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Lithosphere/Asthenosphere Boundary depth inferred from global surface wave tomography

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The coupling between the rigid lithosphere and the weaker underlying asthenosphere is a key point of Plate Tectonics and Mantle dynamics. The characterization of the properties of the Lithosphere/Asthenosphere Boundary (LAB) is essential for understanding the Upper Mantle. Recent studies, using receiver functions for example, provide local constraints. In this study a global view by surface wave tomography is given.
A large amount of data from different groups (Harvard, Boulder, Utrecht, Paris) has been collected. There are more than 100,000 phase and group velocities measurements on the fundamental mode of Rayleigh and Love waves. This global scale dataset in the period range 15s-200s, enables us to investigate the LAB with an approximative lateral resolution of 500km. The regionalization of the path-averaged velocities is performed to extract isotropic and azimuthally anisotropic terms of local velocities. We derive our own crustal model (taking account of topography-bathymetry, sediments and crustal thickness) by a MonteCarlo inversion with the shorter periods of the data.
A forward estimation of the LAB properties on a global map is provided. We choose a low parametrization (isotropic Vs layers) of the Upper Mantle adjusted with the larger periods of the data by MonteCarlo inversion. Then we present a new tomographic model obtained by inverting the larger periods of phase velocities in the least square sense, including isotropic Vs velocity, radial anisotropy and azimuthal anisotropy. Different proxies for the LAB are builded from this 3D Upper Mantle model, such as the strongest negative Sv velocity gradient or the variation of azimuthal anisotropy fast axis.
LAB determination seems consistent in oceanic regions in all of the proxies, presenting a good correlation with ocean floor ages. While the estimated depths beneath continents still unclear depending on the type of parametrizations compared to receiver functions or heat flux studies.