

DEFORMATION AND MINERALIZATION OF THE SERRA GERAL GROUP, PARANÁ INTRACRATONIC BASIN, BY HOT, OVERPRESSURED GUARANI AQUIFER WATER AND VAPOR

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ABSTRACT Overwhelming evidence points to widespread tectonic activity in the Paraná intracratonic basin, South America, particularly the Serra Geral Group of volcanic rocks, caused by vapor overpressure from volcanic heating of the Guarani aquifer. The required heat originated presumably in the same mantle source that caused the generation of basalt and rhyodacite lavas. The main observed structures are hexagonal to polygonal faults (100-500 m large) and lozenge fractures (5-30 km large). Intense hydrothermal alteration (H) occurred continuously, interspersed with two sealing events (S). Initially porous (30 vol.%), cold lava flow was heated (130 °C) and altered (H1) in the Cretaceous (135 Ma), forming smectite and zeolites (e.g., clinoptilolite) and sealed (S1) with porosity reduction to near zero. This nearly impermeable caprock was subjected to vapor overpressure (H2), generating different structural responses in different positions in the lava flow – (1) doming of the hangingwall with generation of lozenge fractures, and (2) fracturing of the hangingwall. In both cases, loose sand from the Botucatu erg was injected, fluidized in water and vapor, and formed breccias, dikes, sills and flows at the surface. Continued hydrothermal activity again sealed the rock (seal 2); overpressured vapor (H3) completed the alteration of the rock (which became a mudstone), generated polygonal faults and opened cavities (H3) by ballooning (amethyst geodes). The hydrothermal activity also generated mineralizations of copper (H1), kaolin and opal (H3). This is a contribution to the understanding of the tectonics of vapor overpressure from the Guarani aquifer in the Paraná volcanic province.

KEYWORDS: PALEOPROTEROZOIC, MESOPROTEROZOIC, BRAZILIAN SHIELD.