Theme [ENV.2011.4.1.3-1]: Inter-operable integration of shared Earth Observation in the Global Context

Duration: Sept. 1, 2011 – Aug. 31, 2014
Total EC funding: 6,399,098.00 €
Project Web Site: www.geowow.eu

GEOS remote sensing
GEOSS interoperability for Weather, Ocean and Water

Use case “River discharge modeling and validation”

3rd AfWCCI Workshop
04 - 05 Feb 2013

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with contributions from WP4 and WP5 partners
GEOWOW Overview

Technology Partners

Weather SBA

Ecosystem (Ocean) SBA

Water SBA

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Digital Earth Communities

GEOWOW Overview

Project Information

- Project web-site: http://www.geowow.eu
- Project Cost: 9.168 MEur
- EC co-financing: 6.4 MEur
- Kick-off date: September 2011
- Duration: 3 years (September 2011 - August 2014)
- GEOOWOW-GCI Extensions v1: November 2012
- End-Multidisciplinary assessment GCI v2: April 2014
- End-to-end Multidisciplinary assessment: June 2014

GEO Ministerial 2014: 'Evolved' architecture properly tested and demonstrated within GEOWOW SBA's

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Main Objectives

• GEOSS Infrastructure Evolution for all stakeholders (with a particular focus on the ‘WOW’ SBAs):
  • To facilitate discovery, access and use of ...
    • Data
    • Other GEO-resources
  • To allow harmonised access to heterogeneous resources
  • To promote and simplify data sharing
    • With a particular focus on the GEOSS Data CORE

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GEOWOW adopts a **structured system engineering approach**:

- **User requirements** from SBAs and across SBAs

- **Technology base**: considering prior development efforts (current GCI, Thorpez, GOOS, EUROGEOSS, GENESI-DEC, StP, AIP, etc.) and from SBA-systems

- **Constraints and recommendations**: from relevant initiatives and standardization bodies, including GEO IIB, IEEE, OGC, INSPIRE, GMES, etc

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**GEOWOW Vision**

- **What:** A long-term vision for [GEOSS - GCI evolution](#) ... considering feedback from *all the stakeholders*.

- **For whom:**
  - For a growing number of *user categories*: ranging from data providers and data specialists to multidisciplinary scientists and decision makers.

- **How:**
  - Via *a flexible architecture*:
    - with a *modular approach*, i.e. a set of interoperable component-based “GEOSS Infrastructure Evolutions” that respond to the community needs
    - enabling *different usage patterns*: different communities will benefit from the components in different manners, according to their needs and their usual working habits.
    - able to *evolve* with new components emerging from the technology landscape, however rapidly this is evolving...

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The GEOWOW proposed evolutions are being prototyped via Showcases. The following are examples.

**#Drought** - Easy discovery and use of GEOSS resources for addressing multidisciplinary challenges related to drought scenarios

**#CoralReefs** - A new concept of operation for elaborating environmental indicators

**#RiverDischarge** – Validated and calibrated forecasting workflow using Ensemble Weather Prediction Systems, a runoff model and in-situ river discharge observations
River discharge

- Critical water cycle variable
- Long-term observations are essential for many water resource applications, to analyse climate trends, and to assess environmental impacts and risks
- (Near)-real-time observations especially relevant for flood forecasting
- Observations are used to calibrate hydrological or coupled land, atmosphere and ocean models
• Under the auspices of WMO, the **Global Runoff Data Centre (GRDC)** collects river discharge data at daily or monthly intervals from more than 8400 stations in 157 countries

• Through the Global Terrestrial Network of Hydrology (GTN-H), GRDC is linked to GEOSS

• To support
  – The climate-related programmes and projects of the United Nations and their special organisations;
  – The international scientific community on global change, climate and hydrology, research and assessment.
- GRDC stations with original daily discharge data
TIGGE ensemble weather forecasts

- TIGGE, the THORPEX Interactive Grand Global Ensemble, is a collection of ensemble weather forecasts from global and regional models, available for scientific research.
- The ensemble forecasts are made from slightly perturbed initial conditions to capture uncertainties stemming from the initial weather conditions and model errors.
- GEOWOW will **significantly enhance the accessibility of TIGGE archive** for the wider user community, an essential requirement to exploit the substantial multi-disciplinary potential in TIGGE data.

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**Application development and GCI components integration**

- **Weather** Societal Benefit Area (WP4):
  - Integrate the TIGGE archive into the GEOSS Common Infrastructure (GCI)
  - Improve the accessibility of TIGGE for long time series of forecast data at user-specified locations
  - Demonstrate the potential of the TIGGE archive in multi-disciplinary applications

- **Water** Societal Benefit Area (WP5):
  - Allow discovery, access, and use of GRDC data through the GEOSS Common Infrastructure (GCI)
  - Standardisation of the exchange of hydrological data (WaterML 2.0 and SOS 2.0 Hydrology Profile)
  - Towards increased multi-disciplinary interoperability to allow integration of data from different domains
“Modeling of river discharge using weather predictions and validation based on river discharge observations”

- Scenario will provide a use case (#River Discharge) for prototyping additional functionalities and GCI components
- To demonstrate the benefits of improved interoperability of domain resources through GCI evolutions
"Modeling of river discharge using weather predictions and validation based on river discharge observations"
Use case development

“Modeling of river discharge using weather predictions and validation based on river discharge observations”

- Development, validation and calibration of **forecasting workflow** using Ensemble Prediction Systems (EPS) of Numerical Weather Predictions (NWP) and a runoff model and river discharge observations
- Availability of river discharge forecasts from the **TIGGE archive**
- Enlarged availability of **GRDC/GTN-R discharge data**
- **Enhanced GCI** to enable interoperable exchange of (hydrological) observation data by linking the GCI to Sensor Web data formats, models, and interfaces (e.g. WaterML 2.0 and the Sensor Observation Service (i.e. hydrology SOS profile)
- **GCI based visualisation** of discharge forecasts and observations in combination for different forecast ranges, different river catchments, and different ensemble models

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Achievements - Weather

- Test computations with river discharge based on TIGGE

- First feasibility studies of using the SOS system and coding the river discharge forecasts in WaterML 2.0 format

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Achievements - Water

- Development of OGC SOS Hydrology Profile: optimised interface to access WaterML 2.0 encoded data
- Provision of server and client implementations by two project partners:
Achievements - Water

- Initial selection of 162 GRDC stations for GEOSS data-CORE
- On-going efforts to make more stations accessible
Achievements - Water

- 12 Stations in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>2</td>
</tr>
<tr>
<td>Benin</td>
<td>2</td>
</tr>
<tr>
<td>Congo</td>
<td>1</td>
</tr>
<tr>
<td>Namibia</td>
<td>3</td>
</tr>
<tr>
<td>South Africa</td>
<td>4</td>
</tr>
</tbody>
</table>

- Develop useful case studies in Africa to demonstrate
  - Benefits of new GCI functionalities, esp. related to data exchange
  - Improved data and products access through GEOSS
  - Benefit of EO data
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Thank You!

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