Geophysical Research Abstracts, Vol. 9, 04994, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04994

The Cenozoic activity of the Polotsk-Kurzeme fault belt in the East European Craton and its influence on the topography

D.M. Kurlovich (1,2), S.V. Bogdanova (1) and A.K. Karabanov (3)

(1) Department of Geology, Lund University, Sölvegatan 12, SE-22362 Lund, Sweden (kura_geo4@mail.ru), (2) Faculty of Geography, Belarusian State University, Leningradskaya 17, 220050 Minsk, Belarus, (3) Institute of Geochemistry and Geophysics, NAS, Kuprievich 7, 220141 Minsk, Belarus

The western part of the East European Craton features numerous fault-bounded lineaments originally formed at 1.5-1.4 Ga. The Polotsk-Kurzeme fault belt is one of these structures. It extends from Moscow across the northern part of Belarus, Latvia, Lithuania, and the Baltic Sea to the Oskarshamn area in southeastern Sweden.

In the present study, the influence of Mesoproterozoic faulting on the Paleozoic, Mesozoic, Cenozoic and recent evolutions of the Precambrian crust has been assessed using 3D reconstructions of paleosurfaces and GIS (=Geographical Information Systems) - models of basement-cover correlation. The key target area of this study has been the Polotsk part of the Polotsk-Kurzeme fault belt in northern Belarus.

The 3D upper paleosurfaces of the crystalline basement and the Riphean, Vendian, Ordovician, Devonian and Quaternary sedimentary deposits as well as the present landform surface have been performed with Arc View 3.2 and ArcGis 9.0 (ESRI, USA) softwares. A series of maps showing correlation coefficients between the upper paleosurface of the crystalline basement and all the various Phanerozoic deposits has been produced for the Polotsk area, in which we have also profiled the Quaternary deposits.

As a result of the study, two main stages of activity of the Polotsk-Kurzeme fault belt have been identified. In the Mesoproterozoic, the major EW- and linked NS-trending fault systems developed in conjunction with orogenic processes at the southwestern margin of the East European Craton. In the Cenozoic, the activity of this belt was

caused by both neotectonics and varying pressures of the ice sheets with attendant Pleistocene deformation of the mostly thin sedimentary cover within the Polotsk area. We reached these conclusions on the basis of the following indicators:

- Positive correlation of the upper paleosurface of the crystalline basement with the Quaternary glacial/interglacial paleosurfaces and present landforms;
- Changes of the thickness and structures (e.g. glacio-dislocations and, declining glacial and interglacial layers) of the Quaternary sediments across the Polotsk-Kurzeme fault belt;
- Recording of the basement faults by shallow and deep depressions on the Middle Pleistocene paleosurfaces, which were formed due to exaration of the ice sheets;
- The presence of neotectonic active linear zones of flexure-faulting atop the Mesoproterozoic faults. These were distinguished by morphometric method and confirmed by geological data such as displacement, flexuring and fissuring in the Quaternary deposits;
- The present seismic activity.

Cenozoic activity along the Polotsk-Kurzeme fault belt also substantially influenced the formation and development of the present landforms. On the Earth's surface, it is expressed by lineaments and hydrography.

In consequence, we find that the application of modern GIS-technologies to the study of the Polotsk-Kurzeme fault belt allows evaluating the effect of the Precambrian tectonics on the Phanerozoic and recent evolutions of the crust. The obtained results can serve as a base for the geological and geomorphological mapping of the western parts of the East European Craton as well as for the assessment of human impact and the prediction of natural hazards.