Final Review Presentation

WP9 Earth Observation Applications

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Outline

- Objectives and Achievements
- Lessons learned
- Future & Exploitation
- Questions

WP9 - EO Team

Objectives vs Achievements

Stated in Technical Annex	Stated in Deliberables, papers
Define EO Application requirements & Usecases, Participation & integration of the WP in the project	Full integration and participation to AWG, ATF, QAG, integration of applications requirements, usercases, …
Testing and evaluation of various EDG testbeds	Various EO Resources (SEs, CEs) registered in EDG testbeds
Deployment of EO applications on EDG testbeds (GOME processors, GOME validation, GOMOS processor)	EO Applications deployed on testbeds; substantial datasets published in RC (e.g. 7 years of GOME observations)
Development of EO Grid application interfaces, tools & environments .	EO WebMap Portal; Grid-surfer user interface; GridEngine; Data & metadata handling tools
Dissemination & Exploitation .	Community to move towards operational Grid services
Committed effort: tot mm (funded mm) ESA: 94(84), KNMI: 24(24), IPSL: 36(0)	Total reported effort (mm): ESA: 150(+70%), KNMI: 30(+10%), IPSL: 36(+30%)

The EDG EO Virtual Organisation

- Initial EO VO: ESA-ESRIN, KNMI, IPSL
- Present EO VO: During EDG the VO was extended to: research (Uni TV, ENEA, IPGP, CNR…), industry (Dutch Space…), International community (CEOS…)
  - At present some 25+ people
- The present EO dedicated infrastructure: EDG testbed (including ESRIN) extended to: IPSL/IPGP local node; I/f to ENEA proprietary GRID infrastructure…
  - Plans to maintain the VO and extend it to: ESTEC, Dutch Space, CNR, CEOS-NASA, new ESRIN CE+SE (based on Globus)…

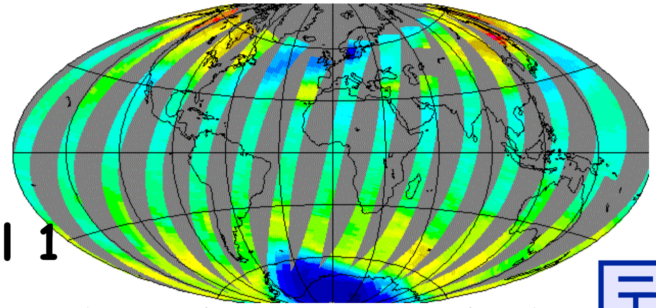
The EDG EO applications

- GOME L2 NNO processing (TV-ENEA-ESA)
  - 7 years GOME (30k orbits, 500GB) processed in EDG 1.4 and in local grid; new algorithm in EDG 2.0 – ongoing
  - Integration of IDL (cots) licenses.
- GOME processing OPERA (KNMI)
  - Use of application metadata DB (Sptifire and RMC) under Grid for large number of files
- GOME validation portal (IPSL-ESA)
  - 1 year integrated with LIDAR profiles. 2 portal versions.
- GOMOS reprocessing and validation (ESA-IPSL)
  - 5 months data (ACRI) in ESA local grid. 40k files, 120GB
- GREASE: OMI simulation (Dutch Space-ESA)
  - 1 month OMI simulation
- CEOS-GRID (ESA-NASA-DS): ongoing

The EDG Ozone validation

Raw satellite data
from the GOME instrument
(~75 GB - ~5000 orbits/y)

Level 1



(example of 1 day total O_3)

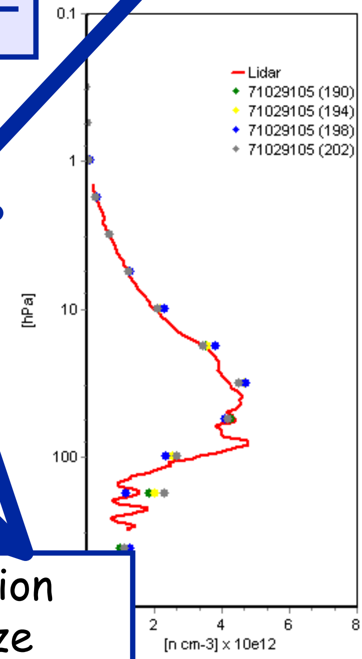
ESA(IT) KNMI(NL)
Processing of raw GOME
data to ozone profiles.
2 alternative algorithms
~28000 profiles/day

IPSL(FR)
Validate some of the
GOME ozone profiles (~10^6/y)
Coincident in space and time
with
Ground-Based measurements

