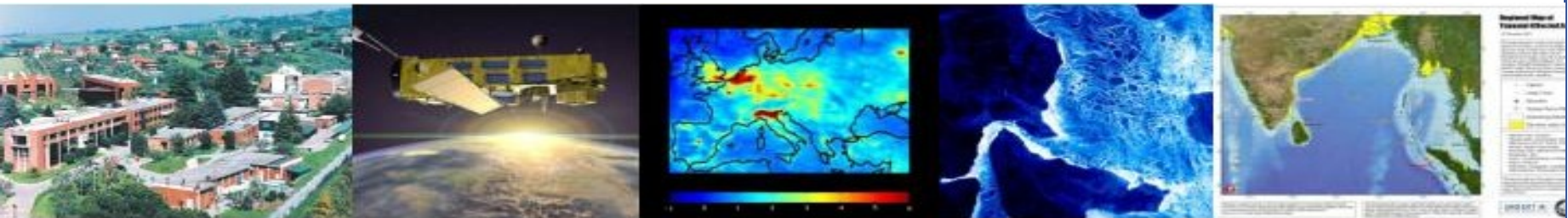


INTRODUCTION TO THE ESA EARTH OBSERVATION PROGRAMME. PROJECTS AND TOOLS FOR EDUCATION



Ana B. Ruescas

- The European Space Agency (ESA)
- Science from Space
- ESA and Earth Observation Programmes
- Earth Observation Applications
- ESA EO Education: available tools for schools
 - The Website EDUSPACE
 - The ESA School Atla
 - Charter for schools

European Space Agency

ESA Member States

- Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Norway, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom
- Canada takes part in EO projects under a cooperation agreement.



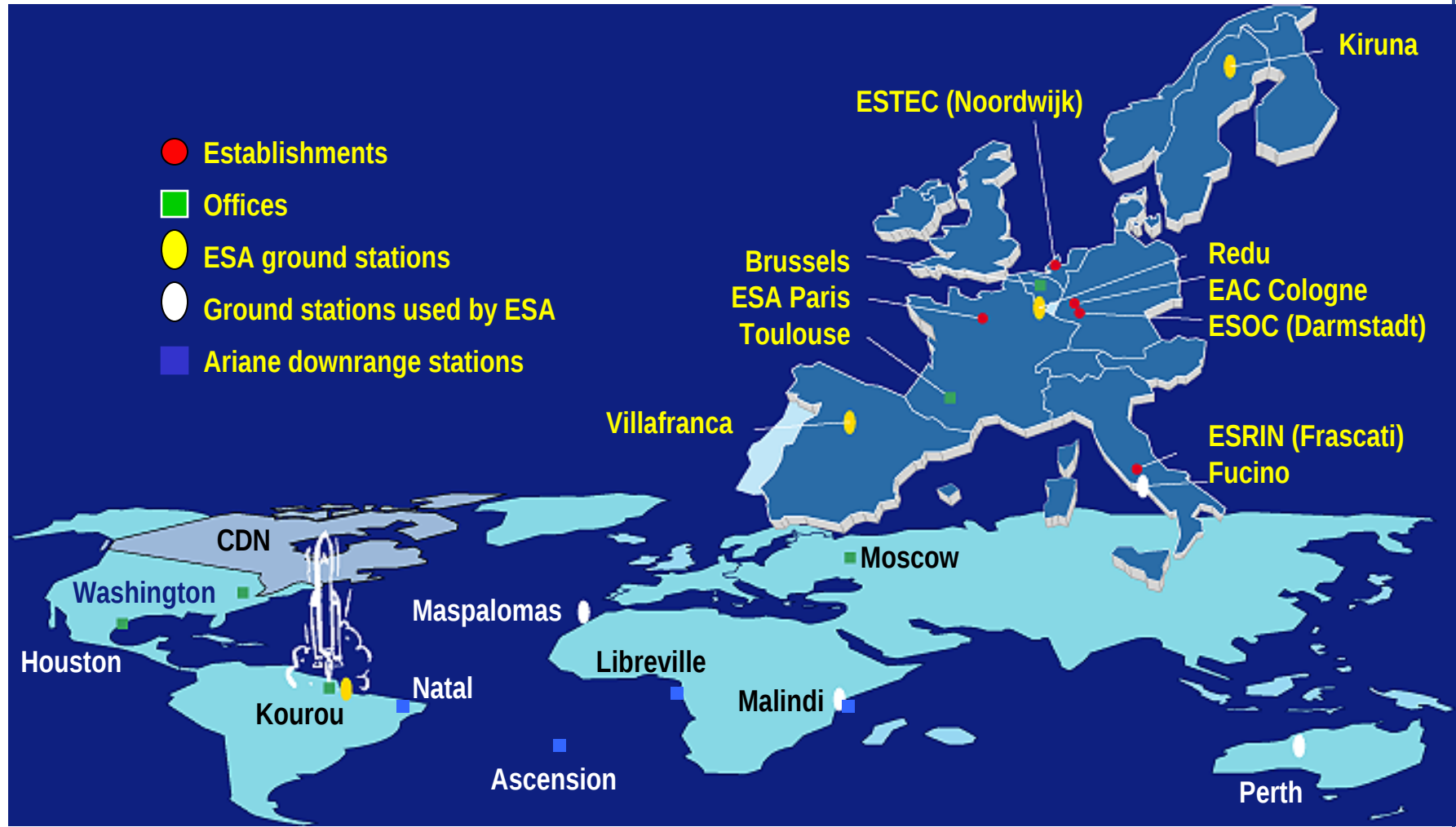
ESA, the European Space Agency, is an international organisation responsible for:

- **Space science, research & technology,**
- **Space applications**

ESA is running:

- space **activities** and programmes
- a long term **space policy**
- a specific **industrial policy**
- **coordination** with national space programmes



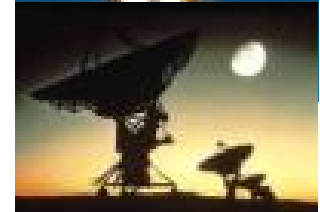
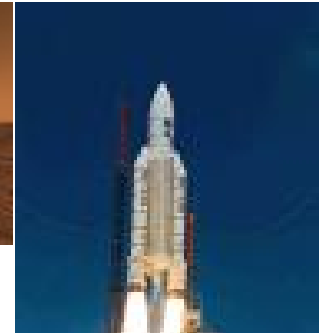
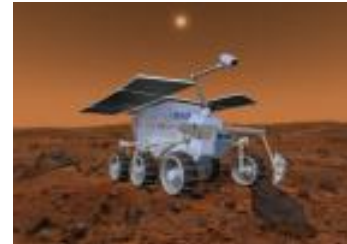


The ESA Programmes

All Member States participate in activities and a common set of programmes related to Space Science (**mandatory programmes**).

In addition, members chose the level of participation in so called **optional programmes**:

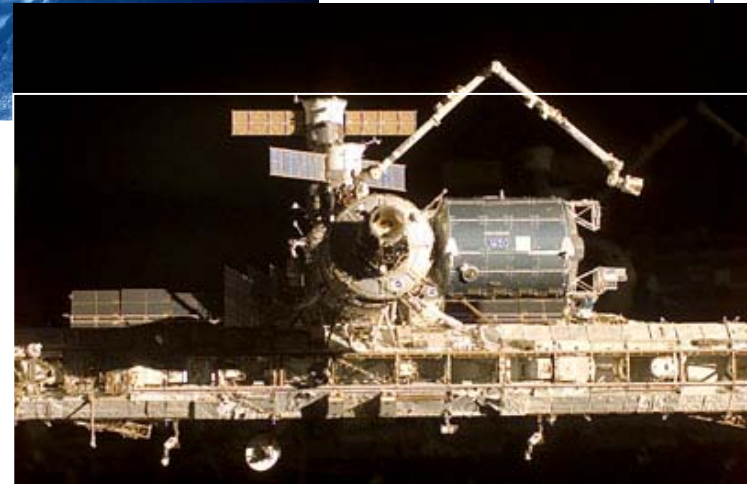
- Human space flight
- Microgravity research
- **Earth observation**
- Telecommunications
- Satellite navigation
- Launcher development



Science from Space



COLUMBUS LABOR

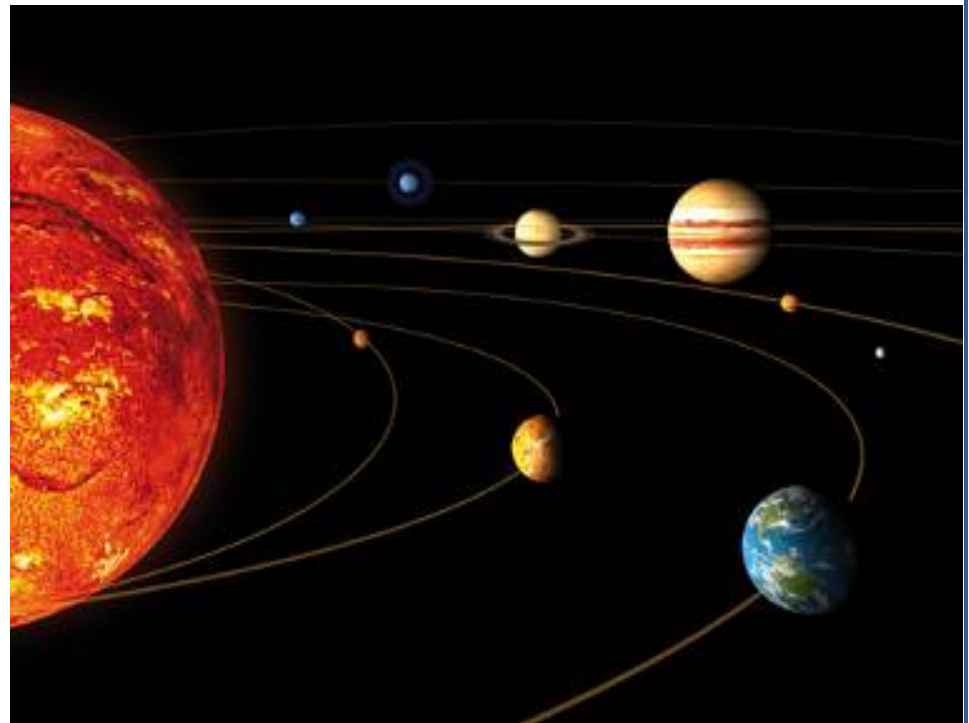


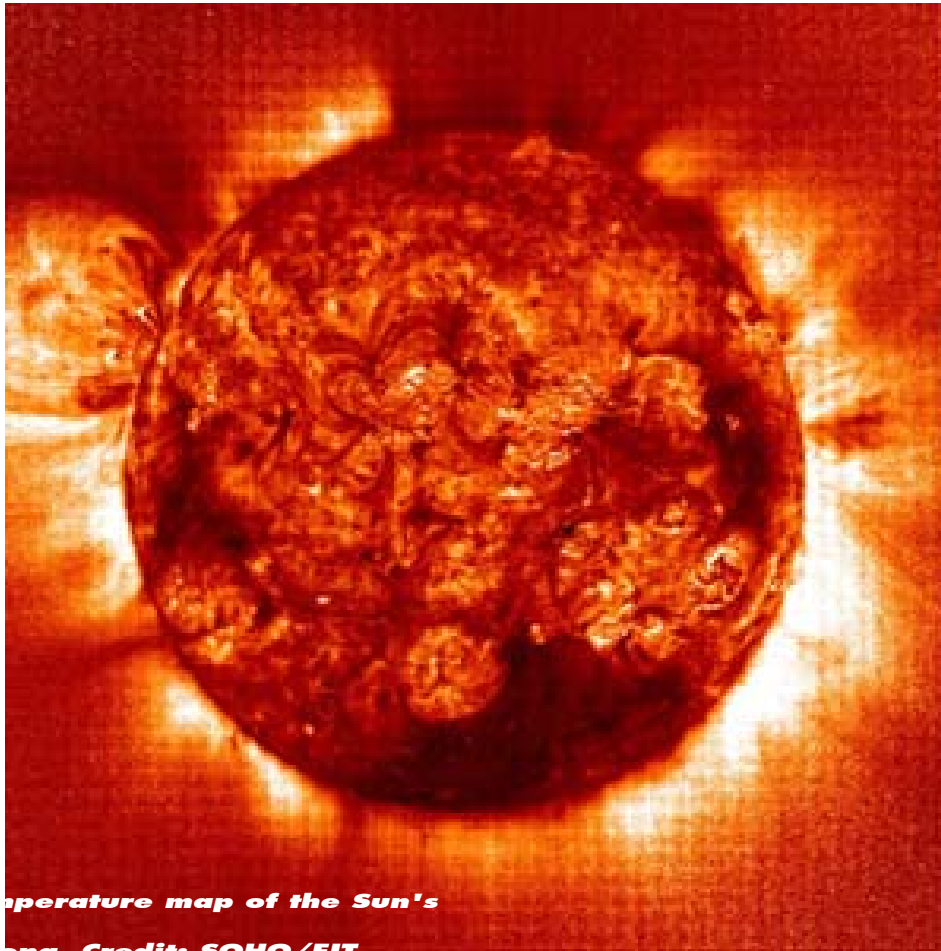
ISS visibility:

<http://spaceflight.nasa.gov/realdata/sightings/index.html>

For over 30 years ESA's space science projects have shown the scientific benefits of multi-nation cooperation.

1. Space environment of the Earth
2. Solar-terrestrial interaction
3. Interplanetary medium
4. Moon, planets and other objects
5. Stars and the universe
6. Fundamental Physics

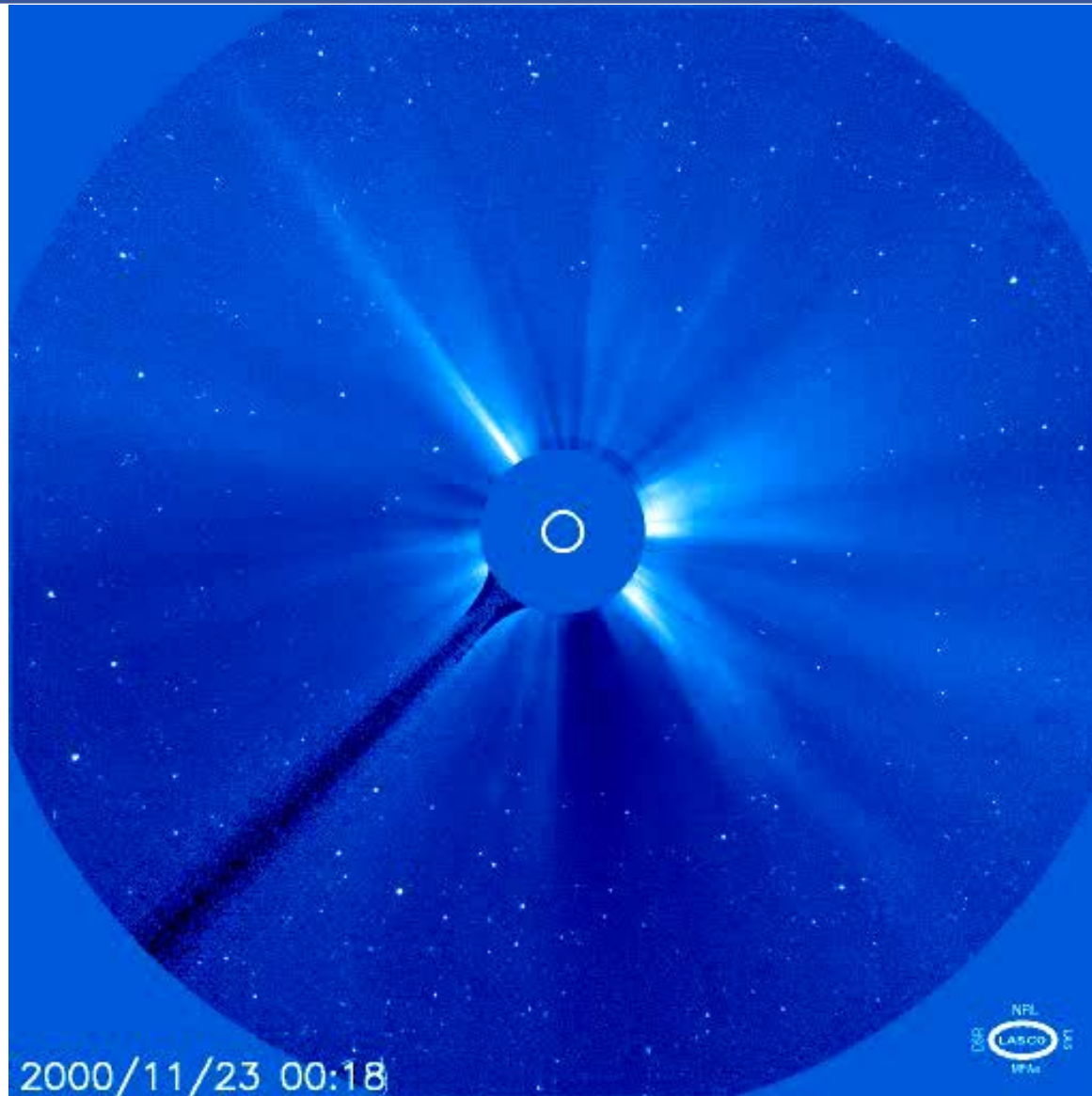




Soho

SOHO is in a [Halo-Orbit](#) with a radius of 600.000 km Radius around Lagrange-Point L1 (distance 1,5 Millions Km from Earth)





2000/11/23 00:18



Cassini and Huygens observes Titan, a moon of Saturn

14 January 2005

after its seven-year journey through the Solar System on board the Cassini spacecraft, ESA's Huygens probe has successfully descended through the atmosphere of Titan, Saturn's largest moon and safely landed on its surface




cassini-huygens
European Space Agency

[ESA](#)
[ESA Science](#)
[Cassini-Huygens](#)

08-Mar-2010



Unique insights into a ringed world...

