

The Earth's Atmosphere

Earth's atmosphere is about 300 miles (480 kilometers) thick, but most of it is within 10 miles (16 km) the surface. Air pressure decreases with altitude. At sea level, air pressure is about 14.7 pounds per square inch (1 kilogram per square centimeter). At 10,000 feet (3 km), the air pressure is 10 pounds per square inch (0.7 kg per square cm). There is also less oxygen to breathe.

Composition of air

The gases in Earth's atmosphere include:

Nitrogen – 78 percent

Oxygen – 21 percent

Argon – 0.93 percent

Carbon dioxide – 0.038 percent

Water vapor and other gases exist in small amounts as well.

Atmosphere layers

Earth's atmosphere is divided into five main layers, the exosphere, the thermosphere, the mesosphere, the stratosphere and the troposphere. The atmosphere thins out in each higher layer until the gases dissipate in space. There is no distinct boundary between the atmosphere and space, but an imaginary line about 68 miles (110 kilometers) from the surface, called the Karman line, is usually where scientists say atmosphere meets outer space.

- The **troposphere** is the layer closest to Earth's surface. It is 4 to 12 miles (7 to 20 km) thick and contains half of Earth's atmosphere. Air is warmer near the ground and gets colder higher up. Nearly all of the water vapor and dust in the atmosphere are in this layer and that is why clouds are found here.
- The **stratosphere** is the second layer. It starts above the troposphere and ends about 31 miles (50 km) above ground. Ozone is abundant here and it heats the atmosphere while also absorbing harmful radiation from the sun. The air here is very dry, and it is about a thousand times thinner here than it is at sea level. Because of that, this is where [jet aircraft](#) and weather balloons fly.
- The **mesosphere** starts at 31 miles (50 km) and extends to 53 miles (85 km) high. The top of the mesosphere, called the mesopause, is the coldest part of Earth's atmosphere with temperatures averaging about minus 130 degrees F (minus 90 C). This layer is hard to study. Jets and balloons don't

go high enough, and satellites and space shuttles orbit too high. Scientists do know that [meteors](#) burn up in this layer.

- The **thermosphere** extends from about 56 miles (90 km) to between 310 and 620 miles (500 and 1,000 km). Temperatures can get up to 2,700 degrees F (1,500 C) at this altitude. The thermosphere is considered part of Earth's atmosphere, but air density is so low that most of this layer is what is normally thought of as outer space. In fact, this is where the [space shuttles](#) flew and where the [International Space Station](#) orbits Earth. This is also the layer where the auroras occur. Charged particles from space collide with atoms and molecules in the thermosphere, exciting them into higher states of energy. The atoms shed this excess energy by emitting photons of light, which we see as the colorful [Aurora Borealis](#) and [Aurora Australis](#).
- The **exosphere**, the highest layer, is extremely thin and is where the atmosphere merges into outer space. It is composed of very widely dispersed particles of hydrogen and helium.

Climate and weather

Earth is able to support a wide variety of living beings because of its diverse regional climates, which range from extreme cold at the poles to tropical heat at the Equator. Regional climate is often described as the average weather in a place over more than 30 years. A region's climate is often described, for example, as sunny, windy, dry, or humid. These can also describe the weather in a certain place, but while the weather can change in just a few hours, climate changes over a longer span of time.

Earth's global climate is an average of regional climates. The global climate has cooled and warmed throughout history. Today, we are seeing unusually rapid warming. The scientific consensus is that greenhouse gases, which are increasing because of human activities, are trapping heat in the atmosphere.