SKS SPLITTING OBSERVATIONS UNDER THE BORBOREMA PROVINCE: A LARGELY ANISOTROPIC MANTLE OR A STEEPLY DIPPING FABRIC?

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RESUMO: Recordings of SKS waveforms at broadband stations operated by the Rede Sísmica do Nordeste (RSisNE) in the Borborema Province of NE Brazil have been utilized to probe into the anisotropic fabric of the lithospheric and sub-lithospheric mantle under this region. Teleseismic SKS waves are P-to-S conversions generated upon refraction of a teleseismic P-wavefront across the core-mantle boundary and are polarized quasi-horizontally along the radial direction of propagation. In the presence of azimuthally anisotropic materials, SKS waves split into two orthogonal waveforms propagating at different wave-speeds along the raypath. In the presence of isotropic and/or transversely isotropic media, on the other hand, SKS waveforms remain unsplit. The Borborema Province is largely regarded as a tectonic collage of basement rocks of Paleoproterozoic age that amalgamated during the Braziliano-Pan African orogeny, but episodes of Cenozoic magmatism and uplift – sometimes associated to edge-driven convection under the continental shelf - demonstrate that more recent tectono-magmatic events have been in operation. Interestingly, our observations reveal that SKS waveforms recorded at broadband stations in the Borborema Province do not generally split. These observations contrast with independent splitting observations in other Precambrian regions of the planet, where past tectonic processes resulted in the formation of a fossil anisotropic fabric in the lithosphere, and with continental-scale flow models for the South American asthenosphere, which display a sub-lithospheric flow in the north-south direction under the Province. The lack of splitting in the SKS waveforms suggests the presence of either a largely isotropic mantle or steeply dipping anisotropic fabrics under the Province. Steeply dipping fabrics are consistent with a dominantly vertical flow in the mantle due to a deep-seated mantle plume or small-scale convection under the cratonic edge. The lack of a fossil anisotropic fabric in the lithosphere, on the other hand, is harder to explain and would require the removal of the fossil anisotropic fabric by recent tectono-thermal events.

PALAVRAS CHAVE: anisotropy, Borborema Province