Accesso e utilizzo di dati OsservazioneTerra: prospettiveGRID

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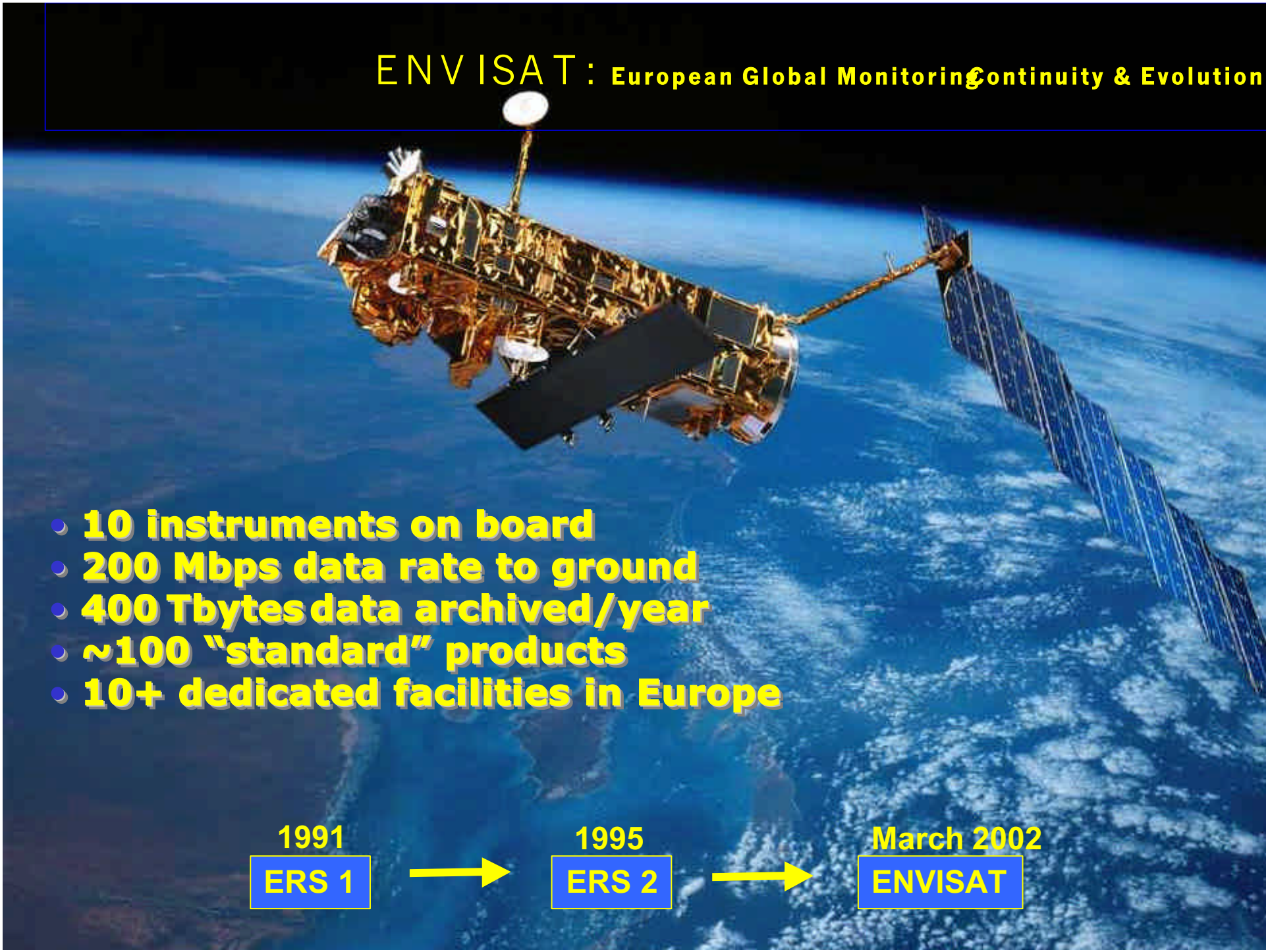
Summary

- ESA and Earth Observation in Europe
- ENVISAT and EO applications
- EO and GRID perspectives
- DataGrid experience and near future plans

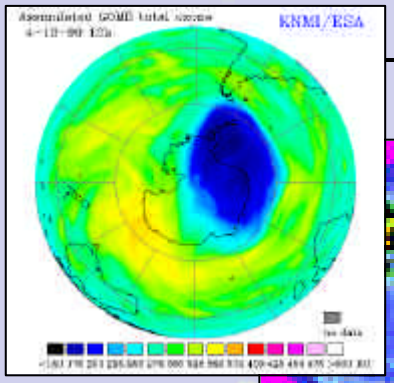
ENVISAT: European Global Monitoring Continuity & Evolution



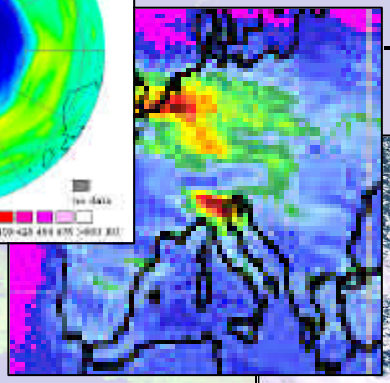
- 10 instruments on board
- 200 Mbps data rate to ground
- 400 Tbytes data archived/year
- ~100 "standard" products
- 10+ dedicated facilities in Europe

1991 ERS 1 → 1995 ERS 2 → March 2002 ENVISAT

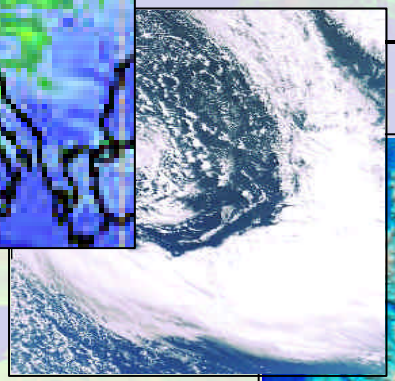
What ENVISAT can see when it looks down at you?



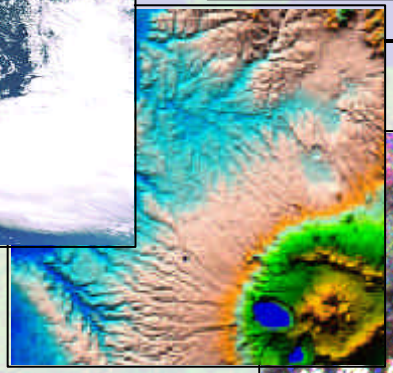
Altitude 0 to 100 km: GOMOS, MIPAS and SCIAMACHY are building a three-dimensional profile of ozone concentrations in the atmosphere.



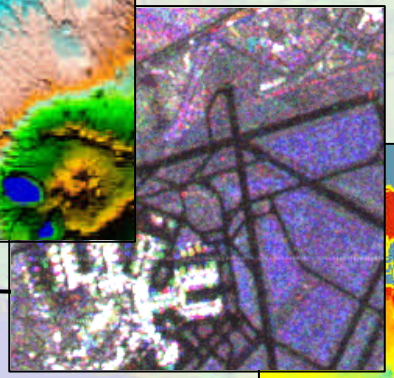
Altitude 0 to 20 km: MIPAS and SCIAMACHY are detecting low levels of gases from industry, power generation and agriculture.



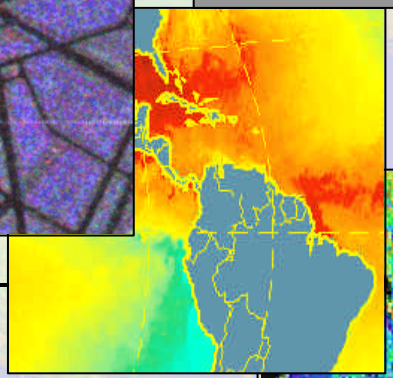
Altitude 0 to 10 km: MERIS obtains an image in which the clouds you see are but a part of a complex map of the concentration of water vapour.



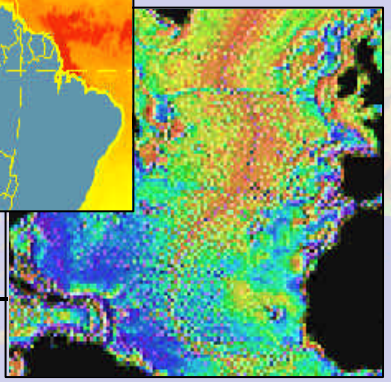
Altitude 0 to 4 km : ASAR and RA-2 create an accurate digital map of your surroundings, with height contours as accurate as 10 m.



