

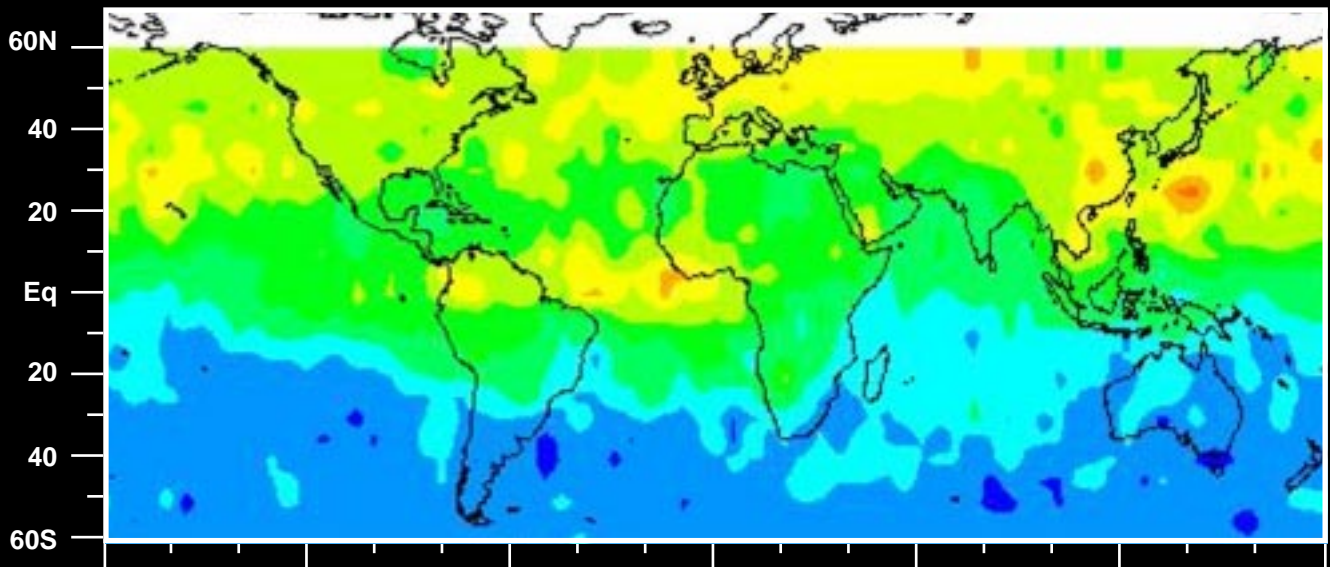


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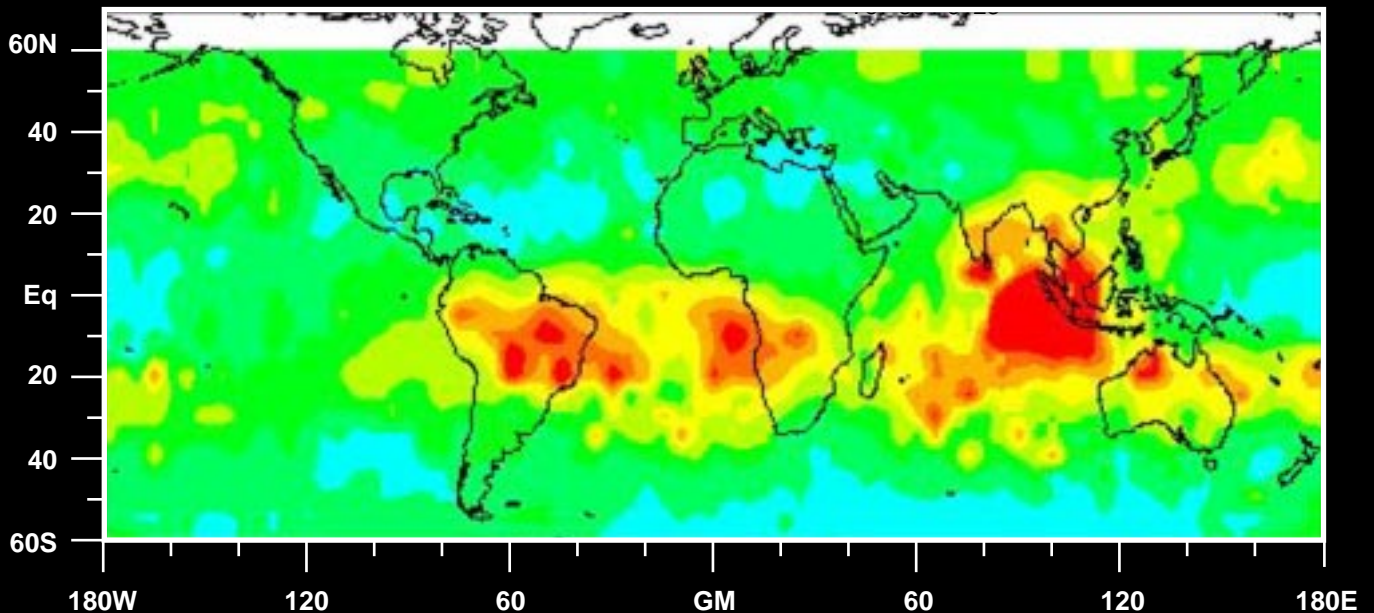
Measurement of Air Pollution from Satellites

