A Grid Enabled Scientific Gateway for Climate Change

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The context: Climate-G testbed

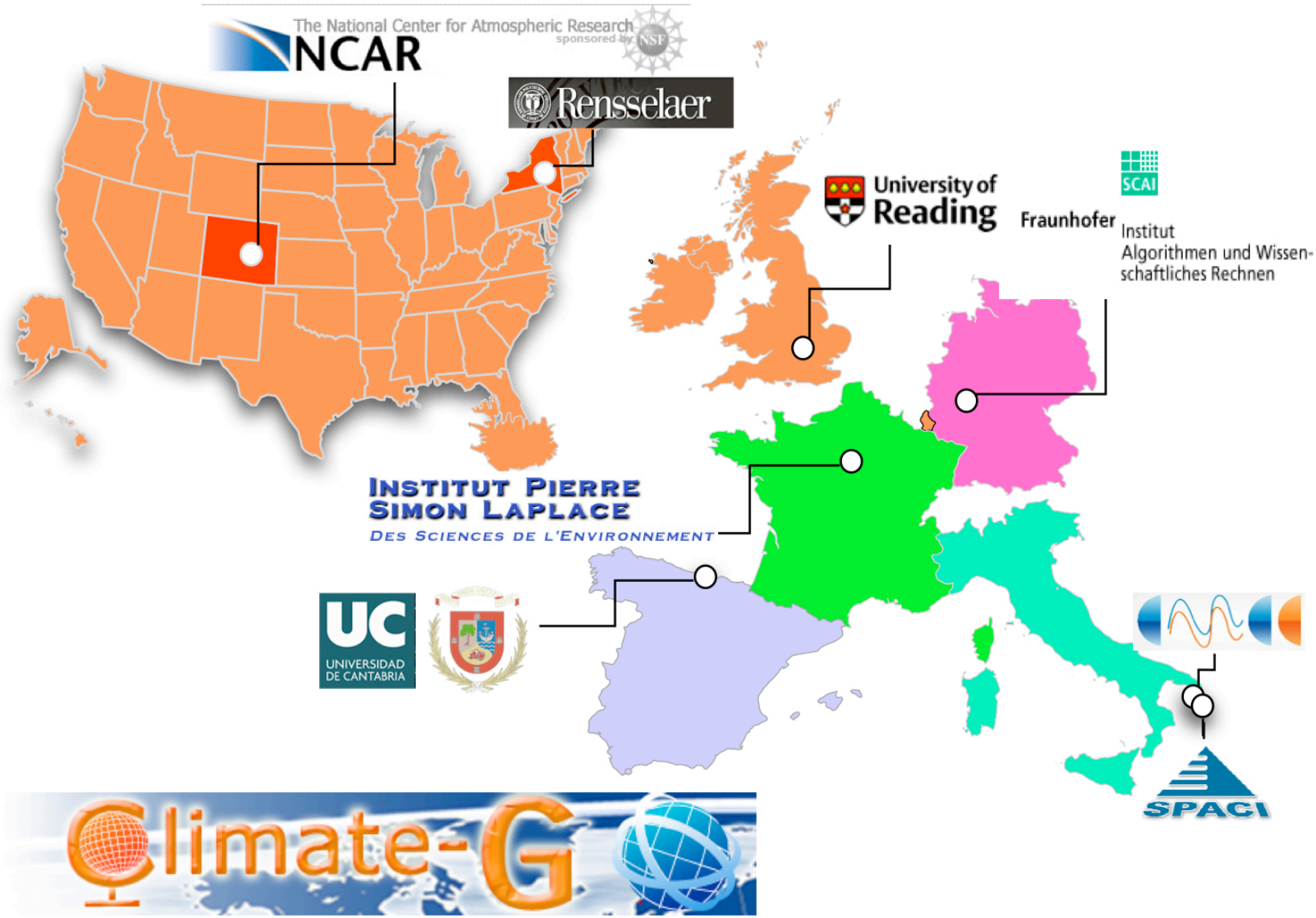
The main goal of Climate-G is to create an open and unified environment for climate change enabling geographical and cross-institutional data discovery, access, analysis, visualization and sharing.

*This effort has been conceived as a proof of concept for the involved grid technologies (in particular GRelC grid metadata service) and it is supported by the Earth Science Cluster Community (**EGEE Project**).*

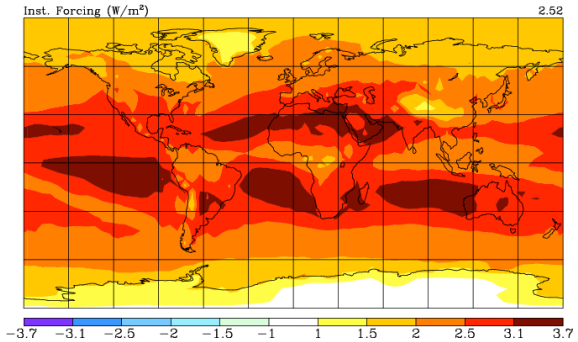
*A **virtual laboratory** involving partners both in Europe and US*

*Interdisciplinary effort: both **Climate Change** and **Computational Scientists***

Climate-G partnership



Climate-G: main challenges and requirements



Management of PBs of distributed data

- performance
- scalability
- fault tolerance
- autonomy
- security
- transparency
- interoperability

