Answer on Question #81666, Geography / Physical geography

Give an account of the structure and composition of the atmosphere explaining it's importance to life on earth.

Answer:

Atmosphere structure

The atmosphere is divided into five main layers (spheres): troposphere, stratosphere, mesosphere, thermosphere (ionosphere) and exosphere. Spheres do not have clear boundaries, they gradually move into each other, forming transitional boundaries.

The troposphere is the lowest layer of the atmosphere, whose thickness above the poles is 8-10 km, in temperate latitudes - 10-12 km, and above the equator - 16-18 km.

About 80% of the mass of the atmosphere is concentrated in the troposphere, almost all water vapor is present, thunderstorms, storms, clouds and precipitation occur, as well as vertical (convection) and horizontal (wind) air movement. We can say that the weather is mainly formed in the troposphere.

The stratosphere is a layer of the atmosphere located above the troposphere at an altitude of 8 to 50 km. The color of the sky in this layer appears to be purple, which is explained by the thinness of the air, due to which the sun's rays hardly scatter.

Ozone is concentrated in this layer (the ozone screen, the ozonosphere), a layer that absorbs ultraviolet rays, not passing them to the Earth and thus protecting living organisms on our planet.

The mesosphere is an atmospheric layer located at an altitude of 50-80 km. The density of air here is 200 times less than that of the Earth’s surface. The color of the sky in the mesosphere appears black, with stars visible throughout the day.

In the mesosphere and thermosphere, under the action of cosmic rays, gas molecules decay into charged (ionized) atomic particles, therefore this part of the atmosphere is called the ionosphere - a layer of very rarefied air located at an altitude of 50 to 1000 km, consisting mainly of ionized oxygen atoms, molecules nitrogen oxides and free electrons. This layer is characterized by high electrification, and from it, as from a mirror, long and medium radio waves are reflected.

The exosphere is the outer layer of the atmosphere, located above 1000 km. This layer is also called the scattering sphere, since particles of gases move here with great speed and can scatter into outer space.

Atmospheric composition

The atmosphere is a mixture of gases consisting of nitrogen (78.08%), oxygen (20.95%), carbon dioxide (0.03%), argon (0.93%), a small amount of helium, neon, xenon, krypton (0.01%), ozone and other gases, but their content is negligible. The modern composition of the Earth’s air was established more than a hundred million years ago, but the sharply increased production of human activity did lead to its change. Currently, there is an increase in CO_2 content of about 10-12%.From the constituent elements of the atmosphere, oxygen plays an essential role in the processes of life that take place in the geographic envelope. It directly affects human life. Increasing or decreasing oxygen in nature would lead to harmful organisms for effects. Oxygen is spent on the oxidation of many elements of the earth's crust, and so on.

Nitrogen, the most abundant gas in the atmosphere, is not very chemically active.

Oxygen, unlike nitrogen, is a chemically very active element. The specific function of oxygen is the oxidation of the organic matter of heterotrophic organisms, rocks and under-oxidized gases emitted into the atmosphere by volcanoes. Without oxygen, there would be no decomposition of dead organic matter.

The role of carbon dioxide in the atmosphere is exceptionally large. It enters the atmosphere as a result of burning processes, respiration of living organisms, decay and is, above all, the main building material for the creation of organic matter during photosynthesis. In addition, the property of carbon dioxide to transmit short-wave solar radiation and absorb part of the thermal long-wave radiation, which will create the so-called greenhouse effect, which will be discussed below, is of great importance.

Ozone also has an effect on atmospheric processes, especially on the thermal regime of the stratosphere. This gas serves as a natural absorber of ultraviolet radiation from the sun, and the absorption of solar radiation leads to the heating of air.

Water vapor is the most unstable component of the atmosphere. It enters the air as a result of evaporation of water from the seas and oceans, from the surface of the land and as a result of transpiration by plants. It plays an important role in the geographic envelope: it absorbs and retains the heat that emits the Earth, clouds and precipitations form from it, during the condensation of water vapor heat is released which heats the air.