

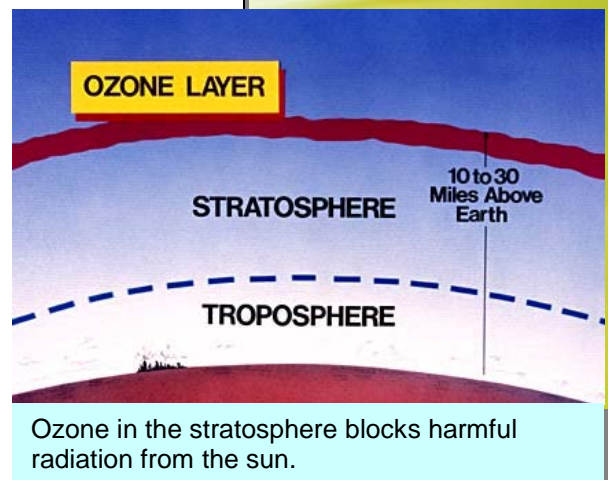
## Ozone: The Good and the Bad

You've probably heard people talk about the ozone layer. Maybe you've heard people mention how the ozone layer acts as a shield to protect Earth. Or perhaps you've listened to people discuss ozone as a greenhouse gas that can harm people and the planet. If so, you may be confused: Is ozone good or bad? And what exactly is ozone, anyway? Let's clear up some confusion.

Although it can act like a shield, **ozone** is not a solid substance. Ozone is a gas and a form of oxygen. Ozone molecules are made of three oxygen molecules bonded together. Ozone occurs naturally in the **stratosphere**, a middle layer in the atmosphere. The stratosphere is located about 10 to 50 kilometers above Earth's surface. Single oxygen atoms in the atmosphere are unstable, so they quickly bond with paired oxygen atoms, forming the three-atom molecule of ozone. When enough ozone molecules are present, ozone forms a pale blue gas. Sunlight breaks down these molecules, and the single atoms again bond to oxygen molecules. Ozone is constantly breaking down and reforming as part of a natural cycle.

Ozone in the stratosphere is important because it helps block out harmful radiation from the sun. The ozone also maintains temperatures on Earth's surface that can support life. Without an ozone layer, Earth's surface would become too hot for human, plant, and animal life. Scientists estimate that the ozone layer absorbs about 95 percent of the ultraviolet radiation from the sun.

Most of the ozone in our atmosphere is found in the stratosphere. However, about 10 percent of the ozone in the atmosphere is found in a lower layer, the **troposphere**. The troposphere is the layer of the atmosphere that is closest to Earth's surface. It's about 10 kilometers thick, and it's where we find clouds, weather, and winds. We can also find ozone. Some of it is naturally occurring, but most is human-caused.



# Ozone: The Good and the Bad

Ozone in the troposphere generally forms when sunlight reacts with different pollutants. These pollutants can include car exhaust, factory emissions, and power plant emissions. Ozone in the troposphere forms when sunlight starts a series of reactions with hydrocarbons and nitrogen oxide, two types of air pollutants. The sunlight breaks down these molecules, and ozone can form. Ozone in the troposphere has the same chemical composition as ozone in the stratosphere, but it has very different effects.

Ozone is beneficial and naturally occurring in the stratosphere, but in the troposphere, ozone is considered harmful. In the troposphere, ozone is problematic for both human and environmental health. High levels of ozone can cause breathing problems, especially for people with asthma. It can lead to lung problems, or it can intensify existing problems like heart disease.

Ozone in the troposphere can harm the environment because tropospheric ozone acts as a greenhouse gas. As the sun warms Earth, Earth emits terrestrial radiation. Under normal conditions, this radiation escapes through the atmosphere, and Earth maintains a healthy temperature. Ozone in the troposphere can block this terrestrial radiation and trap it above Earth's surface. Over time, this can cause temperatures on Earth to increase. All living things on Earth are adapted to live at certain temperatures. Even a slight increase in Earth's temperature can cause numerous organisms to die.

The next time someone talks of the ozone layer, you'll know where it is and why ozone can be considered both good and bad. No confusion necessary!



Ozone in the troposphere forms when air pollution reacts with sunlight.