

# NOAA Balloon-borne Atmospheric Ozone Measurements

South Pole Station, Antarctica.....one of ten sites around the globe where NOAA launches weekly balloons to measure ozone.



# Approaching South Pole in a C-130 aircraft

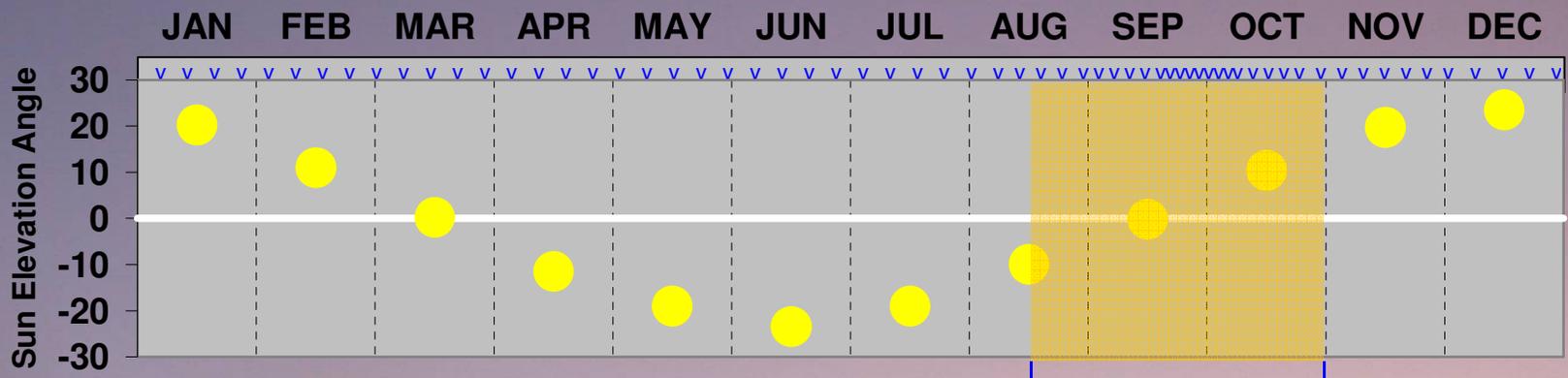


# View from C-130 airplane landing at South Pole Station



C-130 lands at South Pole.  
Snow never melts. Drifting or precipitating snow (about 5 inches per year) must be pushed or hauled off base.





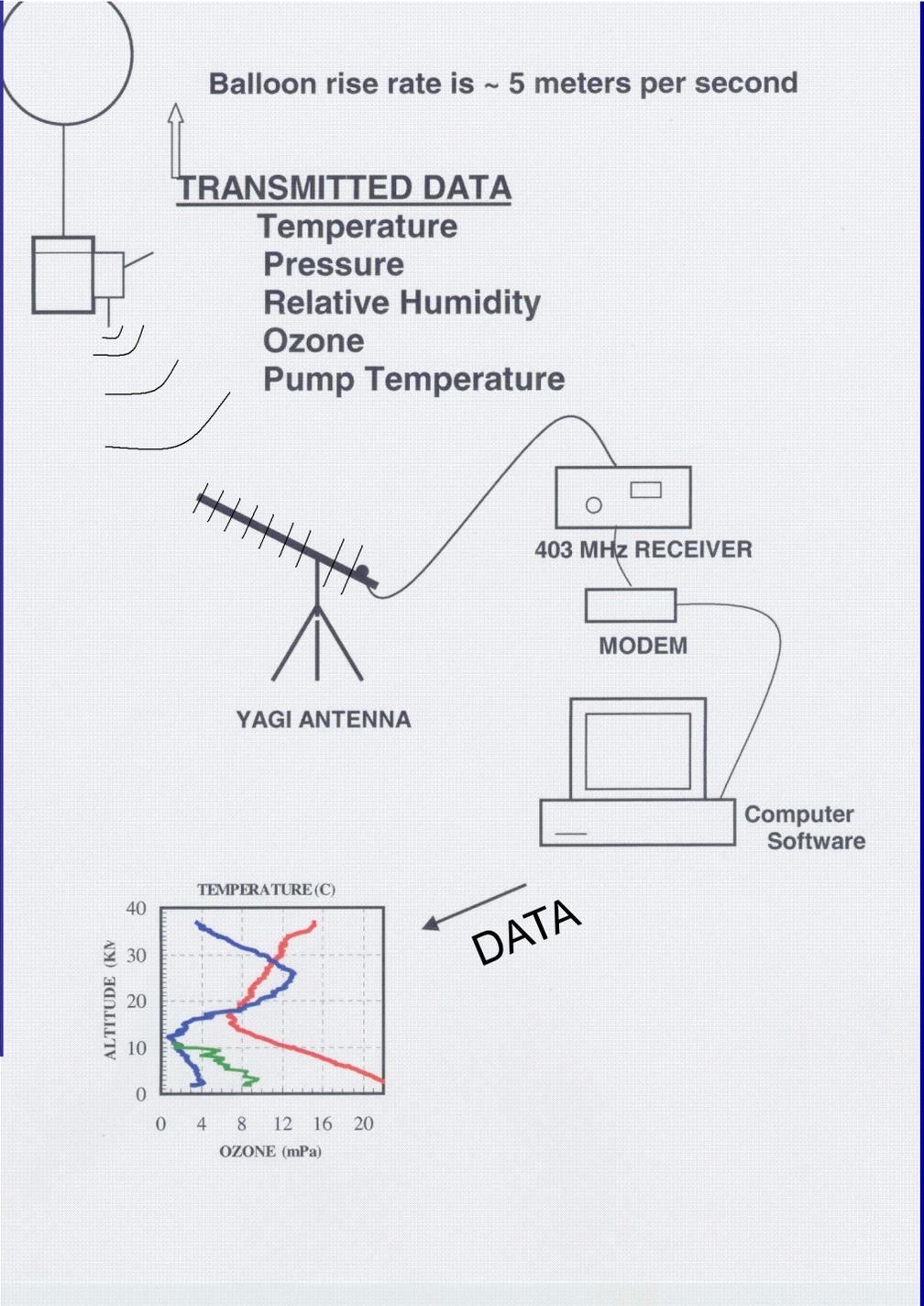
**Ozone Hole Period**  
 ~ Aug 15 – Nov 01