Level 2

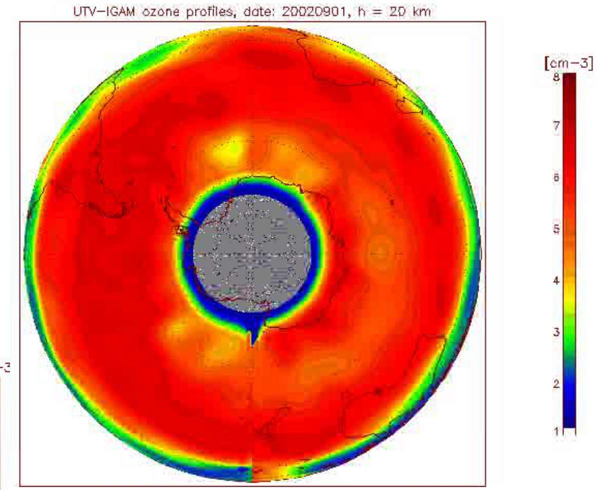
DataGrid environment

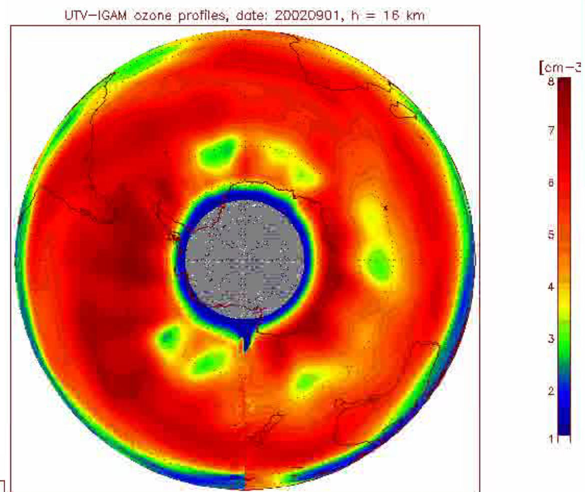
Visualization
& Analyze

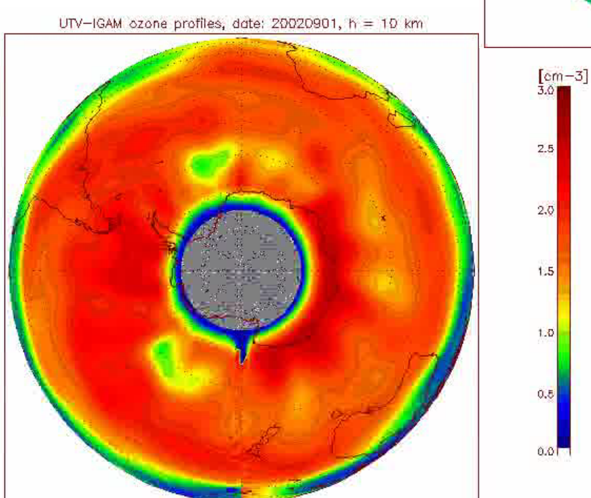


The very-last GOME user results

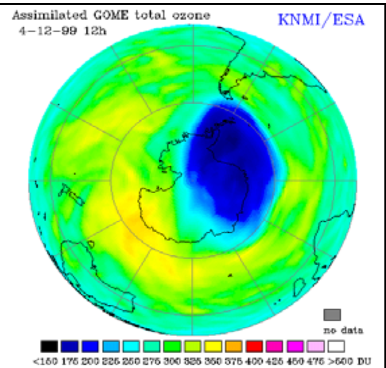
Generated by
S. Casadio – ESA ESRIN
(3D Ozone volume - Sept 02)



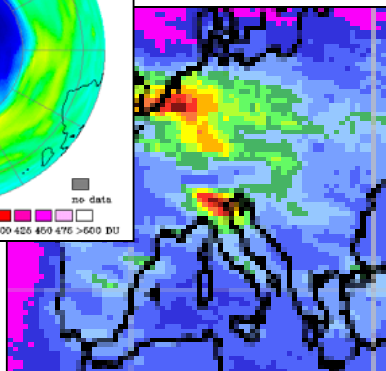




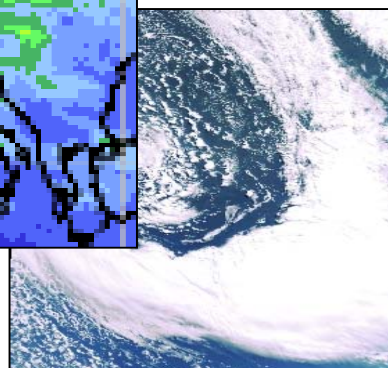
ENVISAT will provide very large data flows… (already archived 1+PB!)



