



MAIN SOURCES OF ATMOSPHERIC POLLUTION AND THEIR CLASSIFICATION

Berdimuratova Lobar

Termez State Pedagogical Institute 2nd year student,
Faculty of Primary Education

Scientific advisor: **Nodira Shabbazova**

Abstract: *This article provides a scientific overview of the Earth's atmosphere, including its composition, layered structure, and key physical and chemical properties. It explains major processes such as energy exchange, atmospheric circulation, the water cycle, and the greenhouse effect. The study also examines anthropogenic impacts such as air pollution, increasing greenhouse gases, and ozone layer depletion, emphasizing the importance of atmospheric protection for global environmental stability.*

Key words: *Atmosphere, climate, troposphere, stratosphere, greenhouse effect, ozone layer, atmospheric circulation, air pollution.*

Atmosphere — A set of gases surrounding the Earth, which is an important part of all physical, chemical and biological processes on our planet, creating the necessary conditions for life. It consists mainly of nitrogen (78%), oxygen (21%) and a very small percentage of inert and active gases such as argon, carbon dioxide, neon, helium, krypton, ozone. The total mass of the atmosphere is about 5.15×10^{18} kg, more than 50% of which is located at an altitude of 5 km above the Earth's surface. Atmospheric pressure decreases with increasing altitude, which is one of the main factors determining air density, temperature distribution and dynamic processes. The atmosphere consists of several layers, and each layer has its own physical properties, temperature regime and processes occurring in it. The troposphere, closest to the Earth's surface (average 12–15 km), is the center of life processes: weather, cloud formation, precipitation, wind systems, turbulence, and cyclones occur there. The stratosphere, located above the troposphere, contains the ozone layer, which absorbs ultraviolet radiation from the Sun and protects biological

organisms from harmful radiation. The mesosphere (50–85 km) after the stratosphere is important as the region where meteorites burn up.

The thermosphere (85–600 km) is the region where, together with the ionosphere, radio communications, auroras, and high-energy particles occur. The uppermost layer, the exosphere, is a rarefied region where atmospheric molecules can escape into space. The composition of the atmosphere is not constant; human activity, volcanic eruptions, processes in the biosphere, and ocean-atmosphere exchanges change its gas composition. An increase in carbon dioxide increases the greenhouse effect, resulting in geophysical changes such as global warming, glacier retreat, and sea level rise. Methane, nitrogen oxides, and other greenhouse gases are also important drivers of the climate system. Aerosols—dust, sea salts, sulfates, and organic particles—directly affect the scattering of sunlight and the radiative balance of the atmosphere.

The constant circulation of the atmosphere - the general circulation - is controlled by the rotation of the Earth, temperature differences between the ocean and land, and the distribution of sunlight. Trade winds, westerly winds, monsoons, anticyclones and cyclone systems play a decisive role in the formation of climates. Also, since the atmosphere is hygroscopic in nature, the main stages of the water cycle - evaporation, condensation, precipitation - occur in it. These processes are of paramount importance in maintaining the global energy balance and ensuring the stability of the biosphere. The atmosphere also plays an important role in the economic activity of mankind: the use of air is the basis of such industries as energy production, aviation, communication technologies, meteorology and ecology. At the same time, atmospheric pollution - smog, acid rain, ozone layer depletion, increased aerosol concentration - is one of the factors that threaten global environmental security. Therefore, atmospheric monitoring, climate change monitoring, and international agreements to reduce global emissions (Paris

Agreement, Kyoto Protocol) have become one of the most pressing issues in the 20th and 21st centuries.

The main physical properties of the atmosphere are temperature, density, pressure, humidity, transparency, and motion. These properties change dramatically with increasing altitude. In the layers near the Earth's surface, the air is dense and hot, and as it rises, the density and temperature decrease. In the troposphere, the temperature decreases by an average of 6.5°C for every 1 km of altitude. In the stratosphere, on the contrary, the temperature begins to rise again as a result of the absorption of ultraviolet radiation by the ozone layer. The opposite change in temperature between these two layers is a factor that maintains vertical stability in the atmosphere.

