GEOELEC WP2
« Prospective for Geothermal Electricity in Europe »

Regional Workshop Greece, Cyprus, Malta, Bulgaria, Romania, Turkey

Athens, 20/12/2011

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INTELLIGENT ENERGY EUROPE

Regional compilation of prospective areas and resource assessment

Geoelec Geothermal resource assessment protocol

Data compilation

Critical review of bibliographic compilation from:

- Geological surveys
- Oil & Gas company public reports
- Direct contacts with underground ‘explorators’
- 7 regional workshops to complete data compilation

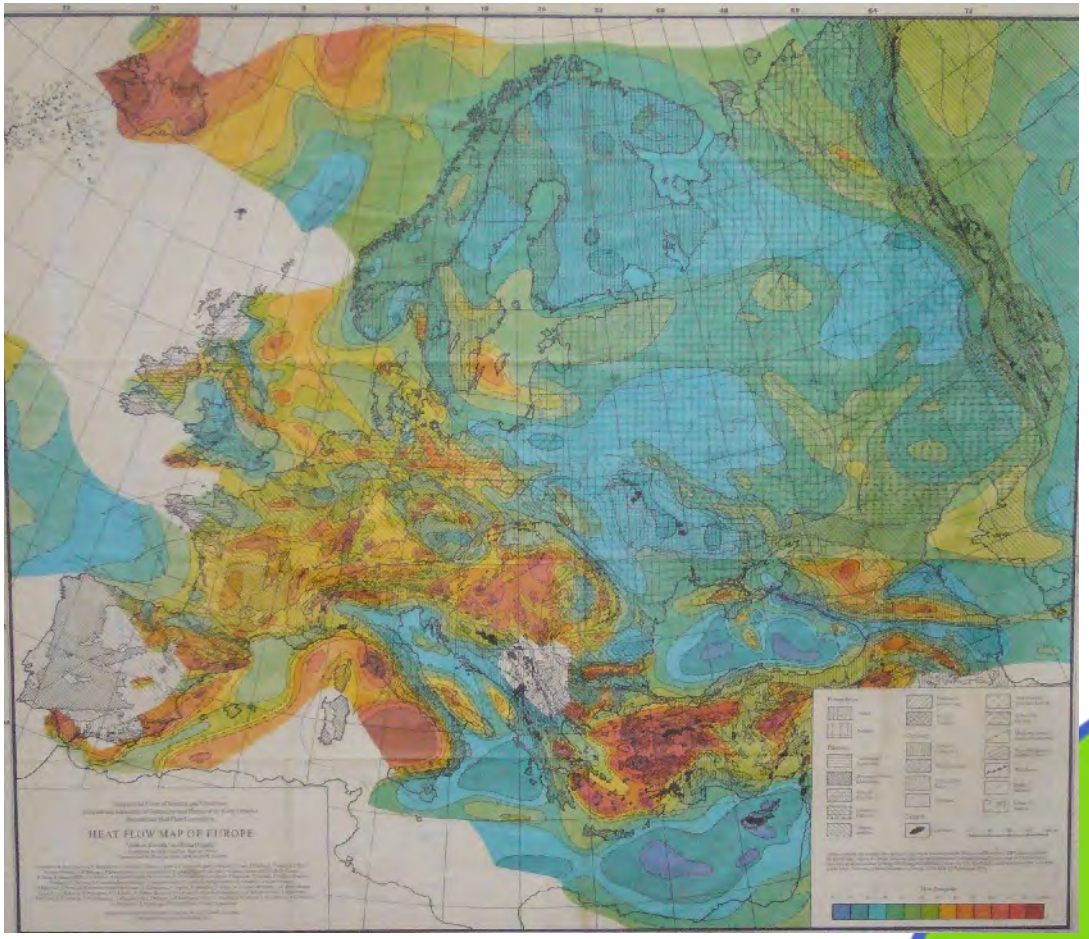
Early geothermal data compilations

CERMAK, V. & RYBACH, L. (eds.) (1979): Terrestrial Heat Flow in Europe

Book with different papers from a Workshop

A map of heat flow density was included in that book

Similar book:
CERMAK, V. & HÄNEL, R. (eds.) (1980): Geothermics and Geothermal Energy, Symposium EGS/ESC Budapest



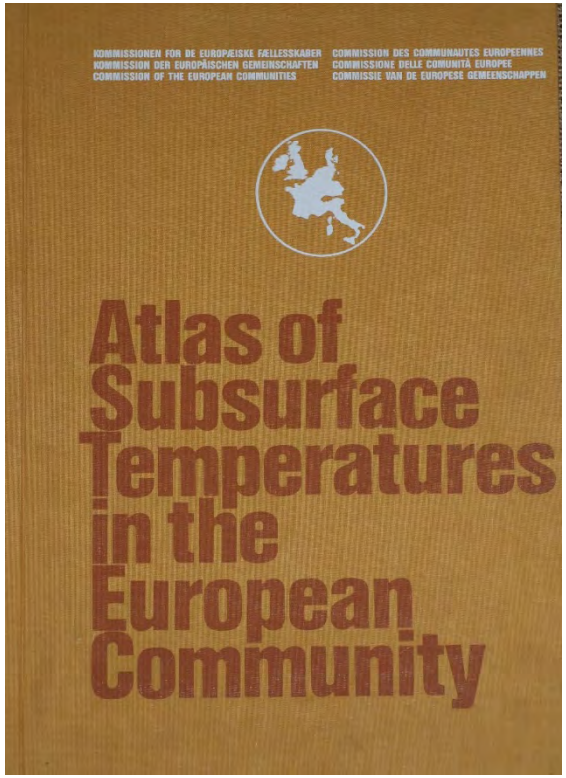
(Map by Cermak & Hurtig, 1979)

