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# European contribution to the Global Earth Observation System of Systems (GEOSS) in the context of the Framework Program of Community Research

12 September 2006

Space Tools for Monitoring Air Pollution and Energy Use for Sustainable Development

UN/Austria/ESA Symposium - Graz

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Sector  
Earth Observation





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# KEY INITIATIVES FOR EARTH OBSERVATION

The EU has a long-standing commitment to meet the challenges of sustainable development. The research policy of the Commission contributes to this commitment through the funding of environmental research, including research dealing with Earth Observation. The observation of the Earth plays a key role in the assessment of the environment and in policy making.

GEOSS (Global Earth Observation System of Systems): **GLOBAL DIMENSION**

INSPIRE directive: Will provide the regulatory framework to facilitate the exchange of data in Europe. Will include remote sensing data and atmospheric observations.

GMES (Global Monitoring for Environment and Security): **SERVICE ORIENTED**





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# GMES

## Initial period:

- **GATO**: Global Atmospheric Observations
- **Apmosphere** : Air Pollution Modelling for Support to Policy on Health and environmental Risks in Europe
- **GEMS**: Global and Regional Earth-System Monitoring using Satellite and In-Situ Data
- **Daedalus-Create**: Delivery of Aerosol products for Assimilation and environmental Use - Construction, use and delivery of a European aerosol database

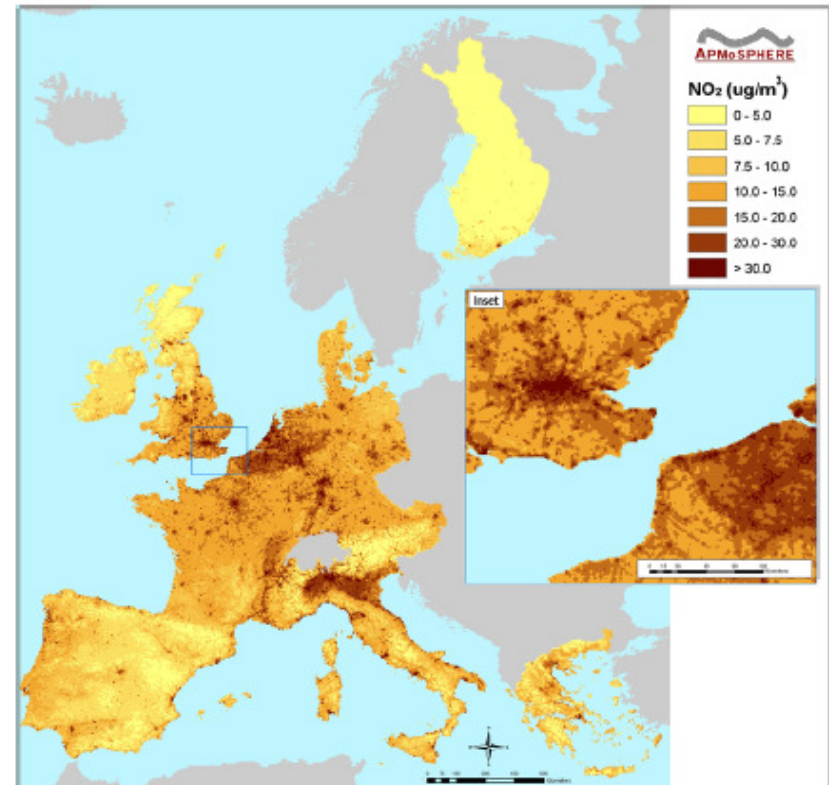


Figure 1. Nitrogen dioxide concentrations in the EU: results of universal kriging

Air pollution maps are now available at regional or local level





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# GMES fast track services to be implemented by 2008

## ◆ **Information for Crisis (Emergency) Management**

Group 4: accidents associated with transports, industrial activities

Delivery of:

