



Variations of the lithospheric strength across the edges of the North American craton and their relation to intraplate earthquakes

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Seismic tomography models revealed a pronounced velocity contrast between the cratonic and off-cratonic regions of North America. However, the location of the transition between the fast/slow velocities characterizing the Archean-Proterozoic and Phanerozoic regions, respectively, is still under debate. In order to understand the structure of the edges of North American (NA) cratons, we analyze the results of two recent thermal and strength models of the NA continent, obtained using seismic and gravity data (Kaban et al., 2014; Tesauero et al., 2014; 2015). We could observe that in the peripheral parts of the cratons, as the Proterozoic Canadian Platform, the Grenville, and the western part of the Yavapai-Mazatzal province, the integrated strength for one model is 10 times larger than the other one, due to a temperature difference of $>200^{\circ}\text{C}$ in the uppermost mantle. The differences in the effective elastic thickness (T_e) between the two models are less pronounced. In both models, Proterozoic regions reactivated by Meso-Cenozoic tectonics (e.g., Rocky Mountains and the Mississippi Embayment), are characterized by a weak lithosphere due to the absence of the mechanically strong part of the mantle lithospheric layer. Furthermore, intraplate earthquakes are distributed along the edges of the cratons, demonstrating that tectonic stress accumulates there, while the cores of the cratons remain undeformed. In both models, intraplate seismicity occurs in weak lithosphere or in the regions characterized by pronounced contrasts of strength and T_e .