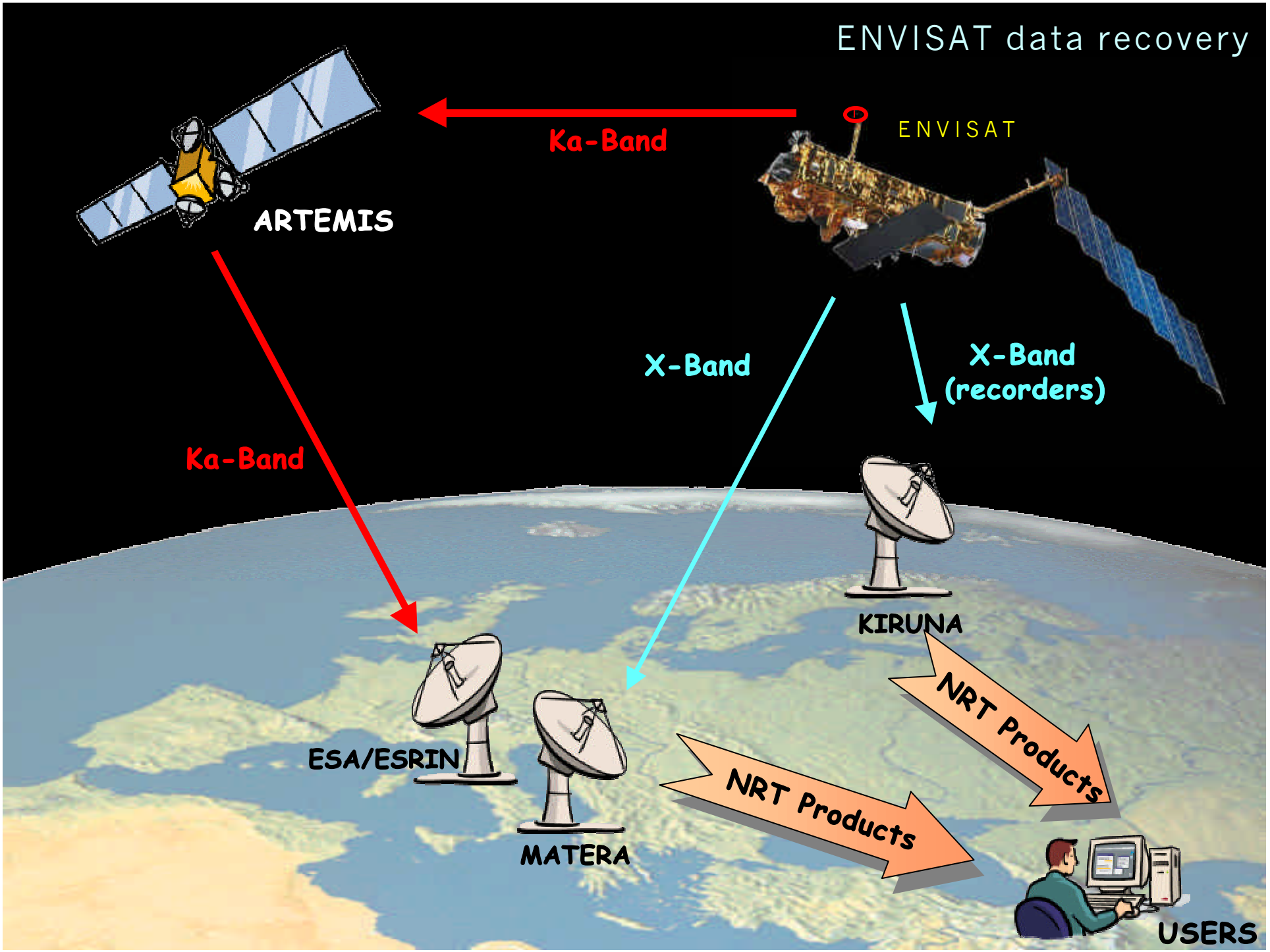
Ground level: ASAR, AATSR and MERIS map the vegetation and land use around you.

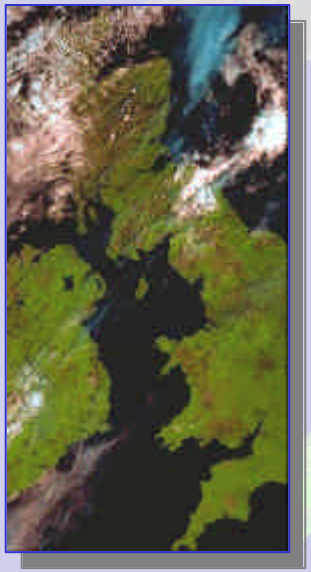


Sea level: AATSR measures sea surface temperature to 0.3 °C accuracy. MERIS precisely maps ocean colour, plankton and chlorophyll distributions. ASAR and RA-2 measure ocean currents, average wave-heights and wind velocities.



Underwater: RA-2 and DORIS combine to produce a detailed map of local gravitational strength, detecting the distribution of denser and less dense rock in the Earth crust beneath the oceans.


ENVISAT data recovery
ENVISAT
Ka-Band
ARTEMIS
X-Band
X-Band
(recorders)
Ka-Band
KIRUNA
NRT Products
ESA/ESRIN
NRT Products
MATERA
USERS



1- Physical media

EXABYTE, DLT

CD ROM, DVD-ROM (in 2003)

USERS

ftp-get

2- Internet

Password protected servers

3- via telecom satellite

MERIS instrument first image

15 Bands

Pixel 300 m

SAR instrument image over sea

6 Oct 1998
night time 23:29

ITALY
Tuscany coast

two Oil Spills are visible on this ERS-SAR image

25km long
7km long

at less than 80km from the coast.

SAR Oil spill: statistic over year 2000 in one test site

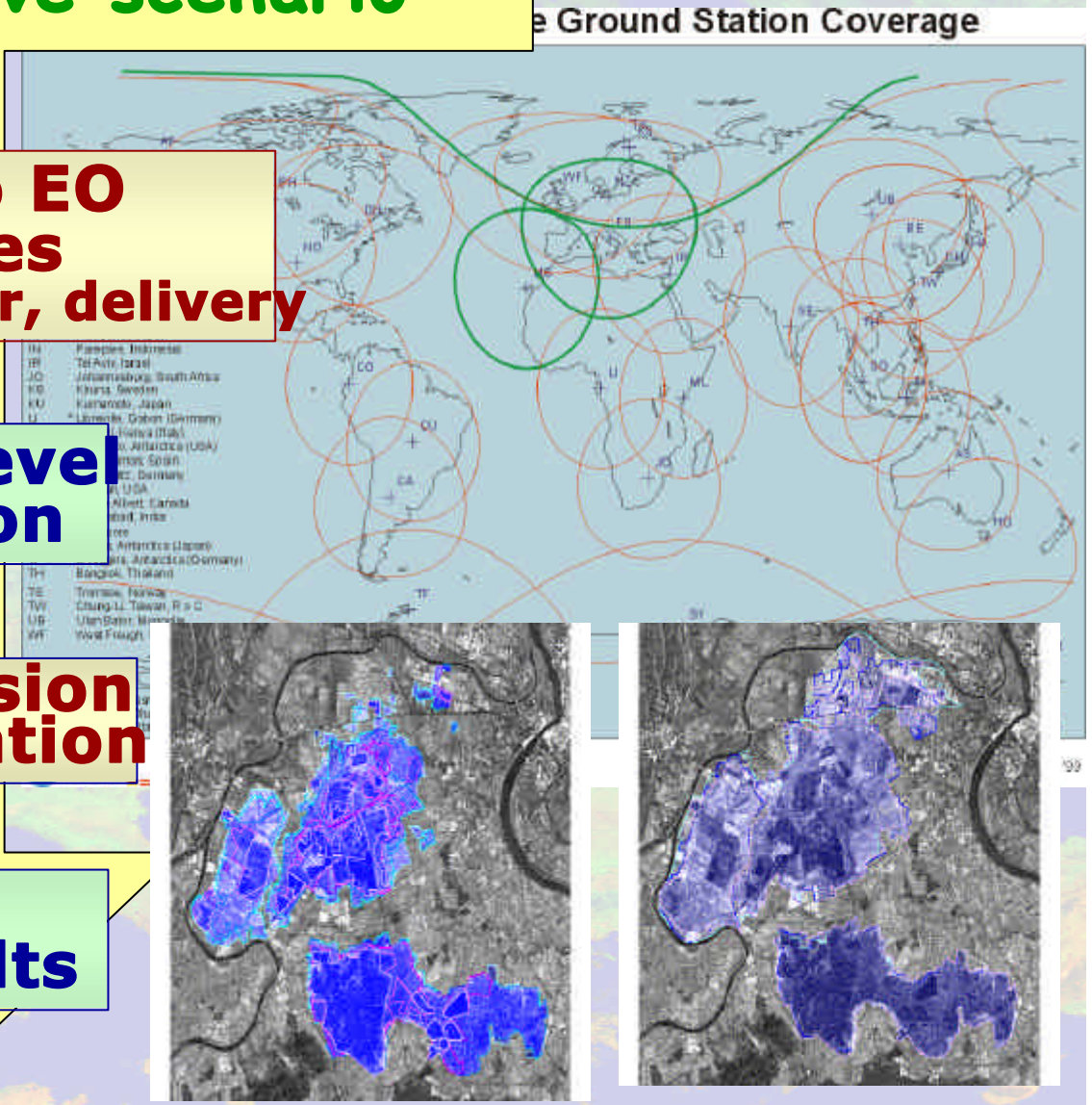
Earth Observation Community
GRID interactive scenario