ISO International Organization for Standardization

Data Distribution Centre

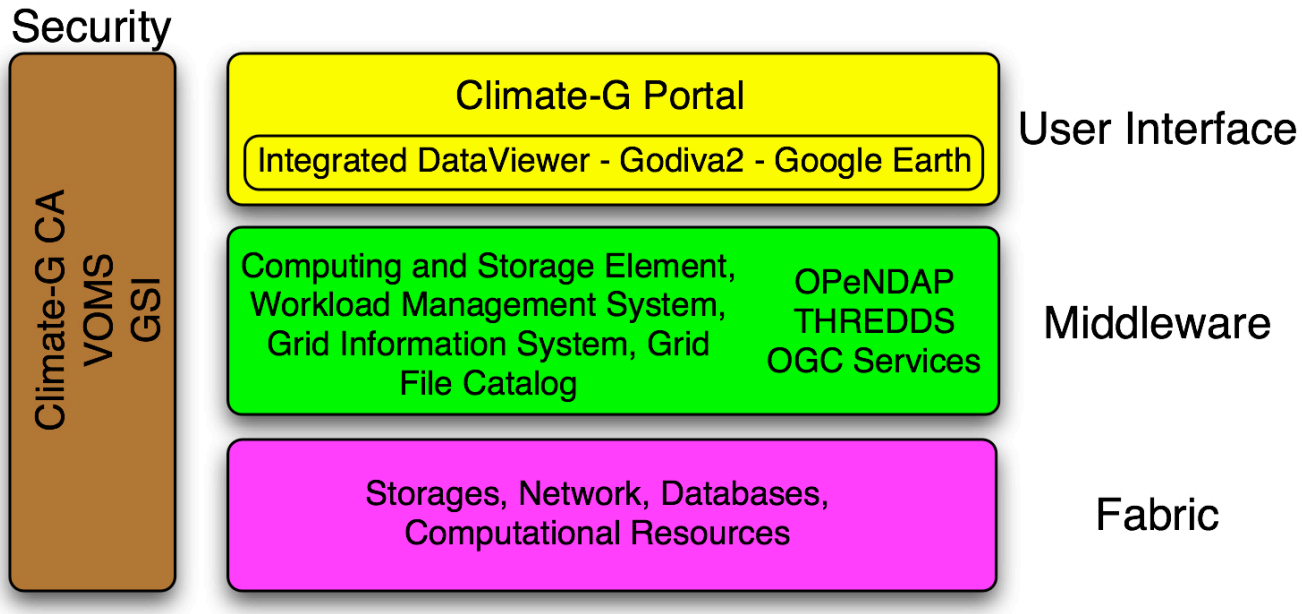
- pervasive
- easy
- ubiquitous

ENSEMBLES

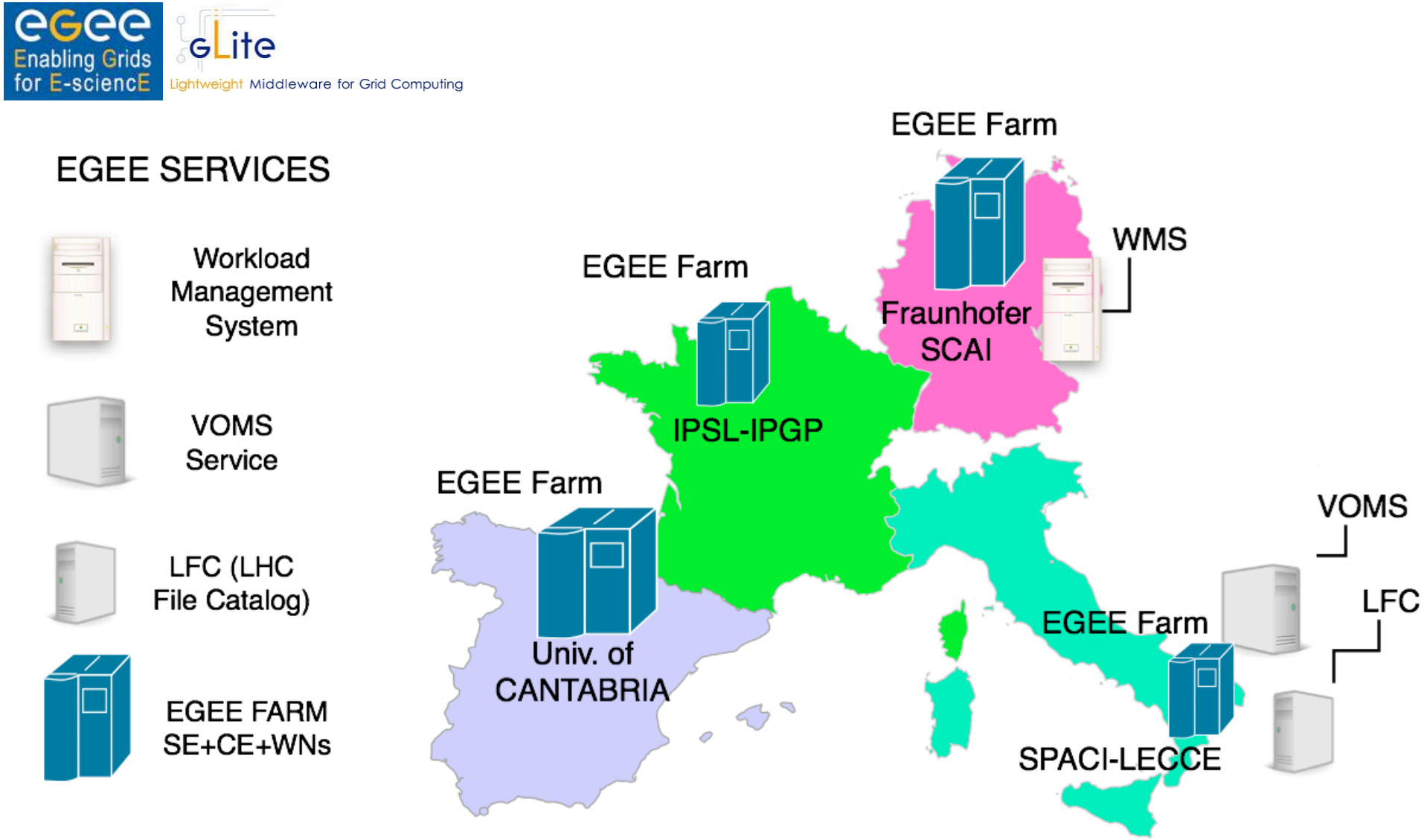
Integrated Environment

- Several tools integrated in the same
- web context. Modular approach
- Easily extensible

