Applications en Sciences de la Planète portées sur EGEE

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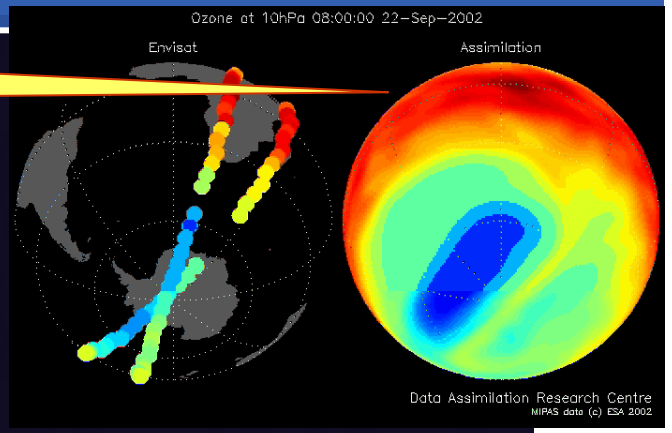
(4) SCAI/Fraunhofer, Germany

www.eu-egee.org

e-infrastructure

Planète Terre: un système complexe

GOME total ozone assimilation



Stratospheric Ozone

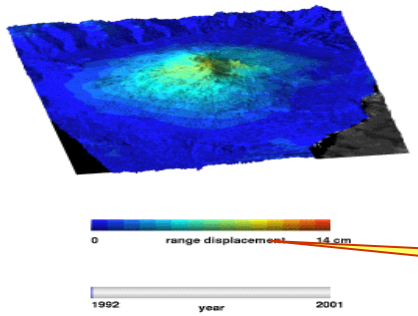
Atmospheric profiles

Topography & Motion

Land cover & vegetation

Marine SST, SSH& colour

Currents, bathymty & ice



10 y displacement of Etna 1992-01

Caractéristiques

- **Observations**
  - D'instrument simple à instrument complexe
  - Instruments au sol, abord de ballons, de fusée, d'avions et de satellite
  - Série temporelle 1D, 2D, 3D
  - Représentées par coordonnées géographiques et altitude ou profondeur => GIS et Open Geospatial Consortium(OGC) Components
  - Observations uniques => grands centres de données
- **Expertises distribuées géographiquement**
  - Campagnes internationales
  - Modèles: collaboration entre plusieurs disciplines

  ⇒ De même pour la Grille
- **Modélisation**
  - De simple à très complexe
  - De local à global
- **Besoins de types de calculateurs**
  - Selon phase de la recherche
  - Nécessité de passerelle en particulier pour les données produites
  - Metadonnées, accès facile aux données
  - Interopérabilité

  => Intérêt pour les services Web et la grille dès 2000

Earth Science Cluster dans EGEE

- **EGEE-III Strategic Discipline Cluster for Earth Science (ES) Grid User**
  - ES Application porting support
  - Workflow management tools
  - Tools and services
  - Documentation – best practice
  - Coordinating collaborations with other ES projects
  - Dissemination in Earth Science community
  - ES Grid community building
- **Parterns: Fraunhofer SCAI, CNRS:IPSL&IPGP, CGGveritas, GCRAS, IISAS, ASGC Taiwan**

ES Cluster to the ES Grid Virtual Research Community

- **9VOs with ES applications**
  - ESR (earth Science Research), EGEODE (expanding Geosciences on Demand), SEEGRID (3VOs), eEarth…
- **25 European and Associated Countries + Taiwan**
  - Albania, Armenia, Belarus, Bosnia, Bulgaria, France, Georgia, Germany, Greece, Herzegovina, Hungary, Italy, Macedonia, Moldavia, Netherlands, Portugal, Romania, Russia, Serbia, Slovakia, Spain, Switzerland, Turkey, UK, Ukrainia
  - Taiwan (ASGC)
- **Connection with projects:**
  - CYCLOPS, EnviroGrid, EELA2 , EUAsiaGRID, EUMEDGRID-support…..
  - Private companies: CGGVeritas,Vito, BluePlanet…
  - Organisations: ESA, ECMWF, OGC,OGF…

Partenaires Français

VO ESR

- **IPSL (Institut Pierre Simon Laplace) Paris**
- **IPGP (Institut de Physique du Globe de Paris) Paris**
- **LISA**
- **LOA (Laboratoire d'Optique Atmosphérique) Lille**
- **BRGM Orléans**
- **LGEI (Laboratoire de génie de l'Environnement Industriel et des risques industriels et Naturels)- Ecole des Mines d'Alès**

Geocluster –VO EGEODE : aspects sismiques

- **Geosciences-Azur**
- **IPGP**
- **IPG/EOST - Strasbourg**
- **ISTEP**
- **UPMC/SISYPHE**
- **UBO/IUEM Brest**

