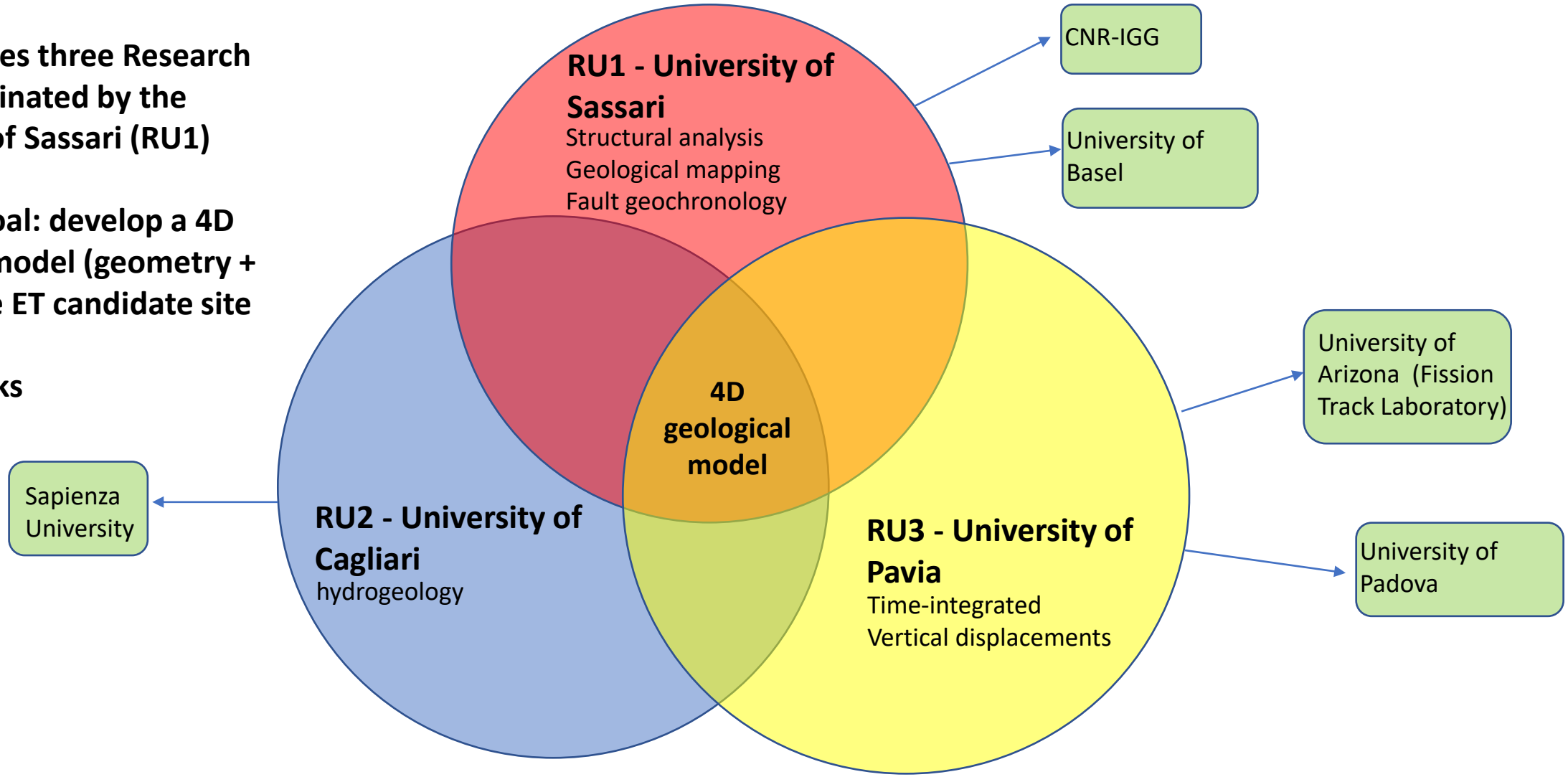
WD organization (WD2)

- **WU2 involves three Research Units coordinated by the University of Sassari (RU1)**
- **Common goal: develop a 4D geological model (geometry + time) of the ET candidate site**
- **Distinct tasks**



Tasks of RU1 (Sassari)

1. Improvement of the geological-structural map (actual scale 1:50.000, expected 1:25.000) of the ET candidate site status – in progress (50% completed), EXPECTED 2023, September
2. New ERT lines across the main lithological contacts along the actual ET tunnel traces. Status – waiting for funding
3. Fault dating of the most recent structures, partly related to fluid circulation. Status – in progress (40%, samples collected). EXPECTED 2023, December

Deliverables

1. 4D geological model. Status – in progress (20% completed). EXPECTED 2024

Tasks of RU2 (Cagliari)

1. Development of a new, high-resolution, Digital Elevation Model
   status – in progress (25% completed), EXPECTED 2022, December
2. Interpretation of remote sensing data (UAV, PSI)
   status – in progress (40% completed), EXPECTED 2023,October (the delay is required to reduce the errors of interpolated vertical displacements)
3. Springs census & chemical analysis of water
   status – in progress (75% completed), EXPECTED 2023, March (?)

