The role of eGY in exploiting multi-band data via VOs for solar extreme events analysis

M. Messerotti

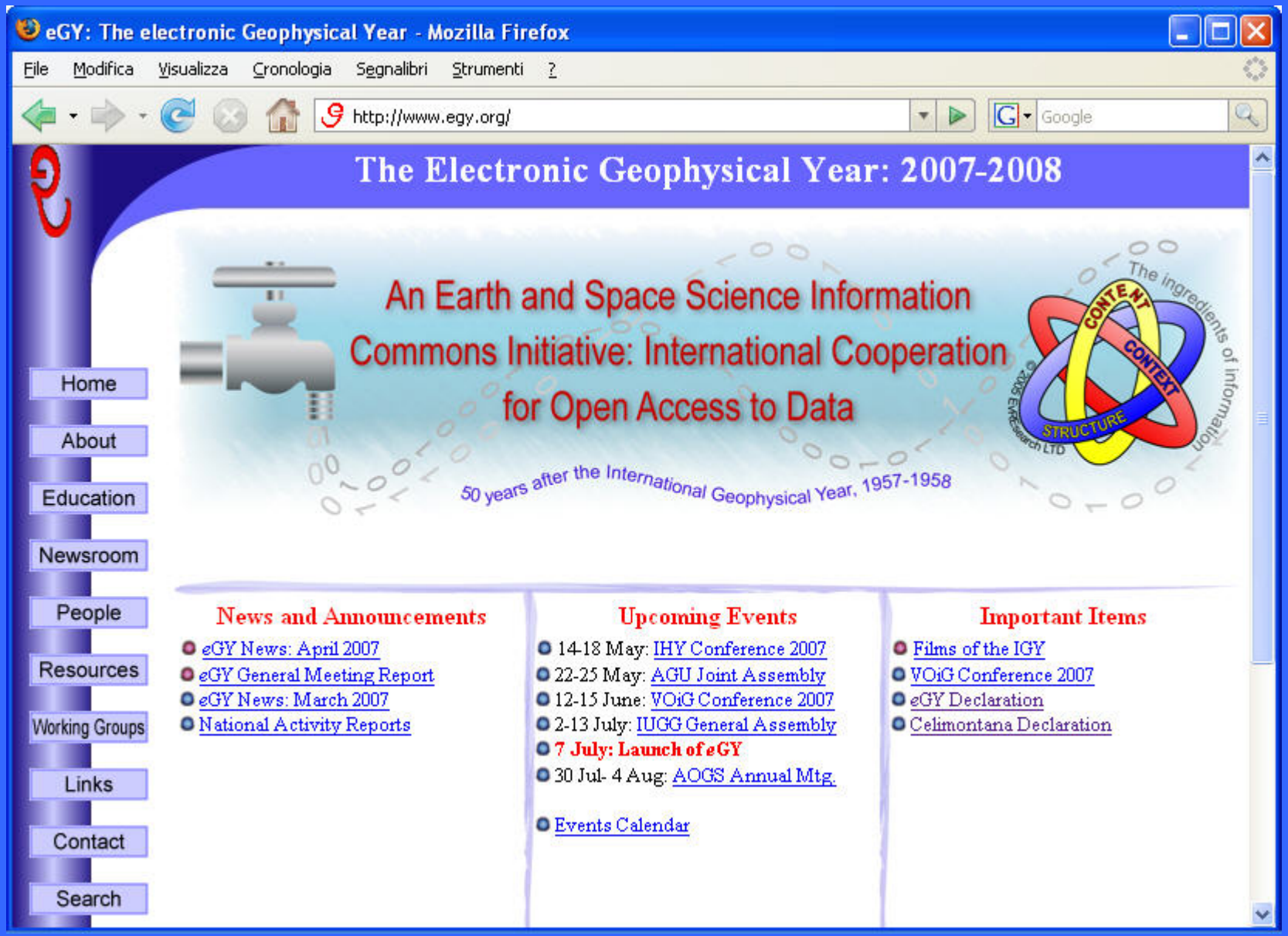
Chair eGY IT Committee

Co-Chair eGY EU Committee

Outline of the Talk

- What is eGY ?
- eGY Europe
- How can eGY synergize the data exploitation for SEE?
- Conclusions