DSI-IRD a participé à la réunion en mai 2009

Compagnies privées

- **CGGVeritas – Geocluster**
- **Footways**

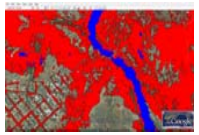
STANDARDS

- **Involvement of ES Grid VRC partners:**
  - OGF leading global standardization effort for grid computing.
  - European and international standardization organizations and initiatives (OGF, OGC, INSPIRE Drafting Teams, GEO SIF and the SIF European Team);
  - contribution to the on-going OGF-OGC collaboration for interoperability and standardization
  - GEOSS (Global Earth Observation System of Systems) activities, which aim to design a system of systems by adopting appropriate standards for models, interfaces and protocols for geoinformation sharing
  - Specific ES standard especially for geospatial metadata and data format, and network services: initiatives for the specification of community standards (e.g. OGC GALEON, UNIDATA THREDDS and CF-NetCDF, NcML, NcML-G; SeaDataNet CDI ISO profile)
  - Discipline standards

Applications portées sur EGEE

Climate - GRelC
CMCC (Italy), IPSL (France), Univ Cantabria (Spain), SCAI (Germany)

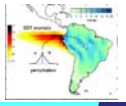
Flood
EMA (France), IISAS (Slovakia), SRI (Ukraine)



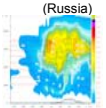
Flood map for Normanton area, Queensland, Australia derived from RADARSAT-2 14-17 Feb 2009 (SRI)

Biodiversity
BRGM (France), Footways(France),JKI (Germany)
Scenarios climatological

Climate - El Niño
Univ. Cantabria – EELA2

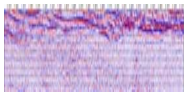


Meteorology
Greece: AUTH, IASA, NOA; SRI (Ukraine), GCRAS (Russia)

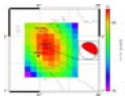


From IASA

Geosciences- Geocluster
CGGVeritas (France), DSI-IRD, Geoazur, IPGP, IPGS, ISTEP, Sisyphe, UBO

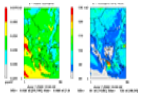


Seismology
AUTH (Greece), IPGP (France), AUTH (Greece), Tubitak Ulakbim (Turkey), Univ. patras (Greece), INFP (Romania)

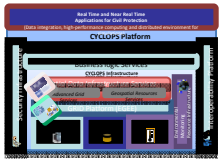


From E. Clévédé - IPGP

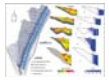
Pollution
IPP-BAS (Bulgaria), IASA (Greece), EnvVO-SEEGRID



Geospatial platform
IMAA(Italy), INFN(Italy), EMA (France), IMHO(Portugal)



Hydrology
CRS4 (Italy), Univ. Genève, Univ. Neuchâtel,INHGA (Romania), Institute for Water Resources "Jaroslav Cerni", Belgrade and CSASA at University of Kragujevac, Serbia



Forecasting seawater intrusion in a coastal aquifer
From J. Kerrou Univ. Neuchâtel

Exploitation de Grands Jeux de données

- **Données satellitales**
  - Parasol : étude de la résolution utilisée- LOA
  - IASI: extraction de profils d'ozone – LISA
- **Scénarios**
  - Footprint FP6 Programme Européen - BRGM
    - 4 millions de scenarios
- **Sismologie**
  - Traitement de la base Geoscope (28 stations, 25 années)

Outils: étude paramétrique

Hydrology

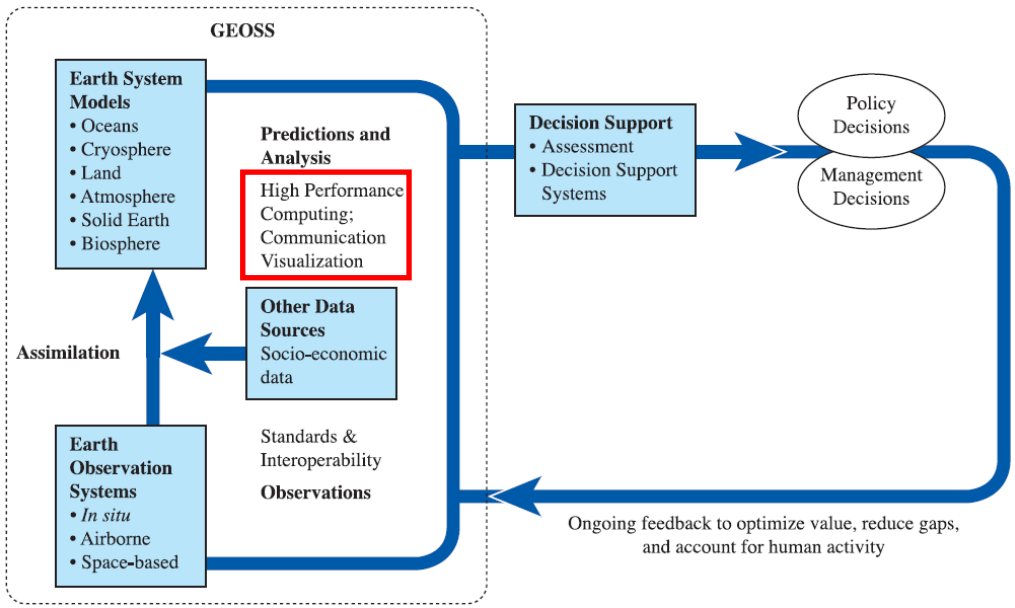
- Flash flood (EMA, FR)
  - Cyberinfrastructure for civil protection operative procedures (http://www.cyclops-project.eu)
- Flood in large rivers
  - Satellite data (SRI, Ukrainia)
  - Cascade of models (IISAS, SK)
- Drinking water supply, management and planning
  - Lizza PAKP Grid enabled groundwater flow simulation (Faculty of Sciences, Kragujevac, Serbia)
- Pesticide risk assesment and management er resources
  - risks of pesticides being transferred to ground- and surface water resources
  - Footprint (eu-footprint.org)
    - Scenarios (climatology, crops, soil, pesticides….)
  - Footways (www.footways.edu) –Start-up

