



11th SSAGI

South American Symposium on Isotope Geology



Cochabamba-Bolivia
July 22-25, 2018



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Program and Abstracts

⁴⁰Ar/³⁹Ar dating of the alkaline rocks from the São Sebastião Island, SP

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The Late Cretaceous alkaline lithologies found in the São Sebastião Island and along the southeast Brazilian coast, are the magmatic outcome of a continental rifting that led to the opening of the South Atlantic Ocean. In this island, the felsic alkaline stocks (Mirante, Serraria and São Sebastião Massifs) are associated with less common layered alkaline mafic-ultramafic rocks, lamprophyres, alkali olivine basalts, and alkali felsic differentiates.

We employed ⁴⁰Ar/³⁹Ar laser step-heating analytical technique on a variety of magmatic and late magmatic minerals in order to constrain the timing of magmatic crystallization and thermal history for the alkaline igneous suite of the São Sebastião Island. Taking into account the petrographic characteristics and field relations, three fresh samples (each with two aliquots) were selected for ⁴⁰Ar/³⁹Ar analysis that represent different geological events. It is estimated that the beginning of the alkaline magmatism is given by the ⁴⁰Ar/³⁹Ar step heating plateau age of 87.9 ± 0.8 obtained from late magmatic amphibole of an olivine-bearing kaersutite gabbro located towards the base of the layered sequence. This first event was followed by the intrusion of crosscutting basalts, picobasalts and alkali olivine basalts (86.0 ± 0.8 Ma on matrix kaersutite) and coeval quartz trachyte to porphyritic trachy-phonolites (86.0 ± 0.4 Ma on biotite phenocrysts and 85.9 ± 0.5 on sanidine phenocyst). Previously available U-Pb (ID-TIMS) data in zircon from the oversaturated to nearly undersaturated syenites yielded ages of 84.8 ± 0.6 Ma, and 85.1 ± 0.5 Ma and are considered the best estimate for the crystallization age of the São Sebastião and Serraria stocks, respectively. Field observations indicate that phonolites and trachyte dykes intrude the above lithologies, representing the last magmatic alkaline event in the region.

These analytical results are in good agreement with the regional geochronological tendencies of a spatial and temporal association of a bimodal magmatism, which lasted approximately 4 million years as a result of a lithosphere-crust interaction during the Mesozoic and that started with the emplacement of layered alkaline mafic-ultramafic sequences followed by distinct pulses of silica-oversaturated to under-saturated magmas.