ECOLOGY OF THE ATMOSPHERE

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Annotation: *"Structure and composition of the atmosphere" The most important climatic and environmental features of the Earth in decisive degrees are determined by the presence and properties of its gas shell - the atmosphere.*

Due to the specific gas composition, the ability to absorb and reflect solar radiation, the ozone layer, which stores the bulk of the short-wave radiation of the Sun, favorable temperature conditions and the presence of water vapor, the atmosphere can be called one of the main sources of life on Earth.

The thickness of the air shell surrounding the globe is at least a thousand kilometers - almost a quarter of the radius of the Earth. The mass of the atmosphere is 5*1015 tons (five quadrillion), which is equivalent to less than one millionth the mass of the Earth. 90% of the mass of the atmosphere is concentrated in the lowest layer 17 km thick, but signs of the atmosphere are clearly visible at an altitude of 20 thousand km.

The structure of the atmosphere. The atmosphere has a complex structure and is divided into several shells. Directly adjacent to the earth's shell troposphere. It extends to an altitude of 8–10 km above the poles and 16–18 km above the equator. In mid-latitudes, the thickness of the troposphere is 8 – 12 km.

In the troposphere, there is continuous mixing of air both horizontally and vertically, which leads to a decrease in temperature. The air temperature in the troposphere decreases by 0.6 C for every 100 m of altitude and decreases from +40 C to - 50 C.

The troposphere contains 75% of the total mass of the atmosphere, the main amount of water vapor and the smallest particles of impurities. The processes that prevail in the troposphere (evaporation of water vapor and its condensation) lead to the formation of clouds and precipitation in the form of rain. It is in this layer that the phenomena we call weather predominantly occur; There are a huge number of thunderstorms and hurricanes.

The thermal structure of the troposphere is caused by heating of the earth's surface by solar radiation, followed by upward transfer of heat through turbulent mixing and convection. The air temperature at the Earth's surface decreases from the equator (to +26 C) to the poles (to -36 C in winter and 0 C in summer).

With altitude, the temperature difference between the equator and the poles decreases. The upper boundary of the troposphere (at an altitude of 11 km) is the tropopause - the region in which the temperature stops decreasing, has a temperature of -53 C.

Above the tropopause, the stratosphere extends approximately 50 km. It is characterized by weak air currents, few clouds and constant temperatures (-56°C) up to an altitude of approximately 25 km. Above this, the temperature begins to rise (on average by 0.6 C for every 100 m) and at the stratopause level (45 - 54 km) reaches 0 C. Unlike the troposphere, in which turbulent exchange plays an important role, the stratosphere is very stable, contains little moisture, there are no weather phenomena in the usual sense of the word, and the only type of cloudiness is noctilucent clouds.

In the stratosphere, at an altitude of 30–35 km, ozone is in its greatest concentration, which is why this part of the atmosphere is often called the ozone shield. Ozone plays a large role in shaping the temperature regime of the underlying layers of the atmosphere and, consequently, air flows. Ozone absorbs ultraviolet rays from the sun, causing the atmosphere to warm. On different parts of

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the earth's surface and at different times of the year, the ozone content is different: more in high latitudes, less in middle and low latitudes, more in spring than in autumn. The ozone layer defines the boundary of the biosphere.

Beyond the stratosphere, at an altitude of more than 50 km, there is the next layer of the atmosphere - the mesosphere, where the temperature drops again. At an altitude of about 80 km it is -70 C. The upper layer of the mesosphere is the mesopause, where the temperature decreases.

Behind the mesosphere (more than 80 km above the earth's surface) there is a fourth layer of the atmosphere - the thermosphere (ionosphere), which does not have a clear upper boundary. At an altitude of 500–600 km, the temperature rises and reaches +1600 C.

Gases in the thermosphere (ionosphere) are very rarefied; molecules rarely collide with each other and cannot cause heating of a body located in this zone. However, atmospheric pressure decreases with altitude. The air becomes thinner the higher you go.

The exosphere is the farthest from the Earth - 800 - 1600 km, extends over a huge distance, passing into interplanetary space. The exosphere is a region of dissipation (dispersion) of atmospheric gases.

The instability of the atmosphere as a natural system is explained by fluctuations in temperature, pressure and density that occur in the troposphere, as well as the gravitational influence of the Moon and the Sun, causing atmospheric tides in the stratosphere.

The origin of the atmosphere is inextricably linked with the formation of the Earth. There is reason to believe that the primary atmosphere of the Earth was rich in carbon dioxide CO2 and poor in oxygen O2. Then, as a result of photodissociation of water, oxygen appeared in the atmosphere, the amount of which began to grow especially intensively as a result of biogenic processes since the origin of life on Earth (about 4 billion of years ago).

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