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Integrating seismic ambient noise, magnetotellurics and gravity for characterizing a geothermal anomaly

Gemma Mitjanas

PhD candidate

Universitat de Barcelona

Integrating seismic ambient noise, magnetotellurics and gravity for characterizing a geothermal anomaly

1. Geological setting
2. Geothermal context
3. Methodology
4. Gravity
5. Seismic ambient noise
6. Magnetotellurics
7. 2D conceptual model
8. Extended 3D model
9. Discussion and conclusions

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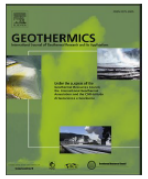

Integrated seismic ambient noise, magnetotellurics and gravity data for the 2D interpretation of the Vallès basin structure in the geothermal system of La Garriga-Samalús (NE Spain)

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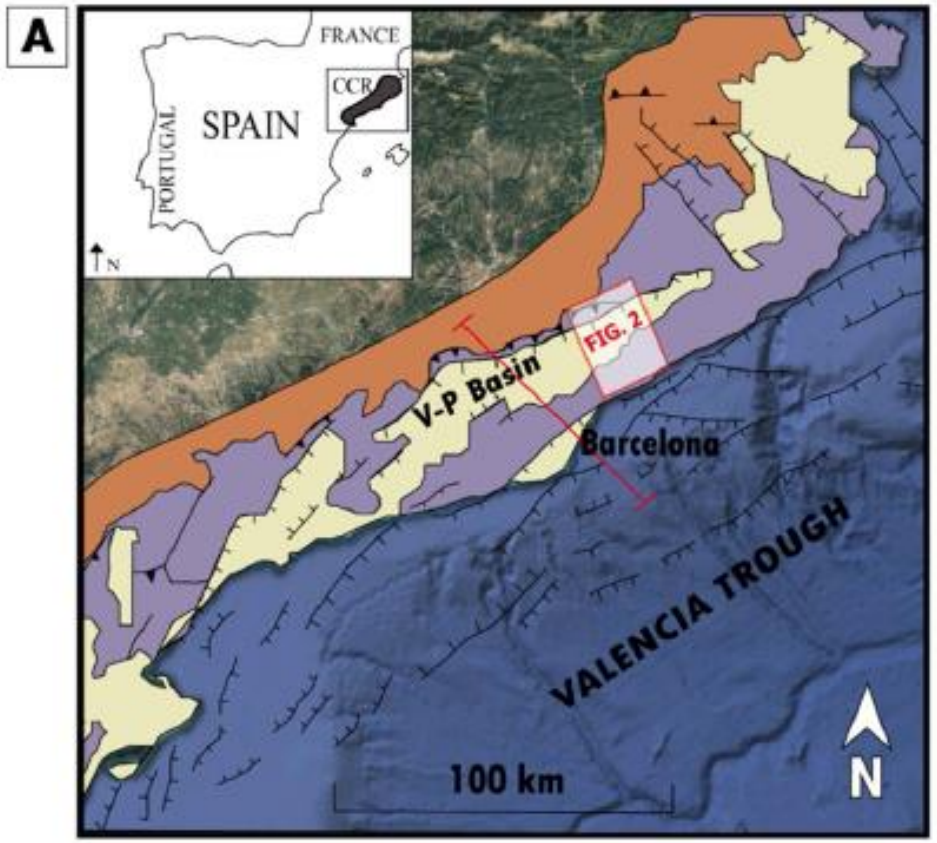
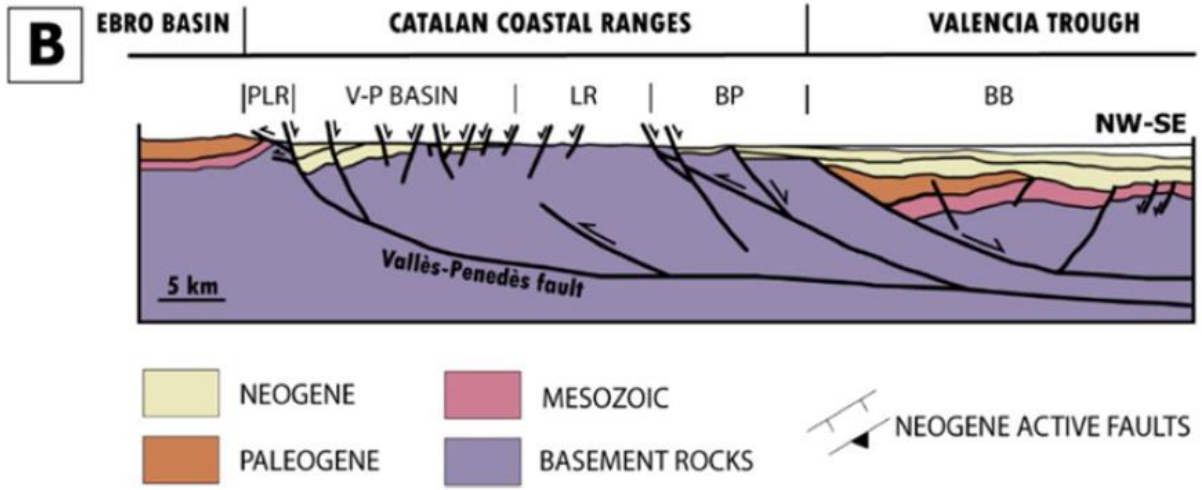
[b] Departament de Mineralogia, Petrologia i Geologia Aplicada, Universitat de Barcelona, C/ Martí i Franquès s/n, 08028, Barcelona, Spain
[c] Institut Cartogràfic i Geològic de Catalunya (ICGC), Parc de Montjuïc, 08038, Barcelona, Spain

1. GEOLOGICAL SETTING

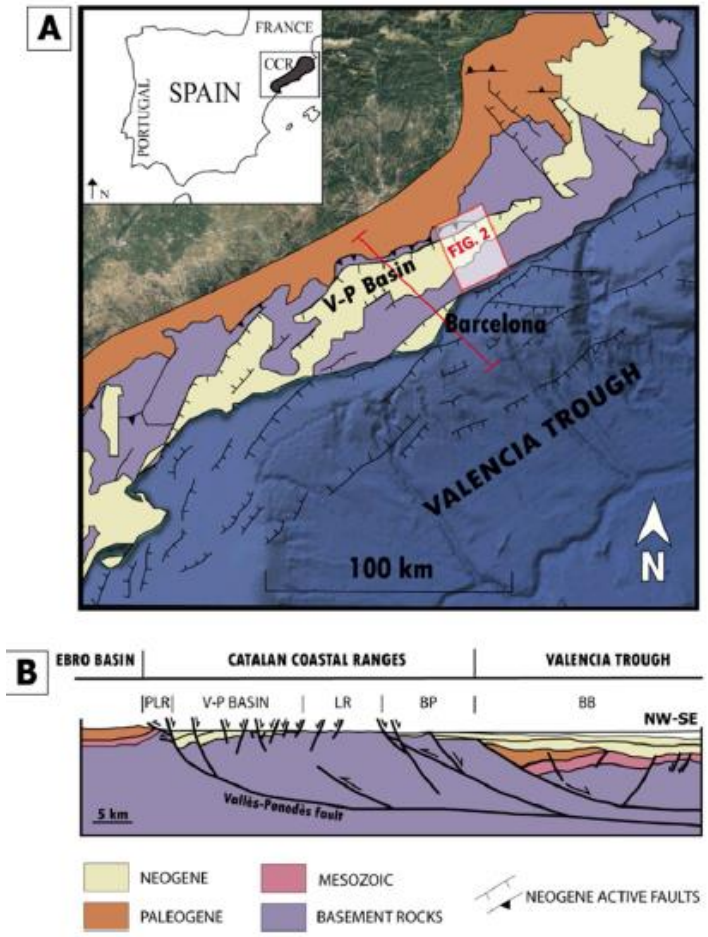


Modified from Martí et al. (1992)

