THE POMERODE DOME IN THE LUIS ALVES CRATON: GEOPHYSICS, GEOLOGY, GEOMETRY AND TECTONIC EVOLUTION

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A rare, major structure was identified in the Paleoproterozoic granulite terrains of the Luis Alves Craton, southern Brazil, designated 'Pomerode dome'. The large (90 x 50 km) structure showed in the 2011 high-resolution aeromagnetometric survey by the Geological Survey of Brazil (CPRM). Understanding the evolution, including formation and exhumation of the dome, is a major contribution to crustal evolution at the end of the Trans-Amazon Orogeny (2.35-2.00 Ga). The study required varied methodology, from aeromagnetic data interpretation, field survey, petrography and rock geochemistry. From total magnetic intensity (TMI) and first vertical derivative (FVD) of the TMI images, we delimited structures, extension and geometry of the granulite-gneiss dome. The elliptic shape has major axis in E-W direction reaching 90 km; the dome is delimited by first-order magnetic lineaments. Both TMI and FVD images show ellipsoidal shape along the body characterized by high magnetic anomaly and curvilinear second order magnetic lineaments. Outside the dome, magnetic response is a mix of responses from granulites, granitoids and basins, that show different, linear magnetic anomalies and second order magnetic lineaments. The Pomerode dome comprises Archean-Paleoproterozoic granulite rocks from Santa Catarina Granulite Complex (SCGC) and Paleoproterozoic granites, all contained in the Luis Alves Craton. The SCGC is composed by metapyroxenite, mafic and felsic granulites and paragneiss with quartzite and banded iron formation. Paleoproterozoic granites are concentrated in the western sector of the dome, covered to the west by Paraná basin sediments and volcanics. Near the granulites, granites are gneissic and foliated with dioritic to granodioritic composition and diffuse contacts. In the western portion, rocks are granitic, some alkali feldspar porphyritic, without banding and less foliated. Geochemistry of rocks is of mantle affinity from a divergent plate setting (tholeiitic rocks N-MORB type, metapyroxenite) with exhalative component (banded iron formation rich in Mn), and volcanic arc in a convergent plate boundary (calk-alkaline rocks, mafic and felsic granulites). Structural measurements in the field show variation of foliation and banding correlated with curvilinear second order magnetic lineaments of the dome, thus, structures seen in aeromagnetic and that shape the Pomerode dome are a direct response of the structural geology of the granulites. Shear zones that delimit the dome also correspond to first-order magnetic lineament. The presence of the Pomerode dome and its metamorphic characteristics are the fingerprint of an orogen, representing its roots and metamorphic core complex. The geometry with asymmetric petrotectonic assemblage with a predominance of high-grade metamorphic rocks and a concentration of granite rocks in the western sector of the dome support an exhumation by detachment faulting with an oblique component, consequence of strike-slip shear zones. This process made possible the exhumation of the metamorphic core complex, which requires a significant vertical crustal flow, also influenced by processes of density change and gravitational instability. Exhumation of the Pomerode dome was related to Paleoproterozoic post-orogenic transtension at the end of the Trans-Amazon Orogeny.