



Upper mantle anisotropy of the Borborema Province, NE Brazil: Implications for intra-plate deformation and sub-cratonic asthenospheric flow

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The geological record of the Borborema province in northeast Brazil documents tectonic events that characterised the Precambrian formation and Mesozoic breakup of Gondwana. Large-scale shear zones and associated granitic plutons that developed during the Neoproterozoic Brasiliano/Pan-African orogeny, and major sedimentary basins of Mesozoic age, indicate significant deformation across the region. However, whether or not the shear zones resulted from Precambrian terrane accretion, or are simply the result of episodes of subsequent intra-plate deformation is debated. Also poorly understood is the effect of the thick São Francisco mantle keel on present-day asthenospheric flow. To address these issues we have performed a teleseismic shear wave splitting study of mantle seismic anisotropy from a new broadband seismograph network in the Borborema region. Splitting parameters (ϕ , δt) in the heart of the Province are dominated by null measurements ($\delta t = 0$), suggesting the lithosphere beneath the region may not have been deformed to the extent observed at Precambrian accretionary boundaries elsewhere on Earth. The intra-plate shear zone hypothesis may thus be more appropriate for the region. The null observations also indicate that horizontal asthenospheric strain fabrics due, for example, to absolute plate motion, or the deflection of asthenosphere around the São Francisco keel, are poorly developed. Towards the Brazilian coast, splitting observations, with $\delta t = 1.6$ s, display anisotropic fast directions that parallel the extension directions during the time of formation of the South Atlantic. This implies that the mantle lithosphere was deformed but not completely destroyed during the breakup of Gondwana.