



Sea ice off the coast of Alaska

Radar Altimeter (RA-2)

RA-2 is an enhanced version of an ERS instrument. RA-2 will provide precise topographic measurement of ocean surface levels, as well as measurements of wave height and wind speed. It will provide improved mapping of icecap and sea-ice as well as land elevation and lake levels.

Doppler Orbitography and Radio Positioning Integrated by Satellite (DORIS)

DORIS is a microwave tracking system which can be used to determine a satellite's exact location in space, allowing the position of ENVISAT to be fixed in real-time to an accuracy of about 1m. Off-line processing can provide an orbit estimation accuracy better than 3 cm.

Microwave Radiometer (MWR)

MWR is a passive radiometer which measures the total atmospheric water vapour and cloud liquid water content at the satellite vertical. Its main purpose is to provide atmospheric correction for RA-2 time delay measurements.

Laser Retro-Reflector (LR)

LR is a passive device which will be used as a reflector by ground-based laser ranging stations using high power pulsed lasers.

LR supports the RA-2 instrument calibration in measuring the satellite altitude and range. It also supports DORIS in calibration and orbit determination.

Global Ozone Monitoring by Occultation of Stars (GOMOS)

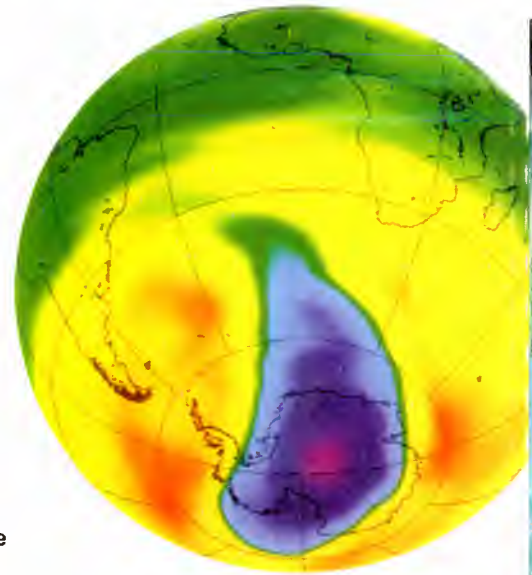
Ozone depletion in the upper atmosphere is now widely recognised as a critical factor affecting our environment. GOMOS will measure star light occultation through the atmosphere. In doing so it can detect ozone and other trace gases between the altitudes of 20 and 100 km.

Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)

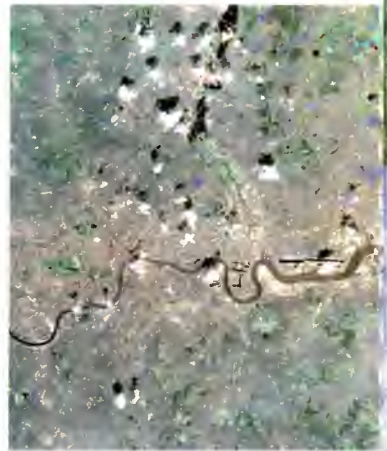
MIPAS is an infrared Fourier spectrometer designed to provide profiles of various atmospheric constituents and temperature by observation of the limb. It has a high spectral resolution and wide spectral range, allowing global measurement of more than twenty relevant trace gases during all seasons. MIPAS operates equally well during daylight and dark.

Scanning Imaging Absorption Spectrometer for Atmospheric Cartography (SCIAMACHY)

SCIAMACHY is an instrument which measures atmospheric trace gas and aerosol concentrations by observing reflected and scattered sunlight. Measurements obtained will enable the investigation of a wide range of phenomena which have a direct influence on atmospheric conditions including forest fires, dust storms, industrial pollution, volcanic activity and events associated with the Sun.



Ozone hole over the Antarctic



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ENVISAT

The Future

Europe's new eyes on the world

The fine balance of our planet's natural ecological system is gradually being altered by many of the normal activities associated with modern daily life that we all take for granted.

Mankind's influence on the environment and the exploitation of resources are now areas of growing public concern, intense scientific investigation and joint action by governments worldwide.

Understanding the process of change is therefore vital if we are to repair some of the long term damage being done to the Earth and prevent the possibility of major catastrophes in the future.

Part of Europe's contribution to addressing this worldwide problem comes in the shape of ENVISAT, a sophisticated satellite developed under contract to the European Space Agency (ESA) in response to the increasing need to provide international scientists with remote sensing data to chart, document and forecast the changes to our environment and climate.

ENVISAT is an Earth observing satellite with a unique combination of sensors that will vastly improve the range and accuracy of scientific measurements of the atmosphere, oceans, land surface and ice. Its total range of capabilities far exceeds those of any previous or planned Earth observation satellite.



