What is going on in ESA:

GRID, space technologies and environmental applications

luigi.fusco@esa.int

http://esagrid.esa.int

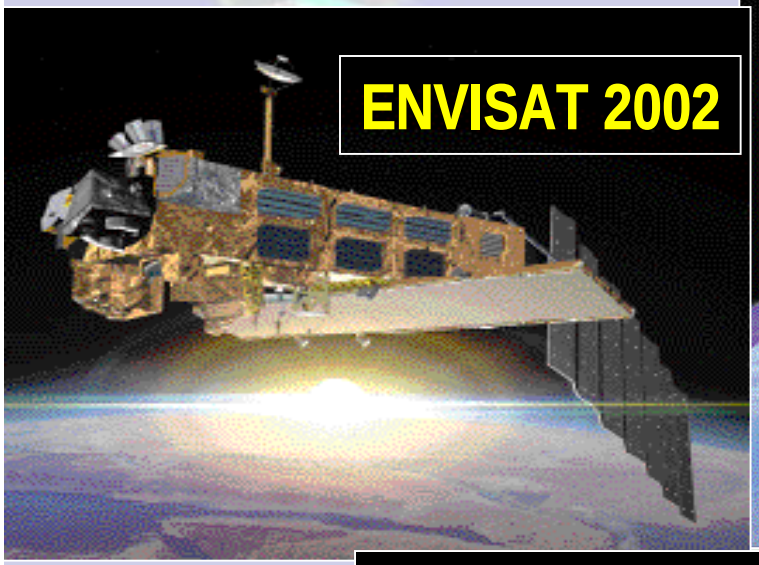
ESAGRID workshop - ESTEC, 25 October 2002

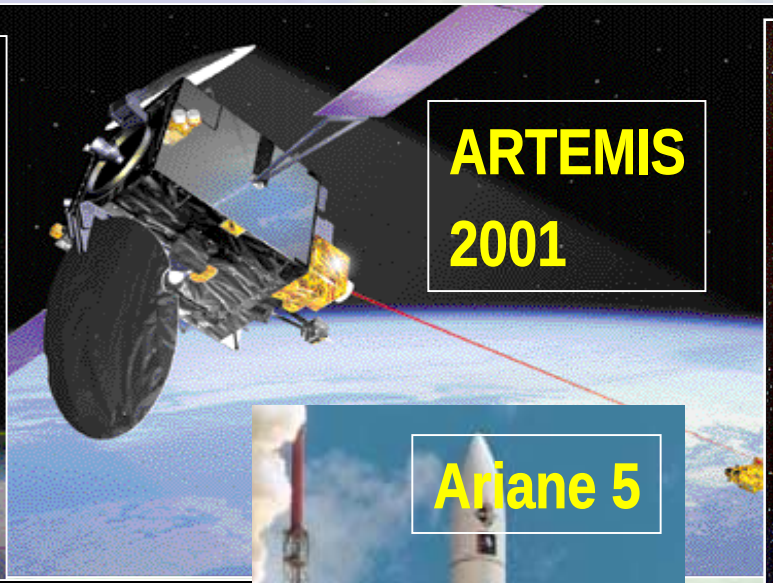
esa

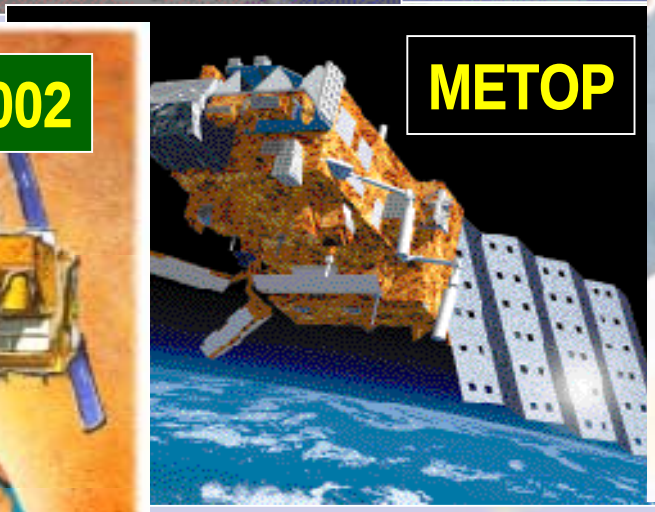
Summary

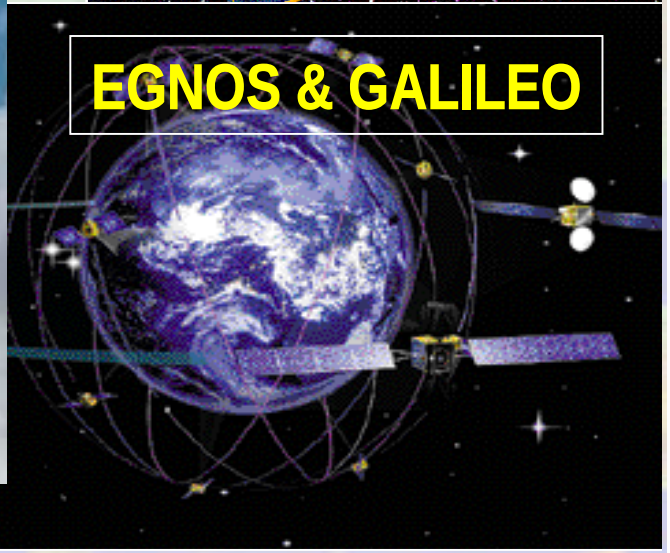
- **ESA, space applications and GRID potential**
- **Specific Earth Observation actions**

