REGULARITIES OF DISTRIBUTION OF LARGE AND UNIQUE DEPOSITS IN NORTH-EASTERN RUSSIA

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ABSTRACT

Northeast Russia is a part of the Pacific ore zone. Large and unique deposits have been discovered in the heterogeneous structures. There are deposits of gold (Natalkinskoye, Mayskoye); of gold and silver (Dukatskoye, Kubaka); of copper-molybdenum (Anuyskoye); of tin (Pyrkakiyskoye); and of mercury (Palyanskoye, Tamvatneyskoye).

Regional ore-controlling criteria are the following: 1) Centers of magmatic structures are fixed by dyke fields and minor intrusions combined with zones of unconsolidated earth's crust (or shell of tension), having an area up to 700 km^2 and of isometric or irregular form. Deposits are located in specific regions. 2) Meridional faults, zones of tectono-magmatic activity with maximum disjunctive saturation, and intersection nodes with regional faults of other directions. 3) Cosmostructures of central type with a diameter 40 to 100 km. Deposits are located in nodes of intersection of low order fractures and interference zones. 4) Ore-forming stage occurs mainly in the Cretaceous period.

The metallogenic zone of North-East Russia is a part of the Circum-Pacific ore Belt divided into Mesozoids of Kolyma and Chukotka, Mesozoids and Cenozoids of the Anadyr-Koryak province, and the Okhotsk-Chukchi Volcanogenic Belt (OCUB) and surrounding areas.

Within the boundaries of the heterogeneous geological structures of this territory are large and unique deposits of gold, silver, tin, mercury and copper. These deposits have different morphogenesis.

This paper deals with the main regularities of distribution of the following large and unique deposits: gold-quartz formation Natalka deposit; ore-placer nodes - Bereliokh, Ryveem, Keperveem and others; gold-sulphide - Mayskoe; gold-silver - Dukat, Kubaka; tin - Pyrkakaiskoe; copper-porphyry - Anyuiskoe; mercury- Palianskoe and Tamvatnei.

The factors controlling regional ore formation are the same for all of these deposits, indepented of their structural position and age. The history of the deposits as they were exposed, from Natalka in 1942 to Kubaka in 1983, is a combination of direct finding of contrast ores and then further investigation. Vast amounts of materials collected by geological prospecting, geological and geophysical surveying, other scientific investigation, and satellite photography permit elaboration on local and regional criteria for exposing similar deposits.

All deposits are combined paragenetically and spatially with hearth structures developed over closed peripheral magma reservoirs. Ore nodes are fixed by the condensation of variably-oriented dikes, forming a split-frame over a peripheral reservoir. This geometry is recognized on geophysical maps by the existence of plots or zones of discondensation which appeared during granitization. Dikes are indicators of hearth structures and sometimes other macrostructures of unclear genesis. Their clusters are grouped into large-scale (about 500-700 square kilometers) missives with irregular, elliptic, and isometric form. The dikes vary in composition; acidic dikes are often intruded into more widespread missives of basic dikes. Post-ore formation basalt dikes represent the final products of differentiation of the ore-bearing magmatic series and therefore can be considered as search signs. Central type structures with diameters of 40-100 km can be readily recognized on satellite photos or less seldomly on airphotos. The deposits are localized in the outlying borders of these structures, situated in the cross-nodes of first-order fractures and interferention zones. The position of magmatic missives of granitoid composition has been determined by deep boreholes drilled at the Dukat, Karamken and Mayskoe deposits.

The distribution of large deposits is controlled by deep breakings, zones of crumpling and tectono-magmatic activization (TMA). The width of the ore-producing area in similar disjunctive structures is up to 30 km. TMA zones in Mesozoides are situated in the perivolcanic zone of the OCUB. The prevailing direction of lineaments is approximately north-south (submeridinal Mayskoe, Kubaka, Dukat, Anyiskoe, Palianskoe and others). The most favorable situation of ore genesis is within cross-nodes of disjunctive structures which break in different directions: for gold, tin, copper deposits - north-west and sublatitude direction, for gold-silver and mercury - north-east and sublatitude. The abnormal density of the breaking cross-nodes (more than 30 crossings) characterizes areas of intensive ore bodies of industrial quality.

Within the Mesozoides the deposits are combined spatially with metamorphic structures, such as "thermoanticlinals" and are associated with greenschist facies metamorphic rocks with well-marked transformation of regressive stage within the OCUB, the deposits are associated with argillization zones.

With the exception of the Paleogenic mercury deposits, most of other deposits are Cretaceous.

The problem of exposing large industrial deposits is becoming more acute as the mineral-source base and quality of placer gold has worsened remarkably. This has forced the transition from placer recovery to intensive exploitation of ore gold and silver deposits.