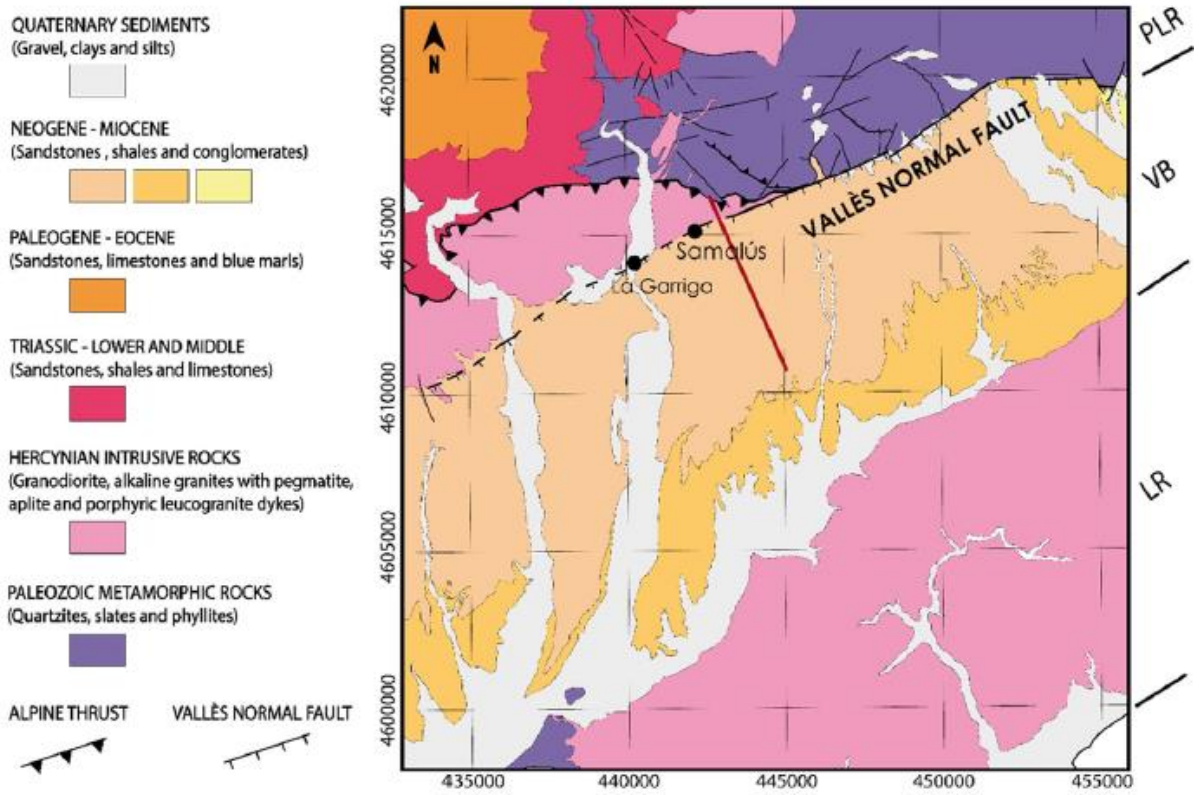


- **Crustal fault** (detachment depth 13-15 km)
- Vallès fault displacement: **3 km**
- Vallès basin: **half-graben**

1. GEOLOGICAL SETTING

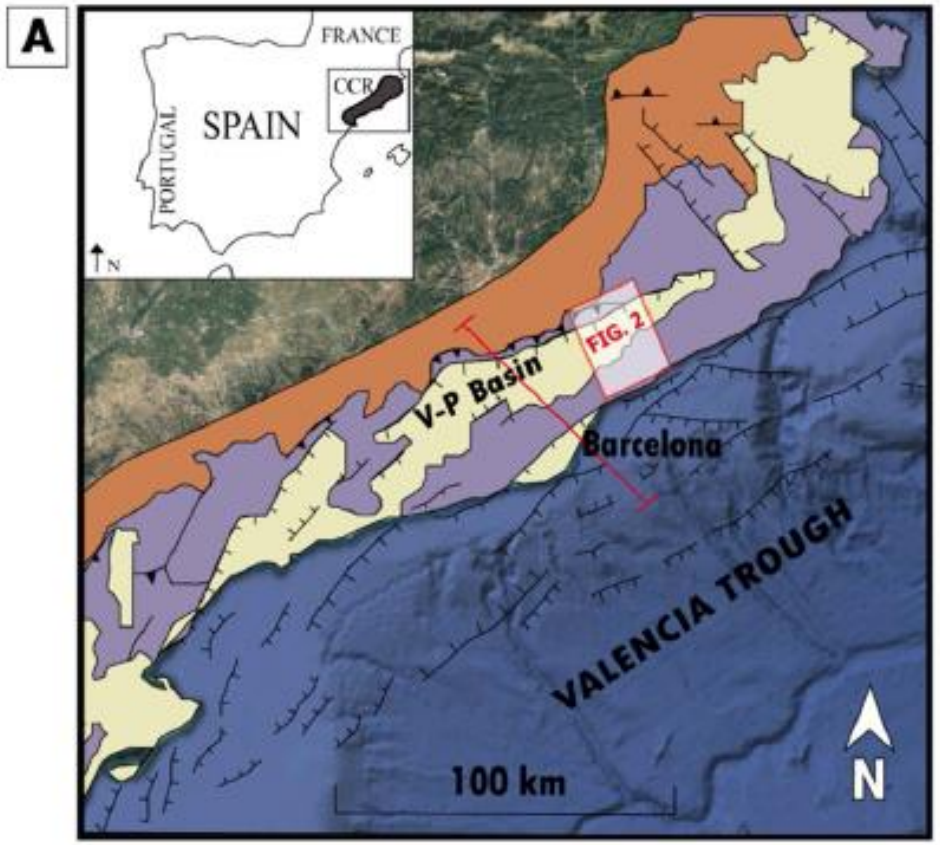


Modified from Martí et al. (1992)



