The contribution of the Geological Survey of Italy to the GeoERA programme challenges towards a Geological Service for Europe

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ERE1.2 GeoERA: Towards integrated European geoscience services for today’s and future generations
Chat time: Friday, 8 May 2020, 08:30-10:15
Geological challenges in Europe.....

The better knowledge of the subsurface is one of the challenges faced by the Geological Survey Organizations all around the world.
In Europe, such geological challenges may contribute to the major environmental challenges identified in the European Green Deal.

- Achieving climate neutrality by 2050
- Decarbonising the energy system optimise the use of mineral resources
- The natural functions of ground and surface water must be restored
- Accessible and interoperable data

The assessment, and sustainable use, also concurrent, of subsurface resources, requires a holistic approach that takes into account also natural hazards and environmental impacts.
Such approach is particularly significant in Italy where:

- the large part of the territory is affected by several hazards, such as earthquakes, landslides, floods, volcanic eruptions, ground subsidence.
- the exploitation of subsurface resources, especially in the recent years, is at the center of a scientific and political debate to address, investigate, and manage the possible interactions between human activities and natural hazards.

[Link tozonesismiche.mi.ingv.it/](zonesismiche.mi.ingv.it/)
Exploration and knowledge, sustainable use and management, impacts, and publicly available information are the key topics addressed by the Geological Survey of Italy (SGI), in the GeoERA Programme, through the participation to eight projects.
ISPRA coordinated and managed the activities for the realization of the 3D geological model of the Po Plain Basin subsurface, an area larger than 25,000 km². The 3D model is the base input data for geothermal analysis at a supra-regional scale.

The 3D geological model realized in the HotLime project is based on the interpretation of a huge amount of 2D seismic reflection profiles (> 26,000 km) and on the analysis of > 450 well logs, kindly provided by geo-energy resources and similar regions, characterized by natural hazards (i.e. earthquakes), is a mandatory tool for the sustainable use and management of the subsurface.

Geological 3D modeling of the Po Plain by geo-energy resources and similar regions, characterized by natural hazards (i.e. earthquakes), is a mandatory tool for the sustainable use and management of the subsurface.
Implementation of the European Fault Database (EFD) with data provided by the GSOs.

The Geological Survey of Italy feeds the EFD information about faults characteristics, including 3D geometry and activity.

The structure of the database follows a hierarchy system both in the attributes table and in the linked semantic vocabulary (description, hierarchy, references, relationship scheme between faults and structural domains).

The Italian fault db will also include for case-study areas thematic fault dataset (i.e. ITHACA; GeoIT3D, etc) and the data coming from other GeoERA projects (in particular HotLIme).
Tools for Assessment of ClimaTe change ImpacT on groundwater and adaptation Strategies

WP4: Assessing groundwater recharge and vulnerability to climate change

Study area
- The North East Po Plain (Veneto Plain, Northern Italy)
- Alluvial plain filled up by fluviatile deposits hosting a propus aquifer.
- Primary water usage is for irrigation, drinking water, industry
- Pilot area size is about 1150 km²

Input Data
- Time series of GW observation >15 years (twice per week)
- Time series of daily rainfall > 30 years
- Potential EPT calculated from time series >30 years
- Lithological and soil data

Methodology
- Model calibration at observation boreholes with the integrated hydrogeological lumped model AquiMOD by BGS. Comparison of the model obtained with a second method (Gardenia by BRGM) with similar results.
- Evaluation of recharge at selected observation boreholes both using field data and climate change scenario data (in progress)

First results
- The geological and hydrogeological features at the site are really very complex
- Two boreholes were successfully by AquiMOD on 8 year data (2011-2018). A preliminary estimation of recharge (about 0.5-0.6 mm/day) was produced and looked good.
- Gardenia model was run at one of the two previous boreholes. Results were just as good and recharge similar to AquiMod
- Stream discharge and abstraction were not included since they are not significant in the boreholes area.

Geographical and hydrogeological sketch of the pilot area

Comparison between observed and simulated groundwater levels obtained after evaluation stage by Aquimod model. NSE obtained after calibration for the last years 2011-2018 series are over 0.7
Study background

- The main thermal-mineral sources in Italy are aligned along the Tyrrhenian-Apenninic margin, and are associated to relevant active or quiescent magmatic bodies.
- Special water characteristics due to the great variety of geological and climatic conditions.

Data

- 83% of the exploited thermal-mineral water resource are located in 6 regions (Tuscany, 25% of total sources; Latium, 16%; Campania, 13%; Sicily, 12%; Sardinia, 9%; Veneto, 8%).
- Collected data about coordinates, use, yield, aquifer type, lithology, temperature, main chemical parameters, etc.