- Paper submitted: 6 hydrological applications ported on Grid

GEOSS and CEOS

N. Kussul – SRI- NASU-NSAU Ukraine

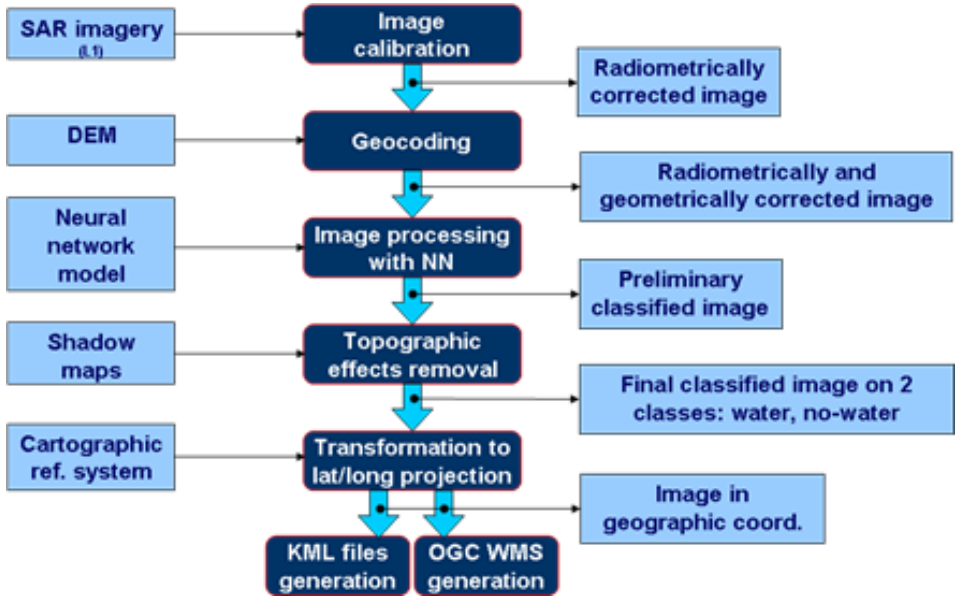
- **GEO – Group on Earth Observations**
  - coordinates efforts to build a Global Earth Observation System of Systems, or GEOSS.
- **CEOS – Committee on Earth Observation** Satellites (CEOS)
  - coordinates civil space-borne observations of the Earth
  - viewed as a satellite “arm” of GEOSS



[GEOSS 10-Year Implementation Plan]

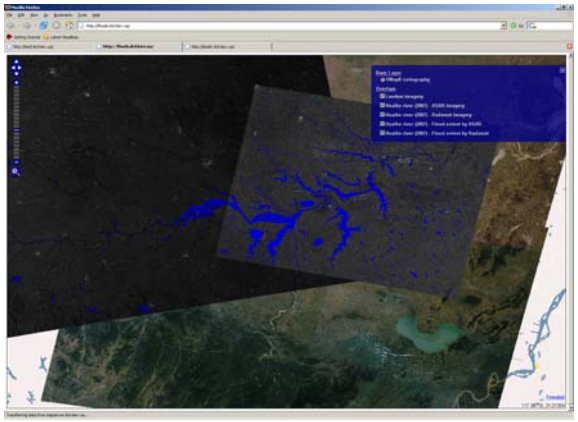
Rapid flood mapping from SAR satellite imagery in Grids

- Delivered within 24 h after data acquisition
- Satellite synthetic-aperture radar (SAR) instruments
  - ERS-2/SAR
  - ENVISAT/ASAR
  - RADARSAT-1/2
- Ground validation
  - Chinese territory on river Huaihe 2008 => 95% match of satellite observations against field measurements
- Output format
  - OGC-compatible: WMS, WCS, KML etc

