



Gravity and magnetic anomalies on the Trindade Island and Vitoria-Trindade Chain: implications for the lithospheric thinning and tectonic evolution of the Brazilian Plattform

Natasha Stanton (1), Cosme Neto (1), and Mauro Cesar Geraldes (2)

(1) Observatorio Nacional, Rio de Janeiro (RJ). Brazil (stanton@on.br); (2) Faculdade de Geologia, UERJ, Brazil (geraldes@uerj.br)

Gravity and magnetic anomalies on the Trindade Island and Vitoria-Trindade Chain: implications for the lithospheric thinning and tectonic evolution of the Brazilian Plattform

Stanton, N. (1) and Neto, C. (1) and Geraldes, M.C. (2)

(1) Observatorio Nacional. Rua Jose Cristino 77. São Cristovão, Rio de Janeiro (RJ). 20.921-400. (stanton@on.br); (cneto@on.br).

(2) Faculdade de Geologia, Universidade do Estado do Rio de Janeiro (UERJ), Rua São Francisco Xavier 524, Rio de Janeiro-RJ, Brazil. 20559-900 (geraldes@uerj.br)

The Trindade island is situated in the South Atlantic Ocean, about 1,150 km from the Brazilian coast and 1,800 km west of the Mid-Atlantic Ridge. The present contribution comprises the interpretation of magnetic and gravity data with a high resolution aeromagnetic anomaly map, and their correlation with the geology of the Trindade island and the regional tectonic pattern.

The magmatic activity at Trindade was essentially bimodal, generating various ultrabasic rocks and mesocratic to leucocratic phonolites. The older episodes comprised pyroclastic rocks, the Trindade Complex (TC). The youngest volcanic events were made up exclusively of ultrabasic rocks (clinopyroxenites, ijolites, malignites). These rocks were formed during at least four volcanic episodes rising the Desejado, Morro Vermelho, Valado and Vulcão do Paredão units.

In this way, the Desejado Sequence is formed by flows of phonolite, granizite and nephelinite interbedded with pyroclastic overlays the TC. The Morro Vermelho Formation, formed by flows of ankaramitic character, is exposed in the eastern part of the island. The third volcanic episode produced pyroclastic deposits and flows of the Ponta do Valado and the tuffs of the Praia do Princepe. The exposures of the Vulcão do Paredão Formation in the eastern part of the island were formed during the last volcanic episode. The ultrabasic rocks belong to two distinct groups requiring the participation of different mantle sources. The more primitive group is composed by olivine and pyroxene nephelinites and commonly carry cumulate xenoliths of phaneritic alkaline rocks. The second group is distinguished by significantly higher contents of K comprising basanites and tephrites. Dating of the rocks of the TC by K-Ar method (mainly using whole rock samples) indicates ages from 2.90 to 2.30 Ma. The rocks from Desejado Sequence were formed between 2.30 and 1.50 Ma. And the Morro Vermelho Formation rocks were formed before than 0.17 Ma. The Morro Vermelho seems to be Pleistocene in age. According to Sr-Nd isotopic systematics, mixing between predominant depleted mantle and subordinate EMI components yielded isotopic variations due two different magma sources. The depleted Sr-Nd isotopic compositions relative to the Bulk Earth indicate that metasomatic events occurred in the mantle sources prior to melting processes.

The regional geophysical data display a positive anomaly peak on the free-air map, superimposed on a regional gravity high associated with the Trindade Island. Differently from other islands of the Vitoria-Trindade Chain that rise from the Brazilian continental basement, the Trindade Islands lies on oceanic crust. Its magmatism is suggested to be a result of the tectonic reactivation of the Vitoria-Trindade chain, perhaps its northern segment displays higher gravity values, possibly associated with the bathymetric step generated by the age difference between the lithospheric plates. The magnetic anomaly map from EMAG2 data displays a series of semi-circular magnetic highs, following the general configuration of the volcanic chain. However, the Trindade Island is associated with a region of relative magnetic low, what may be related to the lack of data resolution over the study region. A new compilation of marine and ground magnetic data will enable us to identify the island's structure and patterns of deformation.

This result may provide important constrains on the influence of the Vitória-Trindade Chain on the crustal structure and the tectonic evolution of the Brazilian platform. The magnetic data allowed us to correlate the magmatism and the sedimentation observed offshore and constitutes a helpful tool to model the magnetic response of the Trindade Island's volcanic edifice at depth.