About Cassini-Huygens...

About Saturn...

About Titan...

Meet the team...

Multimedia

- VideoTalk
- Cassini-Huygens images
- Cassini-Huygens videos
- Titan virtual tour
- Huygens probe descent - multilingual CD-rom
- Download wallpapers
- Download screensavers
- 3D Flash 'model'
- SOI animation
- Waiting for Titan - the human side of Huygens

Watch the event...

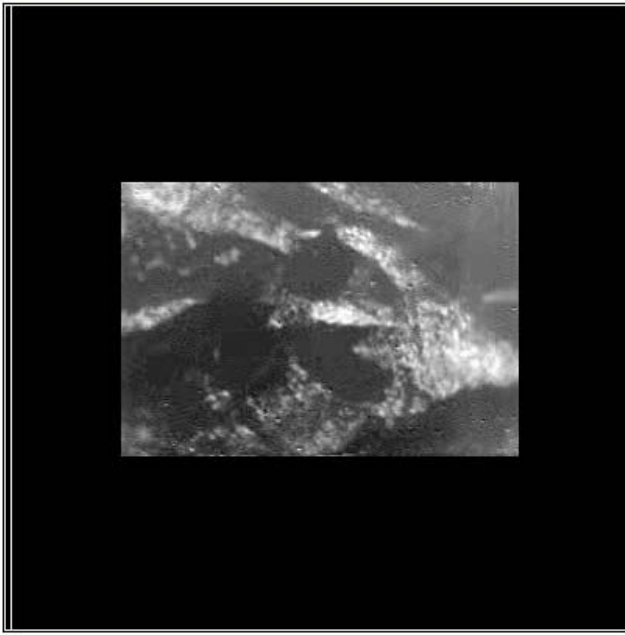
Services

Comments

Search

☐ All

☒ Space Science



Sounds of Titan



Huygens raw images



Titan first images



Where is Cassini now?

- Current positions

For the media

- Media Press Kit

In depth

- Huygens in-depth

For kids



Related links

- ESA Spacecraft Operations
- Web-Spezial in deutscher Sprache
- NASA JPL Cassini-Huygens site
- Italian Space Agency (ASI)
- Music2Titan.com

Fifth anniversary of the landing on Titan

14 January 2010 Five years ago today ESA's Huygens probe reached the upper layer of Titan's atmosphere and landed on the surface after a parachute descent of 2 hours and 28 minutes. As part of the joint NASA/ESA/ASI mission to Saturn and its moons, the Huygens probe was sent from the Cassini spacecraft to explore Titan, Saturn's largest moon.

Celebrating the fifth anniversary of Huygens' Titan touchdown

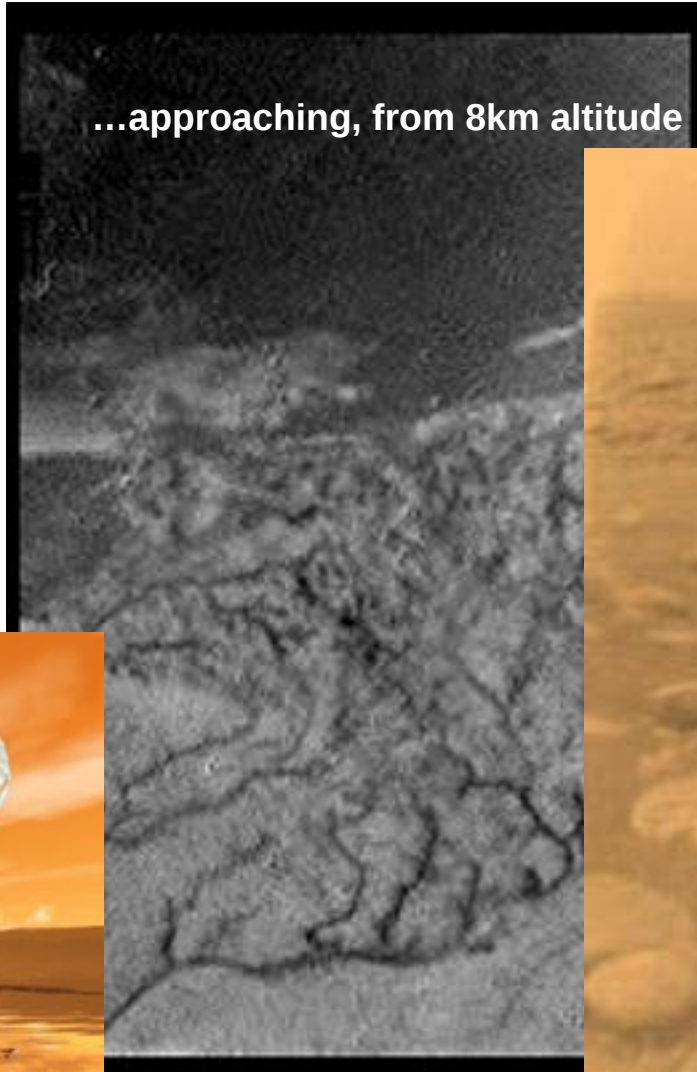


14 January 2010 Five years ago today, ESA's Huygens probe descended to the surface of Titan, Saturn's largest moon. Today planetary scientists from around the world have gathered in Barcelona to discuss the legacy of Huygens

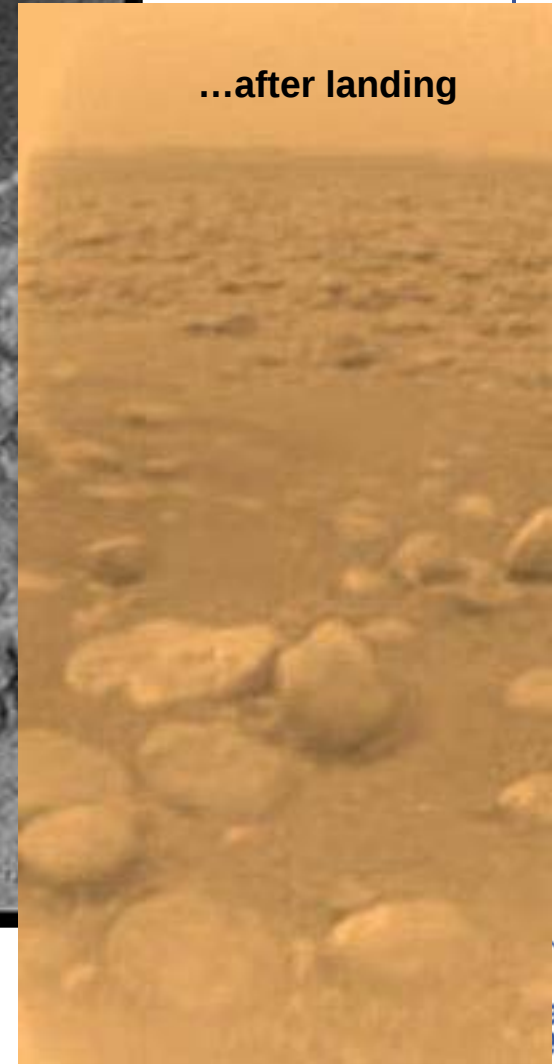
Image of the Sounder...



...approaching, from 8km altitude



...after landing



...and an artist's view



ESA NEWS:

5. September 2008 - Rosetta observes the Asteroid named „(2867) Steins“

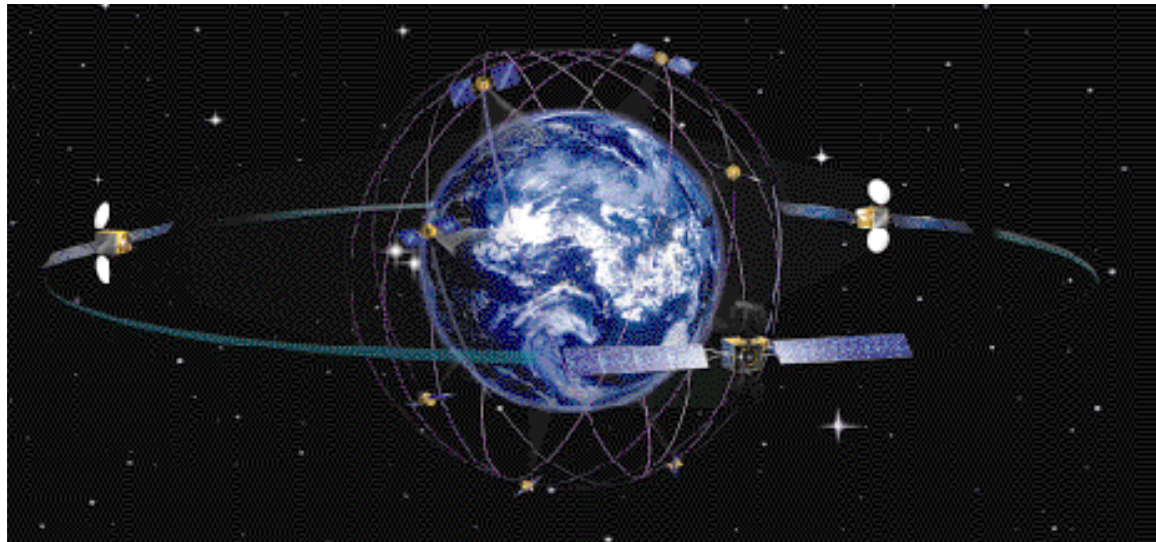


Artist's view

Rosetta is travelling since 2003 to the Cometen Churyumov-Gerasimenko, 11 years away

