REGIONE SICILIA

IRGIE
INVENTARIO DELLE RISORSE GEOTERMICHE
DELLE ISOLE EOLIE

ISTITUTO NAZIONALE
DI GEOFISICA E VULCANOLOGIA

IRGIE

Geothermal resources for the energy autonomy of Aeolian Islands (Sicily)

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Geothermal energy

The margins of the plate correspond to weak and dense fracture zones in the crust, characterized by intense seismic activity, numerous volcanoes, and high geothermal fluxes due to the rise of very hot material to the surface. Therefore, the most important geothermal fields are around the margins of these plates.

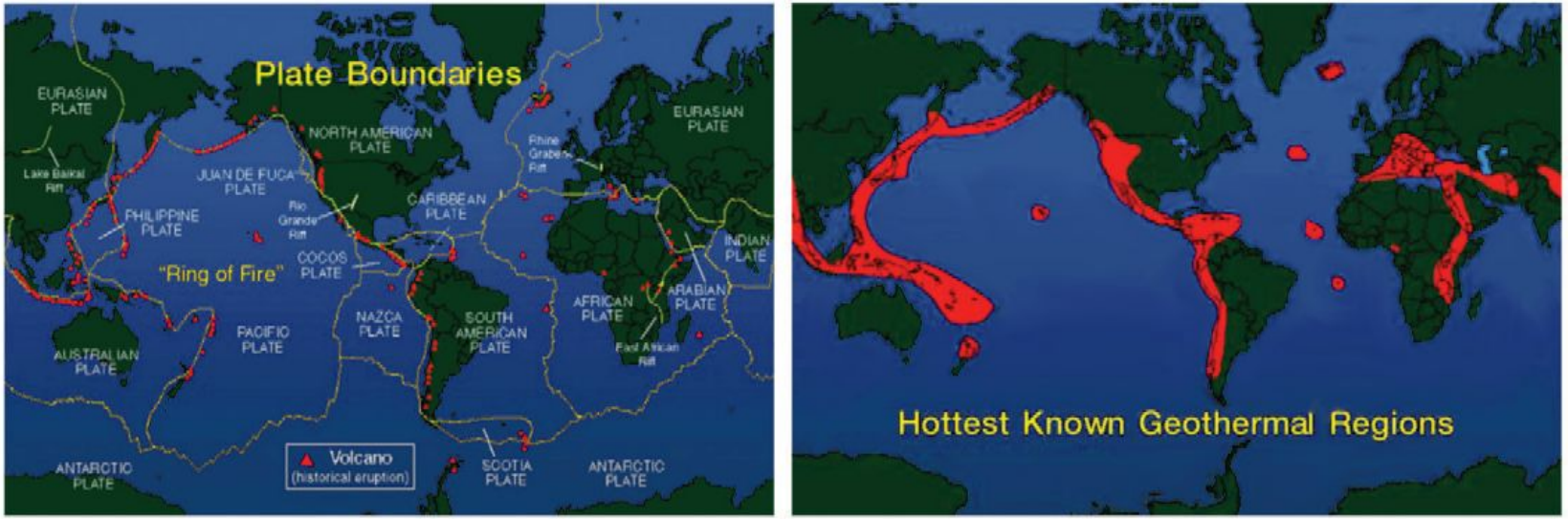
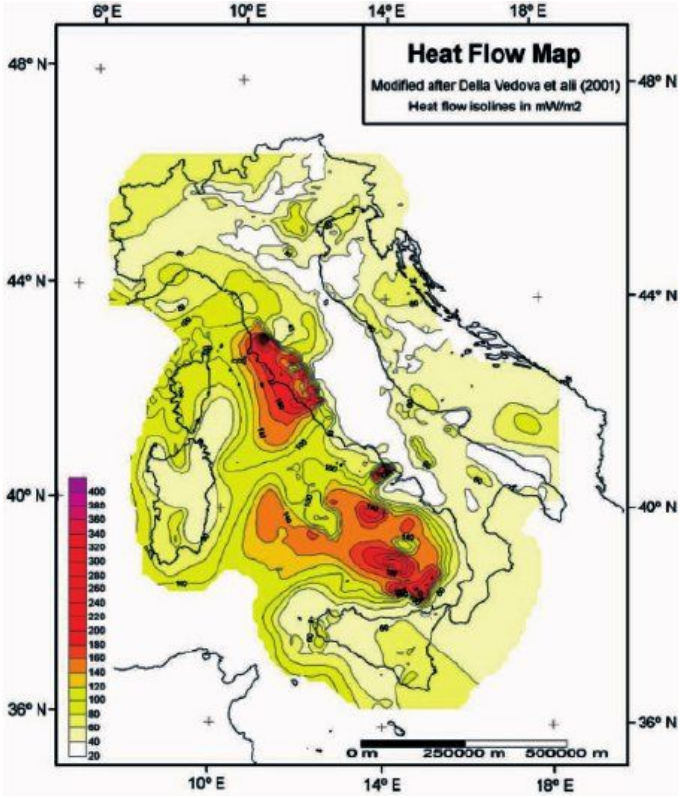