- Reference maps within 6 hours over crisis area
- Damage maps available within 24 hours and daily updated before 5 pm
- Forecasts of situation to be made available based on models and prior knowledge

## ◆ **Land Monitoring Services**

## ◆ **Marine Core Services**







# Future GMES services

## Proposed GMES Pilot Atmospheric Services (2009 ?)

- ◆ **Provide coherent information on the atmospheric composition at local, regional, global scales in support of European policies and for the benefit of European citizens**
- ◆ **Core Services include: global to European scale monitoring and forecasting of reactive gases, aerosols, clouds, and long-lived greenhouse gases; monitoring and forecasting of Air Quality at the European scale**
- ◆ **Down-Stream Services include: monitoring and forecasting of Air Quality at regional to local scales; targeted and personalized services for users (citizens, policy makers, private sector, operational agencies, ...)**





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# Group on Earth Observations Strategic interest

## 1<sup>st</sup> Earth Observation Summit, Washington DC 2003

### Establish objectives

- to monitor continuously the state of the Earth
- to improve understanding of dynamic Earth processes
- to enhance prediction of the Earth system
- to further implement our international environmental treaty obligations

### GEOSS (Global Earth Observation System of Systems):

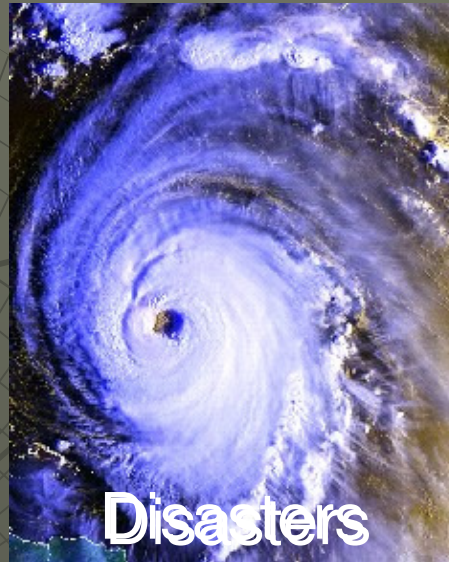
A greater integration of Earth Observation Systems internationally

### GEO 9 Societal benefit areas in crucial domains:

Disasters, Environment and Health, Energy resources, Climate, Water, Weather, Ecosystems, Agriculture, Biodiversity



# Earth Observation Elements







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# GEO STRENGTH

- Unique Forum/Network for Earth Observation
- Identification of gaps (technical, political etc.)
- Looking for ways filling the gaps
- Finding ways for standardisation and Protocol
- Take rapidly advantage of good ideas
- Large umbrella/platform of people and countries to stand on the World stage







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# Funding aspects of GEO

GEO is not a funding institution

The GEO secretariat has limited resources available to support the basic organisational activities of GEO

The development of GEOSS must be supported by participating organisations

GEO has already started to impact on funding agencies plans involving Earth Observation activities (European Commission FP7)





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# Creating the European Research Area

6<sup>th</sup> Research

Framework Programme 2002 - 2006





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## FP6 Projects relevant to GEO Societal Benefit Areas / Transverse Activities

AIR4EU (STREP)	Air Quality Assessment for Europe from Local to Continental	Assessment from monitoring and modelling of PM10, NO2, CO, SO2, O3, and benzene, Clean Air For Europe (CAFE) programme
NATAIR (STREP)	Improving and Applying Methods for the Calculation of Natural and biogenic Emissions and Assessment of Impacts on Air Quality	Satellite data are used for the improvement of calculations from forests in general and forest fires in particular
AMMA (Integrated Project)	African Monsoon Multidisciplinary Analysis	Atmospheric dynamics and chemistry, provide the basis for satellite-based environmental monitoring over West Africa





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## FP6 Projects relevant to GEO Societal Benefit Areas / Transverse Activities

