

Italian National Geothermal Database: updates and developments

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Introduction

The National Geothermal Database was built in 1993 by the International Institute for Geothermal Research in Pisa (currently IGG, Institute of Geosciences and Earth Resources) of the National Research Council (C.N.R.) as completion of the inventory of geothermal resources by CNR, ENEA, ENEL and eni, under Law No 896 of 1986. Data have been continuously updated until 2001.

During 2009, a software and data update have been scheduled and implemented with funding of eni Refining & Marketing Div. (R&D management) and technical support of Saipem SpA. The BDNG (Italian National Geothermal Database) is a part of a wide project, called Geothopica, where the database is the indispensable core.

The commitment of the Institute of Geosciences and Earth Resources, in coordination with Saipem, the support of eni R&M Div., and in collaboration with UNMIG (Ufficio Nazionale Minerario per gli Idrocarburi e le Georisorse – National Office for Mining Hydrocarbons and Earth Resources) department of the National Economic Development Ministry, who guaranteed the access to a new dataset, has produced an upgrade that yields one of the most complete underground data repository at the national level.

- Managed, maintained and updated by CNR-IGG Pisa
- 3193 geothermal wells and 586 thermal springs (last update, april 2010)
- Data Contains:
 - Wells and springs identity,
 - Temperature gradient and heat flow
 - Well stratigraphy
 - Reservoir characteristics
 - Well production, casing and technical profile
 - Chemical, physical and isotopic data of geothermal fluids
- Completely open source and data interoperability – Fig.1,2
- Data update from UMNIG last release is scheduled by the end of 2010
- Future efforts will be oriented to the development of procedures and methods that – together with the BDNG data - will allow a new evaluation of the national earth resources

key [PK]	nome	lat	lon	quota	entit	camploc	lo
174	1000633	98	431317	13258	660	CASTELNUO/LARDERELI	
175	604622	99	431327	105325	490	CASTELNUO/LARDERELI	
176	5043006	A.6	422638	115408	SI	TUSCANA	M
177	3618001	ABBASANTA	400744	84619	SI	ABBASANTA	
178	5341002	AB D 3	425252	113990	938	ABBADIA S. M. AMATA	M
179	5341021	AB D 40	425257	113990	900	ABBADIA S.	M
180	1762001	ACATE 1	365936	142057	NO	ACATE	
181	1009656	ACATE 1 DIR	365936	15348.5	3	ACATE	
182	1862003	ACATE 2	370010	142014	SI	GELA	
183	1862004	ACATE 3	370112	141859	SI	GELA	
184	4450001	ACCIARELLA 1	412730	124703	SI	LATINA	BI
185	4846004	ACEA	420541	121703	170	ANGUILLAR PESCARA...	
186	9909	ACERNO 1	404230	150229	SI	ACERNO	
187	492987	ACQUABONA 1	431327	105352	642	CASTELNUO/LARDERELI	
188	189786	ACQUABONA 2	431335	105347	595	CASTELNUO/LARDERELI	
189	1000621	ACQUABONA 3	431344	13332	607	CASTELNUO/LARDERELI	
190	4647003	ACQUA LAURENTINA	414742	123816	SI	ROMA	CI
191	8877251	ADA 1	4510544	123536	0	-24.5	AC
192	315732	ADA 2 DIR	451058	123530	SI	?	
193	679405	ADARBA	431015	104855	440	CASTELNUO/LARDERELI	

Fig.1 – PostgreSQL BDNG table.

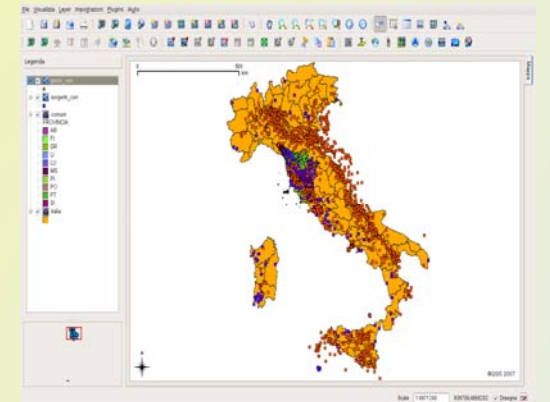


Fig. 2– Qgis geospatial data representation.

Webportal “GEOTHOPICA” URL: <http://geothopica.igg.cnr.it>

- Geothopica webportal make available Italian National Geothermal Database information, data and maps ensuring different kind of data access on the base of data and user typologies – Fig. 3
- A webGIS is now integrated and allows to browse the National thermal maps at the depth of 1, 2, 3 km and National Heat flow map - Fig. 4,5,7,8
- The location and relevant data pertaining to the “geothermal objects” are also available (i.e. geothermal wells and springs).
- Geothopica webportal will be further improved with the possibility to include analytic documents (e.g. plots, reports) that provide a more synthetic and fast data interpretation; new thematic maps will be also added - Fig. 6.



Fig. 3 – Geothopica home page.

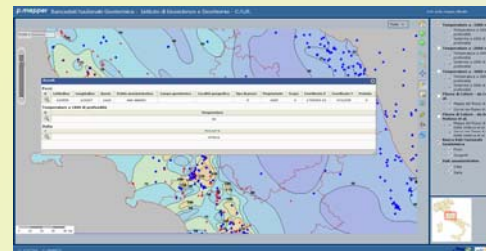


Fig. 4 – Geothopica webGIS: Temperature at 1000 m, and info data table.