Deliverables

1. 3D conceptual hydrogeological model, complemented by numerical simulation to show the pattern of underground water flow (including probability assessment) status – in progress, EXPECTED 2024, June

Tasks of RU3 (Pavia)

1. Sample collection for AFT (Apatite Fission Track) and U/Th-He apatite dating
   status - DONE
2. Sample preparation and analysis
   status – work in progress, EXPECTED 2023, May
3. Thermal modelling/data interpretation
   status – work in progress, waiting for the results, EXPECTED 2023, December

Deliverables

1. Development of time-integrated uplift/subsidence history status – in progress, EXPECTED 2024, June

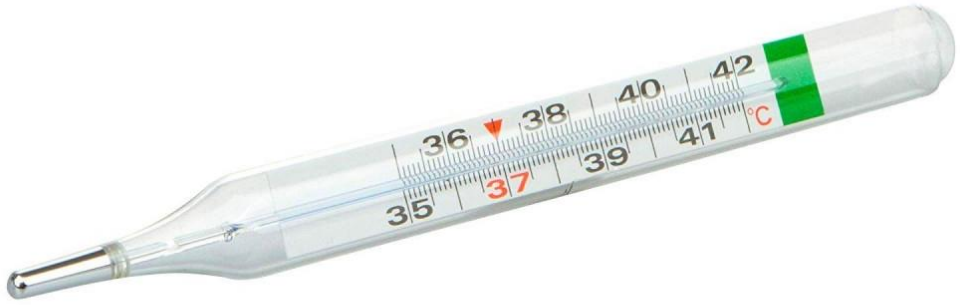
Thermochronology (RU3)

study the cooling history of rocks in the upper crust (<10 km).

It provides information on:

- temperature
- time (since a given mineral cooled below its closure T)

