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GEOGRAPHICAL CROSS AND BIOSPHERE: RELATIONSHIPS, SIMILARITIES AND DIFFERENCES

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Abstract
This article explores the doctrine of the geographic crust and the biosphere, their relationship, similarities and differences, as well as A.A. Grigoriev's theory, landscape crust and epigeosphere, geographic crust and geographic environment, landscape crust, recommendation by I.B. Zabelin replace the concept of the geographic crust with the concept of the biogenosphere, since the origin and development of life took place in the geographic crust, the upper and lower layers of the earth's crust. upper part of the geographic crust Among scientists here are different opinions about the lower limits of the earth's crust, the presence of substances in three states in the geographic crust, that the Biosphere is the outer crust of the Earth, about the composition, structure and boundaries of the biosphere, and the cycle of substances in nature.

Keywords Geographic crust, biosphere, lithosphere, hydrosphere, atmosphere, hypergenesis, landscape crust, epigeosphere, geographic environment, landscape crust, biogenosphere, Mohorovic line, tropopause, living matter, ionized gas, mantle, abiotics, biotics, ancient matter, living . substance, biogenic, biogeochemical cycle, biomass, trophic chain, photosynthesis, biota, gameostasis, biological cycle, biogeochemical cycle.

INTRODUCTION

The geographical shell is a self-developing system; it is characterized by changes in space and time due to the continuous influence of the Earth's and the Sun's energy.

The interrelationship of the components of the geographic crust is manifested in the exchange of matter and energy. The structure of the geographical crust is not homogeneous, each part

of it, all its constituents (zonal and azonal natural complexes) have their own characteristics, and at the same time, they are characterized by general laws of development. The doctrine of the geographical crust was developed in the 20th century by A.A. Developed by Grigorev.

Geographical crust refers to the Earth's crust, where the lower part of the atmosphere, the upper part of the lithosphere, the hydrosphere and the biosphere interact with each other, enter and connect with each other.

The geographic crust includes the hydrosphere and the biosphere in its entirety, it includes areas up to the ozone layer in the atmosphere, and the hypergenesis zone in the lithosphere (from the Greek hyper-topa, genesis-origin; a part of the lithosphere near the Earth's surface). The geological crust is not very thick, its greatest thickness is 40 km. around (extending 15-20 km above and below the surface of the Earth).

In the Earth's crust, these two groups of forces collided on the Earth's surface and combined with the unique conditions and features of the Earth's surface, creating a unique natural system that is completely unlike any other part of our planet. Only within the geographic crust, which is a natural and natural-anthropogenic system, there is life, animals and plants live, soil cover is formed, rocks and various landforms are formed.

Heat from the sun accumulates here, and only in this shell water exists in three states: steam, liquid and solid, and finally, human society appears and lives and develops only in this shell.

In addition to the concept of geographic crust, the concepts of landscape crust (Y.K. Efremov) and epigeosphere (A.G. Isachenko) are also used. But now the concept of geographical shell is widespread.

Despite the widespread use of the concept of geographic shell, scientists are currently trying to replace this concept.

A.A. Grigorev and a number of scientists put forward the idea that the scope of the geographical shell and the geographical environment is one, they are one concept. According to them, these two concepts complement each other and describe the same natural phenomenon from different angles. However, the concept of geographic environment proposed by the French scientist Elisa Reclue in the 70s of the XIX century is not a natural category, but rather a socio-historical category. The boundary of the geographical environment expands with the development of society. At present, human activity has gone beyond the limits of the geographical shell. So, the geographical environment is expanding, and its boundary is consistent with the boundary of the geographical crust.

Yu.K. Efremov expresses the opinion that the geographical shell should be called the landscape shell. But landscapes form a very thin layer in the geographical crust. Therefore, it is wrong to contrast the concept of landscape shell with the concept of geographical shell, because landscapes are part of the geographical shell. Therefore, it is better to use the concept of landscape shell separately and in its place.

A.G. Isachenko recommends that the geographic crust be called the epigeosphere (from the Greek hyper-upper), since it is the outer, upper crust of the Earth. However, as we said above, the Earth's crusts are divided not only according to their location, but also according to the properties of substances, and if we take into account that the outer crust of the Earth is made up of the atmosphere and magni-tosphere, not the geographic crust, it is clear that the term epigeosphere does not correspond to the concept of the geographic crust.

I.B. Zabelin recommended to replace the concept of geographical shell with the concept of

biogenosphere, since the origin and development of life took place in the geographical crust. The concept of "biogenosphere" is very close to the widely used concept of "biosphere" in science. If this concept is accepted, the concept of "biosphere" becomes complicated and confused. In addition, there is no need or basis to exchange the concept of geographical shell.

