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**Long term monitoring of a Mediterranean karst system used for water supply. Implication for the characterization and modelling of its dynamics. Case of the Lez karst system (MEDYCYSS Observatory)**

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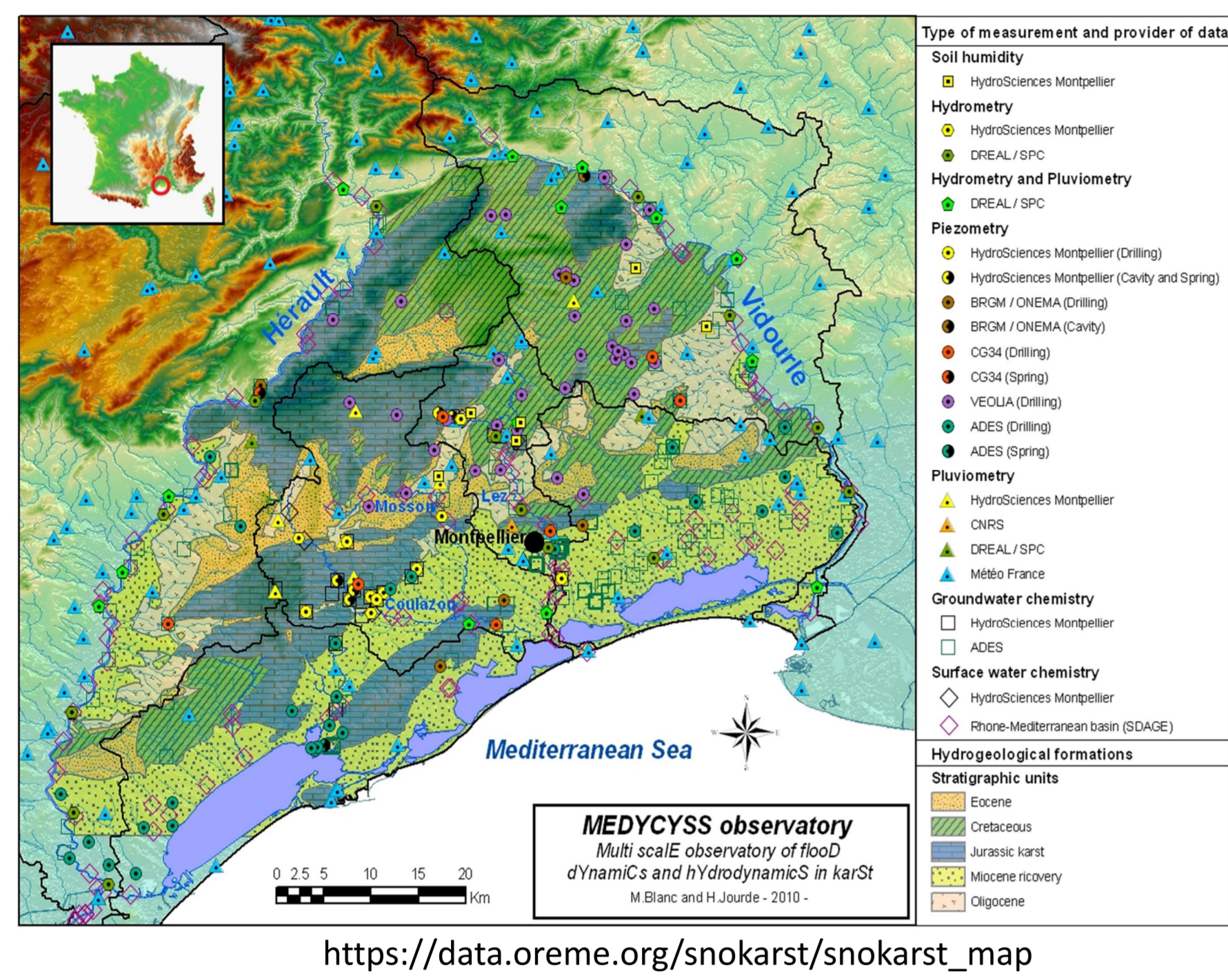
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## A Mediterranean territory