The eGY web site: http://www.egy.org



eGY People

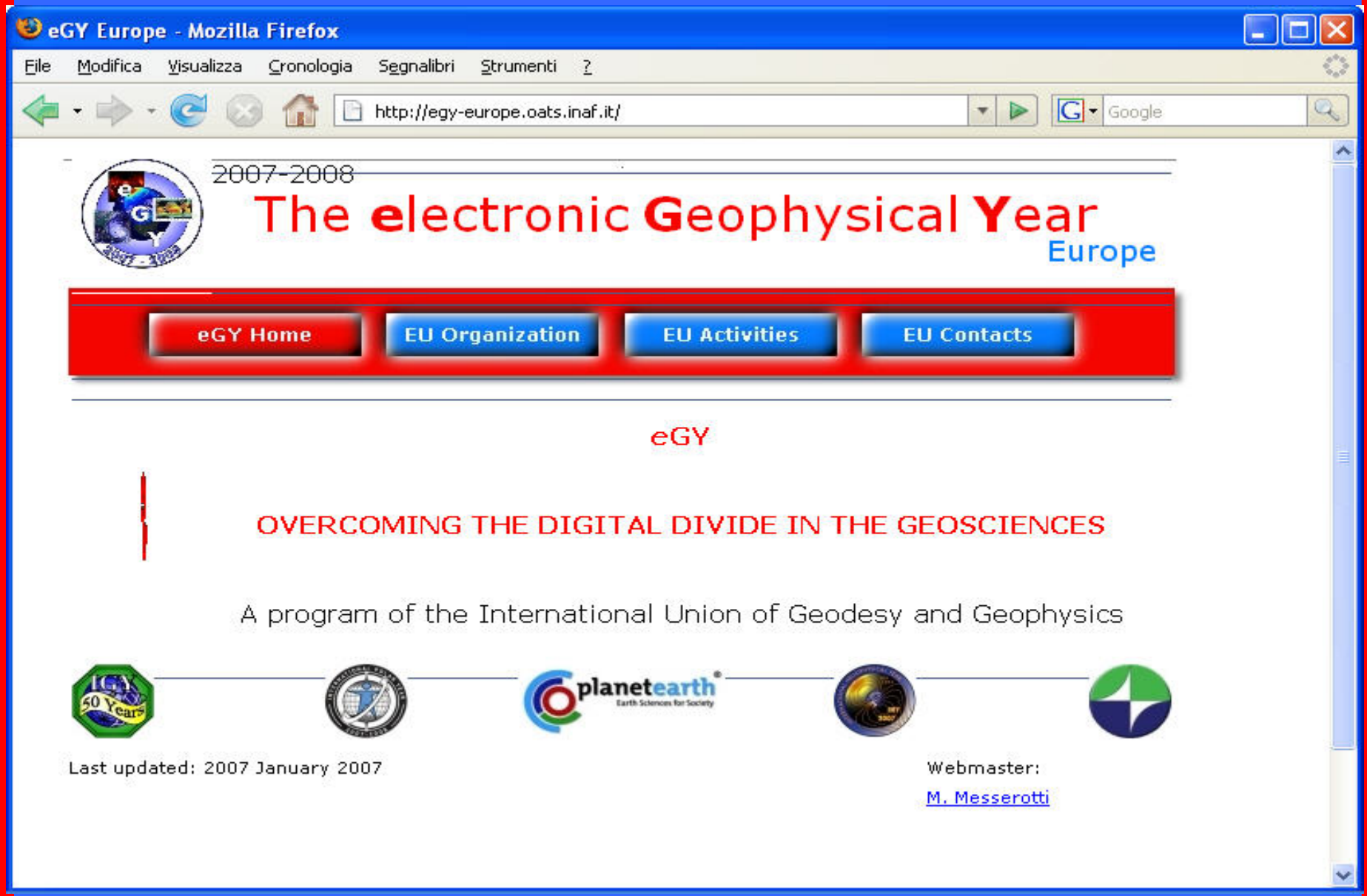

eGY: The electronic Geophysical Year - Mozilla Firefox
File Modifica Visualizza Cronologia Segnalibri Strumenti ?
http://www.egy.org/people.html
Google
The Electronic Geophysical Year: 2007-2008
People
Secretariat
Dan Baker, Executive Director
Bill Peterson, Secretary
Marissa Rusinek, Communications Manager
Cheryl Levey, Website Assistant
Emily CoBabe-Ammann, Media Relations
International Committee
Charlie Barton, Chair
Guo Huadong, Co-Chair
Dan Baker, ED ex. officio
Ferris Webster, WDC Panel
Alexei Gvishiani/Jean Bonnin, CODATA
Ed de Mulder, IUGS and Planet Earth
David Clark, NOAA/NGDC, WGISS
Mark Parsons, IPY Liaison
Barbara Thompson, IHY Liaison
Yohsuke Kamide, CAWSES Liaison
Peter Fox, AGU (ESSI)/EGU Liaison
Home
About
Education
Newsroom
People
Resources
Working Groups
Links
Contact
Search

eGY International Committee

eGY International and National Representatives

- European *e*GY Committee
  - Mauro Messerotti, Chair
  - Bernd Ritschel, Chair
- France
  - Jean Bonnin
  - Jean-Pierre Antikidis
  - Brigitte Schmeider
  - Michel Menvielle
- German *e*GY Committee
  - Bernd Ritschel, Chair
- Indian *e*GY Committee
  - Prof. U. Aswathanarayana, Chair
- Italy
  - Mauro Messerotti
- Japanese *e*GY Committee
  - Y. Kamide, Chair
  - Dr. Ashino
  - Ken Murata
- Russian *e*GY Committee

eGY Europe web site: http://egy-europe.oats.inaf.it



Declaration for a Geoscience Information Commons

"Knowledge is the common wealth of humanity" [1]

Preamble

The Electronic Geophysical Year (*e*GY) joins with the International Council for Science, the World Summit on the Information Society, and many other bodies in recognizing that knowledge is the common wealth of humanity. We have a shared responsibility to create and implement strategies to realize the full potential of digital information for present and future generations. In the 21st century and beyond, access to digital information and new technologies for information integration and knowledge discovery will influence the free and