

Coordinating EO architecture

Standardised and coordinated Earth Observation has become a primary target for decision makers in the environmental sciences. **Dr Massimo Craglia** outlines a project which aims to revolutionise the ways in which research data is shared worldwide



Could you offer some insight into the context from which the EuroGEOSS project emerged?

The European Commission is a leading player in the Group on Earth Observations (GEO), participating in many of its Committee and Board activities. Every year there are calls for projects specifically aimed at supporting various components of Global Earth Observation System of Systems (GEOSS), and DG Research also organises regular workshops of the European GEO-related projects to ensure that they develop the synergy necessary to maximise the European contribution.

Can you explain the specific role of EuroGEOSS within this context?

In 2009, one of the GEO-related calls for research proposals aimed specifically to support the activities of the GEOSS Architecture and Data Committee. The call requested projects to address a 'European Environment Earth Observation system supporting INSPIRE and compatible with GEOSS'. EuroGEOSS was one of the successful proposals.

The project is building an initial operating capacity for Europe in the three strategic benefit areas (SBAs) of Drought, Forestry and Biodiversity. Why have these SBAs been chosen?

As the purpose of the call was to support the development of GEOSS, we wanted to design a project that had long-term sustainability. With this in mind, we identified three thematic areas in which the European Commission's Joint Research Centre (JRC) has institutional commitments: forests, biodiversity and drought.

These three areas offered the opportunity of building a multi-disciplinary research project grounded on long-term institutional funding

How and why does this work extend to the African continent?

One of our thematic areas (biodiversity/protected areas) focuses on Africa as the Joint Research Centre – the in-house science service of the European Commission – supports several of the Directorates General of the Commission dealing with aid, emergency, and development support. It is worth bearing in mind that Europe is the single largest donor of aid to Africa.

What has been the biggest challenge for the project team to date?

The biggest challenge in any multidisciplinary project is to learn to listen to others and make the extra effort to make explicit the formal and tacit knowledge accumulated through years of training and practice.

How would you define the EuroGEOSS Broker and its key functions?

The Broker is a family of components used for discovery, access and use. Other components that have been developed

are helping to publish and document the results of the analysis, search semantically, and mine social networks for information provided by citizens that may be relevant to a problem.

What challenges will the research group now be addressing?

The project was completed at the end of April 2012. A new project has already started in September 2011 for a three-year period, GEOWOW, extending the EuroGEOSS approach to other disciplines: weather, ocean ecosystems and water.

Have you organised any events in 2012 as part of the Capacity Building and Dissemination Work Package?

The major event was the EuroGEOSS conference organised in Madrid on 25-27 January to showcase the achievements of the project, and discuss the European contribution to GEOSS. The conference was very successful with over 200 participants, and keynotes from Alan Edwards (EC), Ivan DeLoach (USGS), Gilberto Camara, Brazilian National Institute for Space Research (INPE), Ian Jackson (OneGeology) and Jacqueline McGlade (EEA). Ed Parson (Google) and Michael Gould (Esri) also provided an industry perspective. There were 37 presentations in total of which 18 from different projects contributing to the development of GEOSS.

How has the project's progress been communicated to interested parties?

The EuroGEOSS website has published all the documents of the project so that others can build upon what we have achieved. Many of the documents are technical, but others are generic enough that they can be adapted for other projects.

Ensuring interoperability in the environmental sciences

As the Global Earth Observation System of Systems evolves from development to operations, Europe is working strenuously on their contribution. EuroGEOSS represents a great example of efforts to create an interoperable system allowing scientists from different disciplines to work together to share data and models more resourcefully

INNOVATION, COOPERATION AND interoperability are the quintessential properties of the Global Earth Observation System of Systems (GEOSS) which provides the scientific community with a plethora of data achieved through the breaking down of technological and language barriers that may otherwise divide researchers. The main issues which GEOSS and the European INSPIRE Directive (inspire.jrc.ec.europa.eu) wish to overcome is that with each scientific infrastructure comes its own individual set of policies, accepted terms, and protocols. Language and disciplinary barriers may render findings inaccessible to some researchers and increase the chances of duplicated activities. Therefore the rewards of making existing systems and applications fully interoperable are apparent, and through the GEOSS and INSPIRE frameworks EuroGEOSS has evolved to focus primarily on the application areas and prospects of new research, allowing new studies to be more easily linked to become GEOSS components.

EuroGEOSS was a three-year project (2009-12) coordinated by BRGM, the French geological service. The main aim of EuroGEOSS was to advance and contribute to state-of-the-art infrastructures like INSPIRE and GEOSS. As a support to GEOSS, EuroGEOSS has looked to establish long-term applications that will still contribute even after the end of their allocated funding. With this in mind, EuroGEOSS has an operating capacity for Europe in the three societal benefit areas (SBAs): Drought, Forestry and Biodiversity.