Early geothermal data compilations

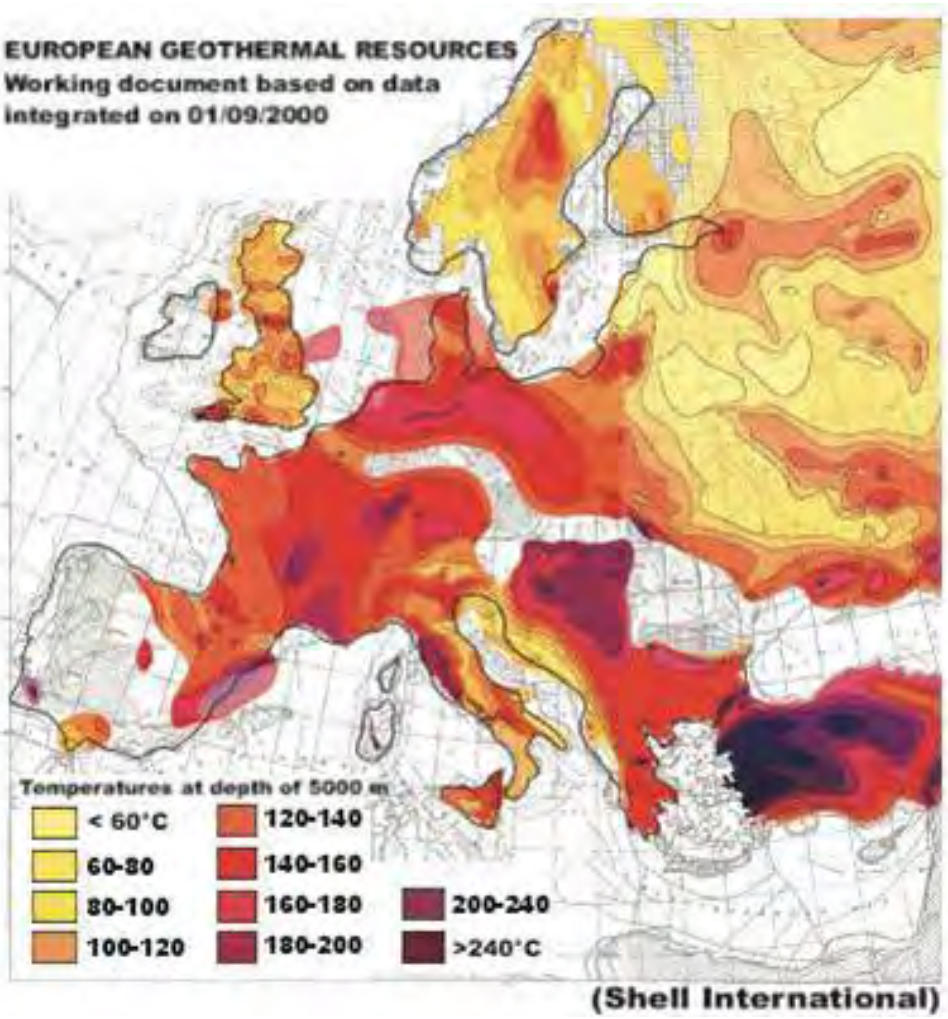
EC 'Atlas of Subsurface Temperatures in the EC' (1980)

Coordinated by BGR, Hannover
(Ralph Hänel)

Only heat flow and temperatures
at depths between 500 and 5000,
for countries and regions
(e.g. Soultz-Landau)



SHELL Map (2000)



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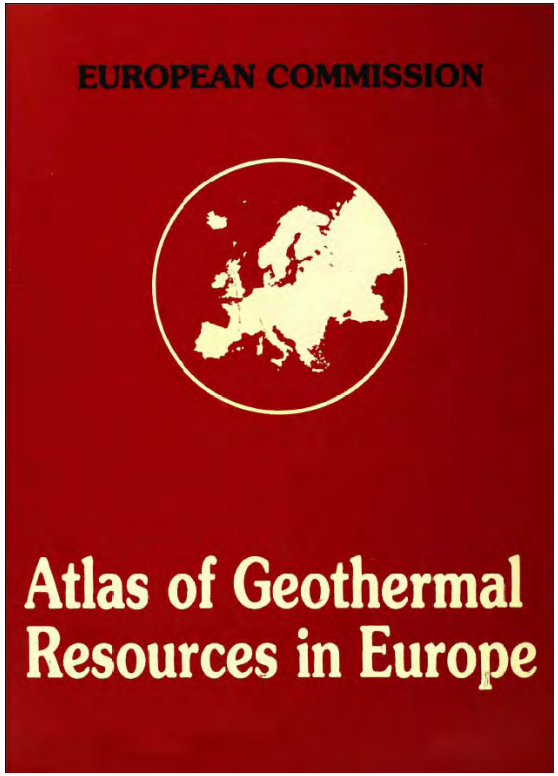
EC 'Atlas of geothermal resources in Europe' (2002)

Coordinated by BGR, Hannover
(Suzanne Hurter)

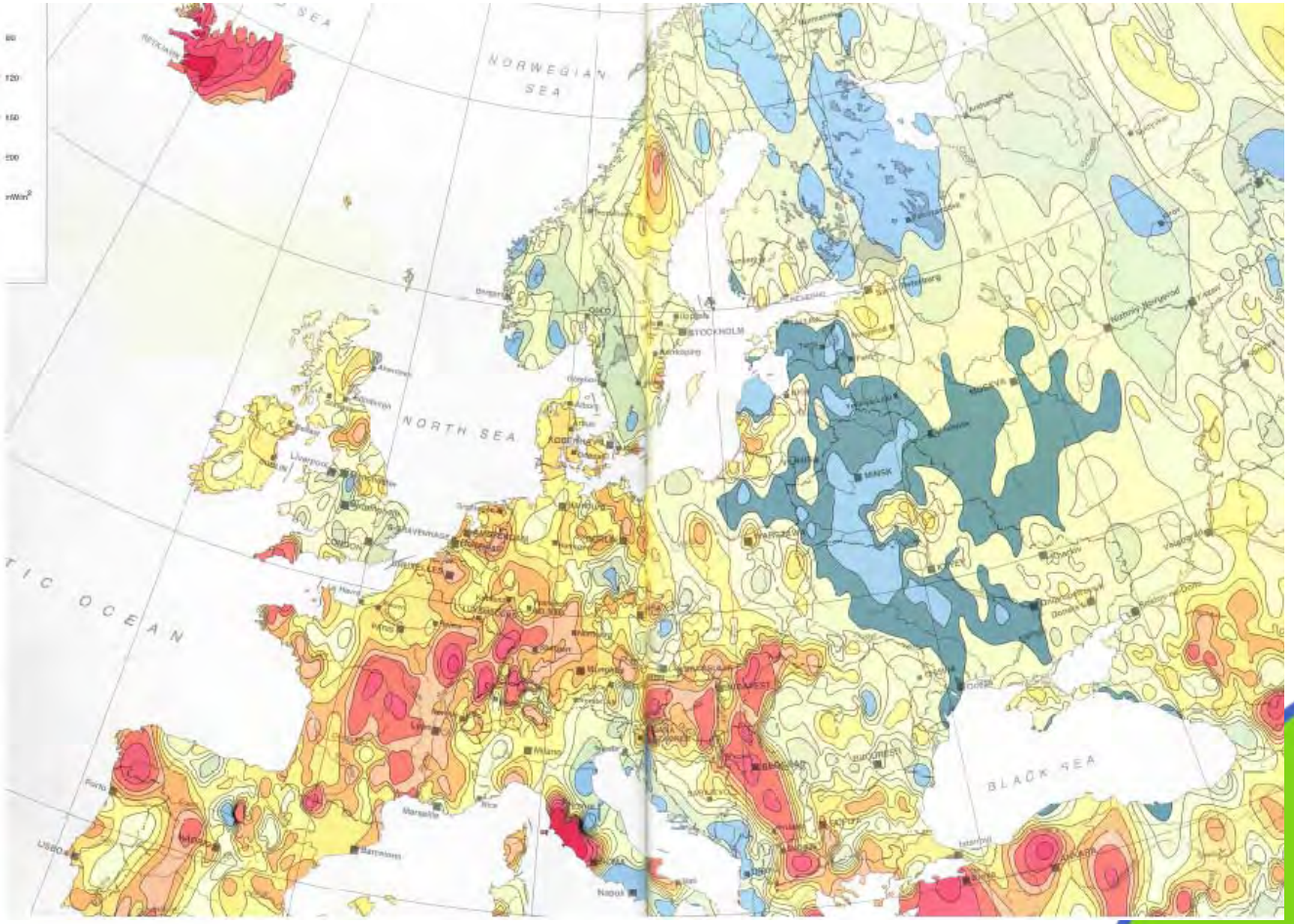
Overview:
Heat Flow
Temperature at 1 Km and 2 Km depth
European Geothermal resources