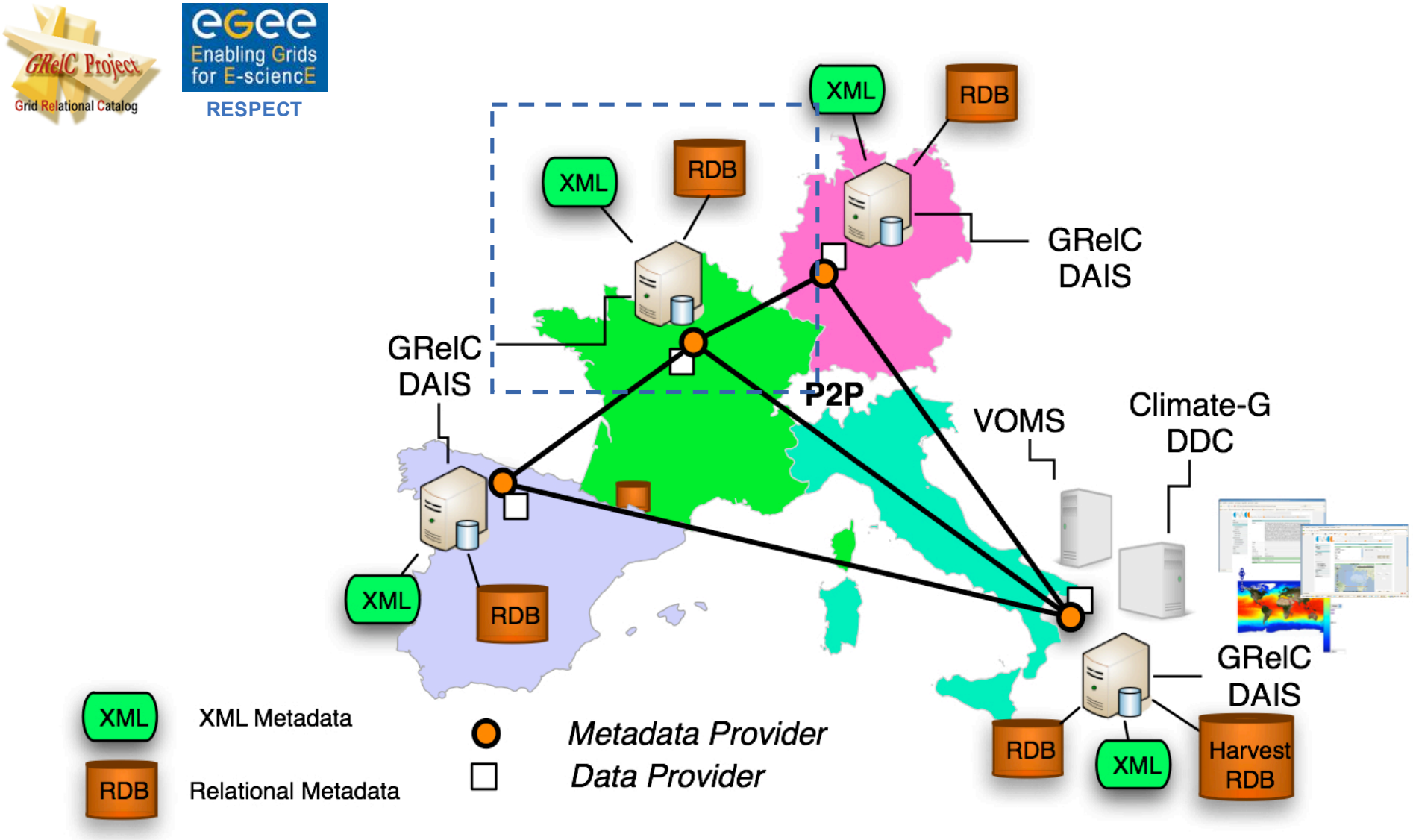
Climate-G Architecture/Infrastructure



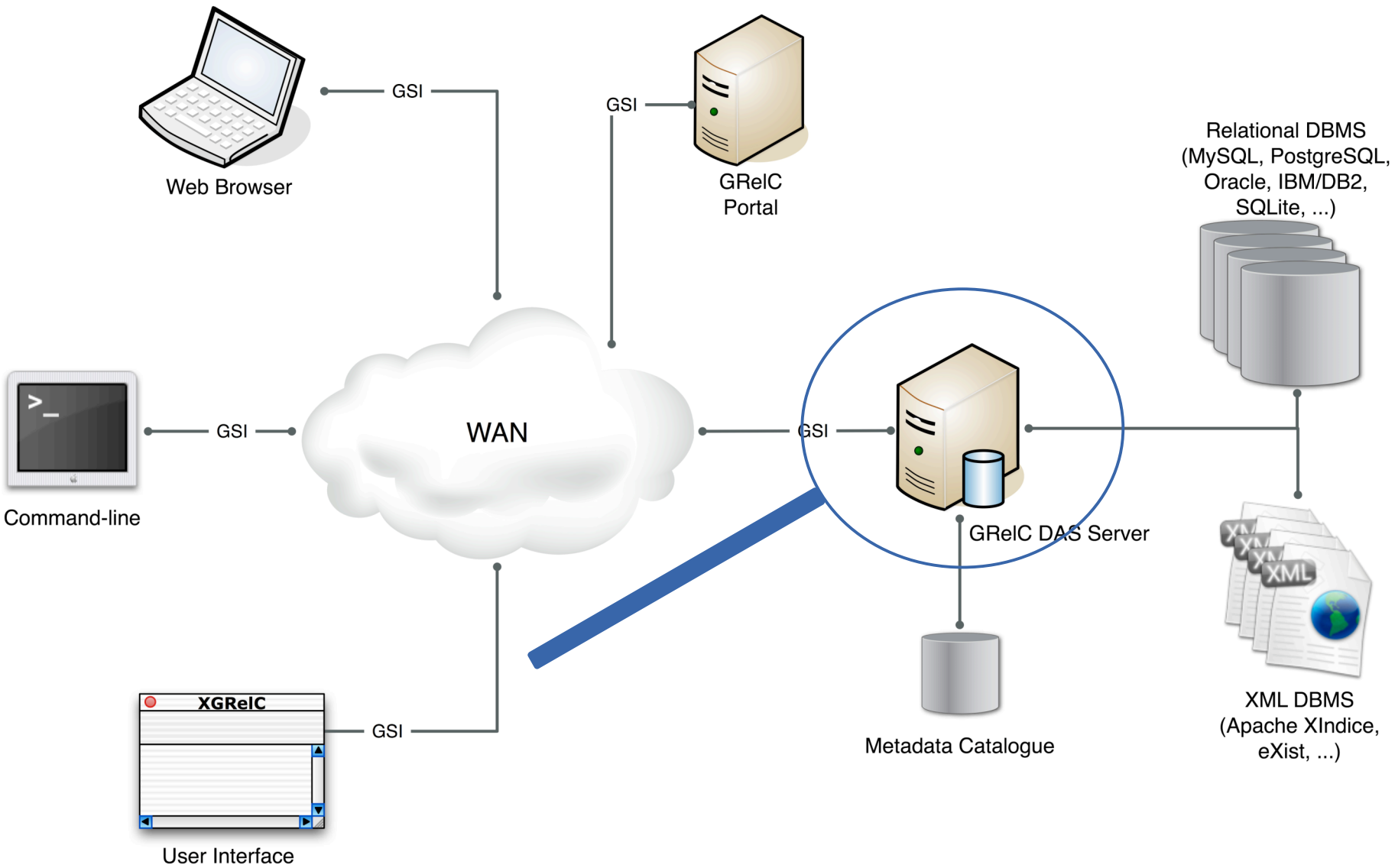
