Ashur university collage

Dept. of Biology

First-year

General geology

Lec. 4

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Earth’s climate is determined by interactions between the atmosphere, biosphere, hydrosphere, and lithosphere.

Over the course of Earth's history, the climate has varied widely due to changes in these factors. For example, the Earth has experienced periods of glaciation, when much of the planet was covered in ice, as well as periods of warming, when temperatures were much higher than they are today.

In recent decades, there has been growing concern about the impact of human activity on the Earth's climate. The burning of fossil fuels, deforestation, and other human activities have resulted in the release of large amounts of greenhouse gases, such as carbon dioxide and methane, into the atmosphere. These gases trap heat in the atmosphere, causing the Earth's temperature to rise and leading to changes in the Earth's climate.

Composition

The Earth’s atmosphere is composed of many different gases. Some of these derive from natural processes, some from anthropogenic processes, and some from both. Nitrogen (N2) and oxygen (O2) make up over 99% by volume of the entire atmosphere, not counting water vapor. The rest is made up of less abundant gases, such as argon (Ar), carbon dioxide (CO2), neon (Ne), and helium (He).

Structure

The atmosphere is divided into four layers, defined by how

temperature varies with altitude. In the lowest layer, the troposphere, temperature decreases with altitude.

The Earth's atmosphere is a thin layer of gases that surrounds the planet and is held in place by gravity. It extends from the Earth's surface up to an altitude of about 10,000 km. The atmosphere is divided into several layers, each with distinct characteristics and functions.

The layers of the atmosphere, from lowest to highest, are:

Troposphere: This is the lowest layer of the atmosphere and extends from the Earth's surface up to an altitude of about 7-20 km, depending on the location. It contains about 80% of the atmosphere's total mass and is where all weather occurs. The temperature generally decreases with altitude in this layer.

Stratosphere: The stratosphere lies above the troposphere and extends from about 20 km up to about 50 km. The ozone layer, which absorbs harmful ultraviolet radiation from the sun, is located in this layer. The temperature generally increases with altitude in the stratosphere.

Mesosphere: The mesosphere lies above the stratosphere and extends from about 50 km up to about 85 km. This layer is the coldest part of the atmosphere, with temperatures decreasing with altitude.

Thermosphere: The thermosphere lies above the mesosphere and extends from about 85 km up to about 600 km. This layer is extremely hot, with temperatures reaching up to 2,000°C, but it would not feel hot to humans because the air is very thin. It is also the layer where the auroras occur.

Exosphere: The exosphere is the outermost layer of the atmosphere, extending from about 600 km up to about 10,000 km. This layer contains only a few particles per cubic centimeter and gradually merges with the vacuum of space.

The greenhouse effect is a natural process that helps to regulate the Earth's temperature and keep it within a range that is suitable for life. It works by trapping some of the heat that is radiated from the Earth's surface and re-radiating it back to the surface, thereby warming the planet.

The greenhouse effect is caused by certain gases in the Earth's atmosphere, called greenhouse gases, which include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and water vapor (H2O). These gases act like a blanket, trapping some of the heat that is radiated from the Earth's surface and preventing it from escaping into space.