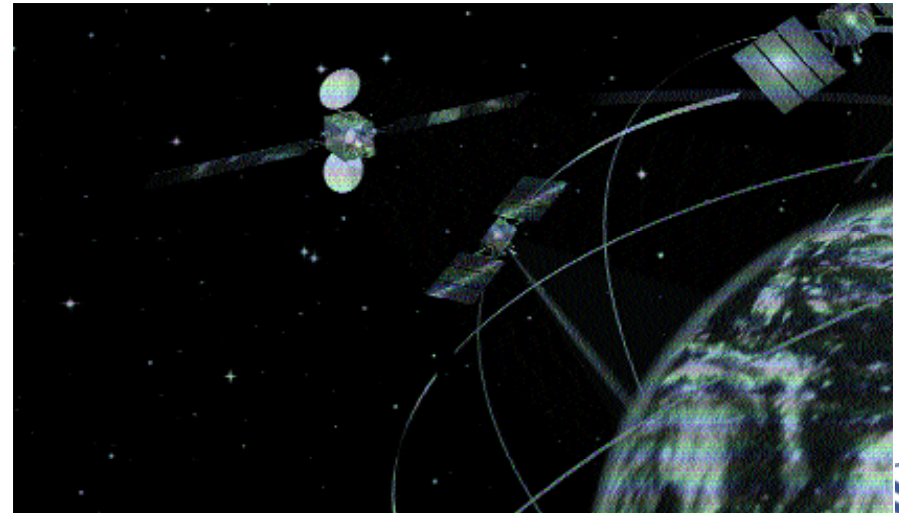


Rosetta acquired this image during a „swing-by“ near the Earth, 23 Nov. 2007

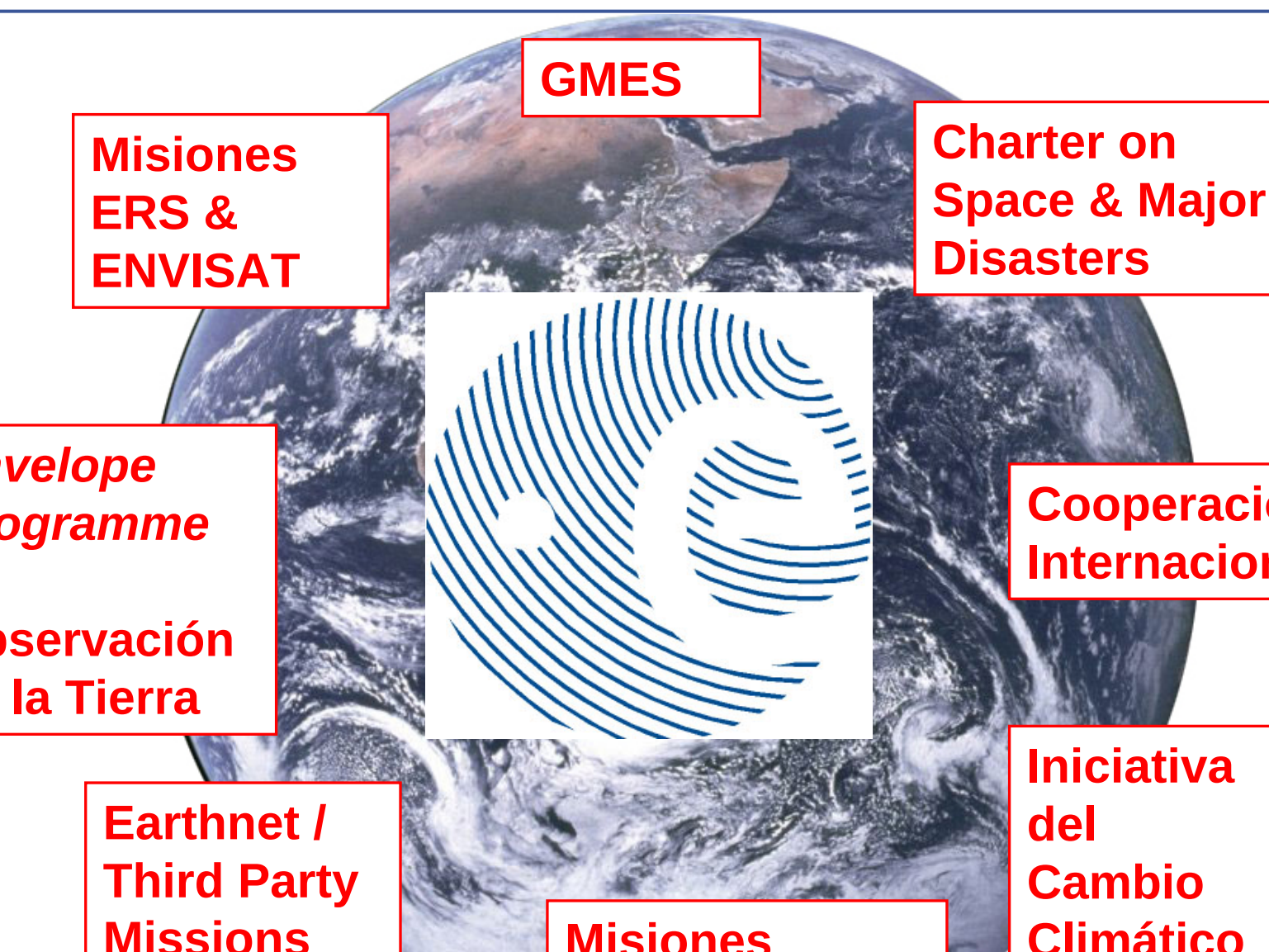


The EU/ESA Project

30 Communications- (EGNOS)
and Navigation satellites
(Galileo) to be launched



ESA and the EO programmes



GMES

**Misiones
ERS &
ENVISAT**

**Charter on
Space & Major
Disasters**

***Envelope
Programme
en
Observación
de la Tierra***

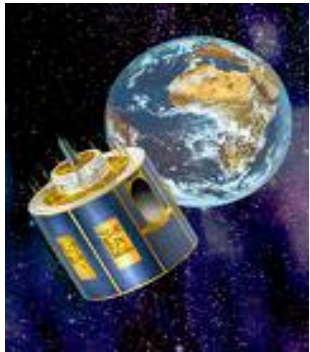
**Cooperación
Internacional**

**Earthnet /
Third Party
Missions**

**Iniciativa
del
Cambio
Climático**

**Misiones
meteorológicas**

Capacidad en expansión de la OT Europea



Since 1978

Meteosat

**Misiones
meteorológicas
geoestacionarias**



1991

ERS 1

**Océanos
Criosfera
Superficie terrestre
Climatología**

1995

ERS 2

**+ Ozono global
+ Superficie terrestre**



2002

ENVISAT

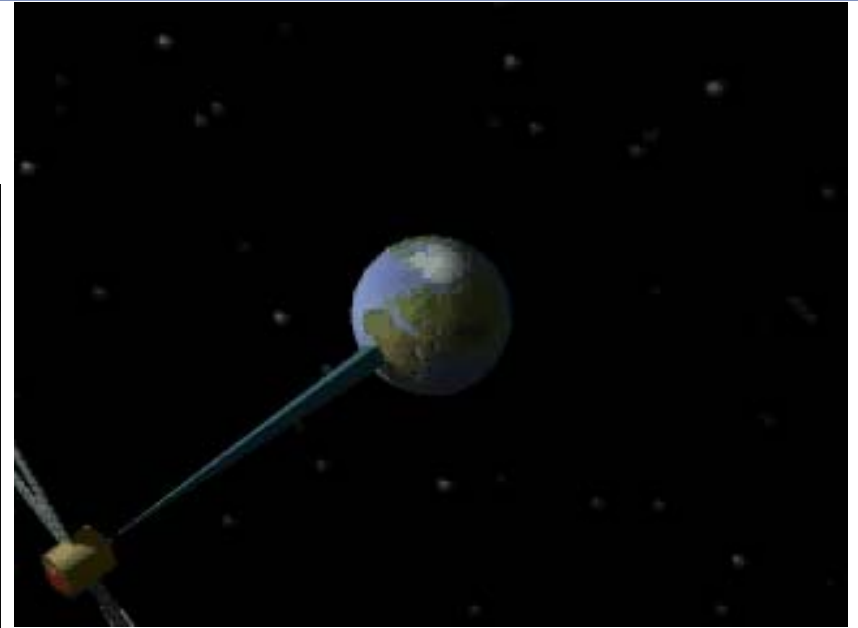
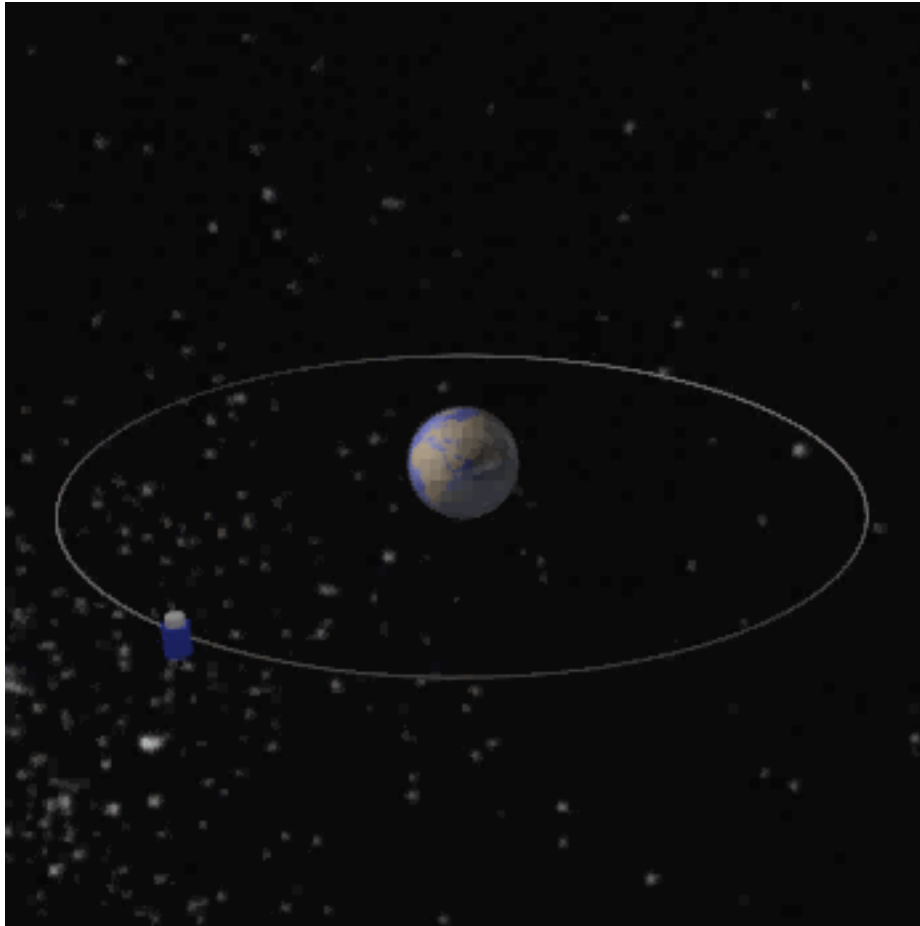
**+ Color océano
+ Constituyentes
atmosféricos**



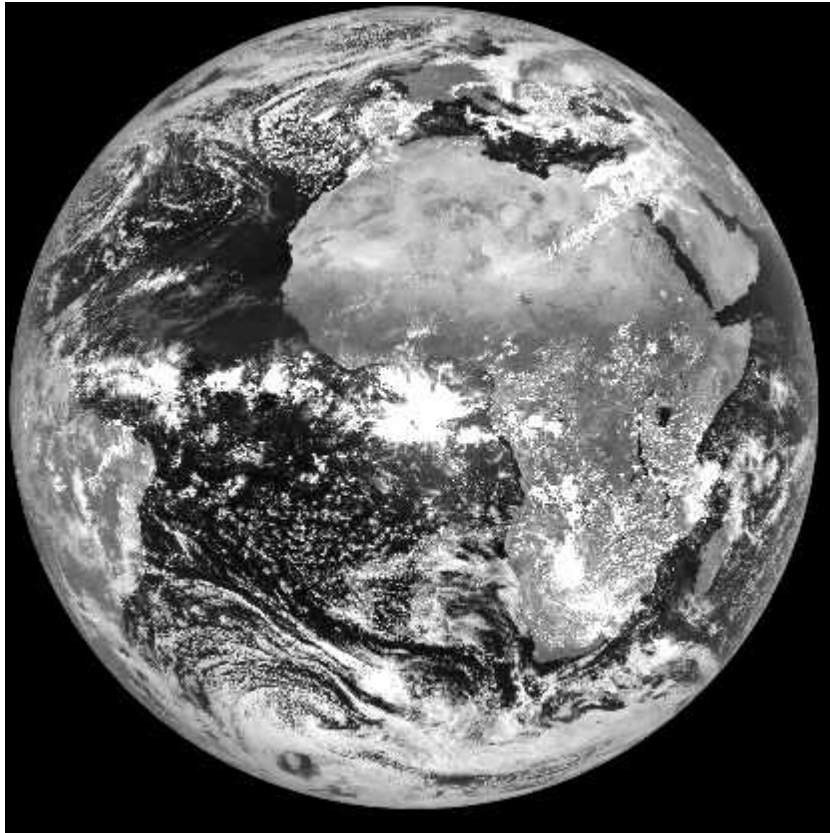
**Earth
Explorers**

**Sentinels /
GMES**



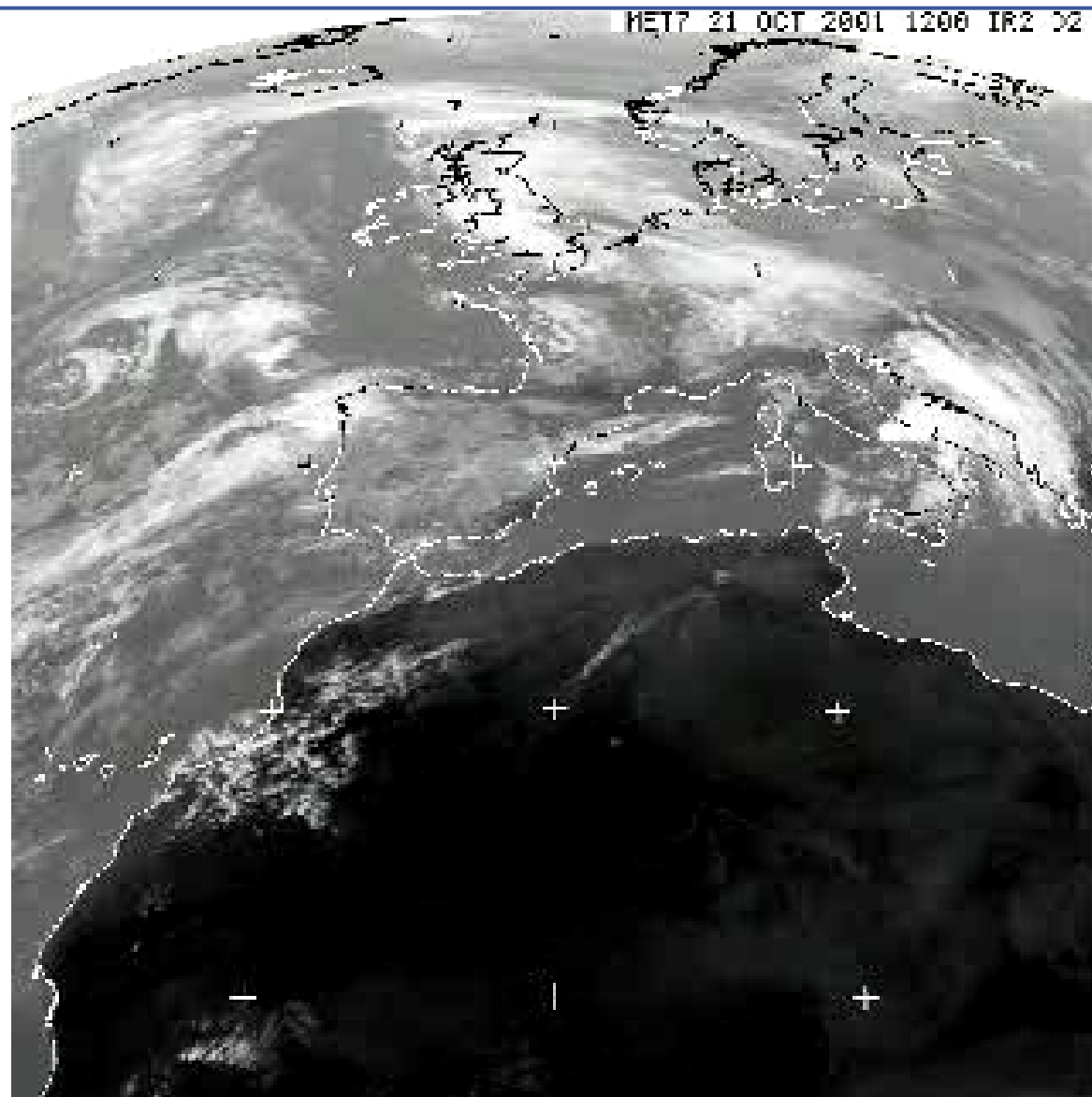


The geostationary orbit is quasi circular at 36000km altitude. One period lasts 24h, hence the satellite moves at the same angular speed as the Earth. The satellite seems fixed with respect to an observer on ground.



ESA has developed the Meteosat and MSG series of weather satellites, METOP, the environmental and climate research and monitoring satellites ERS-1 & 2 and Envisat, and recently launched its first Earth Explorer, respectively for:

- Meteorology
- Environmental & climate monitoring
- Earth resource management & other applications
- Better understand the earth



Development of the meteorological programmes:

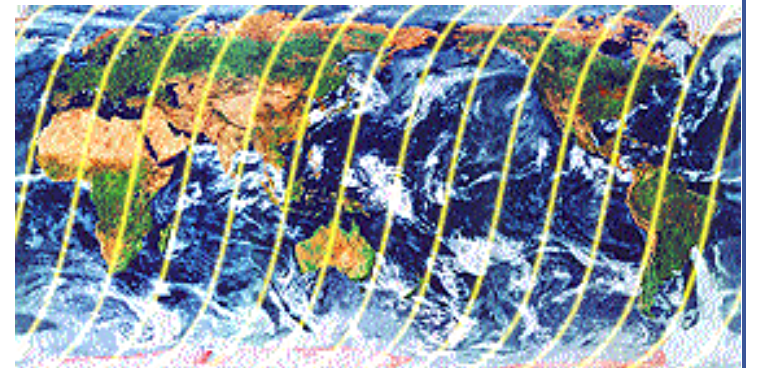
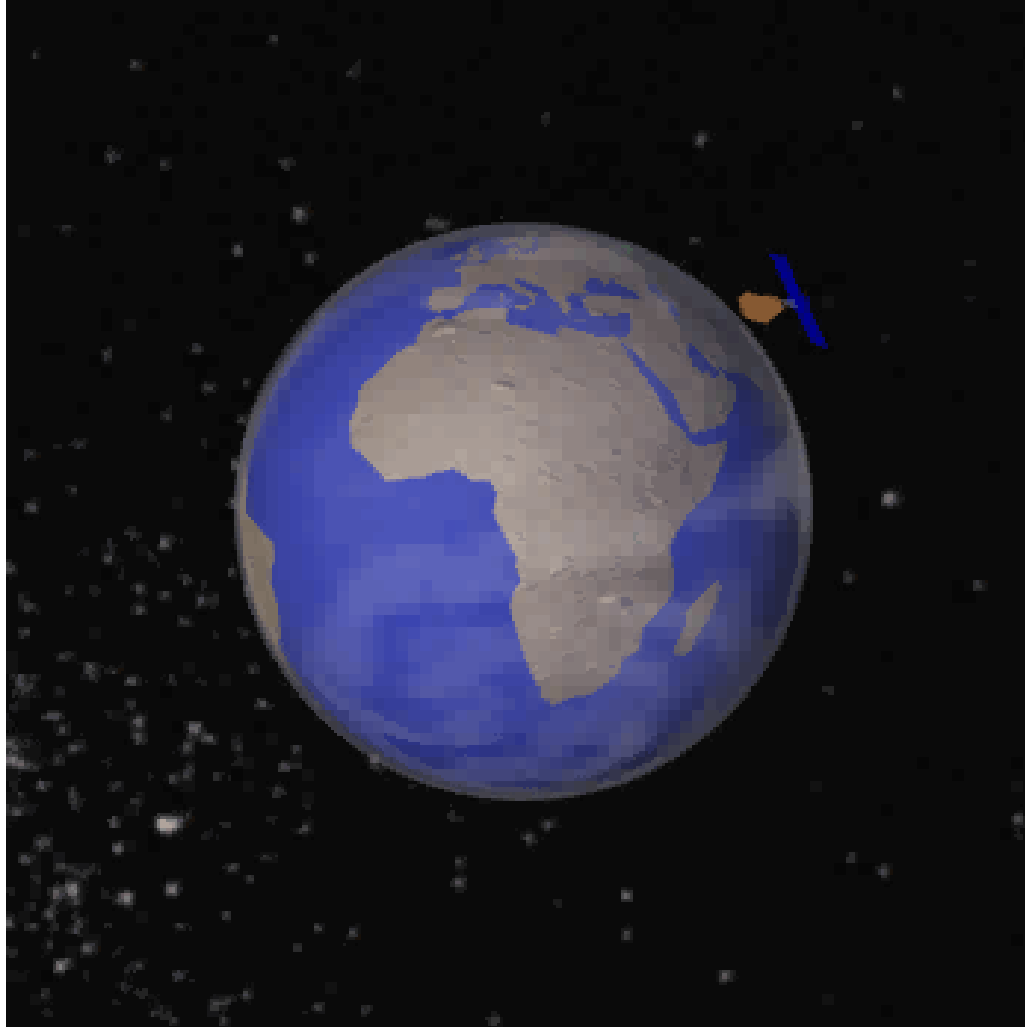


El MeteoSat Third Generation baseline es un sistema de dos plataformas (6 satélites)

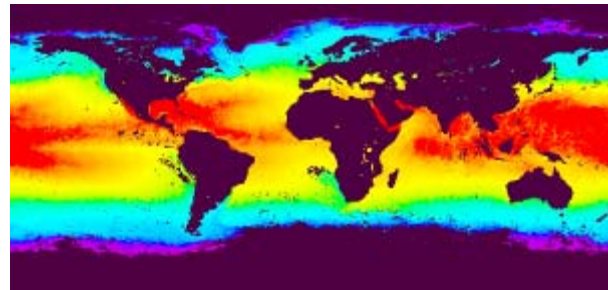
5 observation missions:

- HRFI: 5 channels
- FDHSI: 22 channels
- Lightning Imager
- Infra-Red Sounder

3-axis stabilised satellite



- Envisat 8 años operativo, ERS-2 14 años en el espacio
- Alrededor de 2600 usuarios/proyectos utilizan datos Envisat y ERS-2 30
- *Third Party Missions* para el beneficio de los usuarios europeos