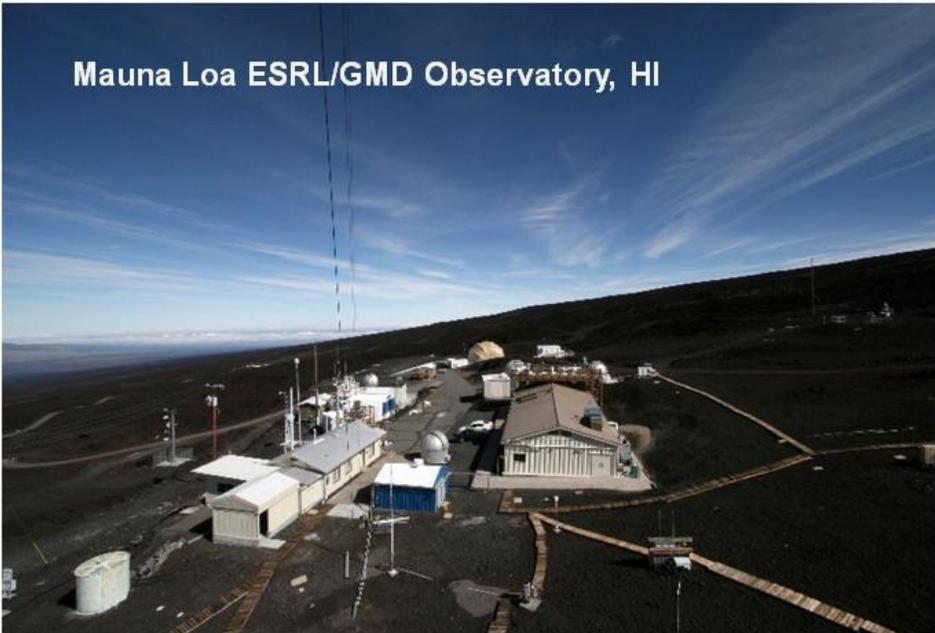
South Pole Station is one of the most important locations for NOAA/ESRL –