Modified from ICGC, (2006) - 1:50.000

1. GEOLOGICAL SETTING



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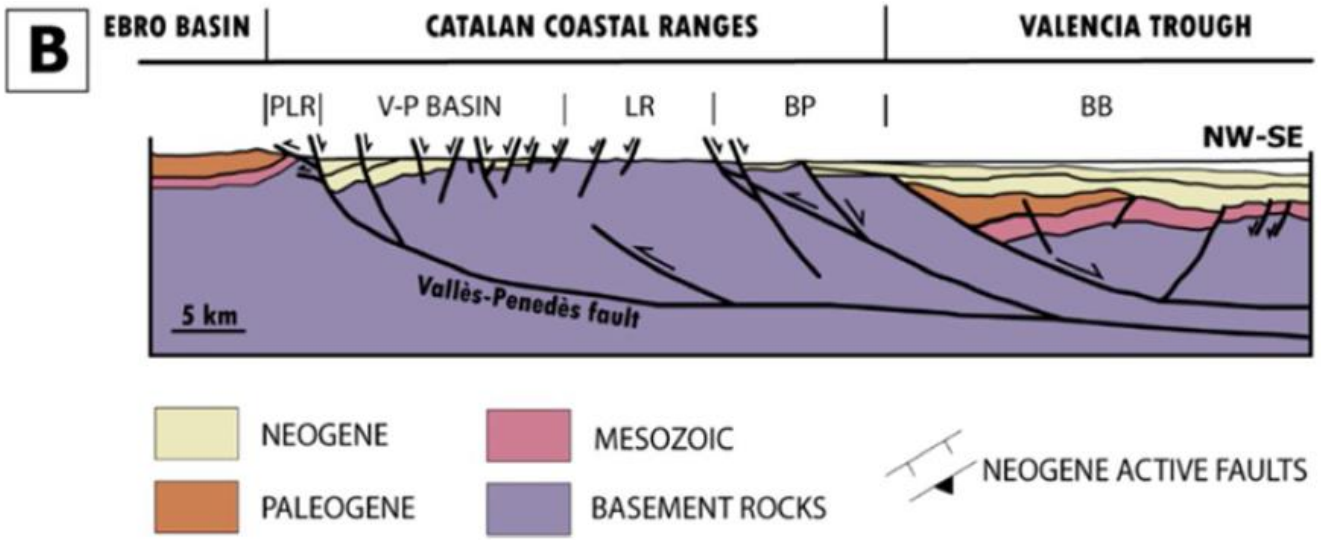
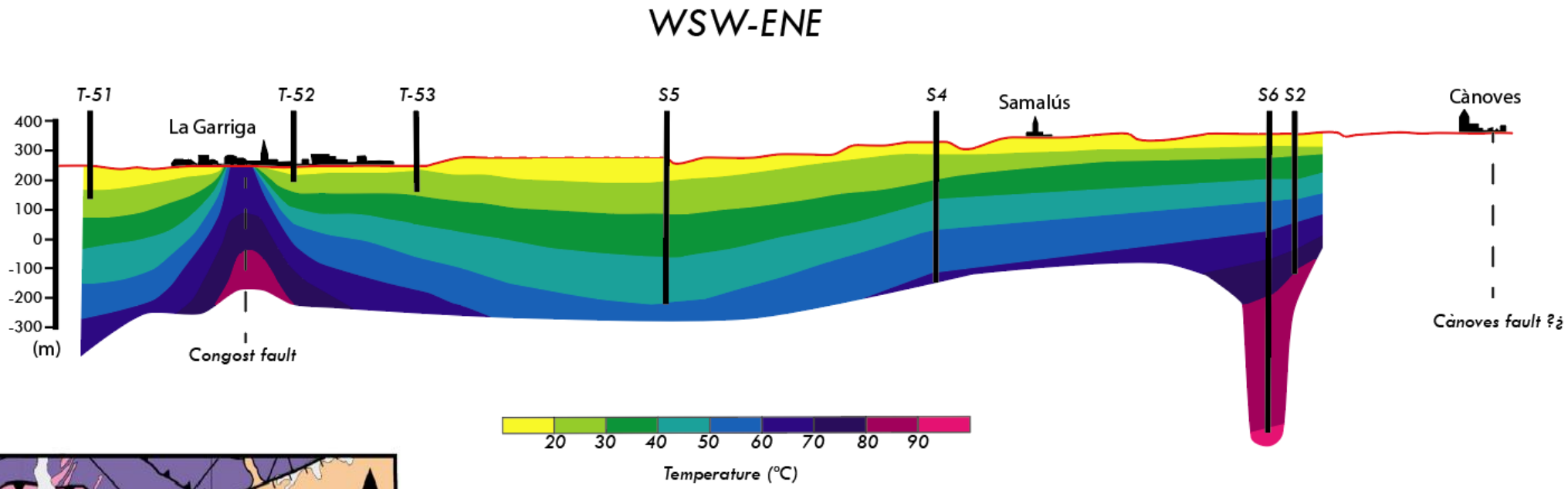
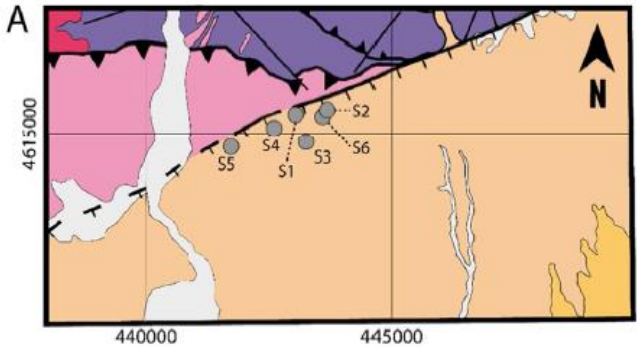


- **Crustal fault** (detachment depth 13-15 km)
- Vallès fault displacement: **3 km**
- Vallès basin: **half-graben**

2. GEOTHERMAL CONTEXT – La Garriga Samalús geothermal system



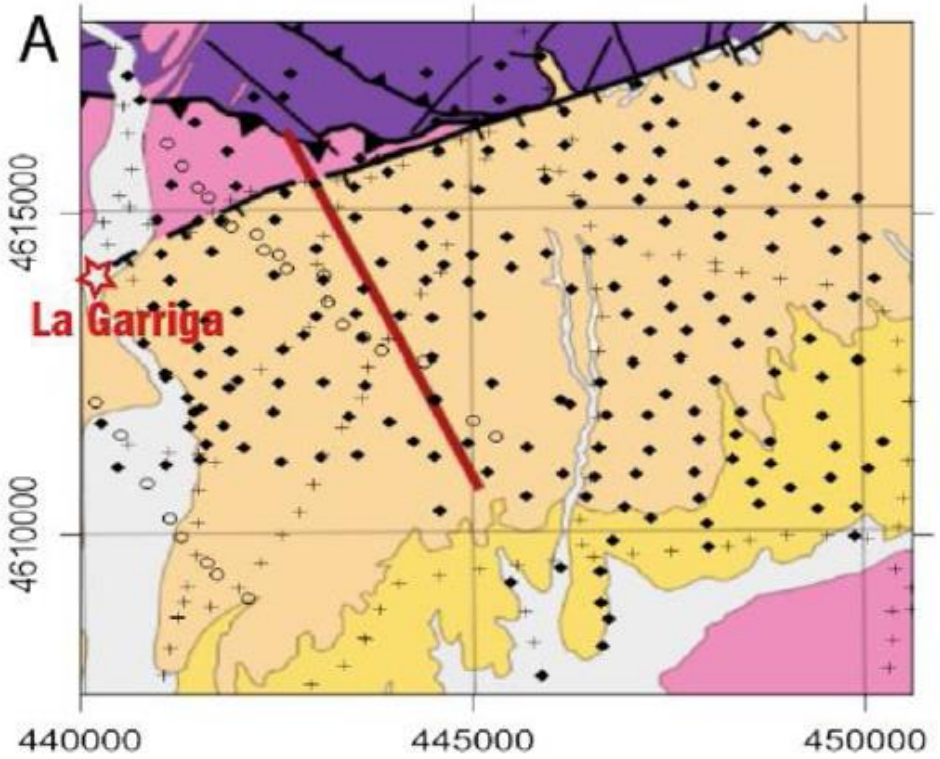
Modified from IGME (1984, 1986)



Mitjanas et al. (2021)

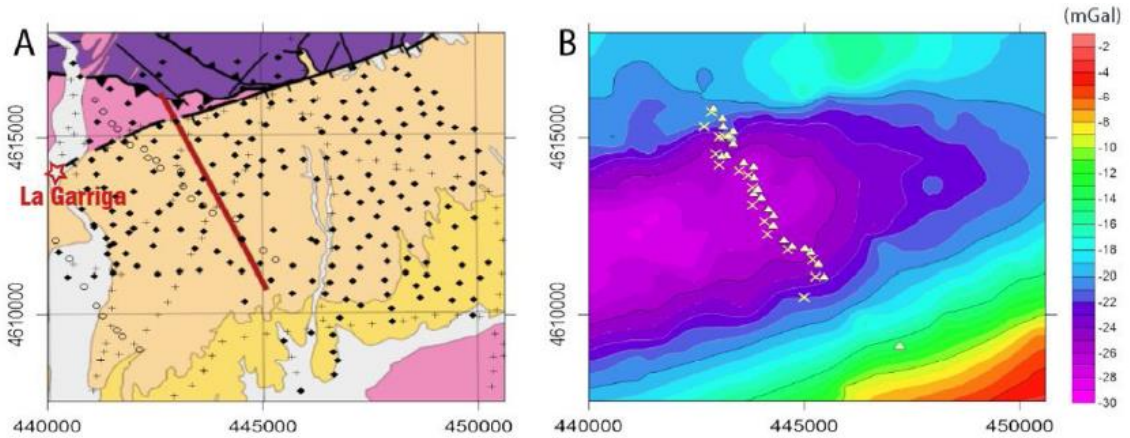
3. METHODOLOGY

- **GEOPHYSICS**
  - **H/V**
  - **Gravity**
  - **MT**
- GEOLOGY
- HYDROLOGY



Mitjanas et al. (2021)

