NASA Facts

National Aeronautics and
Space Administration

NASA Headquarters
Public Affairs Office
Code P
300 E Street SW
Washington DC 20546

FS-1995-08-008-HQ

Mission to Planet Earth

Understanding Our Changing Planet

Using the unique perspective available from space, NASA scientists and their colleagues around the world are taking the pulse of planet Earth, studying it as a single, global environment. They are investigating how that environment changes and how human beings contribute to those changes. Data from Mission to Planet Earth (MTPE) will be distributed to researchers worldwide to help people make informed decisions about how they will affect their environment.

Program

From shifting weather patterns to ozone depletion and rising levels of greenhouse gases in the atmosphere, much has been learned in the past 10 years about how the Earth's environment changes. But there is much more to be learned about the mechanisms that drive the planet, and how humans are influencing those natural forces. The ultimate product of MTPE is information. Trustworthy information and common scientific understanding will provide an objective basis for making decisions about the environment in the future. To that end, NASA is developing a series of spacecraft to study the planet and a vast data base to catalog the findings. The Earth Observing System and its Data and Information System (EOSDIS) will enable a variety of users, from research scientists to students in the classroom to state and local officials, to obtain and use MTPE data. The first Earth Observing System (or EOS) launch is in 1998.

Current Activities

In addition to its operating satellites and the development of EOSDIS, MTPE continues its flight programs. In 1995, NASA instruments will study ozone and ocean biology, and NASA will launch a Canadian radar satellite to study the Earth's oceans and ice-covered regions.

Future Activities

- In 1996, a Japanese satellite will carry NASA instruments to study sea-surface winds and ozone levels.
- In 1997, Japan will launch a U.S.-Japanese satellite to measure the amount of rain that falls in the tropics and how that affects climate.
- In 1998, NASA will launch the Landsat 7 satellite and the first satellite in the EOS series. EOS launches will continue through the first decade of the 21st century.

Recent Accomplishments

The vast data base NASA is assembling eventually will comprise data from almost all NASA environmental research. Most of the data will come from EOS, but other NASA flight programs are already providing a wealth of environmental data to international scientific teams. These satellites and Space Shuttle missions include:

- the Upper Atmosphere Research Satellite, (UARS; launched 1991 and still operational) studying the chemistry and physics of ozone depletion
- TOPEX/Poseidon, (launched 1992 and still operational) a U.S.-French satellite studying ocean circulation and the role it plays in regulating climate change
- ATLAS, a Space Shuttle payload that flew three times (1992-1994) to study the chemistry of the Earth's upper atmosphere and the Sun's energy, and the effect of those two elements on ozone levels
- the Space Radar Laboratory, (two flights in 1994) which demonstrated the uses of a complex radar to study the Earth's surface, with applications in ecology, geology, water-cycle studies and other areas
- three Total Ozone Mapping Spectrometers (TOMS), scheduled for launch in 1995, 1996 and 2000, to continue observing and mapping Earth's ozone layer

- the Tropical Rainfall Measuring Mission, a U.S.-Japanese satellite scheduled for launch in 1997, which will study how tropical rainfall around the world affects the global climate
- Landsat 7, the latest in the series of satellites to observe the Earth's land surfaces and provide data useful in ecological, agricultural, urban and economic studies

MTPE also conducts a variety of investigations using aircraft-borne instruments to sample the atmosphere directly or to observe the Earth's surface. In addition, MTPE sponsors research each year by numerous ground teams whose work in the field verifies and refines the accuracy of satellite data.

Past Accomplishments

Beginning with the 1959 launch of Vanguard II, which returned the first photograph from space of Earth's cloud cover, NASA has been studying the global perspective of our environment. Other NASA accomplishments in observing the Earth include:

- 1960: NASA launched Television Infrared Observation Satellite (TIROS) I, which proved that satellites can observe Earth's weather patterns. Subsequent TIROS satellites improved hurricane-tracking techniques and severe-storm warnings, protecting lives and property in coastal areas around the world. In 1963, weather satellites began carrying automatic transmission cameras that allowed anyone using an inexpensive ground station to obtain weather images directly from the satellite.
- 1966: Environmental Sciences Services Administration I and II gave the U.S. its first global weather satellite system.
- 1972: NASA began the Landsat series. Landsats 4 and 5 continue to observe the Earth's land surfaces.
- 1975: The satellites SMS-A, the first spacecraft to observe the Earth from geosynchronous orbit, and SMS-B started producing cloud-cover pictures every 30 minutes for weather forecasters.
- 1976: Laser Geodynamic Satellite I provided scientists with the ability to track very precisely the movements of the Earth's surface, increasing our understanding of earthquakes and other geological activity.
- 1978: The Heat Capacity Mapping Mission demonstrated the ability to measure variations in the Earth's temperature from space, paving the way for future climate studies.
- 1978: Seasat demonstrated techniques for global monitoring of the Earth's oceans.
- 1978: Nimbus 7, the final satellite in the series, was launched carrying a TOMS instrument that provided 14 years of data on the Earth's ozone layer. Data from TOMS were part of the scientific basis for the Montreal Protocol and other treaties banning the manufacture and use of ozone-depleting chemicals. The satellite's Coastal Zone Color Scanner obtained a data set that would be widely used to study the links between the oceans' biology and the Earth's climate.
- 1984: The Earth Radiation Budget Satellite began its study of how the Earth absorbs and reflects the Sun's energy.
- 1991: NASA's second TOMS was launched aboard a Russian Meteor-3 satellite.
- 1991: UARS began its study of the chemistry and physics of the Earth's atmosphere. UARS data are used to create global maps of ozone-destroying chemicals and to understand the processes related to ozone depletion better. By 1994, UARS' comprehensive data set had provided the conclusive evidence that human-made chemicals are responsible for the annual Antarctic ozone hole.
- 1992: Data from the U.S.-French TOPEX/Poseidon satellite began to detail the links between the Earth's ocean and climate. In 1993, the satellite data allowed scientists to predict correctly the strengthening of the ongoing El Niño, a periodic change in climate patterns. By 1994, TOPEX data indicated that the Earth's average global sea level had risen in the two previous years.

Partnerships

Mission to Planet Earth links NASA to a variety of partners. In the United States, MTPE is part of the federal government's Global Change Research Program, which coordinates the environmental research of 11 cabinet departments and agencies. Through MTPE, NASA funds research at dozens of universities across the country. Internationally, NASA's Mission to Planet Earth partners span the globe, ranging from long-time space collaborators such as Germany and Canada to a former rival, Russia.

Applications

Though focused primarily on basic research, MTPE has already produced numerous applications to everyday life:

- Data from Landsat, one of NASA's most successful satellite programs, is being used to develop techniques to track the loss of coastal marshes along the Chesapeake Bay, which may have implications for the area's fishing and tourist industries.
- The first TOMS instrument, which provided 14 years of continuous data on global ozone levels, provided part of the scientific underpinning for treaties banning the use of ozone-depleting chemicals. In 1994, UARS data provided final confirmation that the Antarctic ozone hole that develops each October is caused by human-made chlorine compounds.
- TOPEX/Poseidon data have been used to monitor El Niño, which can bring devastating rains to California and drought to Australia.

Budget

The fiscal year 1996 budget request for Mission to Planet Earth, (including launch services) $1.34 billion, remained flat from the 1995 budget. Launch services for each year were $17 million. In addition to supporting the ongoing program, the 1996 budget will allow for further development of the Landsat 7, the Earth Observing System and the Earth Observing System Data and Information System.