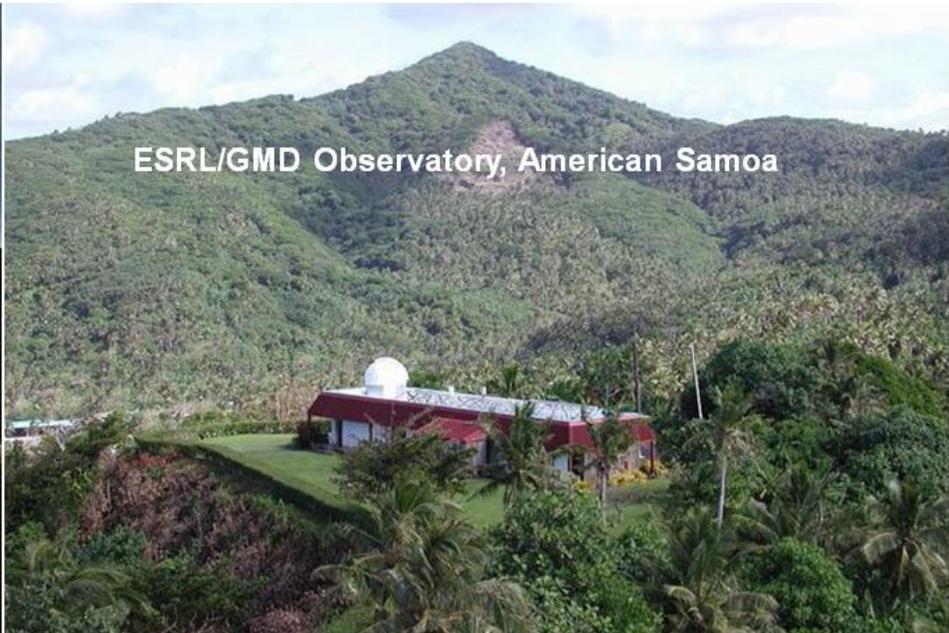
Ozonesonde launch in Fairbanks, Alaska



Mauna Loa ESRL/GMD Observatory, HI

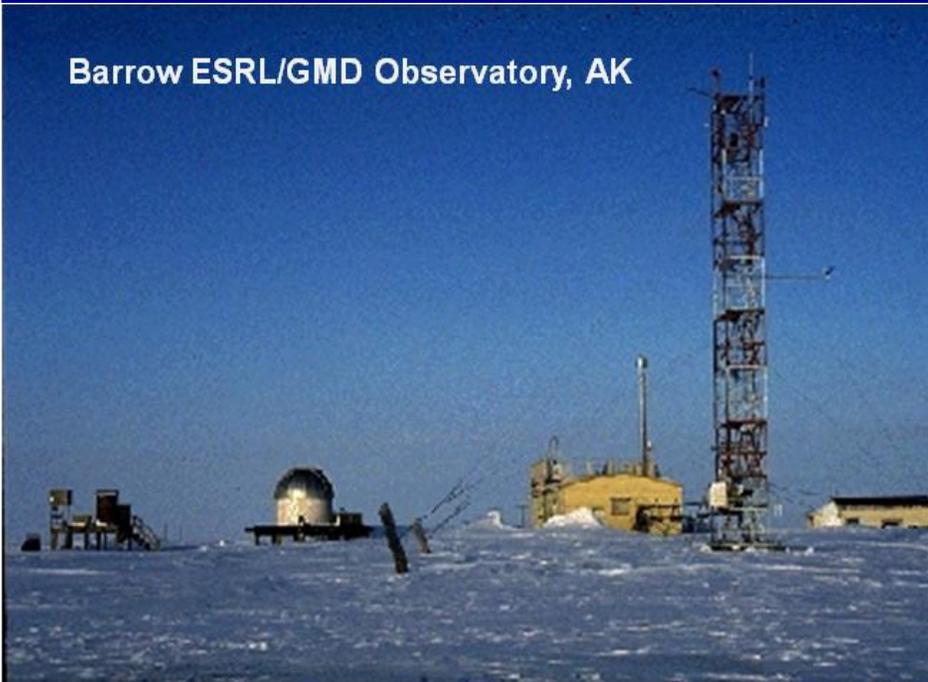


ESRL/GMD Observatory, American Samoa



The 4 Primary NOAA Long term atmospheric locations where we monitor different trace gases - including ozone.

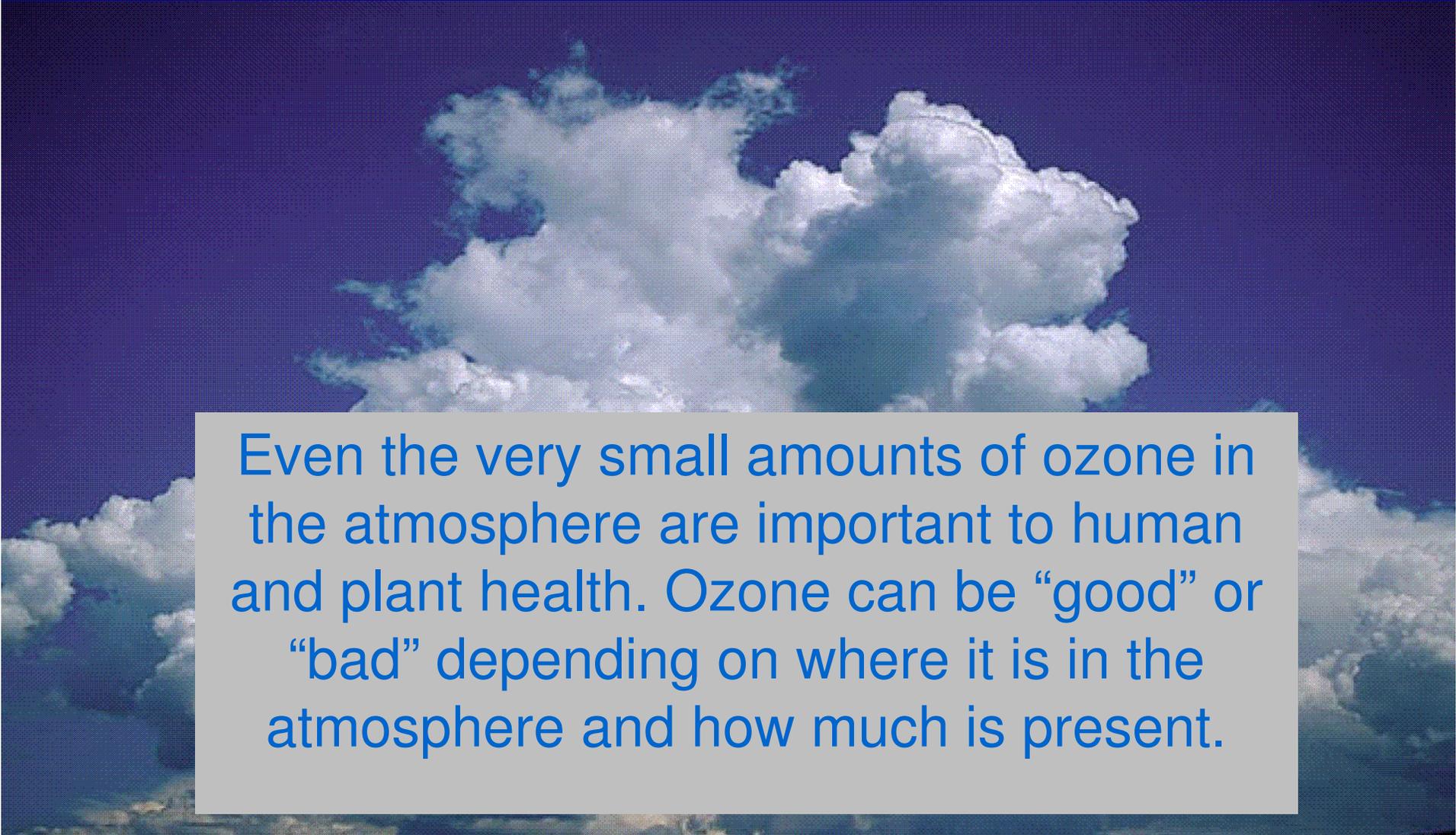
Barrow ESRL/GMD Observatory, AK



ESRL/GMD Observatory, Amundsen - Scott Station, South Pole



# Why do we need to Measure Ozone in the Atmosphere?



Even the very small amounts of ozone in the atmosphere are important to human and plant health. Ozone can be “good” or “bad” depending on where it is in the atmosphere and how much is present.

