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Lithospheric thickness jumps at the S-Atlantic continental margins from satellite gravity data and modelled isostatic anomalies

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Abstract:

Isostatic equilibrium is a good approximation for passive continental margins. In these regions, geoid anomalies are proportional to the local dipole moment of density-depth distributions, which can be used to constrain the thickness of lithospheric jumps and corresponding tectonic stress.
We analysed satellite derived geoid data and, after filtering, extracted typical averaged profiles across the Western and Eastern passive margins of the South Atlantic. They show geoid jumps of 8.1 m and 7.0 m for the Argentinian and African sides, respectively. Together with topography data and reasonable assumptions about densities these jumps are interpreted as isostatic geoid anomalies and yield best-fitting crustal and lithospheric thicknesses. They reveal a small asymmetry between the African and S-American crusts and lithospheres by a few kilometers. On both sides, the continental lithosphere is about 15 - 30km thicker than the oceanic lithosphere. To keep such geoid jumps stable over O(100Ma) fully dynamic models show that lithospheric viscosities must be of the order of 1e23 Pa s.