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The Volga-Don orocline stitching Volgo-Sarmatia

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The crustal segments of Volgo-Uralia and Sarmatia occupy about half of the territory of the East European Craton. They differ from its Fennoscandian part by featuring large Early Archaean blocks and 2.1-2.0 Ga orogenic belts. The Volga-Don belt, which separates Archaean Volgo-Uralia from likewise Archaean eastern Sarmatia (the Oskol-Azov megablock) is one of the intracratonic collisional orogens that stitched together various Sarmatian terranes and Volgo-Uralia during the assembly of megacontinent Volgo-Sarmatia.

The Volga-Don orogen is an orocline, NS-trending in the south, but bending and wedging out in the northwest where Sarmatia and Volgo-Uralia were brought into close contact caused by their oblique collision. It extends for more than 600 km and is very wide in the southeast, embracing several tectonic terranes, bounded by strike slip- and thrust faults. There, the Volga-Don orogen comprises the following terranes from the east to the west:

(1) The wide South Volga province made up of metasedimentary migmatites and S-type garnet-bearing granitoids of granulite and amphibolite facies having NdTDM isotopic ages between 2.4 and 2.1 Ga. These overlie the Archaean basement of Volgo-Uralia,

(2) The Tersa continental- marginal igneous belt, where granitoid intrusions of shoshonitic affinity were emplaced into South Volga metasedimentary rocks and their basement at 2.04 Ga. Their NdTDM model ages vary between 2.6 and 2.1 Ga,

(3) The Balashov block consisting of the East Vorontsovka turbiditic rocks metamorphosed in the greenschist- to amphibolite facies of a LP/HT series, and in places migmatized and intruded by 2.02 Ga S-type granites,

(4) the East Voronezh block, where accretionary-type turbidites of the West Vorontsovka Group have been penetrated by a number of small mafic-ultramafic and gabbro-dioritic plus granitic intrusions with ages of 2.08-2.05 and 2.06-2.05 Ga, respectively,

(5) the 2.1-2.08 Ga Lipetsk-Losevo volcanic arc extending along the continental margin of the Archaean Oskol-Azov (Kursk) block of Sarmatia, and

(6) the Oskol-Azov block with tectonic belts of Palaeoproterozoic intensively deformed BIF (banded iron formation) metasediments.

Terranes 4, 5 and 6 characterize the East Sarmatian accretionary orogen (Shchipansky et al., 2007) developed shortly before the Volga-Don collision. The Volgo-Uralian terranes (1-3) appear to represent an array of intracratonic basin, active continental margin and mature island arcs.

The internal structure of the Volga-Don orogen is bilateral and symmetric, complicated by strike-slip faulting and normal faults mostly related to the formation of the Mesoproterozoic Pachelma aulacogen. Recent seismic reflection profiling revealed typical collisional interfingering of tectonic layers/nappes belonging to the Sarmatian as well as Volgo-Uralian crust, and a mantle reflector dipping beneath Volgo-Uralia (Gusev et al., 2010). On the whole, the deep crustal geometry suggests that the Sarmatia-Volgo-Uralia intersegment suture is situated in the central part of the orocline along the western fault boundary of the Balashov block.

Gusev, G.S., Mezhelovsky, N.V. and Fedorchuk, V.P. (Eds.), 2010. Essays for Regional Geology of Russia, 2. GEOKART, GEOS, Moscow, 400 pp. (in Russian).

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