New European Space Applications Missions









Strategy for space application

- **Integrated and multi-discipline approach e.g.**
  - Earth Observation missions, GALILEO and Communication for precise location and timely access to information (e.g. disaster management)
  - Modeling, simulation and Decision Support Systems
- **Convergence of Applications for defined user communities**
  - Environmental Monitoring institutional and science community

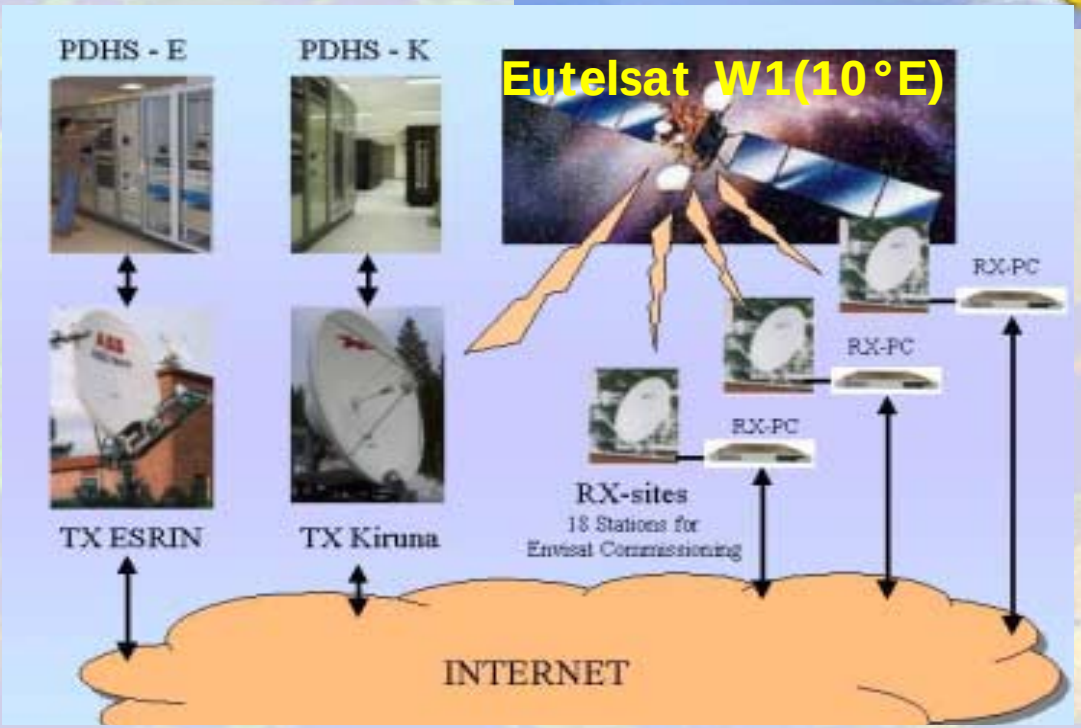
Emerging technologies complementing space

- Fast access to networks and data, interoperability
- Distributed and Massive Processing Systems (GRID)
- Mobile computing
- Internet services
- Real time processing
- …

Satellite communication capabilities

Extending ground high speed capacity

- Data relay
- Data dissemination
  - DVB broadcasting
  - Difficult sites
- Multi-media
  - New generation



Telemedicine: ESA funded activities

All of GRID Interest…

Interactivity level

Simmetric

One way

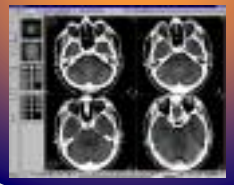
Emergency Consultation

Teleconsultation

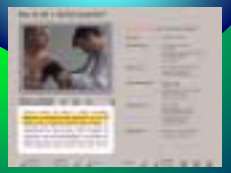
Medical Simul.

Medical Education

Access to MM DBs

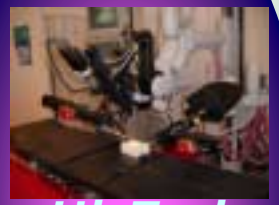


CME



Monitoring @Home

Hi-End: large processing interest



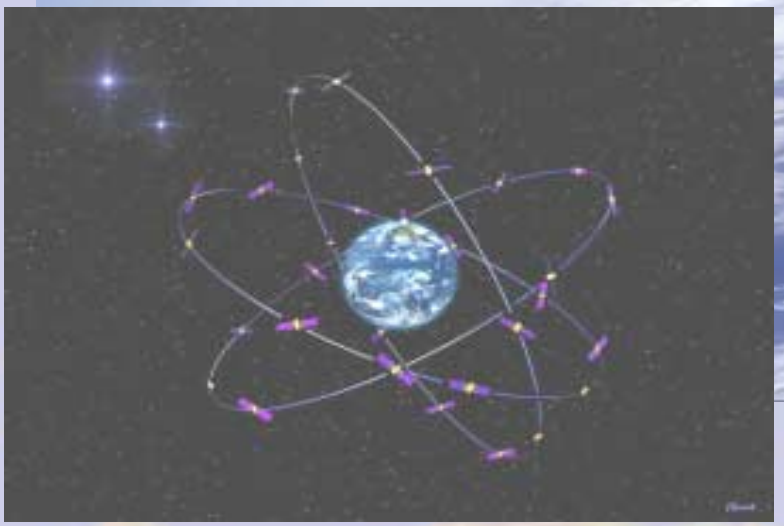
Communication speed

10 kbit/s | 100 kbit/s | 500 kbit/s | 2 Mbit/s | 8 Mbit/s | 50 Mbit/s

The European Galileo programme

Galileo is a EC-ESA joint initiative to provide Europe with a civil satellite navigation infrastructure