Uses: apatite, zircon + other minerals



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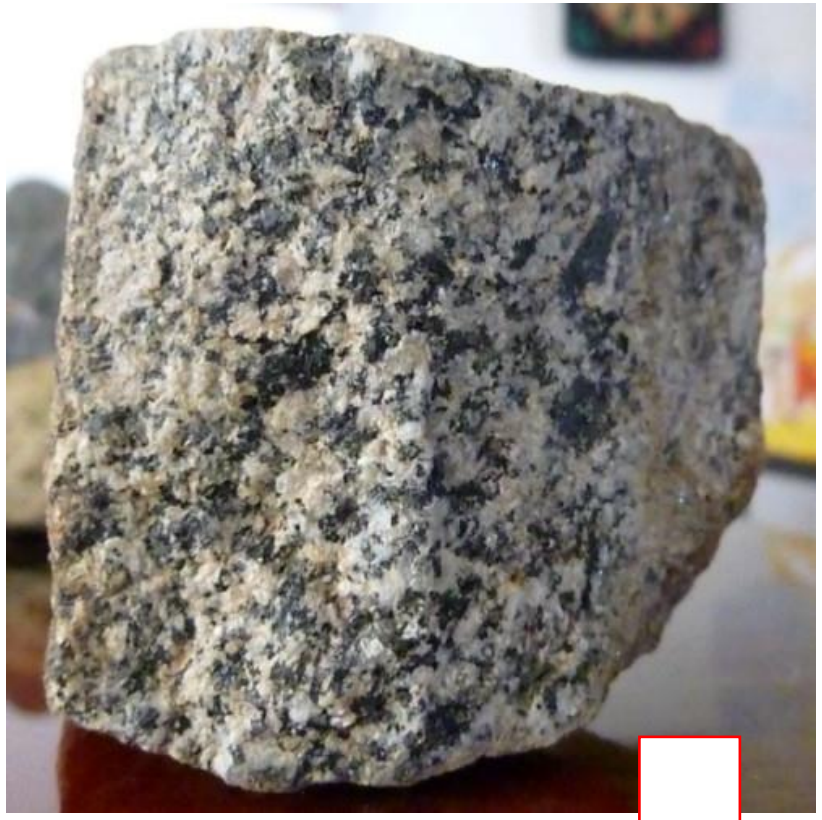
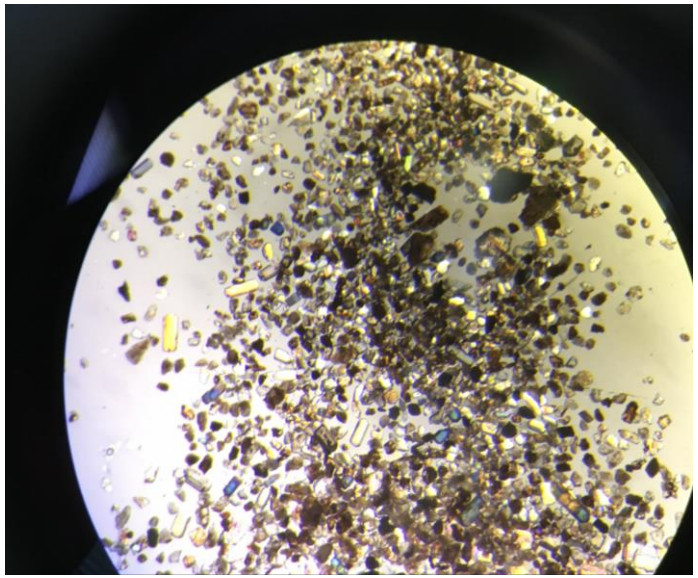
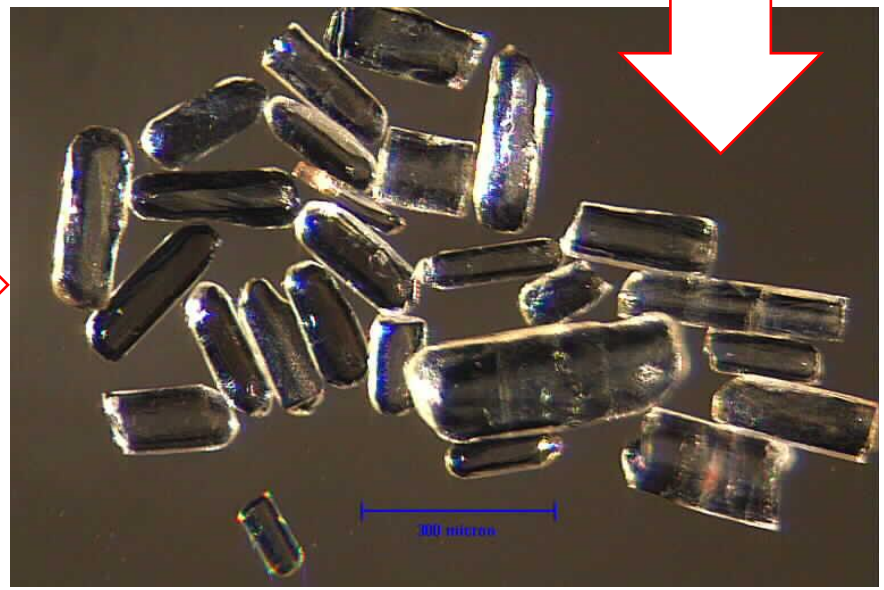
Apatite mineral = natural clock!

can be found in sand and also crystalline rocks (= granite, metamorphic rocks)



