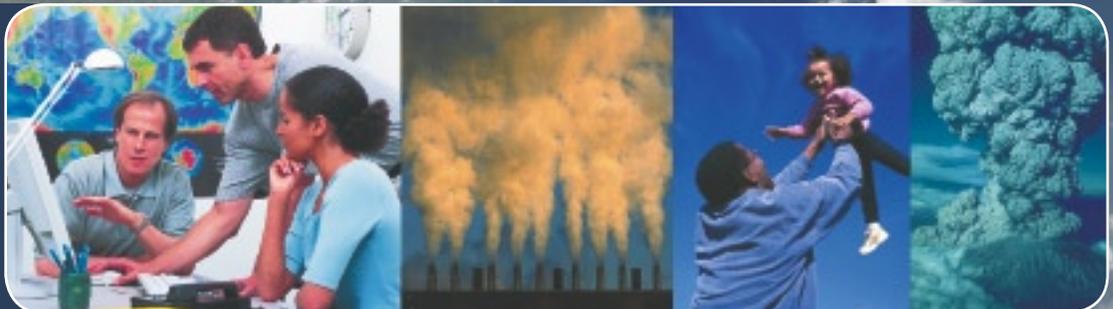




Air quality across the Great Lakes and Mid-Atlantic regions of the United States was less than ideal in late June 2002. Much of the pollution was likely smoke from forest fires in the West. Since the dominant weather patterns across the country move from west to east, it is not uncommon for air quality along the East Coast to be affected by fires out West. (*Jacques Desclotres, MODIS Land Rapid Response Team, NASA/GSFC*)

NASA Earth observing systems acquire global measurements of aerosols supporting research of initiation and transport of atmospheric particulates and gases. NASA engineers have developed and deployed space systems to acquire measurements for air quality and climate change research, with more missions planned.





### Overview of the Program

At present, an array of Earth observing satellites are in orbit, and additional launches both by NASA and others will continue throughout the next decade. Our ability to observe our home planet from space has never been greater and will continue to grow. Increasingly, studies of the Earth focus on understanding the Earth's land, atmosphere, oceans, and various forms of life as a single integrated system rather than as individual independent elements. NASA is an important contributor in this systems approach to Earth Science studies.

Scientists at NASA work in partnership with other government, academic, private, and international organizations to identify ways to link Earth Science information to practical uses for society. Some of these partners contribute *decision support systems (DSS)* that help non-traditional users of Earth Science data use the information to make important decisions concerning environmental issues. The goal is to make sure Earth science data and information flows smoothly *from satellite to society*, so that the maximum number of people possible benefit from Earth Science information.

### Air Quality

The Clean Air Act, created in 1972 and last amended in 1990, responds to the basic societal need for clean, breathable air and recognizes the need to protect this vital natural resource. Congress directed the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Although these regulations have significantly improved the quality of our nation's air over the past 30 years, people in some areas are still exposed to air pollution levels that exceed the NAAQS. Numerous studies have shown significant effects of air pollution on human health, agriculture, ecosystems, and physical infrastructure.

With its unique legacy of space-based observations, NASA is an excellent source of information for air quality studies. Part of the Earth Science Enterprise's research strategy focuses on questions related to air quality issues. For example, NASA works with its partners at the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) to better understand the effects of regional pollution on the global atmosphere, and the effects of global chemical and climate changes on regional air quality. They also seek to more successfully predict how changes in the delicate chemical balance of the atmosphere will impact ozone and other climate parameters.

Several current NASA missions collect data that are directly relevant to air quality issues. For instance, the Total Ozone

Mapping Spectrometer (TOMS) instruments have been collecting valuable information of relevance to studies of ozone, sulfur dioxide emissions, and aerosols for the past several decades. More recently, the Measurements of Pollution In The Troposphere (MOPITT) instrument onboard the Terra spacecraft has been used to study carbon monoxide (CO). Additionally, the Moderate Resolution Imaging Spectroradiometer (MODIS) is used for studies of various pollutants and the Multiangle Infrared Scanning Radiometer (MISR) is used to study aerosols. The Aqua mission also conducts aerosol, CO, and methane (CH<sub>4</sub>) studies, using the Atmospheric Infrared Sounder (AIRS) and MODIS.

The Aura mission, scheduled to launch in 2004, is dedicated to studying the chemistry of our atmosphere. The Dutch-built Ozone Monitoring Instrument (OMI) will build upon the TOMS legacy and offer the most detailed information on ozone that has ever been obtained. The Tropospheric Emission Spectrometer (TES) will offer unprecedented ability to track ozone and other pollutants as they are transported around the globe and help scientists better understand how atmospheric mixing impacts pollution transport. The CloudSat and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) missions, planned for 2004, will collect important information, respectively, on clouds and aerosols, and increase our understanding of how these phenomena can impact air quality. CloudSat and CALIPSO will give us an unprecedented capability to collect three-dimensional profiles of clouds and aerosols. The National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP), a joint NASA, NOAA and Department of Defense mission launching in late 2006, is expected to contribute to a wealth of new information on air quality issues.

However, the story doesn't end with the collection of the data. The real value of space-based measurements begins to be realized when data collected by these NASA missions are input into an EPA model that simulates the actual conditions and is used to forecast air quality. Over the next 10 years, as more and more detailed information is added to the model, the simulations produced will lead to forecasts with increased accuracy and longer lead times. Within 10 years, three-day forecasts of air quality events may be possible, a significant improvement over current same day forecasts of these events.

NASA's Earth Science Enterprise (ESE) is international in scope with participation by the U.S., the European Space Agency, France, Canada, Japan, Russia, Brazil, The Netherlands, and Finland. The ESE works collaboratively with national and international scientists as well as with its Federal partners to provide quality science observations and predictions as input into air quality models. NASA is committed to expanding the use of Earth Science results to serve as decision support tools for the benefit of society.