There are different opinions among scientists about the upper and lower limits of the geographic crust. A.A. Grigorev defined the upper limit of the geographical crust as 20-25 km. passes through the ozone layer located above. The ozone layer traps harmful rays from the Sun, and below it, air movements are observed in the interaction of the atmosphere with land and oceans. Above the ozone layer, such movements are not observed. According to A.A. Grigorev, the lower limit of the geographic crust passes a little below the Mokhorovich line. The interaction of the Earth's crust with the layer under the Earth's crust, which has a high viscosity, is important in the formation of the Earth's surface relief. On land, the lower limit of the geographic crust passes through a depth of 30-40 km (from the Earth's surface), and at the bottom of the oceans, it passes through a depth of 5-8 km.

S.V. Kalesnik understands the geographical shell in a very narrow sense. It is the upper limit of the geographical crust 20-25 km. height, and its lower limit is 500-800 m thick. passed through the lower part of the hepergenesis zone. In this zone, the mineral substances in the pit change under the influence of external exogenous forces. A.G. Isachenko includes the troposphere, hydrosphere and 5-6 km of the lithosphere. includes the upper part to the depth (sedimentary rocks retain their properties at this depth). I.M. Zabelin also approves the separation of the geographic crust at the same limit, but suggests that the lower limit of the geographic crust passes through the depth where life and water are spread.

According to D. L. Armand, the upper limit of the geographic crust extends to the tropopause, and the lower limit extends to the bottom of the Earth's crust. F.N. Milkov also agrees with this opinion and proves this opinion as follows:

- The properties of air masses in the troposphere, which form the Earth's climate, are formed under the influence of the Earth's surface;

- Earth's crust forms the lithogenic basis of landscapes.

At this border, the thickness of the geographic crust is 80 km on land. up to 20-25 km in mid-ocean underwater mountains. constitutes

At present, V.N. Solntsev's opinion on determining the boundaries of the geographical crust is spreading more widely. According to him, substances in the geographic crust have a complex hierarchical structure: from small atoms to large bodies. Matter exists in the geological crust in three states (solid, liquid, gas) or in the form of living matter. Outside the geographic crust, substances are in subatomic form (ionized gases in the atmosphere at an altitude of 80 km; in the mantle, substances are transferred from one state to another transition, this transition is observed with an increase in the density of atoms).

The biosphere is the outer shell of the Earth, which includes the atmosphere up to 25-30 km (up to the ozone layer), the entire hydrosphere, and the upper part of the lithosphere up to a depth of about 3 km. Living organisms are located in the biosphere, and therefore its composition and energy are mainly determined by the activity of living matter.

Composition, structure and boundaries of the biosphere

Biosphere is a global ecological system consisting of abiotic and biotic components, like any

ecosystem.

The abiotic component of the biosphere includes the soil, atmospheric air and water environment, and the biotic component includes the set of living organisms belonging to all biological units. It is this biotic component that determines the essence of the biosphere and life. Living organisms (autotrophs and heterotrophs) provide exchange of substances between components of the biosphere during respiration, nutrition and reproduction.

According to most scientists, the composition of the biosphere includes the following four main substances:

• ancient substance - substances that are formed in the atmosphere, hydrosphere and lithosphere without the participation of living organisms (for example, water, granite, basalt, etc.);

• living substance - substances created from a set of living organisms (for example, microorganisms, fungi, plants, animals);

• biogenic substance - substances that arise during the vital activity of organisms (for example, oxygen, coal, oil, limestone);

• biological substance - substances created by the joint activity of living organisms with ancient (non-biological) processes (for example, mud, soil, etc.).

V. Vernadsky distinguished seven types of substances in the biosphere: 1) ancient substance; 2) living matter; 3) biogenic substance; 4) bio-based substance; 5) radioactive substance; 6) spatial substance; 7) dispersed substance.

The boundaries of the biosphere extend from the upper layers of the atmosphere dominated by low pressure and cold to the ocean sediments with a pressure of 12,000 atm.

The upper limit of the biosphere is determined by the ozone "veil" consisting of a thin layer (2-4 mm) of ozone (O3) gas. The ozone layer traps ultraviolet rays from sunlight that are extremely harmful to living organisms. This layer is located at an altitude of 20-25 km (25-30 km in tropical latitudes, 20-25 km in temperate latitudes, 16-20 km in polar latitudes).

The lower limit of the biosphere is uneven, that is, living organisms can be found at a depth of 3.5-7.5 km in the lithosphere and 10-11 km in the world ocean.