Climate-G and EGEE Middleware



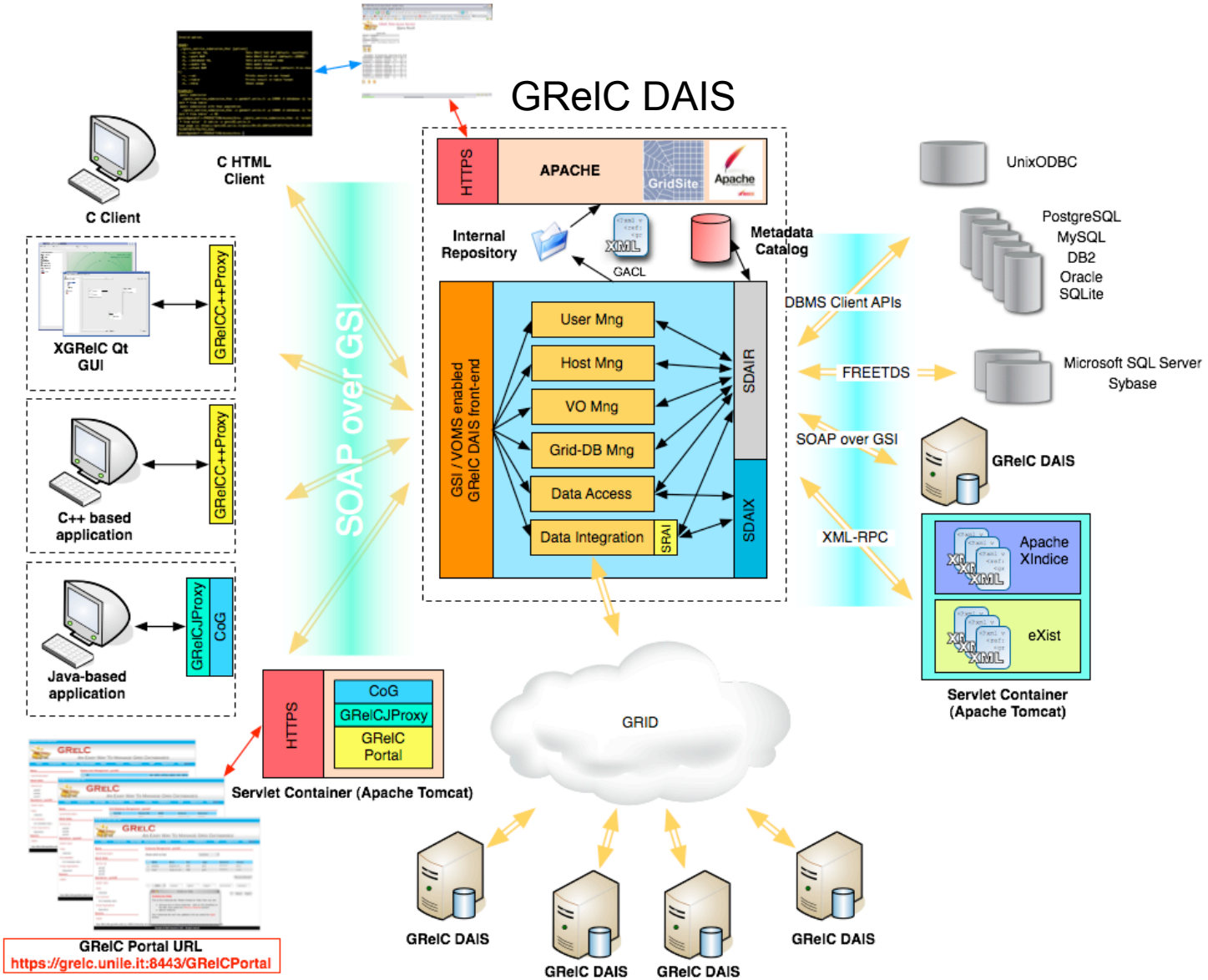
Climate-G: Grid