

Complementarity of academic Critical Zone Observatories with Water Authority measurements

OBJECTIVE:
To catch and understand time variability of water recharge for societal needs (Brussolo et al., 2022)



Decide what is worth monitoring

Given that:
1) winter rainfall vs snow is increasing
2) snowmelt is anticipating



Water authorities can help in measurements continuity in space and time

Rainfall has already many raingages, even if the radar is necessary to fill the gaps



Additional measurements (EC and T) in river can help understanding the subsurface (at the mountain no piezometer networks).



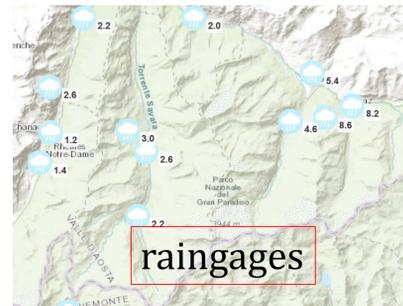
0 15 km

Glaciers are disappearing fast

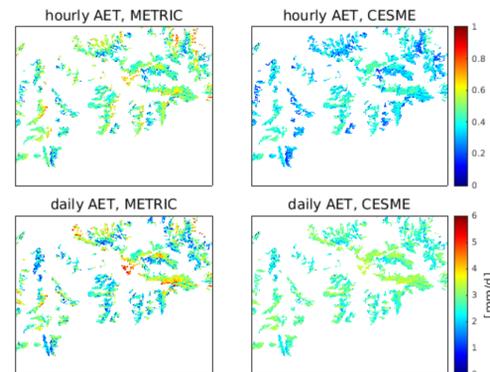
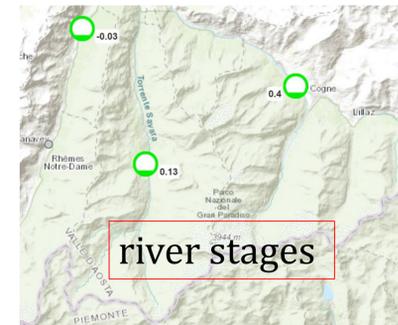


Here water authorities have 5 **soil moisture profiles** down to 40 cm

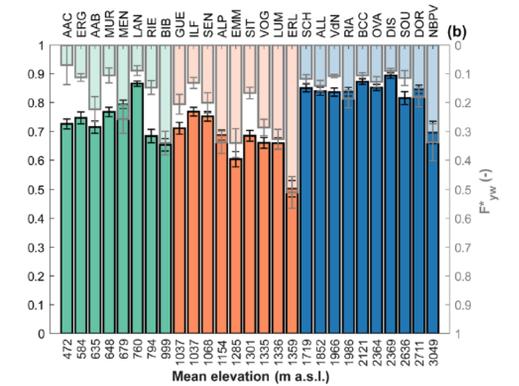
In this Italian mountain area we have one **dam** (but we cannot build new ones) which is providing hydroelectricity and in the near future also water to the 2 million inhabitants of the Turin area.



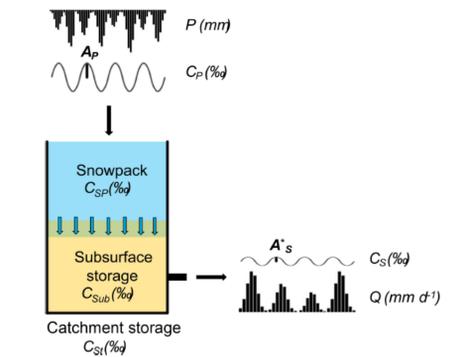
Snow can be evaluated from space, but some **more webcam** are necessary



Actual evapotranspiration can be evaluated with models and thermal images from space (Gisolo et al., 2022), cosmic rays can match the scale of remote sensing with ground truth (Bogena et al., 2022)



Doing some campaigns of stable isotopes we can correlate young water fraction with baseflow (we successfully did in 27 catchments, Gentile et al., 2023)



Brussolo et al. (HESS, 2022). Aquifer recharge in the Piedmont Alpine zone: historical trends and future scenarios.

Bogena et al. (ESSD, 2022). COSMOS-Europe: a European network of cosmic-ray neutron soil moisture sensors.

Gentile et al. (HESS, 2023). Towards a conceptualization of the hydrological processes behind changes of young water fraction with elevation: a focus on mountainous alpine catchments.

CONCLUSION: Synergy with water authority can give continuity, and can give data about water transit times and recharge, if sensors are added.

Gisolo et al. (J.Hydrology 2022) A calibration free radiation driven model for estimating actual evapotranspiration of mountain grasslands.