Plate boundaries and related hottest geothermal regions (Source: IGA)

Geothermal areas in Italy



Heat flow map for Italy

areas to be investigated

Advantages of geothermal energy for smaller islands

The advantages of geothermal energy are:

- does not use **fossil fuels** that are not local resources;
- lower **land consumption**, which in smaller islands is a fundamental requirement;
- **continuous availability** 24 hours a day 365 days a year instead of intermittent availability such as solar or wind power;
- heat and electricity **simultaneous** production.

Energy and water dependency of Italy's smaller islands

The minor Italian islands suffer a great **energy dependence** from conventional energy solutions such as fossil fuels and in particular traditional diesel plants to produce electricity and to power desalinators to produce drinking water.

This creates **worsening social and economic conditions**, which limit development with, moreover, considerable environmental impacts.

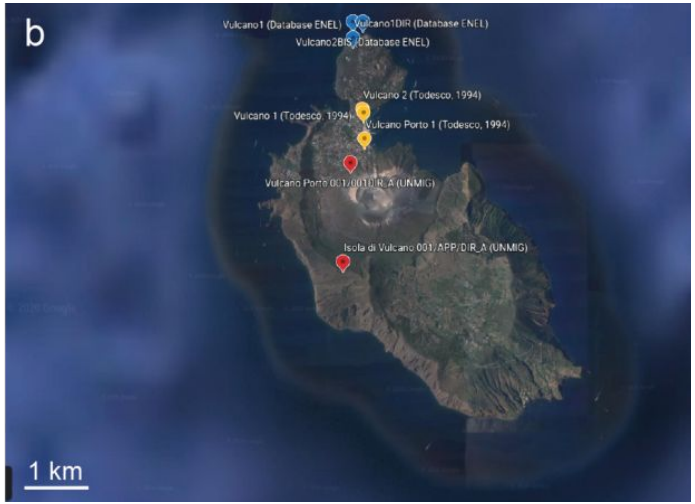
Inventario delle Risorse Geotermiche delle Isole Eolie
IRGIE

INGV and the Regione Siciliana have reached an **agreement** to develop by 2025 an **Inventory** of the Geothermal Resources of the Aeolian Islands to investigate and evaluate the geothermal potential of the islands.

The agreement, in the framework of the IRGIE Project (**Inventario delle Risorse Geotermiche delle Isole Eolie**), aims to provide a tool that **supports** and facilitates the **Companies** in the exploration program for accelerating the geothermal exploitation actions and build geothermal plants.

Geothermal potential of the island of Vulcano

The island of Vulcano has great geothermal potential driven by the high temperatures recorded at depth. In particular, geothermal gradients of up to 200°C/km are recorded from m 600-700 depth.

