ROLE OF MAGMATISM IN PARNAÍBA BASIN AND NORTHEAST BRAZIL

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RESUMO: Three episodes of magmatism affect the Parnaíba Basin and surrounding area in north-east Brazil (e.g. Jurassic Mosquito Formation; Cretaceous Sardinha Formation; and Neogene activity centered on Borborema Plateau). While both the Mosquito and Sardinha formations are characterized by extensive lava flows and intrusions into basinal sedimentary rocks, the Neogene episode does not extend into the basin itself. The Mosquito Formation is linked to voluminous magmatism of the Central Atlantic Magmatic Province (CAMP) associated with initial break-up of the mid-Atlantic ocean at ~ 200 Ma. Related remnants of volcanic activity are found all over northern Brazil as well as in North America and northwest Africa. Distribution of the Sardinha Formation is more localized and is associated with opening of the South Atlantic ocean. At ~ 125 Ma, the Sardinha Formation is coeval with, and of similar composition to, larger volcanic provinces of central Brazil. This magmatism is probably associated with the evolution of a failed rift (i.e. aulacogen) into the Brazilian craton. The origin of the Neogene magmatism within the Borborema Province is much debated.It is probably linked with regional uplift of the Borborema Plateau by almost 1 km. This uplift is manifest by emergent Miocene marine deposits and gives rise to exhumation of the eastern edge of the Parnaíba Basin today. Thus, the easters extent of the Parnaíba Basin may originally have been greater. Here, we analyse and model major, trace, and rare earth elements as well as isotopic data from all three magmatic events. Our main aim is to clarify the role of each event in the formation and present-day physiography of the Parnaíba Basin. During the course of the PABIP project, sponsored by BP Brasil, we sampled and analysed over 50 basalts, mostly from the Borborema Province. We exploit rare earth elements as a useful indicator of the depth and degree of melting in order to illuminate the origin of Neogene magmatism in particular. An inverse model is used to determine the asthenospheric temperature and the depth to the base of the lithosphere, given the composition of the mantle source. Our results cast light on putative mantle plume influences for generation of Neogene and older magmatism. This quantitative approach complements subsidence and geomorphological studies of the near surface.

PALAVRAS-CHAVE: MAGMATISM; PARNAÍBA BASIN; DYNAMIC TOPOGRAPHY.