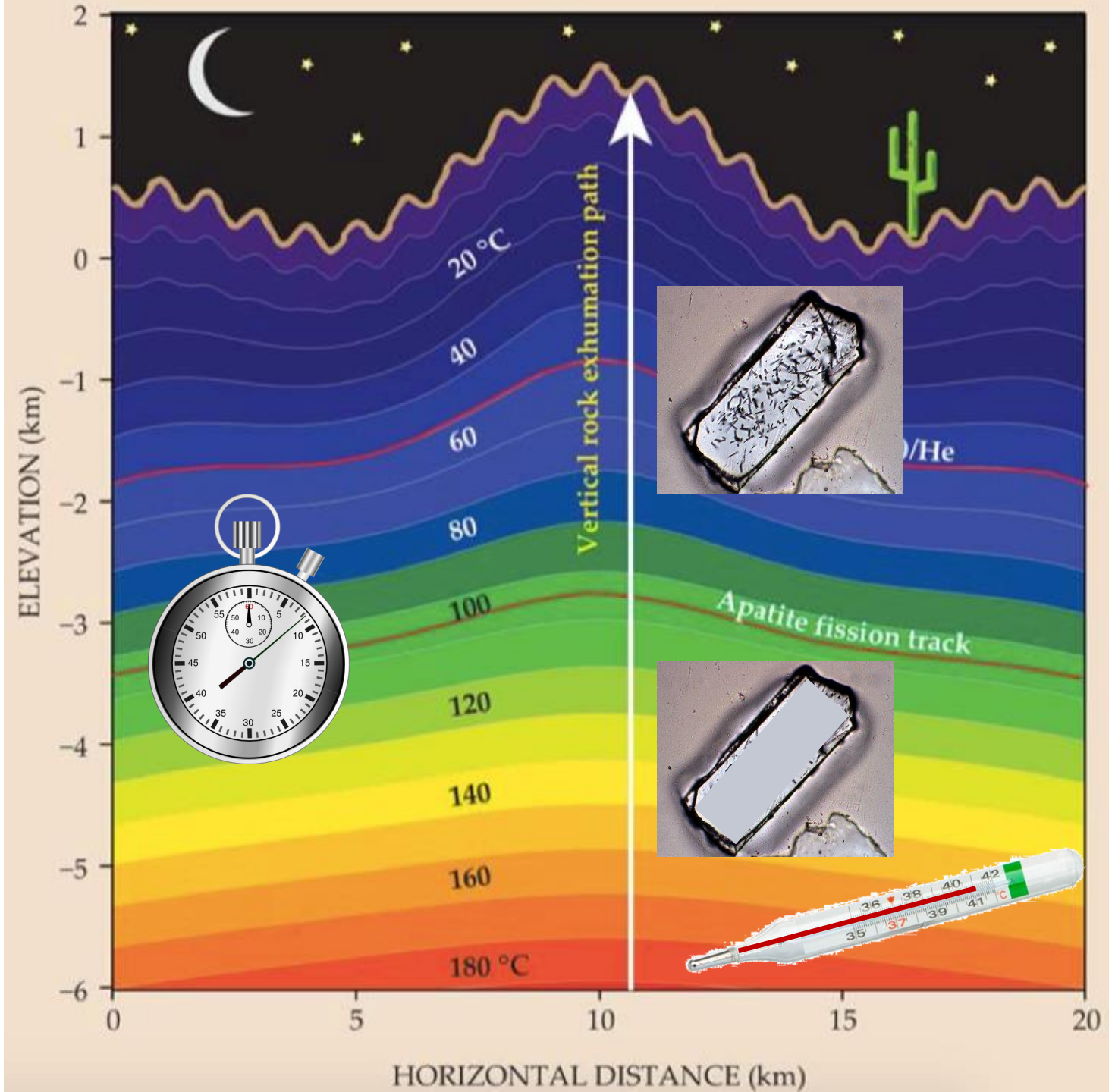
Sand under the microscope





A T vs depth profile

- helps determine the thermal history of rocks, thus their time-integrated vertical motion history as long as a geothermal gradient can be measured/assumed
- Isotherm: temperature tipically increases with depth at a rate of about 20–30 °C/km, so rocks cool as they get closer to the surface.
- **Thermochronometers provide time-temperature histories of rocks (and thus long-term vertical displacement rates!).**



How do rocks cool?

