

## **PEDOSPHERE IS THE SOIL COVER OF THE EARTH (IS THE EARTH'S MANTLE OF SOIL)**

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### **Summary**

The pedosphere is the soil cover (blanket) of the Earth, which consists of specific natural bodies (elements), i.e. of soils, which are diverse by their compositions and properties. The soil cover was formed on the surface of the land as a result of centuries-old effects (actions) of solar radiation, atmospheric moisture, vegetation, animals (animal kingdom), and microorganisms on surface layers of rocks.

The Earth's mantle of soil (the pedosphere) is the zonal-regional type of a spatial structure, reflecting diverse influences of biological-climatic (bioclimatic) and lithologic-geomorphologic conditions of the soil formation as well as of geological history of different regions of the Earth.

Despite the diversity of soils, making up the pedosphere, all of them possess a special type of structure and consist of organic and mineral components, and therefore they are so-called "bio-stagnant" natural bodies.

Among numerous properties and functions of soils and the pedosphere as the whole, the following ones, having especially important ecological significance, are isolated:

- functions of soils as unique habitat for a great diversity of life forms;
- function of soil cover as a link between geological and biological substance circulation in terrestrial ecosystems and the biosphere; and
- function of the soil fertility in agriculture and biological productivity in natural landscapes.

The present-day state of the Earth's soil cover is of concern, and it is critical in a number of countries and regions characterized by acceleration of loss of biologically productive soils due to growth of anthropogenic erosion, industrial pollution and different forms of the soil degradation.

To prevent further deterioration of the soil cover state of the Earth, decrease of biological productivity of soils, and loss of significant part of biological diversity in the biosphere, it is necessary to accept agreed politics for legislative protection of soils against degradation and scientifically justified use of the soil resources both in individual countries and at the international level.

## 1. General Notion of the Pedosphere

Pedosphere (from Greek words *pedon* – soil, and *sphaira* – ball) is the soil shell (cover) of the Earth, similar to other terrestrial envelopes, i.e. geospheres those are the lithosphere, the hydrosphere, and the atmosphere. The term *pedosphere* is synonymous with the notion “the soil cover of the Earth”.

The term “pedosphere” was for the first time introduced by scientist A.A. Yarilov in his monograph “Pedology as independent natural-scientific discipline about the Earth” that was published in 1905 in the Yur'ev University (now Tartu, Estonia).

During the following years, this term together with the notion of the pedosphere was used by the great Russian scientist V.I. Vernadsky in his doctrine on the biosphere and geological envelopes of the Earth as a planet (1942). Now, this term is widely used in both scientific and educational literature on pedology (soil science).

Unlike other geospheres, whose thickness is measured by tens and hundreds of kilometers, the pedosphere is the finest shell, it is literally (naturally) a film on the land surface, which is as thin as only one-two meters. Therefore, the pedosphere is also called as an Earth's skin, i.e. *Geoderma*. Despite this insignificant thickness, the pedosphere is the envelope of the greatest density and diversity of the Life on the Earth. The pedosphere plays an irreplaceable ecological role for the stable functioning of the biosphere, and hence, for preservation of favorable conditions for human life.

The pedosphere, i.e. the soil cover of the Earth, consists of a great number of very diverse soils, was formed as a result of centuries-old effect of the solar heat, the atmospheric moisture, flora and fauna upon surface layers of the land and rocks. This concept was first developed in 1883 by outstanding Russian scientist Vasilii .V. Dokuchaev (1846-1903).

In his well-known book “Russian chernozem” (1883), he proposed to understand soils as “fully independent natural-historic bodies, which are a result of extremely complicated interaction between (of) local climate, vegetable and animal organisms, composition and structure of parent (mother) rocks, relief of terrain, and, at last, an age of the country” (Dokuchaev, Works, vol. III, 1949). Further on, this notion served theoretical basis for new natural-historic science that was genetic soil science (pedology).

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### **Biographical Sketch**

**Gleb Vsevolodovich Dobrovolsky** (born in 1915) is a full member of the Russian Academy of Sciences (elected in 1992). He is Director of the Institute of Ecological Pedology of the Lomonosov Moscow State University, Honored Professor of the University. He is specialist in the field of soil sciences, geography of soils (morphology, genesis, geography and ecology of soils), and history of pedology. Basing on long-term expeditionary investigations (1956-1984) he developed theoretical bases of genesis, classification, and evolution of alluvial soils of the river valleys and deltas of European Russia and Siberia, and had prepared maps of different scales of soil cover and soil-geographic zoning of the World and the Former Soviet Union's territory (1972-1997). His investigations made it possible to substantiate a new notion of the soil cover of the Earth as about a global natural system, having a structural-subdominant type of its structure, which had been developed as a result of the long way of evolution of the land. He investigated also the structural-functional role of soils and the soil biota in the biosphere and various terrestrial ecosystems. Results of these researches served a basis for new functional-ecological direction in the present-day pedology (1986-2004). For many years (1960-1992) Prof. G.V. Dobrovolsky was holder of the chair of soil geography of the Lomonosov Moscow State University, and then organizer and first dean of new Faculty of soil sciences of this University (1973-1990). He was President of Dokuchaev Society of pedologists (1989-2004), editor-in-chief of academic journal "Pedology", and in 1993 he organized a Laboratory for Studies ecological functions of soils in the Institute of Ecology and Evolution of RAS. He is a Member of International Union of Soil Sciences, Honorary Member of the Dokuchaev Society of pedologists on Russia as well as a member of similar societies in Ukraine, Kazakhstan, Georgia, Moldova, awarded by two state scientific prizes and the Dokuchaev Gold Medal, and other scientific prizes, author of more than 500 publications, including 10 monographs and several university textbooks on geography, ecology and soil classification.