PETROLOGY AND GEOCHEMICAL CHARACTERIZATION OF THE SARDINHA FORMATION (CRETACEOUS),PARNAÍBA BASIN, NE BRAZIL.

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ABSTRACT: The Parnaiba basin was affected by two events of mafic magmatism, the Mosquito Formation (ca. 200 Ma) and the Sardinha Formation (ca. 132 Ma). These rocks are related to the break-up of E-Gondwana Supercontinent and occur as extrusive and intrusive basaltic rocks. The Sardinha Formation is mainly intrusive and occurs as sills and dykes at the central to eastern part of the Parnaiba basin. The igneous intrusive rocks play an important role in the oil/gas systems in the Parnaíba Basin and are related to: (1) the main heat source for the organic matter maturation; (2) seal layers; (3) the main hydrocarbon traps; (4) and fluid migration media (e.g. dykes and sin-intrusive generated faults). This study is based on samples from 8 outcrops and two boreholes (BP-01-PI and BG-01-MA), all located in the central-eastern portion of the Parnaíba basin. One of the studied sill is crosscutted by dikes (N85ºE) and present latter tectonic/cooling features, both features may have disrupted the seal and affected the trap quality of the oil/gas reservoir. The host sill and the intruded dike are subalkaline and are classified as basalt and trachydacite, respectively. The dike is more evolved (11,5 Mg# and 62,5 wt% SiO2) and classified as a low-Ti (< 2,0 wt.%) magma. In contrast, the host sill is less evolved (20,3 Mg# and 50,9 wt% SiO_2) and classified as a high-Ti (>2,0wt.%) magma. Both magmas are geochemically similar to the 132 Ma Sardinha volcanics (La/Yb, Pb/Nb, Ta/Ni ratios). Samples were also collected from two different boreholes. One a >50m thick microgabbro sill that intrudes the Poti Formation sediments. The other, a >60m thick sill that intrudes the Longá Formation. The first sill is more homogeneous and do not show alteration features on the host sedimentary rocks beneath it. On the other hand, the second sill is more heterogeneous and present from the bottom to the top of the borehole: subhorizontal aplites (10mm to 5cm thick) at the central part of the igneous body, pyrite-rich intervals, subvertical veins of calcite associated with calcite amygdules and a cooling margin of approximately 50cm near the contact with the sedimentary host rock. Dissolution features and quartz geodes are commonly observed along the thicker aplite intervals. The sedimentary rocks above the intrusion show alterated layers enriched in pyrite and oxydes, as well as calcite and pyrite (+/- magnetite) veins. We argue that the differences in sill and dike major elements and its difference in Ti content may indicate different magma sources and that the low-Ti magma would be latter than the high-Ti magma. Considering the influence on the sedimentary host rock above and below igneous intrusion and the magma differentiation processes in the sills, it is suggested that the rocks above the sill are more alterated not only due to the heat dissipation to the top of the sill but also due generation and concentration of fluids on the upper part of the sill.

KEYWORDS: PARNAÍBA; BASALT; SARDINHA