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From endorheism to exorheism: The Atlantic draining Paraíba do Sul River Basin (Brazil) transition

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Endorheic drainage systems are rare in humid tropical areas and/or near the coast. However, in the passive margin of southeastern Brazil, in a region close to the Atlantic Ocean, is located the hydrographic basin of the Paraíba do Sul River, which has a humid tropical climate and presents landforms typical of endorheic drainage systems. The present work examines the possibility that Paraíba do Sul River Basin was endorheic during the most of the Neogene. It was based on morphological analysis of the drainage system, field work and on the interpretation of paleotopographic maps prepared using the Seppômen method. Five drainage convergence areas were identified along the main axis of the Paraíba do Sul River Basin, separated from each other by structural highs and each one associated with a Cenozoic graben. The drainage convergence areas appear to be endorheic hydrographic paleobasins, separated from each other by structural highs that would constitute their paleodivisors. 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. 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.