productive development of societies around the world. Providing ready and open access to the vast and growing collections of cross-disciplinary digital information is the key to understanding and responding to complex Earth system phenomena that influence human survival. In the geosciences, as elsewhere, the issues of concern are as follows.

Article 1: Data access
Earth system data and information should be made available electronically with interoperable approaches that facilitate open access.

Article 2: Data release
Owners, custodians, and creators of Earth system data should work together to share their digital information with the world community, though in a manner that respects intellectual property rights and security constraints.

Article 3: Data description
Providers and users of Earth system data and information should share descriptions of structure, content, and contexts to facilitate interoperability and the discovery of relationships within and between information resources.

Article 4: Data persistence
Data and information about the Earth system should be preserved and sustained in forms that are both software and hardware independent so as to be openly accessible today and in the future.

Article 5: Data rescue
Effort should be made to identify and rescue critical Earth system data and ensure persistent access to them.

Article 6: Common standards and cooperation
Standards for interoperability should be identified, created, and implemented through international collaboration.

Article 7: Capability building
Communities with advanced information technology and communications capabilities should contribute to developing such capabilities elsewhere to reduce the digital divide.

Article 8: Education and public outreach
Students, scientists, decision-makers, and the public should be informed about and be enabled to contribute to our understanding and management of Earth system phenomena that impact human survival.

[1] Adama Samassekou, Convener of the UN World Summit on the Information Society.

Rev: 06 January 2006

eGY-Europe

Europe

Q: What do we mean by ?

