Geochemistry of igneous silicic rocks of the Martín García Island, Río de la Plata Craton, Argentina

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Keywords: granitoids, Martín García Complex, Buenos Aires Province

The Martín García Island (MGI, Buenos Aires Province, Argentina) is located in the Río de la Plata estuary, 44 km northeast of Buenos Aires city (Fig. 1). The MGI is composed of basement rocks partially covered by modern fluvial sediments. The basement rocks crop out mainly along the southern and southwestern coasts of the island and are constituted by metaultrabasites, metabasites, metagranitoids, and basic and acidic dykes. They correspond to the Martín García Complex, defined by Dalla Salda (1975), which together with the Buenos Aires Complex (Marchese and Di Paola 1975) of the Tandilia System, constitute part of the Río de la Plata Craton, assigned to the Transamazonian Orogenic Cycle (Dalla Salda et al. 2005 and references therein). The aim of this work is to determine the chemical features and petrogenesis of the silicic rocks of the MGI. A selection of samples was made in order to analyse them petrographically and geochemically (bulk rock by ICP-MS). The distribution of samples is shown in Fig. 1.

MGI granitoids outcrops have a N 35° E/40° NW foliation and occur as small and isolated bodies on the southwestern coast. These rocks show fine grained granoblastic (G1) and porphiroid (G2) textures in hand specimen which allow two igneous pulses to be differentiated. Also, they are cut by N-S granodioritic dykes. The rocks are granodioritic and tonalitic protomylonites composed of microcline, ortose, quartz, zoned plagioclase (An_{5-20}), biotite and hornblende. G1 and G2 show microcline crystals about 400-800 µm and 4 cm long, respectively, and a preferential orientation (Dip direction 273°/35°) in some sectors. Quartz with undulose extinction, oscillatory zoning in plagioclase, biotite fish surrounding K-feldspar and hornblende crystals, and biotite and hornblende fish were recognized. Additionally, zircon, apatite and titanite crystals were identified as accessory minerals.

MGI granitoids have high contents of SiO_2 (65.6-71.9 wt.%), Al_2O_3>15.00 wt.% and Mg# between 0.42 and 0.52. They plot within the granodiorite and tonalite fields of the Ab-An-Or diagram (Barker 1979). They also plot into the subalkaline and calc-alkaline fields of the SiO_2 vs. $Na_2O + K_2O$ (Irvine and Baragar 1971) and SiO_2 vs. K_2O (Peccerillo and Taylor 1976) diagrams, respectively. Regarding the alumina saturation, the analysed rocks plot within the metaaluminous field of the Al/(Ca + Na + K) vs. Al/(Na + K) diagram of Shand (1927). The Alumina Saturation Index (ASI) is between 0.85 and 0.97.

Regarding the incompatible elements, an enrichment in large ion lithophile elements and a decrease in high field straight elements can be observed as well as strong negative anomalies of Nb, Ti and Ta. Moreover, a high Sr/Y ratio (43.42-56.23) was observed.

The total rare-earth elements content of the MGI granitoids varies between 88 and 1046 ppm. In the chondrite-normalised spidergram (McDonough and Sun 1995), these rocks exhibit a marked enrichment in light rare-earth elements with respect to the heavy rare-earth elements (La_N/Yb_N= 14.25–30.24). Eu anomalies are slightly negative (Eu/Eu* = 0.85–0.95) and indicate scarce fractionation of plagioclase at the source (Fig. 2). When plotted in the tectonic discrimination diagram of Pearce et al. (1984), granitoid rocks plot within the VAG + syn-COLG field of the Y-Nb. Thus, the MGI granitoids have petrographical and geochemical characteristics of I-type rocks, related to a volcanic arc setting linked to a Rhyacian magmatism, according to the Paleoproterozoic U-Pb ages obtained by Santos et al. (2017). Also, MGI granitoids have remarkable geochemical coincidences with those defined for adakites, which would point out a low crust partial melting origin (Castillo 2012, Arndt 2013 and references therein).

Acknowledgements

This research has been funded by CICPBA and UNLP. We want to thank the support of Carlos Cingolani and also Micaela García, Facundo De Martino, Mercedes Carlini and Eugenia Giannoni for helping with the field work.

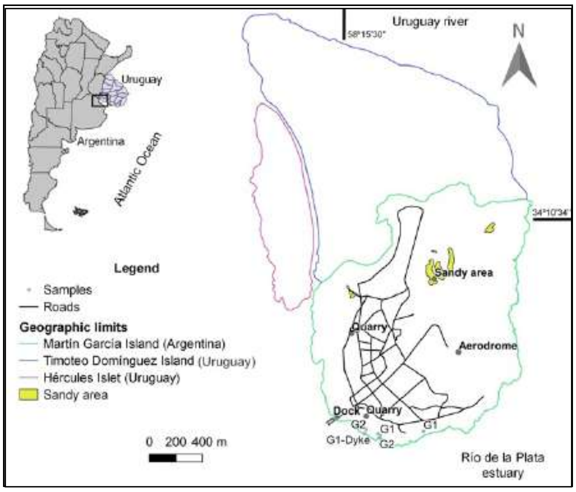

Fig. 1 –Location Map of the Martín García Island. Studied sectors and selected samples locations are shown.

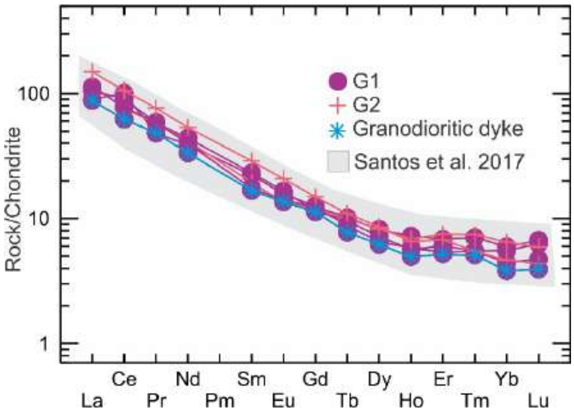

Fig. 2 –Chondrite-normalised spidergram according to McDonough and Sun (1995).

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