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GEOLOGY

Signs of Symmetric Diamond Concentration in the Eastern Siberian Platform (Relative to the Vilyui Syneclise Axis)

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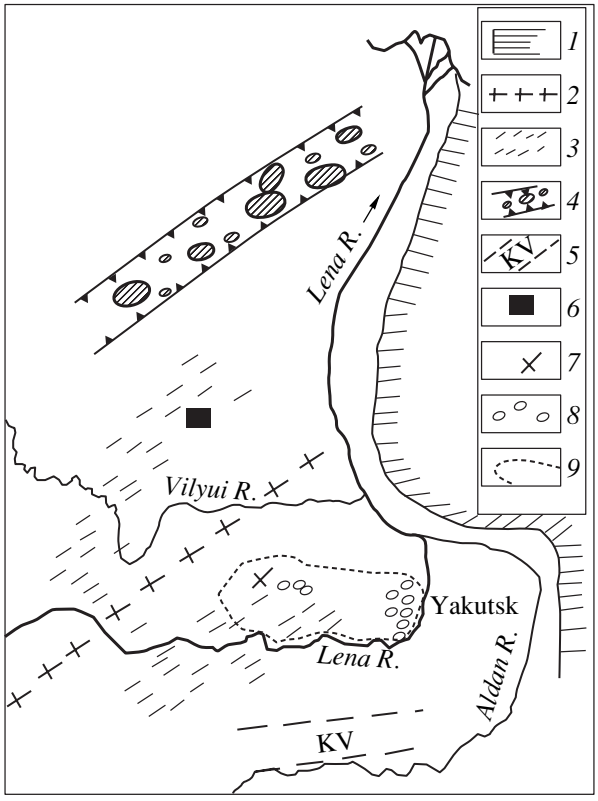
The currently known diamondiferous kimberlite pipes are located northwest of the Vilyui syneclise. However, new factual data indicate that diamondiferous bodies can also be discovered southeast of the Vilyui syneclise axis. The possibility of localization of highly productive kimberlites around the Middle Paleozoic Vilyui–Patom paleorift was suggested long ago in [1]. This forecast was based on the existence of symmetric (relative to the Vilyui syneclise axis) extended deep fault zones recorded on the surface as Middle Paleozoic basic dike swarms (the Vilyui–Markha and Chara–Sina groups in the north and south, respectively). In the mid-1970s, Mesozoic pipe-shaped kimberlite–lamproite bodies were discovered at the upper reaches of the Amga River and on the right bank of the Aldan River (e.g., the Chompolin and Tobuk–Khatystyr fields). The subsequent thematic and prospecting surveys of the southern side of the syneclise revealed that alluvial sediments of the Olekma, Amga, Tuolba, Namana, and Kenkeme rivers always contain diamond-associated minerals (picroilmenite, pyrope, chromite, olivine, and others). Based on findings of hundreds of diamond grains, the authors of [2] predicted the existence of a symmetric Aldan zone of kimberlite–lamproite magmatism (relative to the Daldyn–Olenek zone of kimberlite fields).

Buried pipe-shaped bodies with a cross section corresponding to that of an average statistical kimberlite body have been recorded by geophysical surveys on the Yakutian and Sina uplifts of the crystalline basement. One diatreme (possibly, hyalobasaltic body) has been discovered among Jurassic rocks at the upper reaches of



Scheme showing signs of symmetric diamond concentration in the eastern Siberian Platform (relative to the Vilyui syneclise axis). (*1*) Mesozoides (Verkhoyansk sequence); (*2*) arbitrary axis of the Vilyui syneclise; (*3*) basic dike swarms on walls of the syneclise; (*4*) Daldyn–Olenek zone of kimberlite fields [5]; (*5*) diamond concentration predicted by V.K. Kolodeznikov (KV) [2]; (*6*) Nakyn kimberlite field; (*7*) pipe-shaped hyalobasalt body at upper reaches of the Namana River [3]; (*8*) buried pipe-shaped bodies; (*9*) symmetric zone of the predicted diamond concentration.

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the Namana River [3]. Limestone blocks are found at ~0.5 km from the outer boundary of the diatreme. Granite gneiss blocks and boulders are scattered among Jurassic rocks in the Kenkeme River basin (Yakutian uplift). The limestone and granite gneiss blocks can be considered xenoliths of diatremes. We have found xenoliths of tuffaceous breccia in the Mesozoic sedimentary cover of the Yakutian uplift.

Indicator minerals of kimberlites have been found in panned alluvium samples taken 43 km west of Yakutsk [4]. The minerals are characterized by a heterogeneous origin and setting. High-Cr pyrope of the lherzolite assemblage is the predominant mineral. The samples contain cuboid pyrope and angular picroilmenite grains, which indicate supergene dissolution and continental runoff, respectively [5].

It is worth mentioning that kimberlite bodies in the Transvaal syneclise (rift), an analogue of the Vilyui syneclise, demonstrate a patchy linear (nearly isotropic) distribution. These data suggest that a similar distribution of ejecta (pipes) of upper mantle products may be discovered in the eastern part of the Siberian Platform. However, geologists have been unable to decipher regularities of kimberlitic magmatism in this region because of the development of a thick Mesozoic sedimentary cover and irregular pattern of investigation. For example, the state mapping of some areas is only based on air photo survey. Standard field routes and panning of alluvium samples have also not been carried out. Researchers began to pay attention to tuffaceous xenoliths only at the end of the twentieth century, although such rocks can bear significant information about the diamond potential of a region [6, 7].

Taking into consideration the evolution and tectonic magmatism, as well as findings of indicator minerals, the northern area of the Chara–Sina fault zone with basic and subalkaline dikes seems to be most promising for the discovery of kimberlite pipes (figure). This area is characterized by a symmetric position relative to the Vilyui–Markha fault system (particularly, its southern part extending across the Nakyn kimberlite field) and an abundance of basic and subalkaline dikes. Although productive kimberlite bodies have already been explored in the first area, only numerous signs of diamond concentration are known so far in the second area. The Middle Paleozoic kimberlite bodies in this area are mainly buried under Lower Jurassic sediments (0–200 m) that overlie the Lower Cambrian rocks. These data suggest that the Aldan and Vilyui–Markha zones make up counterparts of the Daldyn–Olenek and Chara–Sina kimberlite fields, respectively. Thus, we can arbitrarily outline the outer and inner belts of diamond concentration relative to the Vilyui syneclise axis.

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