4. GRAVITY



GRAVITY DATA

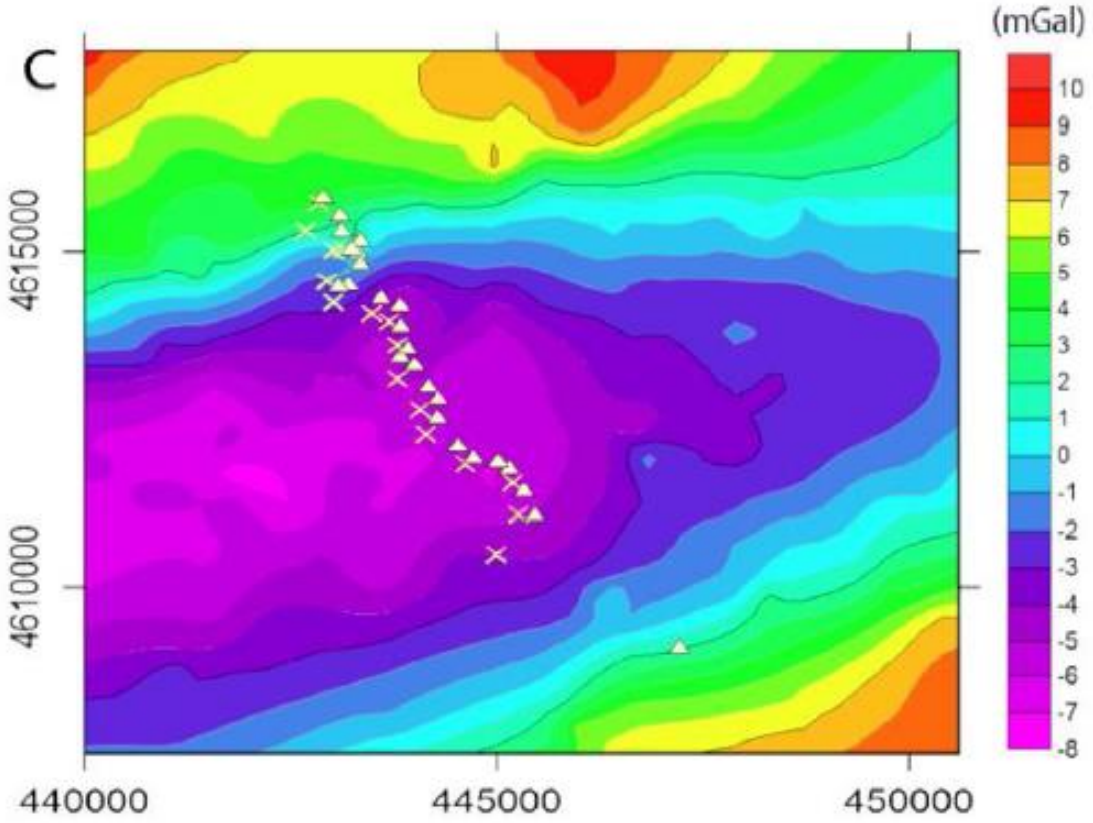
- ◆ New data (214 sites)
- ICGC (2019) (27 sites)
- ○ New data (2012) (113 sites)

MT DATA

- × 16 sites

HVSR DATA

- △ 25 sites

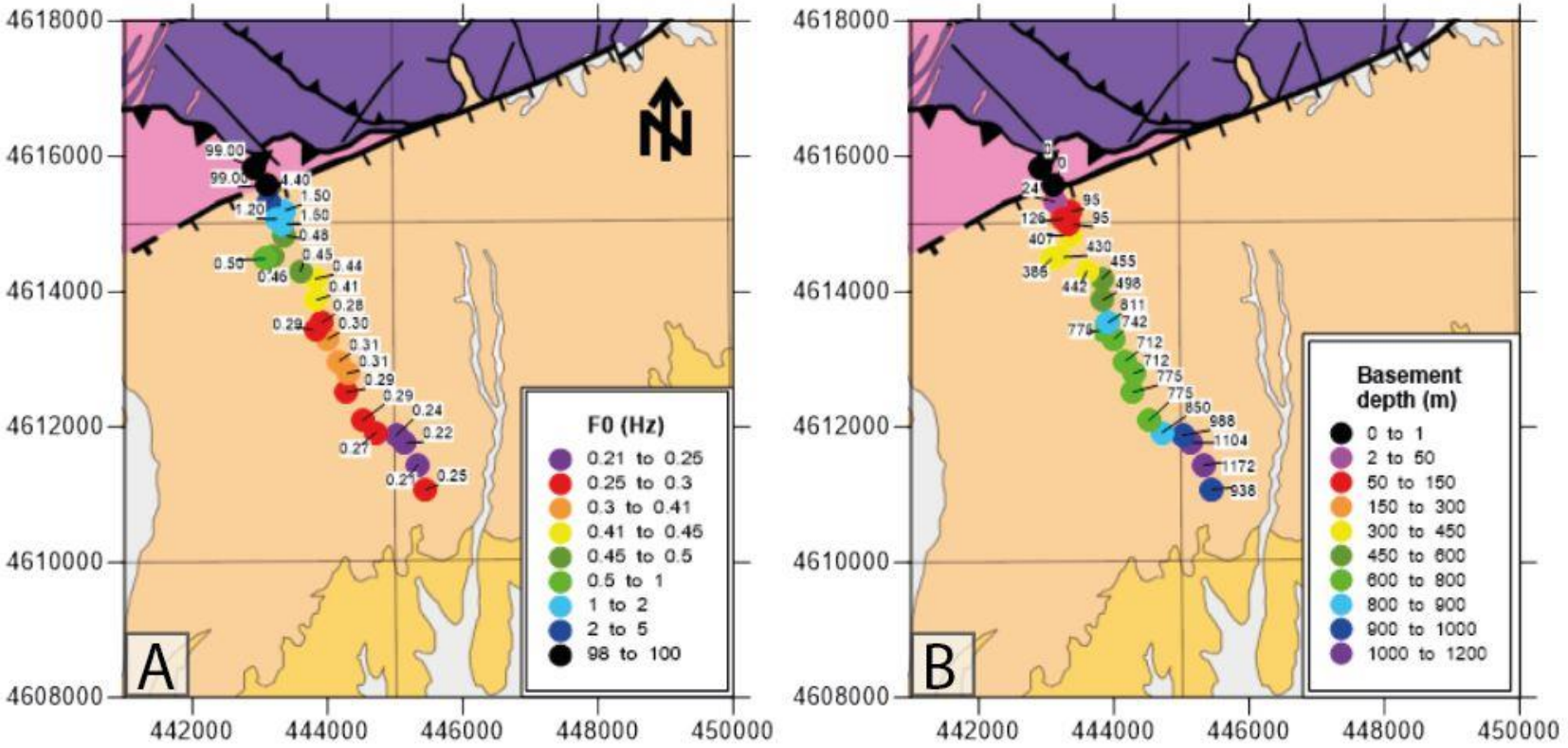


Mitjanas et al. (2021)

5. SEISMIC AMBIENT NOISE (H/V)

Bard (1985)