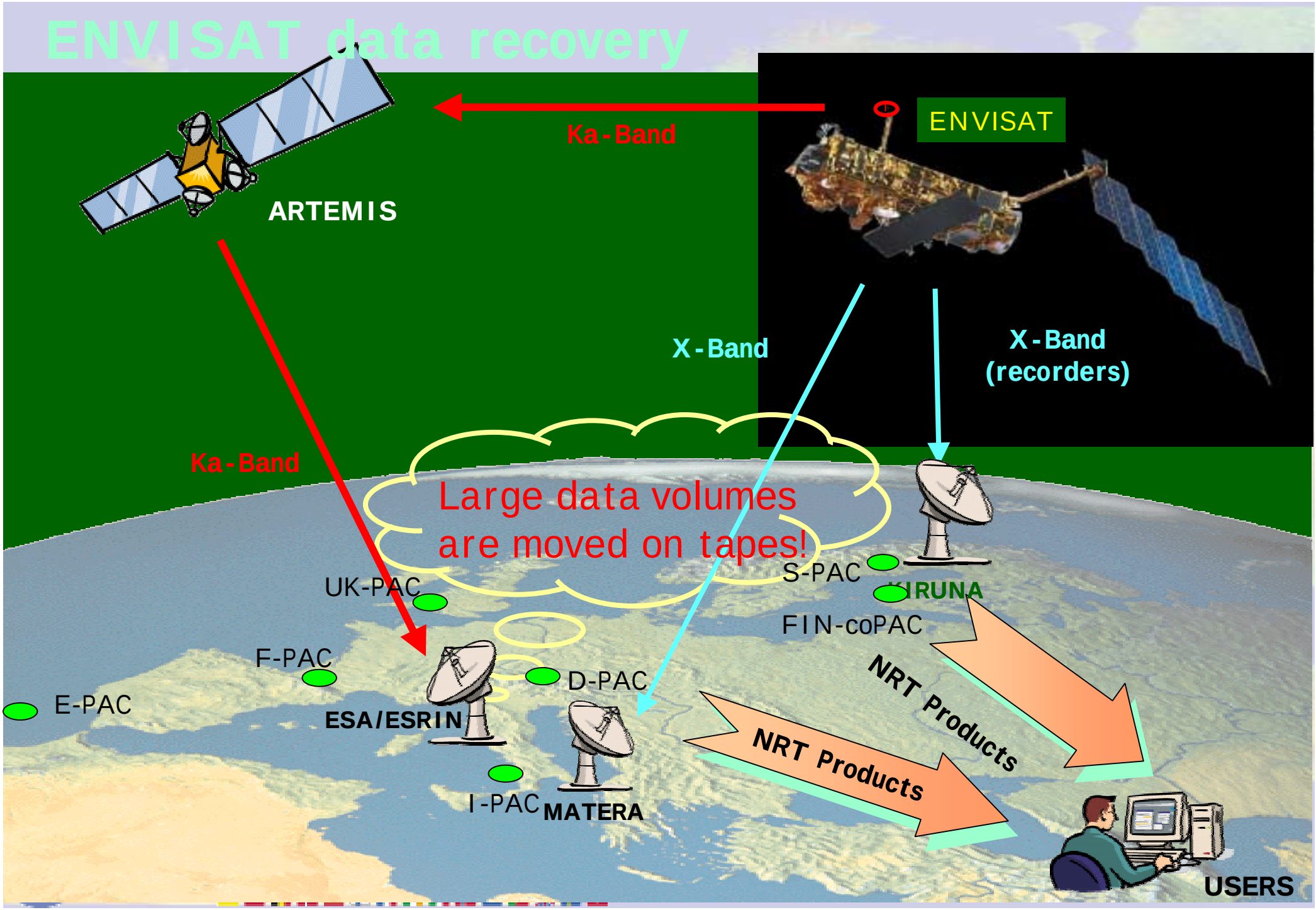
Satellite navigation will enable the development of a large number of applications in several transport and non-transport domains