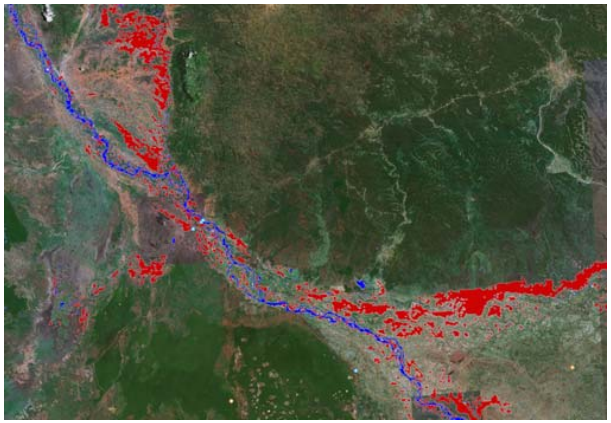


Processing workflow

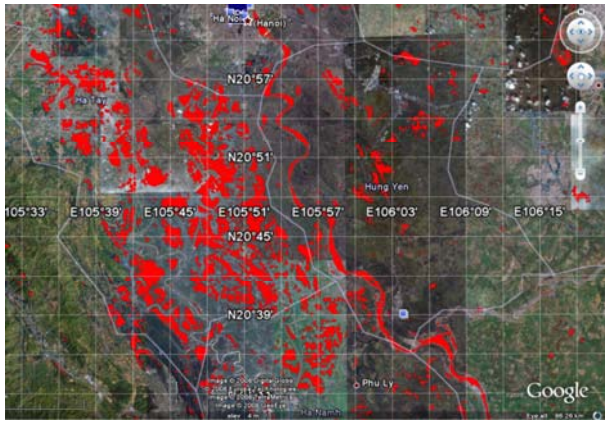
Rapid flood mapping from SAR satellite imagery in Grids (cont.)



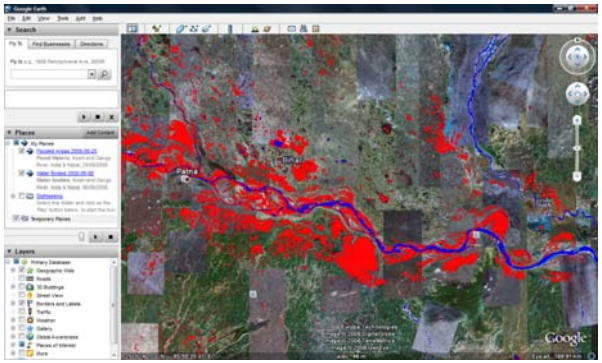
China, river Huaihe, 2007



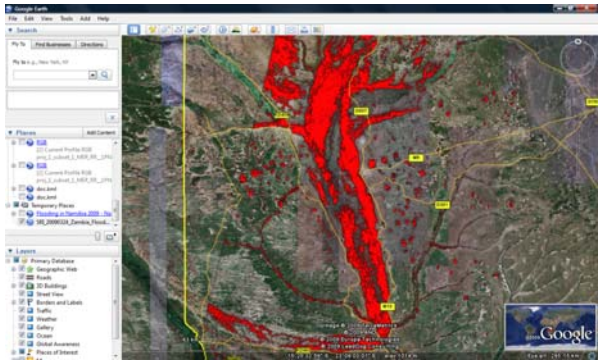
Mozambique, river Zambezi, 2008



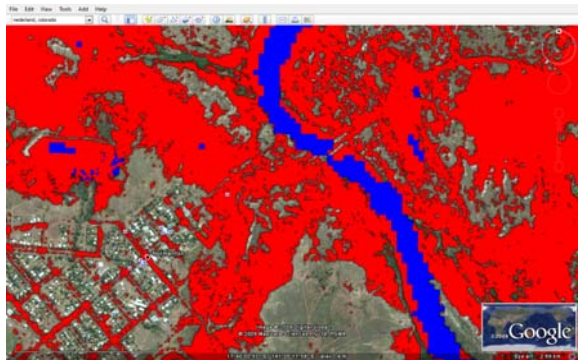
Vietnam, 2008



India and Nepal, river Koshi, 2008



Zambia, river Zambezi, 2009



Australia, river Norman, 2009

End-users: **UN-SPIDER** - UN Platform for Space-based Information for Disaster Management and Emergency Response

Climate Change

- ClimateG Testbed
  - distribution metadata, data
  - GRelC (CMCC, IT)
- El Niño (EELA2, EGEE)
  - CAM
- CORDEX (COordinated Regional climate downscaling Experiment)
  - WRF4G (Weather Research and Forecasting) for Grid
- Impact of climate change : Crucial challenge
  - Access to data storage from Grid
  - Search data
  - Computation on Grid