Common access to EO missions catalogues
Acquisition plan, order, delivery

On demand high level products generation

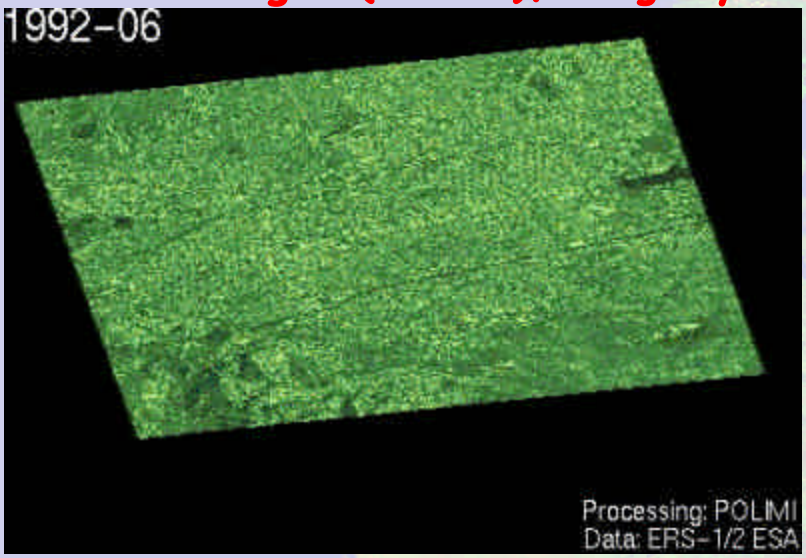
Parametric data fusion and models integration

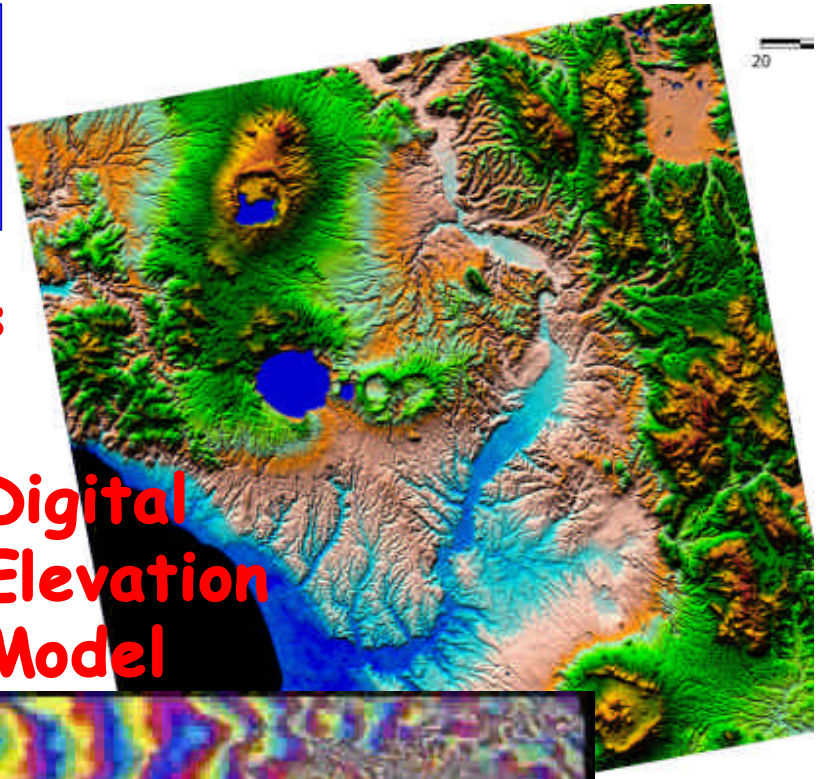
Collaborative publishing of results



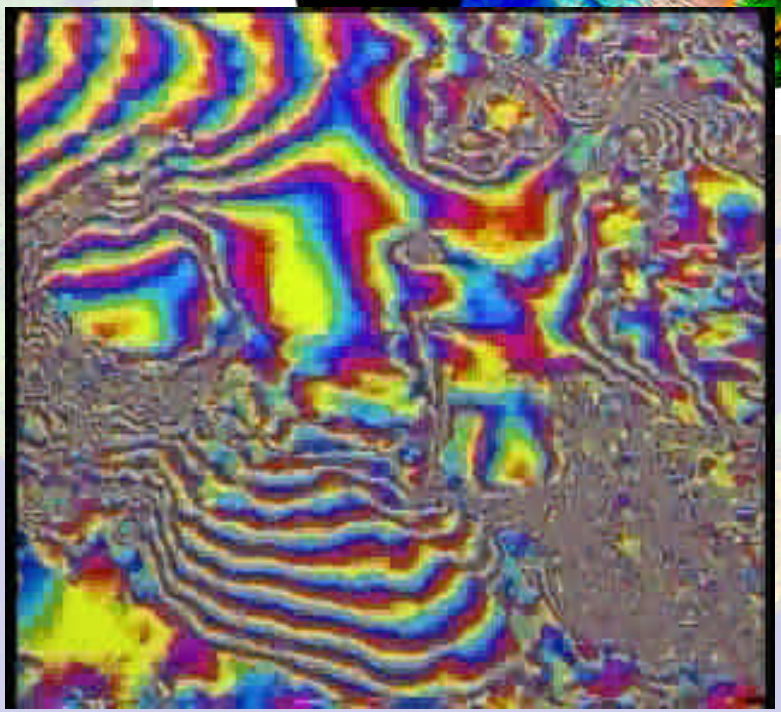
interferometry, subsidence, DEM

Pomona (Cal): subsidence velocity fields
40 ERS1/2 images (92-99) Ambiguity: 28 mm





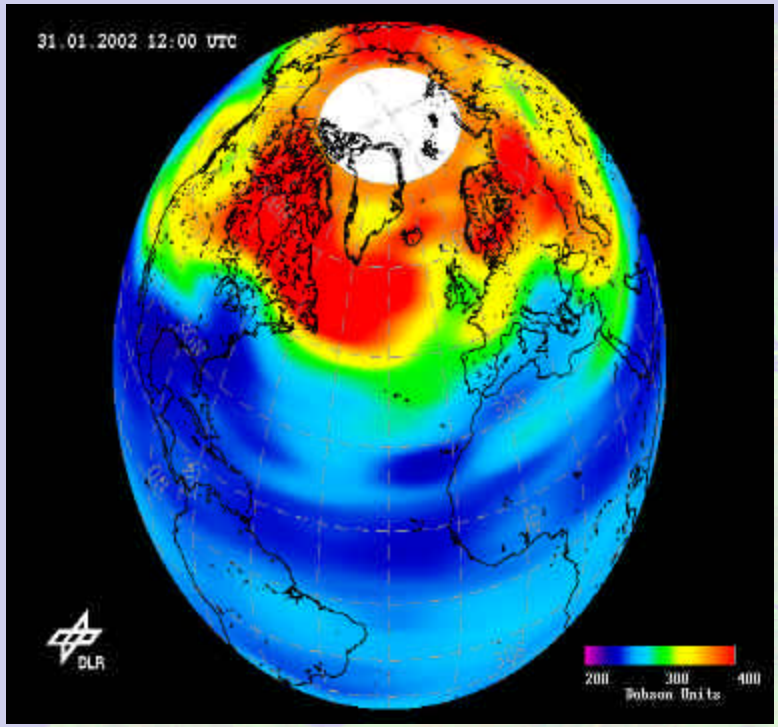
Digital Elevation Model



GRID requirements:

- large data files (10+ GB)
- stages with intensive processing
- science driven value adding

