The "OZCARBRE": the phylogenetic tree of French Critical Zone Observatories

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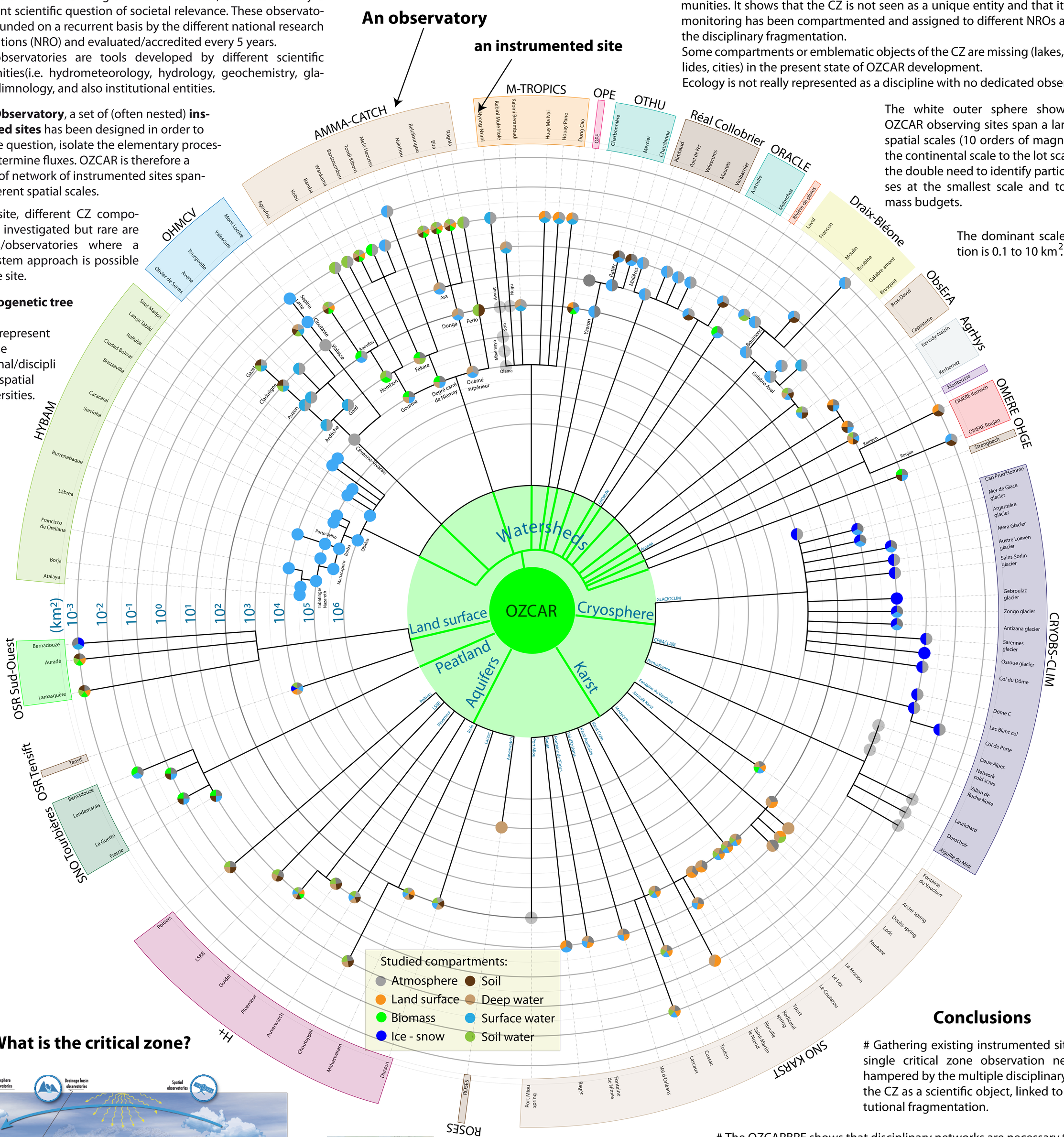
What is OZCAR?

OZCAR is a network of long-term observatories, each defined by a prominent scientific question of societal relevance. These observatories are funded on a recurrent basis by the different national research organizations (NRO) and evaluated/accredited every 5 years.
These observatories are tools developed by different scientific communities(i.e. hydrometeorology, hydrology, geochemistry, glaciology, limnology, and also institutional entities.

