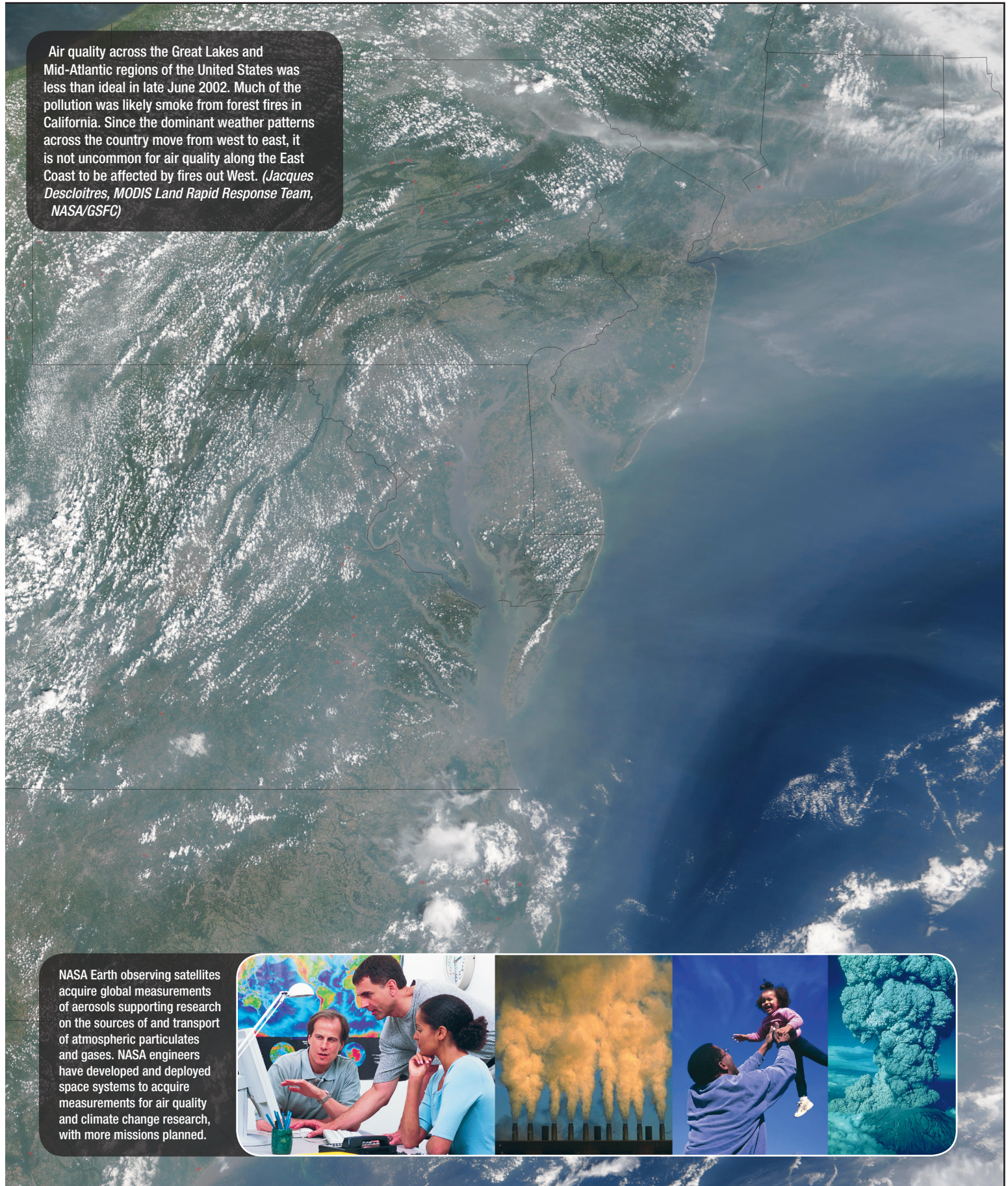


SCIENCE SERVING SOCIETY: AIR QUALITY

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 California. 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 Descloitres, MODIS Land Rapid Response Team, NASA/GSFC*)



NASA Earth observing satellites acquire global measurements of aerosols supporting research on the sources of 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.





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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. Increasingly, studies of the Earth focus on understanding the Earth's land, atmosphere, oceans, and life as a whole integrated system rather than as individual independent elements. NASA is an important contributor in this systems approach to Earth science studies.

In addition to providing Earth observing capabilities, NASA forms strategic partnerships with other government, academic, private, and international organizations. Through these partnerships, NASA's Earth science observations and measurements are linked to practical applications. NASA data, information, and predictive models help NASA's partners, and nontraditional users of Earth science, make timely and accurate decisions regarding management of resources and development of policy. The agency's goal is to maximize the benefit of science and technology to stakeholders by smoothly flowing Earth science data and information from NASA satellites to society.

Air Quality

The Clean Air Act, established in 1972 and last amended in 1990, is intended to protect the quality of our nation's air. 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, some areas are still exposed to air pollution levels that exceed the NAAQS. Numerous studies show that air pollution has significant effects on human health, agriculture, ecosystems, and physical infrastructure.

With its unique deployment of Earth observing satellites, NASA is an excellent source of information for air quality studies. NASA works with its partners at the 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 climate change 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 help scientists monitor air quality. For instance, the Total Ozone Mapping Spectrometer (TOMS) instruments have been collecting valuable information of relevance to studies of ozone, sulfur dioxide emissions, and particulate matter (aerosols) for several decades. More recently, the Measurements Of Pollution In The

Troposphere (MOPITT) instrument onboard the Terra spacecraft has been used to study carbon monoxide. Also on Terra, the Moderate Resolution Imaging Spectroradiometer (MODIS) [see front] and the Multiangle Infrared Scanning Radiometer (MISR) instruments are helping scientists distinguish human-produced from naturally occurring aerosols. NASA's Aqua mission also contributes to research on aerosols, carbon monoxide, and methane studies, using the Atmospheric Infrared Sounder (AIRS) and MODIS.

NASA's Aura mission is dedicated to studying the chemistry of our atmosphere and one of its primary objectives is to study air quality. The Dutch-built Ozone Monitoring Instrument (OMI) extends the TOMS legacy and offers the most detailed information on ozone that has ever been obtained. OMI also provides measurements of nitrogen dioxide and sulfur dioxide associated with urban areas and human activity. The Tropospheric Emission Spectrometer (TES) offers an unprecedented ability to track ozone and other pollutants as they are transported around the globe. TES helps scientists better understand how atmospheric mixing impacts pollution transport.

The CloudSat and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) missions, respectively, give us an unprecedented ability to collect three-dimensional profiles of clouds and aerosols. Such information helps scientists improve their ability to locate and quantify the sources of atmospheric pollution and also more accurately assess where there will be impacts as it spreads. The National Polar-orbiting Operational Environmental Satellite System (NPOESS) and its precursor, the NPOESS Preparatory Project (NPP), both joint NASA, NOAA and Department of Defense collaborations, are also expected to contribute new information on air quality issues.

However, the story doesn't end with the collection of the data. These scientific observations only truly begin to serve society when they are linked to real-world applications. NASA provides data that become input for an EPA computer simulation that attempts to recreate the actual real-world air quality conditions now and how they are likely to evolve in the future. Forecasters use this information to decide when they need to warn the public about a possible air quality event—i.e., a prolonged period of poor air quality in a particular region. By incorporating NASA data into the EPA's model, forecasters hope the forecast accuracy will continue to improve and that they may soon be able to issue warnings for air quality events three days before they occur, which would represent a significant improvement over our current same-day forecasts of these events.