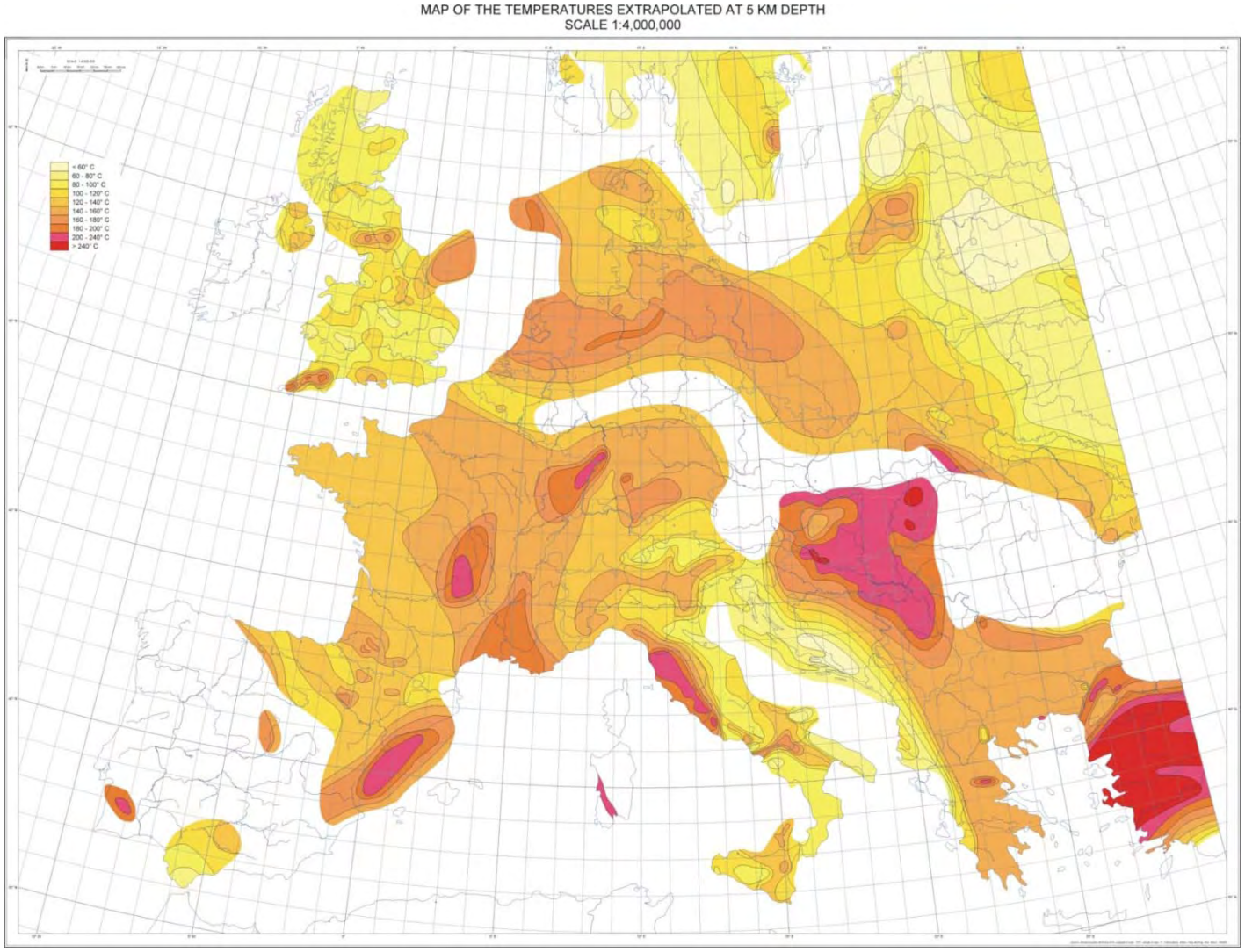
Regional compilation of prospective areas and resource assessment

EC 'Atlas of geothermal resources in Europe' (2002)

Heat flow density



ENGINE Project (FP6)