Grid and Climate Change: Climate-G

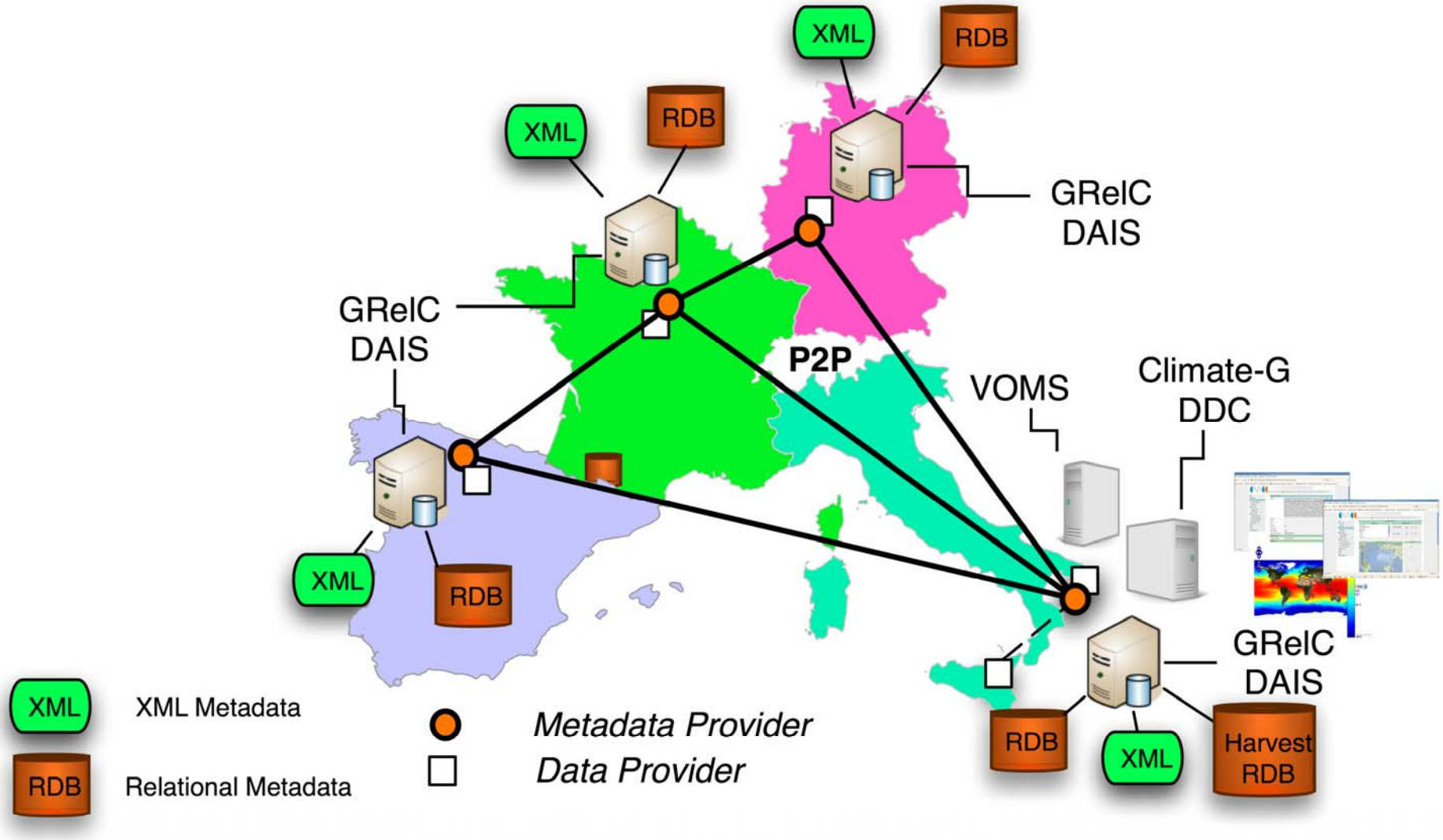
Climate-G is to create an open and unified environment for climate change enabling geographical and cross-institutional data discovery, access, analysis, visualization and sharing.

This effort has been conceived as a proof of concept for the involved grid technologies (in particular GRelC grid metadata service) and 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 : Metadata service Network



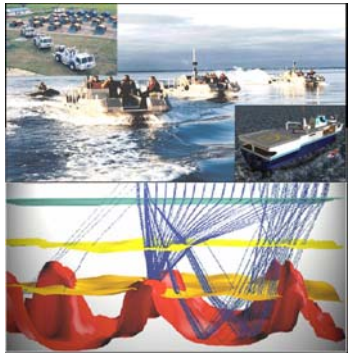
Seismology

- Earthquake –CMT (IPGP)
- Exploitation of Geocluster (IPGP)
- GEOCLUSTER
- Seismology - SEEGrid

Seismology Applications

GEOCLUSTER

CGG-Veritas

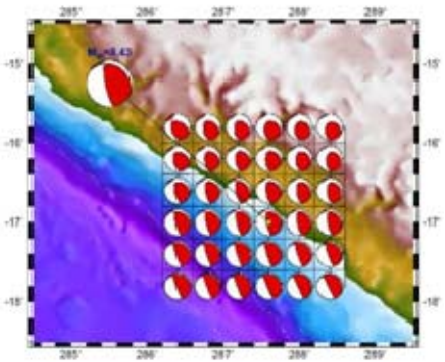


Partners:
VO - EGEODE

software platform for seismic data processing, imaging and reservoir characterization

CMT

IPGP

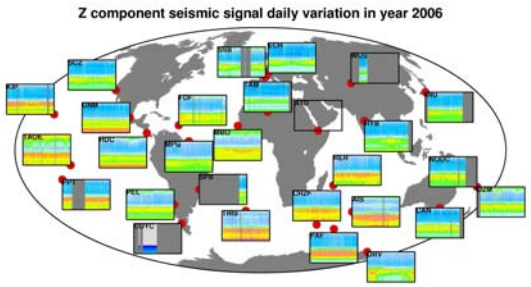


Partners:
VO- ESR

Seismograms from Geoscope
Green function for each 3D-Grid point around approximate earthquake location and for different times 100-300jobs independent