ALTITUDE (Miles)

20 -

15 -

10 -

5 -

ALTITUDE (KM)

40

35

30

25

20

15

10

5

0

Stratosphere

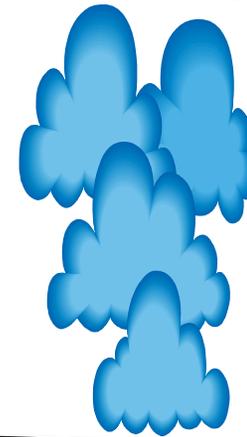
Troposphere

**GOOD OZONE**

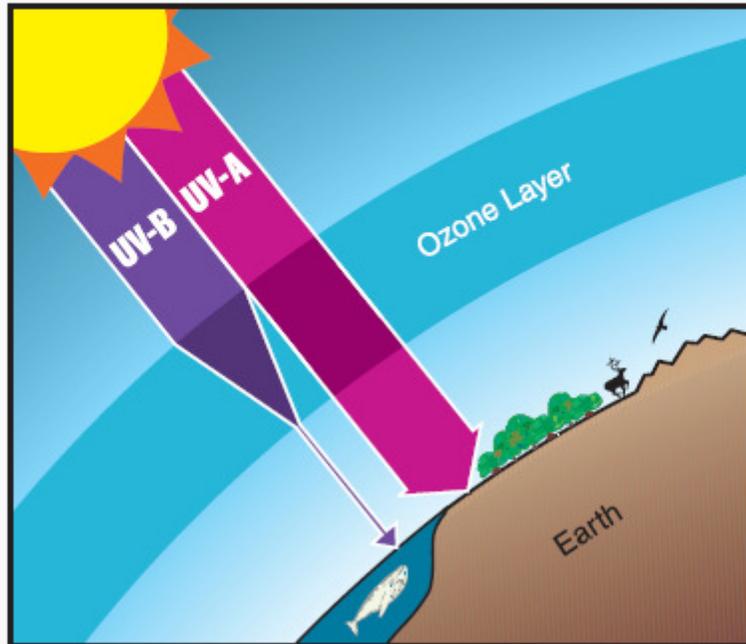
screens out ultraviolet  
light from sun