<p>INTARESE (Integrated Project)</p>	<p>Integrated Assessment of Health Risks from Environmental Stressors in Europe</p>	<p>Support implementation of the European Environment and Health Action Plan (2004-2010). Review, bring together and enhance monitoring systems, including routine environmental monitoring (ground-based and Earth observation)</p>
<p>SUSTDEV 3.1.2 (ex: EUCAARI under negotiation, Aerosols, climate)</p>	<p>Atmospheric pollutants and their regional impacts</p>	<p>Chemistry of atmospheric pollutants ... aerosols and ozone, ... impact on air quality and climate. ... Emissions and long range transport ... Atmospheric chemistry-climate interactions... <b>The project will contribute to GEOSS aims for atmospheric composition</b></p>





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# Building the Europe of Knowledge

7<sup>th</sup> Research

Framework Programme 2007 - 2013





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# STRUCTURE

## 4 specific programmes

- Cooperation – Collaborative research
- Ideas – Frontier research
- People – Human potential
- Capacities – Research capacity







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# Cooperation Collaborative research

## *9 Thematic Priorities*

- Health
- Food, Agriculture and Biotechnology
- Info. & Communication Technologies
- Nanosciences, Nanotechnologies, Materials and new Production Technologies
- Energy
- Environment (including climate change)
- Transport (including Aeronautics)
- Socio-Economic Sciences & Humanities
- Space and Security research (GMES)





# Information and Communication Technologies

## Applications Research: Information & Communication Technologies for the Environment

- **Innovative ICT-based services and tools to:**
  - Implement and assess environmental policies
  - Support modern environmental administrations and civil protection agencies
  - Inform the citizens on the state of the environment
- **Applied to:** "risk and emergency management; ... natural resources management including systems for **reduction of pollutants**; increasing **energy efficiency**; managing human response to environmental stresses and to sustain biodiversity; **alert systems** and timely and reliable public safety communication; ... advanced data and information management for **environmental monitoring** and risk assessment, contributing to INSPIRE; GMES and GEOSS."





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# Cooperation Collaborative research

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- Info. & Communication Technologies
- Nanosciences, Nanotechnologies, Materials and new Production Technologies
- Energy
- Environment (including climate change)
- Transport (including Aeronautics)
- Socio-Economic Sciences & Humanities
- Space and Security research







## Environment (incl. climate change) Activities

Climate Change, Pollution and Risks

Sustainable Management of Resources

Environmental Technologies

Earth Observation and Assessment Tools





## Climate Change, Pollution and Risks

- **Pressures on environment and climate**  
....pressures on environmental quality and on climate from pollution of the air, water and soil....
- **Environment and health**
- **Natural hazards**

## Sustainable Management of Resources

- **Conservation and sustainable management of natural and man-made resources**  
.....advanced models and tools needed for the sustainable management of resources.....

## Environmental Technologies

- **Environmental technologies for the sustainable management and conservation of the natural and man-made environment**  
... managing resources or treating pollution more efficiently, in relation to water, soil, air, sea and other natural resources...



# Earth observation and assessment tools

- **Earth observation**

.....development and integration of the Global Earth Observation System of Systems (GEOSS) .....Interoperability.....information management and data sharing, optimisation of information for understanding, modelling and predicting environmental phenomena....in order to produce advances for the GEOSS societal benefit areas and contribute to GMES.

- **Assessment tools for sustainable development**

.....to quantitatively assess the environmental and research policy contribution to competitiveness and sustainable development ... links between the economy, environment and society and hence beneficial and efficient strategies of adaptation and prevention.....to improve existing indicators and develop new ones to assess sustainable development policy priorities...





