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Nonisostatic structures of the Earth's crust and mantle

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The nonisostatic structures of the crust and upper mantle, consistent with the external gravity and minimizing deviations of the internal gravity from the field of the hydrostatic Earth, are determined. We show that:

1) The distribution of the nonisostatic masses at the upper and lower crust, at the top and bottom of upper mantle is mostly dipole (that is of opposite sign), especially pronounced for some regions (the central and northeast Pacific, deep basins, some zones of oceanic ridges, mountain and coastal zones of continental crust). Such distribution brings to additional nonisostatic vertical compressive stresses in the top mantle of deep basins and in the oceanic crust, increasing with removal from ridges, as well as the tensile stresses in the top mantle of ridges and in the continental crust.

2) Nonisostatic structures bring to some redistribution of isostatic masses, namely to the disdensification of upper continental crust and to the consolidation of lower that, and on the contrary for oceanic crust. However there are exceptions for the lower crust of oceanic coastal zones (it is mostly consolidated as for continents) and for the lower crust of northern and central Eurasia (it is disdensificated as for oceans).

3) Such redistribution not only minimizes deviations of internal gravity from hydrostatic field, but also reflects the motion of masses to a minimum of potential energy. So, it is energetically preferentially for light components of upper oceanic crust, equally with the motion up, also the motion to upper continental crust, and for heavy components of lower oceanic crust - to the lower continental crust and to upper mantle of basins.

As in the Earth's centre the pressures and fields should be equalized, the nonisostatic structures must be compensated somewhere in deep layers of the Earth. The analysis of possible distribution of compensating masses, consistent with the external and internal gravity, with seismic data and with spectral analysis of free-oscillation data, is carried out.

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