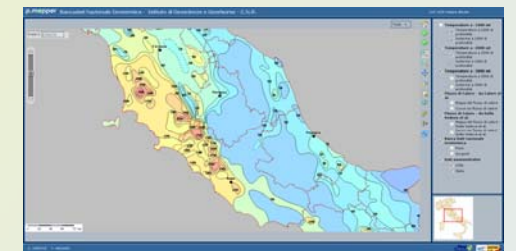


Fig. 5 – Geothopica webGIS: Temperature at 2000 m.

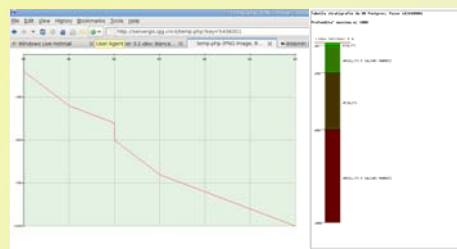


Fig. 6 – Geothopica webGIS: next available tools, temperature vs depth plot, wells litho-stratigraphic column.

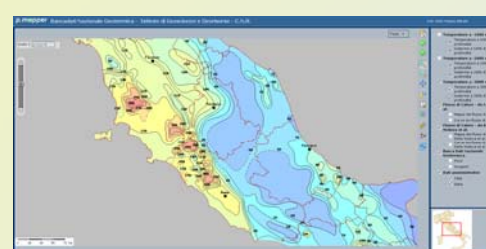
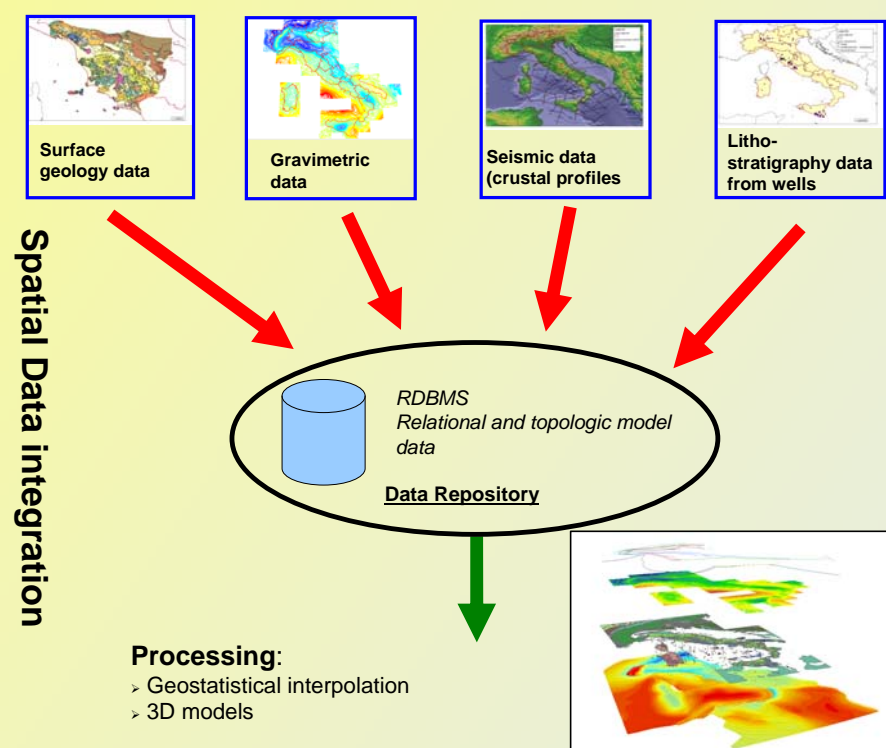


Fig. 7 – Geothopica webGIS: Temperature at 3000 m.



Fig. 8 – Geothopica webGIS: Heat flow surface (Dellavedova et al., 2004).



Dataset:

- Tectonic, geological and hydrogeological maps
- Litho-stratigraphy, temperature and heat flow data from wells
- Geophysical (seismic, magnetic, gravimetric, electromagnetic) data

Methodology:

- Geospatial database
- Relational and topologic modelling to manage geospatial information
- Geostatistic interpolation for a qualitative approach
- 3D geologic modelling for a quantitative approach

Target:

- Geostatistical analysis of data stored in the data repository
- Temperature vs depth - Heat flow - Litho-stratigraphy
- Spatial analysis to define a quantitative assessment of the national geothermal potential
- Spatial analysis to define the most suitable areas for CO₂ sequestration and storage
- To image the lithological and physical parameters of the defined reservoirs.

Fig.9

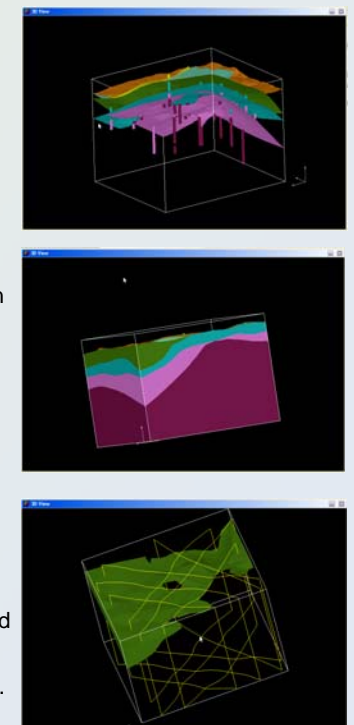


Fig. 9 – 3D geological model results.

GEOTHOPICA improvements will enable automatic or semi-automatic procedure to evaluate and estimate either geothermal or CO₂ sequestration and storage reservoirs, using geospatial data integration, geostatistical analysis and 3D modelling, speeding the integration of a heterogeneous set of necessary parameters to support exploration projects.