- ◆ Improving collaboration between European national Earth observation programs (ERA-NET) (*Coordination action or support specific action*)
- ◆ Establishment of a worldwide multi-hazards observation systems (optimising the observing systems) (*Collaborative project*)
- ◆ Application of Earth Observation to environmental and health issues (*Coordination action or support specific action*)
- ◆ GEONETCast applications for developing countries (*Specific Support Action*)







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# FP7 Capacities

## Research Infrastructures

Transnational Access

Integrating activities

Research e-infrastructures

New research infrastructures





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# GEONETCAST



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## GEONETCast Workshop

Brussels, 3rd May 2006



REPORT



SUSTAINABLE DEVELOPMENT, GLOBAL CHANGE  
AND ECOSYSTEMS





# GEONETCast Concept

- ◆ Utilisation of existing dissemination infrastructure provided by environmental satellite operators;
- ◆ Provision of environmental satellite and in-situ data and products to Users on a worldwide, operational basis;
- ◆ Established in the GEO context to provide a dissemination component of the GEOSS;
- ◆ Lead organisations are EUMETSAT, NOAA, and WMO;







# Building upon EUMETCast

- ◆ **A global broadcast system for the delivery of data, products, and services contributed to GEOSS**
  - Use of standard, multicast, dissemination protocols, such as Digital Video Broadcast (DVB), to encapsulate products of any format
  - Supporting all nine GEO societal benefit areas
- ◆ **Dissemination is full and open, respecting GEO data policies**
- ◆ **The cost of satellite communications for each sector of the globe would be funded by one or more partners in GEONETCast, and the day to day management of each sector would be under their responsibility**





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## Antenna and receiving station





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## **GEONETCast current status**

- **EU has funded the PUMA (Preparation for the Use of Meteosat Second Generation in Africa) project through its development funds: deployment of a GEONETCast compatible infrastructure in all 53 African countries. Follow-up of PUMA: AMESD (Environmental Monitoring for Sustainable Development for Africa) project.**
- **It is proposed under the “Environment” priority of FP7 to have a Coordination and Support Action to facilitate the use of GEONETCast in collaboration with developing countries, in order to implement pilot phases of the use of GEONETCast in various topical domains (carbon monitoring, water management, vegetation, energy, etc.)**





