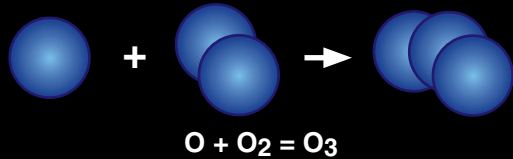


THE OZONE MONITORING GARDEN

What is ozone?

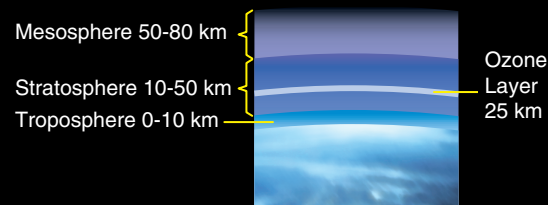
Ozone, or O_3 , is a molecule that is made up of three oxygen atoms.



Ninety percent of the ozone in the atmosphere sits in the stratosphere, the layer of atmosphere between about 10 and 50 kilometers altitude. Ozone in the stratosphere is created when the kind of oxygen we breathe— O_2 —is split apart by sunlight into single oxygen atoms. Single oxygen atoms can re-join to make O_2 , or they can join with O_2 molecules to make ozone (O_3).

Where is ozone?

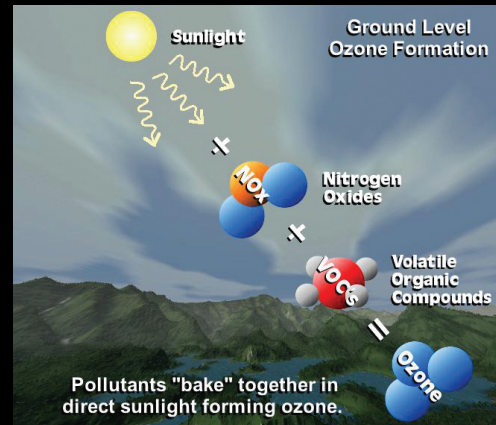
Ozone is found in two places in the Earth's atmosphere. Ozone in the Earth's upper atmosphere (stratosphere) protects life from harmful ultraviolet (UV) rays from the sun. High concentrations of ozone found in the Earth's lower atmosphere (troposphere) are hazardous to life.



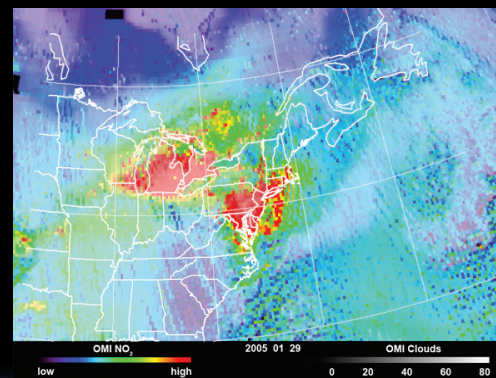
This chart shows the relative heights of the atmosphere's layers and where the stratospheric ozone layer is located.

How is tropospheric ozone created?

Ozone in the lower atmosphere (troposphere) is created through a series of reactions involving man-made chemical species such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs).



Chemical species that contribute to ground level ozone. Courtesy National Park Service.



Aura Ozone Monitoring Instrument (OMI) image of nitrogen dioxide concentrations over the eastern United States on January 29, 2006. In this image, blue and purple denote low levels of nitrogen oxide, yellow and red denote higher levels of nitrogen oxide.

How does it affect me?

In high concentrations, ground level ozone is toxic to human tissue. When ozone levels get too high, the EPA issues "Code Red" days, on which humans should limit their time outdoors.



Smog over upstate New York, October 21, 2000 as viewed by the astronauts from Shuttle STS-92. Courtesy NASA JSC.

How can I help?

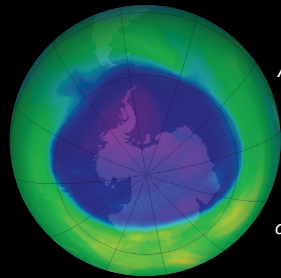
You can help reduce the amount of ozone in the troposphere by taking some simple steps:

- Walk rather than take a car whenever possible
- Turn off appliances and lights when you leave the room
- Cut back on heating and air conditioning as much as you can

THE OZONE MONITORING GARDEN

Why does NASA study ozone?

NASA's vision is "to improve life here, to extend life to there, and to find life beyond." Ozone research contributes to the NASA vision by using satellite missions, such as Aura, to monitor the health of Earth's atmosphere.



Aura Ozone Monitoring Instrument (OMI) image of the 2005 ozone hole, taken September 11, 2005. In this image, blue and purple denote low levels of stratospheric ozone, green denotes higher levels.

How does NASA study ozone?

NASA's Aura (Latin for breeze) was launched July 15, 2004. It is part of the Earth Observing System (EOS), a program dedicated to monitoring the complex interactions that affect the globe using NASA satellites and data systems. Aura is monitoring the chemistry, composition and dynamics of the Earth's atmosphere. Aura scientists are using the spacecraft to answer three essential questions:

- Is the stratospheric ozone layer recovering?
- What are the processes controlling air quality?
- How is Earth's climate changing?

Why does NASA have an Ozone Garden?

NASA's work involves a great deal of research in the service of society on our own planet, including studies of air quality. The Ozone Garden helps to educate people about ozone in our atmosphere.

How can I monitor ozone in my own area?

You can monitor ozone by planting ozone-sensitive species in your own garden.



The Aura Air Quality Garden at Goddard Space Flight Center's Visitor Center.

What does ozone damage look like?

When exposed to high levels of ozone, many plants show damage on their leaves. Older leaves have the most damage. Plants with ozone damage have very fine colored spots on the upper surfaces of their leaves, and some leaves also turn yellow.



*Cut leaf coneflower (*Rudbeckia laciniata*)*



*Black-eyed susan (*Rudbeckia hirta*)*

Where do I go for more information?

For more information, visit the following websites:

Aura Spacecraft:
<http://aura.gsfc.nasa.gov>

Ozone Garden information:
http://handsontheland.org/monitoring/projects/ozone/ozone_bio_search.cfm

Ozone Watch:
<http://ozonewatch.gsfc.nasa.gov/>