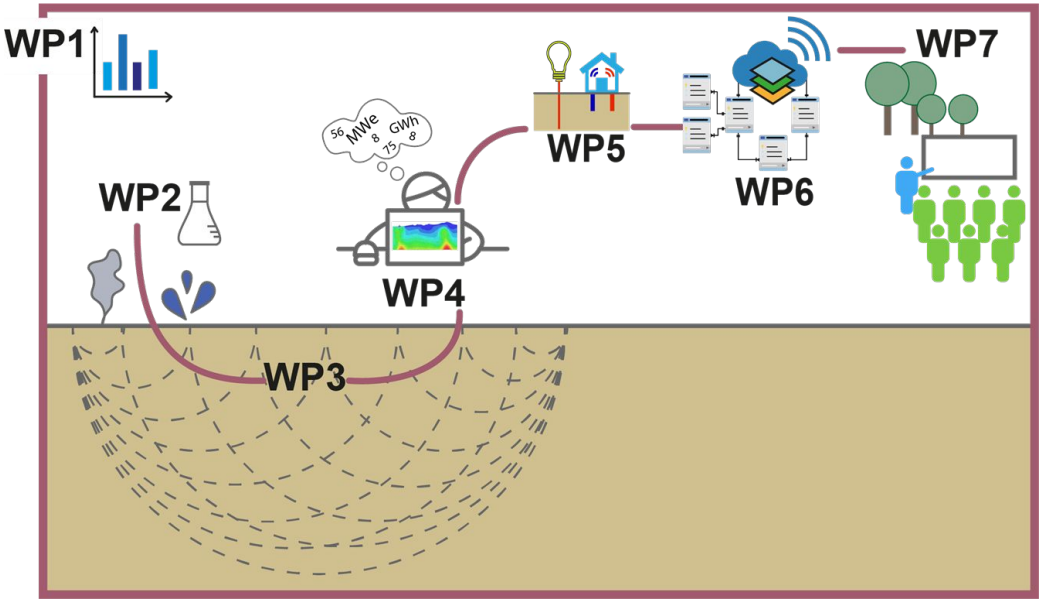


zoom on the island of Vulcano and location of exploration wells drilled between the 1950s and 1980s.

Vulcano wells temperatures

name	year	depth [m]	T_{bottom}	T_{1000m} [°C]
Vulcano 1 (VU1)	1951	250	160	>160
Vulcano 2 (VU2)	1953	250	200	>200
Isola di Vulcano 1 (IV1)	1984	2150	419	100
Isola di Vulcano 1 dirA (IV1 dirA)	1984	1700	350	≃140
Porto 1 (VP1)	1987	970	168	168
Porto 1 dir A (VP1 dirA)	1987	975	233	233

Aims of the IRGIE project



Surface geophysical and geochemical **surveys** are planned accompanied by **dissemination** activities dedicated to the inhabitants to raise awareness of the advantages of geothermal energy as a possible solution to **improve the quality of life** and sustainability of their islands, which represent fragile and vulnerable territories with an enormous environmental and natural heritage.

Deep Borehole Heat Exchanger in Binary System

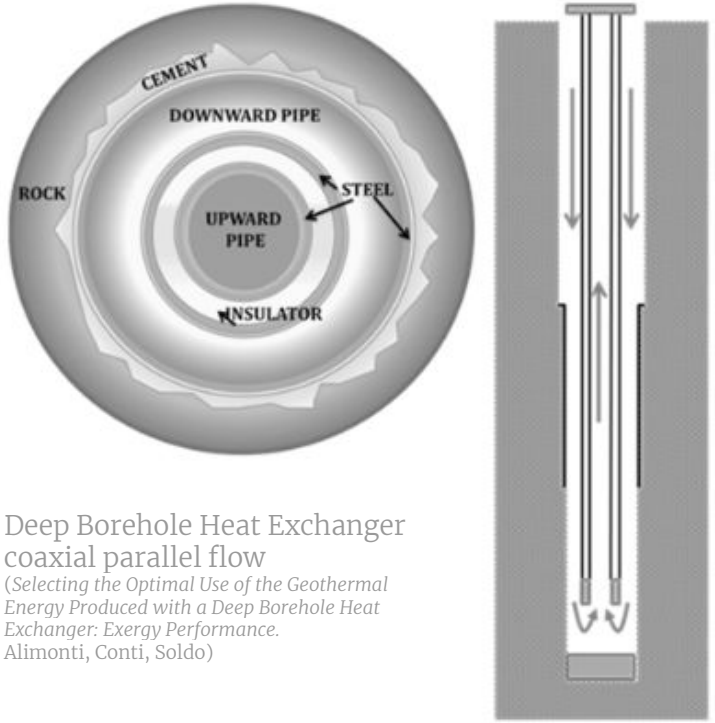
Several studies have focused on the possibility of generating geothermal energy through deep borehole heat exchangers **without extracting brine**.

Deep Borehole Heat Exchangers (**DBHE**) are used to harness energy from the aquifer without taking the fluid, thus saving on electricity consumption and maintenance.

Zero-mass extraction can reduce local seismic activity and avoids the problems associated with the use of fluids in conventional geothermal power plants.

Single well design scheme reduces costs.

DBHE in a Binary Geothermal Power Plant may be the key to increase the **social acceptance**, to reduce the environmental impact of geothermal projects.



Deep Borehole Heat Exchanger coaxial parallel flow
(*Selecting the Optimal Use of the Geothermal Energy Produced with a Deep Borehole Heat Exchanger: Exergy Performance.* Alimonti, Conti, Soldo)

Highlights of IRGIE

- create an inventory of geothermal resources in Aeolian islands;
- inventory minimises costs and study time for companies in geothermal exploration permits;
- possible realisation of small plants (5MWe) with minimal environmental impact distributed throughout the territory;
- In this historical period of the international energy crisis, the IRGIE agreement can represent a showcase for the intense development of geothermal energy in Italy.