THERMO-TECTONICS INSIGHTS ON THE NEOPALEOZOIC SUCCESSION OF THE PARNAIBA BASIN

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SUMMARY: In the last few decades, the Parnaiba Basin is being subject of study since it was discovered its high potential on hydrocarbon exploration. On this manner, this work is intended to determine the quality of reservoir rocks thermally influenced by intrusive igneous rocks in this basin. The study area is located on part of the Maranhão and Piauí states in the northern region of Brazil. In this area, the sedimentary rocks analyzed are composed of sandstones and siltstones of the Cabeças and Poti Formation, with Devonian and Carboniferous ages, respectively. Subordinately, the intrusive magmatic rocks are divided in two events, the Mosquito and Sardinha formations of Mesozoic ages. The first event being related to the breakup between the North America and South America, and the second, between South America and Africa. The samples used are from drilled core and outcrops within the study area and consists of sedimentary rocks and Mesozoic igneous intrusions. In these rocks, it is used Fission Tracks and (U-Th)/He thermochronology methods with apatite and zircon minerals. The separation of these minerals is relevant since they have low closure temperatures, concordant with hydrocarbon maturation temperatures. In which, apatite and zircon have closing temperatures in ranges of 60-120ºC and 180-320ºC, respectively and both work as thermochronometers, corresponding with the mature hydrocarbon window (80-220ºC). These methods are important resources to reveal information on the thermal history of the rocks and characterize uplift, erosion and denudation processes. Along with the thermochronological methods, petrophysics and geochemical methods are used to define the porosity and permeability of the rocks. The process of magmatic intrusion in the Paleozoic rocks changed not only the porosity and permeability, but also influenced the gas maturation in the sedimentary rocks. The intrusion events added temperatures to the system in order that the organic matter naturally achieved the mature window. As it occurred, the potential gas reservoirs show variation in its physical properties. In this system, the igneous rocks work also as structural traps for the hydrocarbons. Therefore, this study integrates the thermal history with physical properties of the rocks to help establishing prediction models pointing out the heterogeneities in the reservoirs.

KEYWORDS: POTI FORMATION; THERMOCHRONOLOGY; THERMAL HISTORY