

The contribution of the geoevolutionary changes to the limits of pollution

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Summary

In the last decades one of the major problems for humanity is the pollution of the environment. When we speak about environmental pollution we mean the pollution of air, water and soil. In the present communication we try to examine this pollution process (especially that of water and soil) from the geochemical point of view. So a serious question that is arising as a result from the various researches that were made in a global level, in order to confront the problem, is how much the earth in itself contributes to this environmental pollution. In this direction we have to examine in a local or global level the contribution of the geological cycles to the climatic changes that are observed in the earth. As a consequence the resulting geological structures like ore deposits, the formation and chemical composition of soils etc, affect the concentrations of various elements like heavy metals, organic compounds and other. In sequence all these factors affect the biological cycles of the plants and animals and the Man himself.

Main part

Our planet Earth, in its attempt to shape the present condition, which is the existence of life, passed through various phases of transformations.

These transformations have brought about calamities to the then occurring flora and fauna, continents vanished and new ones came up. A short impression of the transformations occurred on Earth, are given by the maps of the Ordovician, the Devonian, the Jurassic and of the Tertiary period (Coch, Lundman 1991).

The question arising nowadays is whether the various calamities that occur on Earth are connected to human actions, as the pollution of the environment and the use of nuclear energy, or if Nature

itself takes part at these disasters to a smaller or greater extent, with its processes(McCall, Laming , Scott 1992).

The answer that can be given nowadays from scientists in brief is following: Earth itself has performed these transformations in the past, in order to be able to form the current balance between atmosphere, hydrosphere, biosphere, edafosphere, crust, mantle and core. More detailed studies have shown that our planet, in order to maintain these balances, proceeds during the geological cycles to various changes. These changes, i.e. Earthquakes, appear to modern man as smaller or bigger environmental disasters (Wylie , Filson,1989). However, they are indispensable for the processes of Nature.

Other phenomena, of a much smaller range, could be directed back to man and his actions, i.e. the excessive consumption of energy and goods. These alterations are known as pollution of the environment.

By mentioning briefly some examples, it will be clarified how the transformations related to the modern disastrous phenomena appear to be forms of pollution, yet they are rather mechanisms of the planet in order to maintain the present state of balance and life.

First to be mentioned, is the weathering of minerals and its contribution to the functioning of the biological cycles of animals and plants. On soils which consist of weathered minerals, like the oxides and hydroxides of clay minerals, iron, silicon, alkali and Earth alkali and of organic compounds, the flora and fauna and as a consequence also man, develops and feeds(Burton, Kates 1964).

Here we must strike out that weathered minerals have the greatest ion exchange ability under physiological conditions between soil and water as well as between soil and plants. These processes enable the transport of nourishing compounds, the regulation of the pH and redox potential of the soil, etc. Interference with the ion-exchange ability can cause serious environmental disturbances in the biological cycles, i.e. the carbon cycle, according to the Nature and the degree of the interference. For example, replacement of the alkalis of the soil with heavy metals like Pb, Zn, Cu, Cd, Hg or others, can cause significant disturbances to the flora and fauna, or in general to the nutritive chain. These disturbances can be either immediate or have long-term effects (Boyle 1969).

A second example are the floating particles in water and air which, beyond certain values, can be harmful to living beings and man. Nevertheless, there are different categories of such particles, as well as phases of actions that they undergo in their cycle between air, water and soil, which render them either harmful or useful. Thus these particles play also an important role, with the chemical reactions they participate in, in the purification of air, or the purification of water in lakes, rivers and oceans, from harmful substances. By absorbing the harmful substances in form of sediments, they contribute to the protection of life.

According to the two examples mentioned above, it is not possible to determine general limit values for pollutants at a wide range. Such values can rather be limited to local environments, taking into account the kind of substances that are considered as pollutants, the local conditions that prevail and that have been formed by Nature itself in the specific ecosystems.

For the efficient protection of the environment from pollution resulting from human activities, modern technology offers the means for the following of the industrial or any other commercial activity. Furthermore, Nature itself has provided helpful means for the quick diagnosis of the spreading of dangerous pollutants, which can be used by man. So, using too big quantities of herbicides can harm plants instead of curing them, whereas polluted water causes immediate side-effects to the animals drinking it (cattle, horses, livestock etc.). Such indicators should return to the urban environments, next to the cities, the rubbish dumps, the factories, the highways. Then, with the help of modern analytical instruments, the reliability and viability of industry can be ensured, as well as stricter guidelines for the protection of the environment (PAHO 1990). At the same time no half-measures should be taken such as the transportation of industry far away from the urban centers or insufficient controls, since they would only result in the transportation of pollution over large distances, back to the urban centers.

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