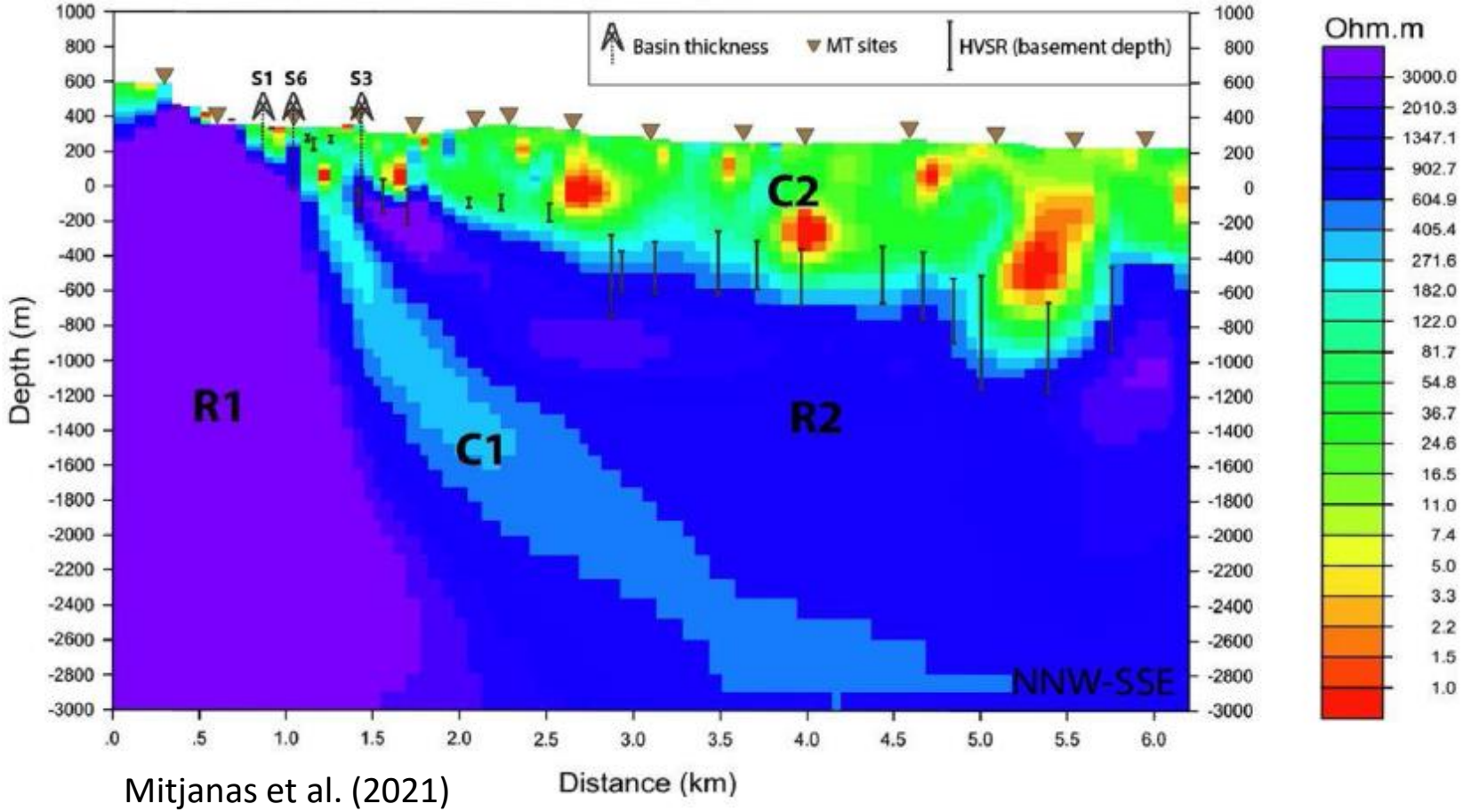
$$f_0 = \frac{V_S}{4 \cdot H}$$



Mitjanas et al. (2021)

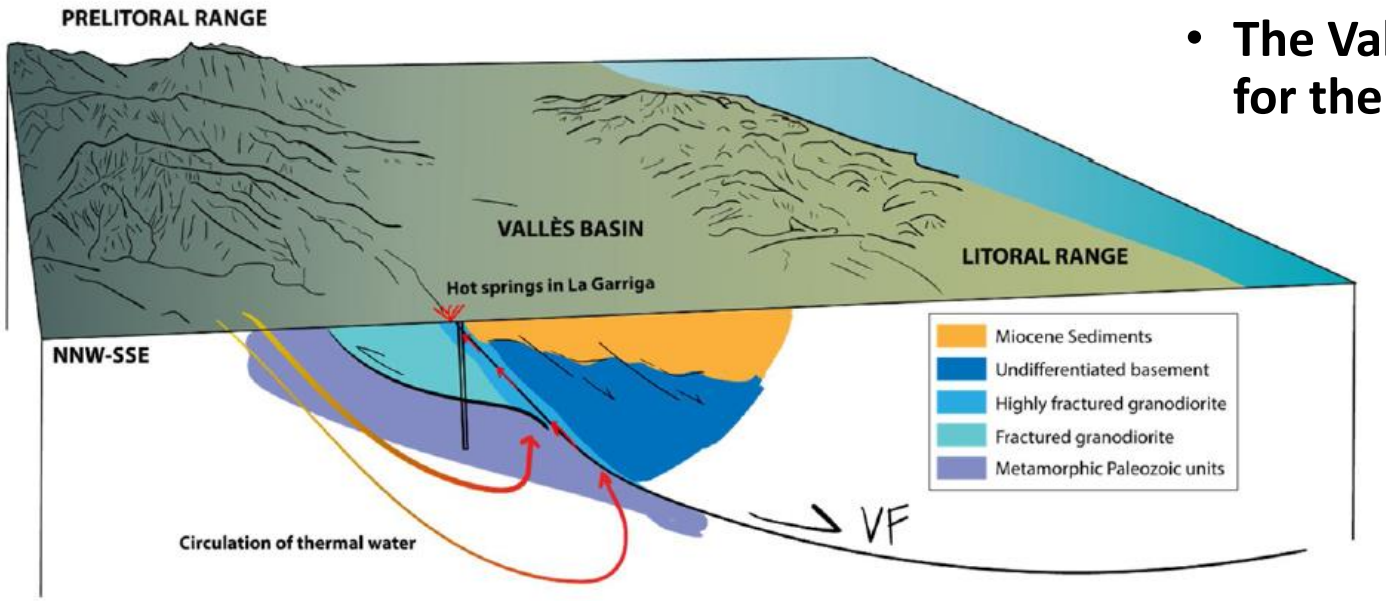
6. MAGNETOTELLURICS (MT)

NNW-SSE



Mitjanas et al. (2021)