A:

All Countries interested in participating in eGY activities

eGY-Europe Structure

- European Committee
- National Committees
  - France
  - Germany
  - Italy
  - …

ADVANCING VIRTUAL OBSERVATORIES VIA KNOWLEDGE MANAGEMENT

M. Messerotti[1,2]
[1]INAF-Astronomical Observatory of Trieste, IT
[2]Dept. of Physics, University of Trieste, IT
Co-Chair eGY-Europe
Chair eGY-Italy

Outline of the Talk

- The Scientific Final User

- The Virtual Observatory

- The Semantic VO

- Embedding Knowledge via Cmaps

- Managing Knowledge via Cmaps

- Conclusions

The Scientific User 1 Research Needs

- wants, by using his own expertise:

  a. to efficiently locate, search, retrieve data

  b. to successfully cross-analyze data

  c. to run models for data interpretation

  d. to flawlessly graph results

  e. to publish the outcomes asap

The Scientific User 2 Typical Attitudes

- does not want, as much as he/she can:

a. to reduce the time devoted to research

b. to invest time in learning the use of new data management tools ("Why, if I can use my good, old, command-line FTP?")

c. to invest time in learning the related new terminology ("What does VO mean and what can a VO do for my research?")

The Scientific User 3 Typical Diseases

a. is affected by the “Publish or Perish” syndrome (not his/her fault…)

b. will continue struggling with multi-instrument, multi-band, time-space-energy multi-resolution, varied-quality data from different repositories with different access modes (his/her fault)

c. will continue proceeding along his/her consolidated “data handling roadmap” (his/her fault)

The Scientific User 4 The Cure

SHOULD ADOPT A VO !

as

- the relevant learning curve is not steep
- it can successfully cope with the mentioned issues, relieving the scientist
- it can favour a significant improvement in the scientific productivity

The Virtual Observatory

A VO can provide the final user with an operational framework controlled via a web-based GUI for accessing registered resources like:

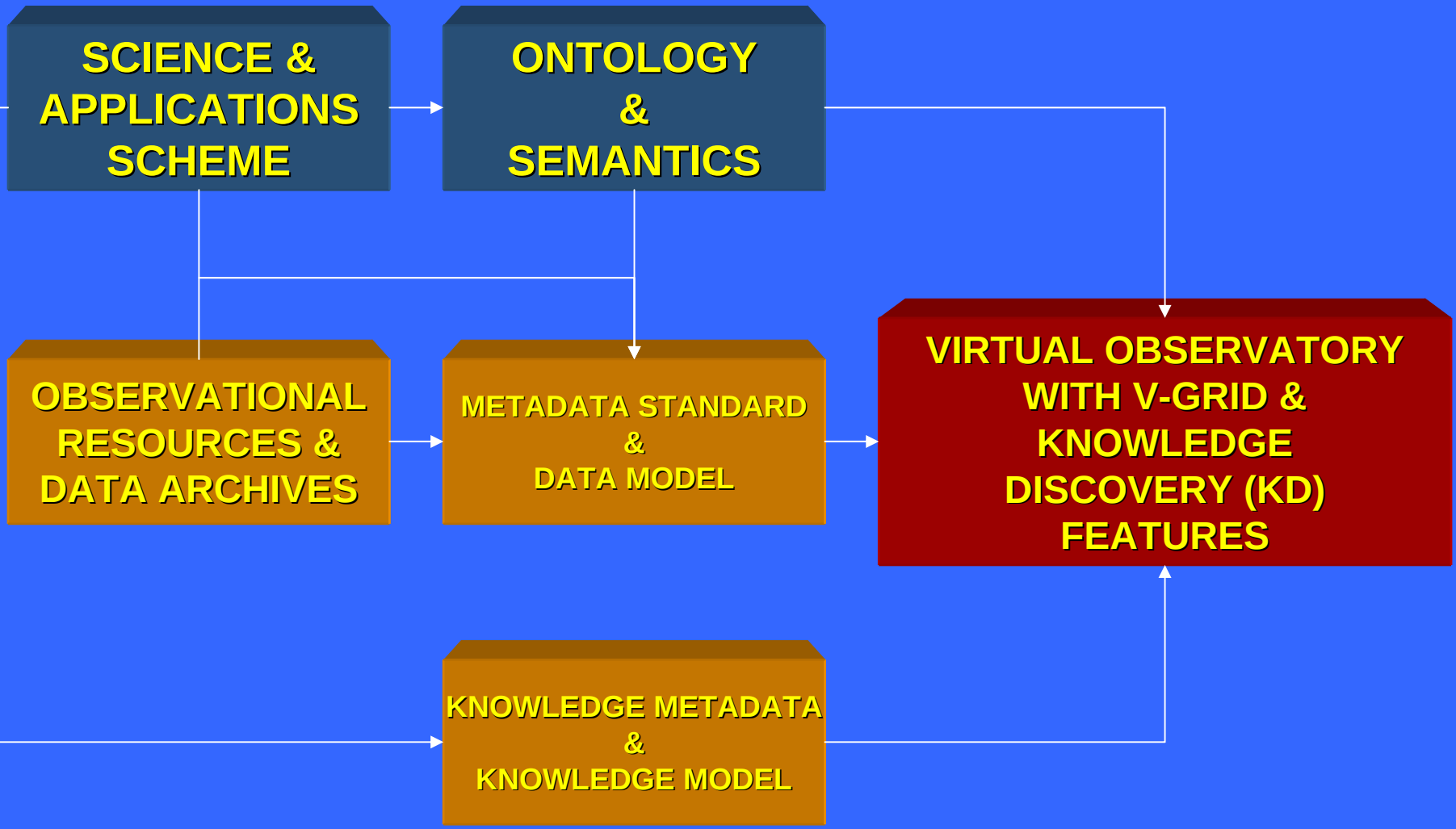
- Complex data search and retrieval
- Data visualization
- Data analysis
- Numerical model running
- Numerical computing

