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Possible analogs of Witwatersrand in the North Asian Craton

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Regions of the South African and Siberian platforms considered in our work are similar in their geological evolution. Gold in the Witwatersrand deposits is concentrated in paleochannels, with thick conglomerates, and is closely associated with pyrite, uraninite, and rounded zircon and chromite grains, with high concentrations confined to erosional surfaces. Genesis of the Witwatersrand gold has remained controversial since its discovery [1, 2]. Models for the origin of Witwatersrand gold deposits can be grouped into placer and hydrothermal types. Discrepancies between the existing models lie in the interpretation of the role of sedimentary or hydrothermal processes and the source of gold. Analysis of the available data shows that the Witwatersrand deposits include a polygenetic complex uranium- and gold-rich mineral assemblage. The primary, undoubtedly mantle-derived ore-bearing material in the source region was concentrated in greenstone belts of the Earth's crust. The gold was then eroded from weathering products of the ancient rocks, transported, and concentrated by fluvial processes in channels as a clastic heavy mineral. It was subsequently remobilized and redeposited by hydrothermal processes in some places [3].

In Russia, Archean and Paleoproterozoic gold-bearing quartzites and crystalline schists have been found in the East European Platform and eastern Siberian Platform. The East European Platform hosts three gold-bearing provinces (Ukrainian crystalline shield, Voronezh massif, and northeastern Baltic Shield), where only iron and diamond deposits currently are known to be of economic grade [4]. In the Siberian Platform, economic Witwatersrand-type gold-bearing conglomerates have not been discovered to date, because the prospective areas are buried at depths of 300-500 m under Riphean and Phanerozoic sequences. Diamondiferous kimberlite pipes, however, have been discovered here. The available geological and geophysical data suggest that the eastern part of the Siberian Platform identified by different names (North Asian Craton, Siberian Craton, and Anabar-Aldan Craton) likely accommodates large and complex Witwatersrand-type gold deposits that also contain enrichments of Pt, Ir, Os, Rh, U, and diamond. These deposits would be confined to the junction of five tectonic provinces: Magan, Anabar, Olenek, Baikal, and Aldan. Three giant (Suntar, Anabar-Udzha, and Yakut) dispersion halos of native gold associated with platinum mineralization are known here [5].

Results from the sampling of cores, outcrops, etc. in favorable areas of the Siberian Platform indicate the presence of gold potential in both crystalline schists and igneous rocks of this region. The grain size and composition of native gold particles are similar in the metalliferous placer fields of both the South African and Siberian platforms. For example, sorting of gold particles in the Vilyui depression in the North Asian Craton testifies to their residence in a coastal marine or eolian setting. This area also includes rounded gold ingrowths typical of the Witwatersrand conglomerates.

References

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