GEOSCOPE

IPGP

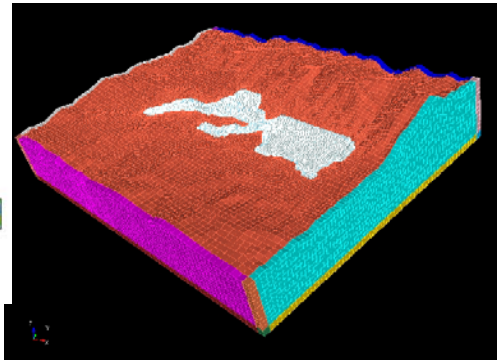


Partners:
VO ESR

28 seismological stations and data centers
25 years of data
Processing of the whole data set on EGEE for different applications
Noise
Polarization

3DSEM_UNSTRUCT

IPGP- France



Partners:
EELA

3D seismic waves Propagation in complex geological media on a local scale

SEE-GRID-SCI
Seismology Virtual Organization (VO) in South Eastern Europe

C. Ozturan (Bogazici University, TR)

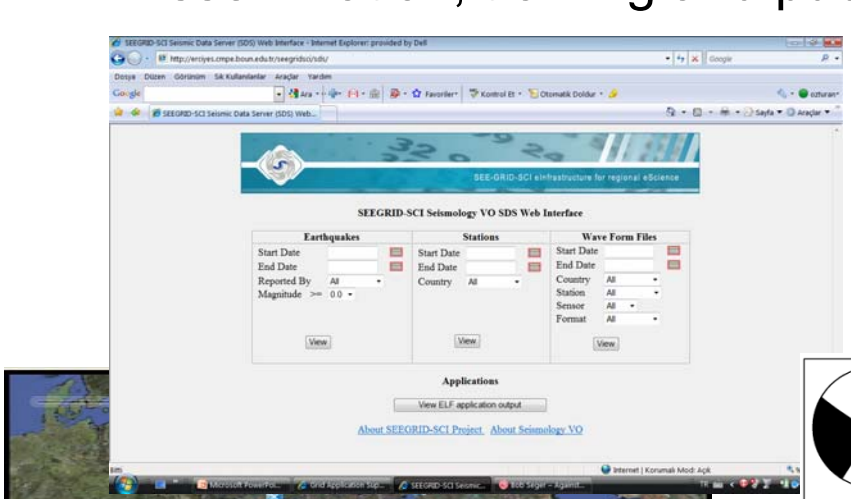
Seismology VO Research Objectives

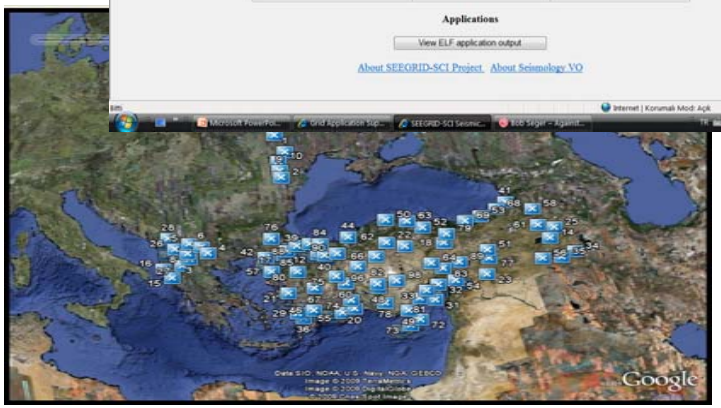
- Serve massive seismology data on EGEE grid
- Gridify seismology applications
- Build seismology VO application services
- Train interested researchers
- Promote sharing and collaborations among researchers

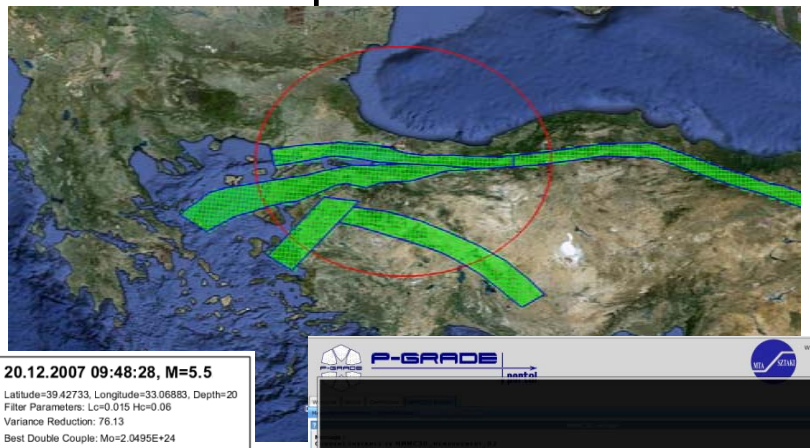
Collaborating Organizations	Country
Polytechnic University of Tirana	Albania
National Academy of Sciences of Armenia	Armenia
Seismological Department, in Geophysical Institute of BAS	Bulgaria
Department of Geophysics in Institute of Geography and Earth Sciences of Eötvös Loránd University	Hungary
Seismological Observatory of Geodetic and Geophysical Research Institute of Hungarian Academy of Sciences	Hungary
Faculty of Natural Sciences and Mathematics of University of Ss. Cyril and Methodius	FYR of Macedonia
Institute of Geology and Seismology of ASM	Moldova
Seismological Survey of Serbia	Serbia
Kandilli Observatory and Earthquake Research Institute, Dept. of Computer Engineering , Boğaziçi University	Turkey
Middle East Technical University	Turkey