in user-transparent mode.

Data and Computing Grid Layers

- Advanced data management is carried out by a DATA GRID, which links multiple data collections by managing data entities across distributed repositories
- Data analysis and visualization occurs via a VIRTUAL DATA GRID, which processes data via Grid protocols
- Numerical computing is performed by a COMPUTING GRID, which relies on distributed computing power

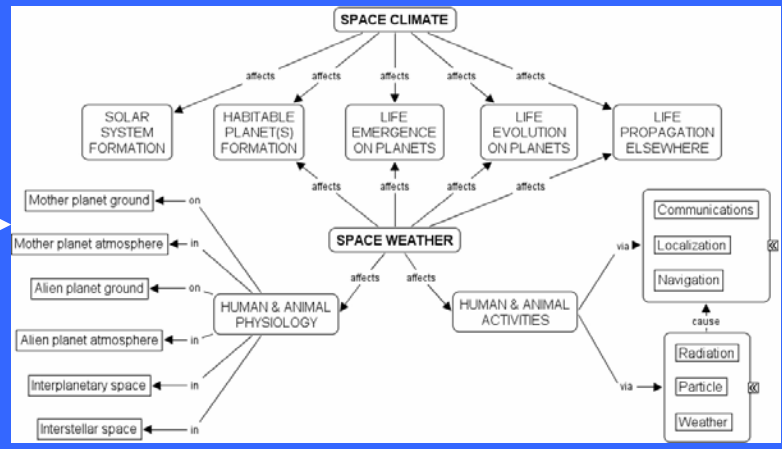
The Semantic VO

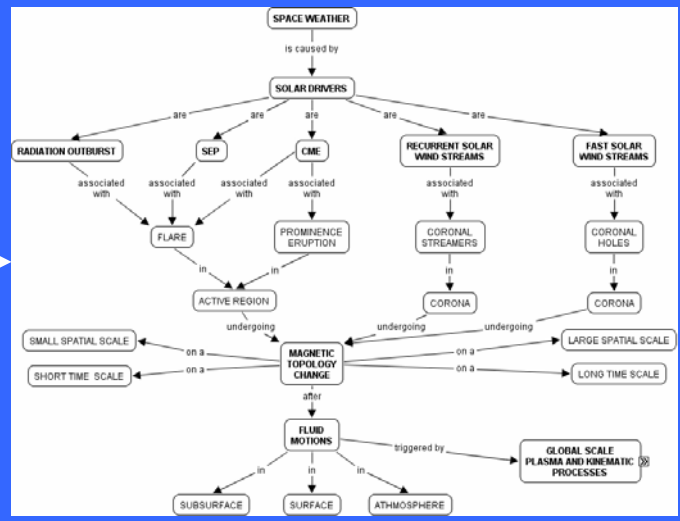


- An SVO can cope with Knowledge

Ontology and Semantics

CMAPS





- Graphically described by Concept Maps

Metadata Standards and Data Model

MULTI-DATA METAMODEL

Describes

- **Multi-disciplinary**
- **Multi-domain**
  - **Multi-wavelength**
  - **Multi-instrument**
  - **Multi-resolution**