### Main focuses

Climate change and anthropogenic impacts on water resources (quantity and quality); Recharge processes, Surface water and groundwater interactions; Extreme climatic events

### Databases:

Observatory created in 2008. First measurements date back to 1950

## Main scientific issues

Observation and modeling of transfer processes associated with various entities (surface and underground) of Mediterranean karst hydrosystems. Specific focus are:

- underground hydrodynamics of karst aquifers subject to the actions of climate and anthropogenic forcings
- rapid hydrologic processes that take place during extreme floods in Mediterranean drainage basins that have a high karst component
- development of specific methods and tools based on a coupled hydrodynamic/hydrochemical approach to determine the quantitative and qualitative risks on water resources.

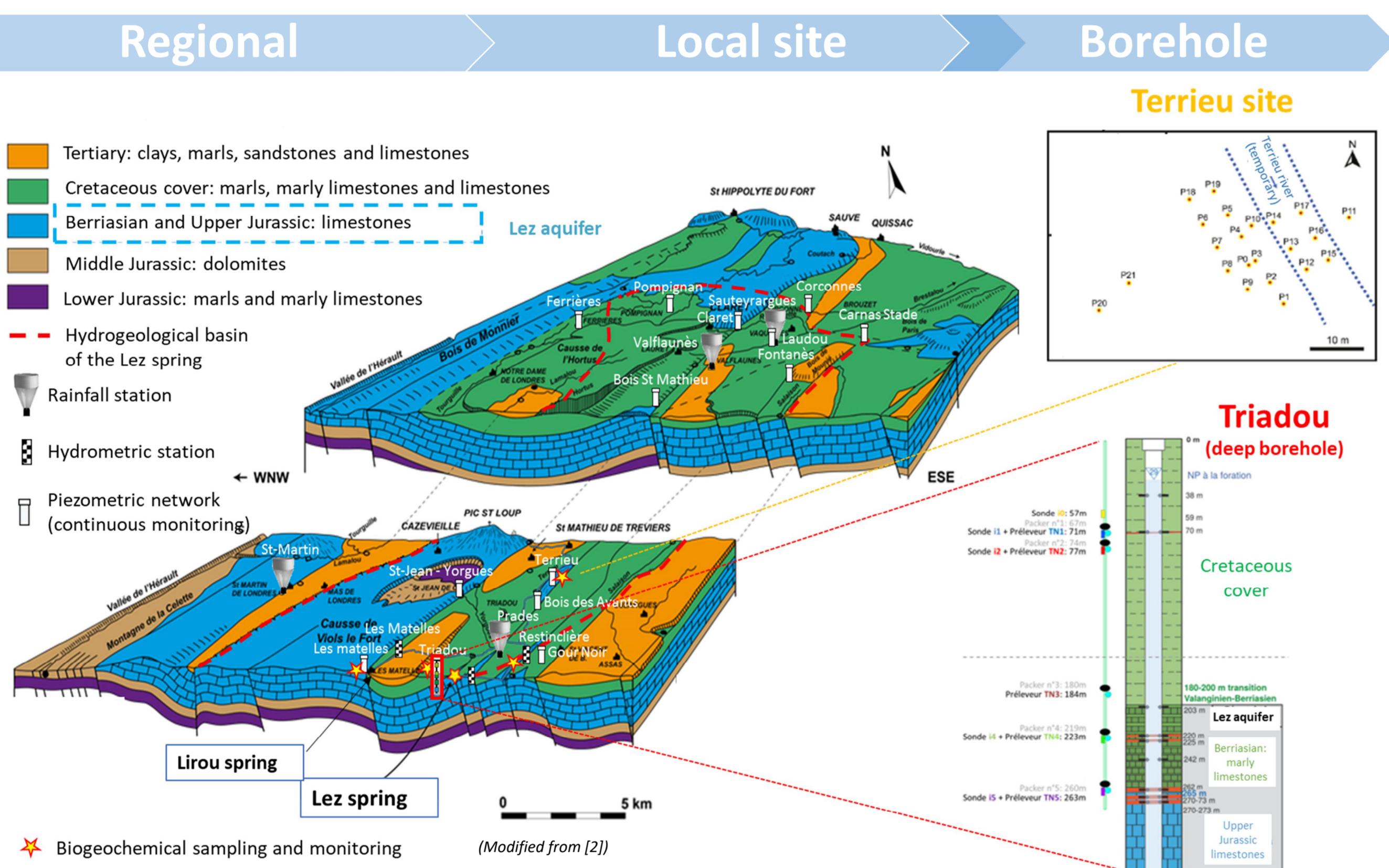
## Research networks

MEDYCYSS belongs to national and international observation sites networks dedicated to the observation and monitoring of the Critical Zone:

- OSU OREME
- French KARST observatory network (SNO KARST, INSU/CNRS)
- Research Infrastructure OZCAR (Critical Zone Observatories: Research and Application), the French network of eLTER (European Long-Term Ecosystem Research infrastructure)