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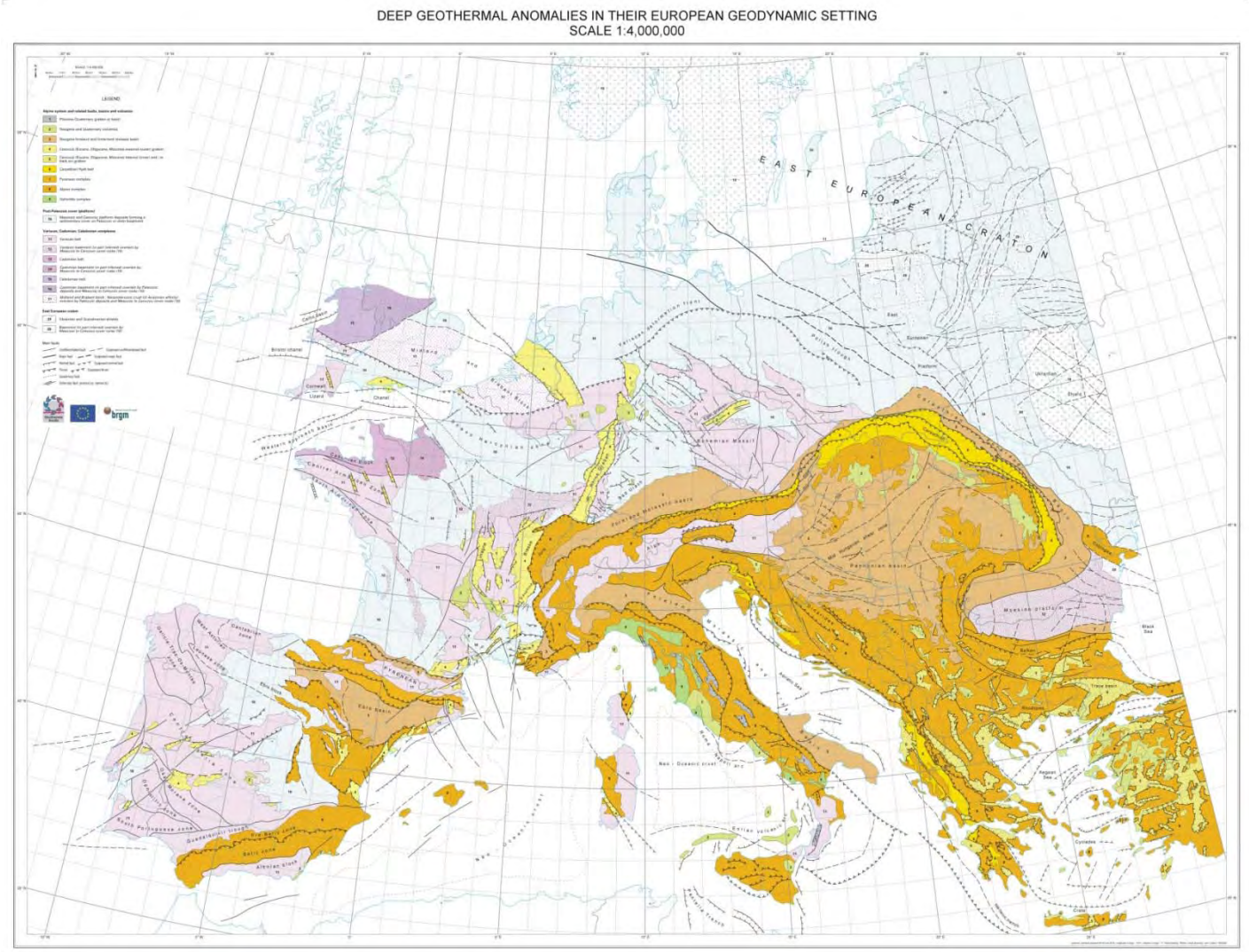
Temperatures at 5 km depth

ENGINE Project (FP6)



Tectonic patterns

Other Public Sources:

- WGC 1995, 2000, 2005, 2010: Country Updates
- National geological databases
- Methodology from other continents:
  - Canada
  - USA
  - Australia