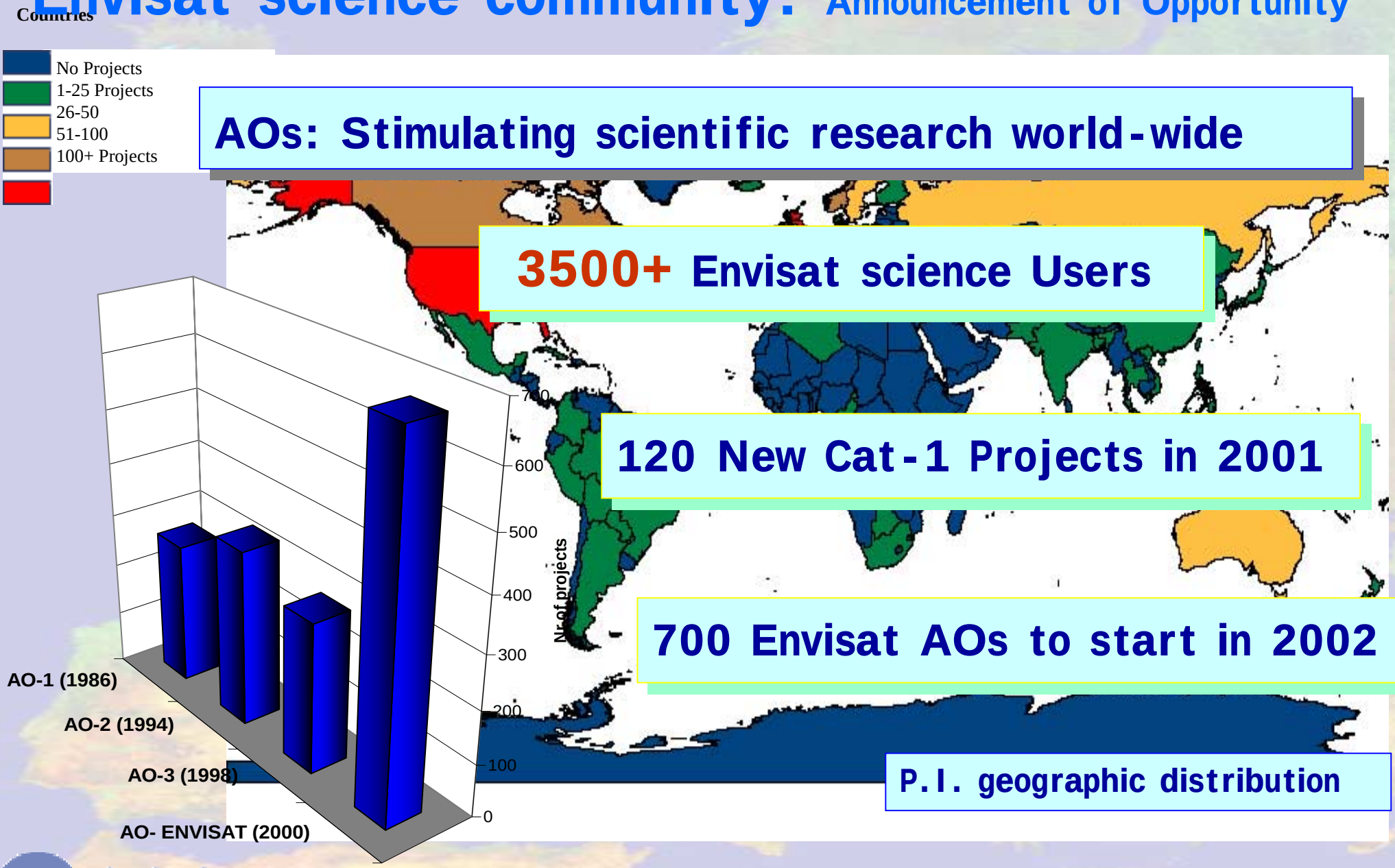
Galileo professional applications

- Agriculture
- Fisheries
- Forestry
- Civil Engineering, Mining, Oil …
- Surveying and Mapping
- Emergency application
- ….

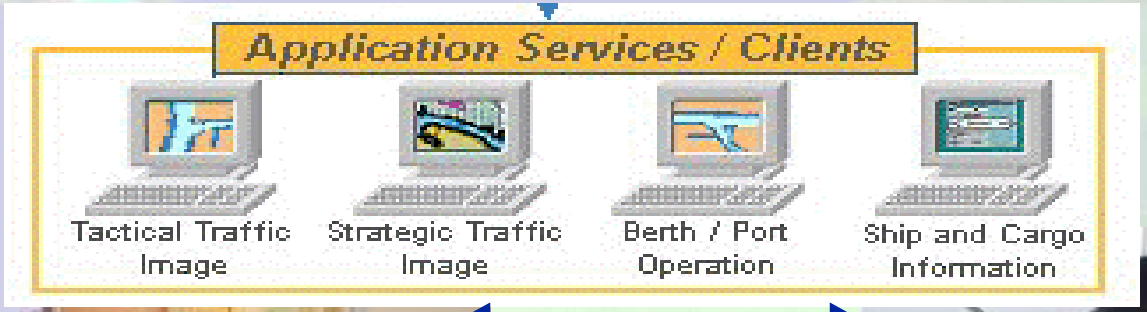
GALILEO Added – value : higher accuracy, service guarantee, integrity


ENVISAT data recovery
ARTEMIS
Ka-Band
ENVISAT
X-Band
X-Band
(recorders)
Ka-Band
Large data volumes
are moved on tapes!
UK-PAC
S-PAC
KIRUNA
FIN-coPAC
F-PAC
D-PAC
E-PAC
ESA/ESRIN
NRT Products
NRT Products
I-PAC
MATERA
USERS