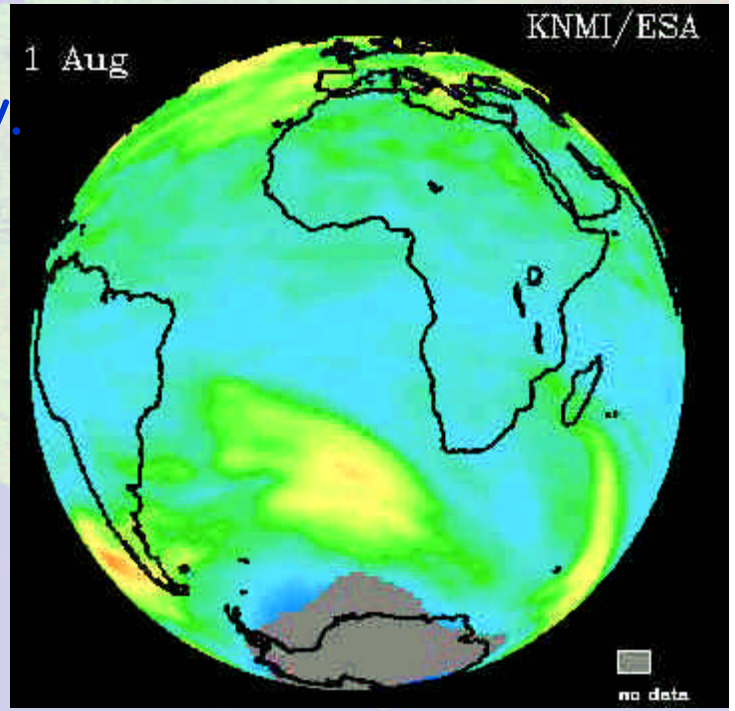
OZONE: a case of Global Environmental Monitoring



GOME analysis detected ozone thinning over Europe 31 Jan 2002

GRID requirements:

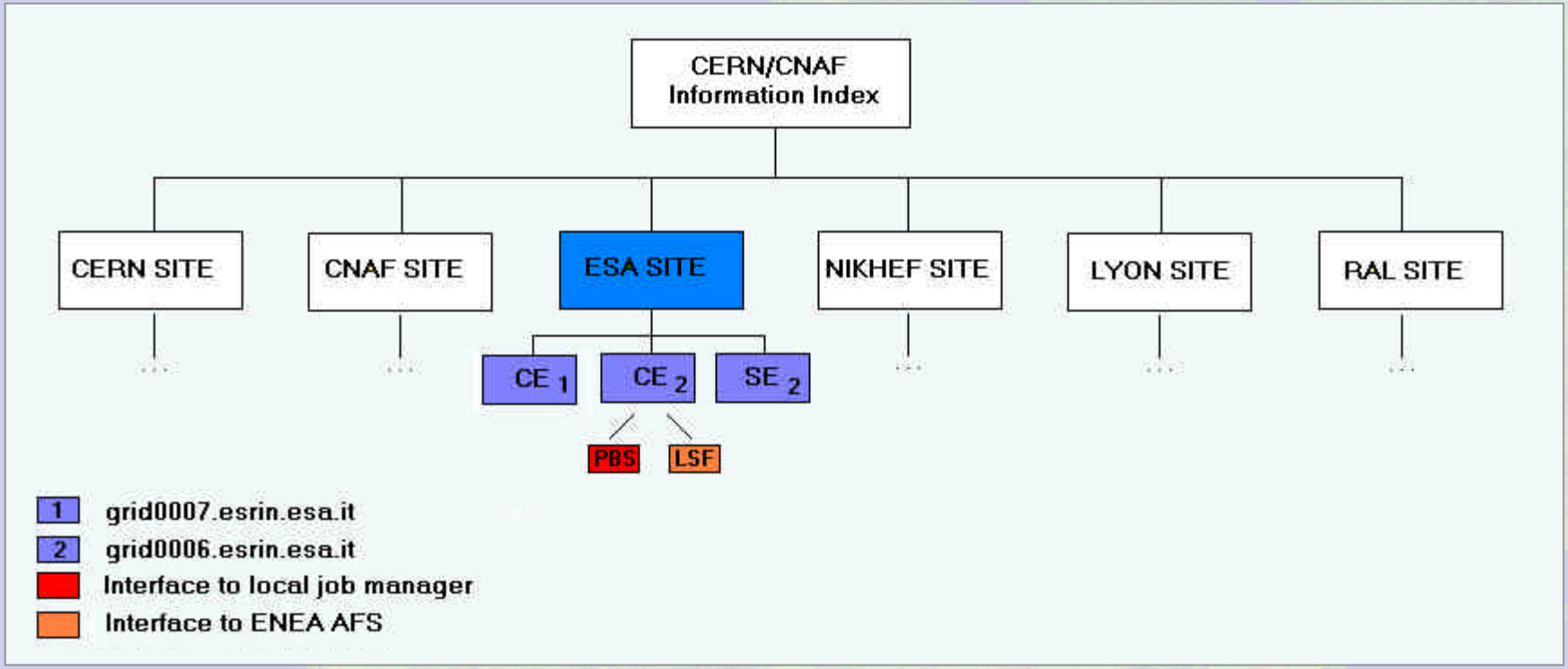
- Multi instrument data fusion
- Distributed data sources, science and institutional users
- Complex data processing
- Near real time deliv



Needed GRID technologies

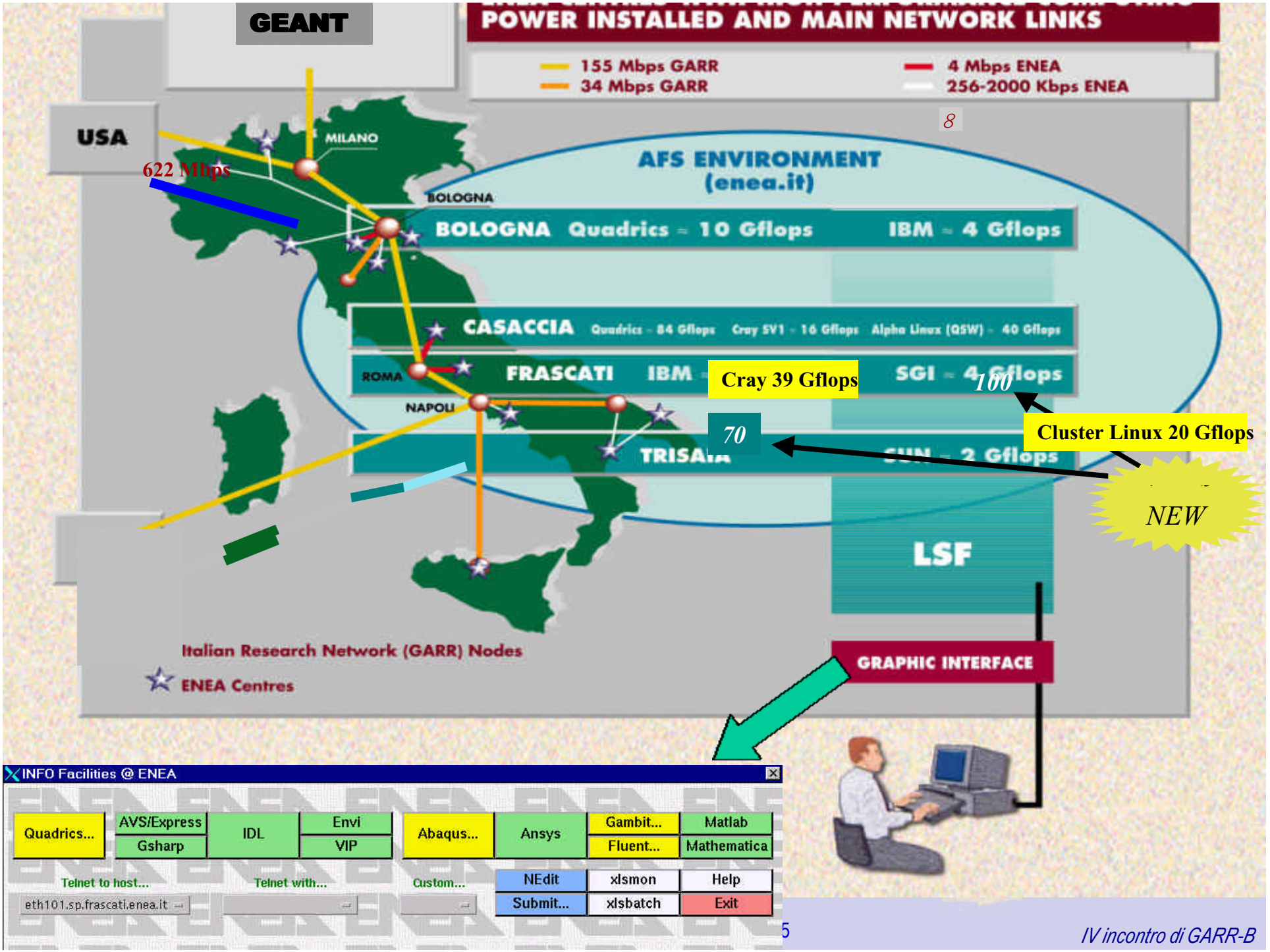
- Resource-independent and application-independent services (middleware)
  - authentication, authorization, resource location, resource allocation, remote data access,
  - accounting, security, quality of services, fault detection, real time services, …
- Specialized protocols, procedures, data standards, operational environments, interfaces to EO legacy systems…
- EO dedicated portal and user access…

