



The Ingul block of the Ukrainian Shield (the East European Craton): multiple stress changes during the Palaeoproterozoic tectonic evolution

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The Palaeoproterozoic Ingul block occupies the central part of the Ukrainian Shield in the Sarmatian crustal segment of the East European Craton. It is situated between two groups of Archaean blocks, the Middle Dniepr and Azov blocks in the east, and the Podolian and Bug blocks, in the southwest. In the Archaean and the earliest Palaeoproterozoic these western and eastern Archaean blocks had different structural evolutions and thus most probably were separated by an ocean. The Ingul block appears to have been formed during the closure of that ocean.

Structurally, the Ingul block is a part of an up to 200 km wide zone of NS-trending dextral strike-slip faults. It extends far to the south and to the north and is also marked by the Kherson-Smolensk transregional fault zone. Archaean and Palaeoproterozoic rock complexes occur at the margins of the Ingul block whereas its middle part is completely Palaeoproterozoic. Its formation began during the 2.1-2.05 Ga collisional closing of the assumed ocean and the docking of the Archaean eastern and western continental blocks with each other. It was accompanied by dextral strike-slip faulting and strong compression. As a result, the Golovanevsk and Ingulets-Krivoi Rog suture zones were formed along the edges of the Eastern and Western Sarmatian microplates.

Between 2.05 and 1.75 Ga, intense tectonothermal reworking and strike-slip faulting took place in the Ingul block. Several phases of deformation have been recognized. These are:

- At 2.05-2.0 Ga – the Kherson phase of extension (azimuth/dip angle of the tension axis σ_3 278/10, the compression axis σ_1 8/00, dextral strike-slip faulting) accompanied by the intrusion of the Novo-Ukrainka monzogranitoids and some anatetic granitoids, and the formation of the Kherson-Smolensk fault zone,
- At 2.0-1.8 Ga - two subsequent phases of compression: (1) the Kirovograd phase (σ_1 49/00, σ_3 319/00) and the development of a system of dextral strike-slip faults in the central part of the Ingul block with associated Au sulfide- and U ore occurrences, and (2) the Lelekovka phase of NS-compression (σ_1 03/00, σ_3 273/05) and the formation of coupled NE sinistral- and NW-dextral strike slip faults,
- At 1.80-1.77 Ga – the Submoshorino phase of NE-SW extension (σ_1 315/00, σ_3 45/00) and the development of cross-cutting systems of strike-slip faults, and the formation of related mafic dykes and ore uranium, rare-earth, gold-sulfide deposits,
- At 1.76-1.75 Ga – the Korsun phase of EW extension (σ_1 06/00, σ_3 96/00) and the emplacement of the Korsun-Novomirgorod gabbro-anorthosite-rapakive granite pluton.

Multiple stress changes indicate possible tectonic block rotations during the development of the Ingul block.

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