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Magmatic Events Recorded within the Pre-Salt Cretaceous Carbonate Strata, Northeast Santos Basin

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With the increasing number of pre-salt discoveries of super-giant fields, the Santos Basin is very important for future oil and gas exploration. Two successions of preserved intrusive and extrusive rocks were recovered within the pre-salt Cretaceous carbonate strata, northeast Santos Basin. The purpose of this study is to present an analysis of formation environment and tectonic emplacement in terms of a variety of petrological, geochemical, geochronological data.

In the lower succession, the rocks are constituted by basalts, which erupted in subaqueous environment characterized by abundant volcanic glass, quench textures and hyaloclastite. In the upper succession, the rocks consist of intrusive rocks characterized by diabase with olivine and feldspathoid. 40Ar/39Ar dating revealed that the ages of the lower basalts range from 114 to 118Ma (Aptian age) and the ages of the upper diabase range from 73 to 76Ma (Campanian age).

The geochemical and petrographic data indicate that these basaltic rocks have sub-alkaline affinity and suggest a single magmatic source. Geochemically discrimination analysis of the basaltic rocks also indicate tectonic setting of within plate. During the Aptian age, the tholeiitic basalts formed under water developed in the tectonic environment of continental rift or continental margin rift, indicating that the crust exists long and deep extensional faults.

The geochemical and petrographic data indicate that these diabases have alkaline affinity and appear to belong to the same magmatic source, constituting sills formed by multiple magmatic pulses or magmatic differentiation. Various geochemical signatures from diabases indicate tectonic setting of within plate. In the Late Cretaceous, basaltic intrusive rocks tends to be mantle plume basalt, indicating that its formation is mainly related to the activity of mantle plumes, and is also related to the process of mantle upwelling and lithospheric thinning.