Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06798, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06798
EGU General Assembly 2008

Long-lived E-W fault zones in the lithosphere of western Sarmatia

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The EW-trending Pripyat'-Brest (P-B) and Dniepr-Laba (D-L) fault zones, the two largest in western Sarmatia, were studied employing integrated structural and geophysical data. The aim was to obtain the 3-D characteristics of the surrounding lithosphere and to follow the structural evolution from the Precambrian to the Recent. The two fault zones are expressed well in the potential fields and satellite images, where they are seen as belts hundreds of kilometres long and tens of kilometres wide. Mostly they cut across the regional Palaeoproterozoic crustal structures and are made up of closely spaced major EW-trending strike-slips and linked N-W tear faults, generally indicating longitudinal extension at present. However, the kinematics varied with time from dextral and sinistral strike-slip to normal faulting with vertical displacements reaching tens of metres. The latest movements contributed to define the present topography of the Ukrainian Shield and are recorded by secular variations of the gravity field, high seismicity, and elevated heat flow. The P-B fault zone with its lowland topography was probably initiated in the Proterozoic, but mostly active during Late Palaeozoic rifting and the formation of the large Pripyat'-Dniepr-Donets Aulacogen (PDDA) with its horst-and-graben internal structure. Highly magnetized bodies of mafic intrusions extend along the E-W faults. The local Palaeoproterozoic crust is up to 50 km thick and consists of wedge-shaped imbricates of crustal rocks. According to the EUROBRIDGE seismic profiling, the E-W trending faults bounding the Pripyat' trough dip SSW across the crust and even down to ca. 70 km into the underlying upper mantle, which has low P-wave velocities of ca. 8.0-8.1 km/s. In general, the P-B

zone separates a region with thick seismic and thermal lithosphere in the south from a thinner and hotter lithosphere in the north along the PDDA. The D-L zone extends far to the west beyond the boundary of the East European Craton. Satellite surveys image it as 50 km wide lineament following an imbricated fault zone. As different from the P-B zone, it was developed atop a Palaeoproterozoic collisional suture separating the Archaean Podolian domain in the south from juvenile Palaeoproterozoic terranes in the north. This created a very thick middle crust, which makes up half of the entire crust but did not overly disturb the deep lithospheric mantle. The adjoining part of the Ukrainian Shield features the highest uplifted crust and has a highland topography. In the D-L zone, several maxima of tectonic and igneous activity occurred in the Precambrian as well as later, and even recently. Particularly important is that the activity along the D-L zone controlled the distribution and alteration of various ore deposits, and elevated radon emanations.

The present is a contribution to the project “Major weakness zones in the lithosphere of Western Baltica” of the Swedish Institute’s Visby Programme.