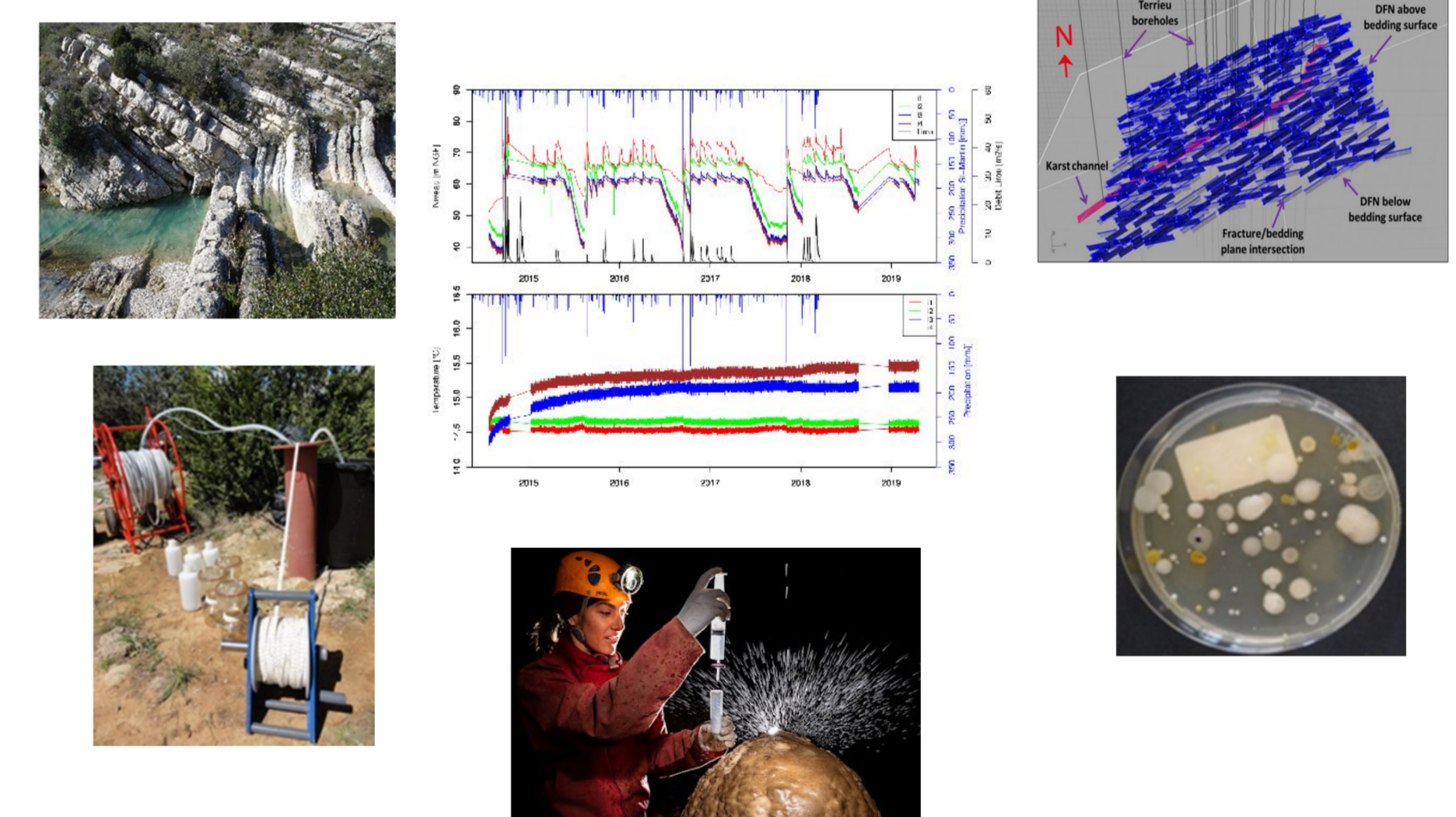
## Tools, methods and monitorings

## Multiscale spatial and temporal observations



## Regular, flood events and high frequency monitorings

- **Meteorology:** 6 rain gauges, 2 weather stations (precipitation, wind, solar radiation, humidity) and a tower fluxes (water and carbon fluxes)
- **Hydrology :** stream water levels and discharges (9 stations)
- **Hydrodynamics :** Pressure, spring discharge (continuous monitoring). Boreholes measurements: loggings, flow profiles, pumping tests, hydraulic packers testings
- **Biogeochemistry:** T°, Electrical conductivity (EC), Major and trace elements, Total Organic Carbon (TOC), Natural fluorescence, Carbon and water stable isotopes, Sr-B-Li-Ra isotopes, dissolved gases (noble and anthropogenic), microbial ecology and antimicrobial resistance.



## Observation networks

- **Regional scale:** boreholes, perennial and temporary springs, sink-holes
- **Local scale:** Terrieu experimental site, located 5 km from the Lez spring, 22 boreholes of 60 m depth spread over an area of 0,5 km<sup>2</sup>
- **Borehole scale:** continuous monitoring (P, T°, EC) on 15 boreholes, including the Triadou deep borehole (333m), located 700m upstream the Lez spring and near a temporary river (Triadou site). Equipped in 2014 with the "Multi-level monitoring PMPS, SolExperts » (Equipex CRITEX Project). It includes a series of packers isolating 5 producing zones for groundwater sampling and monitoring (P, T°).

## Data access

Observations are available to scientific community and general public via the following database platforms:

