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Evaporite formations of the Central Paratethys: correlation, genetic and structural-lithological models

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The paper presents a generalization of evaporite formations many-sided investigations having been carried out by the Institute of Geological Sciences. According to the object selected three main issues are reflected: the principal scheme of the Central Paratethys evaporite formations correlation; genetic models of these formations sedimentation and 3D structural-lithological models of typical geological objects.

The scheme of Central Paratethys evaporite formations correlation presented is a kind of remake for the scheme of 80-th (Khrushchov, Kompanets, 1988) having been modernized by recent biolithostratigraphic, biozonal and tectonic data (Andreeva-Grigorovich, Maslun etc.). This scheme comprises evaporite formations of the following geological regions: Carpathian foredeep (Ukrainian, Polish, Romanian parts), Transcarpathian depression (East Slovakia depression, Mukachiv and Solotvino depressions in Ukraine, Maramuresh depression in Romania), Transilvania and North Apuseny depressions in Romania, Balkan foredeep in Bulgaria, Tusla depression. As to the stratigraphical position the following main age levels are defined: 1 – Upper Egerian – Ottnangian (possibly Lower Carpathian) – Vorotyshcha formation in Ukraine and it's analogues in Romania and Poland; 2 – Carpathian – Badenian – Balich formation in Ukraine, possibly – salt formation of Tusla and Lower salt horizon in East Slovakia depression; 3 – Upper Badenian (upper level of Balich formation) – Tyrass formation in Ukraine and it's analogues in Polish and Romanian parts of Carpathian foredeep, evaporite formations of Transcarpathian and Transilvania depressions, Upper salt formation of East Slovakia depression, gypsum formation in Balkan foredeep.

Basing upon modern lithostratigraphic scheme and conventional lithological-geochemical investigations, basic conditions (paleogeographic, paleotectonic, paleohydrological, hydrochemical etc.) of evaporite formations sedimentation were revealed. Modern paleogeographic schemes of Central Paratethys evaporite basins as well as other illustrations concerning the subject are presented.

Aimed at solution of specific geological problems, a methodology (technology) of Digital structural-lithological modeling (Khrushchov, Lobasov, 2006, etc.) have been modificated for evaporite formations, salt formations in particular. This technology provides to obtain 3D computer reflection of natural (or disturbed by human made intervention) geological environment. According to content of data base having been compiled, the model reflects structural and qualitative characteristics of geological objects. Digital structural-lithological models (DSLM) are developed in regional, zonal and local scales. Models of regional and zonal (small and middle) scales are intended for regional problems solution (oil and gas prospecting, salt resources prognosis etc.). Models of large scales (local) are aimed at information provision of R&D, connected with specific geological objects management – deposits exploitation as well as geological environment protection and remediation. Meanwhile the modeling represents an efficient tool for solution of theoretic problems, concerning evaporite formations forming and regularities of space spread of mineral resources.

The most impressive examples of DSLM of regional, zonal and local scales are demonstrated, in particular commercial deposits of potassium and magnesium salts, rock salt, salt massifs, favorable for construction of underground storages for energetic resources (oil, gas, hydrogen, compressed air, etc.), chemical products, hazardous waste disposal etc. The models of salt mining activity degraded territories are also presented. These models are intended for information support of R&D aimed at territories remediation.