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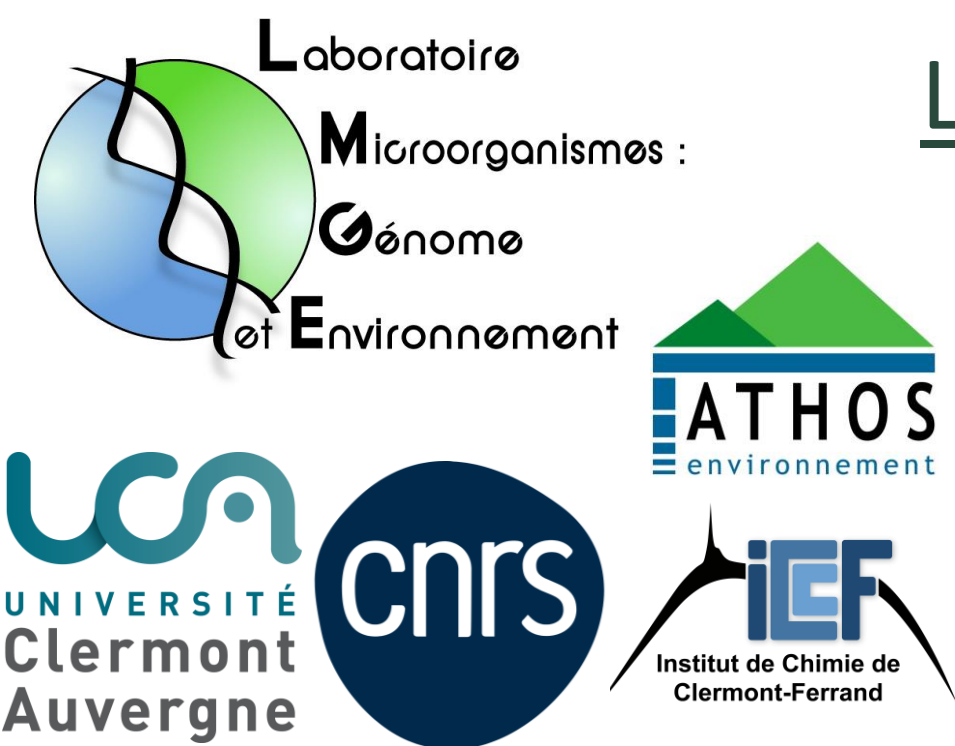
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Ten-year monitoring of cyanobacterial dynamics in seven lakes of Auvergne (France): diversity analysis and environmental parameters assessment

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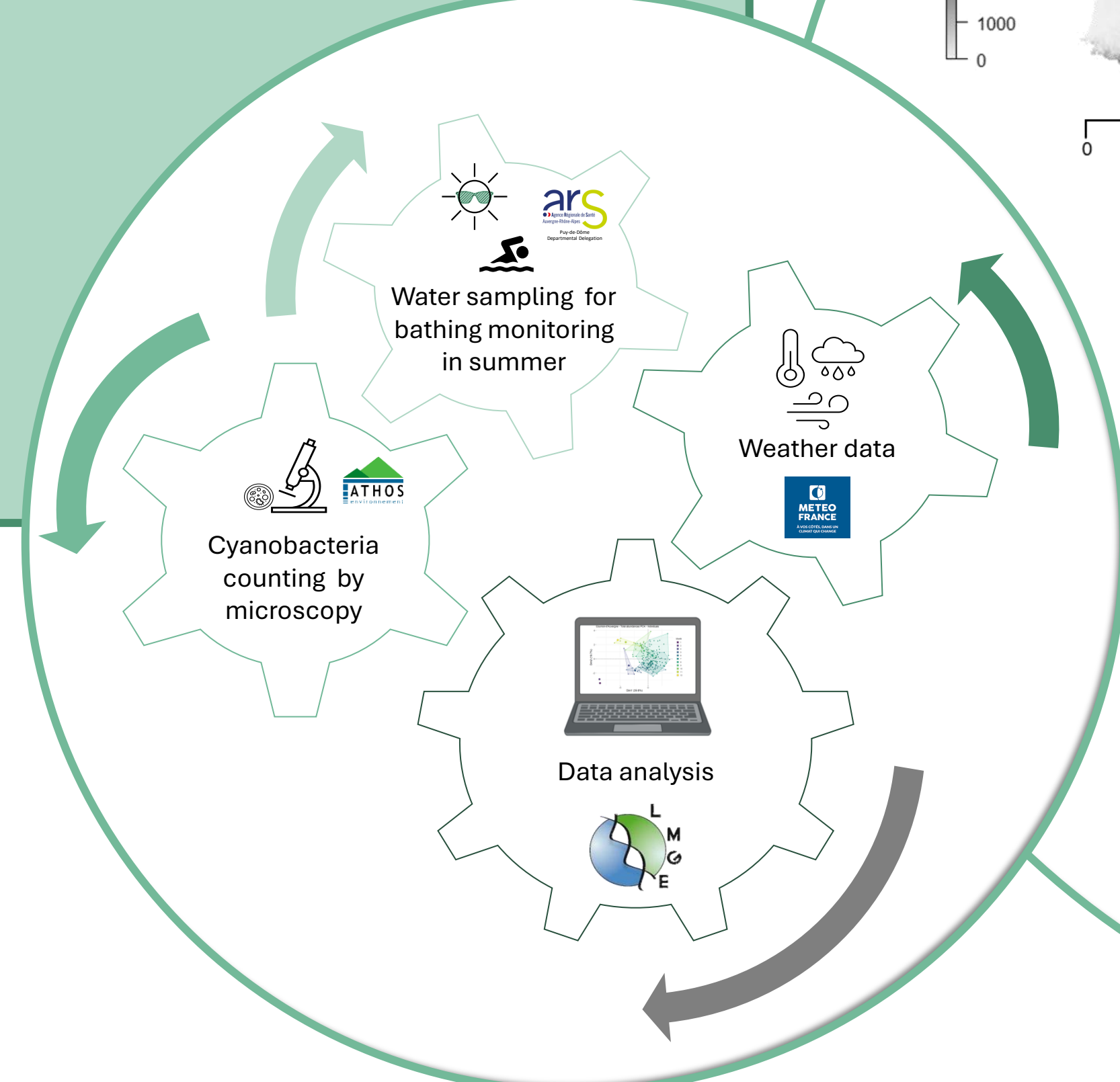
Context

