

# Implications of metallogenic regularities for the understanding of different-scale geological processes

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The accumulated knowledge of the tectonic–geodynamic regularities of the inception and development of different-scale metallogenic geosystems is scarcely used at present for the solution of the general inverse problem—the “reconstruction” of the geodynamic–tectonic histories of the geosystems. This is true not only for the regional and, partially, even global geodynamic processes, but also for the processes creating local metallogenic taxa—ore regions, fields, clusters, and fields. The author’s experience, mostly in the studies of the origin of gold and uranium deposits, partly in multimetal metallogenic provinces, enables him to examine the various aspects of the general problem of trigger effects, including the structures and properties of fault zones and tectonic blocks and the deformation processes associated with the extraction of ores of various compositions in real geological settings. Moreover, ore mining conditions and technologies at great depths are examined as a separate problem, mostly based on the data on gold deposits in India (Kolar gold ore field) and South Africa (the gold-bearing region of the Witwatersrand basin. The maximum mining depth in the Kolar gold field was 3220 m (the mine was closed in 2010). The maximum mining depths in various mines of Witwatersrand were up to 3.5 km; ore bodies were confirmed at depths of 4.5–5 km. Gold mining here, as in other regions, is carried out in the interval of 2–2.5 km. The general problem of deep ore mining is the increase in the probability of rock bursts. In order to address this challenge, in situ leaching and other safe mining techniques are being discussed and devised. Ore mining depth in our country has reached 2 km in the Norilsk region, but the mountain burst problem arose in coal mining industry 75 years ago. Over the last decades, this problem has been settled largely by correlating rock mass dynamics and the gas saturation of rocks, coal seams in particular. The findings of petroleum geologists are also taken into account to a certain extent. Methane and mercury association in coal deposits as well as the co-occurrence of mercury deposits and coal. At the same time, data on the other indicator elements of specialized geosystems, such as uranium and some others, have been accumulated. It would be noted that the data on Hg and U dispersion halos enable us to study probable relationships between the genesis of metallic and nonmetallic mineral deposits and different-depth processes. The problem of the triggers of these processes and their systems organization is common for metallogeny and various nonmetallic mineral deposits. However, the studies in these fields are mostly autonomous. The necessary contacts and integration are established mostly at the initiative of researchers rather than centrally. This is also true for the main subjects of research—the fundamental concepts of the geosystems, their geological–mineragenic specialization and geodynamic settings in different-scale stereo-genetic expressions and in certain time intervals.

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