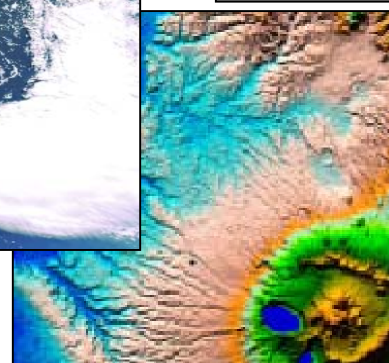
Altitude 0 to 100 km: GOMOS, MIPAS and SCIAMACHY are building a three-dimensional profile of ozone concentrations in the atmosphere.



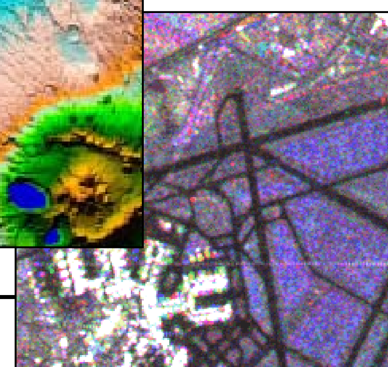
Altitude 0 to 20 km: MIPAS and SCIAMACHY are detecting low levels of gases from industry, power generation and agriculture.



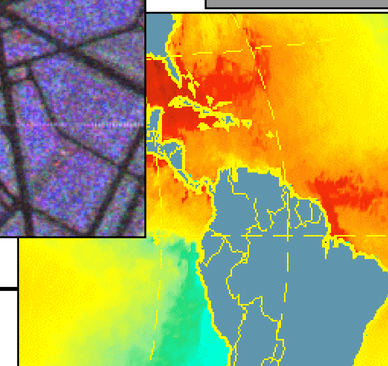
Altitude 0 to 10 km: MERIS obtains an image in which the clouds you see are but a part of a complex map of the concentration of water vapour.



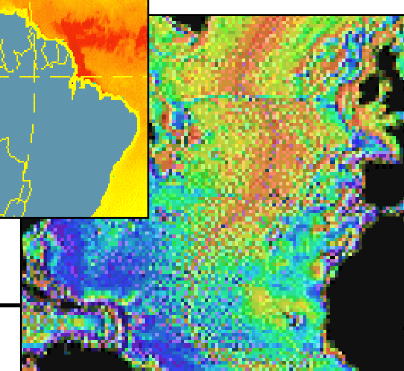
Altitude 0 to 4 km : ASAR and RA-2 create an accurate digital map of your surroundings, with height contours as accurate as 10 m.



