

The genesis of Paraná Magmatic Province basalts (Brazil): contribution of new Hf isotope data

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The Paraná Magmatic Province (PMP) is one of the largest in the world, and the primary volcanic phase took place at 134-133 Ma, preceding the Western Gondwana breakup. The northern PMP is characterized by dominant high-Ti basalts (Pitanga and Paranapanema types), with rare low-Ti ones (Ribeira type), whereas the southern PMP is marked by widespread low-Ti basalts (Esmeralda and crustal-contaminated Gramado types) and limited high-Ti rocks (Urubici type). Hafnium isotope data for 30 representative samples of these groups (except Gramado) are presented. The isotope compositions were obtained after column chromatography with Eichrom Ln resin, and the measurements were carried out using Thermo Neptune and VG-Axiom MC-ICP-MS machines at the Instituto de Geociências and Columbia University. The Hf isotope ratios were normalized to Spex Hf standard with the same value as JMC-475. The 2σ uncertainties associated with $^{176}\text{Hf}/^{177}\text{Hf}$ ratios varied from 0.003 to 0.005%. The Hf isotope ratios for the Esmeralda basalts are significantly higher (ϵHf : 1.1 to 5.4; mean= 2.8 ± 1.7 ; N=7) than those of all other types ($\epsilon\text{Hf} < 0$). The Urubici tholeiites have the lowest ratios (ϵHf : -6.4 to -1.7; mean= -4.5 ± 1.7 ; N=6), although some of them overlap those of the Pitanga and Paranapanema types (ϵHf : -5.0 to -3.0; mean= -4.3 ± 0.7 ; N=9), which have very similar isotope compositions. The Ribeira basalts show the highest Hf isotope ratios (ϵHf : -3.7 to -2.2; mean= -3.2 ± 0.5 ; N=8) of the rocks found in northern PMP. The differences in Hf isotope compositions are accompanied by systematic variations in highly incompatible element concentrations and their ratios, as well as in Sr, Nd and Pb isotope ratios, reinforcing participation of different mantle sources in the basalt genesis. The similarity of the isotope characteristics of Paranapanema and Pitanga basalts points to generation by different partial melting degrees of a common or similar mantle(s) source(s).

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