Envisat science community: Announcement of Opportunity



Integration of emerging space and Grid technologies: marine application

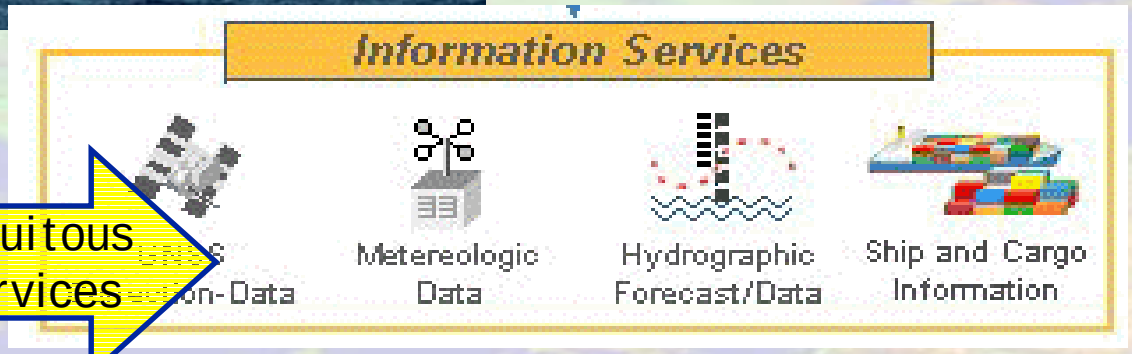


Control Center

Communication with control center

GNSS

Portable terminal with GNSS Receiver



GRID on demand: Weather forecast models ...

Access to ubiquitous application services

Why GRID?

- Space and Earth Science approach based on Progressive refinement of products from many data sources
- Product generation chain involve distributed organisations
- Large international cooperation
- Interoperability of data handling tools
- Value adding industry can take full advantage

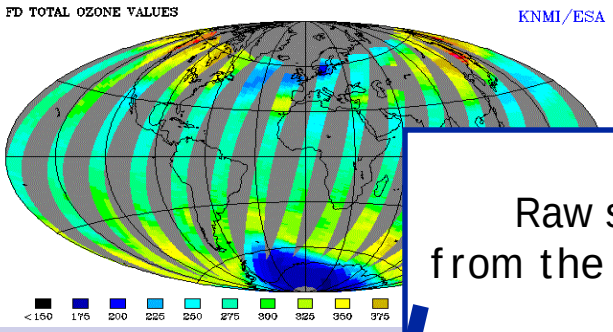
ESAGRID Interest Group

- Started as follow-on of ESA participation to **DataGrid**
- Industrial multi-discipline requirement study – **SpaceGrid** (funded by General Study Programme)
- Discussion group for formulating internal **plans for a space application GRID infrastructure**
  - Improve access to European Research Infrastructures
  - Promote International Cooperation in Space related applications: EIROFORUM, CEOS, …
  - Involve of user communities and Space industry
  - Internal lobbing for funding

Summary

- **ESA, space applications and GRID potential**

- **Specific Earth Observation actions**
  - **DataGrid EO Testbed (with KNMI, IPSL)**
  - **Integrating EO operational user services in DataGrid**
  - **Promoting DataGrid in CEOS (NASA, USGS, NOAA…)**