**BAD OZONE -**

not good to breathe  
lots of ozone



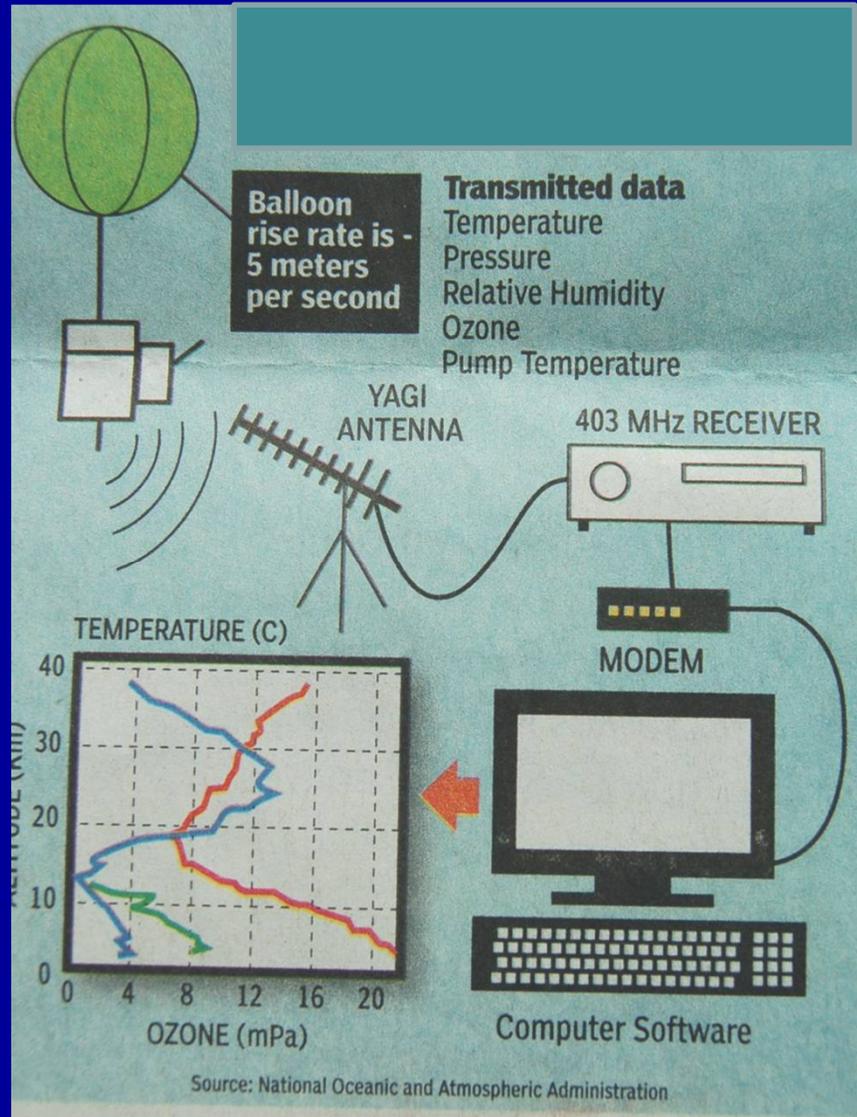
## UV Protection by the Ozone Layer

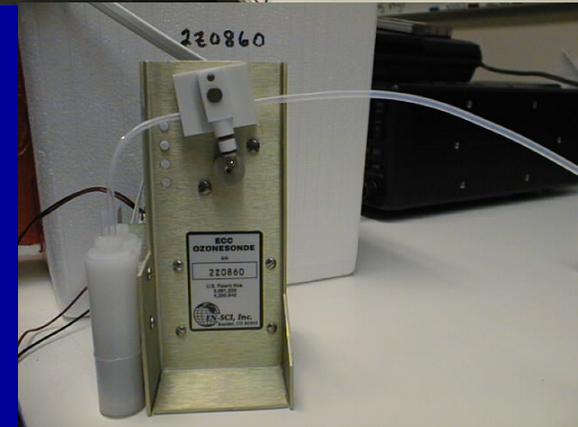
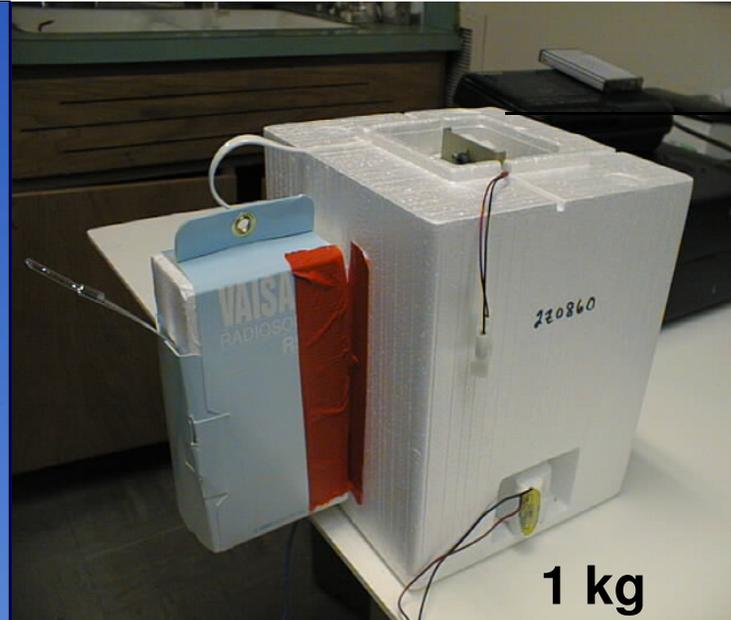


95-99% of sun's UV radiation is absorbed by ozone layer.

### Figure Q3-1. UV-B protection by the ozone layer.

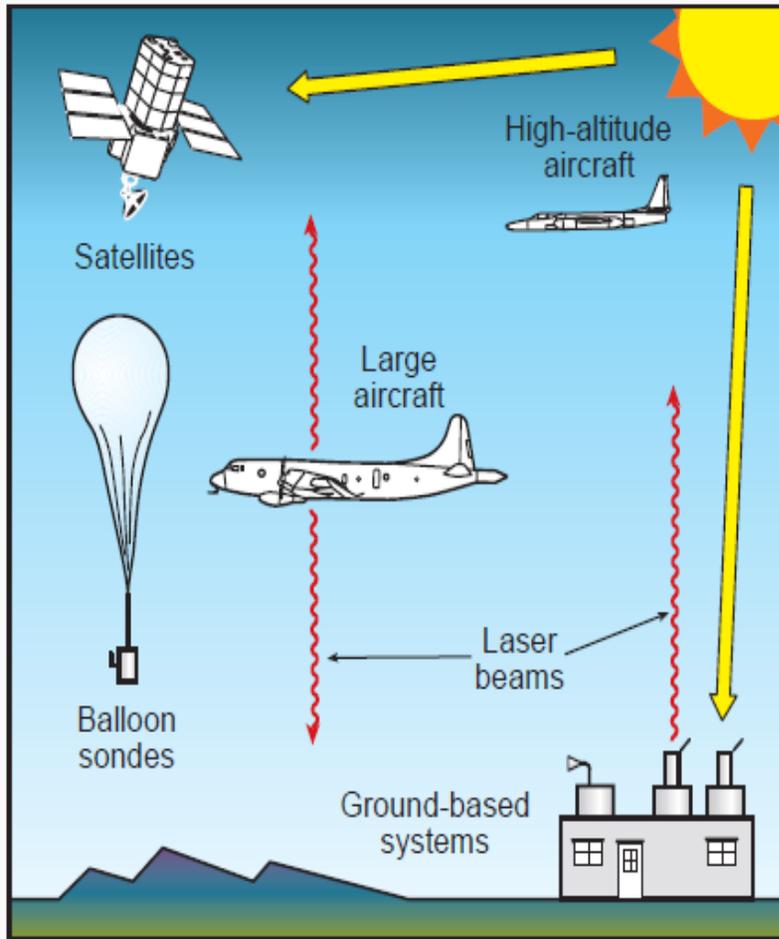
The ozone layer resides in the stratosphere and surrounds the entire Earth. UV-B radiation (280- to 315-nanometer (nm) wavelength) from the Sun is partially absorbed in this layer. As a result, the amount of UV-B reaching Earth's surface is greatly reduced. UV-A (315- to 400-nm wavelength) and other solar radiation are not strongly absorbed by the ozone layer. Human exposure to UV-B increases the risk of skin cancer, cataracts, and a suppressed immune system. UV-B exposure can also damage terrestrial plant life, single-cell organisms, and aquatic ecosystems.