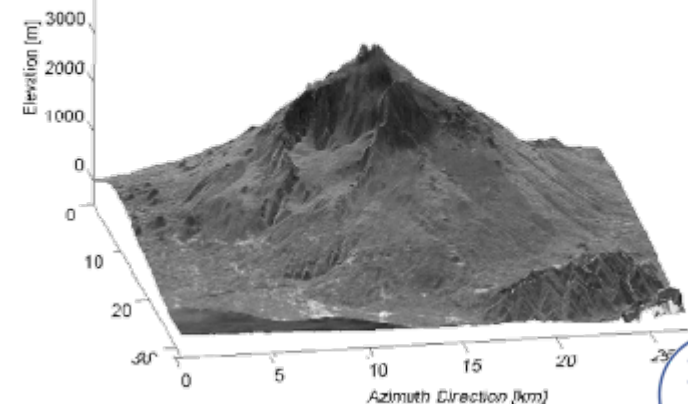
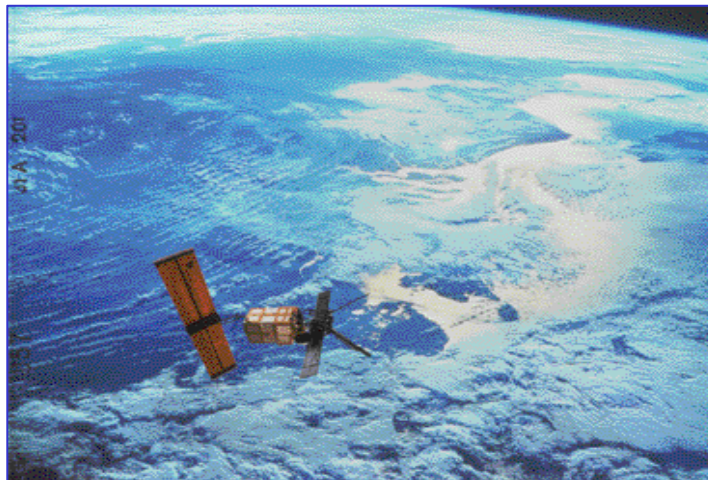
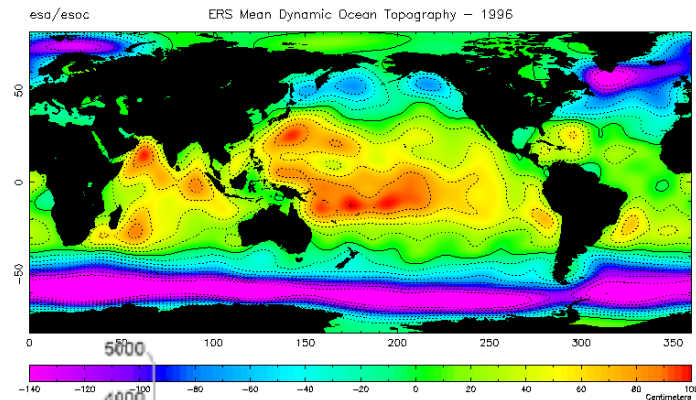


ERS 1 (1991 – 2000):
Oceans, sea ice, cryosphere, land
surface & climatology

ERS 2 (1995 – still operational):
(...) *plus* global ozone &
terrestrial biosphere monitoring

Results of 16 years ERS missions:

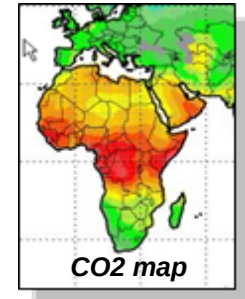
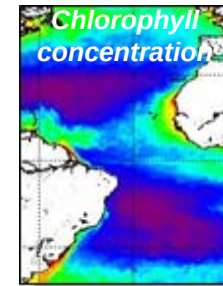
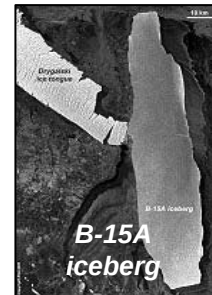
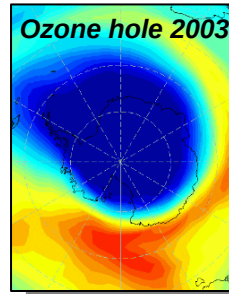
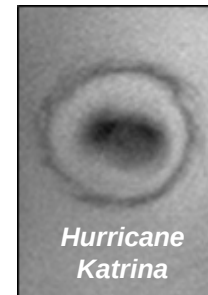
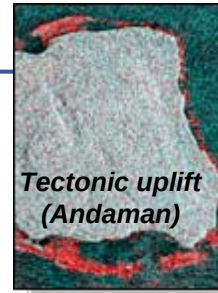
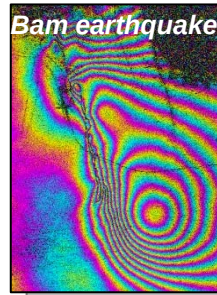
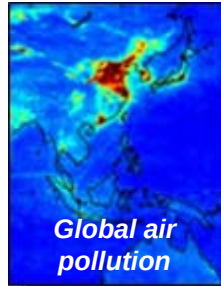
- wealth of science and application results
- consolidation of a large EO community
- basis for long-term environmental monitoring



Etna DEM

ENVISAT mission: 7 years !

First images



Launch

Calibration Review

Validation Workshop

MERIS Workshop

InSAR Workshop

Envisat Symposium Salzburg (A)

MERIS (A)TSR Workshop

InSAR Workshop

Altimetry Conference

Atmospheric Science Conference

Envisat Symposium Montreux (CH)

InSAR Workshop

Mar 02
European Space Agency
Agence spatiale européenne

Sep 02

Dec 02

Nov 03

Dec 03

Sep 04

Sep 05

Dec 05

Mar 06

May 06

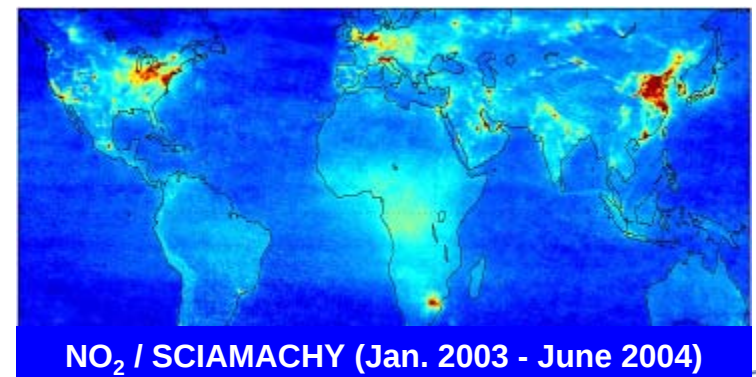
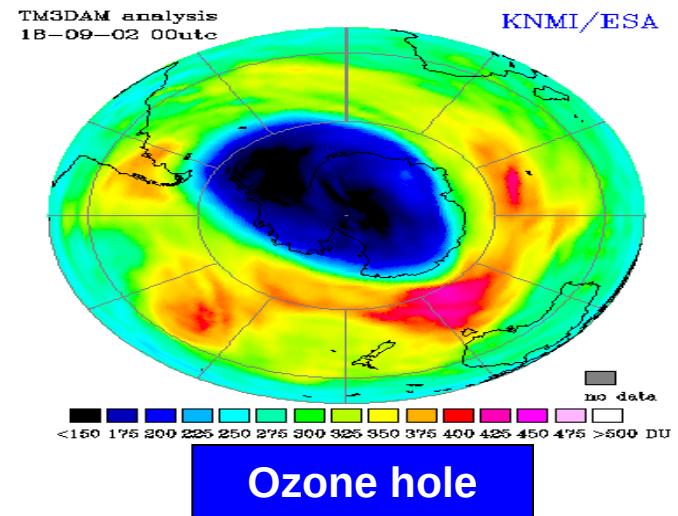
Apr 07

Dec 07

~2000 scientific projects
+ several GMES pre-operational projects

Major scientific results of ENVISAT and ERS

- **Climate change:** Global sea level rise of ~3mm/year and sea surface temperature increase of ~0.1 deg. C since 1992 (Envisat + ERS).
- **Atmosphere:** Worldwide monitoring of air pollution, with evidence of fast growing air pollution in China since 1995 (Envisat + ERS-2).
- **Polar areas:** Daily monitoring of sea ice motion and observation of Antarctica ice-shelves collapse.
- **Oceanography:** Quantification of global chlorophyll concentration, an index of the oceanic phytoplankton biomass.
- **Tectonics:** Identification of the blind tectonic fault at the origin of the Bam earthquake in December 2003.



MetOp

- El EPS es el primer sistema de satélites meteorológicos de órbita polar europeo.
- Vuelan a una altitud mucho más baja que los satélites meteorológicos (~800 km) Meteosats y proporcionan detalles más precisos de la temperatura atmosférica y los perfiles de humedad.
- Desarrollado con la colaboración de ESA y EUMETSAT.



*Launch of
MetOp-A in 2006*

GOCE

17 March
2009



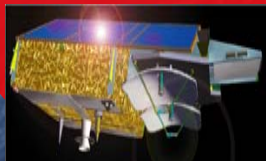
SMOS

November
2009

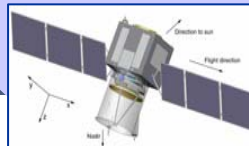


Cryosat

Feb. 2010



**ADM
AEOLUS**

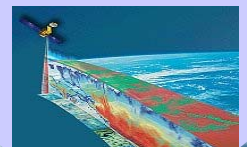


SWARM



7th EE

**EARTH
CARE**



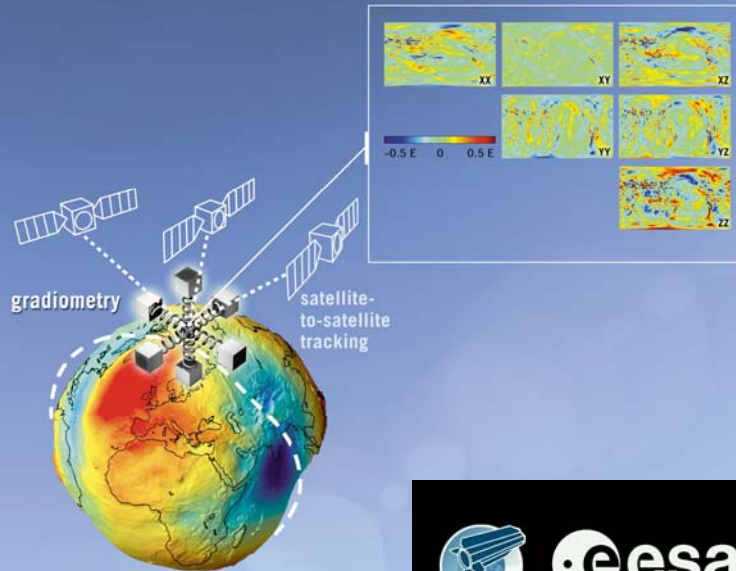
The Earth Explorer Missions

GOCE: Gravity field and steady-state Ocean Circulation Explorer

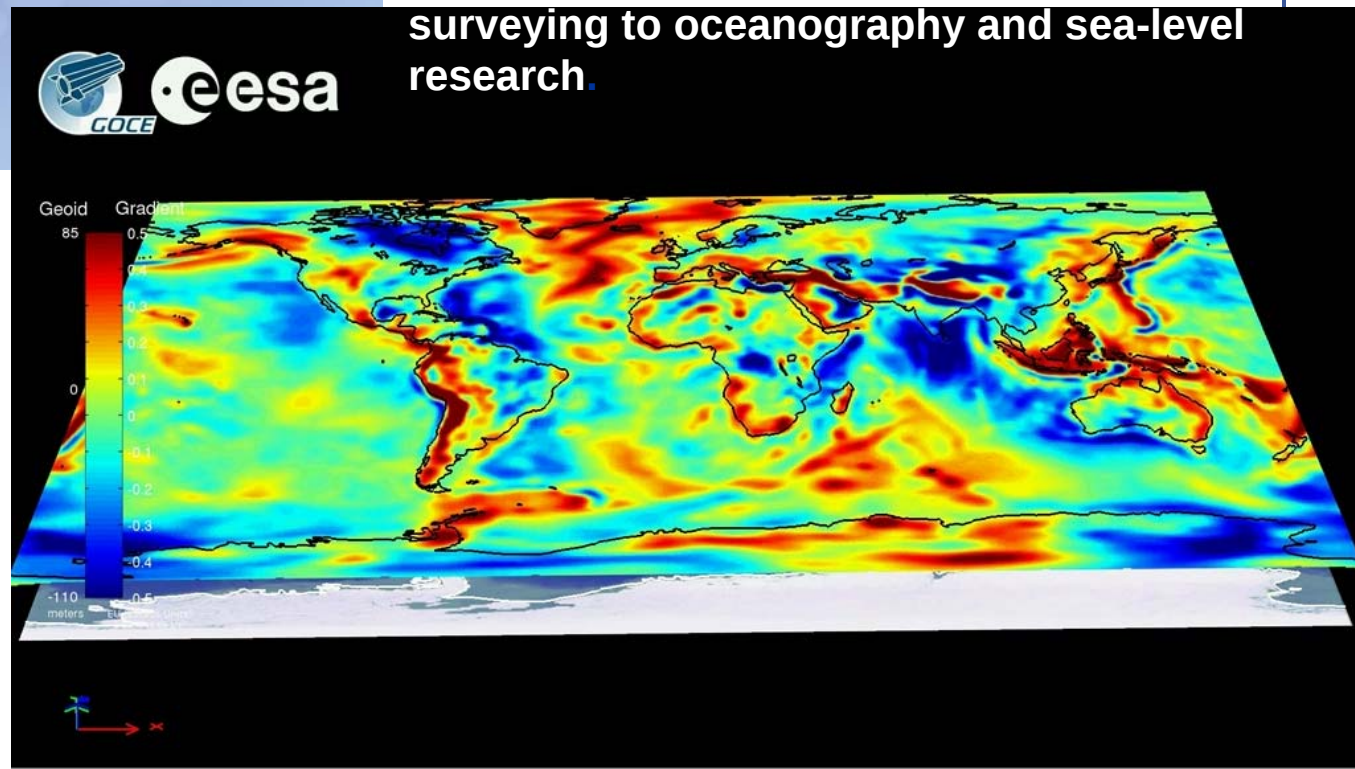


GOCE_liftoff_36s.wmv





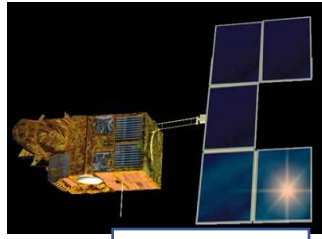
GOCE is now gathering data such as shown here to map Earth's gravity with unprecedented accuracy and spatial resolution. The final gravity map and model of the geoid will provide users worldwide with well-defined data products that will be instrumental in advancing science and applications in a broad range of disciplines. These will range from geodesy, geophysics and surveying to oceanography and sea-level research.



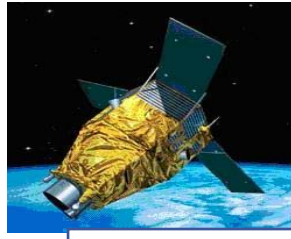
National, Eumetsat and Third Party Missions for GMES



