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PETROLOGY OF JURASSIC AND CRETACEOUS BASALTIC FORMATIONS, PARNAÍBA BASIN, NE BRAZIL: CORRELATION WITH LARGE IGNEOUS PROVINCES

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ABSTRACT: The basaltic Mosquito and Sardinha formations in the Parnaíba Basin, NE Brazil, are related to the opening of the Atlantic Ocean at the Triassic–Jurassic boundary and in the early Cretaceous, respectively. The Mosquito Formation (MF) consists of tholeiitic flows with both high-Ti (>1.5 wt%) and low-Ti (<1.5 wt%) compositions and the petrogenetic characteristics of an OIB-like to enriched mantle reservoirs, respectively. MF basalts have initial $^{87}Sr/^{86}Sr$ isotopic ratios between 0.70296 and 0.70841 with low $^{143}Nd/^{144}Nd$ ratio values (0.512245–0.512677). These are associated with enrichment of large ion lithophile and high field strength elements relative to primitive mantle compositions. The Sardinha Formation (SF), on the other hand, is composed of high-Ti and low-Ti tholeiitic dykes with subordinate alkali diabase/basalt. SF rocks, similarly to the MF, have trace element and isotopic features associated with enriched mantle end-members, although they present a greater variation and likely more multifaceted mantle source. The initial $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios range from 0.702859 to 0.706703 and from 0.512184 to 0.512671 respectively. Their concentrations of large ion lithophile and high field strength elements are elevated relative to primitive mantle values. Although the Mosquito and Sardinha formations share some similarities, they can be differentiated by their unique petrographic characteristics. The MF basalts are mainly composed of glass, clinopyroxene, plagioclase and amygdules (filled with calcite) in a typical intersertal texture characteristic of extrusive rocks. On the other hand, on SF diabase samples, minerals are larger and the lack of amygdules or vesicles is probably due to its intrusive/subvolcanic nature. The presence of olivine also represents a major difference in relation to the MF. Furthermore, geochemical differences are common: MF basalts have lower Nb and Pb contents in a narrower range of values (5–8 and 0.2–2.0 ppm, respectively) when compared with the SF tholeiites (6.7–17.8 and 2-9 ppm, respectively). In addition, the MF rocks have lower Light Rare Earth Elements/Heavy Rare Earth Elements ratios (La/Yb = 2.49–5.89) compared to the SF (La/Yb = 4.74–33.77). The same is true for the Ni and Ta contents, where the SF rocks yield higher Ta and larger Ni variation values. These petrographical and geochemical differences allow the discrimination of the basaltic magmatism in the Parnaíba Basin. The association of MF and SF rocks with large igneous provinces (LIPs) is evident as they are associated with the break-up of a supercontinent (i.e., West Gondwana), as most LIPs are. In this perspective, the MF and SF tholeiites correlates in age and petrological characteristics with the Central Atlantic Magmatic Province and the Paraná–Etendeka Magmatic Province, respectively.

KEYWORDS: LARGE IGNEOUS PROVINCES, BASALT GEOCHEMISTRY, Sr-Nd ISOTOPES.