In each **Observatory**, a set of (often nested) **instrumented sites** has been designed in order to tackle the question, isolate the elementary processes or determine fluxes. OZCAR is therefore a network of network of instrumented sites spanning different spatial scales.

At each site, different CZ components are investigated but rare are the sites/observatories where a whole system approach is possible at a single site.

The **phylogenetic tree** is an at tempt to represent both these institutional/disciplinary and spatial scale diversities.



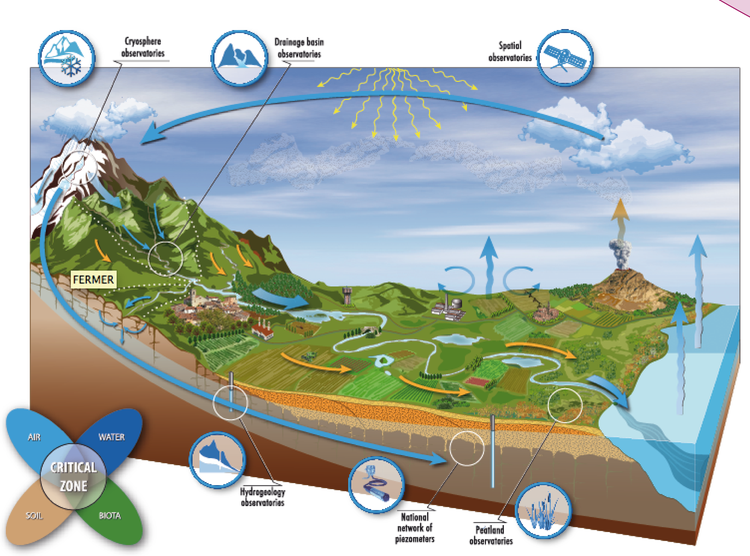
Results

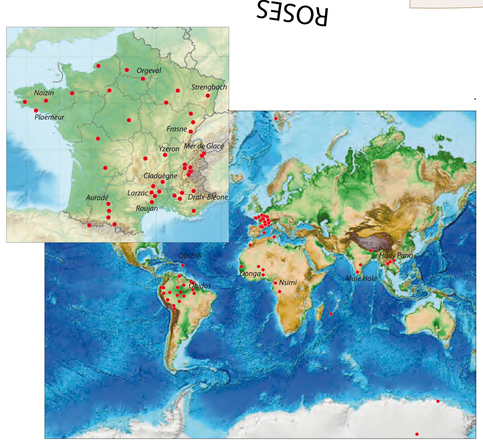
The central green "sphere" represents the sphere of institutions and research communities. It shows that the CZ is not seen as a unique entity and that its long-term monitoring has been compartmented and assigned to different NROs as a result of the disciplinary fragmentation.
Some compartments or emblematic objects of the CZ are missing (lakes, soils, landslides, cities) in the present state of OZCAR development.
Ecology is not really represented as a discipline with no dedicated observatories.

The white outer sphere shows that the OZCAR observing sites span a large range of spatial scales (10 orders of magnitude), from the continental scale to the lot scale, showing the double need to identify particular processes at the smallest scale and to determine mass budgets.

The dominant scale of integration is 0.1 to 10 km^2.

What is the critical zone?





Conclusions

Gathering existing instrumented sites into a single critical zone observation network is hampered by the multiple disciplinary views of the CZ as a scientific object, linked to the institutional fragmentation.

The OZCARBRE shows that disciplinary networks are necessary to disentangle the scientific questions and identify the natural processes and their controls, but do not allow a whole system approach at each site.

In order to achieve a whole system approach and monitor the different compartments of the CZ at the same place, the **watershed** (and the nested sites) appears as good compromise between the disciplinary view and the need for a more systemic approach.

Useful references:
 # Gaill ardet, J., Braud, I., Gandois, L., Probst, A., Probst, J. L., Sanchez-Pérez, J. M., & Simeoni-Sauvage, S. (2018). OZCAR: The French network of critical zone observatories. Vadose Zone Journal, 17(1), 1-24.
 # Braud, I., Chaffard, V., Coussot, C., Galle, S., Juen, P., Alexandre, H., ... & Squividant, H. (2020). Building the information system of the French Critical Zone Observatories network: Theia/OZCAR-IS. Hydrological Sciences Journal, 1-19.