Carbon Monoxide Mixing Ratios in Middle Troposphere during April and October 1994

SRL-1 April 9-19, 1994



SRL-2 September 30 - October 11, 1994





MAPS – Measurement of Air Pollution from Satellites

Global environmental change is one of the most pressing international concerns of the coming century. Many of these changes are caused by natural events, such as volcanic eruptions, but many changes are the result of human activity, such as auto emissions and agricultural burning. In both cases, atmospheric gases like carbon monoxide are produced. We call this air pollution.

Scientists at NASA's Langley Research Center are using satellites to view the Earth and its changing environment. With satellite data, they are able to determine where the pollution is, what kind of atmospheric gases are present and how concentrated they are. Scientists can use the data to make climate models which help them determine how the global climate is changing and predict the future impact of pollution on our atmosphere.

Measurement of Air Pollution from Satellites (MAPS). MAPS was initially flown in 1981 and demonstrated that atmospheric gases can be measured from space. It was the first scientific payload to fly on the space shuttle and gave scientists their first glimpse of the global distribution of carbon monoxide. MAPS was flown again in 1984 and twice in 1994. It generated data which is being compared to its earlier measurements for an understanding of how the atmosphere has changed over 10 years. Perhaps the most significant discovery from the MAPS data has been that air pollution is a world-wide phenomenon and not just a problem in industrialized countries.

MAPS is scheduled to fly again very soon. This time it will be attached to the Russian space station Mir and will gather data for a longer

period of time, generating global maps that show how pollution changes as the seasons change.

The MAPS instrument will be flown into space on a Russian Energia rocket. Cosmonauts will attach the instrument to the outside of the Mir station, and within 6 to 8 weeks MAPS will be operational. Then MAPS will have done something no other instrument has done. It will make its fifth trip into space. Originally designed for a single launch, the technology has proven sturdy enough to withstand several trips!

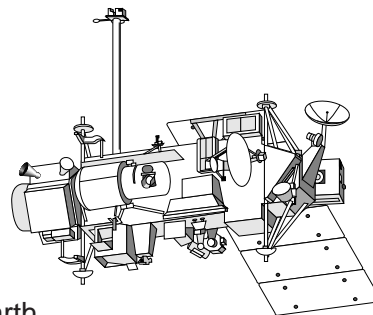
Activities for the Classroom

1. If you were given the opportunity to attach an experiment to Mir, what kind of experiment or research project would you design?
2. From the picture on the front, what conclusions can you make about air pollution, its origins and the effect of its transportation to other parts of the world? Research one or more of the areas from which the most pollution originates and determine what can or is being done about it.
3. Study one of the following causes of pollution and suggest a solution: global burning of rain forests and/or savannas; auto emissions; or deforestation.

What is a Satellite?

It is a small body that revolves around a larger object in space. It could be a moon or a human-made instrument. The first artificial satellite was the Russian Sputnik, launched in 1957. Today there are hundreds of satellites in orbit around the Earth: for communication (your long-distance phone service and TV), weather monitoring, navigation and military uses.

Most satellites are lifted into orbit by multi-stage rockets. Most recently, the United States has used the space shuttle to launch several satellites that were then powered by solar cells and auxiliary batteries. Satellites orbit at least 100 miles above the Earth's surface. This orbit must be adjusted throughout the satellite's life by onboard rockets which accelerate to move the satellite to a higher orbit or decelerate for a lower orbit. Firing to the side changes the direction in which the satellite points at the Earth.



About the Image

MAPS data shows that pollution is a global problem, not just a concern of industrialized areas. MAPS data has shown pollution originating over North America, Asia, Africa and Europe traveling to other parts of the Earth.