Radarsat



SPOT



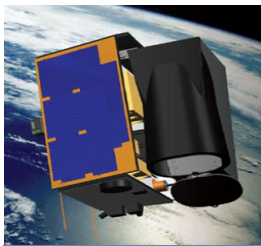
Pleiades



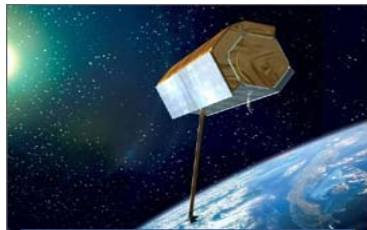
Jason-2



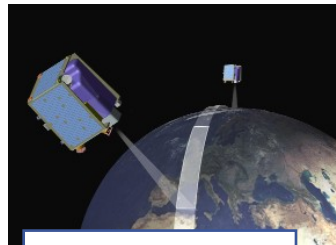
CosmoSkymed



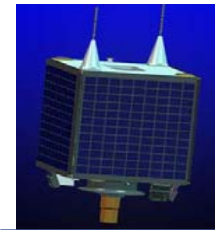
TopSat



Terrasar-X



RapidEye

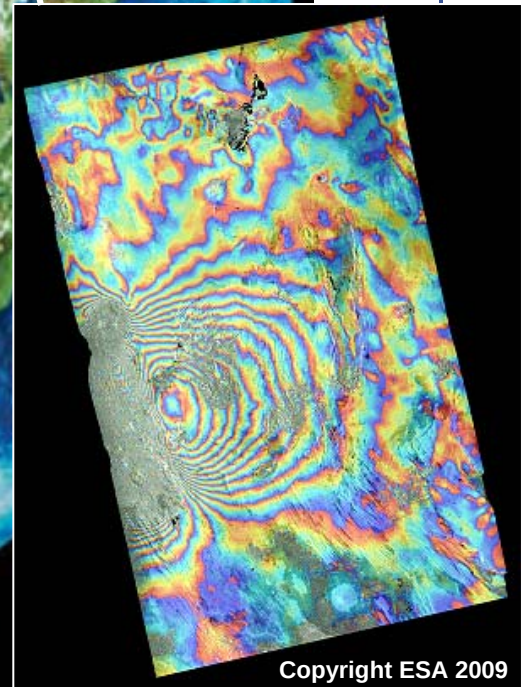
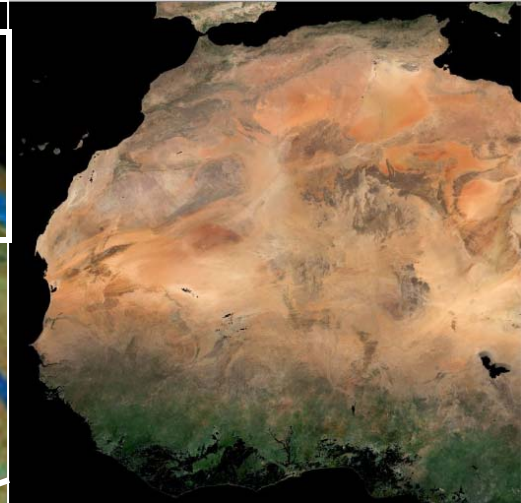
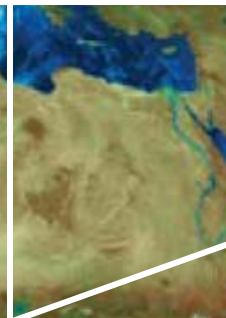
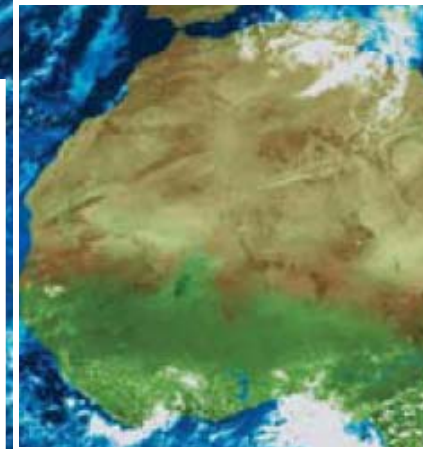
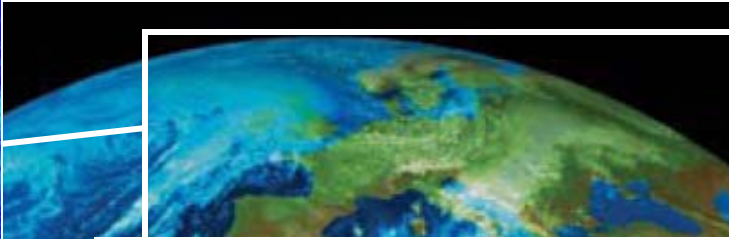
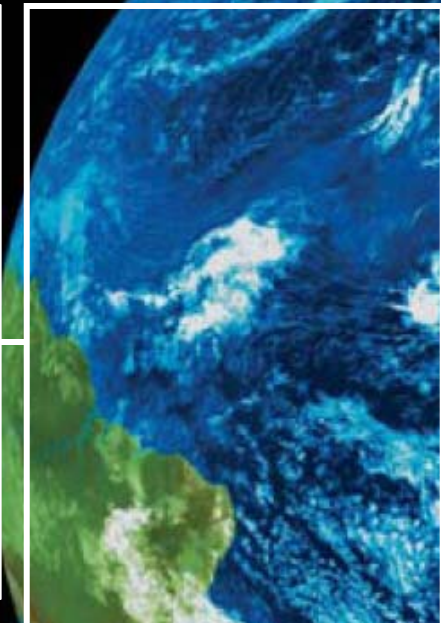
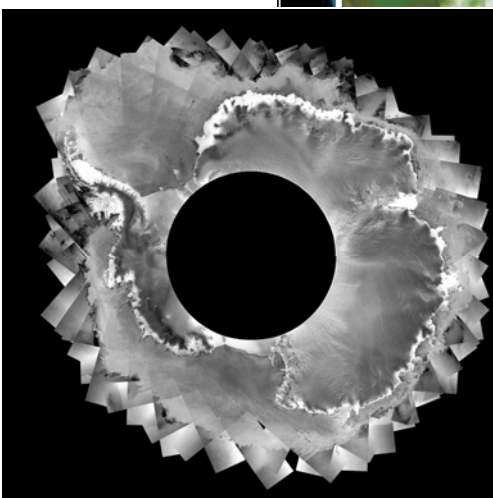
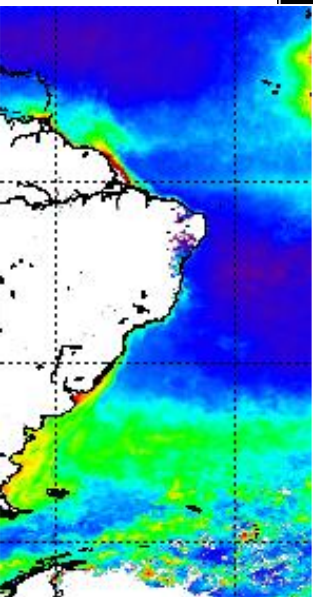
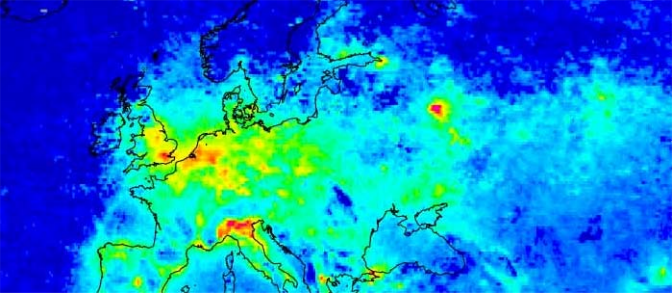


UK-DMC



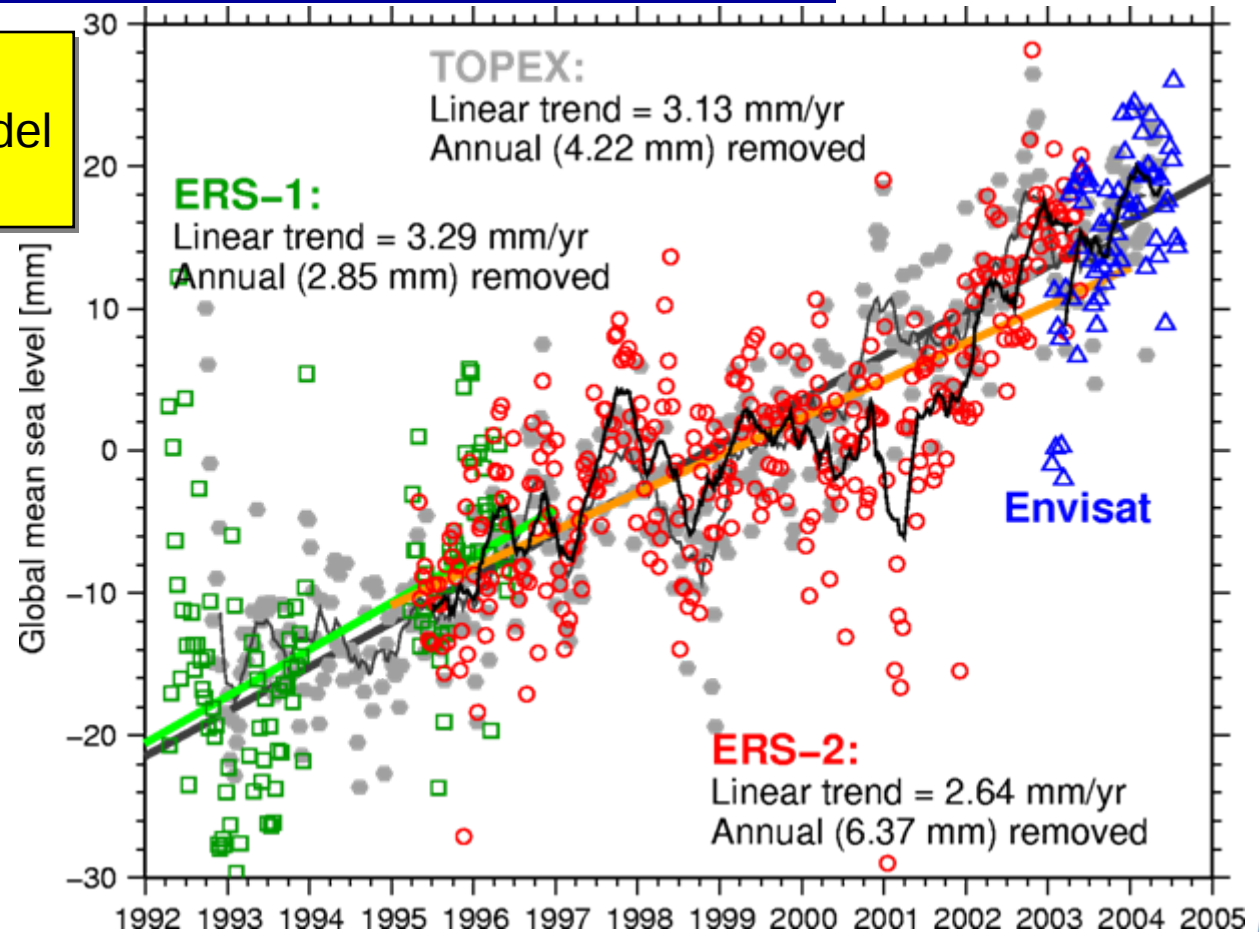
METOP

EO Applications

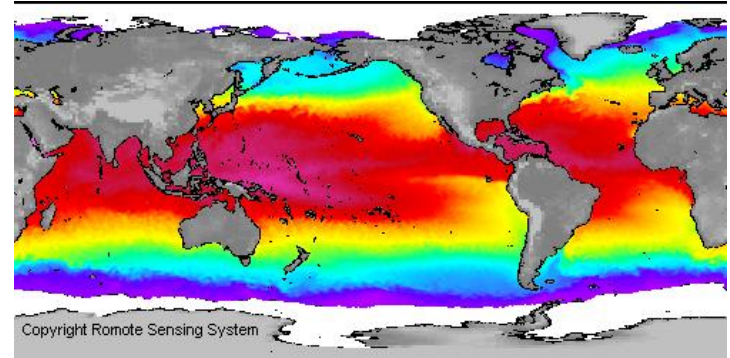


El altímetro de ENVISAT proporciona continuidad en las medidas iniciadas al principio de los años 90

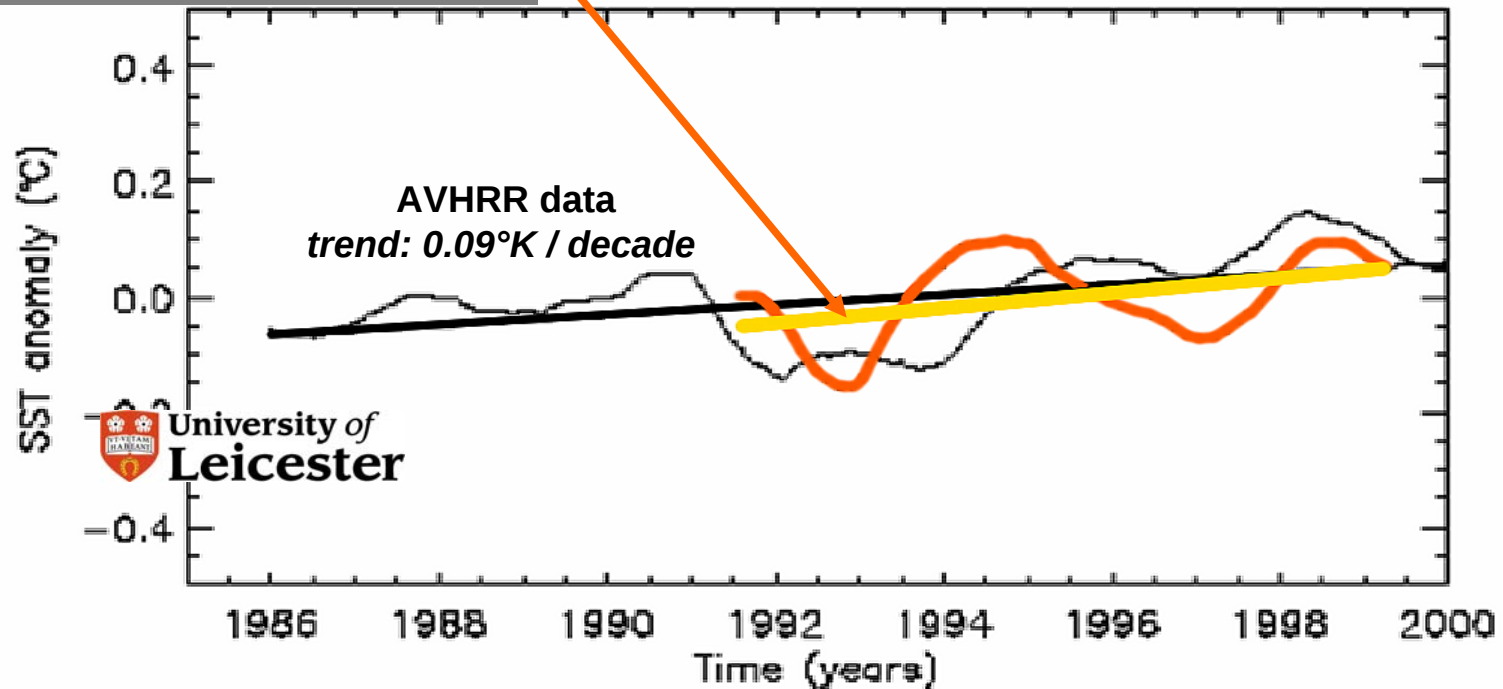
Tendencia de elevación del nivel del mar: +3 mm/año



Medidas de la tendencia residual en la temperatura global de la superficie del mar

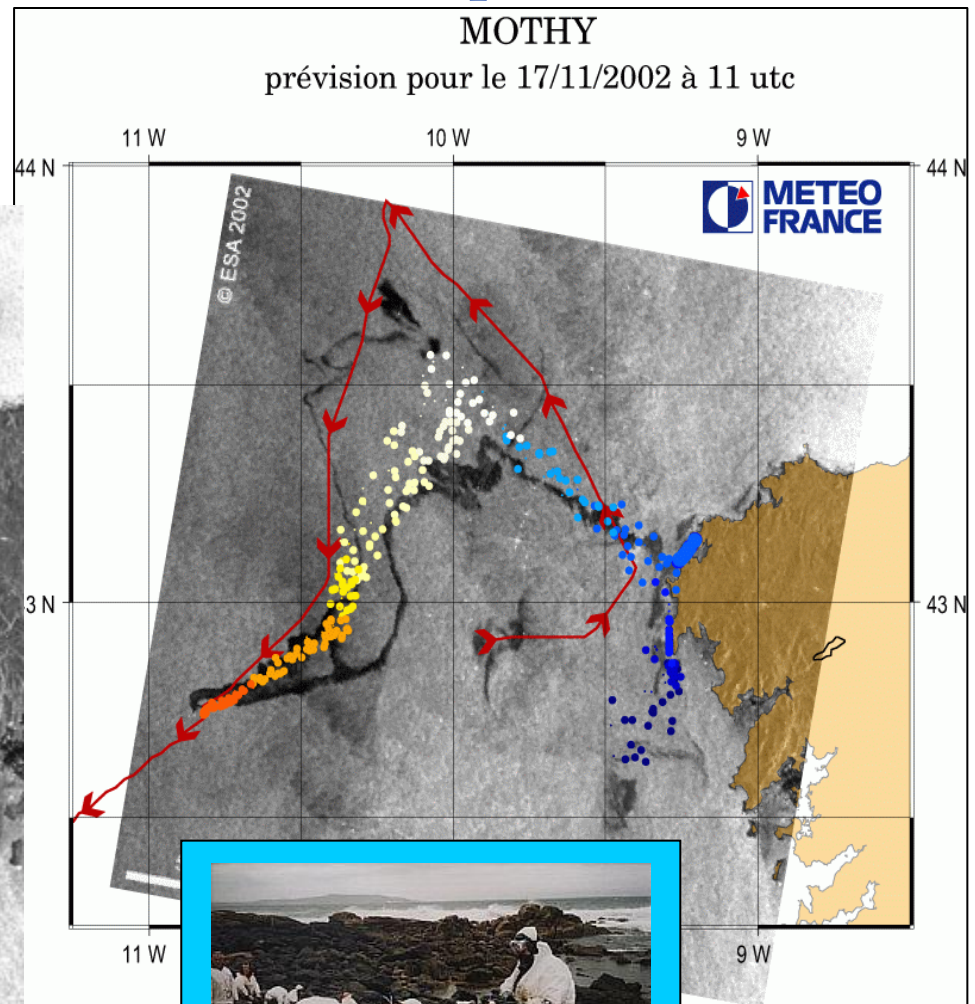
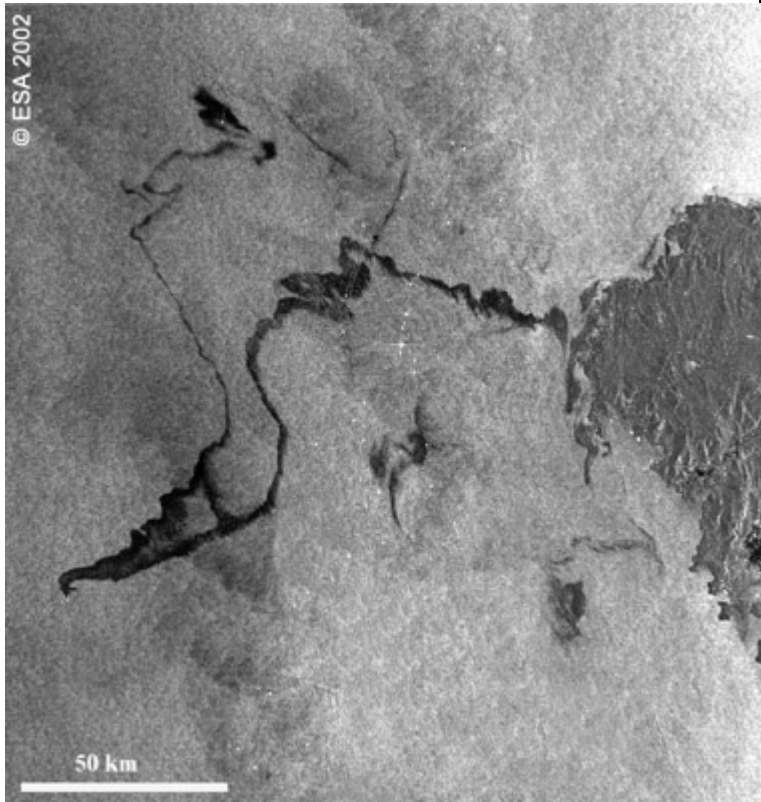