FORESTRY

The EU Joint Research Centre (JRC) is responsible for the European Forest Data Centre (EFDAC), which includes several areas such as Forest Resources, Forest Conditions and the European Forest Fire Information System (EFFIS). The EFFIS system is heavily reliant upon analysis and strategic planning which can

only be achieved through the development of information systems, datasets, and services which need to interact and communicate with each other on a broader scale. Although information and early warning systems already exist at global, European and national scales, it is still difficult to combine datasets and information from different sources. However, through the EuroGEOSS system this can be achieved, giving a clear, detailed and coordinated picture about forest fires.

BIODIVERSITY

For Biodiversity, the JRC has several projects at both European and global levels to which sharing datasets have shown great benefits. As a major recipient of aid from the EU, EuroGEOSS pays particular focus to Africa, monitoring and prioritising different areas of research regarding the continent while ensuring that funding is optimised to the best possible effect. One example of this area of work is the African Protected Areas Assessment tool (APAAT) which is an online GIS information system can be considered as the first consistent, continent-wide assessment of the state of protected areas in Africa. The current evolution of the APAAT towards a more global Digital Observatory for Protected Areas (DOPA) for the monitoring of biodiversity can be further seen as the outcome of EuroGEOSS as DOPA will be constructed around web-based infrastructures of interoperable models and data.

DROUGHT

Drought is a relatively new focus area launched by the JRC with a view to establish a European Drought Observatory. This observatory provides data on droughts on a continental level which are collected from different data sources to provide a series of information on precipitation, vegetation density, and hydrology in different regions. Through the EuroGEOSS system, drought indices can be viewed and subsequently used for inter-comparisons to provide sufficient information for the production of risk maps, see

INTELLIGENCE

EuroGEOSS

OBJECTIVES

To demonstrate the added value to the scientific community and society of making existing systems and applications interoperable and used within the GEOSS and INSPIRE frameworks by building an initial operating capacity for a European Environment Earth Observation System in the three strategic areas of Drought, Forestry and Biodiversity.

PARTNERS

BRGM, France (Project Coordinator) • JRC, EC • CNR, Italy • IIASA, Austria • UJI, Spain • UNOTT, UK • CNIG, Spain • IEEA, France • EDISOFT, Portugal • FAO, Italy • FGUA-OSE, Spain • ULBF, Slovenia • GBIFS, Denmark • UNEP-WCMC, UK • RSPB, UK • Birdlife, UK • UNIHH, Germany • BOKU, Austria • ALU-FR, Germany • UZ, Spain • CHE, Spain • CSIC, Spain • NDMC, USA

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trends in droughts and compare the impact of droughts on the economy.

SUPPORT STRUCTURE

Each of these areas of research requires information systems, datasets and services which could interact and communicate with each other while simultaneously considering the large numbers of existing data on local, national, regional and global level. EuroGEOSS demonstrates an ability to increase access to new forms of data and services in their respective fields, and as a result allows scientists to address new scientific questions, or address old questions in new and better ways. The EuroGEOSS project contributes to an increased capacity for scientists from different disciplines to work together, and share data and models more efficiently.

EuroGEOSS looks to challenge preconceived methodologies and models in use by EO operatives by making them much easier and accessible. Dr Massimo Craglia, Scientific Coordinator of the project, is keen to expound the merits of an interoperable system: "Finding resources is important, but it is in their use that real added value is created. In the past, it was necessary to download each dataset from the producer's website, and then undertake significant manipulations to extract the portion of the data required, and transform different datasets to the same coordinate reference system, projection, and so on," he explains.

Much of this ease has come about due to the brokering system of EuroGEOSS. This brokering system allows users and data providers to continue using their own tools and publishing data without having to implement any specific interoperability technology. The Discovery Broker makes it possible to search data through multiple distributed catalogues, while the Access Broker carries out all the settings, time windows and transformations necessary so that only the required data is extracted directly from the broker interface. The chosen data is then downloaded according to a common reference

system of choice. Through these techniques multiple datasets can be accessed in a way that makes them quickly ready for integrated analysis. The EuroGEOSS Broker is a clear

EuroGEOSS has made a leap forward in recognising that the global challenges of the 21st Century require a true multidisciplinary effort

achievement in interoperability, international collaboration and technological innovation.

Language and technological barriers have been broken down to provide clear, exchangeable research amongst collaborators, scientists and researchers worldwide: "The project has demonstrated that not only a System of System approach is possible, but also a 'Discipline of Disciplines' approach can be made to work if we take the time and effort to make tacit knowledge explicit and develop systems able to convey not only the meaning of the data available but also the theoretical underpinning of different approaches to the use of data," Craglia comments. The EuroGEOSS broker has seen phenomenal success in its initial years of implementation; as a result of including the Discovery Framework in the GEOSS Common Infrastructure, datasets have risen from 90,909 contributed in September 2011 to over 28 million in November of the same year.

The project was completed at the end of April 2012 wherein the EuroGEOSS approach will now be adapted in a new project called GEOWOW to suit other fields of research such as weather, ocean ecosystems and water.