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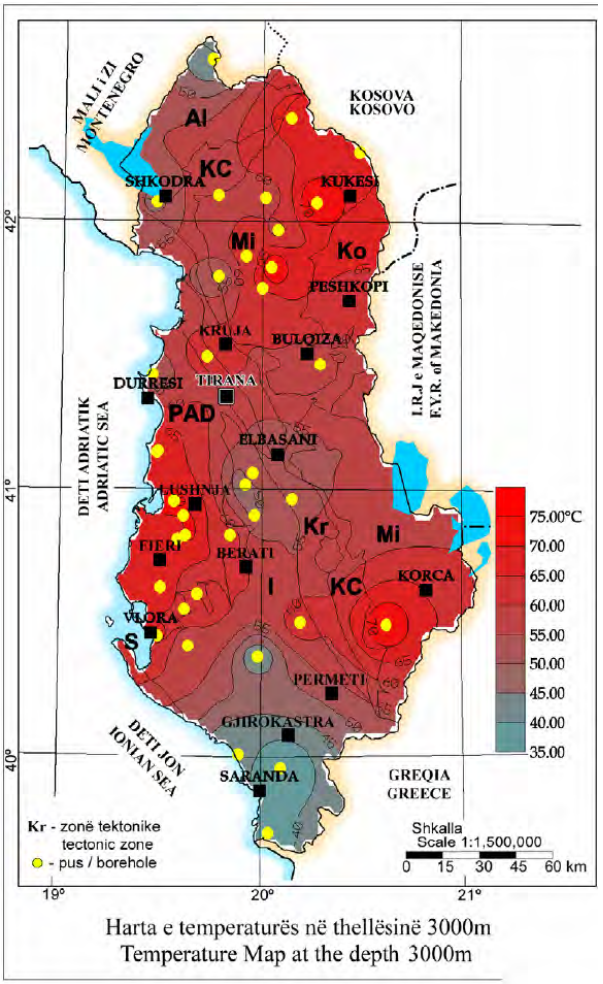
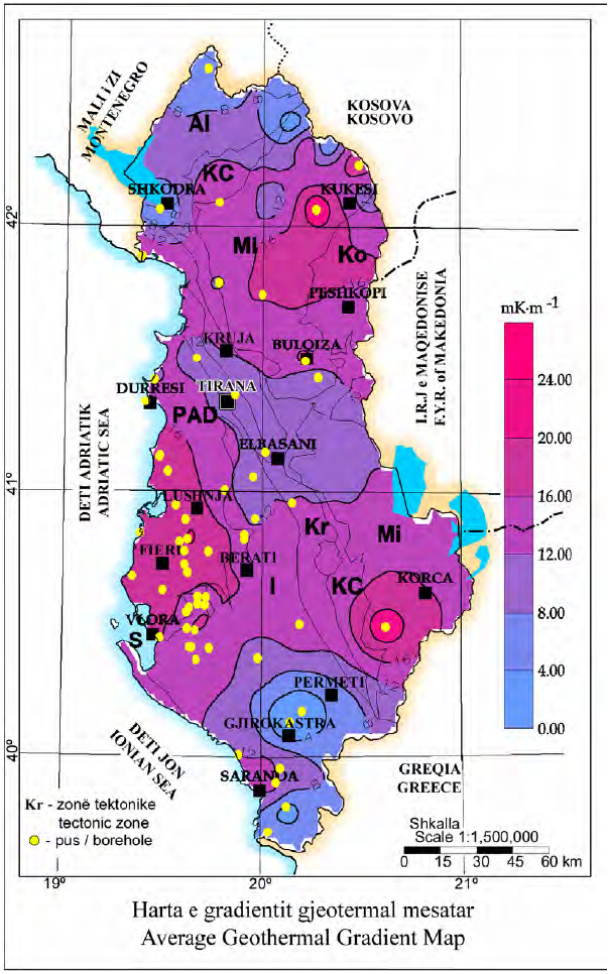
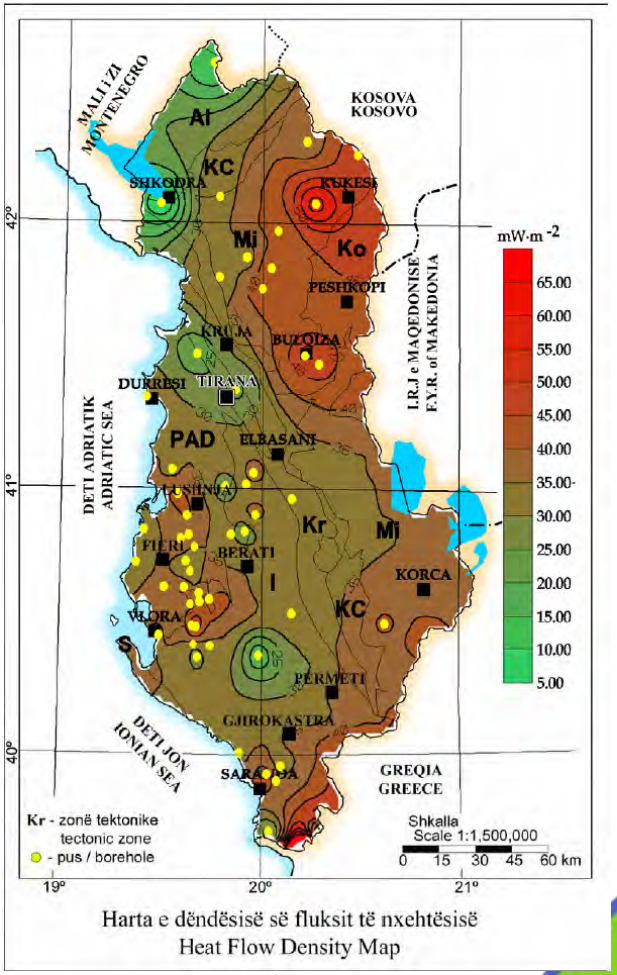
ALBANIA



Harta e temperaturës në thellësinë 3000m
Temperature Map at the depth 3000m



Harta e gradientit gjeotermal mesatar
Average Geothermal Gradient Map



Harta e dëndësisë së fluksit të nxehtësisë
Heat Flow Density Map

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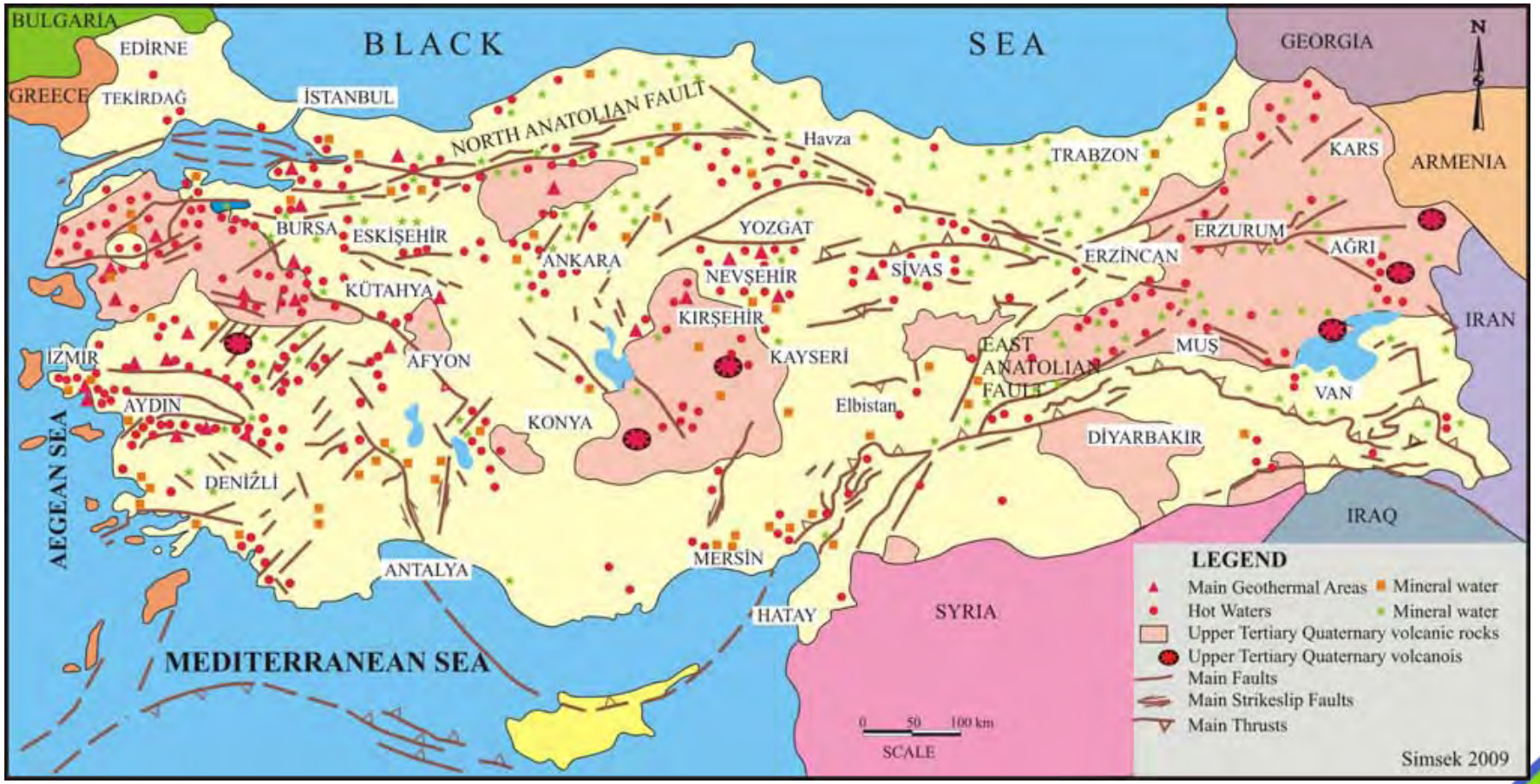
TURKEY



