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Cambro-Ordovician Granites in the Araçuaí Belt, in Brazil: snapshots from a late orogenic collapse

Cristina P. De Campos (1), Júlio Cesar Mendes (2), Silvia Regina de Medeiros (2), and Isabel P. Ludka (2)

(1) University of Munich, GeoCenter, Earth and Environmental Sciences, Munich, Germany (decampos@lmu.de), (2) Inst. Geoscience, Federal Univ. of Rio de Janeiro, UFRJ, Cid. Univ., Rio de Janeiro, Brazil (julio@geologia.ufrj.br)

Along the Brazilian Coast, surrounding the São Francisco Craton and adjacent mobile belts, deep segments of a Neoproterozoic orogen (Araçuaí-West Congo) generated over 120 Ma of successive magmatic episodes of granitic magmatism. The c.630-585 Ma calc-alkaline magmatic arc consists of metatonalite to metagranodiorite, with metadioritic to noritic facies and enclaves. During the syn-collisional and crustal thickening stage (c. 585 to 560 Ma) S-type metagranites have been built by dehydration melting of a diverse package of sediments. Around 545-525 Ma late orogenic crustal remelting formed mostly non-foliated garnet-cordierite leucogranites. In the post-orogenic stage (c. 510-480 Ma) inversely zoned calc-alkaline to alkaline plutons intruded previous units.
This work will focus on the youngest post-orogenic magmatism. It will present the state of the art by reviewing structural measurements, detailed mapping of flow patterns and additional geochemical and isotopic data. The architecture of around 10 plutons, ranging from c. 20 to 200 km2 in surface area, unravels deep mushroom- to funnel-like magma chambers and/or conduits. Available data point towards different compositional domains, which are interfingered in complex concentric layers, so that, each pluton depicts a unique internal flow pattern. In the silica-richer structures concentric fragmented or folded layers of granite, in a hybrid K-gabbroic/dioritic matrix, contrast with predominantly homogeneous K-basaltic to gabbroic regions. These may be separated by magmatic shear zones where mixing is enhanced, also resulting in hybrid compositions. Sharp and pillow-like contacts between granitic and K-basaltic rocks locally depict a frozen-in situation of different intrusive episodes. In the silica-poorer plutonic bodies gradational contacts are more frequent and may be the result of convection enhanced diffusion. For all plutons, however, mostly sub-vertical internal contacts between most- and least-differentiated rocks, suggest generation from predominat large magma bodies of variable composition, which crystallized while crossing the middle to lower crust (< 25 km depth). They register snapshots of the interaction dynamics between granitic and noritic/dioritic or syeno-monzonitic and gabbroic magmas with the production of hybrid rock compositions. They provide, therefore, outstanding evidence for a major process of mixing between contrasting magmas, which have been generated from different sources and depths. These are considered to have originated from the orogenic collapse with coeval crustal and mantelic contributions changing in space and time.