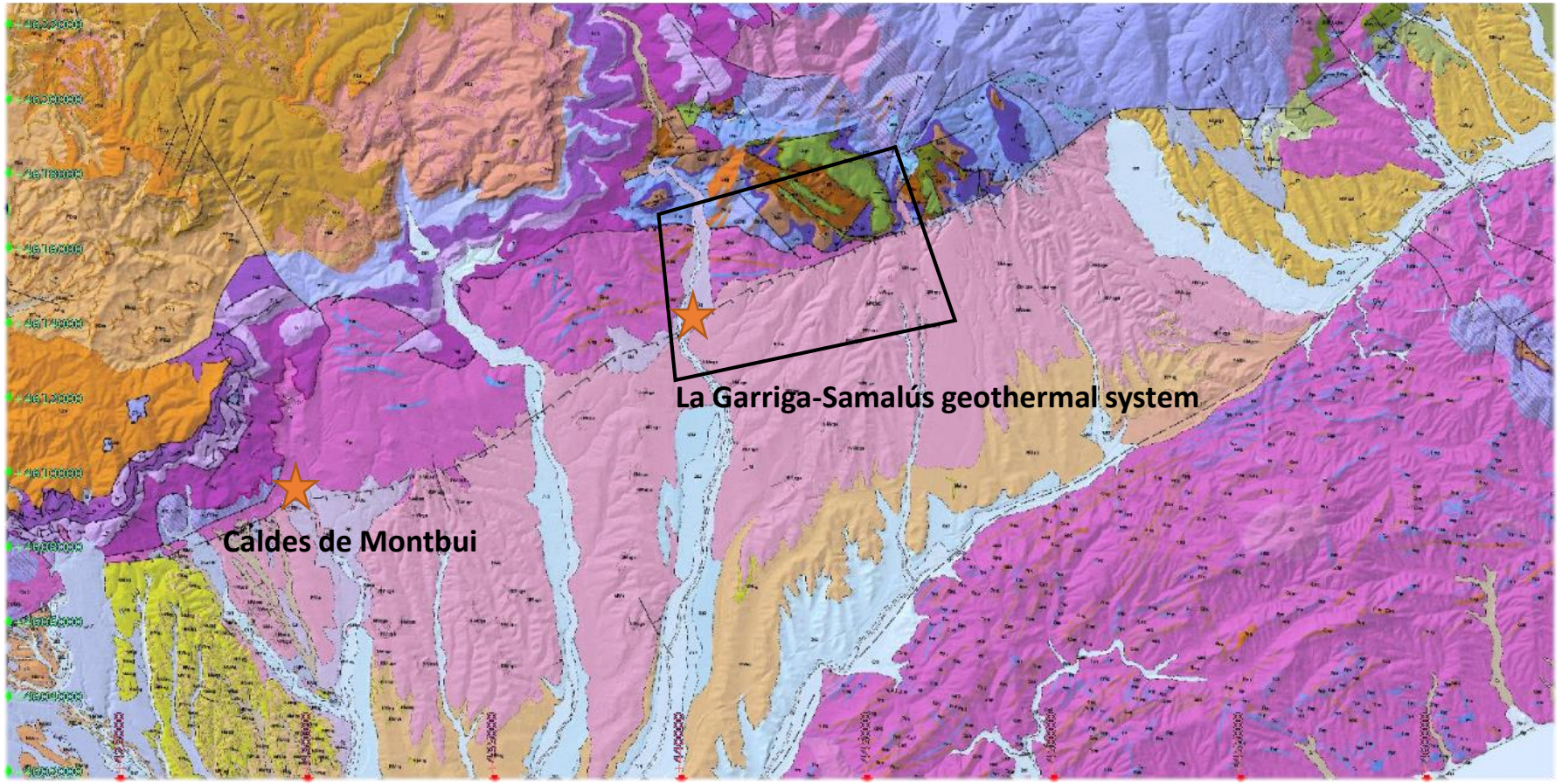
7. 2D CONCEPTUAL MODEL



- **New geometry for the Miocene basin**
- **The Vallès fault zone act as the main path for the hot fluids**

Mitjanas et al. (2021)

