Investigation of heavy metal concentration in soils and factors affecting metal uptake by plants in the vicinity of a basaltic terrain of Igatpuri, Nasik District, Maharashtra, India

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Heavy metals are released into the environment by both natural and anthropogenic sources. Most alarming is the increasing contamination of heavy metals due to rapid industrialization, urbanization and intensive agriculture in a region. The knowledge of chemical mobility of heavy metals in soils and plants is fundamental to understand their toxicity, bioavailability and geochemical behavior. Heavy metal concentrations were measured in soils and plants in and around Igatpuri area of Nasik District, Maharashtra. The study area falls under Deccan Traps of western India known as one of the largest and best-preserved flood basalt provinces related to the break-up of Gondwana. The province is made up mainly of differentiated tholeiitic basalts and small amounts of basaltic andesites, with minor intercalated potassium-rich lavas, differentiated felsic rocks and rare alkaline intrusions (Krishnamurthy *et al*. 2000). The soil types include laterite, reddish brown and medium black soils.

The results of chemical analysis and correlation coefficient indices indicate that the heavy metals in soils with high concentrations for some of ferromagnesian elements (Fe, Mg, Ni, and V) with correlation of $r^2 = 0.99$, were derived from surrounding rocks. Furthermore, the agriculture activity also contributes for Pb, Zn, As and Cu enrichment in soils of the study area indicating the sources to be of both lithogenic and anthropogenic background. The metal concentrations measured in plant species generally decreased in the order root > leaf > stem, although this pattern varied moderately between different elements. However, a better understanding of heavy metal sources, their accumulation and effect on human health due to their presence in soil and plant systems in the study area can be arrived by making more emphasis on correlating the diseases of local people with respect to the abundance of particular element.

Modern geodynamic processes in the Earth crust and the problem of a deep origin of oil

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Monitoring studies have shown that fluid discharge processes still go on and vary with time. Their characteristics can be determined by assessing changes in host rocks caused by fluid systems.The preliminary results of the monitoring of loosely aggregated zones in the crystalline basement of Tatarstan indicate their geodynamic activity, and the initial data acquired by deep seismic studies of the Earth's crust below a supergiant oil field, indicating heterogeneities of the upper crust and the upper mantle, imply a relationship between these phenomena. The experimental results of the compositional monitoring of basement water and free gases as well as of oil density variations raise the following questions. What are those seismic heterogeneities of the Earth's crust that have been identified by the regional seismic studies? What stages of tectonic activity (past or recent) do they reflect? How true is the concept that the roots of the ancient, stable formations are still active and bear the marks of the long-term metamorphic dehydration permitting the long-term existence of fluid-bearing zones in the Earth's crust? What is the relationship between the geophysical heterogeneities of the crust, its fluidisation, and the tectonic development regime within individual structures of the ancient platforms characterised by geophysical anomalies and neotectonic activities? To what extent do the present-day mantle processes going on under the thick craton crust affect its strata? Do they take place in the sedimentary cover, and what are their mechanisms and forms? How do these processes affect the formation of mineral deposits including oil and gas fields? All these issues appeared in recent years and are directly related not only to fundamental studies but also to practical problems associated with the petroleum exploration. Since the tectonics and the block structure of the crystalline basement generate the block structure of the sedimentary cover, the basement's tectonic dislocations extend into the sedimentary cover. Therefore, the geodynamic processes going on in the sedimentary cover are to a large extent governed by the geodynamics of the crystalline basement. Since the crystalline basement and the sedimentary cover form a single hydrodynamic reservoir, the fluid dynamic processes in the Earth's crust affect the development of the sedimentary cover. This is clearly seen in the oil density monitoring data from the sedimentary cover. Oil density has been analysed in those pressure-observation wells that were used as monitor wells and were not engaged in the development. Periodical oil sampling in more than 200 wells located in the eastern portion of Tatarstan – primarily, in the Romashkino oil field – have shown that the oil density is gradually decreasing. This can be caused by the periodical replenishment of the oil pool with light hydrocarbons.