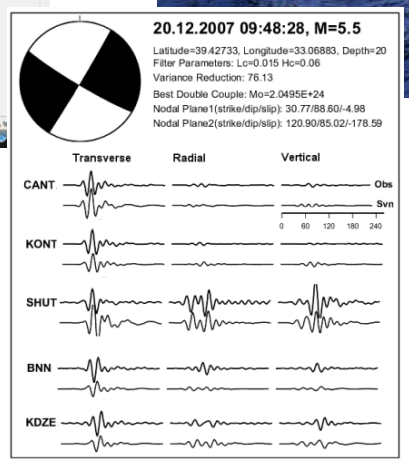
Seismology VO Major Outcomes and Results

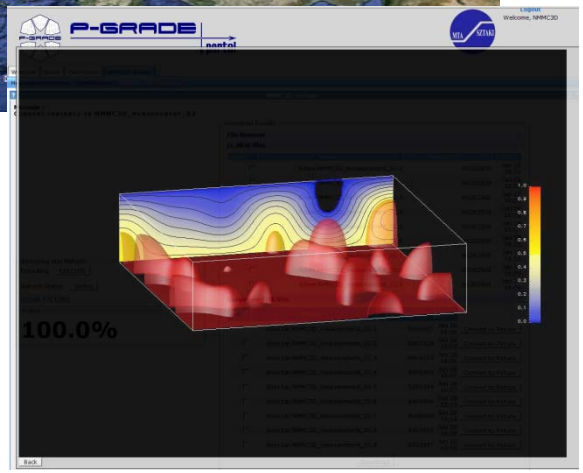
- 3.4 TB of data collected from roughly 100 stations
- Seismic data iterators developed
- A simple interface to NERIES/ORFEUS, European datacenters
- Applications gridified by collaborating teams
- Dissemination, training and publication activites performed











ES Cluster DEVELOPMENTS

- **Automatic workflow composition** using semantic data

  Workflow developed by KWF-Grid and Int-eu-grid

  supported and adapted by II-SAS, Bratislava
  - Workflows for meteorological, hydrological and hydraulics applications
- **GENESI-DR (*Ground European Network for Earth Science Interoperations - Digital Repositories)* Interface**
- **GEOCLUSTER: licence server, Grid file browser (Kereon), help porting applications (gEclipe), GUI for job control,…**

  www.egeode.org

Collaboration avec EU-AsiaGrid

- **EUASIAGrid (www.euasiagrid.org)**
  - Italie(INFN),République Tchèque(CESNET), France, Taiwan, Indonésie, Malaysie, Philippines, Singapour, Thailande, UK, Vietnam
  - Mitigation of natural disasters (Tremblements de terre, innondation,typhon…)
  - Changement climatique, …
- **WRF4G (Weather Research and Forecasting on Grid)**
  - WRF porté sur EELA2 & EGEE pour passer de sortie de modèle global à résultats régionaux (downscaling) par l'Université de Cantabria (Espagne)
  - Participe à CORDEX
  - Tutorial en Thailande regroupant personnes de EUASIAGRID intéressées
  - Installation en Thailande et autres pays

ES Vision

- **Problem: How and can I use this data for my research?**
  - Interpretation: I may not have the domain knowledge?
  - Data knowledge: how was it created? What is the quality?
  - Data access: I do not want a Terabyte, I want just what I need!
- **Not only valid for data, but also for algorithms/models!**
- **Harmonization needed**

- **ES Grid platform to share knowledge over a continuum of time and a variety of geographical scales, to share data and information and to provide the required computing resources.**
- **The platform will be built by steps the first one is this proposal...**
- **Roadmap for a dedicated Earth Science Grid Platform, Earth Science Informatics Journal, 2010**

