Contribution of the EVER-EST project to the community of the Geohazard Supersites initiative

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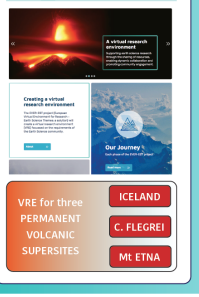
1. SUMMARY

The EU's H2020 EVER-EST Project is dedicated to the development of a Virtual Research Environment (VRE) for Earth Science, during 2015-2018. EVER-EST implements innovative and state-of-the-art technologies in the area of Earth Science. The VRE is designed with the aim of providing the GEO-GSNL user community with an innovative framework, enhancing the ability to interoperate and share knowledge and experience. Using the VRE, the GEO-GSNL scientists are able to collaborate with colleagues located in different parts of the world. This includes being able to remotely access and share data, software codes, research results, to carry out training sessions and discussions, to compare different results and models, and to synthesize in a single consensus product to be disseminated to end-users. Among the innovations of the project is the exploitation of the "Research Object" concept, that encapsulates not only data and publications, but also algorithms, codes, results, and workflows that can be stored, shared and re-used.

2. EVER-EST AS A TOOL FOR THE SUPERSITE INITIATIVE (GEO-GSNL)

www.ever-est.eu



Specific goals of GEO-GSNL

- Promote scientific advancements in geohazard research through open data access and better international collaboration
- Promote a more direct uptake of scientific results in local prevention and response activities for seismic and volcanic risks
- Promote knowledge transfer on geohazard research

Peculiarities of the GEO-GSNL Virtual Research Community

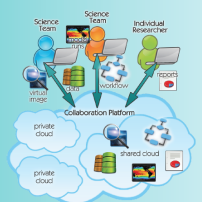
- Large variety of data catalogues (different standards, content, metadata, status of implementation)
- Strong collaboration requirements, with tools for IPR protection
- Fast turnover of algorithms/models
- Need for a single cartographic interface (mostly spatial datasets)
- Need for community management tools (registration, user level, data policy implementation
- Need for dissemination capabilities to the public/stakeholders

3. WHY A VIRTUAL RESEARCH ENVIRONMENT FOR GEO-GSNL

The EVER-EST VRE gives a series of tools and services which can improve collaboration and make the scientist's work more effective. The EVER-EST VRE architecture is built to satisfy the following general requirements of the GEO-GSNL community.

Collaboration

The Supersite scientists collaborate with colleagues of different parts of the world. They should be able to **remotely access** and **share data, research results, ideas**, to carry out training, to **compare** results and models, and to synthesize many different pieces of information in a single consensus product to be disseminated to **end-users. EVER-EST implements many flexible services that facilitate collaborative work for the GEO-GSNL community.**



Enhancing scientific investigation

A further need of the Supersite scientists, especially in less developed countries, is the **need to access computing resources** and **software codes** for data processing and modeling, as well as tutoring for research data analysis and interpretation. **The EVER-EST platform will implement effective technological solutions to allow remote data processing, software sharing, and remote training.**

(Credit to IT Partners: MEEO, PSNC, Terradue, Alma Sistemi)

4. THE RESEARCH OBJECT CONCEPT (*www.researchobject.org*)

What is a RESEARCH OBJECT?

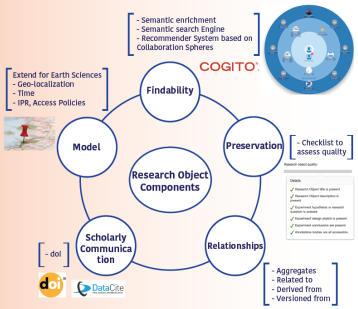
Aggregation of resources that bundles the content of a research work to facilitate the reusability, reproducibility and better understanding. The resources are:

- Data
- Experiments
- Workflows
- Metadata
- Annotations
- Bibliography
- Results
- Provenance
- ...

Why Research Objects?

