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New method of finding the zones of hydrothermal sulfide mineralization in the ocean

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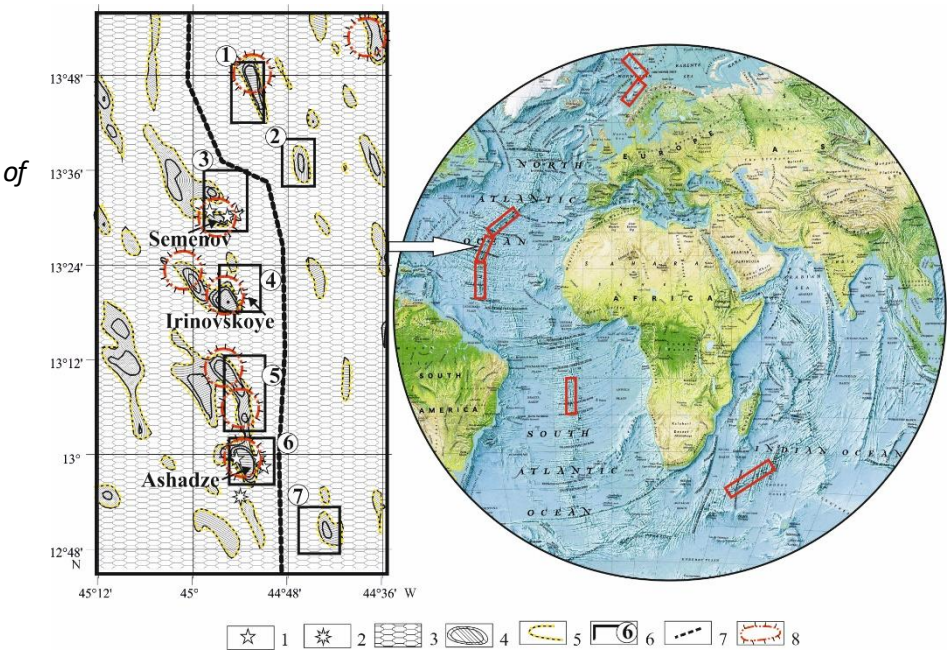
The authors study a possibility of finding zones of hydrothermal venting, based on the analysis of geomechanical (deformation) model built for the analyses of stressed deformation of the earth's crust. For this purpose, we were modeling distribution of the tangential stresses (σ_t) in the upper layer of the earth's crust. In the search for hydrothermal vents, we choose those areas of the earth's crust where the tangential stresses (tension/compression) change i.e., where (σ_t=0). These areas we regard as being in the state of "discharge". In addition, we choose the areas of the earth's crust where the tangential tensile stresses are maximal (σ_t>>0).The areas where the "discharged" zones are bordering the areas of maximal tangential tensile stresses (σ_t>>0) are thought to be the most promising. The information basis for the geomechanical computer model is the data on the relief of the ocean floor.

However, the presence of these two factors may be insufficient to look for the ore objects with confidence. As a third factor we propose to use seismic data of the bottom and sides of a rift valley, pointing to the possible location of an ore-generating hydrothermal center. A combination of all these three geodynamic parameters can define the location of accumulations of deep-sea polymetallic sulfides (DPS).



of The works on the modeling deformation the parts of MOR, to identify the areas favorable for finding DPS (red rectangles)

Figure 1 Results of modeling the tangential stresses in the MAR area. (12°48'-13°50' N)
1-ore; 2-hydrothermal anomaly; 3-zone of compression; 4-zone of tension; 5-"zero" line; 6-promising areas; 7-the MOR axis, 8-oceanic core complexes (OCC)

The works on identifying the areas favorable for finding DPS based on modeling the deformation state of Mid-Oceanic Ridges (MOR) areas the authors have been conducting for over 10 years. We have built the models for the MOR areas in the Atlantic and Indian Oceans. The data available to the authors confirm the effectiveness of the proposed method.