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General patterns in the distribution of gold and diamond deposits, oil and gas fields, and accumulations of other minerals

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Data on the distribution of gold, diamond, and other mineral deposits and oil and gas fields in Russia, Australia, South Africa, and elsewhere indicate that this distribution shows a certain general pattern (Fig. 1, [1–6]): regardless of their age and genesis, most currently known gold, diamond, and other mineral deposits and hydrocarbon fields are spatially constrained to areas with low positive or negative magnetic anomalies (ΔT), in fact, to virtually nonmagnetic areas. Some deposits and hydrocarbon fields are located at the border lines of "magnetic" areas and in their marginal parts but are absent from dominant portions of areas with positive magnetic anomalies. This is explained by that the sources of the valuable components and their host rocks are produced under reduced conditions, at low oxygen fugacity, and hence, these rocks contain practically no magnetite (<1 wt.%), a mineral responsible for positive magnetic anomalies [2]. With regard for these considerations, the areas worth of exploring for gold, diamond, and other minerals and for hydrocarbons can be significantly narrowed and the efficiency of the exploration operations can thus be much enhanced.

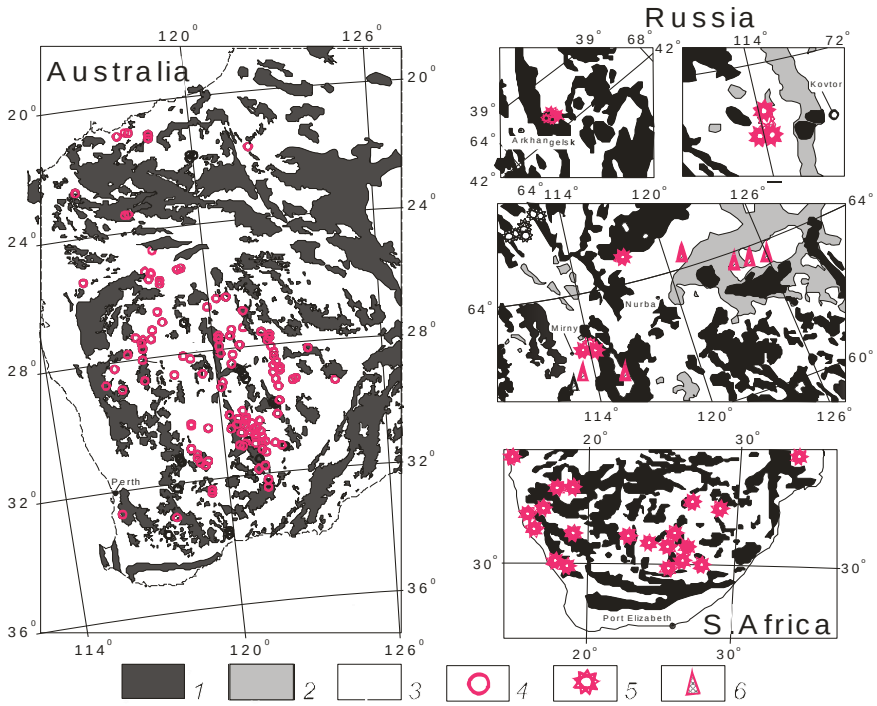

Figure 1: Distribution of gold and diamond deposits and oil and gas fields. Magnetic field (ΔT, nT) [4, 5]: 1 – positive – "magnetic" (50 – >2000), 2 – "low-magnetic" (50–100), 3 – "zero" and the negative – "non-magnetic" (50 – ->1000); deposits [1, 6]: 4 – gold, 5 – diamonds, oil and gas fields.

References:

[1] Australian gold resources, scale 1:10000000 Commonwealth of Australia, 2008. Produced by Geoscience Austrslia

[2] Likhachev AP (2012) Otechestvennay geologiya 6: 13–29

[3] Likhachev AP (2013) Otechestvennay geologiya 6: 40–50

[4] Magnetic anomaly map of Australia, scale 1:5000000 Australia Government, 2004

[5] Map of the anomalous magnetic field in Russia and adjacent areas (ΔT), scale of 1: 5000000 S.-P. VSEGEI. 2004

[6] Map of minerals of the Russian Federation, scale 1: 5000000 S.-P. VSEGEI. 2007