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Volgo-Uralia: a large piece of the global Archaean framework

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Archaean lithosphere has played an important role in regional- as well as global-scale geodynamics during all periods of Earth's evolution. It is also a major source of various ore deposits. Nevertheless, many Archaean protocratons and supercratons are difficult to use in geodynamic modeling because of their extensive post-Archaean covers and intense tectonic reworking. Volgo-Uralia is a good case of such a hidden and reworked Archaean realm. It occupies the eastern third of the East European Craton covered by thick sedimentary deposits locally reaching 20 km in thickness. However, due to high oil-and-gas potentials of the platform cover, the crystalline basement of Volgo-Uralia has been also penetrated by several thousands of deep drillings, some for more than 3 km down. These drillings demonstrate that high-grade, amphibolite to granulite facies rocks dominate its upper crust. Age determinations by Rb-Sr, Sm-Nd , TIMS and SHRIMP U-Pb zircon methods all indicate that the crust -forming processes acted from more than 3.3 Ga onwards and comprised major collisional events at ca. 2.7, 2.1-2.0 Ga. and 1.9-1.8 Ga. The oldest rocks appear to make up separate domains of "mosaics"-type structural patterns, where widespread granitoids form cupolas. The recently obtained SHRIMP zircon ages of dioritic and tonalitic gneisses and zircon xenocrysts from later magmatic rocks range between 3.5 and 3.3 Ga. Younger Archaean meta-sedimentary and meta-igneous rock complexes of 3.0-2.6 Ga age form discrete belts, displaying geophysically well recorded signs of fold-and-thrust structure of the crust. It is probable however that this deformation mostly took place in the Palaeoproterozoic at 2.1-2.0 Ga, when Volgo-Uralia collided with Sarmatia, the other crustal segment of the East European Craton. During that time the Archaean crust and

Palaeoproterozoic deposits in both crustal segments was affected by broad granitoid magmatism. These collisional processes could well have led to the large-scale doming that is indicated by characteristic circular gravity and magnetic anomalies superimposed upon the earlier belt-shaped structural pattern. A last stage stage of deformation and reworking of the lithosphere in Volgo-Uralia occurred in the late Palaeoproterozoic during the final amalgamation of the East European Craton at ca. 1.8 Ga. In view of the available data it is difficult to refer Volgo-Uralia to any particular type of Archaean protocratons or their assemblies. Volgo-Uralia lacks evidence of the broad rifting and dispersal of the lithosphere that characterized Fennoscandian, Laurentian and many other Archaean protocratons between 2.5 and 2.0 Ga. At that time, instead, it was colliding with the Archaean microcontinents of Sarmatia.