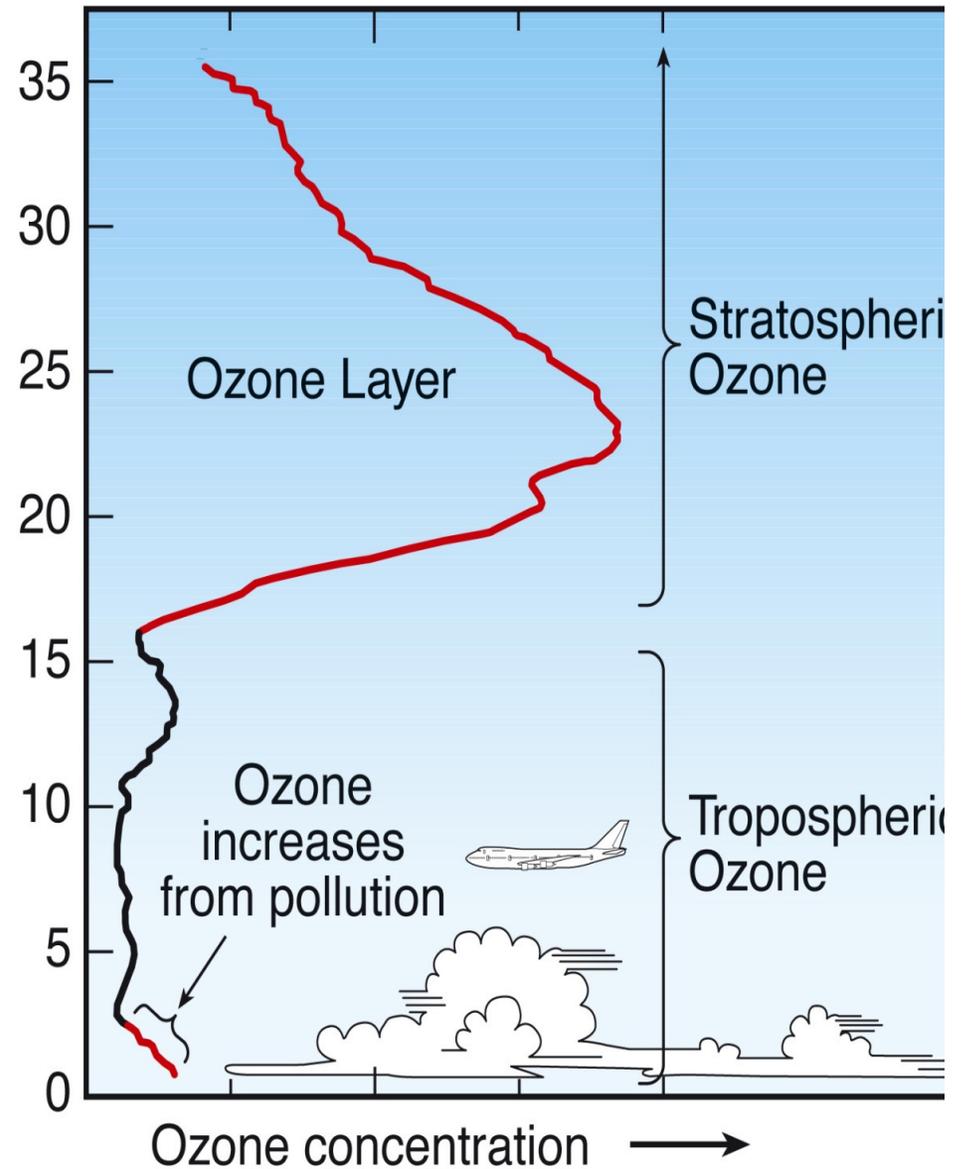
- Electrochemical Concentration Cell (ECC) Ozonesonde Instrument (Ozone Partial Pressure and Total Column Ozone).
- Vaisala RS-80 Radiosonde (Temperature, Pressure, Relative Humidity)
- Data transmits at 403 MHz during ~ 2 hour flight from surface to 30 km.

## Measuring Ozone in the Atmosphere



**Figure Q5-1. Ozone measurements.** Ozone is measured throughout the atmosphere with instruments on the ground and on board aircraft, high-altitude balloons, and satellites. Some instruments measure ozone locally in sampled air and others measure ozone remotely some distance away from the instrument. Instruments use

## Ozone in the Atmosphere



# Ozonesonde Balloon launched from Boulder, Colorado.

Next few slides show photos taken from a camera mounted on a balloon-borne ozone & water vapor instrument (with GPS).