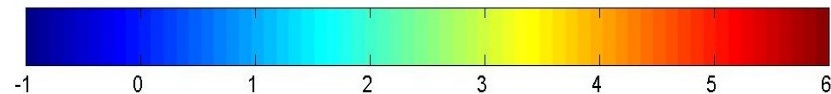
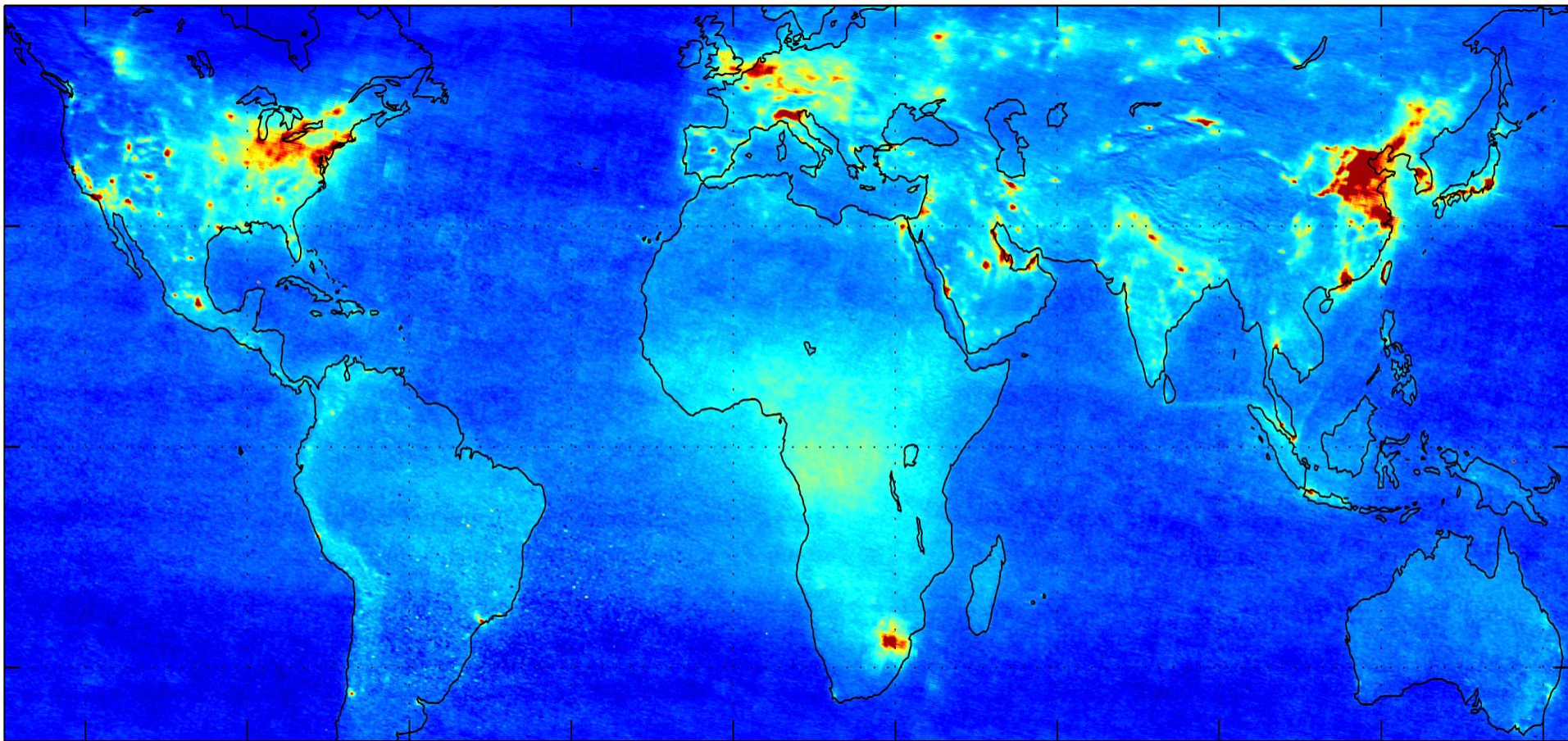
ERS / Envisat
Tendencia: $+0.13^{\circ}\text{K}$ /
decada



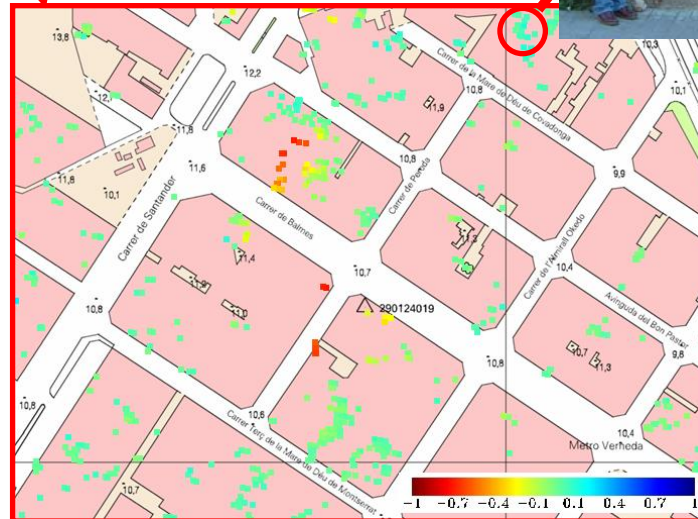
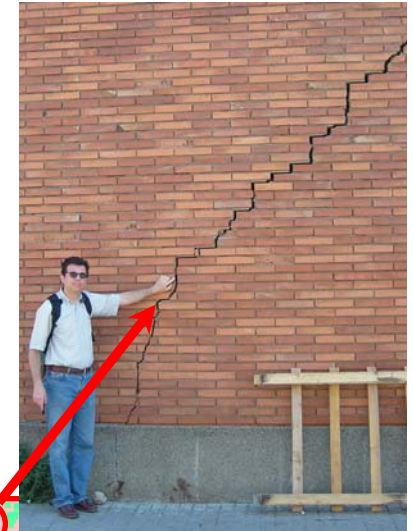
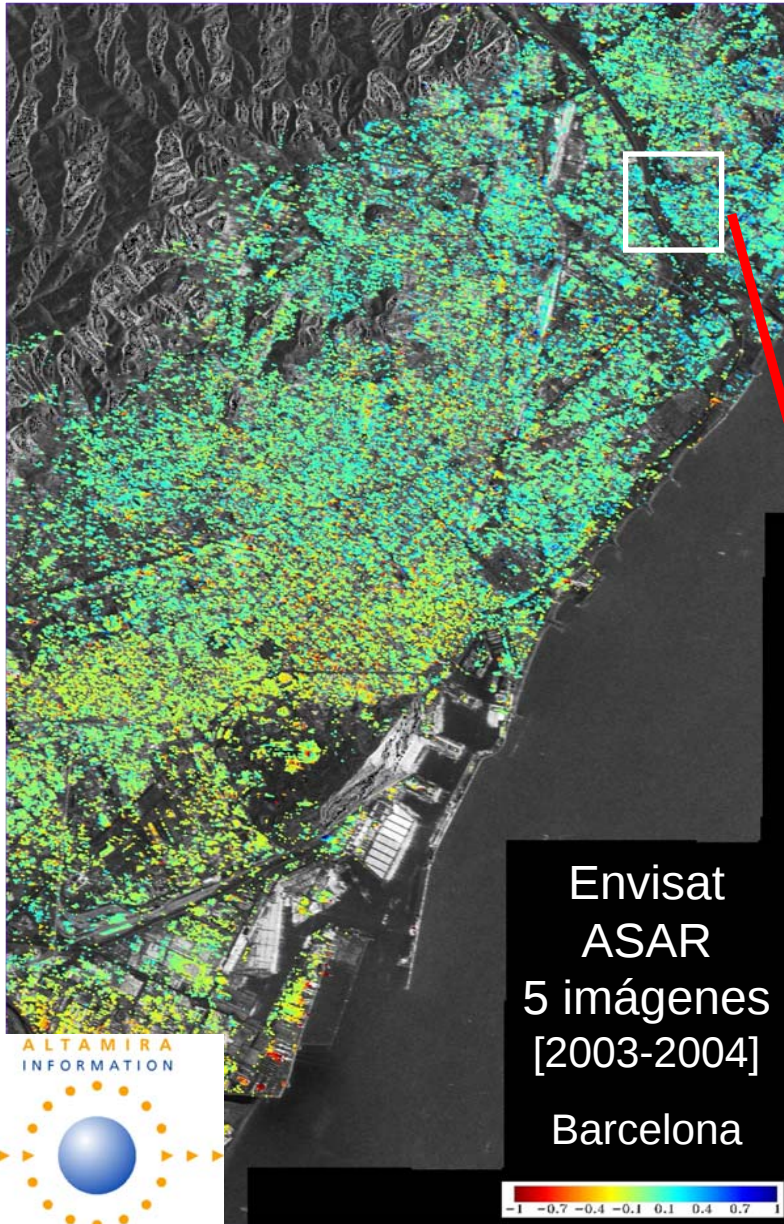
Seguimiento de derrames de petróleo

Derrame del petrolero “Prestige” visto por Envisat





Medidas interferométricas utilizando ERS SAR y Envisat ASAR



GlobCover: El nuevo retrato de la Tierra muestra la cubierta del suelo como nunca había sido vista antes



ESA EO Education: available tools for schools

<http://www.ceos.org/>

The CEOS strategy for Earth observation education and training is the creation of an effective coordination and partnership mechanism among CEOS agencies and institutions offering education and training.

<http://www.eohandbook.com/>



Home | Foreword | Preface | Our Changing Climate | Case Studies | Earth Observation Satellites

THE EARTH OBSERVATION HANDBOOK

Climate Change Special Edition 2008

 Beta online database

CEOS, the Committee on Earth Observation Satellites, coordinates civil spaceborne observations of the Earth. Participating agencies strive to address critical scientific questions and to harmonise satellite mission planning to address gaps and overlaps.
www.ceos.org

ESA, the European Space Agency, is Europe's gateway to space. It is an international organisation with 17 Member States. ESA's mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world.
www.esa.int



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Strategic Groups
SIT - Strategic Implem. Team
SEO - Sys. Engineering Office

Working Groups
WGCV - Calibration/Validation
WGEdU - Education
WGISS - Information Systems
WGCV - Test Site
WGEdU - Test Site
WGISS - Test Site

Constellations
ACC - Atmos Composition
LSI - Land Surface Imaging

Welcome to the CEOS Homepage

Established in 1984, the **Committee on Earth Observation Satellites (CEOS)** coordinates civil space-borne observations of the Earth. Participating agencies strive to enhance international coordination and data exchange and to optimize societal benefit. Currently 28 space agencies along with 20 other national and international organizations participate in CEOS planning and activities.

For more information about CEOS, how to add events to the CEOS calendar, how to access the CEOS Actions/Documentation, or to update web content, please contact:

Brian Killough, NASA SEO (Brian.D.Killough@nasa.gov) or
Kenneth McDonald, NOAA SIT (Kenneth.McDonald@noaa.gov)

CEOS SIT-23 Meeting



The 23rd CEOS SIT Meeting was held in Cocoa Beach, Florida, USA on March 3-5, 2009 at the Doubletree Hotel Cocoa Beach Oceanfront. Details regarding the meeting can be found at: <http://www.ceos-sit23.com>



Recent News and Events

[CEOS Newsletter #32](#)
February 2009

[CEOS Flyer for GEO-5](#)
November 2008

[CEOS Brochure](#)
October 2008

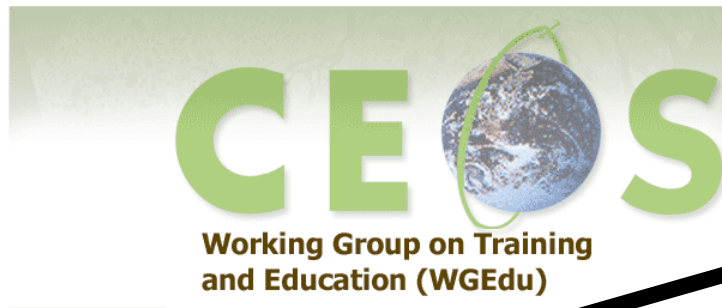
<http://wgedu.ceos.org>
reference to courses,
case studies, satellite
data, links to education
sites

GIFT Workshop, Mérida, MX, 2010

The CEOS Working Group on Education and Training (WGEdu) links to a large database of free EO Educational material

http://www.acrors.ait.ac.th/ceos/home1_e.html

<http://wgedu.ceos.org> reference to courses, case studies, satellite data, links to education sites of various institutions through the internet.



WGEdu Home | Contact Us | CEOS Site
Overview | Strategy | Educational Resources | Events | Documents



The CEOS strategy for Earth observation education and training is the creation of an effective coordination and partnership mechanism among CEOS agencies and institutions offering education and training. The CEOS Working Group on Education and Training (WGEdu) was established by the 13th CEOS Plenary in November 1999. Tasked to develop a plan for future CEOS activities in education and training particularly in developing countries, a coordination and partnership mechanism between CEOS agencies was established. The goal of the WGEdu is to facilitate activities that enhance international education and training in Earth observation techniques, data analysis interpretation, and applications.



WGEdu Home | Contact Us | CEOS Site
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Search - Educational Materials

Search for free Earth observation Educational Materials

Search by Keyword: (optional)

Keyword examples: Landsat, satellite, IRS, MOS, ERS, SPOT, J-ERS, CASI, SFSI, SWIR, RADARSAT

Type of Materials

- ☒ ALL
- ☐ Schools and Universities
- ☐ Geomatics Professional

Resource Type

- ☒ ALL
- ☐ Case Studies
- ☐ Reference Materials
- ☐ Tutorials
- ☐ Workshop Materials

Format

☒ ATT

International Co-operation with Africa

TIGER Training Courses

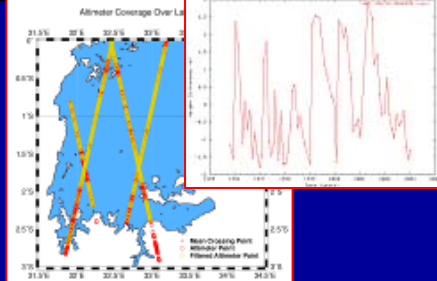
Following the 2002 Johannesburg World Summit on Sustainable Development and focused on the use of space technology for water resource management in Africa. Series of training courses on a variety of applications and techniques.

http://www.tiger.esa.int/training_main.asp

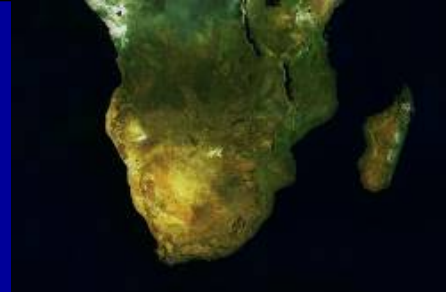




Wetlands Mapping



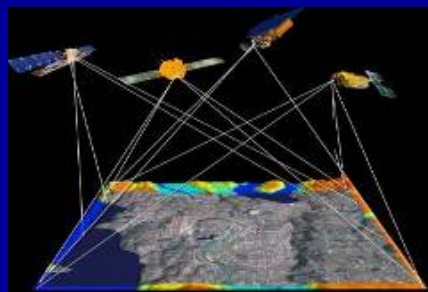
Rivers-Lakes-Water levels



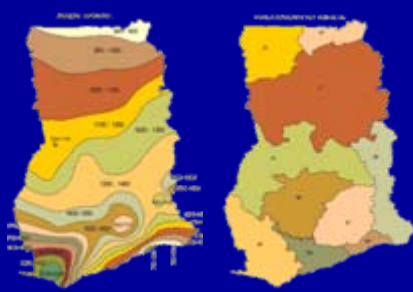
Soil Moisture-SADC



Nile Awareness Kit



Land and Topo. -Ghana.



