ENDORHEIC – EXORHEIC TRANSITION: THE ATLANTIC DRAINING PARAÍBA DO SUL RIVER BASIN (BRAZIL)

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Present-day endorheic drainage systems are rare in tropical humid regions and / or close to the coast. During the late Cenozoic, under a humid tropical climate, the Paraíba do Sul River basin (SE Brazil) has developed along the South America passive margin (Fig. 1). This basin currently drains into the South Atlantic ocean, but it preserves landforms that are indicative of previous endorheic paleodrainage. This study examines the possibility that this region was endorheic for most of the Neogene, prior to the establishment of the present-day drainage to the Atlantic and discusses the transition from an endorheic to an exoreic system. Data was achieved through analysis of geomorphological features identified by remote-sensing techniques and verified in the field, as well as the interpretation of landscape evolution models elaborated by the Seppômen method. Five drainage convergence areas and possible endorheic paleobasins, previous to the Quaternary (or to the Pliocene) have been identified within the present-day Paraíba do Sul River basin (Fig. 2). Each area is associated with a Cenozoic graben and is separated by structural highs which would have formed paleo-drainage divides. The most probable mechanism for the transition endorheic-exorheic is overspill, leading to the progressive incorporation into the exorheic system and followed by headward erosion advancing inland from the gorge developed at each overspill area. Atlantic Ocean. Two processes often occur concomitantly and both contribute to the same result: the expansion of an exorheic basin by the incision of a permanent channel into the endorheic basin infill. The geological evolution ancestral Paraíba do Sul River, draining to the Atlantic, was later controlled by the very low sea levels during the Quaternary which determined the stage of fluvial incision. No numerical dating has been yet obtained for the proposed endorheic-exorheic transition; nonetheless, regional denudation rates suggest that this transition occurred sometime in the interval 8 to 4 Ma (end of the Miocene to mid-Pliocene), probably by 4 Ma. This transition was marked by a decrease in subsidence within the aforementioned grabens and by a much wetter climate that promoted the overspill and connection to the Atlantic. According to the interpretation of the evolution of headward erosion pulses in the Paraíba do Sul River basin, surfaces that dissected and sculpted the relief at different times during each tectonic and/or climatic event were interpreted (Figure 3).