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

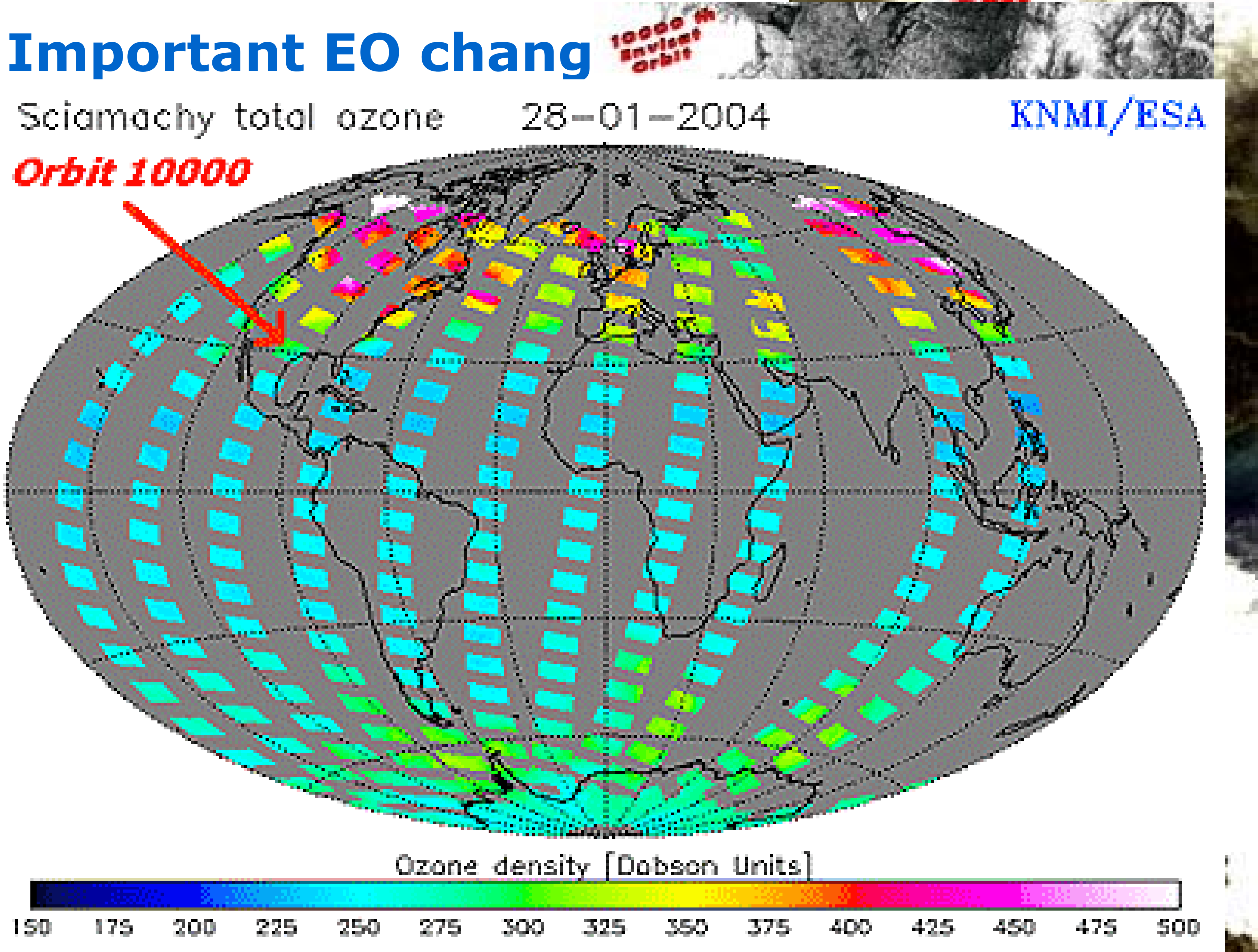


Sea level: AATSR measures sea surface temperature to 0.3 °C accuracy. MERIS precisely maps ocean colour, plankton and chlorophyll distributions. ASAR and RA-2 measure ocean currents, average wave-heights and wind velocities.