Methodology

- National definitions of thermal water are mentioned by Law (323 of 24/10/2000), but not referred to technical-scientific issues;
- Some thermal-mineral water information is managed at a local or regional scale, but a comprehensive national database is still lacking.
- For contributing to fill this gap, a national database of the main thermal-mineral sources (about 240) was built.

First results

- Most of thermal-mineral occurrences are directly associated with igneous rocks (about 56%), but also with sedimentary (about 26%) and metamorphic rocks (about 17%)
- About 70% of sources have values between 20-40 °C.
- About 40% of sources have TDS between 1000-3000 ppm;
- About 35% of sources have yields between 1 and 5 l/s.
WP2: Update to Electronic European Minerals Yearbook
WP3: Minerals Inventory
WP5: Improvement of KDPs’ applications and interaction with the RMIS and the EGDI

• ISPRA is involved in, cataloguing the Italian mining sites (quarries and mines: active, ceased and restored
• The need to harmonize information has given even a great boost to the collaboration with Regional Geological Surveys sharing best practices in order to reach a national standardization.
• The flow of information has brought to implement the Italian mining information in the EGDI Platform (i.e. Minerals4EU Project) carrying on a new National Database GEMMA (in progress), including the geological, environmental, economic and cultural aspects of mines and quarries.
ISPRA has compiled the National Unique Stone List in order to integrate this into the European Raw Materials Knowledge Base (EURMKB) in close connection with the GeoEra Information Platform. With more than 150 records, all the Dimension Stones archived according to the UNI EN12440 Rule, have been listed for Italy.

WP3 Atlas of European Ornamental Stones

ISPRA is providing data and information for the compilation of the “identity card” for ornamental stone, about their composition, physical properties and “performance in use” criteria.

WP4 Directory of ornamental stone properties

ISPRA is providing data and information for the compilation of the “identity card” for ornamental stone, about their composition, physical properties and “performance in use” criteria.

Deliverable D3.1

Summary on the nature and type of available spatial data in each country partner and framework for the Atlas.
Work package 7 – Historical mining sites revisited

Identification of potential target areas for case studies - Study area

- The Island of Sardinia (Italy)
- Closed mining waste facilities,
- The wastes were produced during the old mining industries, that operated between the late 1800s and late 1900s approximately

Methodology and data

- Project partners proposed some potential case studies of closed mining sites with potential availability of recoverable elements in historical mining waste,
- Mining waste was characterized in previous reclamation activities and the analytical data would seem to indicate a potential availability of elements considered raw materials, even critical ones.

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<th>CRM 2</th>
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GeoERA Information Platform

WP 2: GPS User Requirements

WP 3: Standards and interoperability issues

WP 4: Semantic harmonisation issues

WP 6-7: Developments (central)

WP 8: Data provider support

WP 11: Communication and dissemination

23 Standard data models to map GPS data and recommendations to improve

Provide a Validation system

Project vocabulary - share knowledge and terminology in the form of project specific vocabulary concepts on a scientific level and to use them in datasets to code data

Support in developed some integrated tools to enrich semantic search and validation of dataset and metadata in the central harvest system

Set-up a support central repository where is stored online guidelines and set-up a eLearning platform

Communication plan and project brochure
The Italian Network of Regional Geological Surveys (RISG): a contribution to GeoERA

- ISPRA coordinates a network of 21 “Regional Geological Surveys” established by Law in 2000 and reactivated in the last 2 years
- 1 Directive Council, with strategic role
- 11 Thematic Groups, with operational and technical mandate

- Three regional geological surveys are full partners in GeoERA

**Emilia Romagna**
- HotLime
- HIKE
- TACTIC
- EUROLITHOS

**Piemonte**
- HotLime
- HIKE

**Umbria**
- HotLime
- MINTELL4EU

Diagram:
- Directive Council
- Georesources
- Soil protection
- Geoheritage
- Active tectonics
- Data, metadata and services
- 3D modeling
- Coastal and marine geology
- Land use and consumption

Legend:
- ISPRA
- Regional authorities
- Icons representing thematic areas
Towards an European Geological Service

• Through the participation to 8 GeoERA projects, the Italian Geological Survey, ISPRA is providing a relevant contribute to face with geological challenges both at national and EU level.

• Three regional geological surveys with geological mandate at local level will provide an added value to GeoERA, within the network of regional geological services, coordinated by ISPRA.

• In a long term perspective, all these actions should be aimed at developing an European Geological Service built on stable joint cooperation among national and regional geological surveys.
  • This will be the final goal of the GeoERA Programme and has to be developed through the most suitable tool (European Partnership or Coordinated Supporting Action).