

## **COLUMNAR JOINTS IN THE CABEÇAS FORMATION SANDSTONES, EASTERN OF PALEOZOIC PARNAÍBA BASIN, PIAUI, BRAZIL**

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**ABSTRACT:** Columnar joints in sandstones, similar to those ones that occur in igneous rocks, are exotic structures known in a few Phanerozoic basins, for example in Botucatu Formation (Parana Basin, Brasil), Patino Formation (Chaco Basin, Paraguai), and Old Red Sandstone (Lanark Basin, Scotland). However, the existence of this kind of structures in sandstones from Parnaíba Basin was unknown or restrict to papers or limited circulation academic thesis. Recently, remarkable columnar joints are found in Devonian sandstones from Cabeças Formation, located in eastern portion of Parnaíba Basin, around Piripiri County, Piauí, northern region of Brazil. These sandstones with columnar joints display an arched shape in certain outcrops induced by the occurrence of basic intrusion corresponding to the Mesozoic Sardinha magmatism, related to the opening of the Brazilian North Atlantic Ocean during the Lower Cretaceous. The Sardinha Formation occurs in the form of dikes and sills of tholeiitic trend, manifesting as finger magmas type in the interior of the basin displaying the same columnar patterns observed in the sandstones. That suggests that the columnar structures in the sandstones are associated with this magmatism which acted as a heat source that has spread through the overlying sandstones. The dimension of the joints varies from centimeters in the sandstones to meters in the basic intrusion. It is well known that igneous intrusions in unconsolidated or poorly consolidated materials may result in detachment, assimilation and transfer of material from the host rock. In addition, shallow intrusions in sedimentary rocks exhibit wide spectrum zones of metamorphic contact reactions: from fusion/recrystallization to low metamorphic degree areas. At the zones of contact in low metamorphic degree there is the development of columnar joints. The regular distribution of the stresses according to preferential directions related to the thermal gradient of cooling would contribute to the formation of such structures. Thus, when the contacts are exposed, the columnar joints are visible in the sandstones that occur above the basic intrusion. It is believed that the arrangement of such diaclasses in hexagonal prisma shape is the most efficient way in accommodating neighbors stress. The influence of this metamorphism is also observed in thin sections of these sandstones, exhibiting clastic texture with anhedral grains of quartz and feldspars, partially cemented by amorphous silica presenting domains with marginal recrystallization that evolve to subhedral to euhedral grains with triple joints resulting in polygonal texture.

**KEYWORDS:** COLUMNAR JOINTS, SANDSTONE, PARNAÍBA BASIN.