data based on the domain- specific data models

- **Managed by a Multi-Data Metamodel**

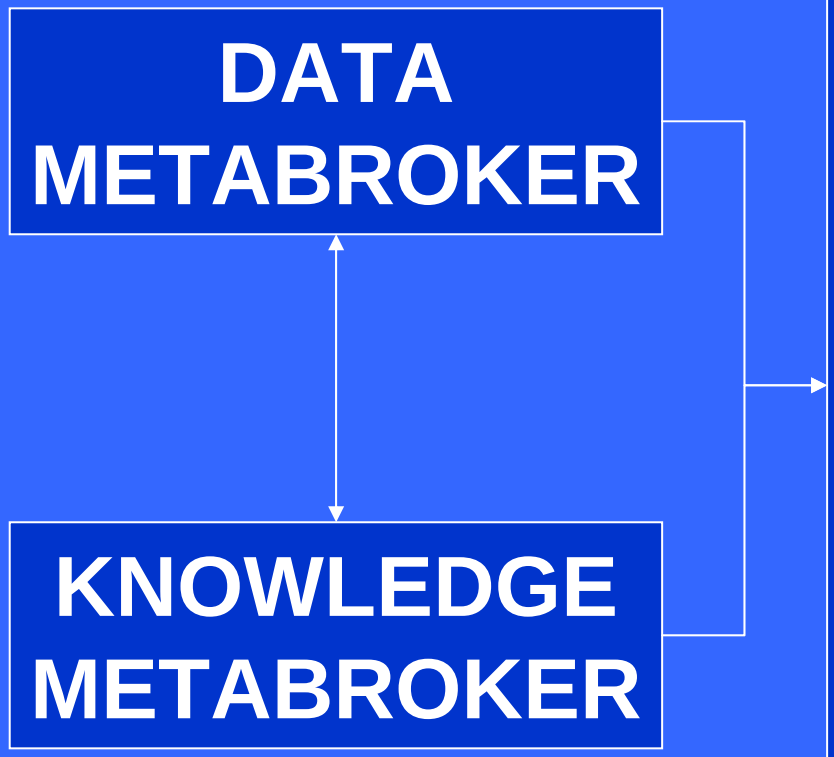
Knowledge Metadata & Knowledge Model

KNOWLEDGE METAMODEL

Describes
- Concepts
- Interrelationships
- Case-Based Reasoning

- Managed by a Knowledge Metamodel

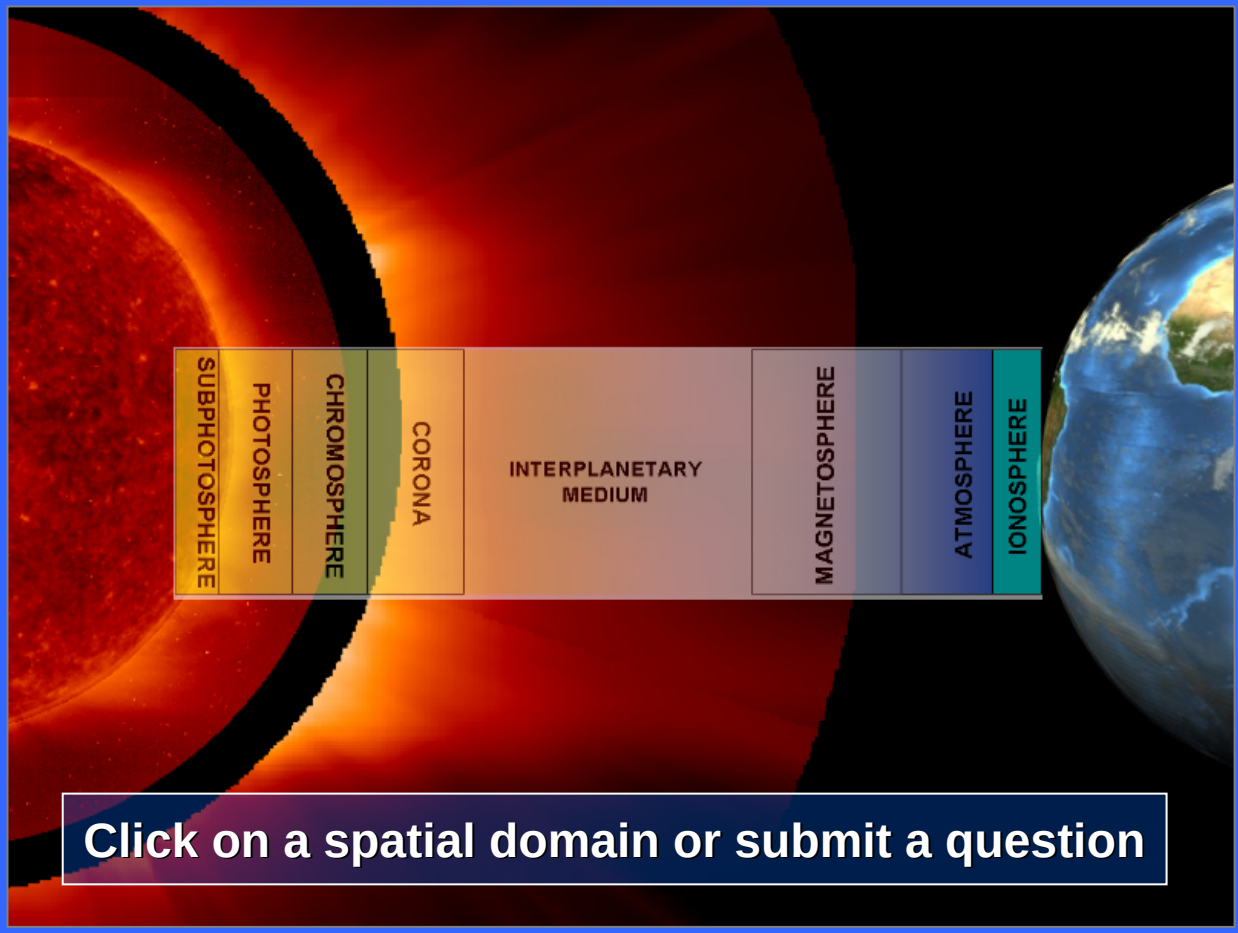
Advanced Brokering System



- OWL Web Ontology Language
  - Web Services
  - Description on Demand
- KEA Knowledge Exchange Architecture
  - Web Services
  - Cmaps
  - CXL Concept Mapping XL

- Managed by specialized Metabrokers

An Advanced Intelligent GUI



A MULTI-DOMAIN SPATIAL GUI

- AJAX **Asynchronous Javascript & XML**
  - **XHTML + CSS for visuals**
  - **DOM Document Object Model**

A NATURAL LANGUAGE INTERFACE

- **NL Parser**
- **Query Builder**
- **Query Processor**

- **Provides Natural Language interaction**

Managing Knowledge via Cmaps

- A Cmap can be published on a KEA server
- A KEA server is VO compliant as a set of Web Services (WS) allows to extract the knowledge coded into any published Cmap in a machine-readable format
- A machine-readable knowledge base can be built from Cmaps to be used by a VO provided with an extra layer for knowledge processing

A Knowledge Processing Layer

- Cmap WS Mapper → Knowledge Broker
- Cmap WS Query System → Get Cmap
- Cmap Knowledge Extractor → Get Knowledge
  - Cmap parser → Identify:
    - Concepts
    - Connections
    - Linking phrases
- Knowledge Base Manager → Index and Retrieve Knowledge
- A NLP Interface → Process Queries

CONCLUSIONS

- A VO provides the scientific user with all the tools he/she needs for data search, retrieval, visualization and analysis
- **A SVO is the next step in VO development as it can cope with Knowledge to significantly exploit the data information content and the scientist expertise**
- Cmaps are quite promising tools for Knowledge coding and exchange both at the human and at the machine level thanks to the recent developments
- eGY is promoting such developments worldwide
- **A similar tool is a must for the analysis of multi-instrument, multi-band data as needed when making post-event analysis of SEE**

THANK YOU FOR YOUR ATTENTION !