Mechanisms of magmatic-solid state deformation transitions at Tauá and Senador Pompeu shear zones, CE: implications for crustal welding

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RESUMO: The Borborema province is most remarkable for widespread occurrence of strike-slip putatively translithospheric shear zones permeated by syn-to-late stage granitoid magmatism both within and outside fault cores. Deformation leading to two major conjugate strike-slip shear zones over 100 km long, the Senador Pompeu and Tauá shear zones, affects all units from Neoarchean to Ediacaran in the Central Ceará nappes. Their conjugate arrangement, kinematics and similar ages could imply a northward extrusion of the Santa Quitéria block. Deformation within these shear zones is accompanied by the syn-tectonic intrusions of Quixadá-Quixeramobim, Nova Russas-Pedra Lisa granitoids and shallow felsic dykes. Shear structures recorded in these plutons include a pervasive vertical to subvertical magmatic fabric defined by parallel feldspar phenocrysts and S-C foliations. Such magmatic structures are later overprinted by solid state viscoplastic deformation at high temperature. However, the amounts of strain recorded in the plutons even where they are most affected by deformation are low, as only protomylonites occur. This could imply that most of the deformation was partitioned into the magma bodies, which may accommodate flow indefinitely without a strain gauge and at a low flow stress. Additionally, solid state deformation took place at very high temperature, as suggested by activation of hard slip systems in quartz recorded by prismatic axes fabrics, large recrystallized quartz grain sizes, and feldspar recrystallization by bulging and/or sub-grain rotation. The wall-rocks along the shear zones farther south exhibit more diverse features of deformation, comprising viscoplastic conditions of strain as well as frictional processes (cataclasites, pseudotachylites and brittle structures); such deformation takes place on Archean-Paleoproterozoic basement rocks where the Senador Pompeu and Tauá shear zone interfere to form the Cococi molassic basin. The low difference in ages of plutons and shallow felsic dykes indicate that the transition from high-temperature deformation to brittle upper-crust regime in the Ceara Central domain was relatively fast at ca. 580 Ma. Overall the deformation microstructures suggest that following emplacement of the syn-tectonic plutons, strain partitioned to their magmatic edges near faults. After their ensuing solidification, deformation waned during high-temperature solid-state deformation, whereas to the south on basement units deformation took place at lower temperatures. This could have led to welding and the rheological stabilization of the Borborema middle crust, after a long state of high lithospheric heat flow recorded by widespread magmatism and migmatisation. Furthermore the lithospheric strength would have increased southwestward probably due to the prominent role of magma weakening at central parts of the shear zones in the Ceará Central.

PALAVRAS-CHAVE: BORBOREMA PROVINCE, MAGMATIC RHEOLOGY, SHEAR ZONES