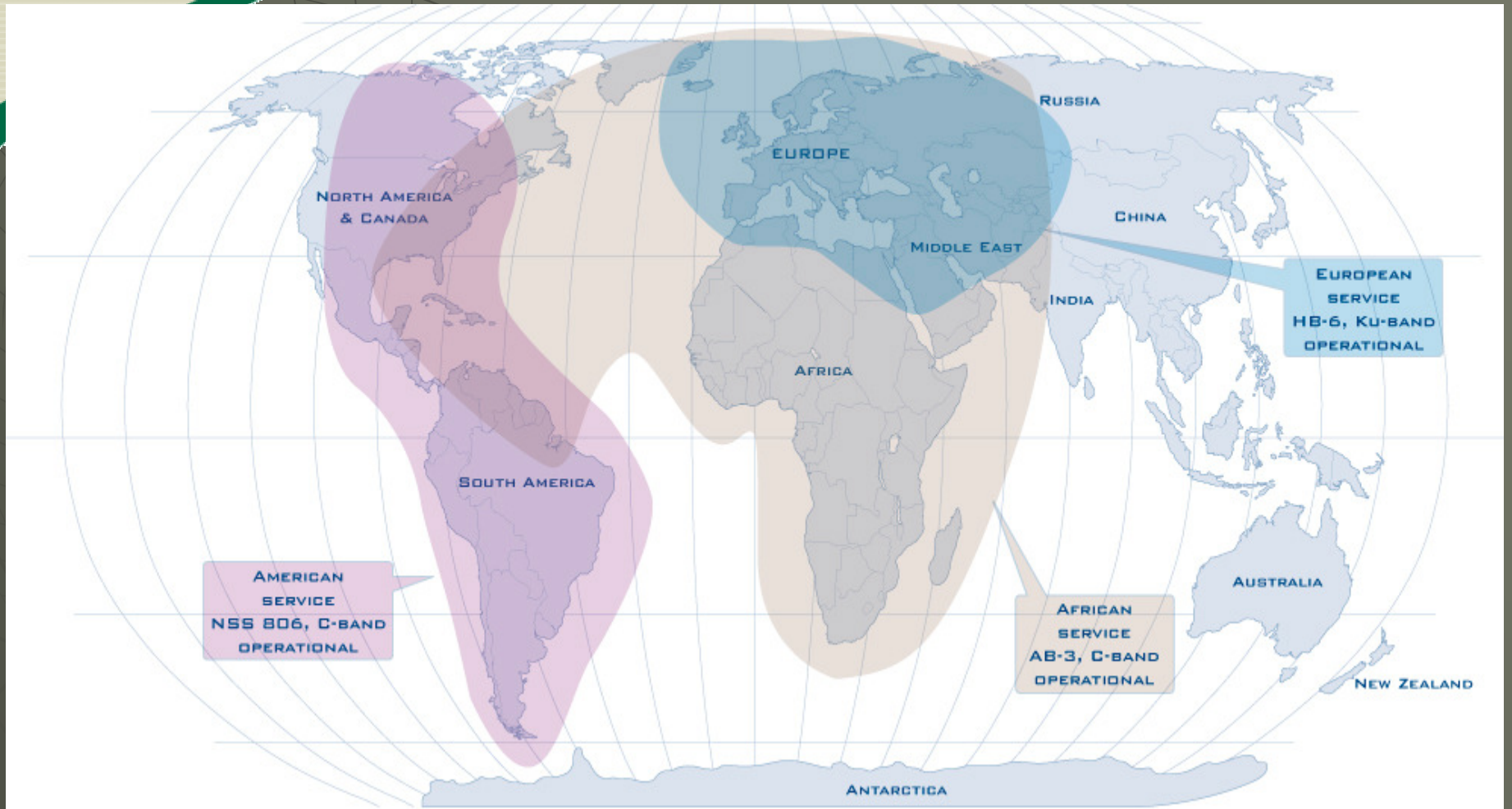


## **GEONETCast current status**

- **Broadcast of Data and products from EUMETSAT, NOAA, ESA, NASA, EC funded project: VGT4AFRICA (Distribution of VEGETATION data in Africa through EUMETCAST), AMMA (African Monsoon Multidisciplinary Analysis): data on the regional water cycle, the atmospheric dynamics and chemistry, the land-surface and oceanic conditions.**
- **The provision of NOAA products to be broadcasted by the current EUMETSAT facility is a good example of EU-US collaboration through GEONETCast and further through GEO. Collaboration with the Chinese Meteorological Administration (CMA) and the Japanese Space Agency (JAXA). For example, CMA is looking to expand its data dissemination to include non meteorological data, such as those falling within the nine societal benefit areas defined under GEO.**