The circulation of substances in nature.

Within the boundaries of the biosphere, various living organisms belonging to various groups of microorganisms, fungi, plants and animals form various biological associations, i.e. biocenoses, biogeocenoses (eco-systems) in altitude regions and geographical latitudes. thus, it is very unevenly distributed in the composition of natural regions (landscapes).

Biomass mainly accumulates in places where the uppermost part of the lithosphere (soil), the lowermost part of the atmosphere and the uppermost part of the hydrosphere meet. In particular, green plants on land - 2400 billion. t (99.2 %), animal-

and microorganisms - 20 billion t (0.8%); plants in the ocean - 0.2 billion t (6.3%), animals and microorganisms - 3 billion. t (93.7%). So, land biomass is mainly made up of forests, and ocean biomass is made up of animals and microorganisms.

There are mainly two types of circulation of substances in nature: large (geo-logical) and small (biogeochemical) circulation movements.

In nature, the large (geological) circulation of substances is determined by the interaction (connection) of solar energy with the energy in the Earth's depths, which redistributes substances between the biosphere and the deep layers of the Earth.

In nature, the circulation of water between the ocean and the land through the atmosphere is also a great circulation.

In particular, water evaporated from the surface of the world's oceans (about half of the solar energy falling on the Earth's surface is spent on it) moves to the land under the influence of air currents - winds, and falls to the surface of the earth in the form of atmospheric precipitation. Then it returns to the ocean in the form of surface and underground water flows in accordance with the local landforms. The circulation of water in nature plays the most important role in the creation of unique natural conditions in different regions of the planet Earth.

In nature, the small, biogeochemical circulation of substances, unlike the large circulation, occurs only on the scale of the biosphere. This cycle is reflected in the formation of organic matter from inorganic compounds in the process of photosynthesis and its decomposition and transformation into inorganic substances.

In nature, the main source of energy for the movement of substances is sunlight, which causes photosynthesis. Solar energy is very unevenly distributed over the surface of the Earth. For example, the Arctic region (at 800 north latitude) receives three times less heat per unit area than the equator.

In most natural ecosystems, the transfer of matter and energy takes place mainly through the trophic chain (food chain). Trophic chain - interactions of organisms that carry out the change of matter and energy in the ecosystem; groups of species connected to each other through the "food-consumer" relationship, that is, a chain in which each group serves as food for the next group. Such circulation of substances in nature is called biological circulation. At the scale of the biosphere, the biogeochemical circulation is effective, that is, macro- and microelements and simple inorganic (SO2, N2O) substances are exchanged with the substances of the atmosphere, hydrosphere, and lithosphere. V. Vernadsky distinguished five functions of living matter:

• the first task - gas generation - the main gases of the Earth's atmosphere, i.e. nitrogen and oxygen, are biogenically formed, as well as all underground gases are the decomposition products of the remains of animals and plants that have died;

• the second task - accumulation (gathering) - organisms accumulate many chemical elements in their body, in particular carbon and calcium; diatom algae - silicon, kelp - iodine, vertebrate skeletons - phosphorus collectors;

• the third function - oxidation-reduction - organisms living in water bodies regulate the oxygen regime and create conditions for a number of metals (Mn, Fe) and non-metals (S) to melt or settle;

• the fourth function - biochemical - growth, growth and migration of living substances in space;

• the fifth task - biogeochemical activity of man - includes an ever-increasing amount of earth's materials for economic and household needs of man, in particular, carbonaceous materials such as coal, oil, gas.

It is necessary to distinguish two parts of biogeochemical circulation:

1) reserve fund (fund) is the largest mass (overabundance) of substances in motion that are not directly connected with the activity of organisms;

2) exchangeable fund (fund) - conditioned by a slightly less, but extremely active, direct exchange of biogenic substances between organisms and the environment.

If the biosphere is considered as a whole, then the following are clearly visible:

1) circulation of gaseous substances together with the reserve fund in the atmosphere and hydrosphere (ocean);

2) the cycle (period) of accumulation of sediments with reserve funds in the earth's crust.

In this regard, it is worth noting that the only process that does not consume solar energy on Earth, but instead collects and accumulates it, is the formation of organic substances due to photosynthesis. So, the main planetary task of living matter on Earth is to absorb and absorb the Sun's energy.

Thus, the presence of biogeochemical circulation creates the possibility of self-regulation (or homeostasis), which ensures the stability of the biosphere. In this case, living matter, i.e. biota, receives the necessary energy and substances from the Sun and Earth's geospheres, and releases (returns) the products of its vital activity to the geospheres, serving to ensure the natural balance in the biosphere.

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