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ROMANIA

Figure 1: Location of the main Romanian geothermal reservoirs

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GREECE

Figure 1: Geothermal fields and areas of geothermal interest in Greece. (This map has been compiled by I.G.M.E. - Division of Geothermal Energy and Thermal Mineral Waters, with recent modifications and additions by Arvanitis A. The officially characterized as proven and probable geothermal fields are written with capital letters into the frames and the other areas of geothermal interest with no classification are written in small letters).

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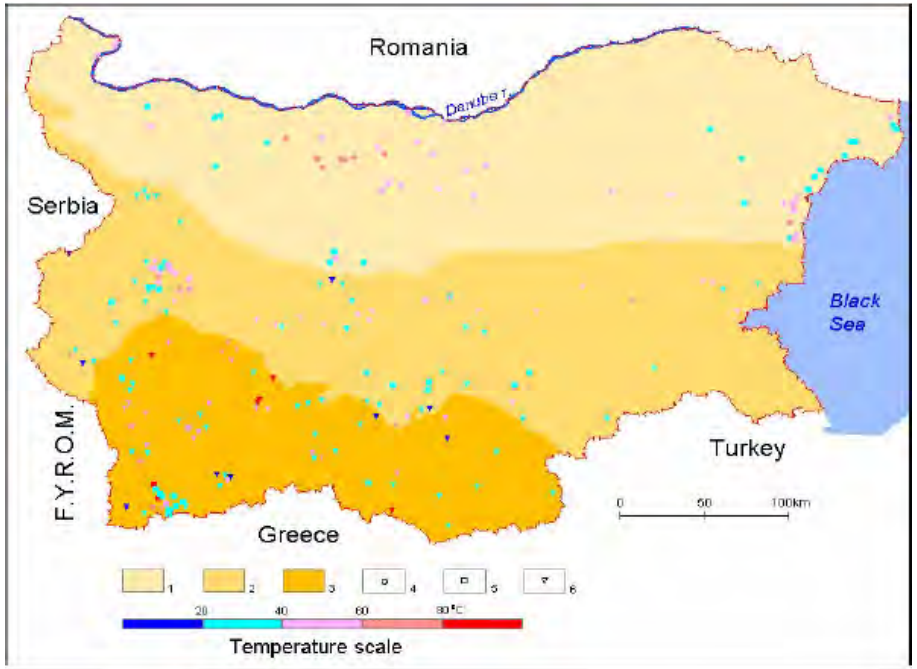
BULGARIA



1. Moesian plate (stratified reservoirs)

2. Sredna goraSredna gora, incl.Balkan zone (secondary stratified reservoirs, fractured reservoirs)

3. Rila-Rhodopes massif (predominantly fractured reservoirs)

4. Major wells and groups of wells discovering stratified reservoirs in a plate region

5. Hydrothermal sources associated with waters from fractured reservoirs located in Southern Bulgaria.

6. Hydrothermal sources associated with waters from secondary stratified reservoirs located in Southern Bulgaria

Figure 3: Map of hydrothermal deposits of Bulgaria

Other Public Sources:

- WGC 1995, 2000, 2005, 2010: Country Updates

- National geological databases

- Methodology from other continents:
  - Canada
  - USA
  - Australia

Canada

Geothermal energy resource potential of Canada (GS of Canada, 2011)

Contains maps on EGS potential !

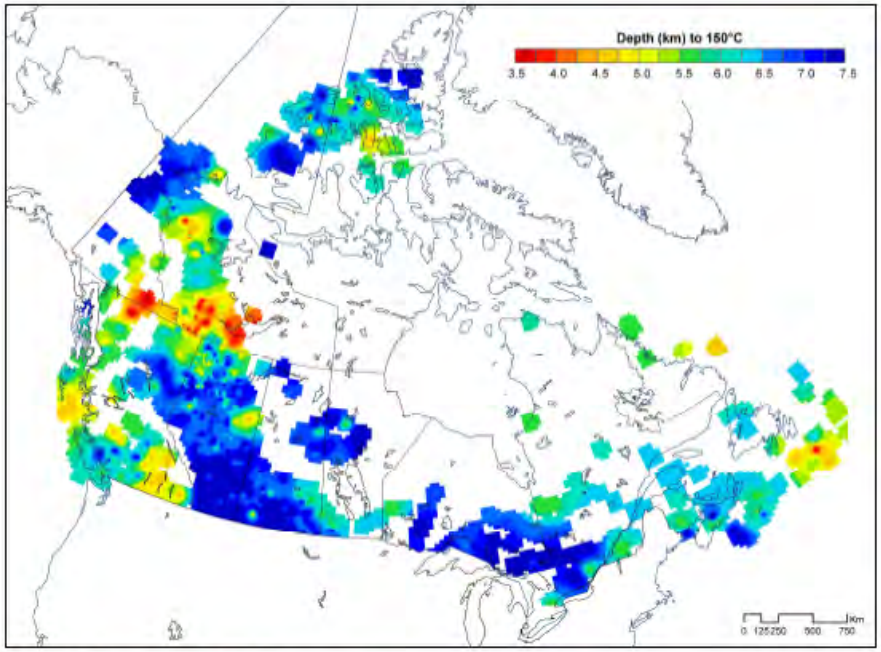
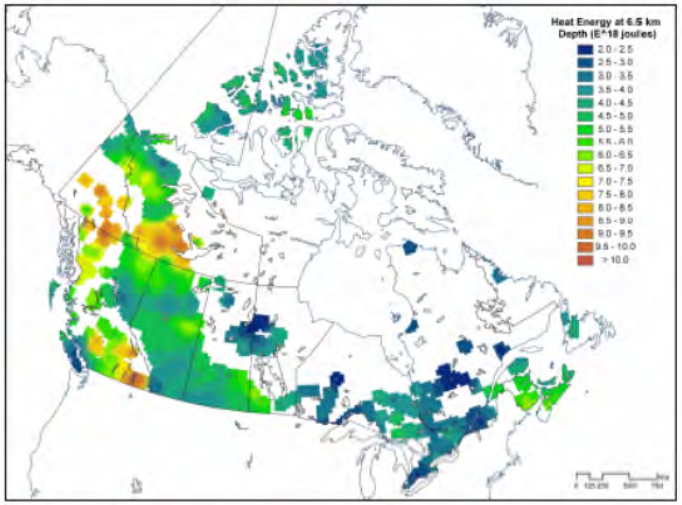