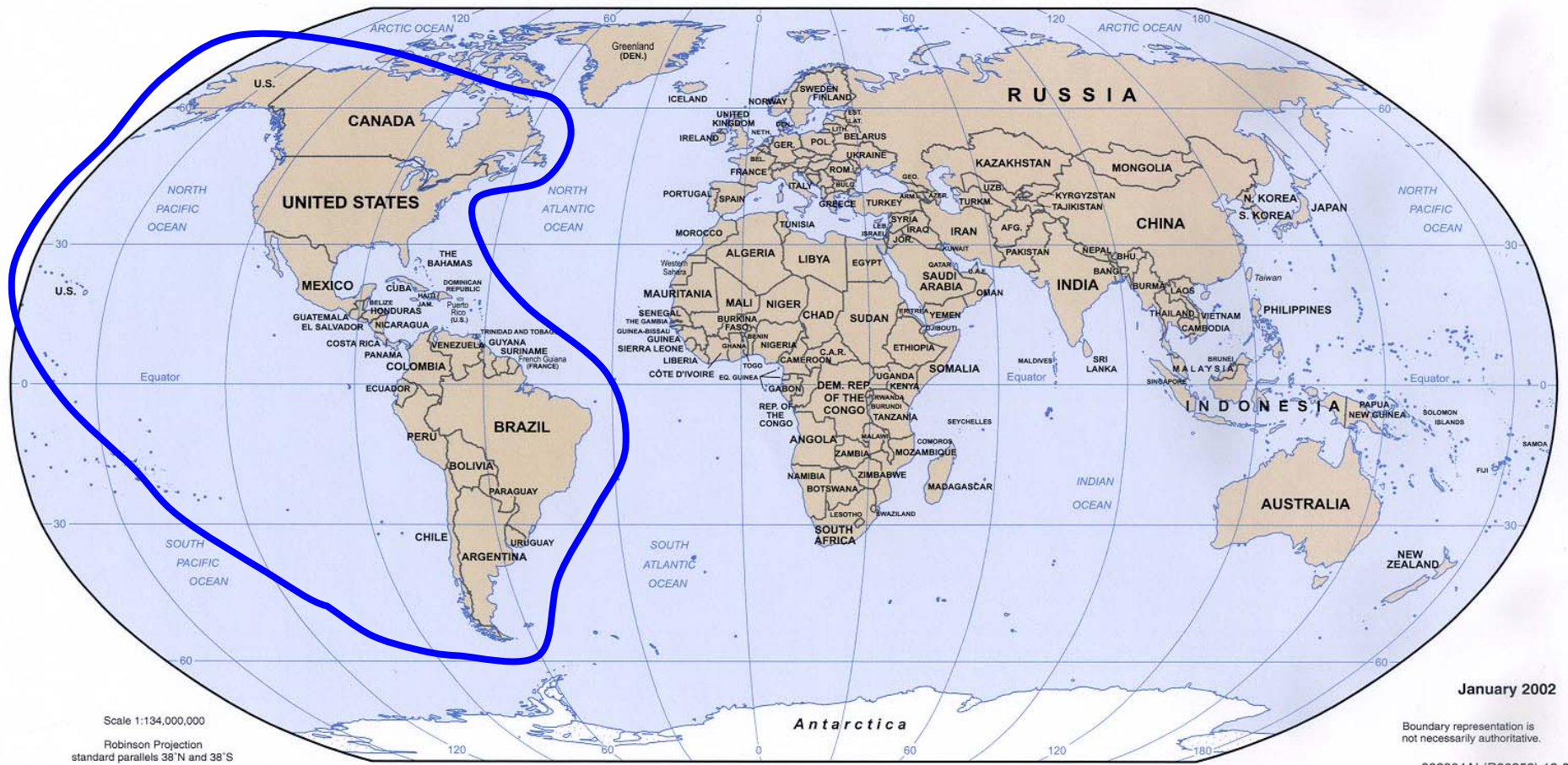
# EUMETCast Coverage





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Scale 1:134,000,000  
 Robinson Projection  
 standard parallels 38°N and 38°S

January 2002

Boundary representation is not necessarily authoritative.

