

# Worldwide ozone distribution by using Grid infrastructure

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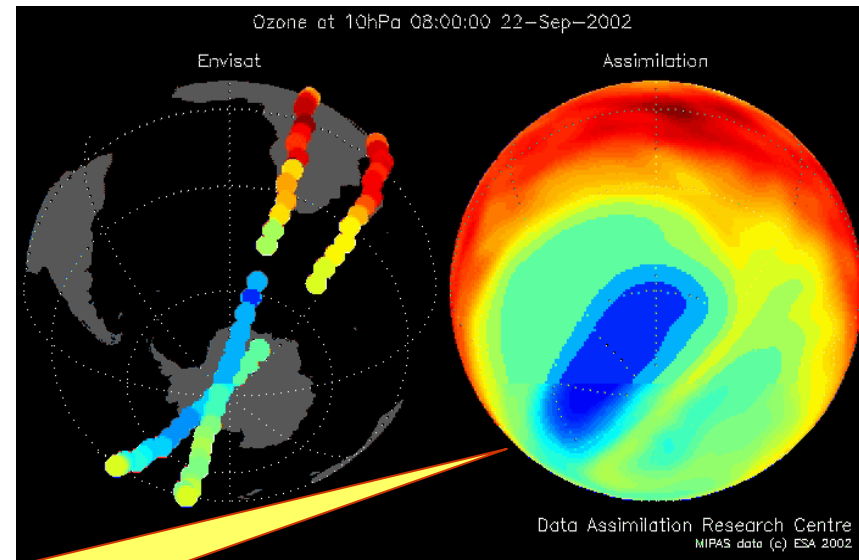
*KNMI: W. Som de Cerff*

*SCAI: J. Kraus, H. Schwichtenberg*

*UTV: F. DelFrate, M; Iapaolo*

## Earth Observation by satellite: large community

- Space Agencies
  - Scientists in many fields
  - Organisation in charge of natural risk alerts
  - SMEs for elaborated products
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- Grid Technology seems very well adapted to a lot of applications related to Earth Observations
  - ESA/ESRIN, IPSL and KNMI have started to port applications in DataGrid



**GOME total ozone assimilation**

•Figure from ESRIN

Typical satellite case: large number of files

7 years of Ozone from GOME/ERS2 experiment

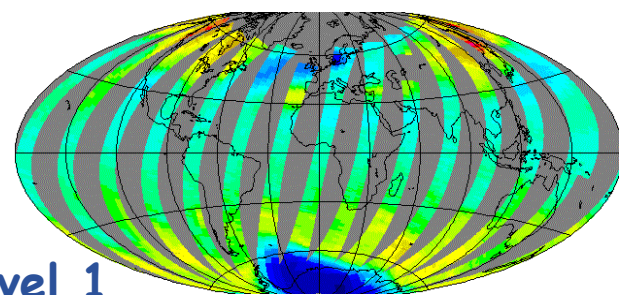


## CHALLENGE

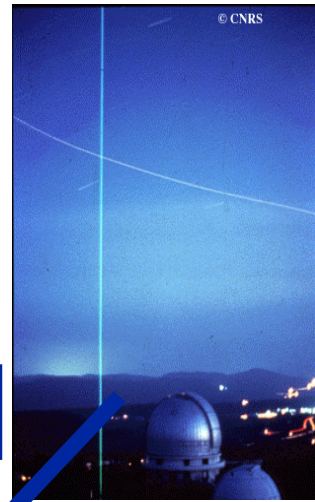
PRODUCTION: Complex Algorithms: neural algorithm and inversion

VALIDATION: For a given day find 10 profiles among 26000.

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



Level 1 (example of 1 day total O<sub>3</sub>)



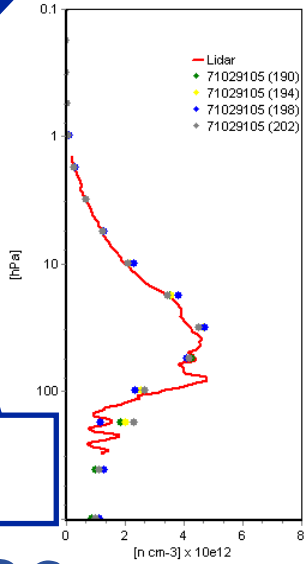
ESA(IT) - KNMI(NL)  
Processing of raw GOME data to ozone profiles.  
2 alternative algorithms  
~28000 profiles/day

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

Level 2

EGEE environment

Visualization & Analyze



Additional GRID demonstration: GOMOS, OMI, CEOS, ...



