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Concerning evaluation of eco-geochemical background in remediation strategy

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The geochemical concept of biosphere developed by V.I. Vernadsky states the geological role of the living organisms in the course of their active chemical interaction with the inert matter (Vernadsky, 1926, 1960). Basing on this theory it is reasonable to suggest that coevolution of living organisms and their environment led to development of the dynamically stable biogeocenoses precisely adequate to their geochemical environment. Soil cover was treated by V.I. Vernadsky as a balanced bio-inert matter resulting from this interaction. Appearance of human mind and then a civilization led to global expansion of human beings, first able to survive in unfavorable geochemical conditions and then starting chemical transformation of the environment to satisfy the growing demands of mankind in food and energy. The residence in unfavorable environment and local contamination was followed by appearance of endemic diseases of plants, animals and man.

Therefore zonal, regional and local chemical composition of the soil cover formed in natural conditions may be used for estimation of the optimum geochemical background, most adequate for the corresponding zonal biogeocenoses and species. Moreover, the natural geochemical background and technogenic fields have unequal spatial structure and this facilitates their identification that may be relatively easy realized in remediation strategy.

On the assumption of the foregoing, the adequate methodical approach to remediation of technogenically affected areas should account of the interaction of the existing natural and the newly formed technogenic geochemical fields and include the following steps: 1) the study and mapping of geochemical structure of the natural geochemical background basing on soil maps; 2) the study of contaminants and mapping spatial distribution of technogenic releases; 3) construction of risk maps for the target risk groups with due regard to natural ecological threshold concentration in context of risk degree for plants and animals (Kovalsky, 1974; Letunova, Kovalsky, 1978, Ermakov, 1999).

Obtained zones of different eco-geochemical risk need particular strategy basing on maximum possible correspondence to the natural geochemical conditions. For example, the assessment of effects of the nuclear accident in any case needs taking into account the synergetic results of ionizing radiation in different eco-geochemical conditions. In this respect the most contaminated areas should be withdrawn from living but some spatial arable lands can be used for seeds or technical crops production. The less contaminated areas still used in agriculture need shifting to fodder or species giving non-contaminated products (e.g. oil). Wet meadows of superaqueous landscapes with a relatively high radionuclide transfer to the plants should be excluded from grazing but other areas with lower transfer to forage may be used. In all the cases the resultant remediation should achieve first of all the maximum decrease of the summary negative health effect for the residents or working personnel.

References

Vernadsky V.I., 1926. Biosphere. Leningrad, Nauch. khim.-tekhn. izd-vo, 147 p.

Vernadsky V.I., 1960. Selected works, Vol. 5. Moscow, izd-vo AN SSSR, 422 p.

Kovalsky V.V., 1974. Geochemical ecology. Moscow, Nauka,

Letunova S.V., Kovalsky V.V., 1978. Geochemical ecology of microorganisms. Moscow, Nauka, 148 pp.

Ermakov V.V., 1999.Geochemical ecology as a result of the system-based study of the biosphere. Problems of biogeochemistry and geochemical ecology. Transactions of the Biogeochem. Lab., 23, Moscow, Nauka, 152-182.