Metadata P2P System



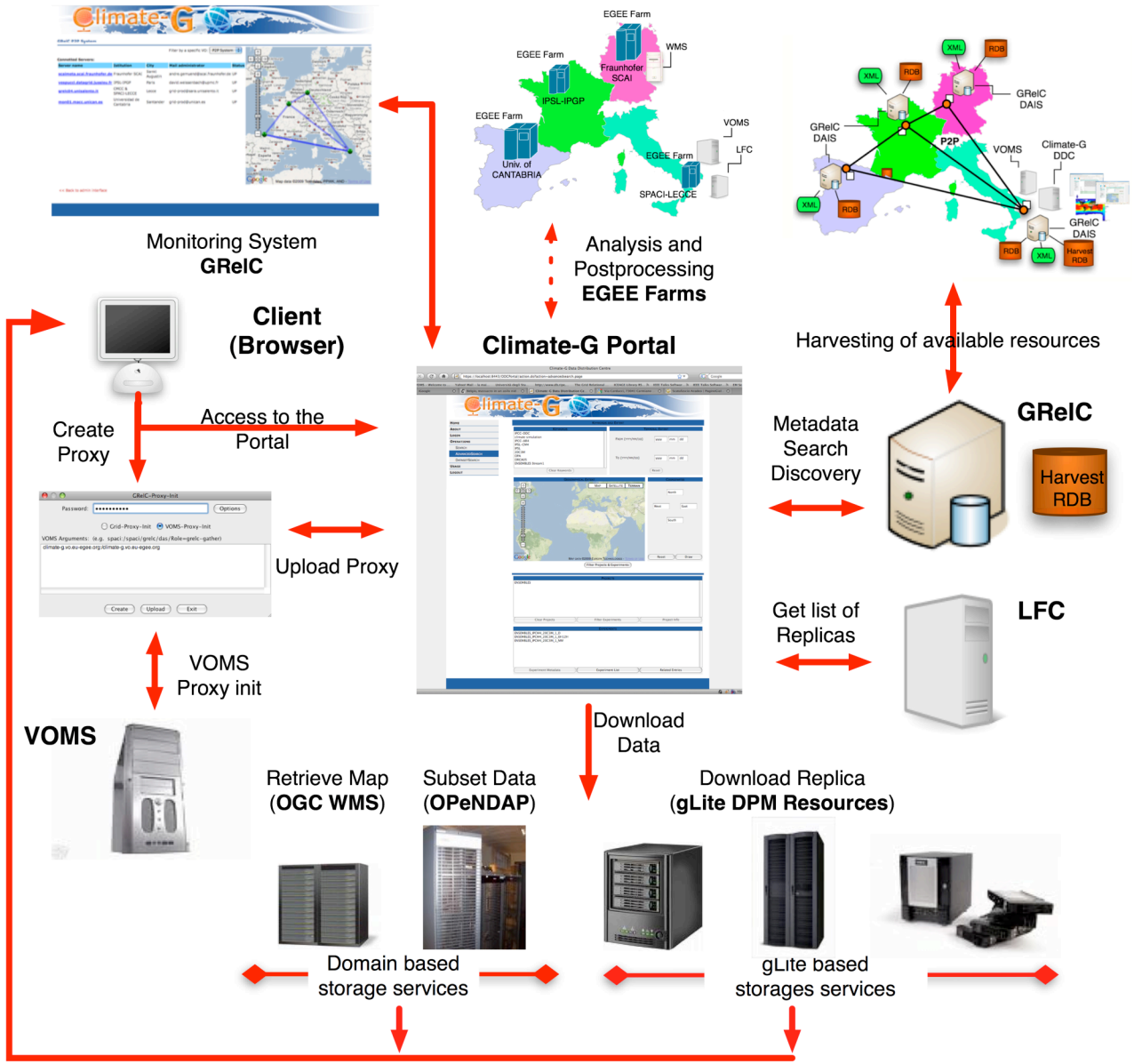
Grid Metadata Service: GRelC (EGEE RESPECT)



