The Meso-Neoproterozoic Sedimentary Basin in the Volgo-Uralian Province and Adjacent Part of the Urals: A Corrected Stratigraphy, Correlation and Oil and Gas Prospect

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Abstract

The Precambrian deposits in the southern part of the western slope of the Urals and adjacent area of the Volgo-Urals oil and gas Province (VUP) belonged to a single basin. In the Urals, these sediments form almost uninterrupted section, 15 thick, corresponding to ~ 1.2 Ga of geological history. This section serves as a stratotype of the Riphean straton (RF) and is present in the General Stratigraphic Scale of Russia (GSSR), being widely used for geological mapping and prospecting. The sediments are only slightly metamorphosed, and comprise volcanic rocks of several levels, which permitted us to refine the stratigraphic scheme, based first on new isotopic ages, obtained with new techniques. Our work was stimulated by understanding that the International Scheme (ISS) of division of Meso- and Neoproterozoic into systems/periods of equal duration (200 Ma) contradicts to traditional principles of stratigraphy. Until recently, the Riphean was subdivided into three systems (periods): Lower Burzyanian, Middle Yurmatinian and Late (Karatavian). We added to it the Uppermost (Terminal) Arshinian system. The ages of the boundaries of these stratons were updated. It permitted to correlate the Riphean scheme with the Meso- and Neoproterozoic units of the ISS and suggest a correlation with the Chinese scheme (Sinian to Changcheng units). The Uralian section characterizes only the easternmost part of an extensive basin, which occupied in the Meso-Neoproterozoic a considerable part of the Volgo-Uralian oil and gas province, have thickness of 0 to 10 km and is concealed under a Paleozoic sedimentary cover, 2-3 km thick. In the Province, a couple of dozens deep boreholes penetrated the Proterozoic deposits, and it permitted to construct the stratigraphic scheme of the VUP part of the basin, which have the same fundamental features as in the Southern Urals, though differ in many details. The correlation between the Uralian and VUP stratigraphic schemes serves much for the refinement of the latter. Moreover, it was shown that a stratigraphic section of a unique deep borehole in the Urals; Kulgunino, is transitional and can be described as a combination of the Uralian and platform schemes. As for the oil and gas prospects of the Riphean section, they are still uncertain, because the quantity of the deep boreholes is insufficient. Anyway, a possibility of discovering of new deep deposits cannot be discarded and needs a further consideration.