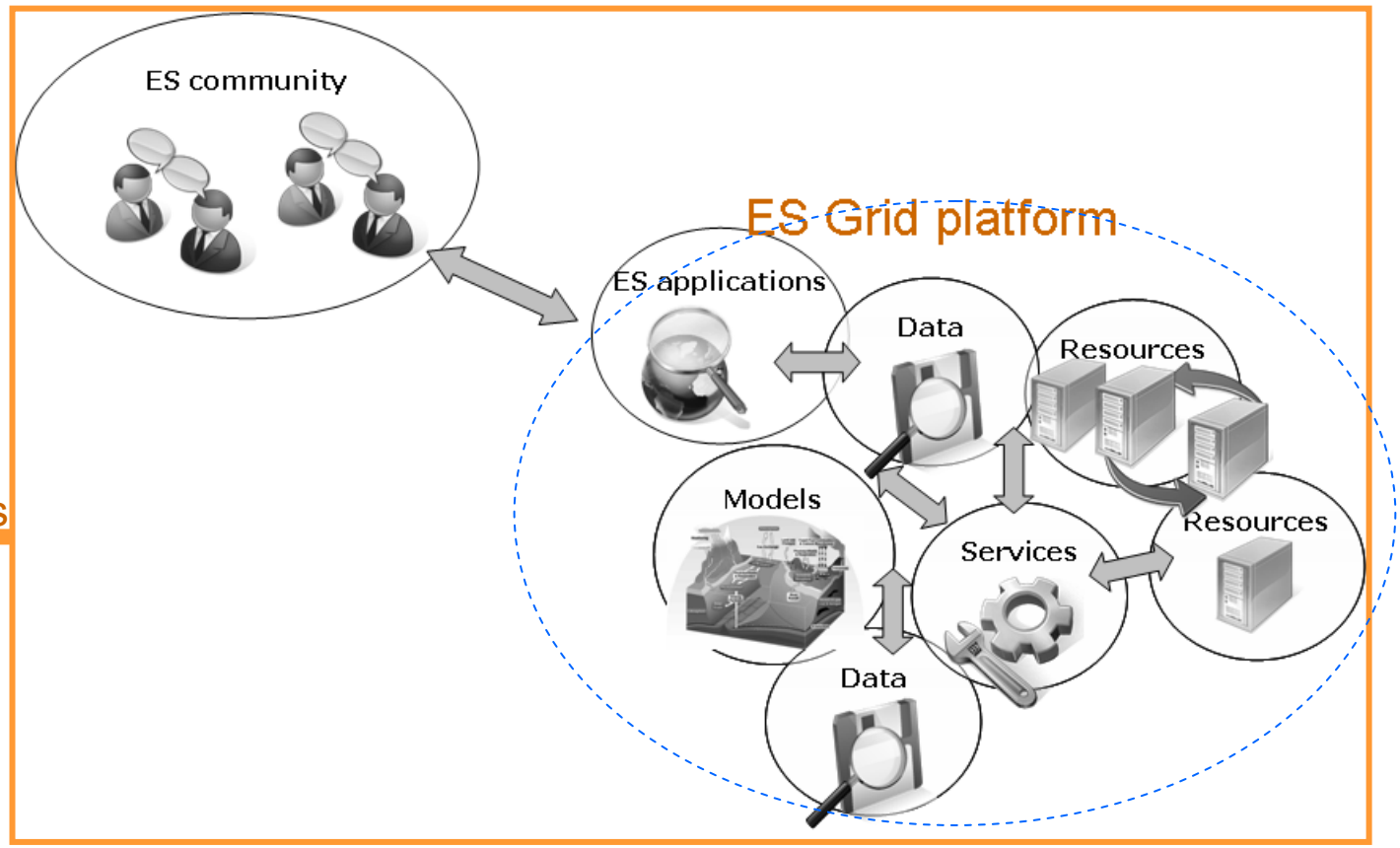
(white paper from the DEGREE project)

The roadmap

Short term

Long term

4-8 years



Publications

- Eos, AGU Transactions, Grid computing for Earth Sciences, Vol. 90, N° 14, p117&119, 7 April 2009.
- Special issue of Earth Science Informatics Journal
  - 12 papiers publiés en Juin 2009, un en 2010
- Environ 30 papiers dans Journaux internationaux par ES VRC
  - Important de signaler les publications pour les instances scientifiques
  - Références à EGEE dans remerciements…
- En France 5 thèses (ES) avec résultats obtenus sur EGEE, 2 à soutenir; 1 thèse collaboration scientifique avec IPSL
- Papier soumis au Journal d'Hydrologie à la demande d'un éditeur suite au papier Eos
  - 6 Applications en hydrologie
- Actes de Conférences – résumés étendus ou papier >40
- Livre: 1 en Russe, chapitres dans des livres

CONCLUSION

- **Organisation of the ES Grid VRC**
  - coordination scientifique et technique
  - Un groupe d'experts spécialisés en ES
  - Des partenaires ES avec différents niveaux d'implication
- **ES Grid VRC opportunité pour les partenaires de travailler ensemble**
  - Remplir les besoins en suspens
  - To address community issues;
- **User Forum 5 – Uppsala 12-16 April 2010**
  - http://egee-uf5.eu-egee.org/index.php?id=689
- **European Geosciences Union 2-7 May 2010**
  - Sessions « Grille » Lundi 2 et Tuesday 3 May
  - Geosciences Applications on Grid and HPC http://meetingorganizer.copernicus.org/EGU2010/session/1921
  - 29 résumés
- **Réunion à Paris –date à fixer**