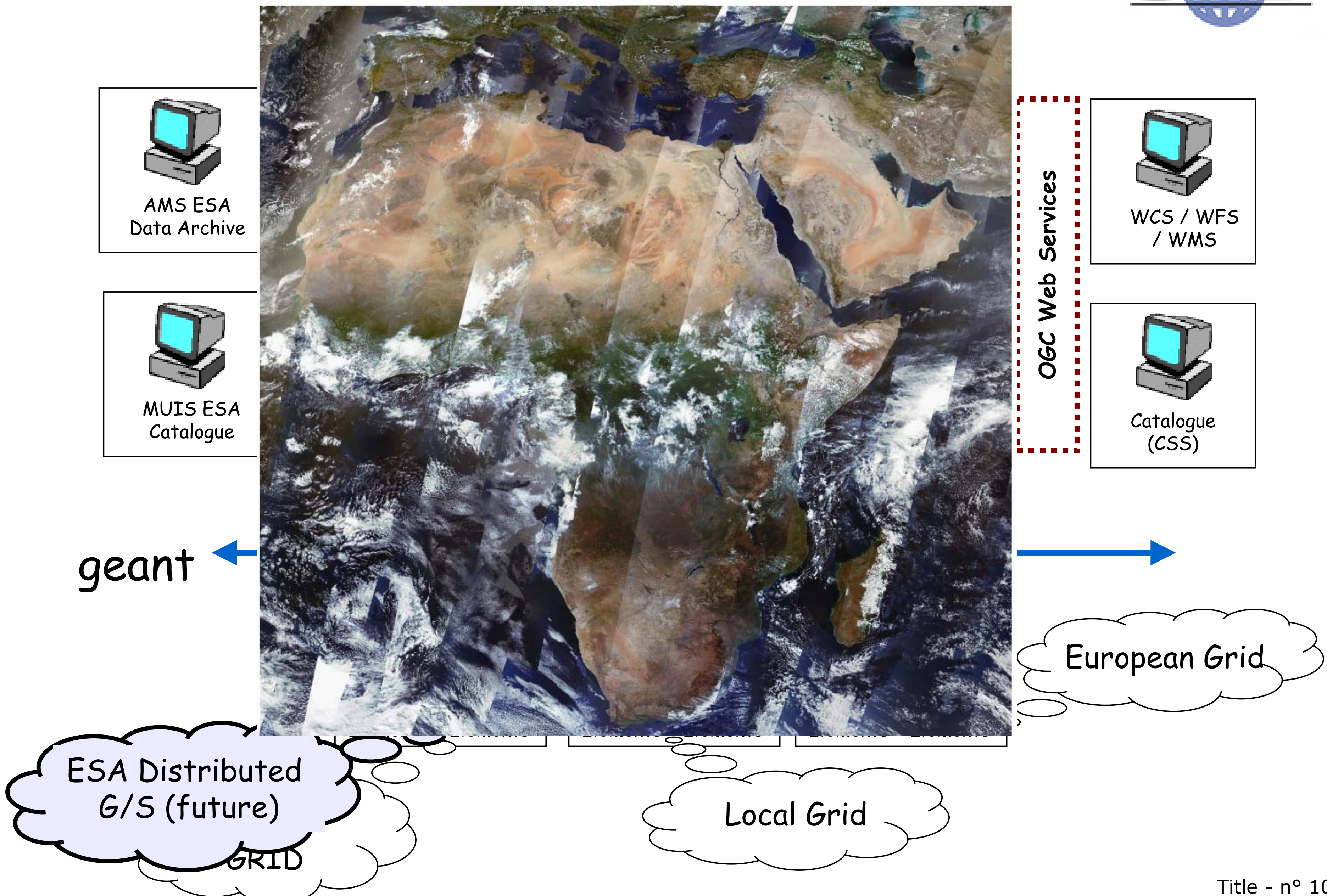


Underwater: RA-2 and DORIS combine to produce a detailed map of local gravitational strength, detecting the distribution of denser and less dense rock in the Earth crust beneath the oceans.

Important EO chang



Present "GRID on Demand" Environment



Lessons Learned

- Substantial first-hand experience and understanding of Grid technology (as users)
  - Grid middleware encompassing wide range of standards and technology is understood and now being used for real world applications
  - Possibility to access, process, handle and store large sets of data without transfer to home storage and computers
- Impact of Grid technology on EO community and applications
  - Improved Collaboration - communication among participants with distinct backgrounds
  - unprecedented experience for many of the communities involved
  - No need to develop the same tool by each user
  - New approach to scientific work
- Testbed evaluation
  - Move to “operational use” mature elements of middleware
  - Need time and experience to convince operational users

Future & Exploitation

- **Continue widespread dissemination and promotion of Grid solutions in the EO community**
  - **Establish operational Grid service for potential new users and applications in EO community**
- **Continuation of EO Virtual Organization**
  - **New EO Applications proposed in EGEE**
    - **NIKHEF to maintain the VO**
    - **ISPL/CNRS to lead participation to EGEE**
    - **ESA-ESRIN available to provide data and TBD infrastructure**

EO GRID plans @ESA-ESRIN

1. Recent facts - references

- **Frame work for ESA–EC in near future activities**
  - EC-ESA framework agreement …; (ESA+) EC COM(2003)673 White Paper on "Space: a new European Frontier for an expanding Union. An action plan for implementing the European Space Policy"
- EC- ESA **Global Monitoring for Environment and Security**, Final Report for the GMES Initial Period (2001-2003):

"A key feature of the GMES information architecture is the need **to support collaboration between geographically dispersed GMES users and service providers**. **Collaboration** has to be **supported by an electronic infrastructure** enabling GMES users not only to communicate but also to access resources such as very large data collections or archived information, scientific experiments and computing power. **For the data- and computationally intensive areas of GMES, such as real-time modelling based on Earth observation data or climate modelling, high-performance networks and GRID-based computing are essential for mining, sharing and analysing data and visualising results**." ….

"The combination of an ESDI together with high-speed technology networks (**GRID&GEANT**), space and in-situ monitoring and data collection …"

- **ESA Agenda 2007** (ESA DG internal plan)
  - Technology innovation plans …; EO "Open & Operational" initiative

EO GRID plans @ESA-ESRIN

2. New short term RTD projects
   - "The VOICE" – e-collaboration environment –funded by ESA (3+ new applications)
3. Preparation of "operational environment"
   - Integration of compatible and available ENVISAT software processing tools
   - Upgrading of Research Network Bandwidth
4. Preparation of ESA internal GRID technology plan
   - Consider internal and science operational requirements for coming 3-4 years

Which operational services? …raising interests

1. Support to science users

- Support science communities for focused collaborations, e.g. cal/val, global products, new algorithms
- Support selected AOs and PIs

2. Support to application projects

- Provide reference application processing environment for generation of products

3. Support to communication needs

- Generation of periodic global and regional products for immediate availability at ESRIN

4. Support to Specific Reprocessing

- Allow multiple re-processing of same dataset
- Consider long term evolution of ground segment

Questions?