EO DataGrid challenge:
Processing and validation of 1 year of GOME data

Raw satellite data
from the GOME instrument

Level 1

ESA – KNMI
Processing of raw GOME data to ozone profiles
With alternative algos

Lidar

LIDAR data

IPSL

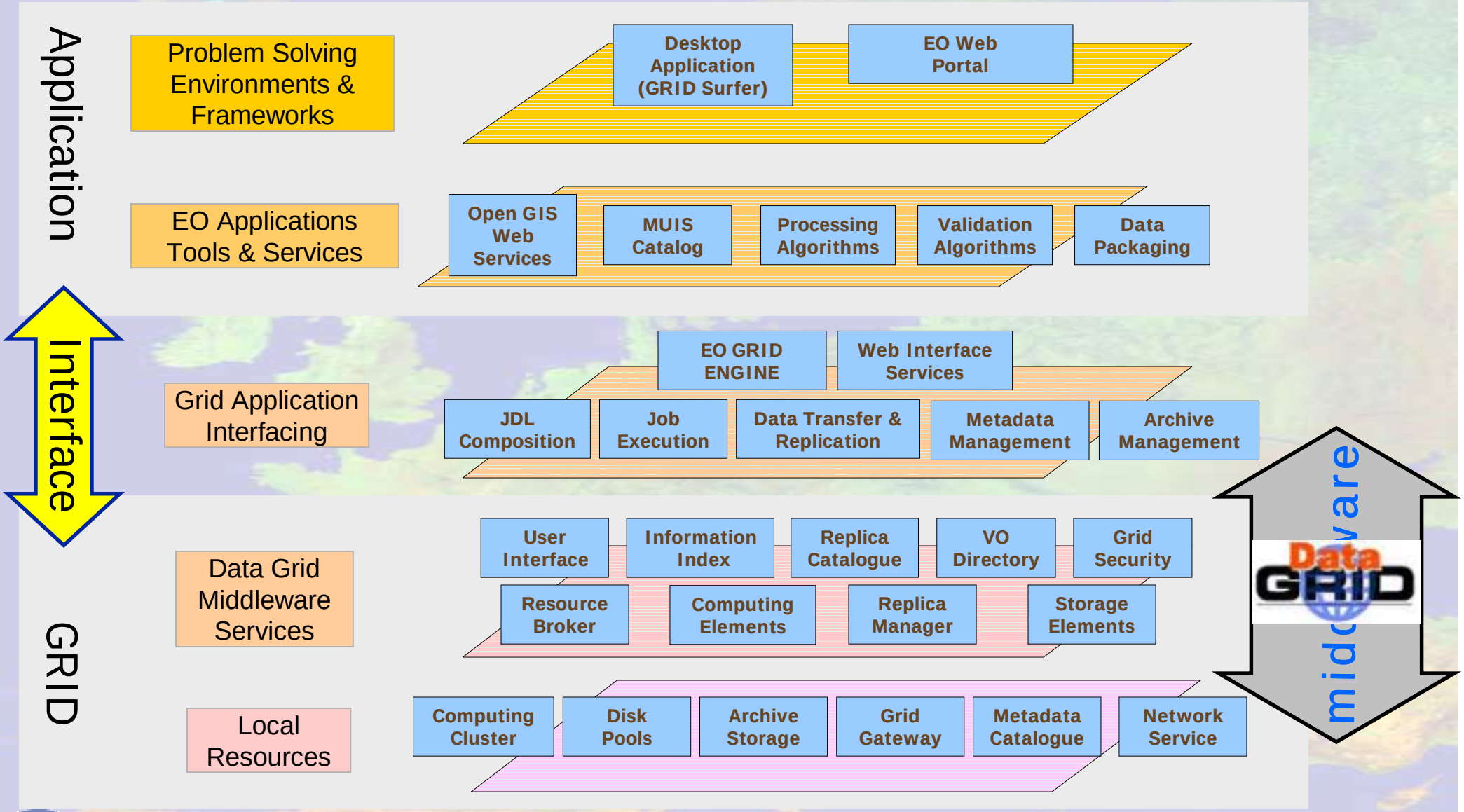
Validate GOME ozone profiles
With Ground Based measurements

