Mapping petrographic variations with gammaspectrometry in granites: The example of the Três Córregos Granitic Complex, SE Brazil

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Two large Neoproterozoic bodies, the Cunhaporanga and Três Córregos Granitic complexes (CGC, TCGC) crop out in Paraná state, SE Brazil, constituted mainly by calc-alkaline granitoids. Both show ellipsoidal outlines, with a NE orientation, the prevailing basement structural trend in SE Brazil. CGC shows poor outcrop pattern and a large faciological diversity, not so TCGC. Aerial gammaspectrometric surveys were used to test variations in K, U, Th abundances for definition of facies domains in both complexes. Colorgraded maps were prepared for TC, the three elements and several calculated factors (including U/Th, U/K, Th/K ratios, F factor, triangular K-U-Th, etc.). In the case of TCGC, the color maps clearly reproduce the petrographic distriibution pattern established during ground mapping. Aerial gammaspectrometry showed, for TCGC, the potential for accurately pinpointing petrographic variations.

Melt supply and magmatic evolution at a large central MOR volcano located in the Lucky Strike Segment

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New major and trace element, volatile (H_2O and CO_2) and Sr-Nd-Pb isotopic, data on samples from the Lucky Strike segment (LSS) are presented. All studied samples are E-MORBs, but different degrees of enrichment are identified. LSS basalts have been subdivided into three distinct compositional groups: In Group 1, the basalts have the highest more-to-less incompatible element ratios (e.g. La/Sm, Nb/Zr, Ba/Y) and have the most Sr-Nd-Pb radiogenic values. They are spatially restricted to the central part of the axial volcano, are highly vesicular, and plagioclase phyric. Group 3 basalts have the lowest more-to-less incompatible element ratios and the lowest Sr-Nd-Pb radiogenic values. They were collected throughout the LSS (from 37º12,0' to 37º27,3' in latitude), are almost aphyric and exhibit low vesicularity. Group 2 basalts have chemical characteristics intermediate between those of Groups 1 and 3. This subdivision is readily recognised in the volatiles data. Group 1 glasses have higher dissolved H_2O concentrations (and estimated pre-eruptive CO_2 concentrations), relative to those of Group 3, but have lower H_2O/Ce ratios (108-197 and 251-343 for Groups 1 and 3, respectively) that are well below the average defined for this MAR region (253±33).

Taking into account the sample spatial distribution, the bathymetric (shallow depths at segment centre), and the gravity data (negative "bull's eyes" RMBA anomalies at segment midpoint), together with the geochemical data interpretation, a genetic volcanic model is generated. The enriched, more fertile, mantle heterogeneities (Group 1), related to Azores mantle plume material, in the LSS sub-oceanic mantle, are delivered to the centre of the segment by highly focused, sub-lithospheric processes. Forming wetter domains, they start to melt first, deeper in the mantle, melting more, but generating lower melt fractions, than the ambient mantle (Group 3). Group 1 vesiculating melts, having their density reduced, will be aggregated in a high- level axial magma chamber (AMC). The limit of neutral buoyancy of these magmas is never reached, thus the magmas are delivered vertically to the segment centre. Further magmas, formed from melting of the ambient mantle, will be aggregated in the AMC. Thus, initial mixing of Group 1 and 3 melts and, lastly, only differentiation of Group 3 melts will produce Group 2 and 3 basalts, respectively. The disruption of pressure equilibrium of the magmatic system as a result of the ridge extensional stress regime, and the subsequent magnitude of internal overpressure in the magma reservoir will control the magma delivery along the LSS.