GRelC: architecture in the small

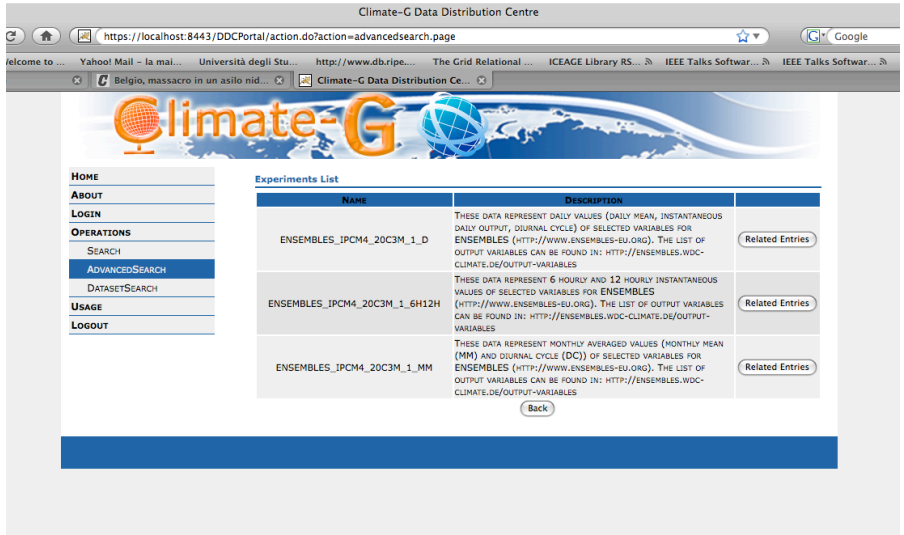


Portal centric view



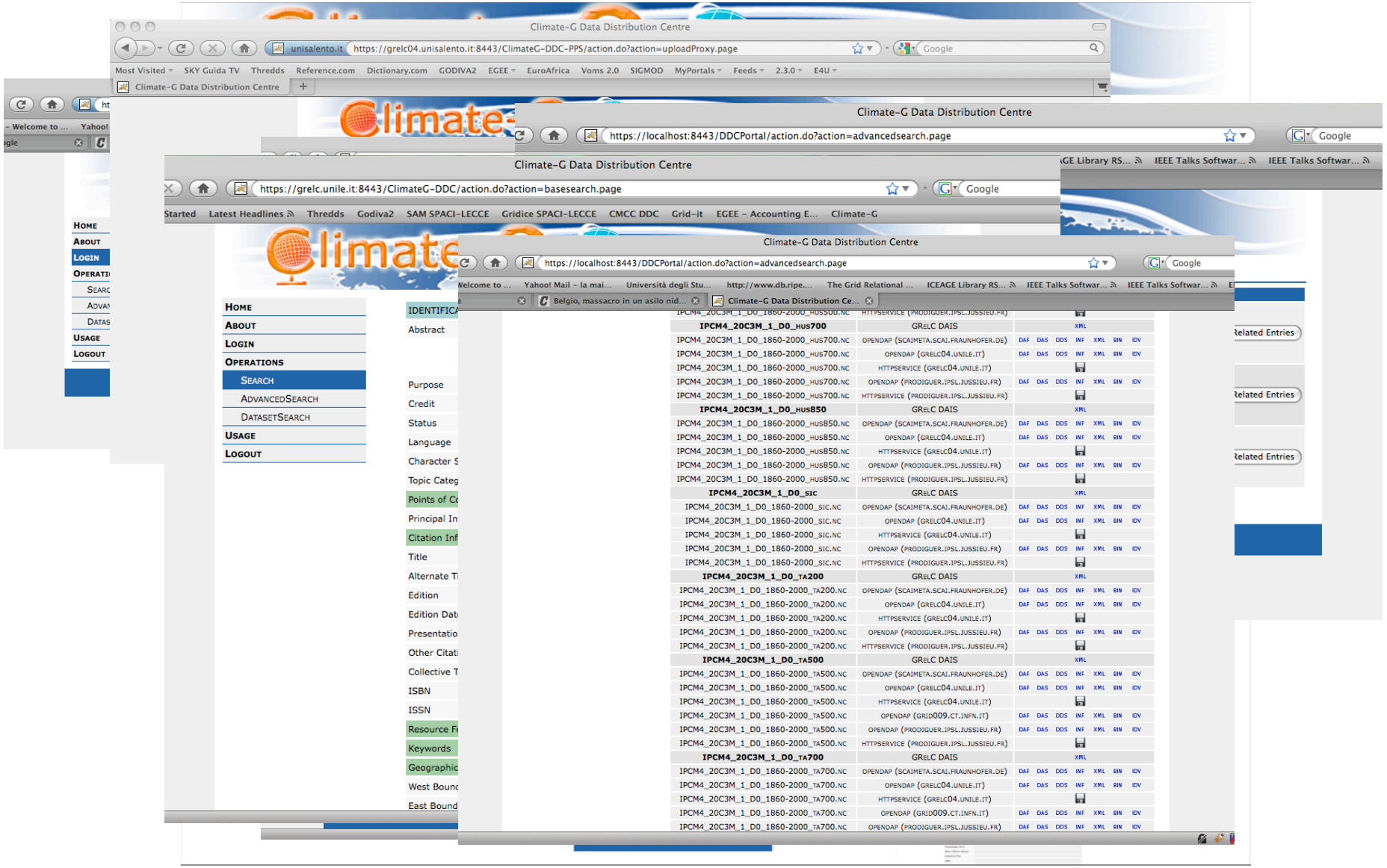
Climate-G Portal

- **Main Functionalities**
  - o Search & Discovery
  - o Data access & viz
  - o Metadata management
  - o Users and roles mng
  - o List of experiments
  - o List of entries/datasets



- **Features**
  - o Easy to use interfaces
  - o **Platform independent**
  - o Secured by design - GRelC Proxy Init
  - o **No additional software is required**
  - o It entirely replaces the Command Line Interface
  - o **JSP/Servlets** based, **AJAX** (dynamic web pages)
  - o Fast adoption of components in **mashups**, like Google Maps

Climate-G Portal: Snapshots



Data Access - Complete OPeNDAP Support

Climate-G Data Distribution Centre

OPeNDAP Dataset Query Form - Mozilla Firefox

http://gandalf.unile.it:8080/thredds/dodsC/ENSEMBLES/IPCM4_20C3M_1_DM_hfls_1-50760.nc.html

Dataset Information - Mozilla Firefox

http://gandalf.unile.it:8080/thredds/dodsC/ENSEMBLES/IPCM4_20C3M_1_DM_hfls_1-50760.nc.info