Figure 8.4. Depth (km) to 150 °C temperature.



igure 8.2. Heat Energy at 6-7 km depth.

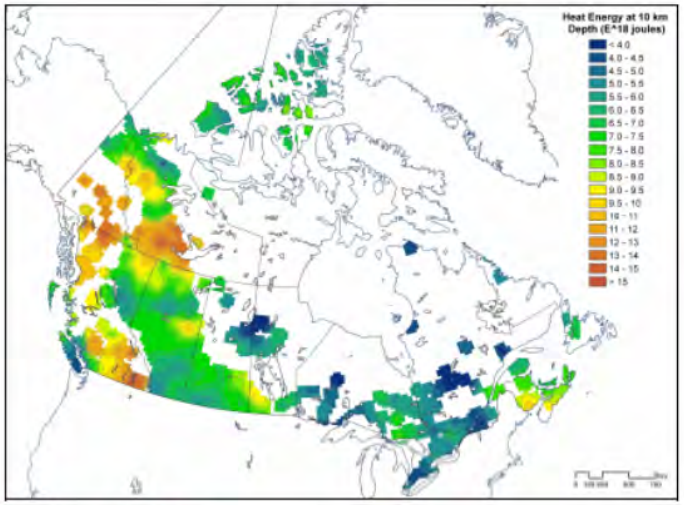


Figure 8.3. Heat Energy at 9-10 km.

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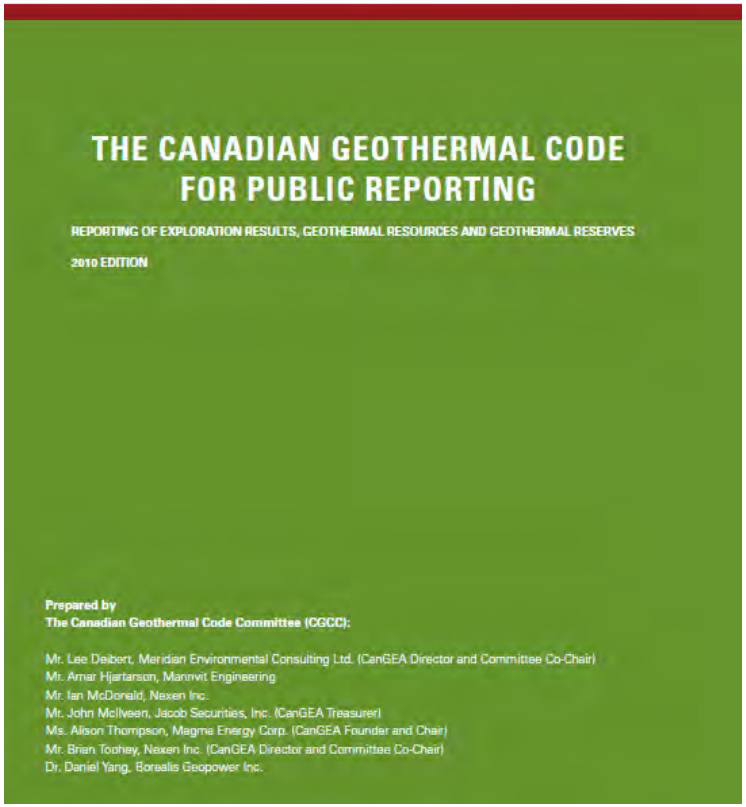
Canada

Canadian Geothermal code for public reporting, Cangea, 2010

CanGEA
CANADIAN GEOTHERMAL ENERGY ASSOCIATION

"Accelerate Canadian exploration and development of geothermal resources in order to provide secure, clean and sustainable energy"

5,000 MW BY 2015!



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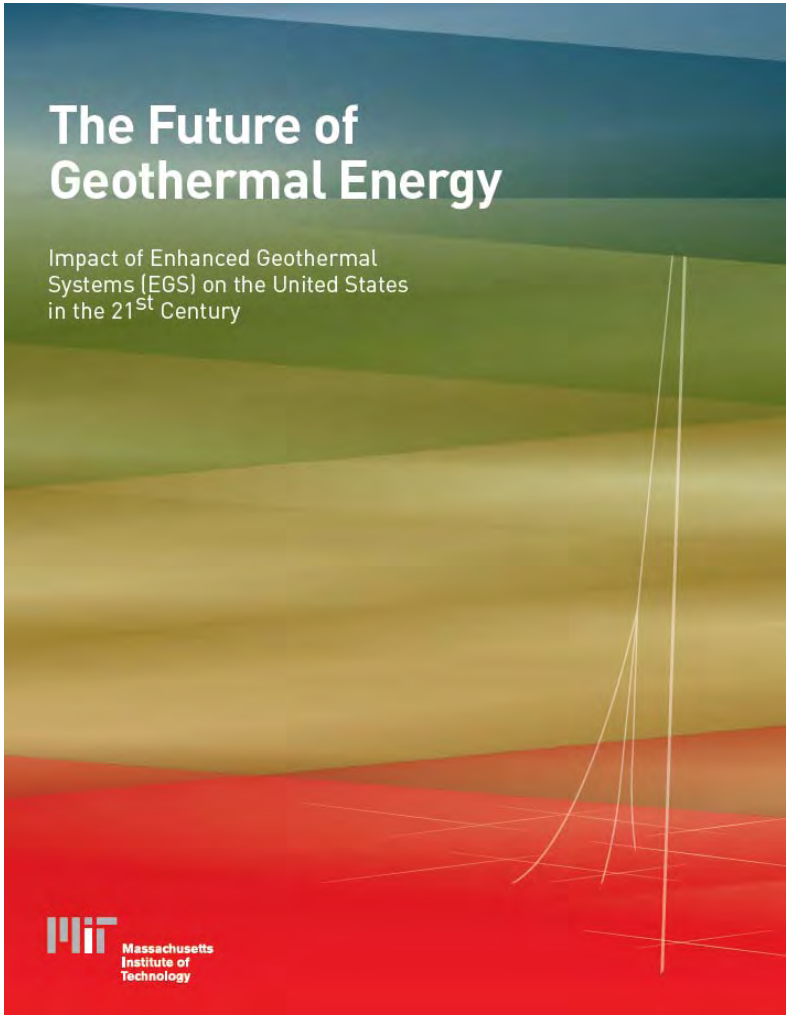
USA

