047 Paço d'Arcos, Portugal (nlourenco@am-em.org, mapabreu@am-em.org)

[5]UMR Interactions et Dynamique des Environnements de Surface-CNRS 8148, Université Paris Sud, 91405 Orsay, France (cecile.gautheron@u-psud.fr)

[6]Univ. Lisboa, Faculdade de Ciências, Dep. Geologia (GeoFCUL), CeGUL, Edifício C6, Campo Grande, 1749-016, Lisboa, Portugal (mdrcarvalho@fc.ul.pt, jmata@fc.ul.pt)

We present He and Ne isotopic data from subaerial and submarine samples collected along the Terceira Rift. Graciosa Island as well as the western end of S. Miguel Island and D. João de Castro Bank display $^4He/^3He$ ratios similar to those observed along the MAR segments located to the north of the Azores Triple Junction area. Conversely, samples from the south Hirondelle Basin display a $^4He/^3He$ ratio similar to that of the MAR segments located to the south of the Azores Plateau. The Terceira Rift is thus characterized by the mingling of two different mantle domains referred as 'Eurasia' and 'Nubia' type. He and Ne systematics shows that the influence of the relatively primitive source sampled by the Azores plume can be followed along the Terceira Rift from the Graciosa Island towards the south Hirondelle Basin. Moreover, samples from the south Hirondelle Basin, D. João de Castro Bank and Graciosa Island cannot be explained by the same hyperbolic mixing model that encloses Terceira data.

SHRIMP studies of the uranium oxide-based U/Pb SIMS calibration

C.W. MAGEE

Australian Scientific Instruments 111/113 Gladstone St. Fyshwick ACT 2609 Australia (cwmagee@gmail.com)

Since the earliest days of SIMS U/Pb geochronology, it has been necessary to correct for variations in the relative ionization efficiency of Pb and U. Extensive research during the twentieth century has resulted in the empirical derivation of calibration cures based on observed relationships between Pb/U and UO_x/U, where x is equal to 1 or 2. This calibration is the precision-limiting step in SIMS U-Pb data reduction.

Both oxygen activity and secondary ion energy have been proposed asmachanisms for measured Pb/U variation. For example, the extreme sensitivity of Pb ionization to oxygen flooding in some SIMS instruments suggests that oxygen activity at the sample surface may important to relative Pb and U ionization. As is shown in figure 1, this is consistent with the ability to use a variety of Zr, Hf, Th, or U oxide pairs as a rough calibration, with about ~3% accuracy and precision.

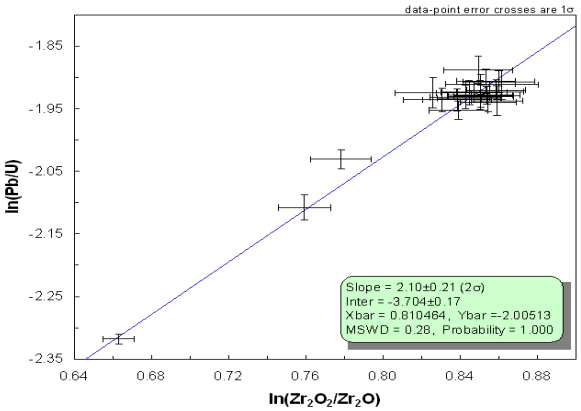

Figure 1: Arbitrary oxide calibration of SHRIMP U/Pb data. This and similar Hf and Th-based calibrations yield less scatter than raw Pb/U or Pb/UO_2.

Additional effects beyond fO_2 must be responsible for the superior performance of UO_x based calibrations compared to randomly selected metal oxide pairs. While the effect of secondary ion energy has been discussed previously, the effect of primary ion energy is less well studied. Primary energies as low is 2.5kV have been investigated to determine the change in calibration due to changes in Pb ionization efficiency, secondary ion energy dispersion, and uranium oxide speciation.