Level 2

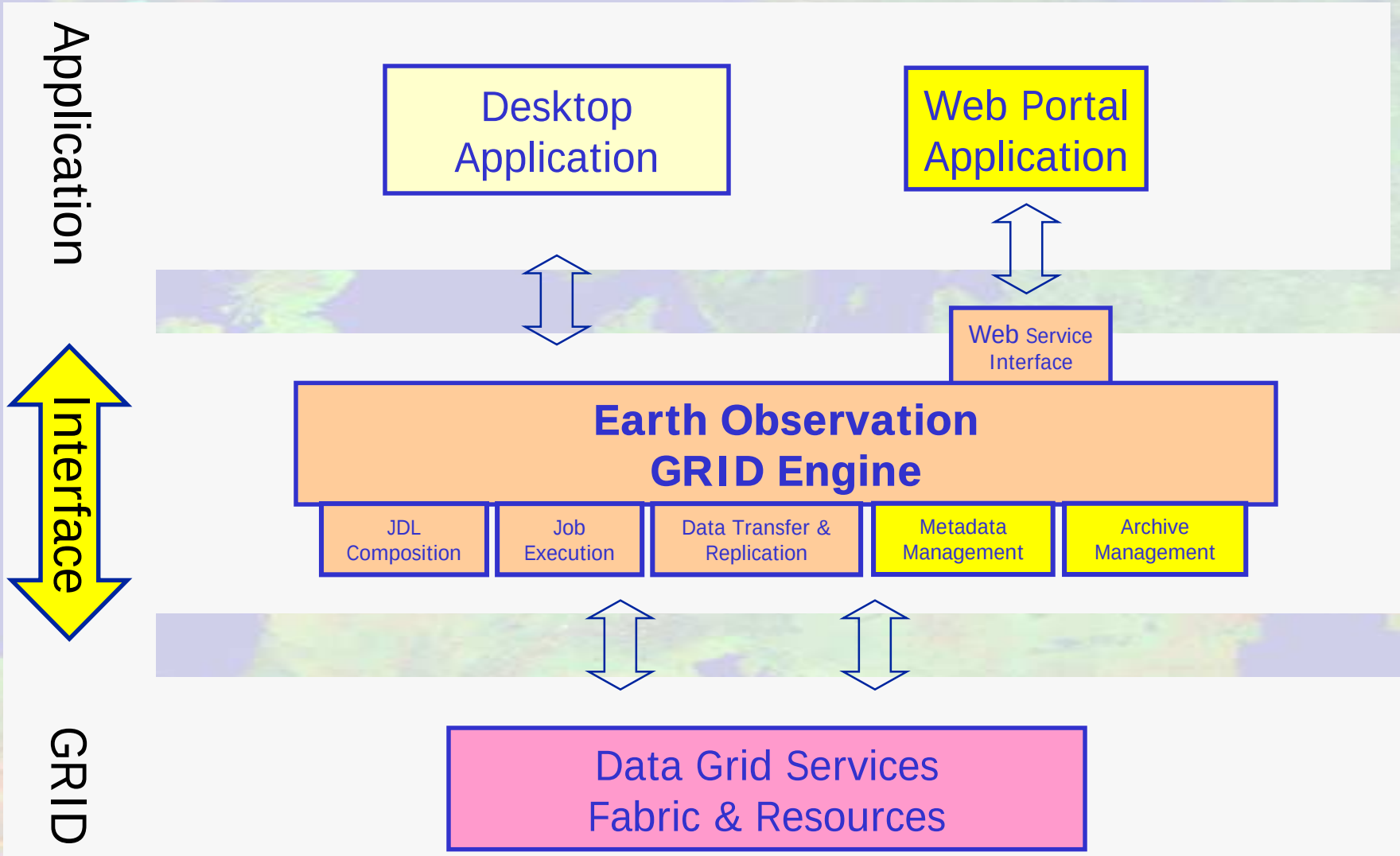
DataGrid

Visualization

EO GRID Architecture Layers

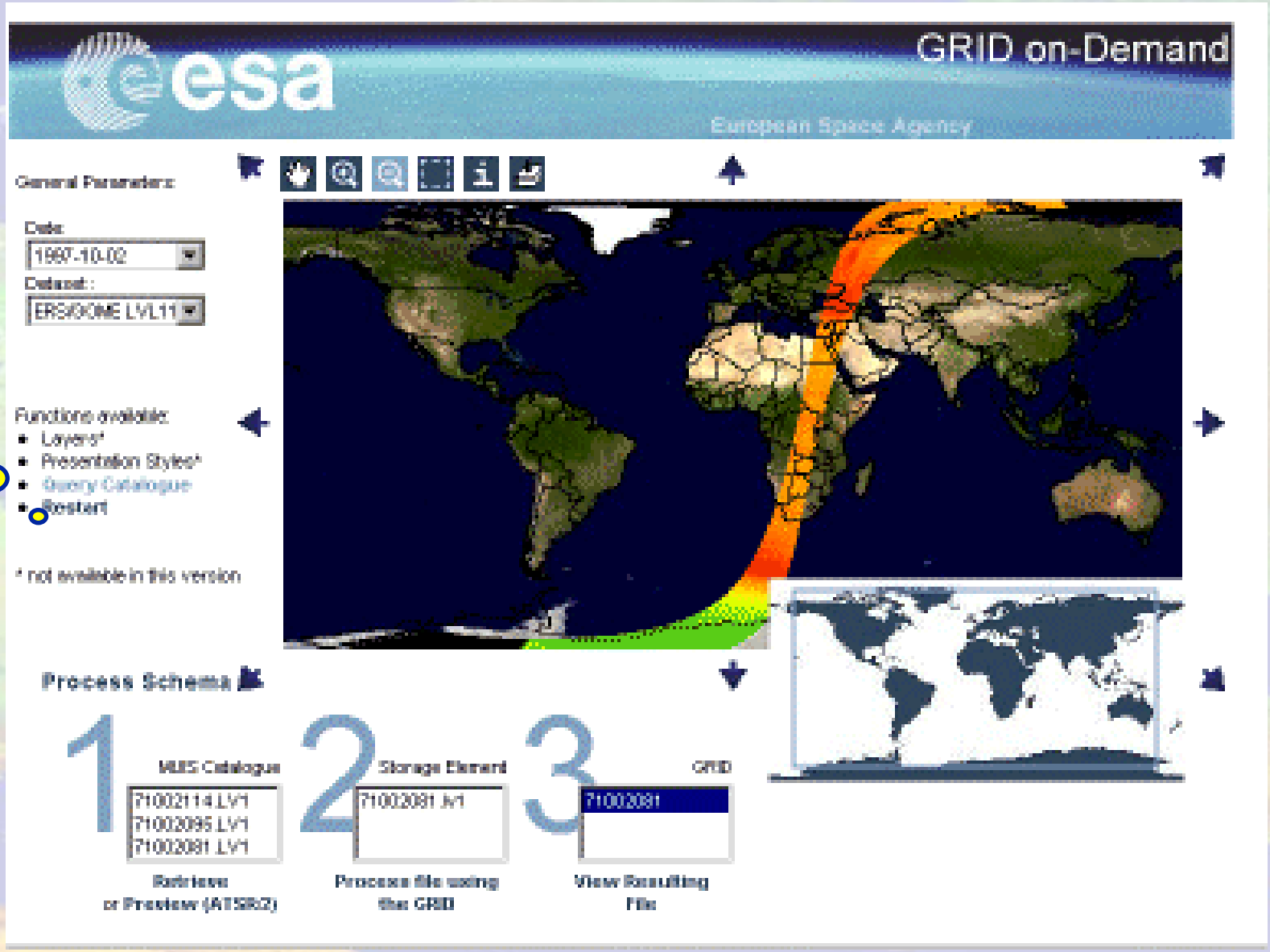


Earth Observation Grid Engine

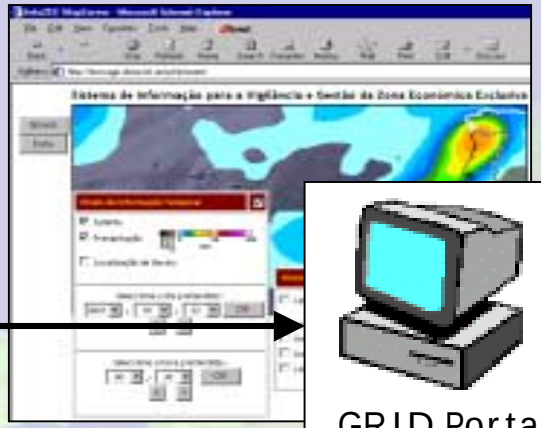


EO DataGrid web client user interface

NEW !