- **The Future of Geothermal Energy, MIT, 2006**

- **GOOGLE.ORG:**

  U.S. Geothermal Resource (3-10 km depth) on Google Earth



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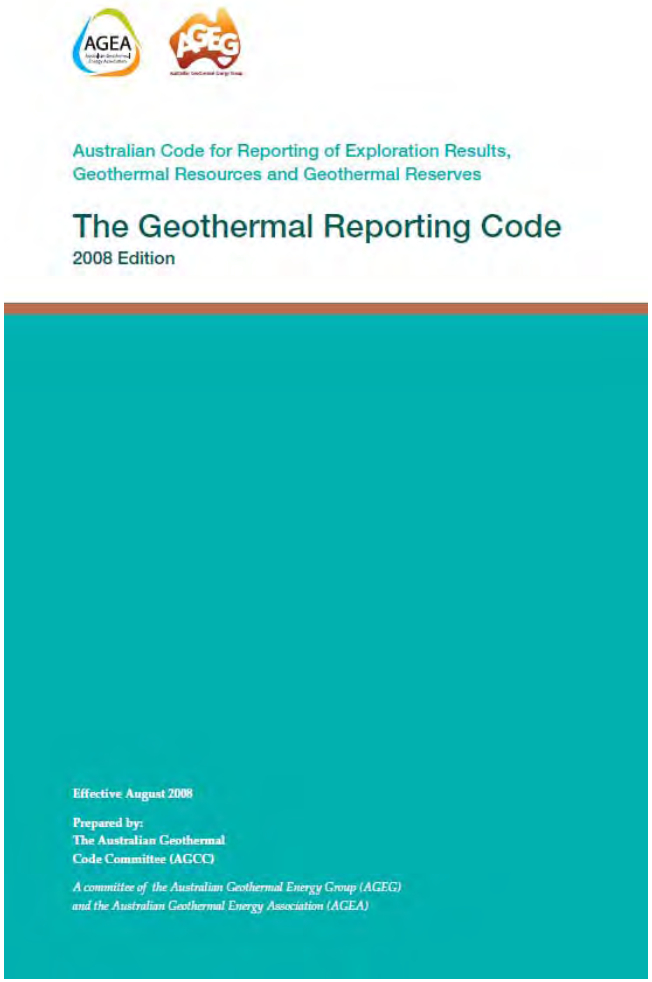
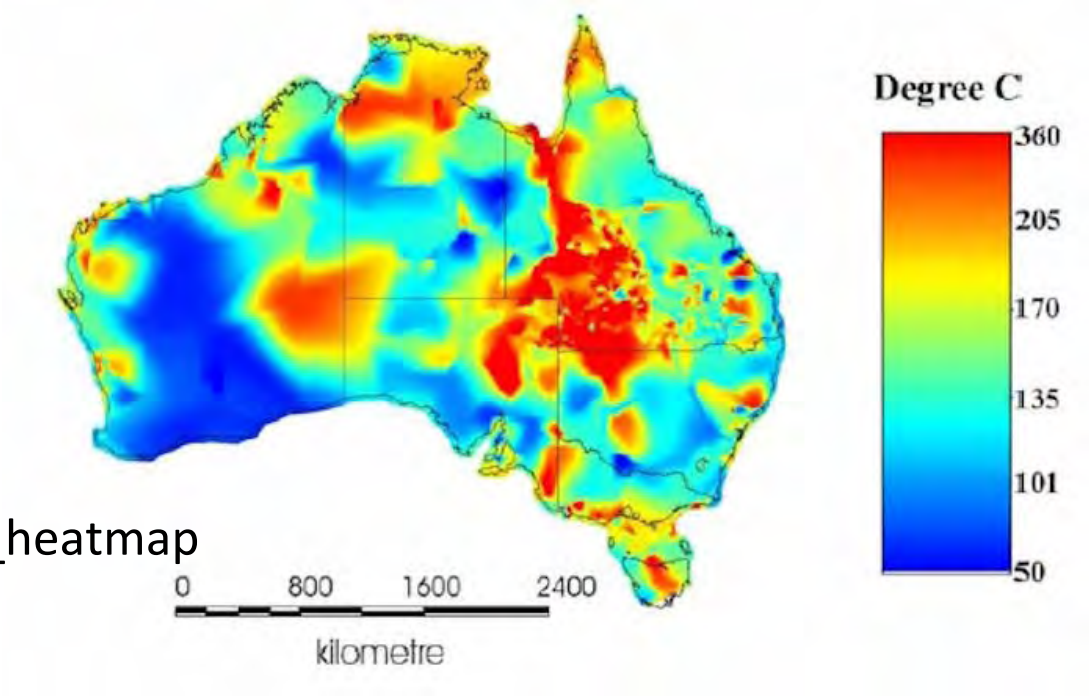
Australia

The Geothermal reporting code, 2008, AGEA-AGEG



Australia

November 07, 2011: Exciting project looks at new way of characterizing resources in Australia



Australia_geothermal_heatmap

The Australian geothermal energy industry goes new ways with enlisting machine learning experts to identify and characterise resources by combining industry data and data of Geoscience Australia

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Regional compilation of prospective areas and resource assessment

Geoelec Geothermal resource assessment protocol

Expected results:

- Compilation of geological and geophysical data inside Geological surveys, accessible to interested developers as open and easily as possible

- European Geothermal Reporting Code (discussion already started within TP Geoelec)

Thank You!

Visit www.geoelec.eu

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