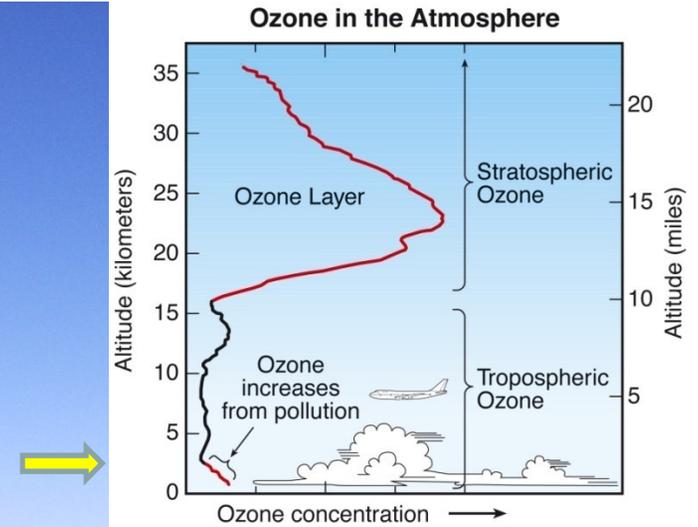
Courtesy of Patrick Cullis and Allen Jordan (NOAA/ESRL)



**7,200 feet above sea level**

**2,000 feet above ground level at Boulder,  
Colorado**

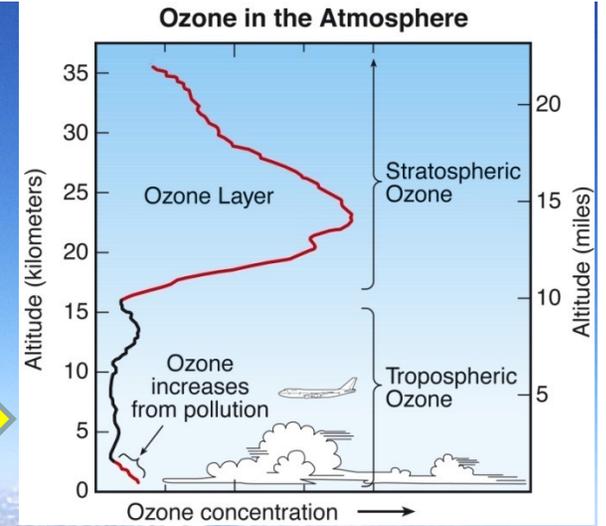
**Atmospheric pressure = 785 millibars**



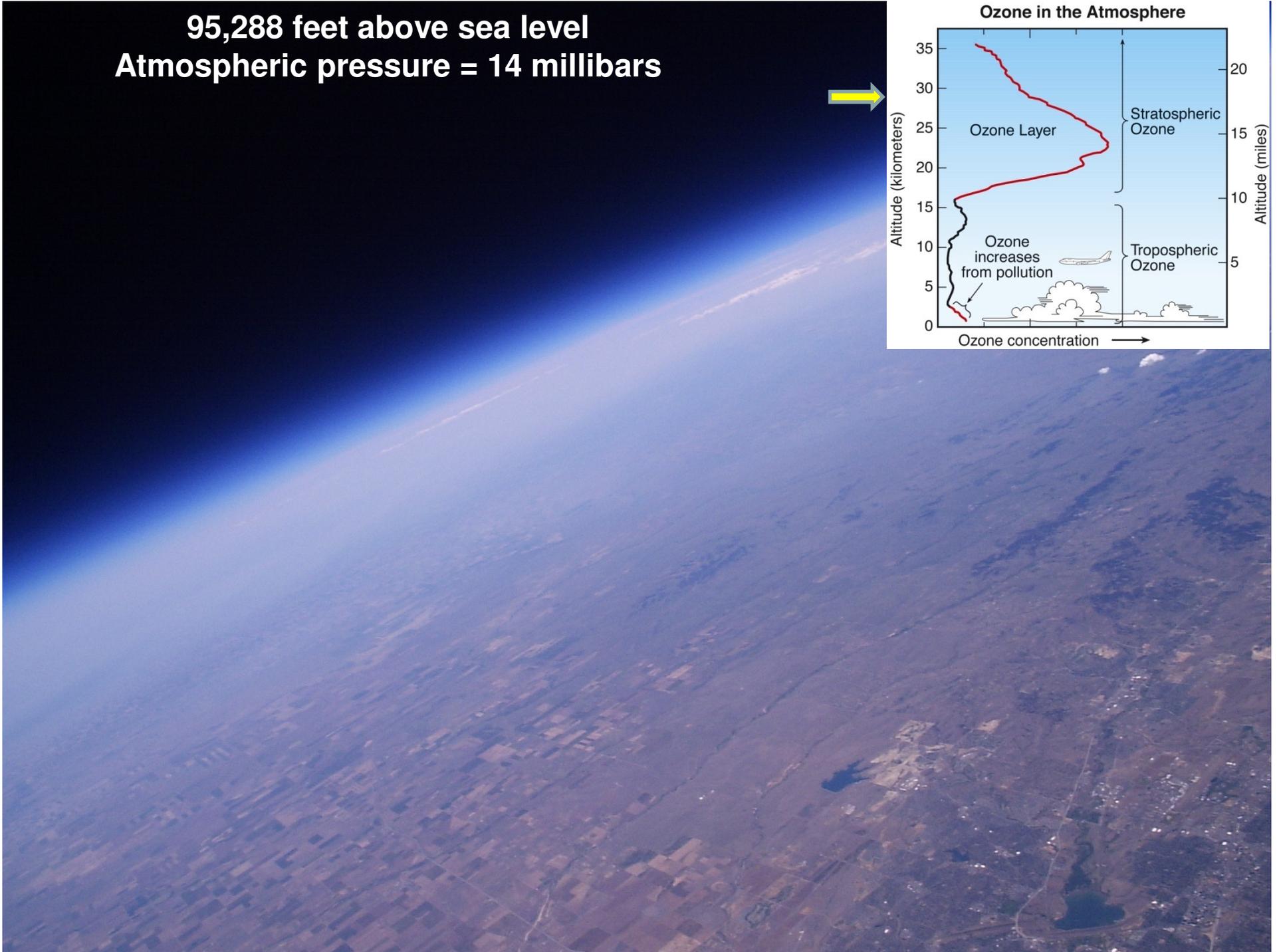
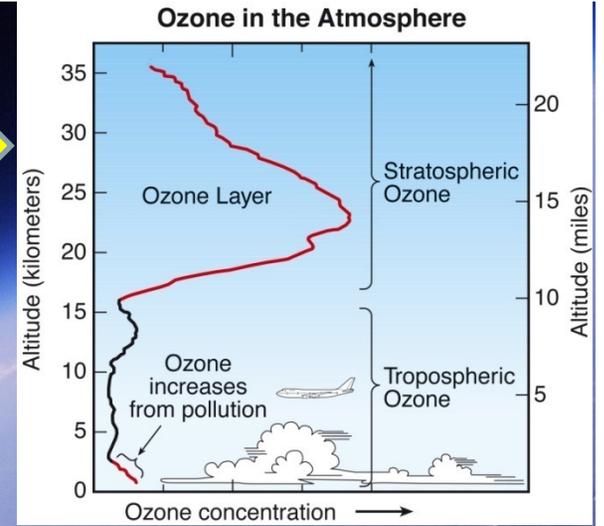
**19,740 feet above sea level**