Integration with DataGrid Information Services

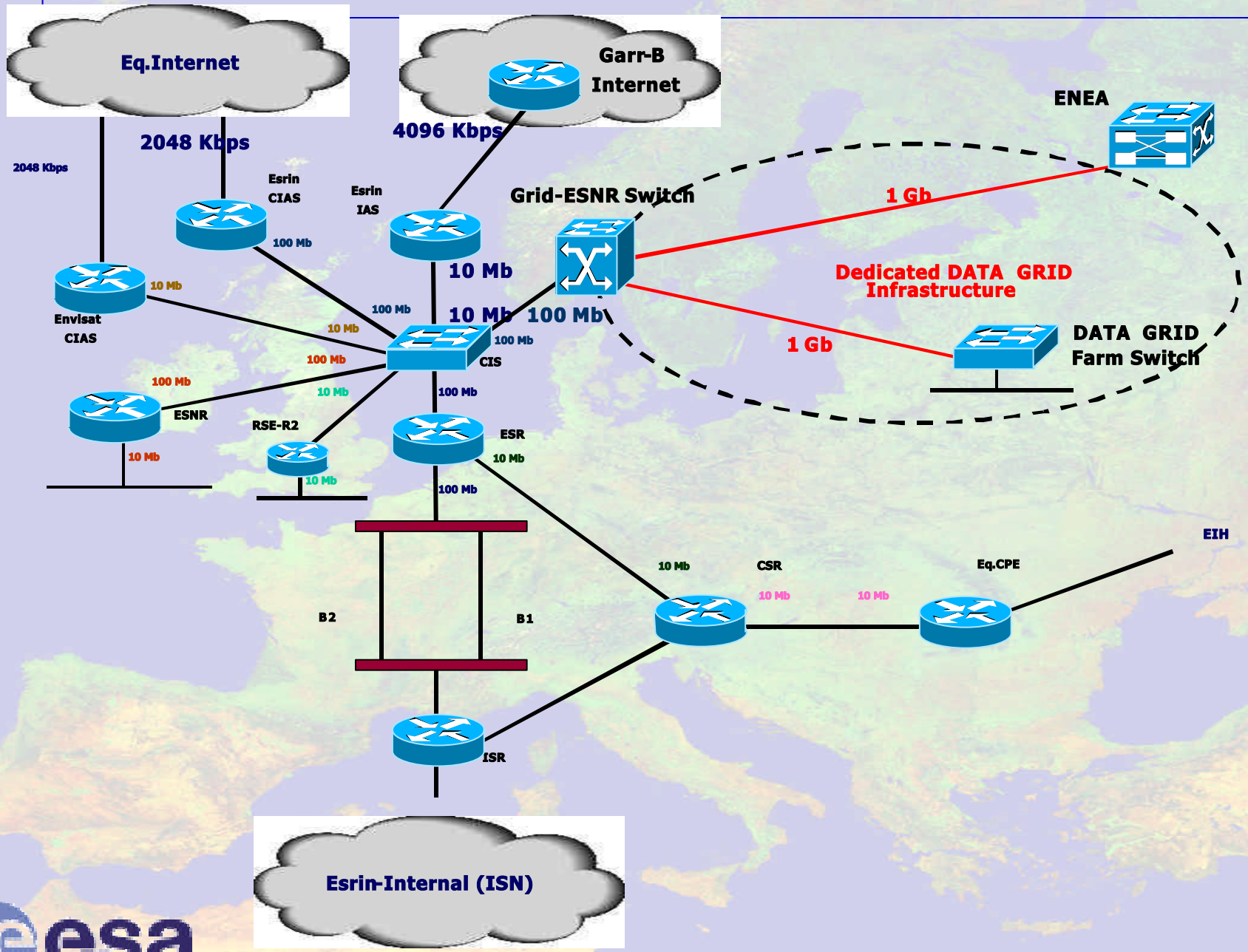


Esrin CE and SE are registered with CNAF and CERN Information Index and accessible from both Resource Broker machines:

- testbed011.cern.ch
- grid004f.cnaf.infn.it


GEANT
POWER INSTALLED AND MAIN NETWORK LINKS
155 Mbps GARR
34 Mbps GARR
4 Mbps ENEA
256-2000 Kbps ENEA
8
USA
622 Mbps
MILANO
BOLOGNA
AFS ENVIRONMENT
(enea.it)
BOLOGNA Quadrics - 10 Gflops
IBM - 4 Gflops
CASACCIA Quadrics - 84 Gflops
Cray SV1 - 16 Gflops
Alpha Linux (QSW) - 40 Gflops
ROMA
FRASCATI
IBM -
SGI - 4 Gflops
NAPOLI
TRISAIA
SUN - 2 Gflops
Cray 39 Gflops
100
70
Cluster Linux 20 Gflops
NEW
LSF
GRAPHIC INTERFACE
Italian Research Network (GARR) Nodes
ENEA Centres
INFO Facilities @ ENEA
Quadrics...
AVS/Express
Gsharp
IDL
Envi
VIP
Abaqus...
Ansys
Gambit...
Fluent...
Matlab
Mathematica
Telnet to host...
Telnet with...
Custom...
eth101.sp.frascati.enea.it
NEdit
Submit...
xlsmon
xlsbatch
Help
Exit

