Geochemical and mineralogical pattern recognition and modelling with Bayesian approach at the hydrothermal gold deposits

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The Bayesian approach is an effective method of identifying the certain probability mineralogical and geochemical type mineralization on trace element in galen, pyrite and other distribution ore mineralization. Monomineral samples have been identified using computer upon Bayes method and exploration geochemical techniques of gold deposits for MGT. In order to realize the method, we have used a data bank consisting the results of analysing more than 12000 monomineral samples collected from main hydrothermal gold deposits on territory of CIS. Bayes approach applied to geochemical data such as posteriori probabilities and discriminate analysis provide a numerical and graphical means through which the relationships of the trace elements and samples can be studied. There methods were used here beside GIS to find MGT that can be used as geochemical indicators of regions with gold mineralization**.**

The results of analyzing100 monomineral samples of pyrite from Au-Ag Shkolnoe deposit (Tajikistan) reveals multiformational anomaly of superposition which is a combination of three MGT as:

1. Gold - silver type (85 % and more)
2 Gold- sulfide - polymetalic type (46 %).
3. Gold - sulfide type (40 %).

Mineralogical and geochemical maps (MGM) are results of generalization and analysis of MGT and GIS of different objects. There arises the possibility of quantitative modeling using spatial links of objects and multivariate models helps significantly in making optimal managerial decisions that give maximum economic effect.

References

Grigorian S.V. (1992), *Mining Geochemistry*, Moscow, 301p (in Russian)

Grigorian S.V., Ziaii M, etc (1999) Trace element in mineral as a criterion of geochemical anomaly estimations, *Science and Technology in Russia*, **1** (31)

Ziaii M., (1999) *Technique rational mineralogical and geochemical sampling ore manifestation of gold*, Unpubl. Ph.D. Thesis of Geol-mineral Nauk, IGEM RAN, Moscow 140 p (in Russian)

Ziaii M.,(2004) *Application of GIS technology in regional exploration programs, II international conference*" GIS in Geology",

Safonav Yu.G. (1997), Hydrothermal gold deposits, *Geology of ore deposits*, .**39**, 1,

Influence of hydrothermal crustal fluids on deep-biosphere populations

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Seawater that circulates within the upper porous layers of the ocean crust is forming the largest aquifer on earth. These hydrothermal crustal fluids are supposed to fuel the deep biosphere within deeply buried sediments by introducing electron acceptors for anaerobic respiration from below. To test this hypothesis, we have analysed sediment samples microbiologically that were collected during IODP Exp. 301 to the eastern flank of Juan de Fuca Ridge, an ocean spreading zone in the northeast Pacific. The 265 m long sediment column at IODP Site U1301 (water depth: 2656 m) is characterised by a diffusive flow of fluids from the underlying basalt, a steep temperature gradient of 0.23 °C/m and two sulfate-methane transition zones (SMTZ).

The cell counts generally decreased with the sediment depth. However, elevated numbers were found around the SMTZ and towards the ocean crust. Radiotracer measurements of sulfate reduction and anaerobic oxidation of methane (AOM) at near *in situ* temperatures were elevated in fluid-influenced layers. While sulfate reduction was a dominating process within the upper sediments, in deeper layers AOM rates were up to five times higher with a maximum around the lower SMTZ. As a more general measure for metabolic activity, potential phosphatase rates increased in phosphate-depleted layers towards the sediment-basement interface. Further investigations were focussed on the cultivation of indigenous microorganisms for subsequent analyses of their adaptations to the environment. So far, sulfate-reducing bacteria were enriched from both, the seawater and the fluid-influenced sediment zones. Molecular screening of enrichment cultures via PCR-DGGE revealed that completely different microbial communities thrive within the different zones.

Our studies confirm that metabolic activities and microbial community structures are influenced by fluids from the ocean crust. Regarding the worldwide expansion of the crustal fluid aquifer, we assume that this impact is a major driving force for marine deep-biosphere populations on a global scale.