Mozilla Firefox

http://gandalf.unile.it:8080/thredds/dodsC/ENSEMBLES/IPCM4_20C3M_1_DM_hfls_1-50760.nc.ddx

```
<?xml version="1.0" encoding="UTF-8"?>
<Dataset name="ENSEMBLES/IPCM4_20C3M_1_DM_hfls_1-50760.nc"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://xml.opendap.org/ns/DAP2"
xsi:schemaLocation="http://xml.opendap.org/ns/DAP2  http://xml.opendap.org/dap/dap2.xsd" >

        <Array name="lon">
                <Float64/>
                <dimension name="lon" size="96"/>
        </Array>
        <Array name="lon_bnds">
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                <dimension name="lon" size="96"/>
                <dimension name="bnds" size="2"/>
        </Array>
        <Array name="lat">
                <Float64/>
                <dimension name="lat" size="72"/>
        </Array>
        <Array name="lat_bnds">
                <Float64/>
                <dimension name="lat" size="72"/>
                <dimension name="bnds" size="2"/>
        </Array>
        <Array name="time">
                <Float64/>
                <dimension name="time" size="50760"/>
        </Array>
        <Array name="time_bnds">
                <Float64/>
                <dimension name="time" size="50760"/>
                <dimension name="bnds" size="2"/>
        </Array>
        <Grid  name="hfls">
                <Array name="hfls">
                        <Float32/>
                        <dimension name="time" size="50760"/>
```
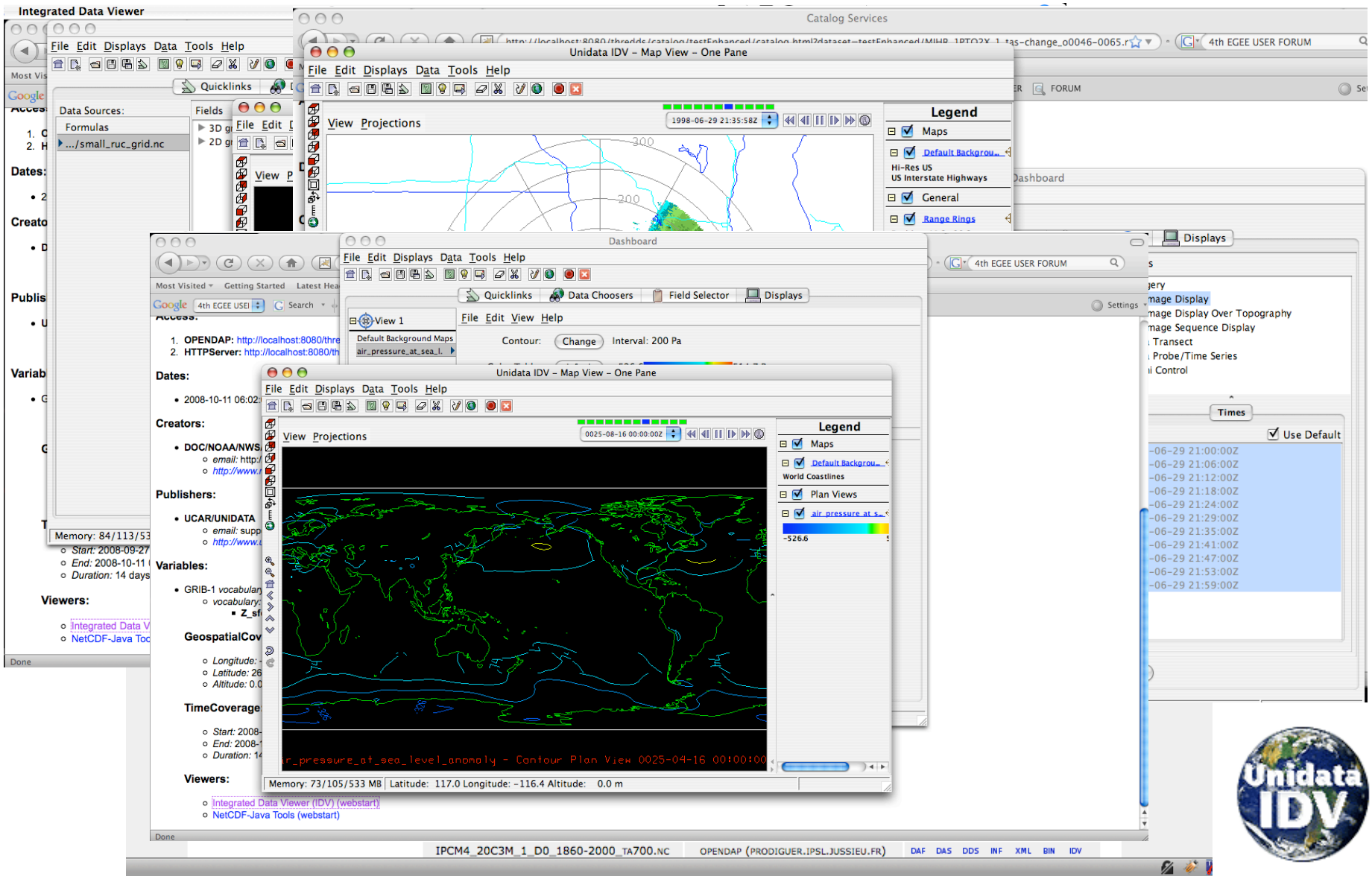

IPCM4_20C3M_1_D0_1860-2000_TA700.NC OPENDAP (PRODIGUER.IPSL.JUSSIEU.FR) DAF DAS DDS INF XML BIN IDV

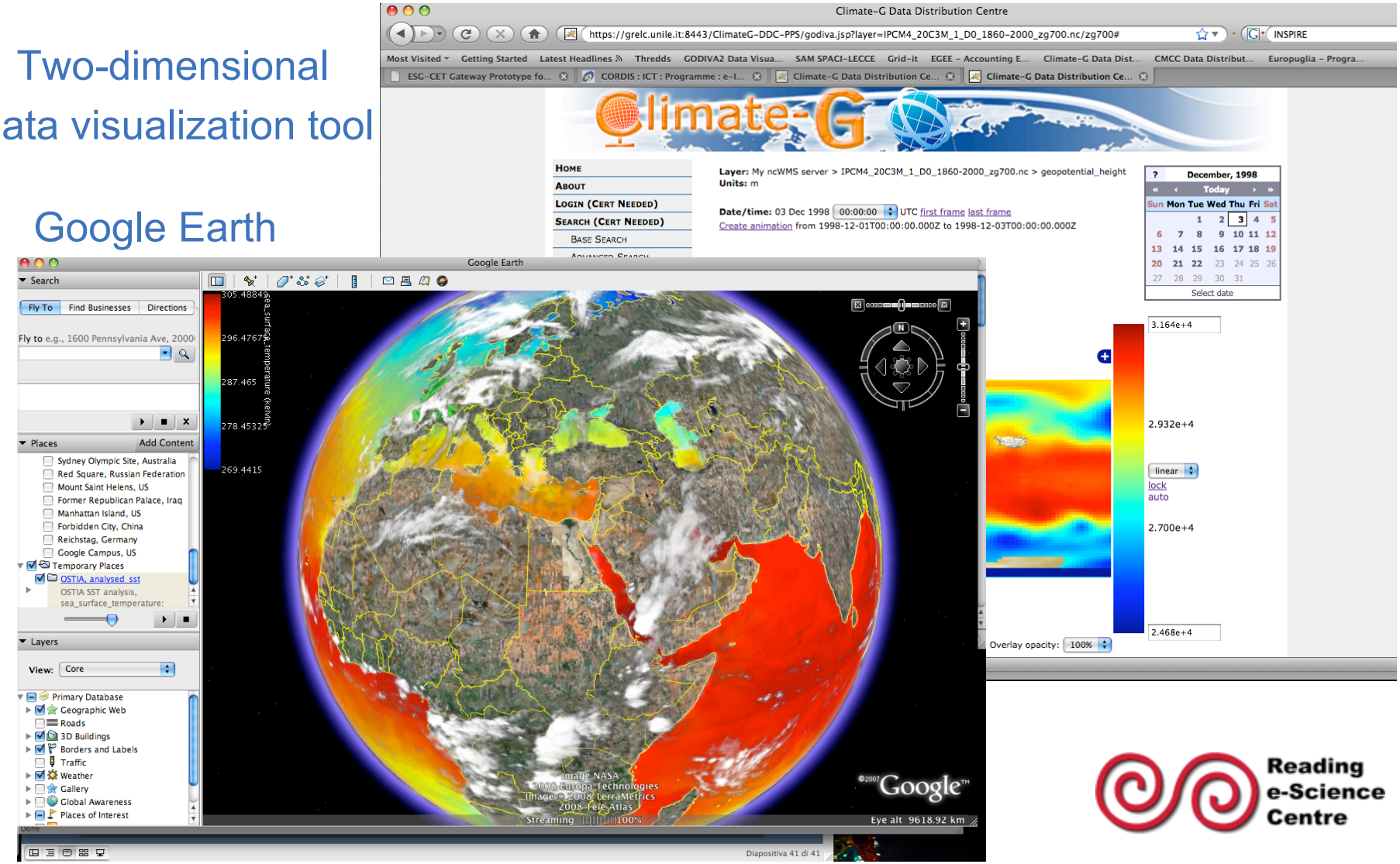
Data Visualization (IDV support)