**Atmospheric pressure = 492 millibars**

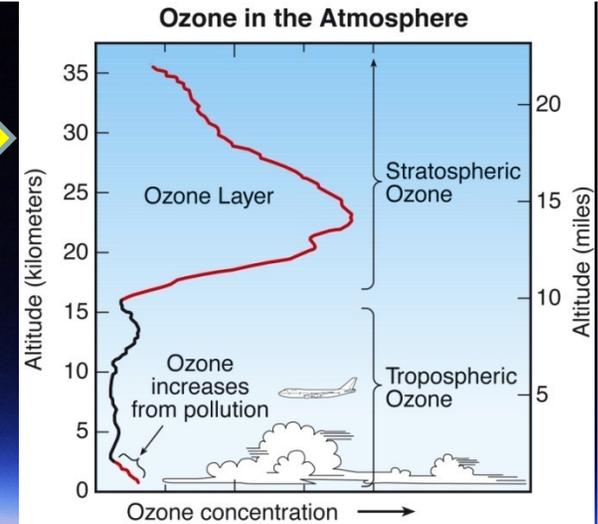
**~ Half way point for atmospheric mass.**



**95,288 feet above sea level**  
**Atmospheric pressure = 14 millibars**



**97,342 feet above sea level**  
**Atmospheric pressure = 13 millibars**



**The balloon instrument has now gone through nearly all (98%) of the atmosphere surrounding the earth. Further out in space there are instruments on board satellites looking down at Earth to view weather, and even ozone surrounding the earth.**

# Approaching South Pole in a C-130 aircraft

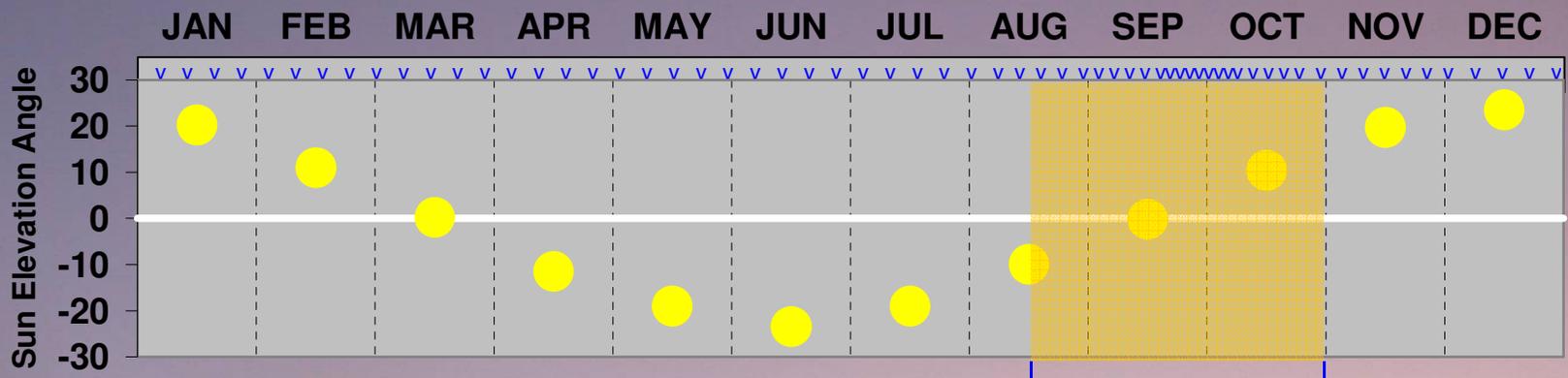


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