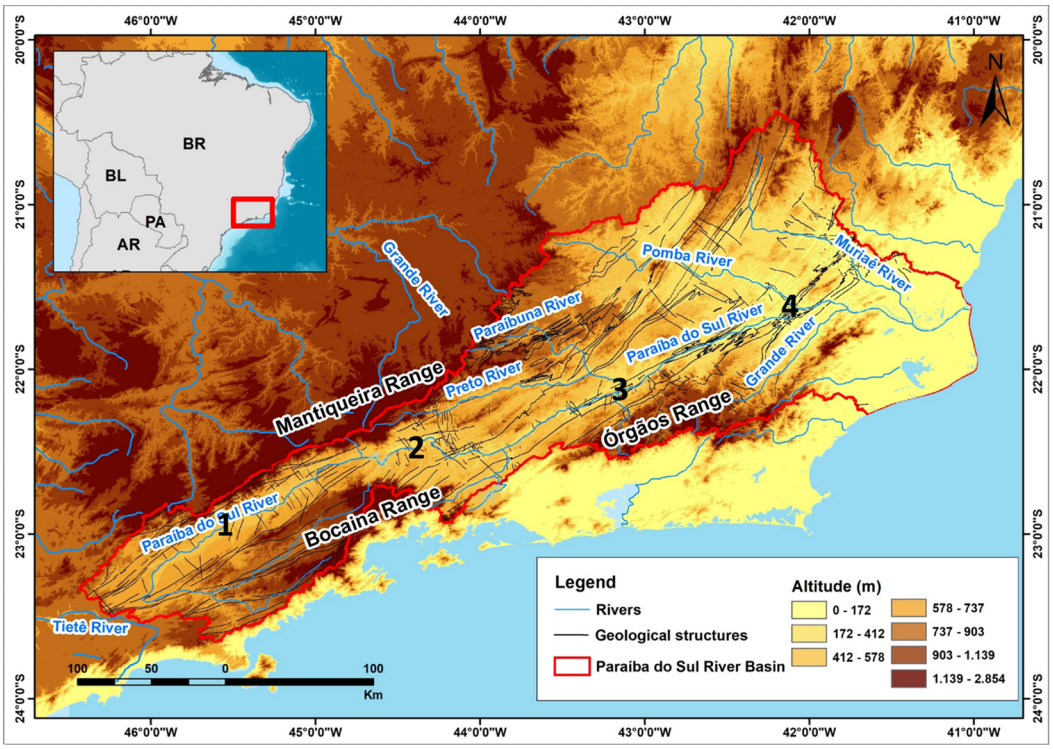

Figure 1: A) Digital elevation model of the region showing the location of Paraíba do Sul hydrographic basin. Grabens in the region: B) – Taubaté (1); C - Resende/Volta Redonda (2); D - Três Rios (3); E – Itaocara (4).

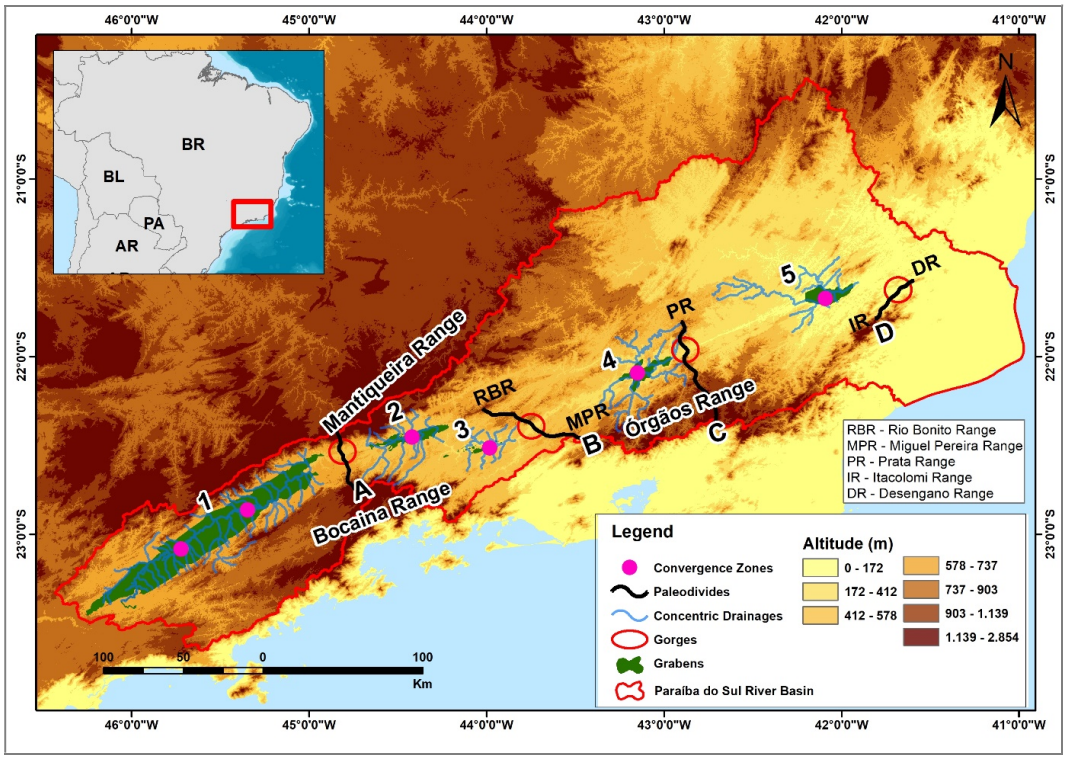

Figure 2: Hydrographic basin of the Paraíba do Sul River showing the location of areas with convergent drainage patterns, paleodivides and gorges. Convergent drainage areas: 1. Taubaté; 2. Resende; 3. Volta Redonda; 4. Três Rios; 5. Itaocara. Paleodivides with transversal topographic profiles given in Fig. 3: A - Queluz; B - Miguel Pereira; C - Sapucaia; D - Desengano.

