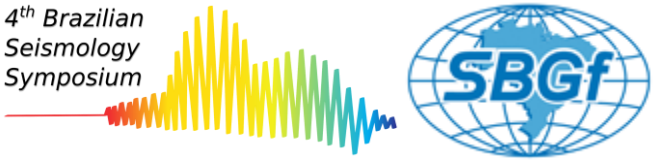

The role of extensional stresses in the formation of the Recôncavo-Tucano basin.

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Extensional stresses are essential for explaining the formation of sedimentary basins. Whether by pure shear, simple shear or a combination of both, the stresses behind their formation mechanisms always result in basin subsidence regardless of rheology. In northeast Brazil, a region strongly influenced by extensional events that culminated in the opening of the South Atlantic Ocean, the influence of extension is apparent through the presence of several aborted rift basins that pervade the region. In this paper we investigate the nature of extensional stresses in the formation of the Recôncavo-Tucano basin, for which a debate over the underlying mode of extension (pure or simple) has been ongoing for decades. To study this particular problem, we utilized data from 18 broadband and short-period stations deployed in and around the basins during 2018-2020, to develop - through the joint inversion of receiver functions and surface-wave dispersion curves - S-wave velocity-depth profiles beneath each station. Receiver functions were additionally utilized to develop independent crustal thickness and Vp/Vs ratio estimates for each station through H-κ stacking. We found that stations west of the basin (São Francisco Craton) show crustal depths of 40-44 km and Vp/Vs ratios of 1.68-1.72, while stations east of the basin (Borborema Province) display thicknesses around 36-37 km and Vp/Vs ratios of 1.68-1.75. Within the basin, crustal thicknesses are around 40 km, similar to the São Francisco craton, but display a lowermost crustal layer of fast S-velocity (> 4.0 km/s) that is absent outside the basin. Moreover, one station immediately outside the basin shows an uncommonly thin crust of 31 km. We argue that the lowermost crustal layer represents a layer of mafic cumulates that underplated the basin after crustal stretching, and that it might have triggered regional uplift and erosion of the post-rift sedimentary sequences observed in other Mesozoic rift basins of NE Brazil. Moreover, if simple shear is allowed in the upper crust, a flexural cantilever model might be able to explain locally thin crust outside the basin through footwall uplift and erosion. We thus conclude that our results support models that invoke extension of the lower crust by pure shear in the Recôncavo-Tucano basin.