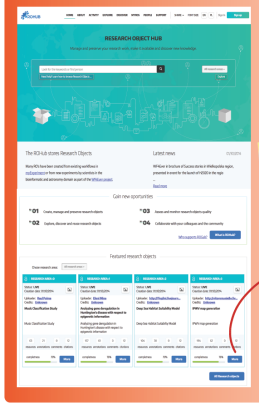
- **Process Preservation** - url/doi for referencing resources
- **Reusability** of any part of the RO
- **Reproducibility** of the method
- **Traceability** and error detection
- **Attribution** - cite data and publication of the RO
- **Understandability** - links between data, results and annotations
- **Curation** - explicit exposure of the method

EVER-EST will implement ROs in Earth Sciences for the first time



5. ROHUB (*www.rohub.org*)

ROHUB will be the main interface for the management of ROs (reference all data and products)



Workflow RO

It contains scientific analyses, modeling attempts, experiments. It should reference input data, processing workflow (code, parameters, assumptions, etc.), outputs, the used knowledge (through a description). It is used to exchange knowledge across the scientific community.

Bibliographic RO

Mainly grey literature

White	Grey	Web
• peer-reviewed journals • books • conference proceedings	• preprints • technical reports • theses • memo's, data sets • sectional/cut media • blogs	• videos • concepts • thought

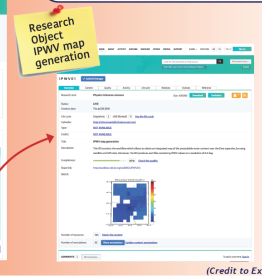
Grey Literature

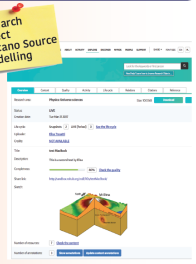
Data RO

It contains reference (unique URIs) to one or several datasets, e.g. all TerraSAR X SAR imagery for a given Supersite, or for a given volcanic eruption. It is used to exchange in an efficient way data relevant for specific applications.

Product RO

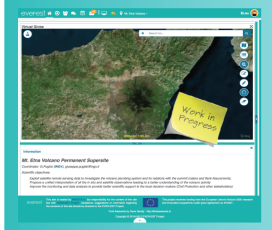
It is designed to disseminate the results of a scientific investigation to a non-scientific audience (end-users, the public), which is not interested in the details of the process (workflow RO). It contains a report on the results and impacts of an investigation.





(Credit to Expert System Iberia, PSNC)

6. VIRTUAL RESEARCH ENVIRONMENT (*vm1.everest.psnc.pl/supersites*)



VRE Components

Personal File Storage (5TB) — Seafile

Remote Service Execution

Authentication (unique) — ROHUB, Seafile, everest

Workflow management — Taverna

EO data discovery and access — esa

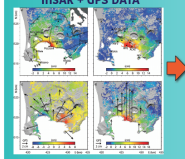
Research Objects management — ROHUB

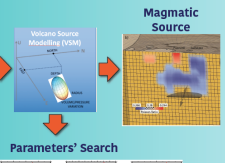
WorkFlow Use Cases: VSM (Volcano Source Modeling), IPWV (Investigation of Precipitable Water Vapor), REFIR (Real time Mass Eruption Rate calculation), Ash mass calculation in volcanic clouds, InSAR analysis tool, etc.

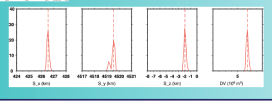
7. USE CASE - VOLCANO SOURCE MODELING (VSM)

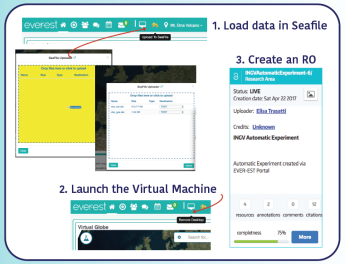
2011-2013 unrest at Campi Flegrei detected by InSAR and GPS and related VSM results

InSAR + GPS DATA

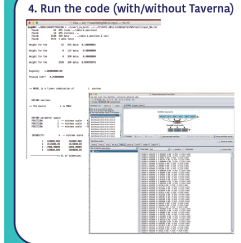






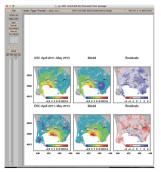
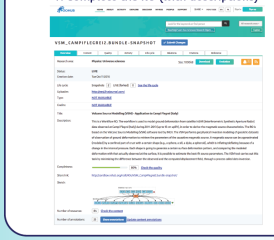


4. Run the code (with/without Taverna)



5. Write results in Seafile

6. Validate results



7. Complete the RO (with descriptions)