802804A1 (R00352) 12-01

# NOAA Proposed Coverage

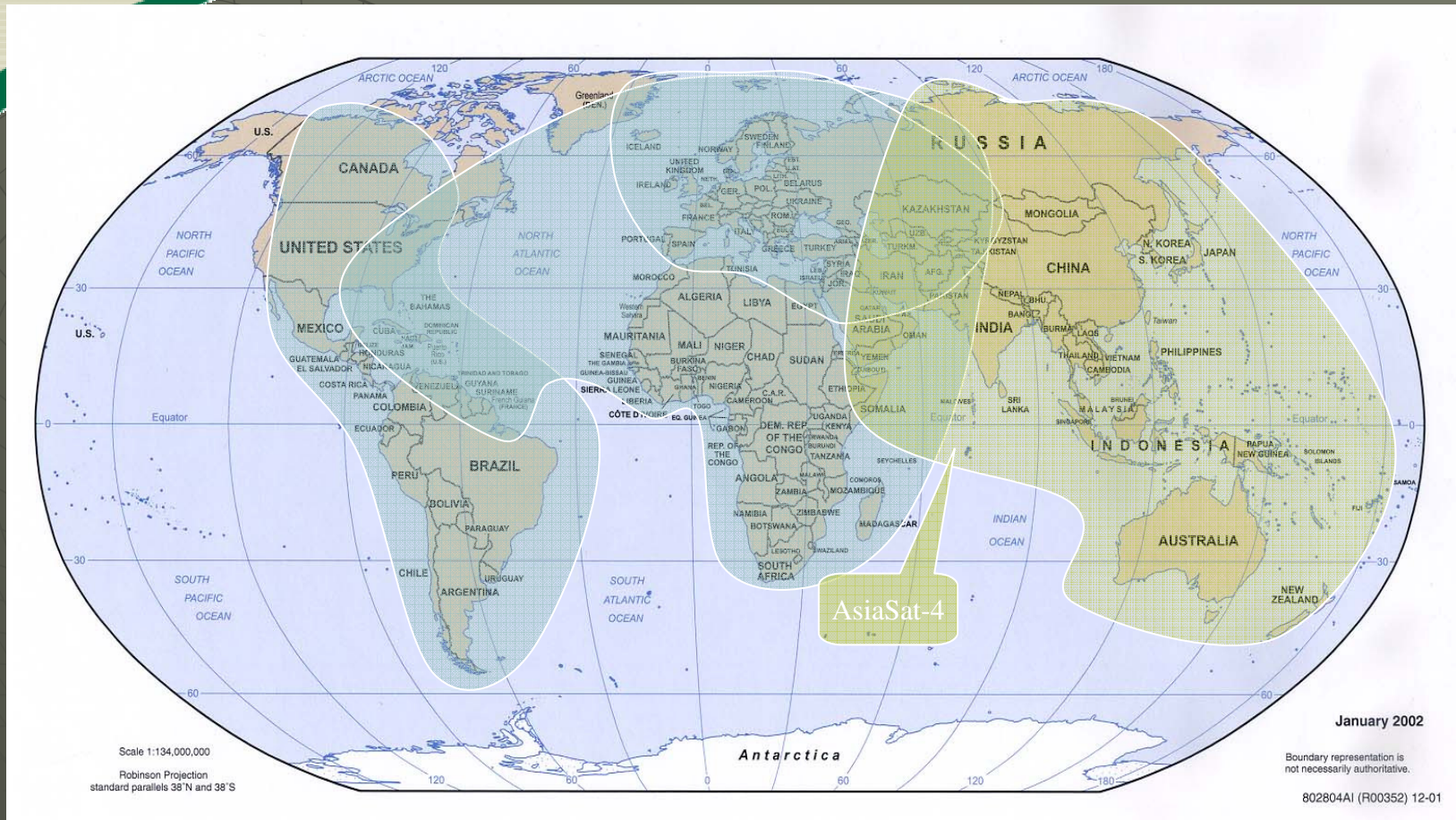






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# Proposed Asian Pacific Coverage Area