Hydrogeo. Model-Ghana



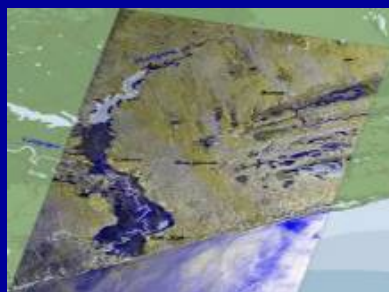
Lake Quality-Victoria



Lake Quality-Egypt



IS for IWRM-Morocco



IS for IWRM- Mozambique



IS for IWRM-Zambia



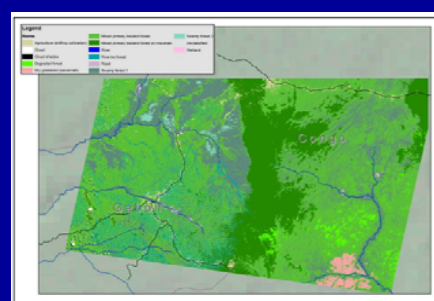
IS for WRM-Burkina Faso



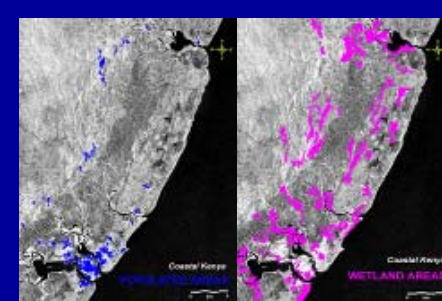
AQUIFER



Water & Ground str.-Niger



EPIDEMIO



Malaria-mapping

International Co-operation with China:

DRAGON Training Courses



The screenshot shows the website for the ESA-NRSCC Dragon Cooperation Programme. The header includes the ESA logo, the text 'ESA-NRSCC Dragon Cooperation Programme', and the NRSCC logo with 'National Remote Sensing Center of China'. A date stamp '03-Oct-2007' is visible. The left sidebar contains a navigation menu with links such as 'Dragon Home', 'Background', 'Dragon Project Themes', 'Dragon Partners Info', 'Kick-off Symposium...', '2005 Symposium...', '2006 Symposium...', '2007 Symposium...', 'Related Links (NRSCC, ESA, Envisat)', 'Dragon Coordinator', 'Contacts', 'Dragon Progress', 'Meetings', 'Dragon Documentation', 'Photos...', 'Training...', 'Ocean 2007', 'Atmosphere 2006', 'Land 2005', 'Ocean 2004', 'Trainees at ESRIN 2005', 'Trainees at ESRIN 2004', 'Training material', 'Communication material', 'Dragon Results', 'News', and 'Contact us'. The main content area features a banner for the 'ESA-MOST DRAGON PROGRAMME' with the text '2nd ADVANCED TRAINING COURSE IN OCEAN REMOTE SENSING' and dates '15 to 20 October 2007'. It also lists the host institution: 'State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration of China'. Below the banner is an 'INTRODUCTION' section with a link to 'In Chinese 中文'. The text describes the training courses and lists objectives: 'To stimulate and support the exploitation of ESA EO and TPM remote sensing data for ocean applications' and 'Introduce available software tools and methods for the exploitation of ERS, Envisat, TPM and Explorer mission satellite data'. It also mentions the course will be hosted by the State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, State Oceanic Administration, Hangzhou, P.R. China. At the bottom, there are two small images: one of a satellite launch and one of a modern building.



ESA

Home



envschool@esa.int

2010 >

2008 >

2006 >

2004 >

2003 >

To join the EO
summer school
mailing list enter
your email address
and press submit.

Submit

→ 5th ESA EARTH OBSERVATION SUMMER SCHOOL ON EARTH SYSTEM MONITORING & MODELLING

2-13 August 2010 | ESA-ESRIN | Frascati (Rome) Italy

*Application is now open.
Please apply by completing the form no later than 15 March 2010.*

Background and Objectives

The European Space Agency (ESA) organizes a series of summer schools on *Monitoring of the Earth System* to promote the exploitation of Earth Observation EO data across disciplines, with a specific focus on their assimilation into Earth System models.





Earth Observation
Principal Investigator Portal
European Space Agency

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Category-1


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Training & News



ESA "Earth Observation" Summer School
(2-13 Aug 2010, ESA ESRI - Frascati, Italy)
02/2010
[Read more](#)



SeaSAR 2010 Workshop [ESRI, Italy, 25-29 January 2010]
07/2009
[Read more](#)



ESA Living Planet Symposium 2010
[Bergen, Norway, 28 June - 2 July 2010]
04/2009
[Read more](#)



Third Coastal Altimetry Workshop
[Frascati, Italy 17-18 September 2009]
04/2009
[Read more](#)



2nd Advanced Training on Ocean Remote Sensing
[Bergen, Norway 28 September - 2 October 2009]
04/2009
[Read more](#)

08-Mar-2010 UT

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<http://eopi.esa.int/esa/>


eduspace

European Space Agency

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08-Mar-2010

**Earth from Space:
Image of the week**



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Eduspace

Earth from Space



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Target Groups

- Secondary school teachers who want to incorporate EO into their curricula
- Secondary school students to extend on what they have learned in class
- University students pursuing related academic studies
- Access to website www.esa.int/eduspace is free

ESA	Education	Inicio
Sobre Eduspace		
¿Qué es Eduspace?		►
¿Cuáles son las herramientas que ofrece?		►
Idiomas...		
Elementos de la teledetección		
¿Qué es la teledetección?		►
Teledetección, a fondo		►
Historia de la observación terrestre		►
La cartografía y los datos de los satélites		►
Las órbitas de los satélites		►
Los satélites de recursos naturales		►
Satélites meteorológicos		►
Recursos...		
Multimedia		
Image Gallery		►
Video Gallery		►
MIRAVI: Earth live		►
Services		
Búsqueda		GO
BOOKMARK		

http://imagedb-srv.esrin.esa.int/Eduspace_Installer/install.htm

Recursos
Eduspace image catalogue viewer
Install Image Catalogue Viewer
Instruction manual
Image processing software
Earth images gallery

Combine RGB

Select Red Band

RON1

Select Green Band

RON2

Select Blue Band

RON3

Output Type

Byte

OK

Cancel

Help

Image processing software

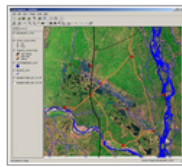
Eduspace provides students and teachers with the proper tools to manipulate images.

LEOWorks

LEOWorks is a major component of this educational resource, which makes the actual processing of satellite imagery on school computers possible. LEOWorks is able to perform many advanced processing operations including image classification, geometric correction, and pan-sharpening. Many image filters are available, and GIS tools enable the displaying and drawing of vectors on images. LEOWorks is a didactical tool, and has very good help pages and an all-inclusive tutorial (see right of page). With the assistance of this help documentation, everyone is able to experiment with their own imagery to undertake their own processing. LEOWorks can process images in standard jpg, tiff, bmp, and png formats.

ArcExplorer

is a freeware used to display and ers of Geographical Information (S). It includes a complete user as been made available by ESRI, ading providers of GIS software tions.



Send this page to a friend

<http://earth.eo.esa.int/satelliteimages/>



Envisat MERIS Image Rapid Visualisation
 Observing the Earth
 European Space Agency

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 35820 images available

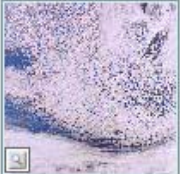
K << 1 2 3 4 5 6 7 8 9 10 11 12 13 14 >> H



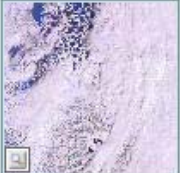
Mode	FR/Level0/PDHS-K
Orbit	41933
Date	08-MAR-2010
Time	13:04:59
First	73.9N 15W
Last	62.7N 30.3W



Mode	FR/Level0/PDHS-E
Orbit	41932
Date	08-MAR-2010
Time	11:24:22
First	73.9N 10.2E
Last	28.5S 33.1W



Mode	FR/Level0/PDHS-K
Orbit	41932
Date	08-MAR-2010
Time	11:24:22
First	73.9N 10.2E
Last	50.4N 12.5W



Mode	FR/Level0/PDHS-E
Orbit	41931
Date	08-MAR-2010
Time	09:43:47
First	73.9N 35.3E
Last	1.9N 0.9W



About MIRAVI



MIRAVI is a data-driven system for real time image rendering and quality analysis of satellite data. It has been designed and developed by Chelys.

This website represents the MIRAVI front-end and it shows the gallery of images generated on the Level0 (raw data) Meris Full Resolution products, few seconds after their availability.

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Start date	Stop date
☐ From	
Latitude	Longitude
☐ First	
Last	
Search	

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OBJECTIVES



- To inspire teachers to incorporate Earth observation into their curricula
- To provide ready-made curricula projects
- To provide tools and Earth observation data for educational purposes
- To enable schools to take part in collaborative work in Earth observation through a network

About Eduspace

- What is Eduspace? ▶
- What tools does it offer? ▶

Languages...

Remote Sensing Principles

- What is remote sensing?
- Remote sensing in depth ▶
- History of Earth observation ▶
- Mapping and satellite data ▶
- Satellite orbits ▶
- Resource satellites ▶
- Weather satellites ▶



What is remote sensing?

Remote sensing is a way of collecting and analysing data to get information about an object without the instrument used to collect the data being in direct contact with the object.

For example, if you take a photograph of your house, and on the picture you see that the house is composed of a roof, walls and windows, all of which

appear as different colours, then this is remote sensing.

In remote sensing, three elements are essential. They are:

- 1 - a **platform** to hold the instrument
- 2 - a target **object** to be observed



European Space Agency

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Rondonia

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[The Tropical Rain Forest Information Center](#)

[The World Resources Institute](#)

EduSpace - Software

[LEOWorks](#)

EduSpace - Download

[Ron1-noaa-1234.zip \(448 Kb\)](#)

[Ron1-LS-345.zip \(815 Kb\)](#)

[Ron2-LS-345.zip \(816 Kb\)](#)

[Ron3-LS-345.zip \(638 Kb\)](#)

[Ron4-LS-345.zip \(719 Kb\)](#)

[Ron5-LS-345.zip \(720 Kb\)](#)

[Ron6-LS-345.zip \(791 Kb\)](#)

[Ron7-LS-345.zip \(593 Kb\)](#)



Rondonia

Throughout the tropics, rain forests are being cut down. By different methods and for different reasons, people in tropical regions of the world are cutting down, burning, or otherwise damaging the forests. The process in which a forest is cut down, burned or damaged is called 'deforestation'.

This case study on Rondonia, Brazil, focuses on deforestation. It includes background material, exercises and a collection of external links. The exercises use computer tools that analyse satellite images.

This case study includes:

- a background section
- exercises

You can access them by clicking on the links on the right.

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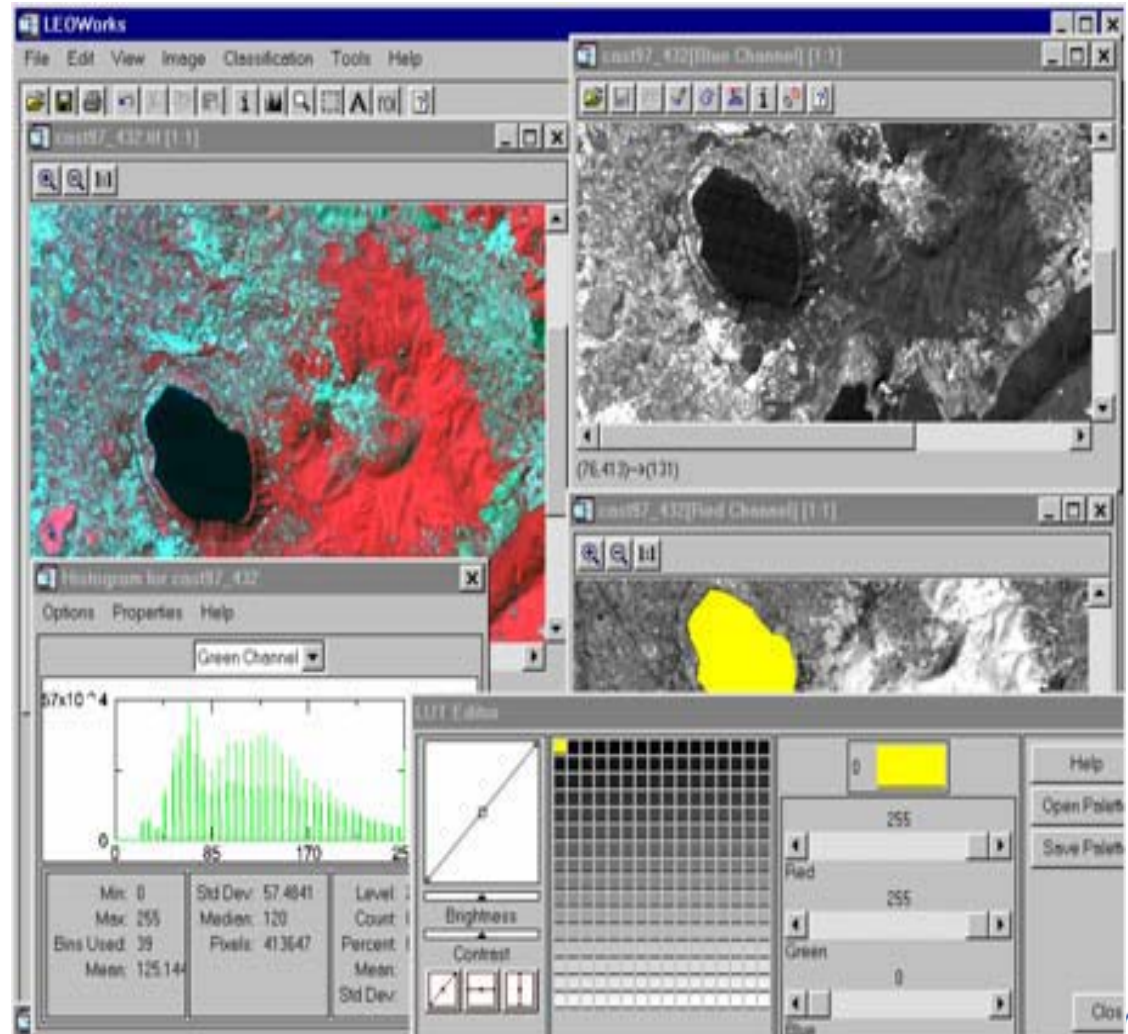
European Space Agency

Agence spatiale européenne

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Download
Data

- View images, histogram, pixel values, header info
- Crop, invert, stretch, layer stack, etc
- image arithmetic, filters
- Classification, PCA, geometric correction, pan sharpening
- GIS tools





INTERNATIONAL CHARTER SPACE AND MAJOR DISASTERS

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The Charter for Schools



ESA in collaboration with the French publisher Nathan has produced a supplement on the Charter for "La Documentation par l'Image", a magazine distributed to schools and targeted at 8/12-year-olds and their teachers.

The objective is to explain how the mechanisms of the International Charter Space and Major Disasters work and to provide an introduction on the use of satellites and satellite images.

As a teaching guide, the supplement also includes three worksheets which can be used in the classroom to check how much children have learned and stimulate discussion.

The supplement is available in five languages: [English](#), [French](#), [Italian](#), [Spanish](#), and [German](#).

The teaching guides and an introduction to the Charter for teachers are also available at the [ESA education portal](#).

CHARTER for schools

- **Target:** primary/lower secondary level (8-12 years)
- **Objective:** make the role of space facilities to manage natural and technological disasters more visible to youngsters
- **Product:** a children supplement in 5 languages (En, Fr, It, Sp, Ger) downloadable in pdf from the Charter website
http://www.disasterscharter.org/ecoles_e.html
- **Includes 3 worksheets** to be used in the classroom as exercises and to stimulate the discussion

(*alias* **TEACHER's PACK**)

- Target: lower secondary level (11-14 years)
- Objective: provide teachers with a working tool to introduce EO themes in schools.
- Available in 4 languages (En, Fr, Sp, Ned). German translation is ongoing
- Product: a folder containing 11 worksheets on EO themes related to teaching subjects such as geography, life and Earth sciences, physics. Each worksheet is composed of 3 colour pages recto-verso (triptych), plus an exercise sheet and a teacher information note

EUROPE CONTAINS VAST TRACTS OF AGRICULTURAL LAND



Agro-forest, Ardèche.

When data obtained on the vegetation cover is required, images are often captured by satellites in the near infrared. It is the wavelength which is used to detect vegetation since it tends to reflect more energy in this band than in the visible channel. Such images show the characteristics of vegetation and variations in the types of vegetation in more detail and with greater accuracy.



Agricultural research in France: three channels, left, and false-color, right, from the SPOT 1.

The great diversity of European soil and climate means that conditions for agriculture are good. Consequently, Europe has a rich variety of food and agricultural products covering most of its land-mass.

Germany has become a relatively wealthy, but its main focus is on the export of its agricultural products.

Australia, in Africa, has a climate which provides high yields and at low production costs. However, it is one of Europe's most important agricultural areas, and much of its production goes to the north of the continent.

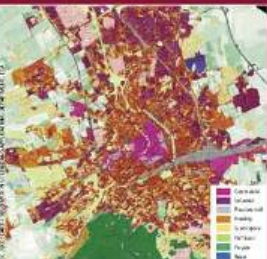
How do satellites work?

Urban expansion in Europe



Paris, view of the city from the river.

Using satellites to analyse the characteristics of urban areas



A false-color composite image of a satellite image of a city area.

Light and the shadows reflected by the Earth's surface display different characteristics depending on their nature. In built-up areas, a view containing reflected houses will not look like the same as a view containing agricultural buildings. Likewise, fields do not look like the same as forests or mountains.

Armed with a good knowledge of how the different types of land use and vegetation behave, satellites can provide the knowledge with measurements. In the satellite images, they observe how the satellite needs to be calibrated to detect the different types of land use and vegetation. In a satellite image, the same results (the same land use and vegetation) can be seen in different ways, depending on the type of satellite used.