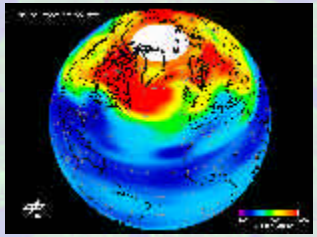
ESRIN-ENEA Gigabit link

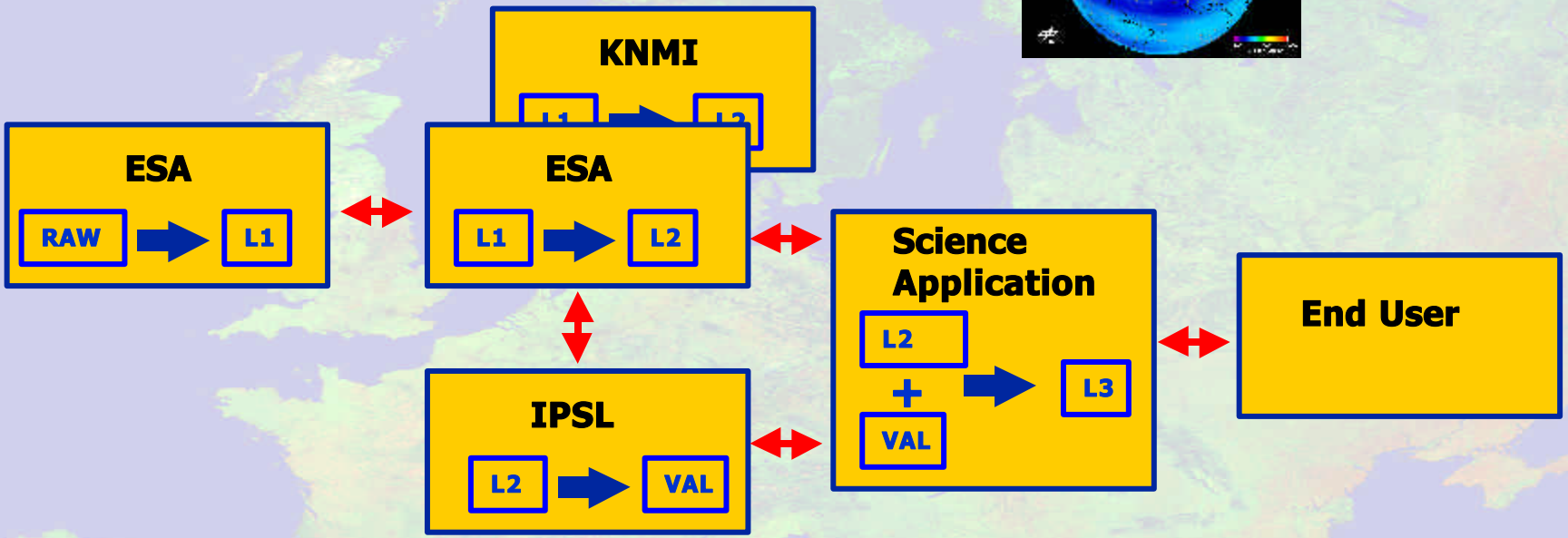


DataGrid GOME demo'tion

L1 4724 files = 66 Gb

L2 9,448,000 files = 108 Gb

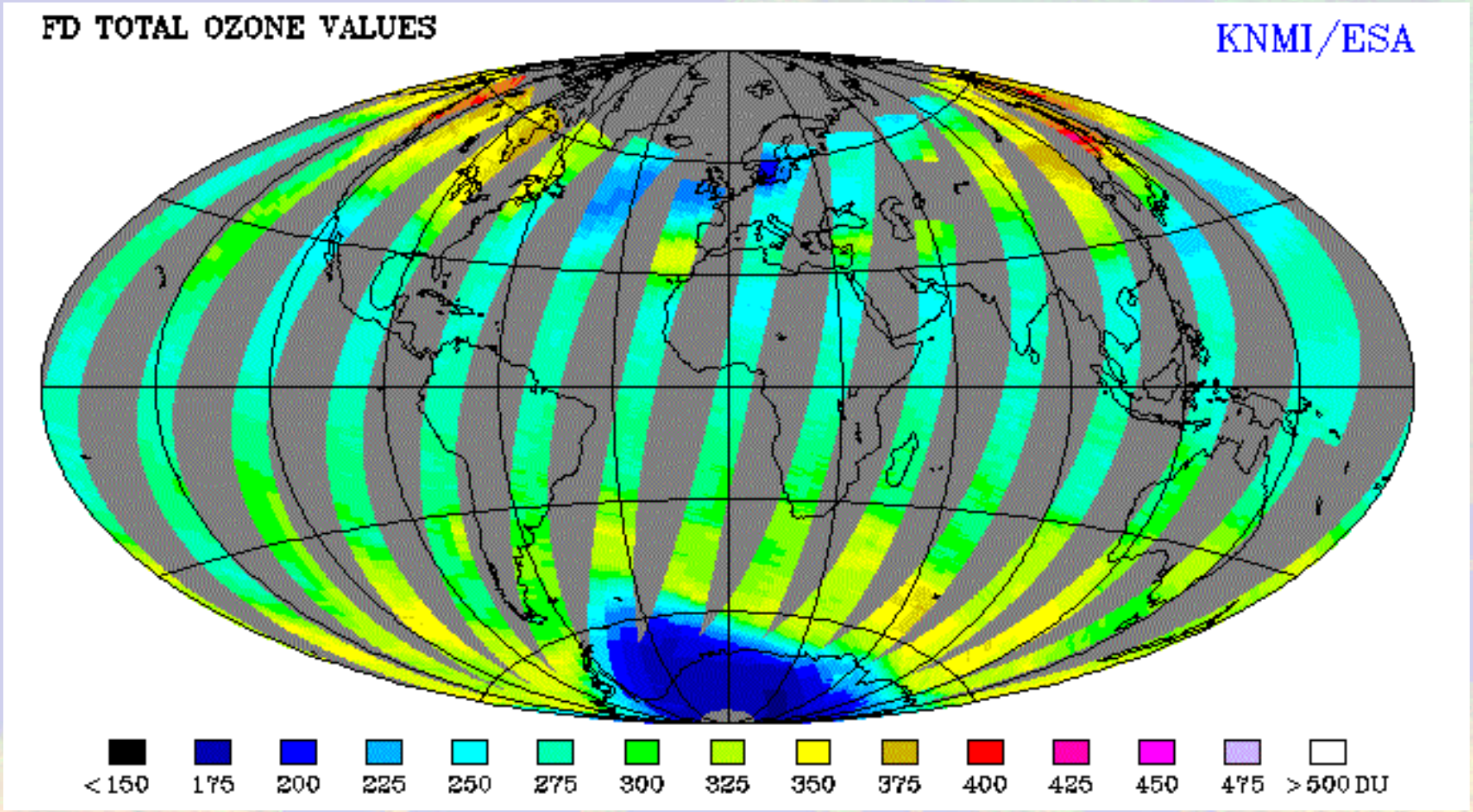




Regulated Access to Grid processing power

Secure access to Grid-registered high-volume data storage

GOME Inst'nt(1 day coverage)