Godiva2 Integration

Two-dimensional Data visualization tool

Google Earth



Reading e-Science Centre

Monitoring Climate-G Metadata System

Climate-G Data Distribution Centre

https://grelc04.unisalento.it:8443/ClimateG-DDC-PPS/batch_monitoring.jsp

Most Visited Start Headlines Thredds GODIVA2 EVO Grid-it EGEE - Accounting Dictionary.com Climate-G DDC Climate-G PPS CMCC DDC Voms 2.0 DDC User Mng DAS DAIS DAIS PPS BBC BBC2

YouTube - Broadcast Yourself. | Climate-G Data Distribution Ce...

Climate-G

GRelC P2P System

Filter by a specific VO: P2P System

Global view

Connetted Servers:

Server name	Istitution	City	Mail administrator	Status
scaimeta.scai.fraunhofer.de	Fraunhofer SCAI	Sankt Augustin	andre.gemuend@scai.fraunhofer.de	UP
vespucci.datagrid.jussieu.fr	IPSL-IPGP	Paris	david.weissenbach@upmc.fr	UP
grelc04.unisalento.it	CMCC & SPACI-LECCE	Lecce	grid-prod@sara.unisalento.it	UP
mon01.macc.unican.es	Universidad de Cantabria	Santander	grid-prod@unican.es	UP

Site specific view

Server Detail

Address: scaimeta.scai.fraunhofer.de
Port: 18500
Number of Local User: 3

GRelC Instances:

Name	Type	Host
monitoring	monitoring	localhost
batch_monitoring	batch_monitoring	localhost

Grid DBs:

Grid DB Name	Instance Name
cmcc-index-xml	xindice_on_localhost
cmcc-index	mysql_on_localhost
monitoring	monitoring
batch_monitoring	batch_monitoring

VOs:

VO Name	Grid DB Number
climate-g.vo.eu-egee.org	1

<< Back to admin interface

Done

Climate-G and EGEE

- In April, Climate-G has been recognized as a **new VO** by the EGEE Resource Allocation Group (***climate-g.vo.eu-egee.org***)
  - First VO devoted to climate change community!
  - Wide climate community in Europe potentially interested in Climate-G
  - Several Climate-G presentations in the Geoscience community (EGU09, ESA Workshop, etc.)
  - About 60 users joined the VO since April (less than 2 months)
  - 20 new users from CMCC Divisions (agricultural, soil & coast and economic impacts people) will soon join the VO
  - Most of them (more than 85%) comes from the climate context and are using a grid infrastructure for the first time -> new users
  - Interesting level of feedback from our users in terms of:
    - suggestions to improve the portal
    - new data sources and new tools to be included into the portal
    - application-level requirements (=> good for EGEE computational infrastructure)
- Several **EGEE sites have been configured** to support the "Climate-G VO" (*Fraunhofer SCAI, SPACI-LECCE, IPSL/CNRS IPGP,UniCantabria*)
  - More than 300 CPUs are now available for preliminary tests
- **Seed Resources** will be exploited by the Climate-G testbed/users
  - Thanks to the EGEE NA4 VO Support Group for their support
- The whole Climate-G EGEE infrastructure (data and computational) must be accessible through the Climate-G Portal, our scientific gateway

How to get access to the Climate-G Portal?

To get access to the portal, please follow these steps:

- **Load your personal** X509.v3 digital **certificate** into the browser (please ask for a new one to the Climate-G Certification Authority if needed).
- After having loaded your certificate into the browser, please go to the **Climate-G Registration form**
- **Join Climate-G Virtual Organization** for VO based authorization.
- **Create a proxy** (via *grid-proxy-init* or *voms-proxy-init* command) **and upload it** in the login page.

For any problem please contact us by email (**climateg-info@cmcc.it**).

Several CAs are currently supported: **Climate-G**, **CMCC**, **Grid-FR**, **Germangrid**, **IrisGrid,…**

Conclusions

- Climate-G has a strong relationship with the **EGEE Project**
- A new **EGEE VO** for the Climate-G testbed has been created (April 2009)
- GRelC DAIS provides a grid based **distributed metadata management as well as harvesting solution**
- **Data oriented** EGEE services already integrated into the portal**, computational** ones soon available for *analysis* and *post-processing*
- **Climate-G Portal** to ease Metadata management via Web Interface
- Visualization tools have been integrated (**IDV**, **Godiva2**)
- Climate-G is conceived as a **Virtual Laboratory** for the involved people and technologies

Acknowledgments

Many thanks to all of the involved people in the Climate-G testbed

Giovanni Aloisio (CMCC)

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Horst Schwichtenberg (Fraunhofer-SCAI)

Sébastien Denvil (IPSL)

Peter Fox (RPI, NCAR)

Jon Blower (Univ. Reading)

Antonio Cofino (Univ. of Cantabria)

For more information…

Climate-G URL: http://grelc.unile.it:8080/ClimateG-DDC

Newsletter: climateg-news@sara.unisalento.it
(if you want to join send an email to climateg-info@cmcc.it)

If you wish to Join: climateg-info@cmcc.it

To issue a Grid Certificate: climateg-ca@cmcc.it