Proposed EO GRID testbed: inteoperability and web-services



GRID Portal

Web Map Services (WMS/WCS/WFS)

GeoCache System

Geographical Data

Remote Servers

Service Layer Broker

Service Catalague

JOB Launcher

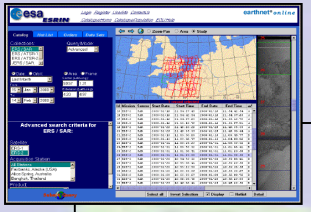
XXX

Earth System GRID

EU-DataGRID

Storage Elements

Computing Element



EO Data Warehouses

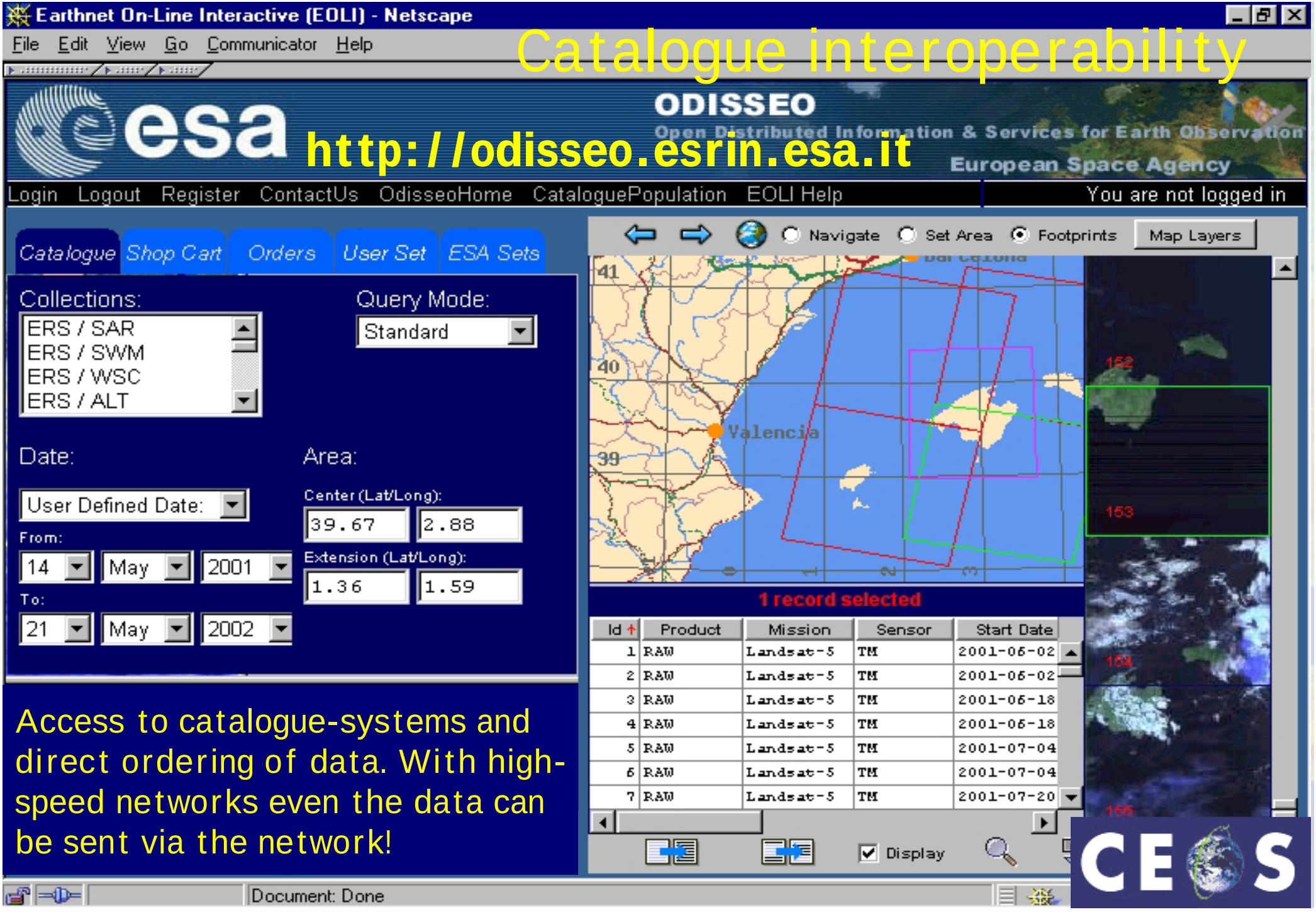
Geographical Data

Remote Servers

GRID

FTP

Catalogue interoperability



Access to catalogue-systems and direct ordering of data. With high-speed networks even the data can be sent via the network!

Oil spill monitoring near the Suez canal (ESA).
On the background 1x1 km² MODIS (NASA).

The ESA Web map server offers access to multiple globally distributed databases (e.g., NASA and ESA). The need for fast access to large volumes of data requires usage of high-speed networks..

Thank you!