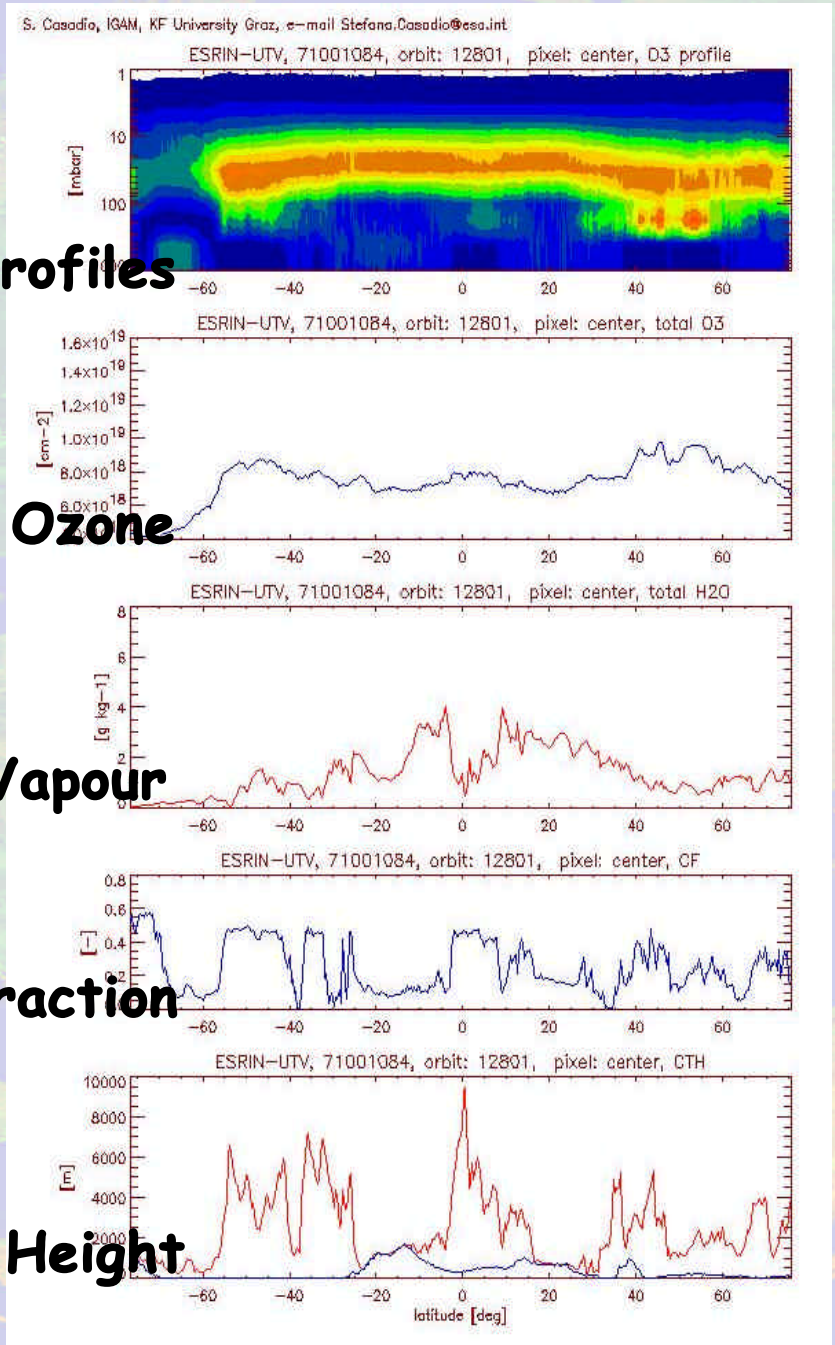


The output products

1 orbit daylight data (45 min) =

- **30 h processing (KNMI modelling) =**

- **8 sec processing (ESA / Uni Roma 2 neural net approach)**



Ozone profiles

Total Ozone

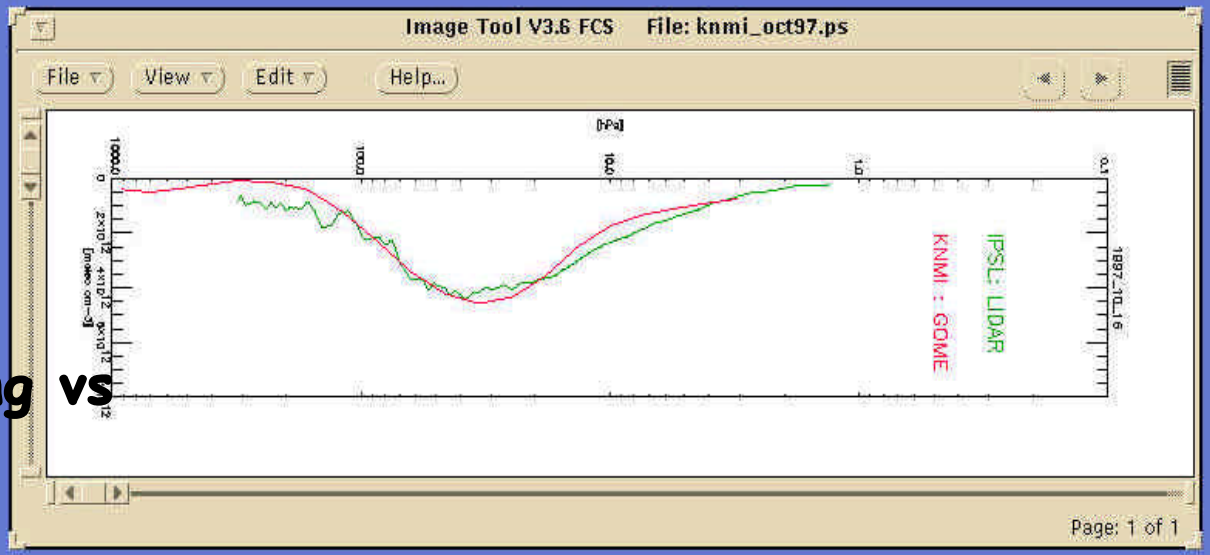
Total Water Vapour

Cloud Fraction

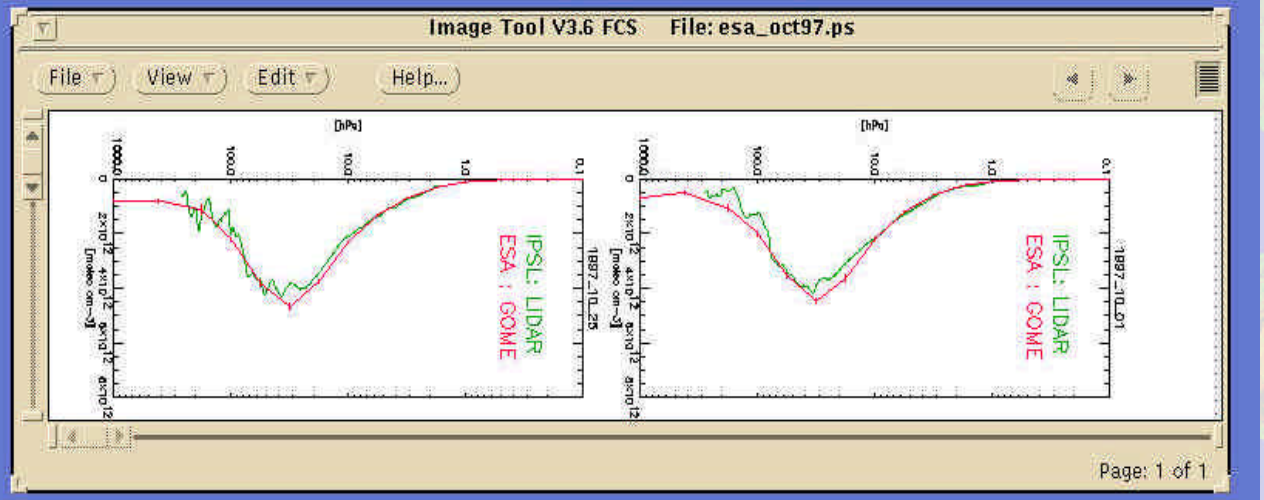
Cloud Top Height

First collaborative scientific results using GRID! (IPSL demo)

