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Lithospheric thermal and strength model of the Arctic region

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We estimate the lithospheric strength distribution in the Arctic region. With this aim, we use the most recently updated models of the Arctic's crust of Lebedeva-Ivanova et al. (in preparation), based on seismic and gravity data. These models include the thickness and density of the crust and sediments, the boundaries between the continental and oceanic crust, and the age of the oceanic lithosphere. We estimate the temperature variation in the continental lithosphere by using the one-dimensional steady-state heat conductive equation, assuming a ratio between the upper and lower crust of 0.5 and 0.7 and a constant surface heat flow of 50 and 65 mWmˆ2, respectively. We take also into account the temperature dependence of the the thermal conductivity in the lithospheric mantle. We adopt the cooling plate model of McKenzie (1976) to estimate the temperature in the oceanic domain.
At a depth of 50 km, the resulting thermal models show a stronger lateral variations in the oceanic (∼550 °C) than in the continental lithosphere (∼100°C). Within the continental domain, the increase of a surface heat flow from 50 to 65mWmˆ2 raises the temperatures of ∼300 °C. This is translated in a significant lithospheric strength reduction (from 3x10ˆ13 Pa to ∼ 0.5x10ˆ13 Pa) and decoupling between the crust and mantle lithosphere. Other parameters, such as the crustal rheology and thickness cause second order strength variations. Continental strength variations reflect the different tectonic evolution of the Artic basins and ridges.