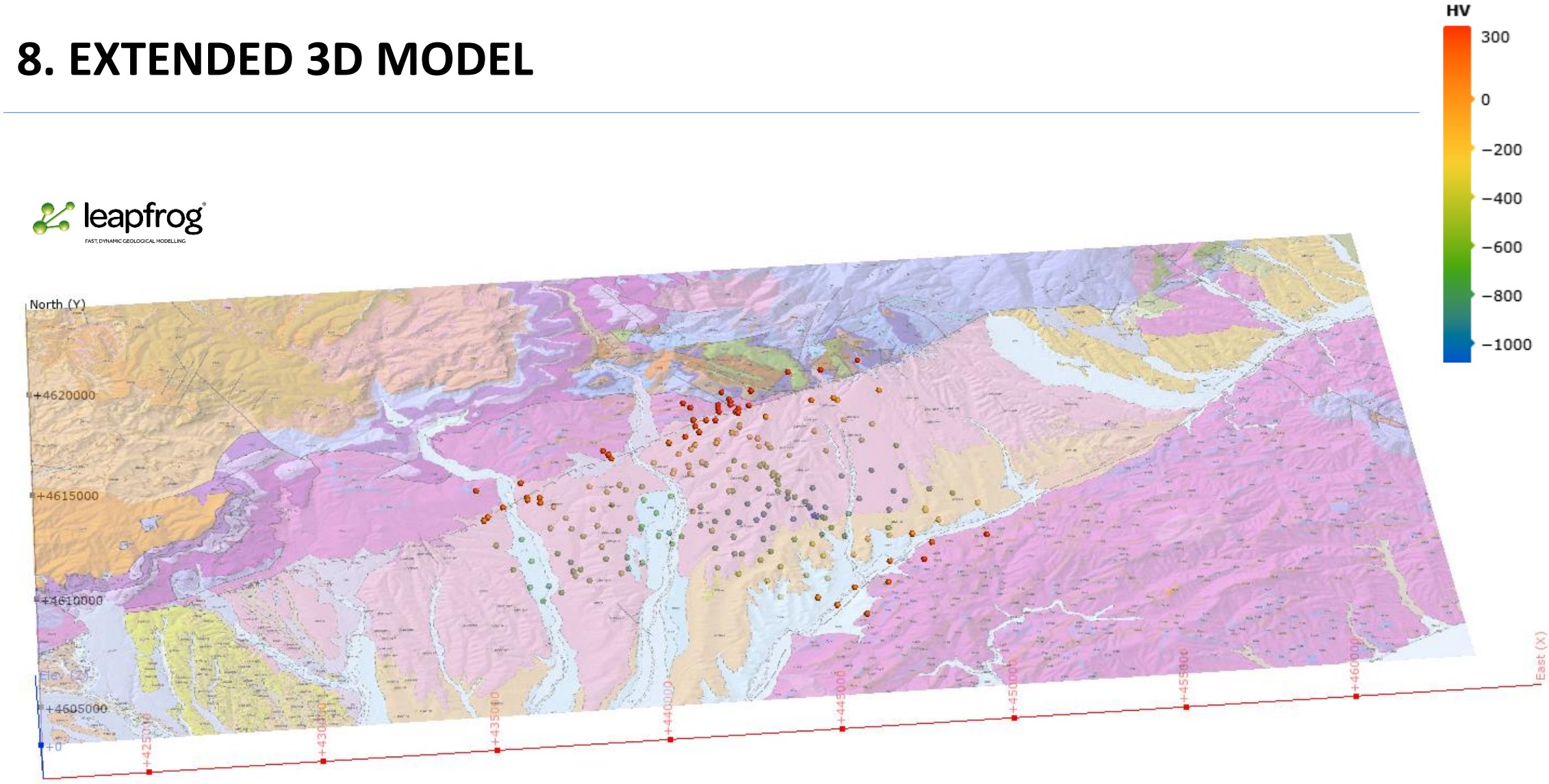
8. EXTENDED 3D MODEL



★ Thermal hot sprigs

ICGC – Mapa Geològic 1:250.000

8. EXTENDED 3D MODEL



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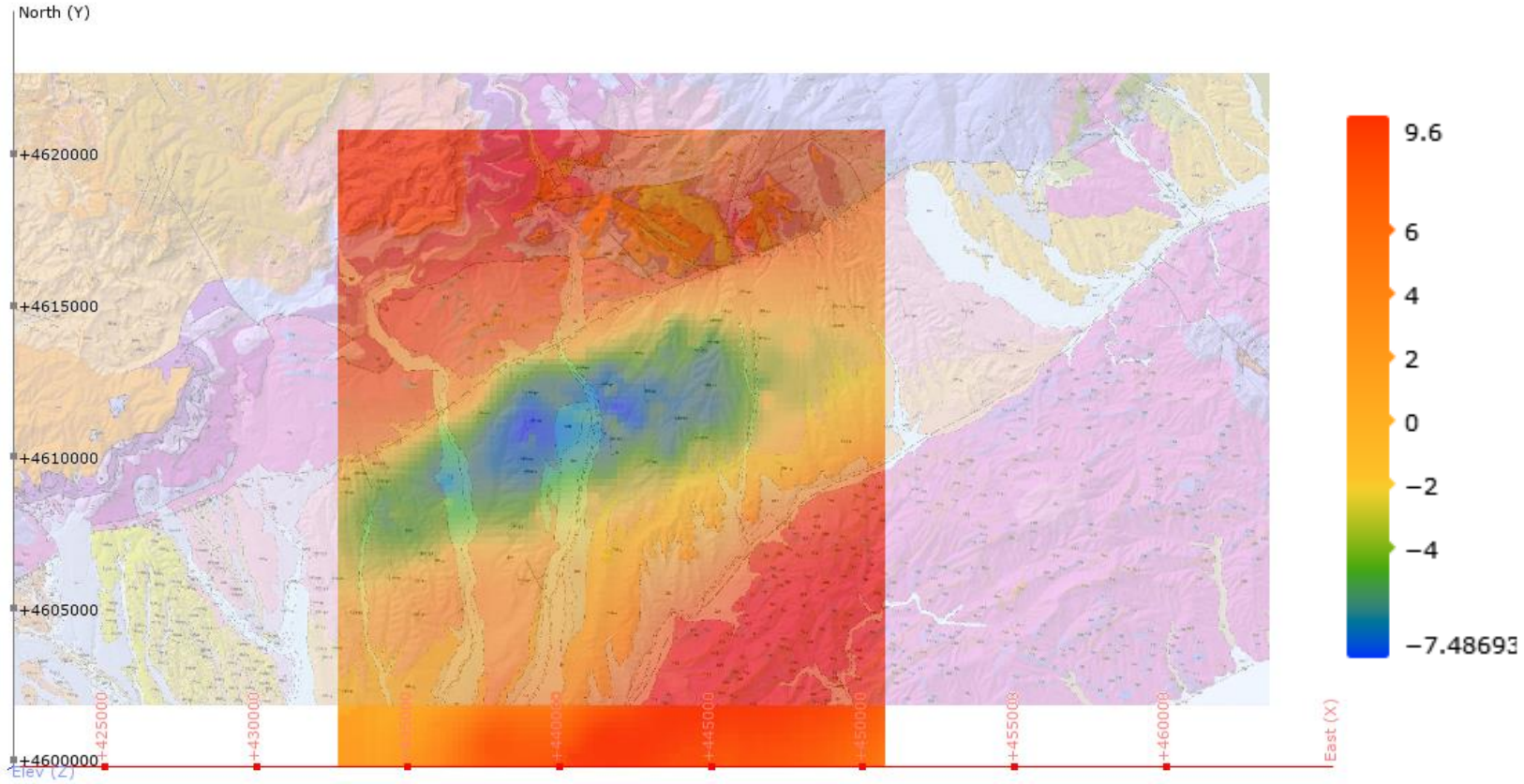

leapfrog

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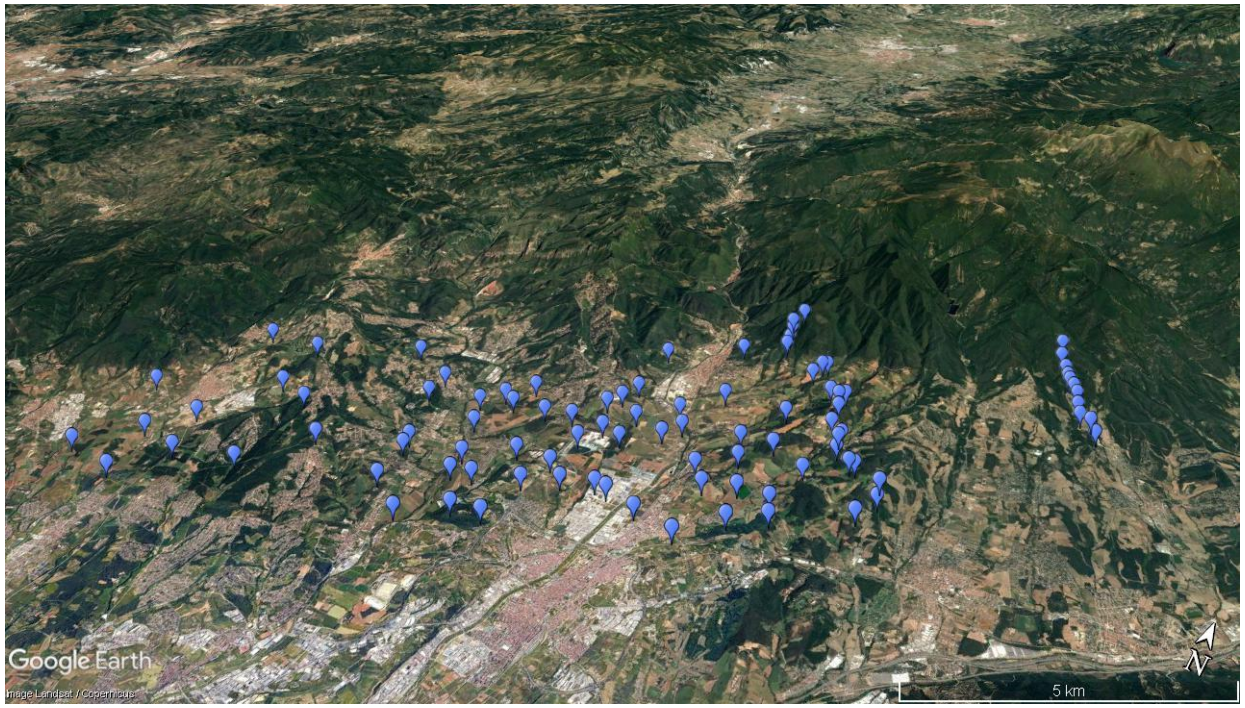
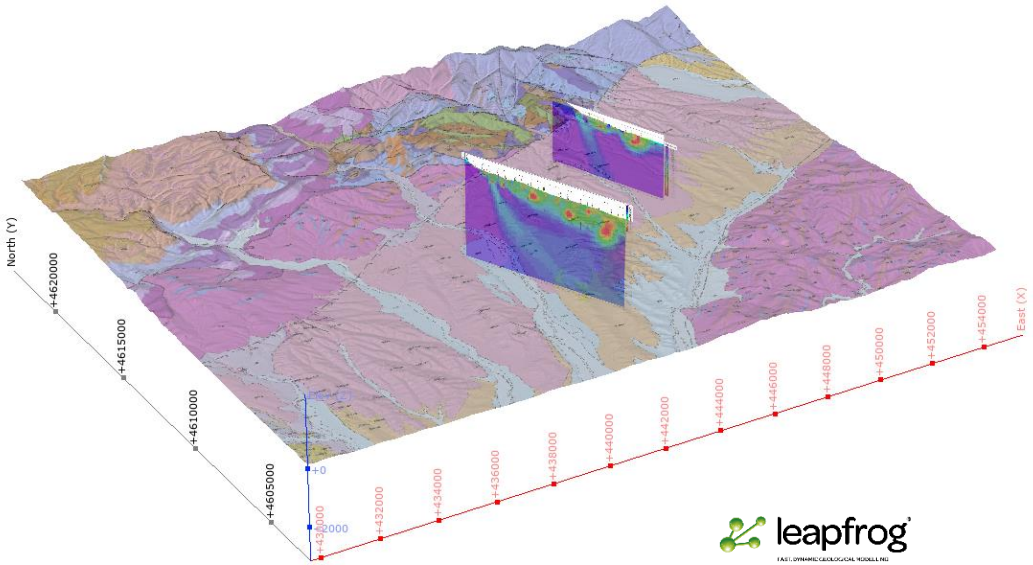
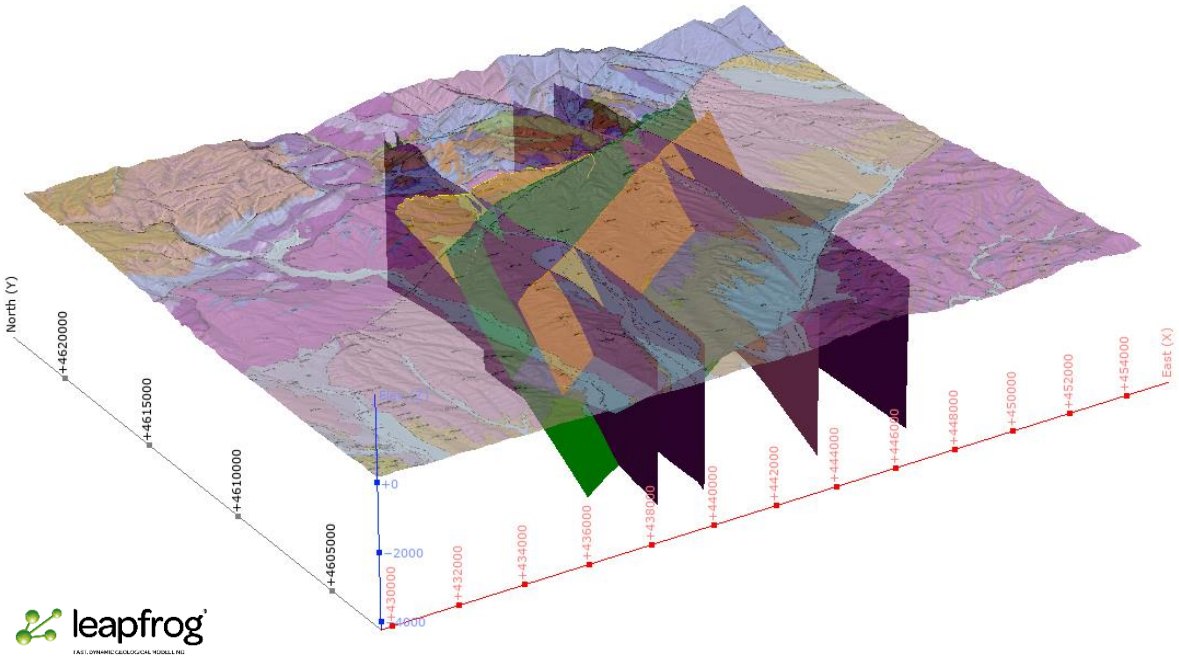
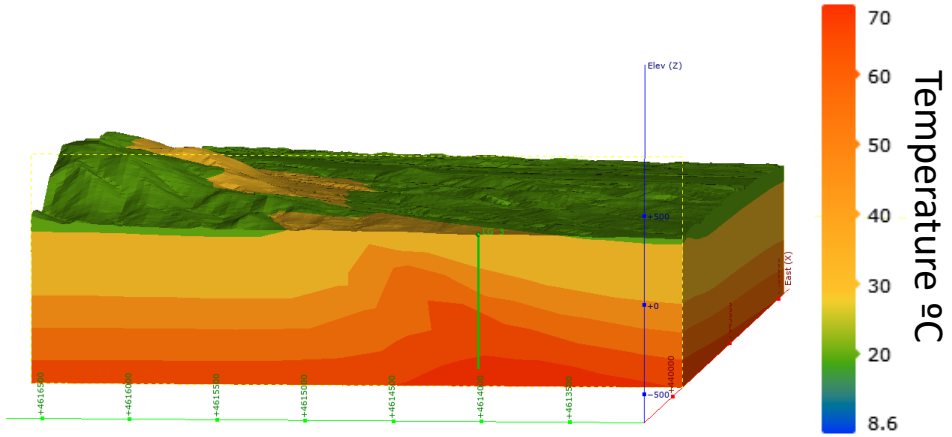