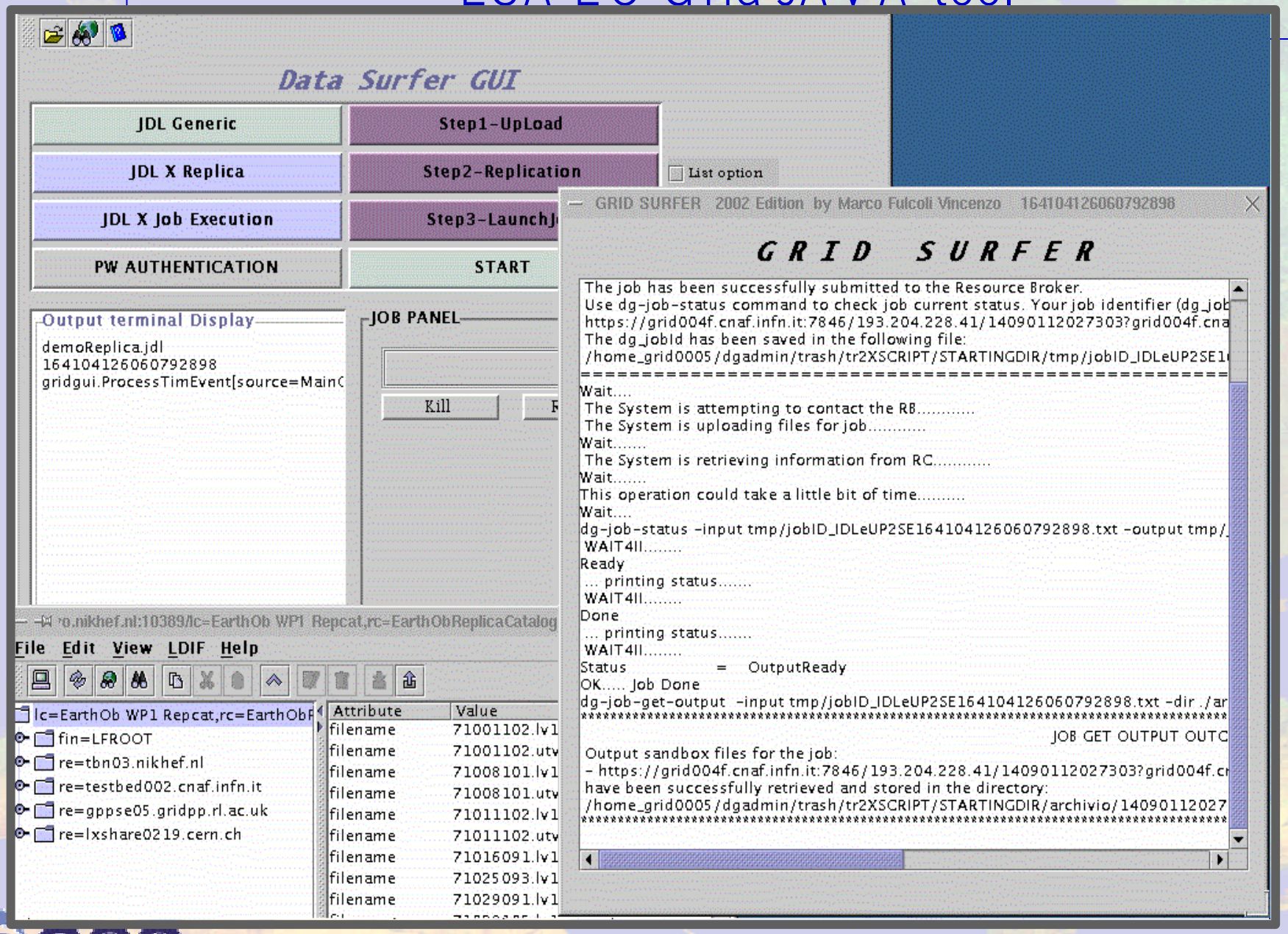
KNMI modelling vs ground Lidar



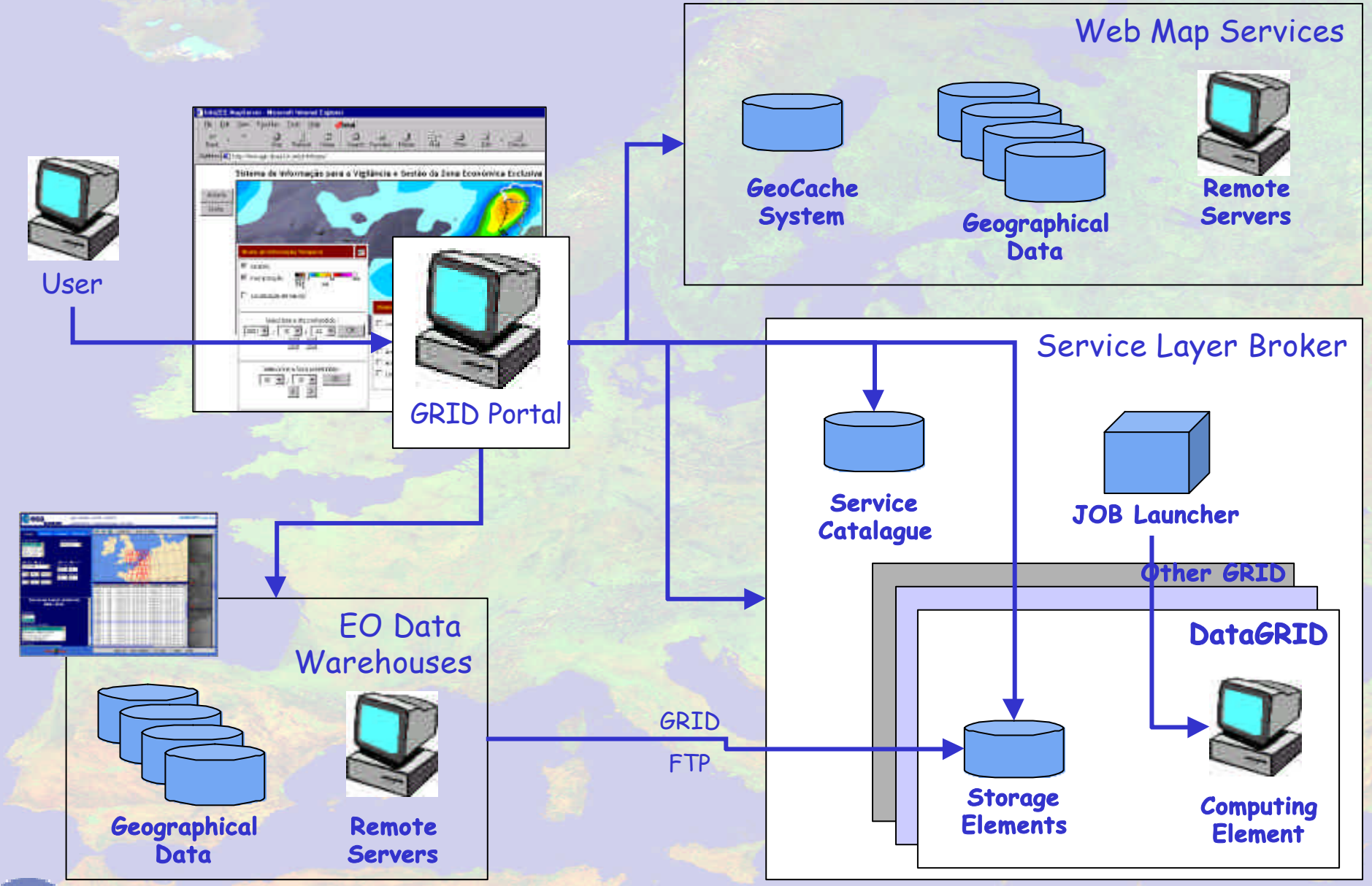
(ESA / Uni Roma 2 neural net approach vs ground Lidar



ESA EO Grid JAVA tool

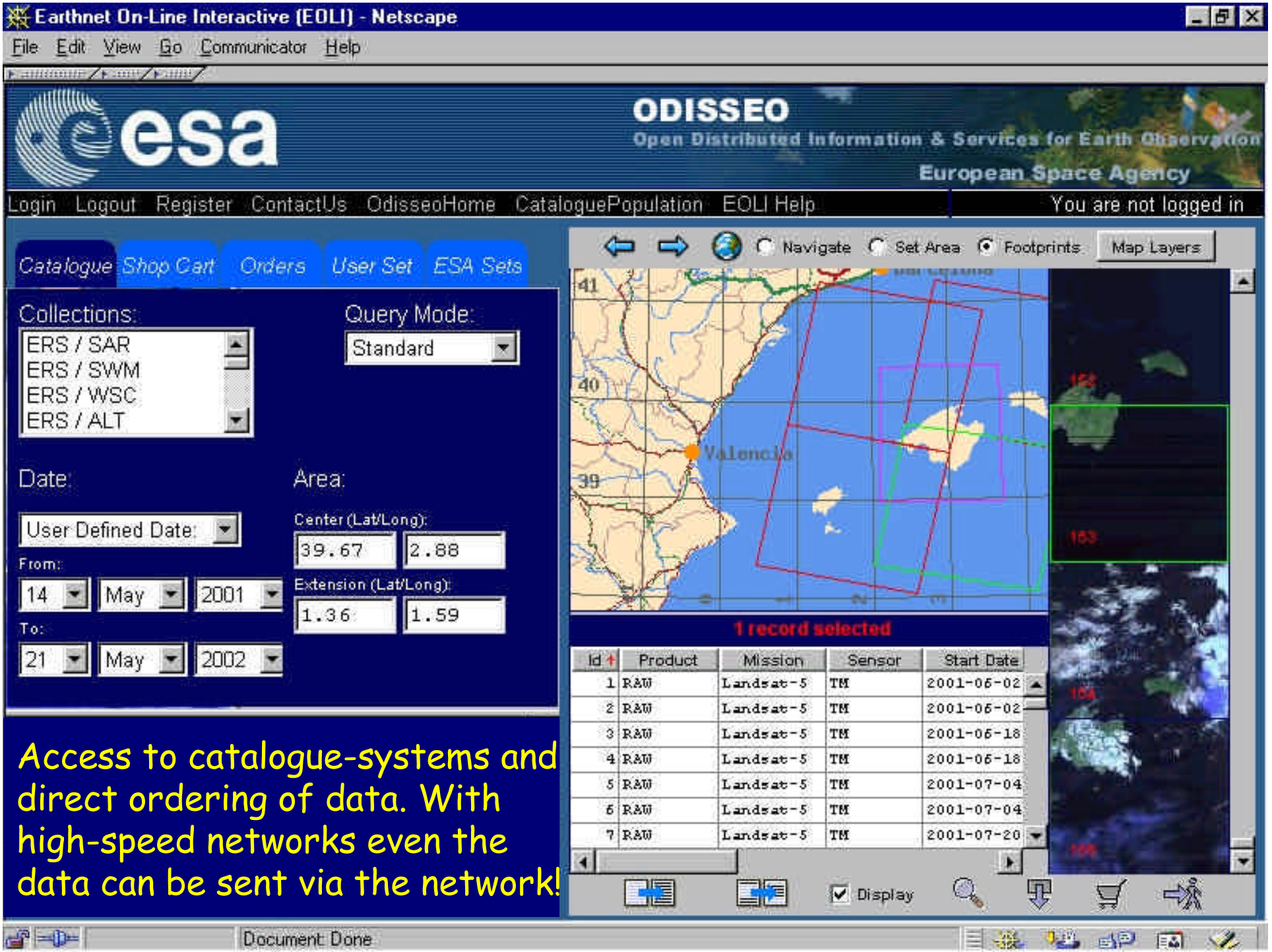


Potential for “GRID on demand” Services



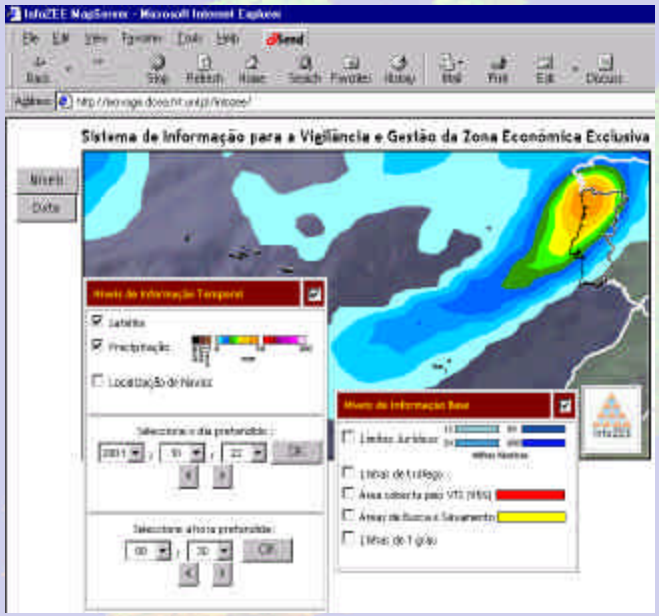
Oil spill monitoring near the Suez canal (ESA).
On the background 1x1 km² MODIS (NASA).

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...



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

W eb A ccess to GRID Services



User

Server

Certificat e Authority

GRID Service Layer Broker

External GRID Server

Geographic Information

Grazie!