The main source of energy exchange in the atmosphere is solar radiation. The Earth's surface absorbs short-wave radiation from the Sun and returns it to the atmosphere as long-wave (infrared) heat. Greenhouse gases trap this heat and maintain the Earth's temperature balance. If there were no greenhouse gases in the atmosphere, the average temperature of the Earth's surface would be -18°C , while today it is $+15^{\circ}\text{C}$. This difference is crucial for the existence of life. Water vapor in the atmosphere, as the initial component of the global water cycle, plays an important role in the formation of clouds and in the process of precipitation. The physics of clouds is very complex and includes many stages, such as the condensation of water vapor, the formation of small ice crystals, coagulation processes, the enlargement of droplets and their fall to the ground in the form of precipitation under the influence of gravitational force. The degree of cloudiness of the atmosphere directly affects the radiation balance: white clouds reflect some of the Sun's rays back into space, while dark clouds absorb heat and affect the local climate.

The atmosphere is also closely linked to the Earth's magnetosphere and ionosphere systems. The solar wind—a stream of high-energy particles—collides

with the ionosphere, producing auroras. The accumulation of electrons and ions in the ionosphere ensures the return of radio waves, helping global communications systems function. Therefore, the atmosphere is not only a physical environment, but also a source of protection and capabilities for modern technologies.

The Earth's atmosphere is in constant motion, and these motions are divided into two large groups: horizontal and vertical currents. Horizontal currents include winds, large wind systems from trade winds to westerlies. Vertical motions include convection, the formation of cyclones and anticyclones, frontal processes, and the rise or fall of air masses. Due to the rotation of the Earth around its axis, winds are affected by the Coriolis force: in the Northern Hemisphere, the currents deviate to the right, and in the Southern Hemisphere, to the left. As a result, a stable general circulation occurs, from trade winds in tropical latitudes to westerly wind zones in temperate latitudes. Monsoons, on the other hand, depend on the seasonal temperature difference between land and ocean and determine the climatic conditions in South and East Asia.

The dynamics of the atmosphere are constantly changing under the influence of large natural processes such as El Niño, La Niña, solar activity, and volcanic eruptions. For example, sulfate aerosols released into the atmosphere during volcanic eruptions scatter solar radiation, causing a temporary decrease in global temperatures. El Niño, on the other hand, occurs due to the interaction of the Pacific Ocean surface and the atmosphere, causing changes in precipitation and temperature in many regions of the world. The atmosphere is an integral part of the biosphere, it is not only necessary for the respiration of animals and plants, but also the main working medium for the photosynthesis process. Processes such as the exchange of oxygen and carbon dioxide, the nitrogen cycle, pollination, and the dispersal of spores and seeds all take place through the atmosphere. Plants absorb billions of tons of carbon dioxide every year and make a significant contribution to the stability of the gas ratio in the atmosphere. If this process were to stop, the composition of

the atmosphere would change dramatically and the global climate system would become unstable.

In conclusion, it should be emphasized that the atmosphere is the life-supporting layer of the Earth, its composition, structure and the physical and chemical processes occurring in it ensure the stability of the climate, weather and biosphere on the planet. It creates the necessary conditions for all living organisms as the main area of heat balance, water cycle and gas exchange. Today, anthropogenic impact - pollution, increase in greenhouse gases and depletion of the ozone layer - is disrupting the natural balance of the atmosphere. Therefore, monitoring the state of the atmosphere, its protection and reduction of pollution are the most important conditions for global environmental security.

REFERENCES

1. Abdurakhmonov A., Jo'raev M. General meteorology. – Tashkent: Teacher, 2018.
2. Eshboyev R., To'xtayev B. Fundamentals of natural geography. – Tashkent: Science and technology, 2019.
3. Sattorov T. Atmospheric physics. – Tashkent: Science, 2017.
4. Rasulov M. Climatology and atmospheric processes. – Tashkent: University, 2020.
5. Yu'ldoshev Q. Ecology: basic concepts and laws. – Tashkent: Ma'rifat, 2016.
6. Nizomov D., Ashurov A. Meteorology and climatology. – Tashkent: Science and technology, 2021.
7. Karimov U. Earth science: atmospheric and hydrosphere processes. – Tashkent: Innovation, 2022.
8. Kho'jayev Sh. Ecology of natural resources. – Tashkent: University, 2018.
9. Khamidov S. Dynamics of the geosystem and the natural environment. – Tashkent: Science, 2015.
10. Jorayev A. Global ecology and sustainable development. – Tashkent: New Century Generation, 2020.