**OSU OREME, OZCAR-THEIA, DEIMS-SDR eLTER**

<https://data.oreme.org/observation/snokarst>

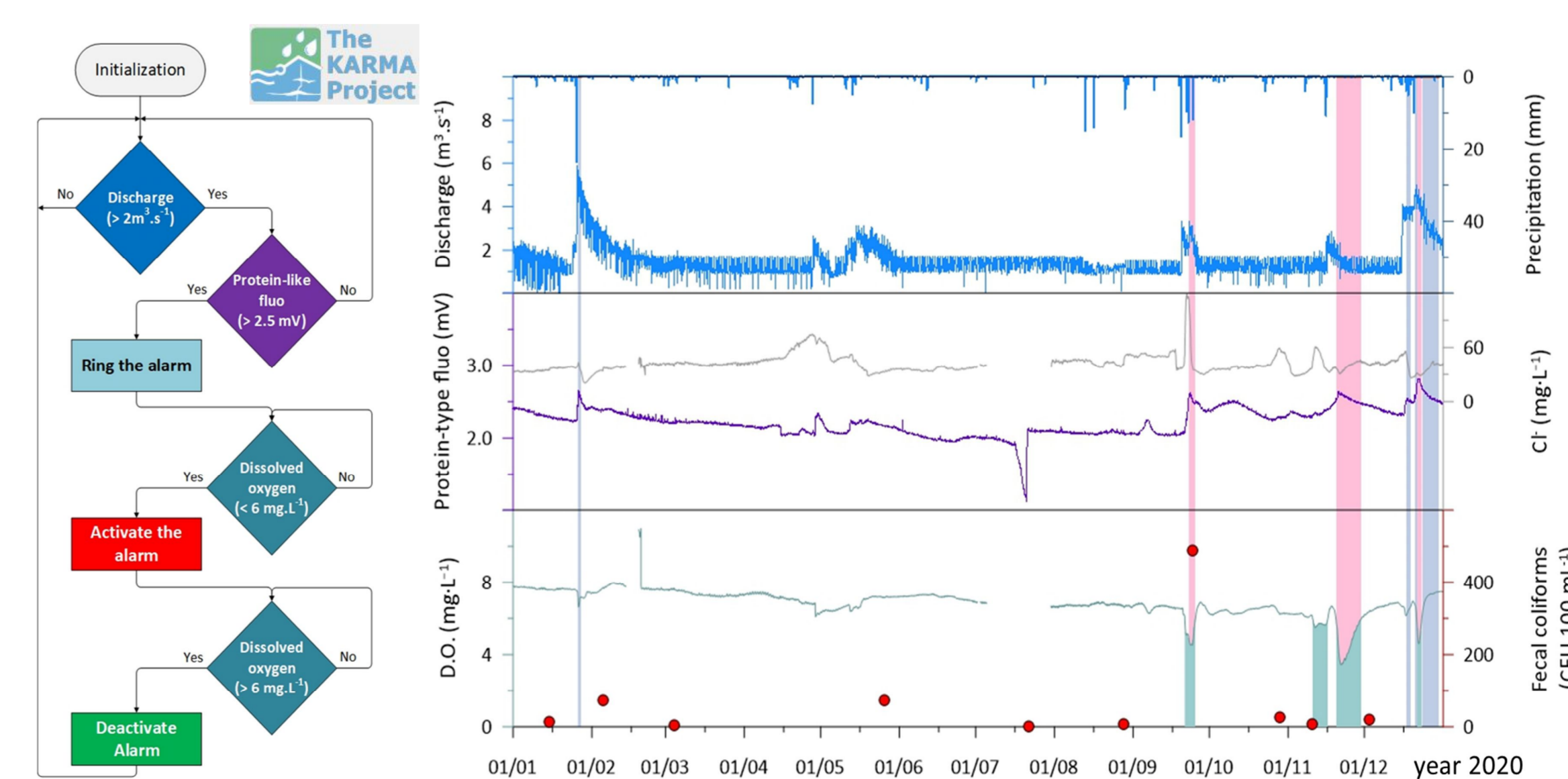
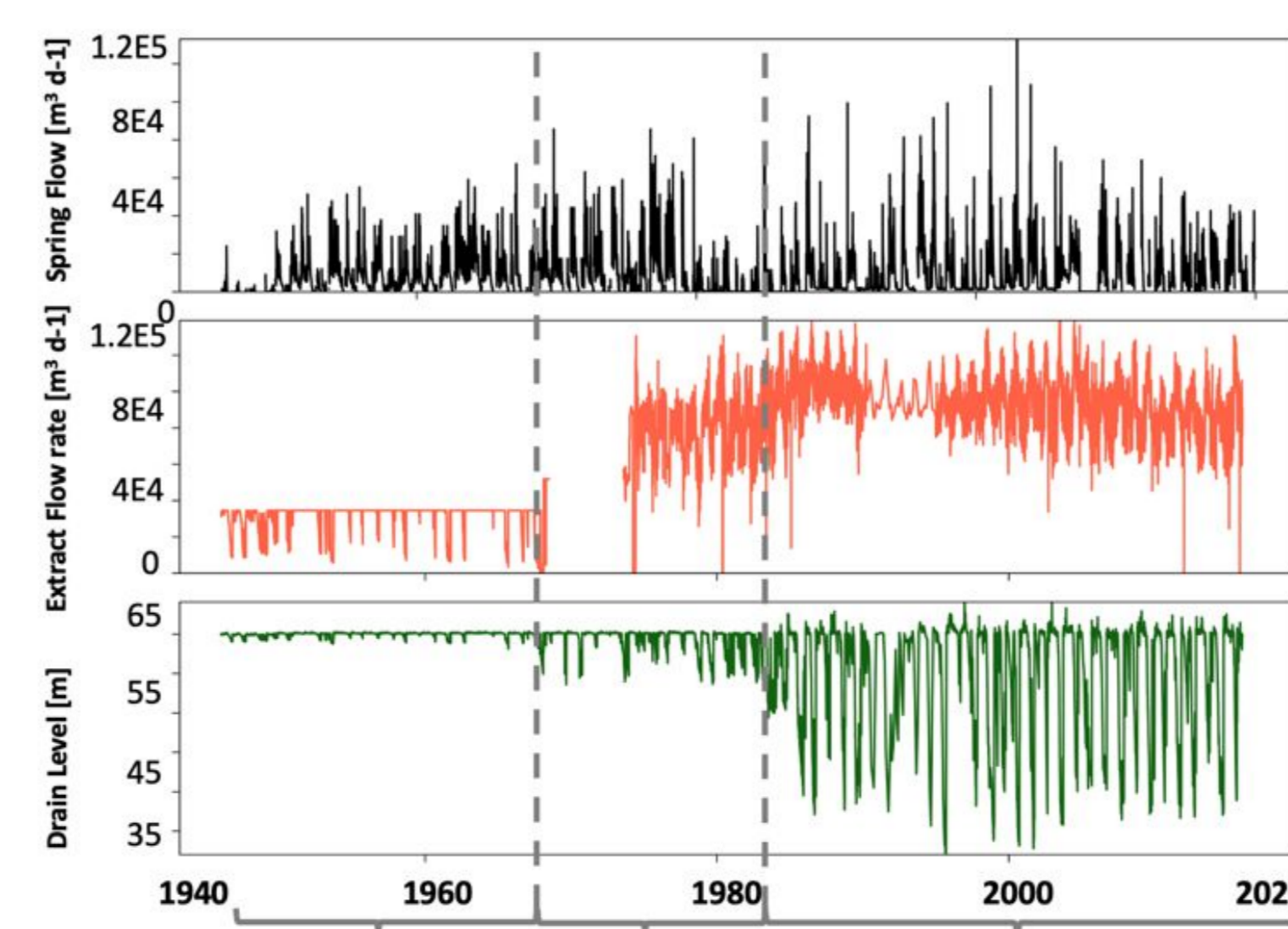
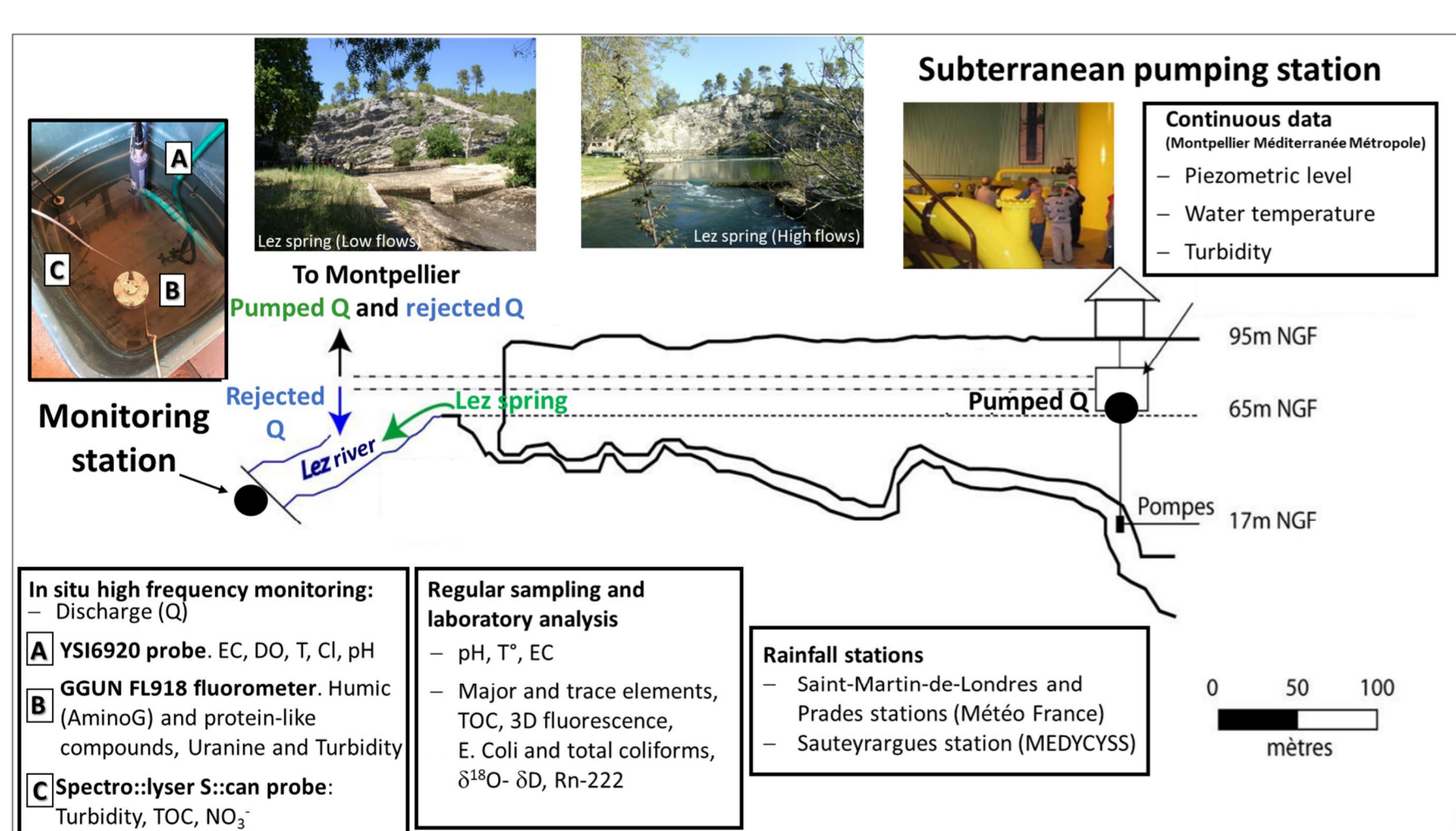
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## Mediterranean karst water resources: water availability and quality

### Ongoing scientific challenges

Characterization of climate change and anthropogenic impacts on the recharge processes and water resources : Importance of long terms monitoring of karst systems

Development of specific hydrochemical tools to characterize the different origin of water, and water quality at karst outlets: contribution of in situ high frequency monitoring to develop Early Warning Systems (EWS)



Coupling numerical approaches and modeling:

see Poster # 48 (Sivel et al.)

References: [1] Cousquer, Y., & Jourde, H. (Under review). Reducing Uncertainty of Karst Aquifer Modeling with Complementary Hydrological Observations for the Sustainable Management of Groundwater Resources. [2] Davaux, A. (2023). Facteurs d'échelle dans la hydrodynamisation des écoulements au sein d'un aquifère karstique : Analyse multi-échelles des propriétés hydrodynamiques et de transport de l'aquifère du Lez, Montpellier: 2023. PhD Thesis, Université de Montpellier. [3] Ulloa-Cedamano F., Batiot-Guilhe C., and Jourde H. (2022). Développement de systèmes d'alerte précoce (EWS) pour la contamination des eaux dans les zones karstiques méditerranéennes. 10<sup>th</sup> Workshop of SNO-KARST, 14-16 June 2022, France.