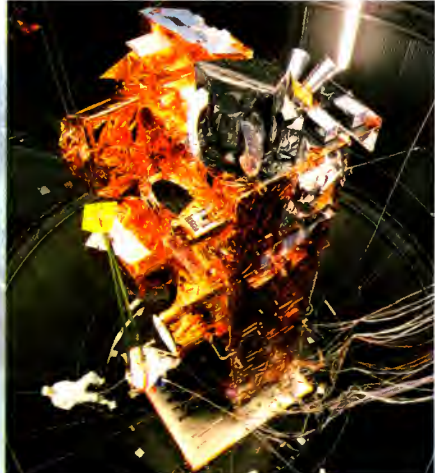
ENVISAT will also provide more opportunities for developing and improving the application of Earth observation data in commercial and operational fields.

Among other things, it will allow Europe to continue the development of a global data bank of measurements extending over almost two decades - giving scientists a realistic period of time within which to analyse longer term trends and changes.

As a successor to ESA's highly successful ERS-1 and ERS-2 spacecraft launched in 1991 and 1995, ENVISAT is a tool that will help to put Europe in a position to meet the environmental, economical and political challenges of the 21st Century.

ENVISAT will be launched by Ariane 5 in mid 2001.

ENVISAT during test in the Thermal Vacuum Chamber



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*Photos courtesy of the Bickerton



Oil Pollution



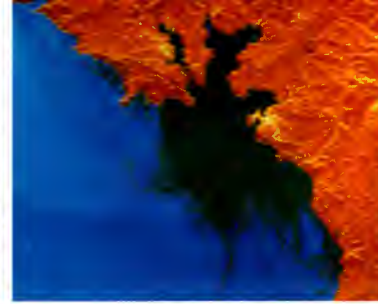
Deforestation *



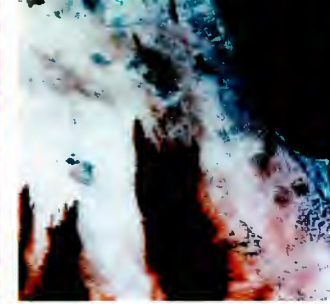
Flood



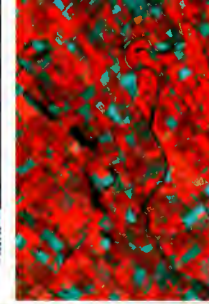
Desertification *



Oil slick off Spanish coast



Kuwait oil well fires



Agricultural land use



Development Programme

The ENVISAT mission is implemented through three major contracts of the European Space Agency:

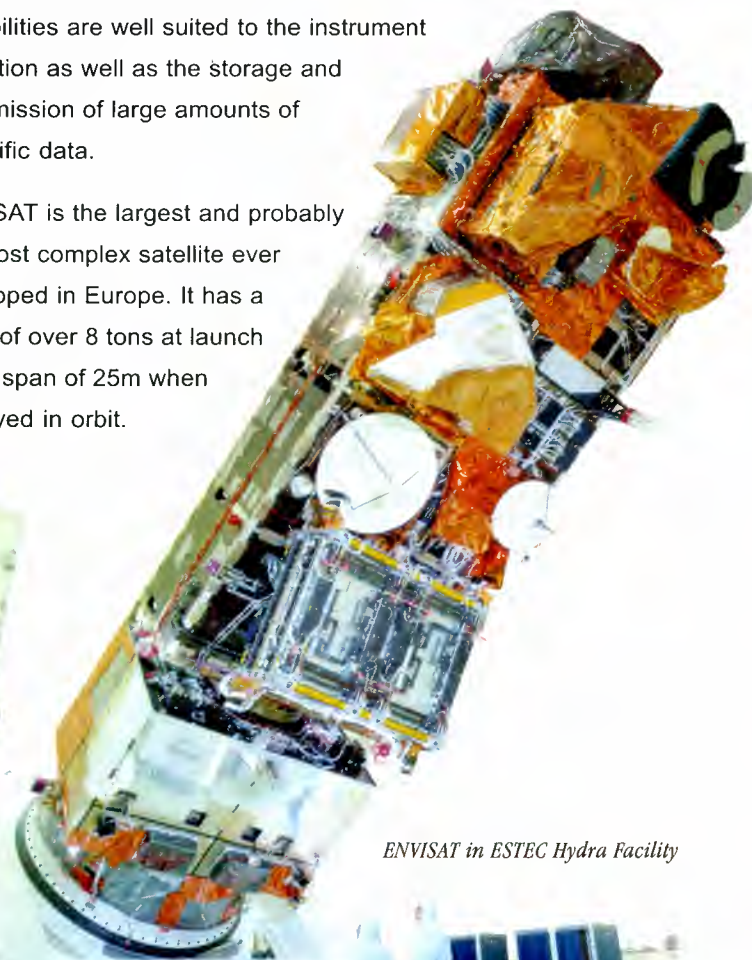
- The Polar Platform under the leadership of Astrium Limited, formerly Matra Marconi Space
- The ENVISAT Instruments under the leadership of Astrium GmbH formerly Dornier Satellitensysteme GmbH
- The ENVISAT ground segment under the leadership of ALCATEL

The industrial consortia developing ENVISAT comprise overall more than 100 companies.

ENVISAT Polar Platform

The large, modular construction of the Polar Platform provides accessible accommodation and unobstructed field of view for the various instruments. Its power distribution, data handling and communication capabilities are well suited to the instrument operation as well as the storage and transmission of large amounts of scientific data.