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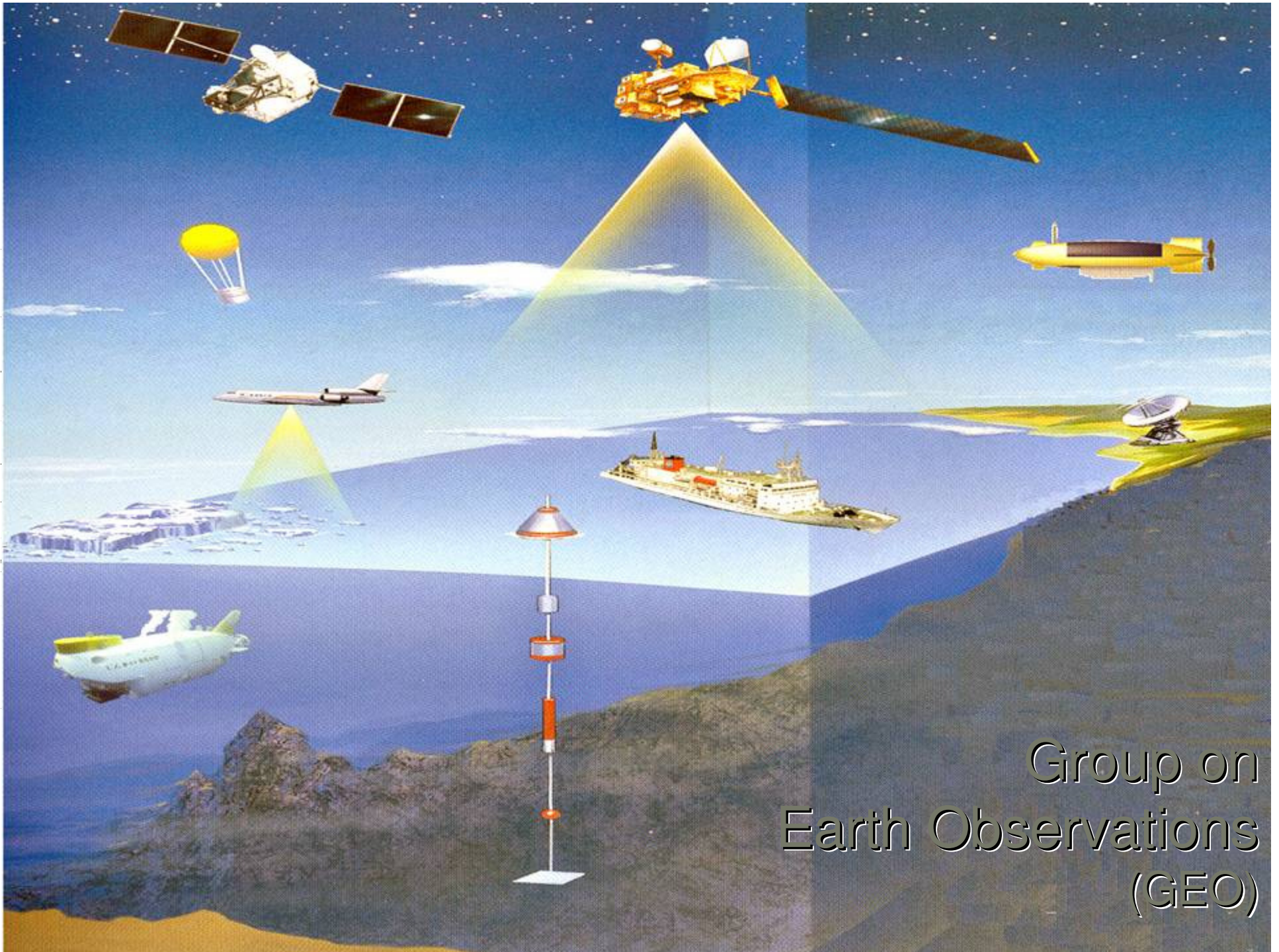
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## Complementary initiatives

- **ESA is working in collaboration with the European Commission under the GEANT program for data exchange and user access through broadband telecommunication systems. ESA would then support directly GEONETCast through the available ESA Networks for Data Dissemination, Exchange and User Access, and dedicated ESA studies on interoperation, including operations and costing models.**
- **IST TANGO project: *Telecommunications Advanced Networks for GMES Operations* - to develop, integrate, demonstrate and promote new satellite telecommunication services to support GMES services and enhance their performance.**







Group on  
Earth Observations  
(GEO)