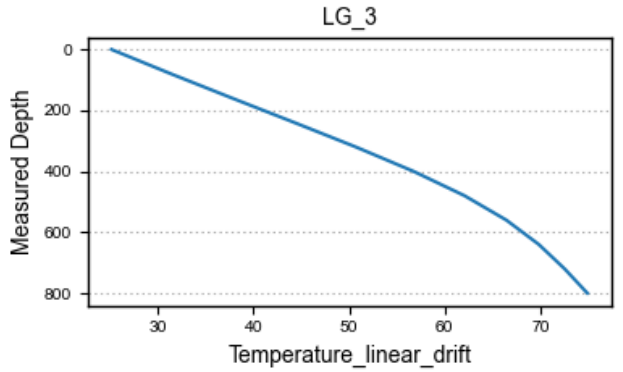
95 MT sites



9. DISCUSSION AND CONCLUSIONS







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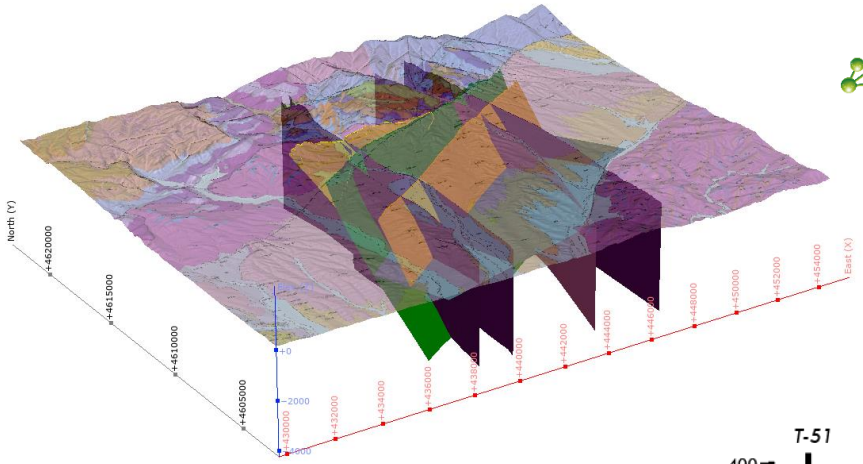
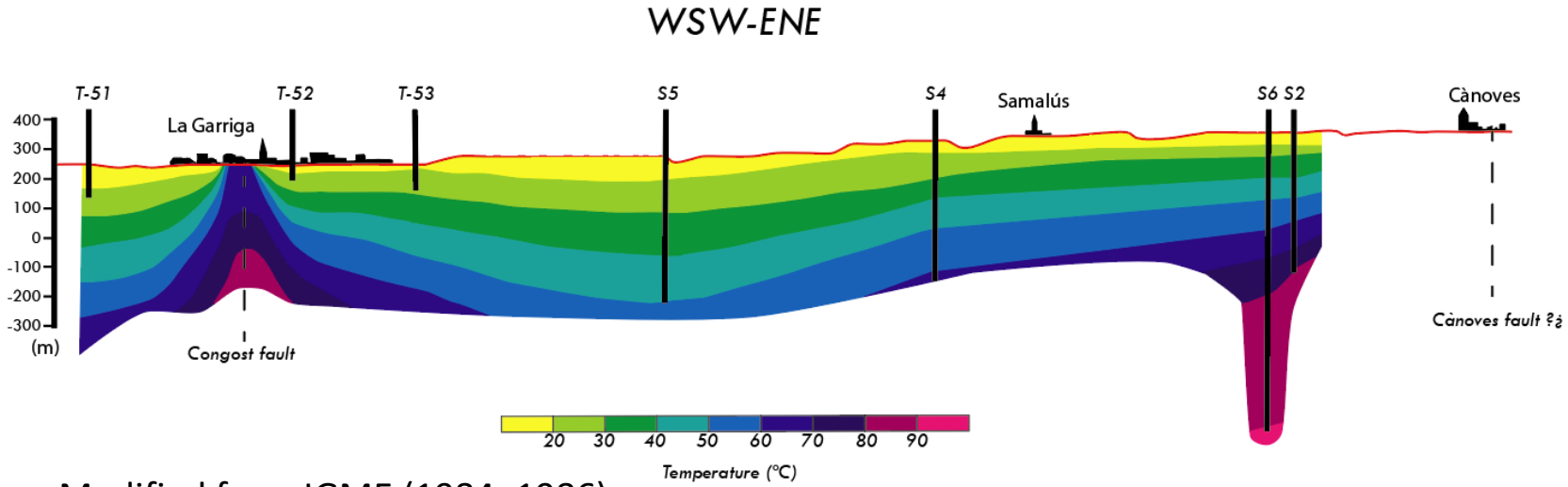


leapfrog



Modified from IGME (1984, 1986)

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