ANTHROPOGENIC IMPACT ON THE ATMOSPHERE

Shermatova Zamira Sherzod kizi

Student of Astrakhan state technical university in

Tashkent region Republic of Uzbekistan

Annotation: *The air envelope of the Earth, consisting of a mixture of various gases, water vapor and dust, is called the atmosphere. Atmospheric air is the source of respiration for living organisms. It is known that without air a person cannot survive even 5 minutes, while without food he can live about 5 weeks, and without water - about 5 days.*

The atmosphere protects all life on the earth's surface from the harmful effects of cosmic radiation (primarily ultraviolet radiation from the Sun), from meteorites and cosmic dust; it traps heat emitted by the Earth into outer space. Atmospheric air serves as a raw material for the synthesis of chemicals and is used for cooling various installations. The atmosphere is an environment into which many waste products from living organisms enter, including waste from human economic activities.

The atmosphere consists of 78% nitrogen and 21% oxygen, the remaining 1% consists of all other substances: inert and other gases (including carbon dioxide CO2 - 0.03%), water vapor and other aerosols (so-called dust and liquid particles in suspension). This composition remains virtually unchanged up to a height of several tens of kilometers.

The modern atmosphere is largely a product of the living matter of the biosphere (a layer of living matter, according to I, the “film of life”). Complete renewal of the planet's oxygen by living matter occurs in 5200-5800 years. The entire mass of oxygen is absorbed by living organisms in approximately 2 thousand years, and all carbon dioxide - in 300-395 years (according to).

The atmosphere is divided into three main parts:

1) lower - the troposphere (up to a height of 8-18 km depending on the geographic latitude of the area);

2) middle - stratosphere (from 8-18 km to 60 km);

3) upper - ionosphere (above 60 km).

The troposphere is characterized by a decrease in temperature with height (about 6 °C per 1 km). Since warm air is lighter than cold air, this leads to vertical movement of air flows, condensation of water vapor, cloud formation and precipitation. Very often the troposphere is called the kitchen of the weather. It contains 80% of the mass of atmospheric air. At the equator, the intensity of vertical air flows caused by heating of the earth's surface is higher, because of this the troposphere there extends to the highest altitude - up to 16-18 km, in moderate latitudes - up to 10-11 km, and at the poles - up to 8 km.

The stratosphere is located above the troposphere up to an altitude of about 60 km. In it, the temperature does not decrease with height, but increases, and vertical movements of air flows are not observed. In the stratosphere, conditions are created for the accumulation of such a chemically active substance as ozone (O3), which is a modification of oxygen (O2). In the troposphere, natural ozone is formed from oxygen due to electrical discharges during thunderstorms and, due to its activity, is very short-lived. In the stratosphere, under the influence of ultraviolet solar radiation in the absence of vertical mixing, a layer of increased ozone concentration is formed, which is called the ozone layer (screen).

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The ionosphere lies above the stratosphere. Up to an altitude of about 80 km, there is a sharp drop in temperature (down to minus 75-90°C), which often causes the formation of the highest clouds - stratified ones, consisting of ice crystals. At high altitudes, a significant increase in temperature is characteristic (up to 1000 °C or more). At these altitudes, atmospheric gases are in an ionized state under the influence of intense solar radiation. The appearance of the aurora as a glow of gases is associated with this state. The ionosphere has the ability to repeatedly reflect radio waves, which makes it possible to provide long-distance radio communications.

Only in the troposphere do conditions that are favorable for the life of living organisms. At the heights of the stratosphere and ionosphere, neither animals nor plants can exist without means of protection.

2. Main sources of air pollution and measures to prevent pollution

Atmospheric pollution is understood as any change in its composition and properties, which has a negative impact on human health, the condition of plants and animals. Atmospheric pollution can be caused by natural processes (then called natural or natural) and human activities (anthropogenic pollution).

Natural sources of atmospheric air pollution are primarily volcanic emissions, forest and steppe fires, dust storms, typhoons, mass flowering of plants, etc. These factors do not have a sharply negative impact on natural ecosystems, with the typically exception of large-scale catastrophic events. For example, the eruption of Mount Katmai in Alaska in 1912 released such an amount of ash that it caused a 20% decrease in the influx of solar radiation to most of the Earth's surface and led to a decrease in the average annual temperature by 0.5 ° C in the North. hemisphere for three years.

Large forest fires can also be a source of dust in the atmosphere. , the area of catastrophic forest fires in 1915 in Western Siberia amounted to Thus about 1.5 million km2 (this is almost three times the territory of France); the smoke from them spread over an area of 6 million km2, reducing the influx of solar radiation to the earth's surface, which determined the delay in the ripening of grain crops by half a month compared to normal periods.

Significant natural atmospheric pollution is caused by dust storms; their formation is associated with the transfer of dust particles raised from the surface of the earth by strong winds. This can be facilitated by both natural factors (drought, etc.) and human activities (excessive plowing, grazing, etc.). For example, powerful dust outbreaks have occurred in recent decades; the storms originated in Kalmykia, where just one release raised 1.5 million tons of dust into the air (more than 400 trains would have been needed to transport such a mass of cargo).

During the period of mass flowering of plants, ground layers of air can contain a significant number of spores and pollen. Many of them can cause allergic diseases in people. Particularly susceptible to these ailments are people who, in the first or second generation, moved to new places that are very different in vegetation composition from their homeland.

Anthropogenic atmospheric pollution significantly exceeds natural pollution in scale. It affects the atmosphere in various ways, directly affecting its condition (heating, changes in humidity, etc.), affecting the physical and chemical properties of the atmosphere (increasing the concentration of sulfur dioxide, particulate matter, etc.), changing the properties of the atmosphere. underlying surface (deforestation increases wind speed, flowing of natural landscapes changes the ability of the earth's surface to reflect the sun's rays, etc.).

The main anthropogenic sources of pollution include industrial enterprises, building heating systems (boiler rooms), transport and agriculture. Man-made emissions into the atmosphere number tens of thousands of types of substances. More than 90% of their mass comes from carbon dioxide and water vapor. Other common pollutants are relatively few in number: particulate matter, carbon monoxide (CO), sulfur dioxide (SO2), nitrogen oxides (N0 and NO2), hydrocarbons, hydrogen sulfide (H2S), ammonia (NH3), chlorine (Cl)., phosphorus compounds, hydrogen fluoride (HF).

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The greatest air pollution occurs in industrial regions of the world, such as North America, Europe, China and Japan. The main "supplier" of air pollutants among the countries of the world is the United States; country this accounts for about a fifth of total atmospheric emissions, and Russia about one-seventh.

Anthropogenic air pollutants are often substances not found in the natural environment, so living organisms have not developed mechanisms to neutralize or use these substances. Some of them are especially toxic. For example, the accidental release of the chemical intermediate dioxane in the early 1980s at a chemical plant in the city of Bhopal in central India led to the death and serious poisoning of thousands of people.

Hundreds of millions of internal combustion engines operating on Earth emit into the atmosphere huge amounts of nitrogen and sulfur oxides, products of incomplete combustion of hydrocarbons (many of which cause cancer), especially dangerous lead compounds (in the case of using leaded gasoline), which can accumulate in the skeleton of living organisms, causing nervous diseases.

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