EROSION

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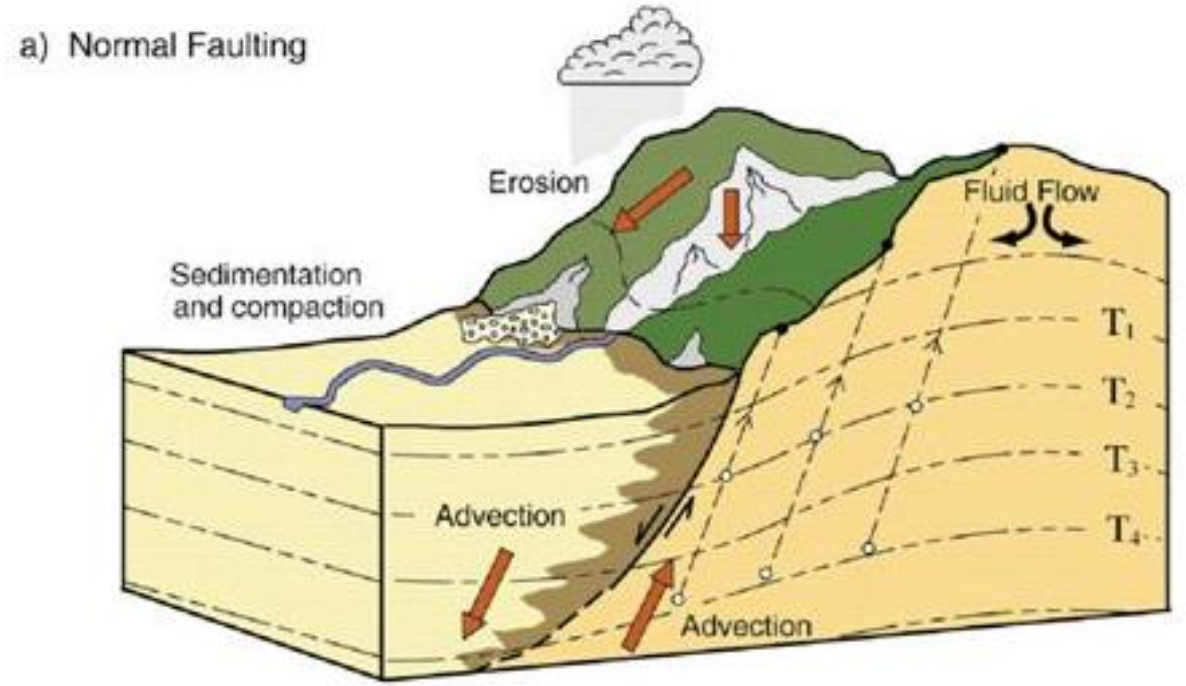
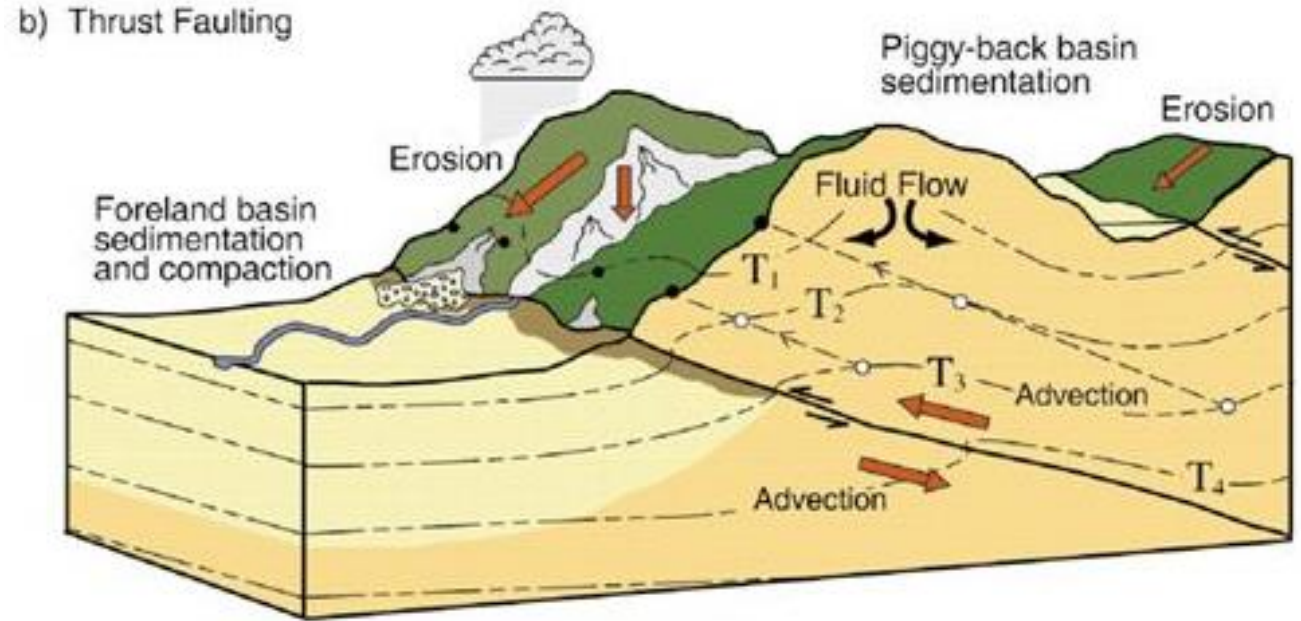
TECTONICS

The distinction between different forcing factors require combining thermochronoloy with other methods (structural analysis, geochronology)





Remote sensing (RU2)

Persistent Scatter Interferometry (**PSI**) – preliminary results indicate a general stability of the ET candidate site in Sardinia, with negligible apparent vertical displacements. More data (larger time-span) is needed to improve the accuracy.