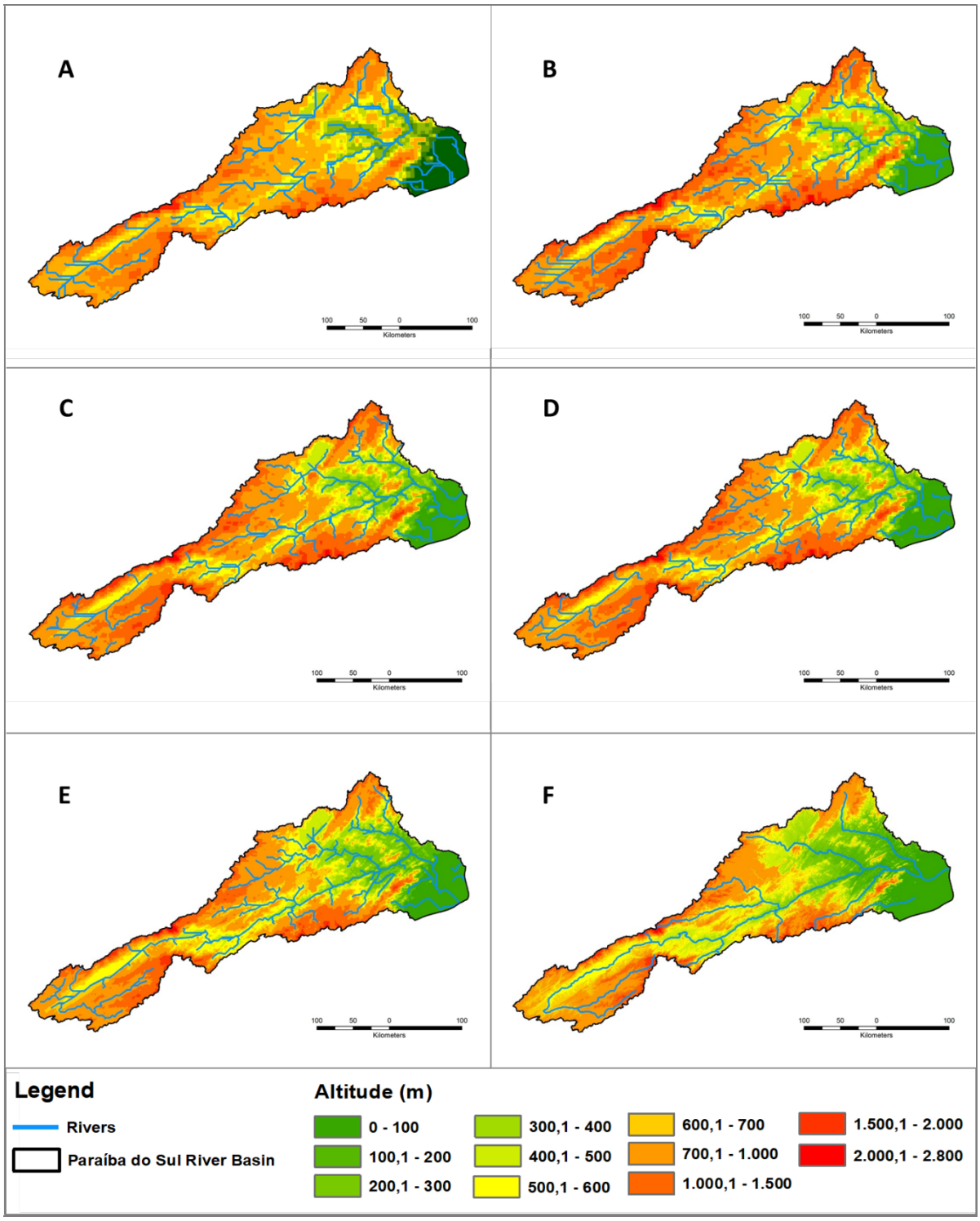

Figure 3: Paleotopographic (Seppômen) maps of the Paraíba do Sul River basin generated using varying cell sizes (km): A - 5x5; B - 4x4; C - 3x3; D - 2x2; E - 1x1; F -Present-day relief (DEM).