CAMPOS RIFTED MARGIN ARCHITECTURE: FIRST-ORDER CONTROL OF LITHOSPHERE INHERITANCE, MAGMATISM AND SAG BASIN FORMATION

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The study of rifted margins shall involve the investigation of the preexistent lithosphere, which rheological and mechanical behavior under extension is complex since it is the product of numerous tectonic events. In order to understand such complexity, we need to know the initial pre-rift composition of the continental crust and lithosphere. It has been shown that compositional inheritance influences the distribution or localization of deformation, the ocean-continent transition structure (OCT) and magmatism. Variations in lithosphere rheology result in different styles of depth-dependent extension (Huisman and Beaumont, 2011) and margin geometry. In this study we investigate the Campos Rifted Margin architecture on the Southeastern Brazilian Margin, with the aim of exploring the role of Precambrian/Eo-Paleozoic basement inheritance and early magmatism on basin evolution. We present a new compilation of aeromagnetic data, integrated with seismic interpretation and crustal thickness from 3D gravity inversion, to resolve the OCT structure, the oceanward prolongation of continental basement and their control on the resulting ocean-continent structure of the rifted margin. The basement of the Campos Rifted Margin consists of Precambrian/Eo-Paleozoic Ribeira Belt, with the easternmost Cabo Frio Tectonic Domain containing Paleoproterozoic and Neoproterozoic gneisses. Our results show that its Neoproterozoic-Cambrian nappes and thrusts are well preserved offshore and configure a rheologically layered crust. This pre-rift basement canvas, along with the Mesozoic magmatism, have resulted in a differential crustal response to extension. It influenced the temporal and spatial distribution of deformation, and as a consequence the necking geometry, subsidence and sedimentary evolution of the margin. The geophysical and geological data reveal rheological variations and crustal boundaries that may have exerted a first-order control on the northward rift propagation, leading to variations in crustal thickness, and the possible reactivation of the deep structure impacting on the present-day margin geometry. The deviation and propagation of the rift, guided by ancient boundaries, produced the transition from wide to narrow rift, as observed between the southern and northern Campos and Espirito Santo basins. We propose that the hyperextension of the crust leading to the giant salt basin formation might be associated with a transition to a more regional “uniformity” in crustal deformation, culminating with more synchronous extension and breakup along this segment of the Brazilian margin.

KEYWORDS: CAMPOS BASIN; OCT STRUCTURE; CRUSTAL INHERITANCE