Satellites are used in the production of maps and images of a city area. They can be used to detect changes in an urban area, such as the expansion of a city.



Watching over the Earth



European Space Agency Agency satellite programme

6-Europe: a developed continent



THE MAIN AREAS OF ECONOMIC ACTIVITY IN EUROPE

Europe can be divided into three main regions, classified according to their levels of activity and economic importance. There is the heart of Europe, which comprises the key cities and is home to much of the industrial and commercial activity. This region stretches from southern England to northern Italy. An intermediate zone just beyond is also dynamic and active, with modern agriculture and industrial activity. The expansive outer zone is poorer and more thinly populated.



London, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).

Levels of development across the European Union vary considerably. The level of Europe's development is not uniform. The greatest concentration of population and economic activity is in the heart of Europe, where the density of economic activity is highest. The other two zones, on the other hand, are less industrialized and less densely populated.



London, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).

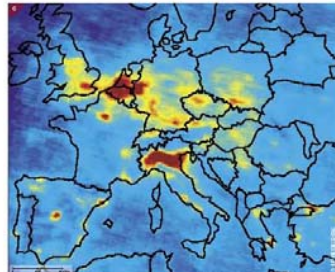
Satellite images, since they are able to observe an entire territory, reveal disparities between Europe's regions. These images, which cover very wide areas, do not show industrial activity directly but instead measure its indirect consequences. For example, through luminous flux and atmospheric pollution. Other satellite images, focussing on a more limited part of a given territory, make it possible to monitor changes in urban and industrial areas and can thus be used in town planning.



The satellite image, recorded from a high-altitude, shows a large-scale view of the city. The image is a false-color composite of three channels (red, green, and blue). The image shows a clear trend of economic activity across the continent.



London, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).



Map of Europe showing the main areas of economic activity. The map is color-coded to show different types of economic activity: red for built-up areas, green for agricultural land, and blue for water.

ROTTERDAM: EUROPE'S LARGEST PORT

Rotterdam, at the mouth of the Rhine, whose port handles almost 350 million tonnes of goods every year is the biggest port in Europe and the largest in the world. Some of its port facilities, which are continuously expanding in response to the growth in international maritime traffic, are built on platforms in the sea. The port authorities often use satellite images to assist them in their development.



Rotterdam, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).

Economic activity has its drawbacks, notably that it generally causes high levels of pollution. By regularly measuring emissions of pollutants across the globe, satellites help to build up a map of atmospheric pollution. But, however, that not all regions are affected to the same degree.

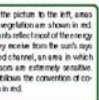
In 2004, more than 15 billion tonnes of carbon dioxide (CO₂) were released into the atmosphere.



Rotterdam, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).



Rotterdam, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).



Rotterdam, view of the city from the river. The image is a false-color composite of three channels (red, green, and blue).

European Space Agency
Agence spatiale européenne

TOPICS

1. Earth observation satellites
2. The Earth viewed from space
3. Humans on Earth
4. Africa and environmental diversity
5. Asia and rice-growing
6. Europe: a developed continent
7. Living species and their environments
8. Water on Earth
9. Volcanoes: Mount Etna, a case study
10. Flood monitoring
11. Colours in satellite imagery

ESA School Atlas – Funded by ESA, produced by GEOSPACE

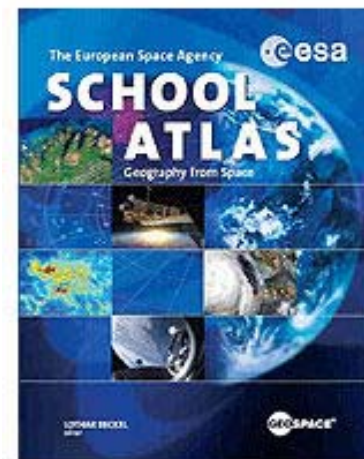
Targeting secondary schools and first university courses:

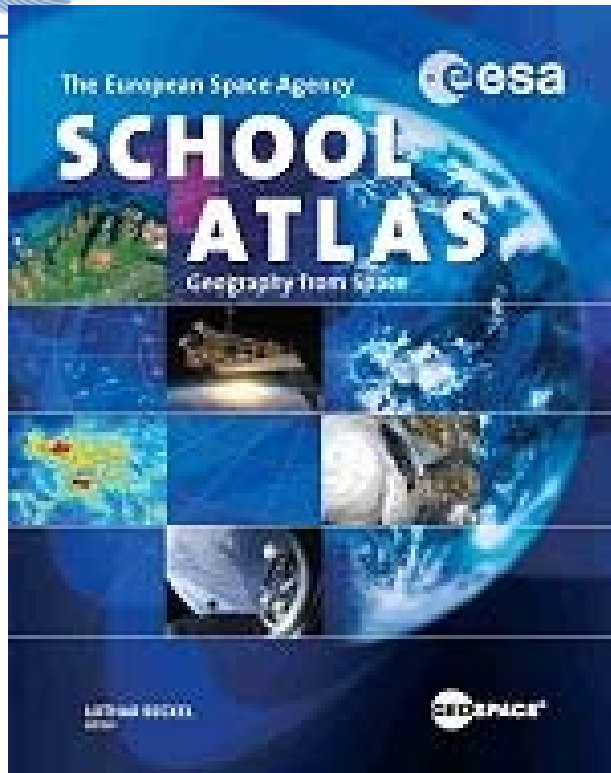
Realistic views of the Earth's surface, combined with thematic maps demonstrate the dynamic processes of our globe.

The atlas is accompanied by a Teachers' Handbook, a digital version on 2 DVD's and is also connected to Eduspace.

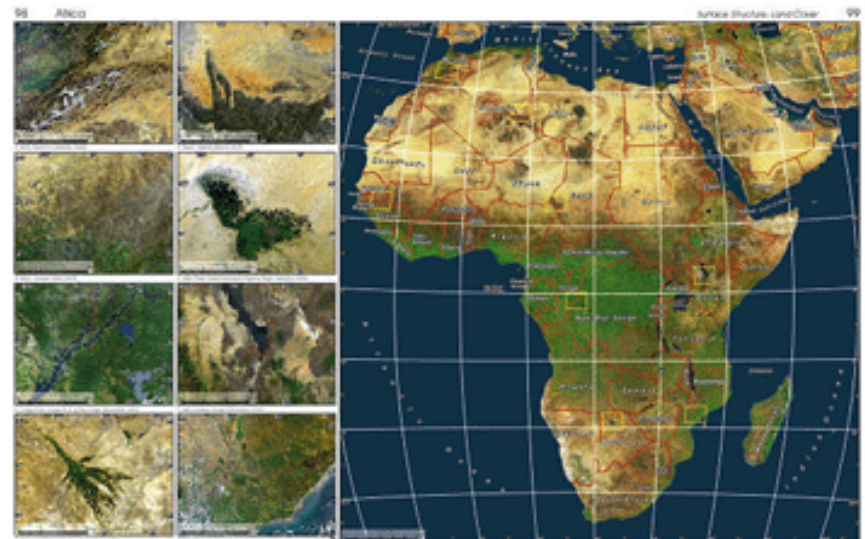
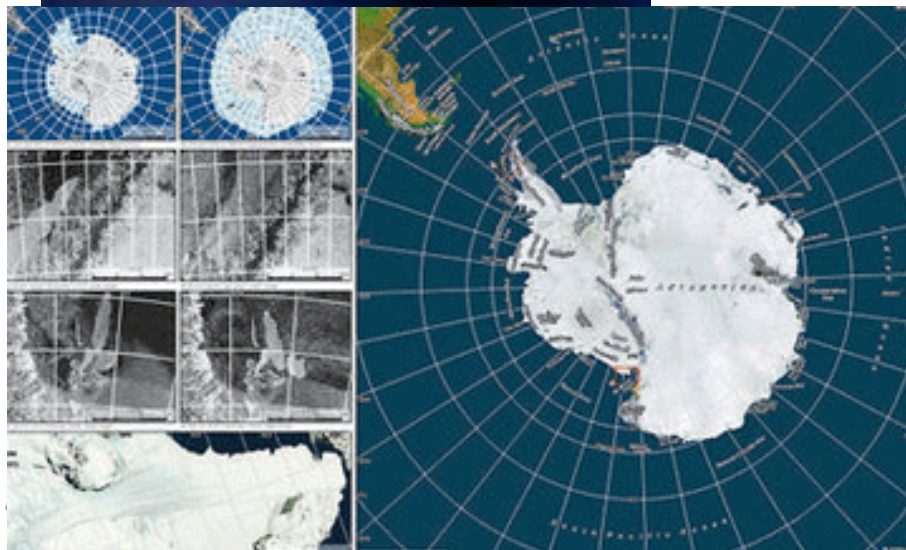
The Atlas is available in both English and German from the Geospace website at a special concessionary price for schools.

Order from: www.geospace.co.at

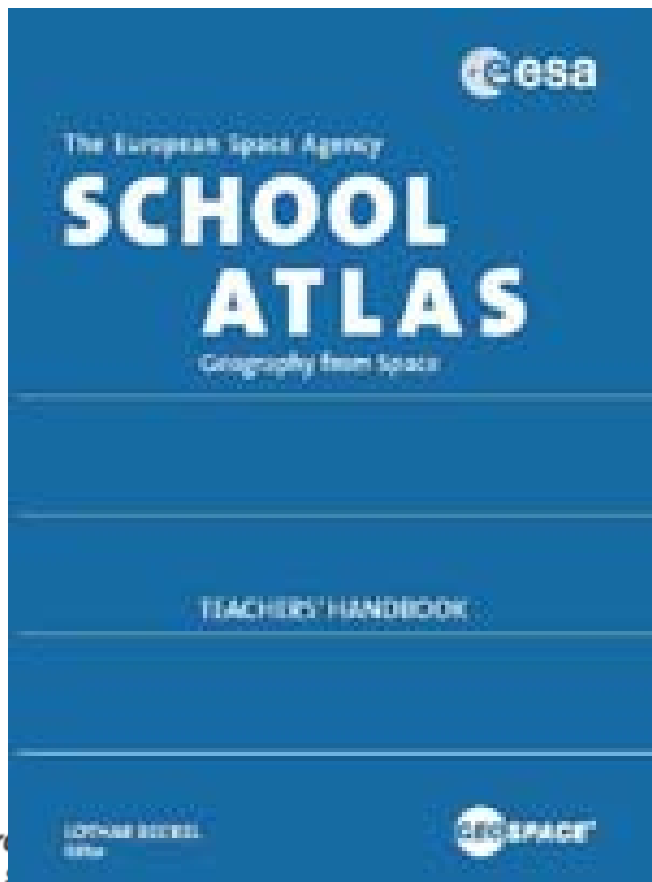




- 1) Introduction to ESA (10 pages)
- 2) Earth Observation (8 pages)
- 3) Global Overview (20 pages)
- 4) Continental Overview (82 pages)
- 5) The Natural Sphere (60 pages)
- 6) The Cultural Sphere (78 pages)
- Index (18 pages)



Annex to the ESA School Atlas - Teachers' Handbook



Provides an introduction to Earth Observation and a general description of each double page of the Atlas. For every image or thematic map, technical information on the data, as well as descriptions and interpretation aids are included.

The purpose of the Teachers' Handbook is to support teachers in the use of the Atlas in the classroom. There are numerous suggestions of questions and exercises – for many of them the LEOWorks software may also be used.

Annex to the ESA School Atlas - DVDs



The two DVD-ROMs contain the pages of the ESA School Atlas in reduced resolution (PDF format), **original bands of the satellite data, handbook content and exercises**. The images correspond with the maps in the atlas in the form of original data and thematic vector data. The software tools allow to process and evaluate the image data and thus to arrive at new maps.

- Target: primary level (8-10 years)
- Objective: present EO themes (e.g. atmosphere, water, Earth's ice cover) to children trying to amuse and interest them (game approach)
- Product: CD-Rom in 7 languages (En, Fr, Du, De, It, Sp, Port)



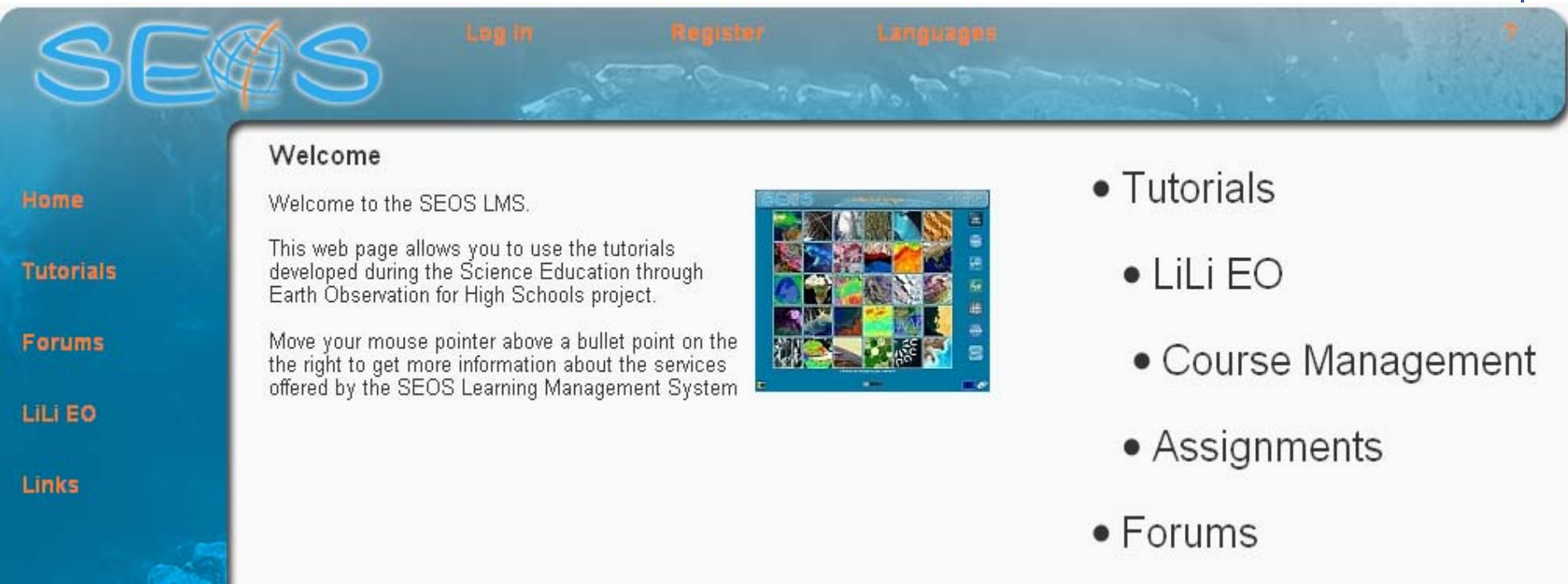
The screenshot shows the ESA Education website interface. The header includes the ESA logo and 'Education' text. A navigation bar lists 'ESA', 'Home', 'High School', 'Higher Education', and 'Teachers'. The date '07-Jun-2006' is displayed in the top right. A left sidebar contains a menu with categories like 'About ESA Education', 'Sites', 'Current Activities', and 'Services'. The main content area features a CD-ROM cover for 'Planet Earth - Heavens Above!' with a cartoon bird character. To the right of the cover, the title 'Planet Earth - heavens above!' is followed by details: Subject (Physics & chemistry, biology, geography), Level (Primary), Language (Deutsch, English, Español, Français, Italiano, Nederlands, Português), and Type (Support materials). A paragraph describes the CD-ROM's aim to help 8-10-year-olds discover satellite remote sensing. Below this, it states the CD-ROM is available in Dutch, English, French, German, Italian, Portuguese, and Spanish, and provides contact information for the ESA Education Department (education@esa.int). A search bar is located at the bottom of the sidebar.

Science Education via EO for High Schools (SEOS)

Projects with external partners :

6th Framework Programme of EC

<http://lms.seos-project.eu/>



The screenshot shows the SEOS LMS homepage. At the top, there is a navigation bar with the SEOS logo and links for 'Log in', 'Register', and 'Languages'. On the left side, there is a vertical menu with links for 'Home', 'Tutorials', 'Forums', 'LiLi EO', and 'Links'. The main content area has a 'Welcome' section with the following text: 'Welcome to the SEOS LMS. This web page allows you to use the tutorials developed during the Science Education through Earth Observation for High Schools project. Move your mouse pointer above a bullet point on the right to get more information about the services offered by the SEOS Learning Management System'. To the right of this text is a small thumbnail image of a grid of various satellite images. On the far right, there is a list of services offered by the LMS.

Welcome

Welcome to the SEOS LMS.

This web page allows you to use the tutorials developed during the Science Education through Earth Observation for High Schools project.

Move your mouse pointer above a bullet point on the right to get more information about the services offered by the SEOS Learning Management System

- Tutorials
- LiLi EO
- Course Management
- Assignments
- Forums

- EO education and capacity building is becoming increasingly more important in view of climate change, more frequent natural disasters (storms, flash floods, etc...), natural & cultural heritage degradation and need of preservation
- ESA and many other space agencies are taking this very seriously and aim to promote EO to an increasingly large, world wide audience
- All audiences including schools are targeted as decision makers and disaster managers of tomorrow are sitting in the classrooms today! EO and Space Education should be available for youngsters in schools, well before university level.....

