



Dynamic Topography of the East European Craton

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While most of the East European Craton lacks surface topography, (a) the topography of its basement exceeds 20 km, (b) the amplitude of topography undulations at the crustal base reaches almost 30 km with an amazing amplitude of ca. 50 km in variation in the thickness of the consolidated crust, and (c) the amplitude of topography variations at the lithosphere-asthenosphere boundary exceeds 200 km. This paper examines the relative roles of the crust, the subcrustal lithosphere, and the dynamic support of the sublithospheric mantle in maintaining surface topography, using regional seismic data on the structure of the consolidated crust and the sedimentary cover, and thermal and large-scale seismic tomography data on the structure of the lithospheric mantle. The isostatic contribution of the crust to the surface topography of the East European Craton is almost independent of age (ca. 4.5 km) due to an interplay of age-dependent crustal and sedimentary thicknesses and lithospheric temperatures. On the contrary, the contribution of the subcrustal lithosphere to the topography strongly depends on the age, being slightly positive (+0.3+0.7 km) for the regions older than 1.6 Ga and negative (-0.5-1 km) for younger structures. This leads to age-dependent variations in the contribution of the sublithospheric mantle to the topography (residual, or dynamic topography). Positive dynamic topography at the cratonic margins, which exceeds 2 km in the Norwegian Caledonides and in the Urals, clearly links their on-going uplift with deep mantle processes. Negative residual topography beneath the Archean-Paleoproterozoic cratons (-1-2 km) indicates either smaller density deficit (ca. 0.9 per cent) in their subcrustal lithosphere than predicted by petrologic data or the presence of a strong downwelling in the mantle. Such mantle downflows can effectively divert heat from the mantle, leading to a long-term survival of the Archean Paleoproterozoic lithosphere. (Paper in press, *Global and Planetary Change*, 2007, "Topo-Europe" special issue).