Geophysical Research Abstracts, Vol. 9, 09905, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09905

Paleomagnetic evidence of rotations and conjugate rifting of the East European Craton in the Mesoproterozoic

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After the final amalgamation at 1.8-1.7 Ga and entering with other continental blocks into the Palaeo- to Mesoproterozoic supercontinent Nuna/Columbia, the East European Craton (EEC or Protobaltica) developed differently in its eastern and western parts. Between 1.6 and 1.0 Ga, accretion of juvenile continental crust and collision went on in the west, while rifting and formation of passive margins dominated in the east.

Particularly important was the period of 1.5-1.3 Ga of incipient breakup of Nuna supercontinent when Protobaltica was still in close connection with other continental blocks. Whereas strong penetrative deformation, metamorphism and emplacement of numerous mafic and granitoid intrusions both in compressional and extensional tectonic settings characterized southwestern Protobaltica, rifting affected its eastern half. Large NW-trending aulacogens and separate grabens began to build up. We consider that these differences in the geodynamic evolution of the East European Craton during the Mesoproterozoic were due to its paleogeographical position and kinematics of plate motions.

New paleomagnetic data for the Mesoproterozoic time were recently obtained on the magmatic rocks from the three parts of the EEC: Dalarna (Central Sweden), Lake Ladoga region (South Karelia) and (the Bashkirian anticlinorium, the South Urals). The age of Dalarna dykes have yielded identical U-Pb baddeleyite ages in the range 1461-1462 Ma (Soderlund et al., 2005), and the Valaam sill and Salmi basalts (Lake Ladoga) have been dated as 1457+/-2 Ma (Ramo et al., 2005) and 1499+/-30 Ma (Bogdanov et al., 2003), correspondingly. In the South Urals, the age of the Main

Bakal Dyke is of 1384+/-2 Ma by U/Pb methods (Ernst et al., 2006). The similar age of 1386+/-10 Ma has been obtained by U-Pb SHRIMP zircon method for the Berdyaush intrusion (Ronkin at al., 2006).

The new paleomagnetic poles for the EEC demonstrate a regular trend from the older Salmi basalts (F=15.9 L=194.8 dp=2.9 dm=5.4; Lubnina et al., 2005) through Dalarna dykes (F=11.2 L=183.1 dp=3.4 dm=6.3; Lubnina et al., EGU2007-A-08308) to dykes of the South Urals (F=4.8 L=177.5 dp=4.4 dm=8.2). According to these paleomagnetic data, the EEC moved from the 9 to the 13 southern latitudes and anticlockwisely rotated about 20 degrees from 1.499 (Salmi basalts) to 1.384 Ga (Mashak dykes). Laurentia (Meert&Stuckey, 2002) and Siberia (Veselovsky, 2006) had the same trend of movements during the Mesoproterozoic.

Comparisons of the APWP of the three continents allow testing the relative position of these continental blocks within Nuna supercontinent. New paleomagnetic data also suggest that the Mesoproterozoic rifting at the eastern EEC can have been caused by rotational movements in the peripheral parts of this supercontinent.

This is a contribution to the Project ”Major zones of the lithosphere weakness in Western Baltica” of the Visby programme, Swedish Institute.