About the Atmosphere: Background Information

What is the Atmosphere?

This sphere is the outer part of the Earth System that extends nearly 500 km above Earth's surface and includes an ever-changing mixture of gas and small particles surrounding the Earth’s surface. It includes meteorological features and phenomena such as weather, clouds, or aerosols (particles in the air).

Why is the Atmosphere important?

This sphere is integral to several key functions in the Earth system:

- Supports life on Earth by supplying the necessary chemicals for life
- Protects Earth's Biosphere from harmful solar radiation
- Cycles heat, water, and necessary chemicals through the climate system

What are the layers of the Atmosphere?

Troposphere
The troposphere starts at the Earth's surface and extends 8 to 14.5 kilometers high (5 to 9 miles). This part of the atmosphere is the densest. Almost all weather is in this region. This lower level includes most of the climate system that creates conditions that make Earth suitable for life.

Stratosphere
The stratosphere starts just above the troposphere and extends to 50 kilometers (31 miles) high. The important ozone layer is located here which absorbs and scatters the Sun's harmful ultraviolet radiation to protect life.

Mesosphere
The mesosphere starts just above the stratosphere and extends to 85 kilometers (53 miles) high. Meteors burn up in this layer.

Thermosphere
The thermosphere starts just above the mesosphere and extends to 600 kilometers (372 miles) high. Aurora and satellites occur in this layer.

Ionosphere
The ionosphere is an abundant layer of electrons and ionized atoms and molecules that stretches from about 48 kilometers (30 miles) above the surface to the edge of space at about 965 km (600 mi), overlapping into the mesosphere and thermosphere. This dynamic region grows and shrinks based on solar conditions and divides further into the sub-regions: D, E, and F; based on what wavelength of solar radiation is absorbed. The ionosphere is a critical link in the chain of Sun-Earth interactions. This region is what makes radio communications possible.

Exosphere
This is the upper limit of our atmosphere. It extends from the top of the thermosphere up to 10,000 km (6,200 mi).

Diagram of the layers within Earth's atmosphere. **Credit:** NASA/Goddard

How does the Atmosphere interact with the spheres in the Earth System?

Geosphere: Gases emitted from volcanic eruptions have warming and cooling impacts on the Atmosphere. On long time scales, weathering of rocks in the Geosphere changes the composition of the Atmosphere.

Biosphere: Exchanges of carbon dioxide and oxygen occur between the Atmosphere and Biosphere in a process called the photosynthesis-respiration cycle. The Biosphere also influences the amounts of some of the greenhouse gases that impact Earth's climate.

Hydrosphere: Evaporation of water in the Hydrosphere adds water vapor to the Atmosphere, a process that requires energy input.

Cryosphere: The presence of light-colored ice and snow reflect more of the Sun's energy at the surface than open ocean or bare ground, cooling the Earth's surface and the Atmosphere near the surface.