

A TELLTALE SIGNATURE OF ARCHEAN LITHOSPHERIC MANTLE IN THE PARANÁ CONTINENTAL FLOOD BASALTS GENESIS

Rocha-Júnior, E.R.V.¹; Marques, L.S.²; Babinski, M.²; Machado, F.B.³; Petronilho, L.A.²; Nardy, A.J.R.⁴

¹Universidade Federal da Bahia; ²Universidade de São Paulo; ³Universidade Federal do Paraná; ⁴Universidade Estadual Paulista

RESUMO: The origin of the Paraná Continental Flood Basalts (PCFB), which constitute one of largest magmatic provinces in the world, remains a very controversial subject, particularly whether melts are sourced in the mesosphere (deep mantle plume), asthenosphere and/or lithosphere. In an effort to scrutinize those competing hypotheses, new measurements of Os, Nd, Sr and Pb isotopes, along with major and trace elements are presented for low-TiO₂ tholeiites from the province. This suite occurs discreetly in the central-north of the province (termed Ribeira magma-type), whose lithospheric structure is characterized by higher P- and S- wave velocities, and high electrical resistivity. The initial ¹⁸⁷Os/¹⁸⁸Os isotopic compositions in Ribeira lavas, ranging from 0.10660 to 0.12575, are more unradiogenic than the other magma-types of the PCFB, as well as the estimates of the contemporary Depleted Mantle and are lower than any osmium isotopic ratio yet reported for continental flood basalts. These remarkably unradiogenic ¹⁸⁷Os/¹⁸⁸Os ratios preclude significant continental crust contamination and require the involvement of an ancient subcontinental lithospheric mantle source that evolved in a very low Re/Os environment. The fact that the Ribeira rocks occur on a peculiar lithospheric geophysical structure and have a unique unradiogenic osmium isotope signature reveals for the first time the existence of Archean lithosphere concealed by the Paraná Basin, inserted in the Paranapanema fragmented lithosphere. On the other hand, the other magma-types of the province, whose osmium isotopic signature is similar to the modern fertile mantle, occur close to more electrically conductive lithospheric structures. Thus, osmium isotopic information integrated with recent crustal and upper mantle geophysical soundings provides crucial information about the PCFB mantle sources. To account for the combined Os, Nd, Sr and Pb isotopic compositions of the Ribeira rocks, we propose that the primary melts formed from the heterogeneous lithospheric mantle (including Archean lithosphere fragments) that was variably hybridized by melts derived from recycling of eclogites related to multiple Neoproterozoic-Cambrian suture zones that surround the Paraná Basin and subduction processes.

PALAVRAS-CHAVE: PARANÁ CONTINENTAL FLOOD BASALTS; RE-OS ISOTOPIC SYSTEMATICS; HETEROGENEOUS LITHOSPHERIC MANTLE