Production of Ozone profiles from satellite data GOME/ESR by UTV (Italie), ESRIN (Italie), KNMI(Hollande)

Validation of the profiles with lidar data by IPSL, UTV

**NNO:** Algorithm « Neural network »

2 versions (F. del Frate, M. Iapaolo, S. Casadio)

8 years (1995-2003) on EGEE:

38489 files/algorithm with ~ 1800 profiles d'ozone/file

Database: metadata taking into account the orbits footprint

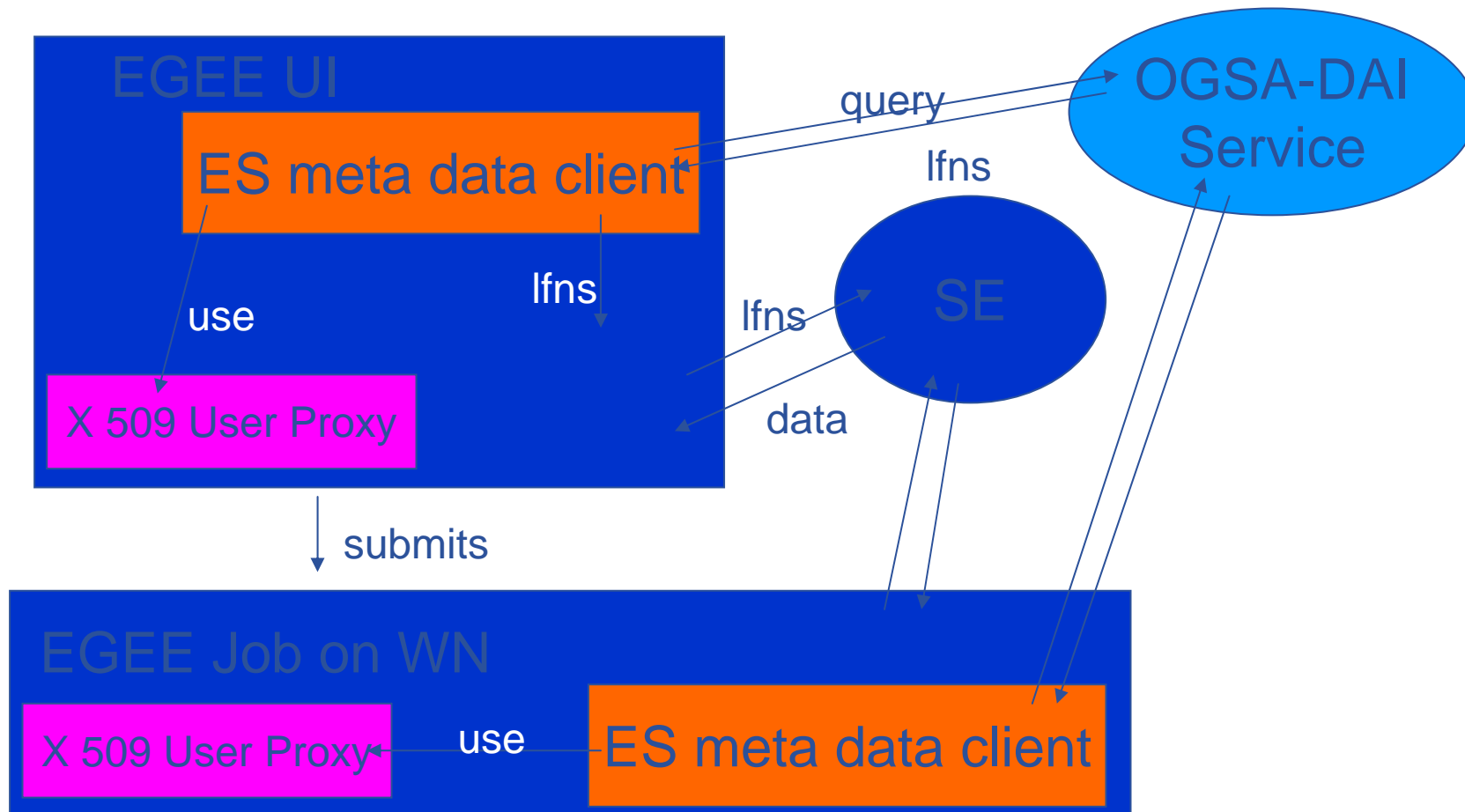
**OPERA:** Algorithm - Inversion (R. van der A et al., 2002)

Several months on EGEE: 76000 Files

1 profil/file (W. Som de Cerff)

- Capability to run complex algorithms and to handle large amount of files

- In ES, Metadata and data bases are very common as large data sets are handled by different teams. The RDBMS generally used are MySQL, PostgreSQL or Oracle
- Many bases already exist and the aim is at least to make a copy of them.
- If they are developed to be used on EGEE they need to be useful outside Grid.
- Another specific point is the satellite data that are stored by orbit. The orbits are described by their footprint, expressed in geographical coordinates.
- Many queries concern collocation in time and/or space
- Some metadata and data are only accessible to authorized persons
- Others available on web site have rules for publications(acknowledgement, co-author)



## • Relational DataBase Management System

- **What do we need?**
  - RDBMS support OpenGIS conform data types
- **What is PostGIS?**
  - PostGIS adds support for geographic objects to Postgres: <http://postgis.refractor.net/>
- **Why PostGIS?**
  - MySQL spatial extensions only support convex polygons



- **In EGEE : Feasibility studies carried out on relatively simple applications**
- **Needs to pass from simple to complex applications and operational chain**
  - for near-real time like daily prevision of ozone.
  - Cascade of jobs
  - Inclusion of web services
  - .....
- **Some solutions in gLite**
- **Others investigations via SSA DEGREE(Dissemination and Exploitation of GRids in Earth ScienceE)**