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Relationships between Precambrian fault zones and present-day lineaments in northern Belarus

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The combined information from topographical maps, air photographs and satellite images shows a remarkable linear arrangement of the landforms (”lineaments”) in northern Belarus. These lineaments appear to be related to large-scale fault zones in the Precambrian crystalline basement. A good instance of this relationship is the Polotsk-Kurzeme Deformation Zone (PKDZ). It is one of the numerous EW-trending zones of faulting in the western part of the East European Craton (EEC), which are associated with c. 1.50-1.45 Ga AMCG and A-type granitoid magmatism (Bogdanova et al., 2006; Skridlaite et al., 2007). The PKDZ faults have been identified mainly by linear, intensive, gravity and magnetic anomalies and their truncations, and high gradients of potential fields (Garetsky et al., 2006).

In the Polotsk key area of the PKDZ, the crystalline basement lies beneath an up to 3 km thick sedimentary cover. The present topography in this area was mostly formed by the accumulated activity of repeated Pleistocene glaciations. Lineaments have been recognized by visual identification using the digital terrain model (DTM) as well as the positions of rivers and lakes. The rectified parts of the rivers, lakes and linear landforms have been interpreted as topolineaments. Some of them have been identified using combined analysis of hill-shaded reliefs, anaglyphs, steepnesses and aspects of slopes.

The Pleistocene complexes respond to the PKDZ faults by changing their widths and the structures (declining glacial and interglacial layers) of the Quaternary sediments

across the fault zone. Morphometric methods and geological data such as displacement, flexuring and fissuring in the Quaternary deposits atop the Mesoproterozoic faults strongly indicate neotectonic activity along the PKDZ (Kurlovich, 2007). Many topolineaments trend along the PKDZ faults. Notably, the positions of the PKDZ faults to some extent controlled the formation of some morainic highlands within the study area.

We suggest that the Cenozoic sedimentary cover above the PKDZ basement affected both by neotectonics and by varying pressures of the ice sheets. The rapid changes of neotectonic regimes in the Pleistocene were, in part, due to far-field effects of the Alpine orogeny (Karabanov et al., 1996). The thicknesses of ice sheets can have been of great importance for the subsidence during the glacial advances and the neotectonic uplift during the glacial retreats.

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