ENVISAT is the largest and probably the most complex satellite ever developed in Europe. It has a mass of over 8 tons at launch and a span of 25m when deployed in orbit.



ENVISAT in ESTEC Hydra Facility

Data Handling and Services

Extensive facilities are required on the ground to support the ENVISAT mission, both to command and control the satellite, and to handle the large volume of data provided by the onboard instruments.

ESA's European Space Operations Centre (ESOC) in Darmstadt, Germany, will be responsible for the command and control.

The data from the payload will be received at the ground stations in Kiruna, Sweden, and Fucino, Italy, and through the data relay satellite system, ARTEMIS.

ESA's ARTEMIS satellite, combined with the onboard solid state memory, will allow recovery of all data generated by ENVISAT covering the entire Earth surface.

The Payload Data Segment (PDS) comprises all services related to the acquisition, processing, distribution and archiving of ENVISAT data as well as user interface facilities. It will be coordinated by the Agency's data processing facility (ESRIN) in Frascati, Italy. PDS provides product distribution to users in both near real-time and off-line.

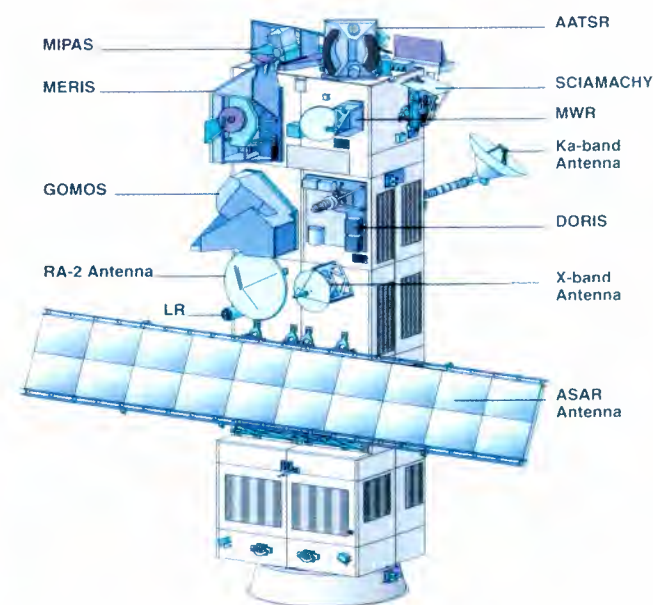
ENVISAT Characteristics

Launch	2001
Launcher	Ariane 5
Launch Mass	8200 kg
Payload Mass	2050 kg
Dimensions (deployed)	25 m x 10 m
Instruments	10
Solar Array Power	6600 W (end of life)
Payload Power	1700 W (day & night)
Orbit	Sun-Synchronous, polar
Altitude	800 km
Period	101 minutes
Cycle	35 day repeat

Instruments

The ENVISAT payload complement is designed to meet the general objective of observing the Earth's surface and its atmosphere from space, addressing a variety of complementary issues in the process, such as global warming, climate change, ozone depletion, and changes in oceans, ice sheets, vegetation and atmospheric composition. During five years of scheduled operations, ENVISAT will continue and extend the process of data gathering initiated by the ERS-1 and ERS-2 satellites. Its advanced instruments will, however, provide a wider range of applications and more flexible operations. The mission is also designed to meet some of the requirements related to global monitoring of the Earth as expressed by international initiatives, such as the World Climate Research Programme.

Achieving such goals and monitoring a complex system like the Earth's environment demands a highly specialised set of instruments which can operate in a wide cross-section of complementary scientific disciplines. The ENVISAT payload therefore comprises ten different instruments.



Advanced Synthetic Aperture Radar (ASAR)

ASAR, the largest ENVISAT instrument, produces high quality images of the oceans, coastal zones, polar ice and land regions by radar illumination of the Earth's surface and measurement of the reflected echoes. It will collect information on:

- ocean wave characteristics
- sea ice extent and motion
- snow and ice extent
- surface topography
- land surface properties
- surface soil moisture and wetland extent
- deforestation and extent of desert areas
- disaster monitoring, e.g. floods and earthquakes.

A major advantage of using radar for such tasks is its capability to produce images day and night without having to rely on favourable weather and clear skies. ASAR has five different modes of operation, allowing a variety of image types.

Medium Resolution Imaging Spectrometer (MERIS)

MERIS measures solar radiation reflected from the Earth's surface and clouds in the visible and infrared parts of the spectrum. MERIS will detect biophysical properties (e.g. chlorophyll concentration) of the oceans and coastal water composition which are especially important in understanding the impact of human activities on the coastal environment.

Advanced Along-Track Scanning Radiometer (AATSR)

AATSR will provide continuity with similar ATSR instruments on ERS, ensuring the production of a near-continuous 15 year data set of sea surface temperatures at an accuracy level of 0.3 °C or better. Sea surface temperature is one of the most stable of several geographical variables which, when determined globally, characterise the state of the Earth's climate system.

Kluane National Park, Canada showing surface topography



Deforestation in Brazil