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UPPER MANTLE FABRIC EVIDENCED BY SEISMIC ANISOTROPY IN SE BRAZIL

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We investigated the structure of the upper mantle beneath southeastern Brazil, using teleseismic shear wave splitting measurements. Seismic anisotropy is mainly induced by preferred orientation of rock-forming minerals. In the continental upper mantle, it results from the development of lattice preferred orientation (LPO) of olivine, which displays large intrinsic anisotropy, and in a lesser extent of ortho- and clinopyroxene. Splitting parameter phi (direction of polarisation of the fastest S wave), are compared to large scale tectonic structures of the area, in order to infer to which extent the deformations in the upper mantle and in the crust are mechanically coupled.
Measurements were performed on seismic data recorded in the Ribeira and Brasilia neoproterozoic mobile belts, that wrap around the southern termination of the archean São Francisco craton. Westward, these belts are buried under the Parana basin and flood basalts attributed to the Tristan da Cunha hotspot.
Within the Ribeira belt, stations located in the northern domain, dominated by EW thrust tectonics, show phi trending N079°E, whereas f is parallel to the structural trend of the belt in the central domain dominated by strike slip tectonics. These values of phi, parallel to the structural trend of the belt, are associated to large delay times (up to 2.4 s) at stations ALP and IGAB, both located on the lithospheric-scale faults of Alem Paraiba and Cubatão. Such values are among the largest in the world and never observed elsewhere than active tectonic areas such as Tibet, Caribbean or New Zealand. Two possibilities may be considered : 1) the presence of two layers of anisotropy with similar fast directions respectively in the asthenosphere and the

lithosphere, or 2) the existence of a coherent tectonic fabric in the lithosphere and the asthenosphere, meaning that no decoupling occurred since Neoproterozoïc times. Within the Brasilia belt, directions of anisotropy follow closely the structural trend of the belt. Although part of the pattern of anisotropy can be related to the deflection of the asthenospheric flow around the stiffer cratonic lithosphere, the large-scale pattern of anisotropy we observed favours a fossil anisotropy related to past tectonic event that occurred in the region.