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パンアフリカン造山帯の上部マントル異方性

Upper mantle anisotropy of Pan-African orogenic belt

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It has been known that the upper mantle is anisotropic up to 10%. Investigations of the anisotropy may contribute to ideas about the influence of recent or fossil mantle flows and/or the tectonic evolution of the study regions. In this study, we investigate the anisotropy beneath Lutzow Holm Bay Region (LHB), East Antarctica, Sri Lanka, and India to know the origin of the anisotropy. We calculate the splitting parameter (f, dt) of the core-phases using Silver and Chan (1991), where f is fast direction of split shear wave and dt is the delay time of two split waves. The splitting parameters are determined by minimizing the energy of the transverse component by using the net grid search technique with intervals of 1 degree and 0.1s, respectively. We also calculate the splitting using two layer modeling (Silver and Savage, 1994).
The results show fast polarization directions of the lower layer are generally parallel to the directions of Absolute Plate Motion (APM) based on the HS3-NUVEL1. These indicate that the lower layer anisotropy might have been produced by asthenospheric mantle flow. In contrast, the upper layer anisotropy does not coincide with the APM direction.
The directions correspond well to polarization of NE-SW convergence direction between East and West Gondwana in the Pan-African age. Furthermore, the spreading direction of the Gondwana break-up was NW-SE and the strike of the rift is generally parallel to the continental margin. The fast polarization directions of the upper layer are roughly parallel to the continental margin in the LHB. Therefore, it is plausible that break-up processes affected the formation of anisotropy in the upper layer. The preexisting lithospheric structure may also influence the formation of the anisotropy during the Gondwana break-up. We conclude that the upper layer anisotropy is caused by plate convergence during the Pan-African period involving the Gondwana assembly, subsequently modified by rifting and continental break-up.

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