To ensure the safety of aquatic activities in summer, the Regional Health Agency (ARS) monitors the swimming areas of the lakes. Bathing can sometimes present health risks, notably due to the presence of potentially toxic cyanobacteria that can cause skin, digestive or nervous system problems, or even fatal poisoning.

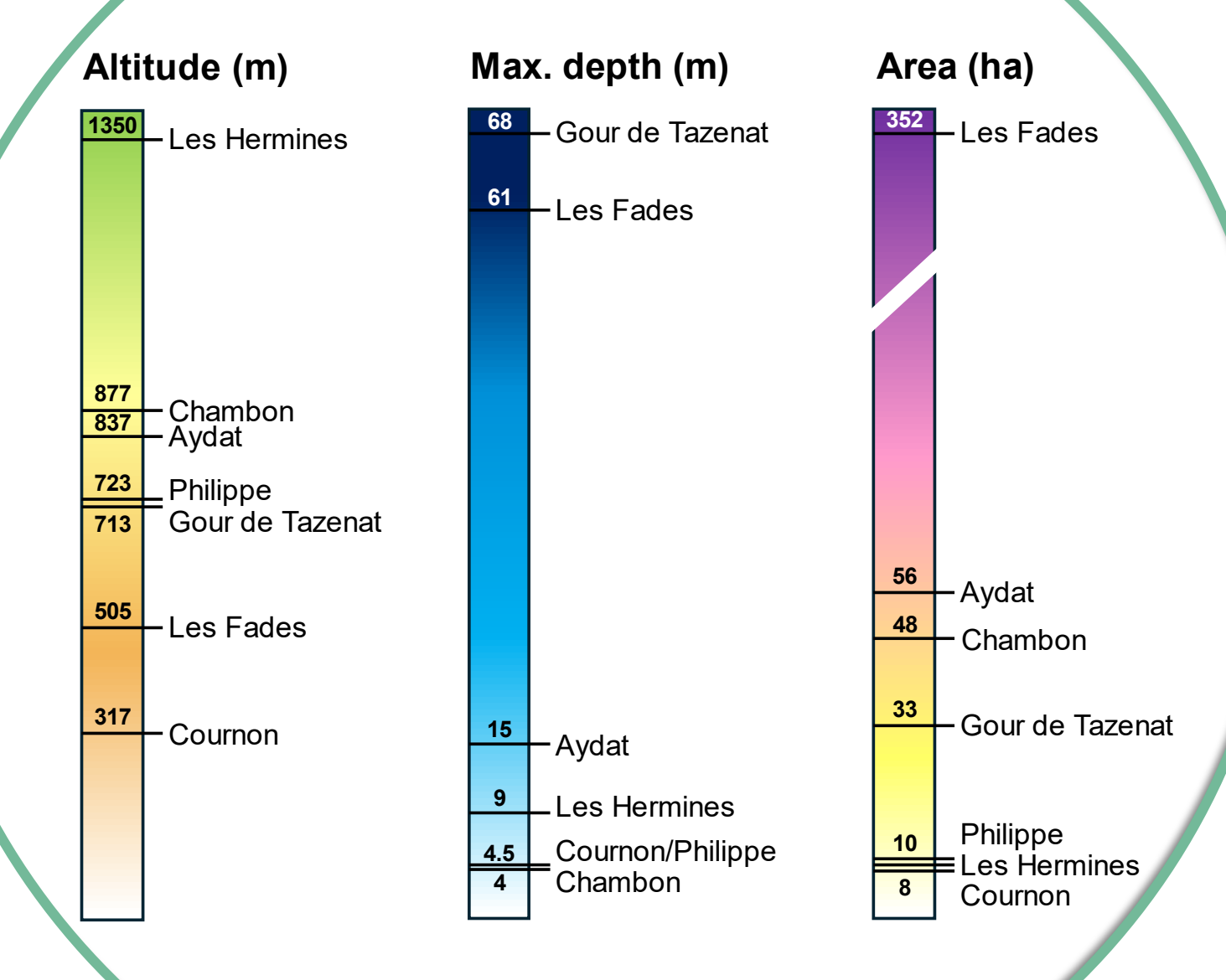
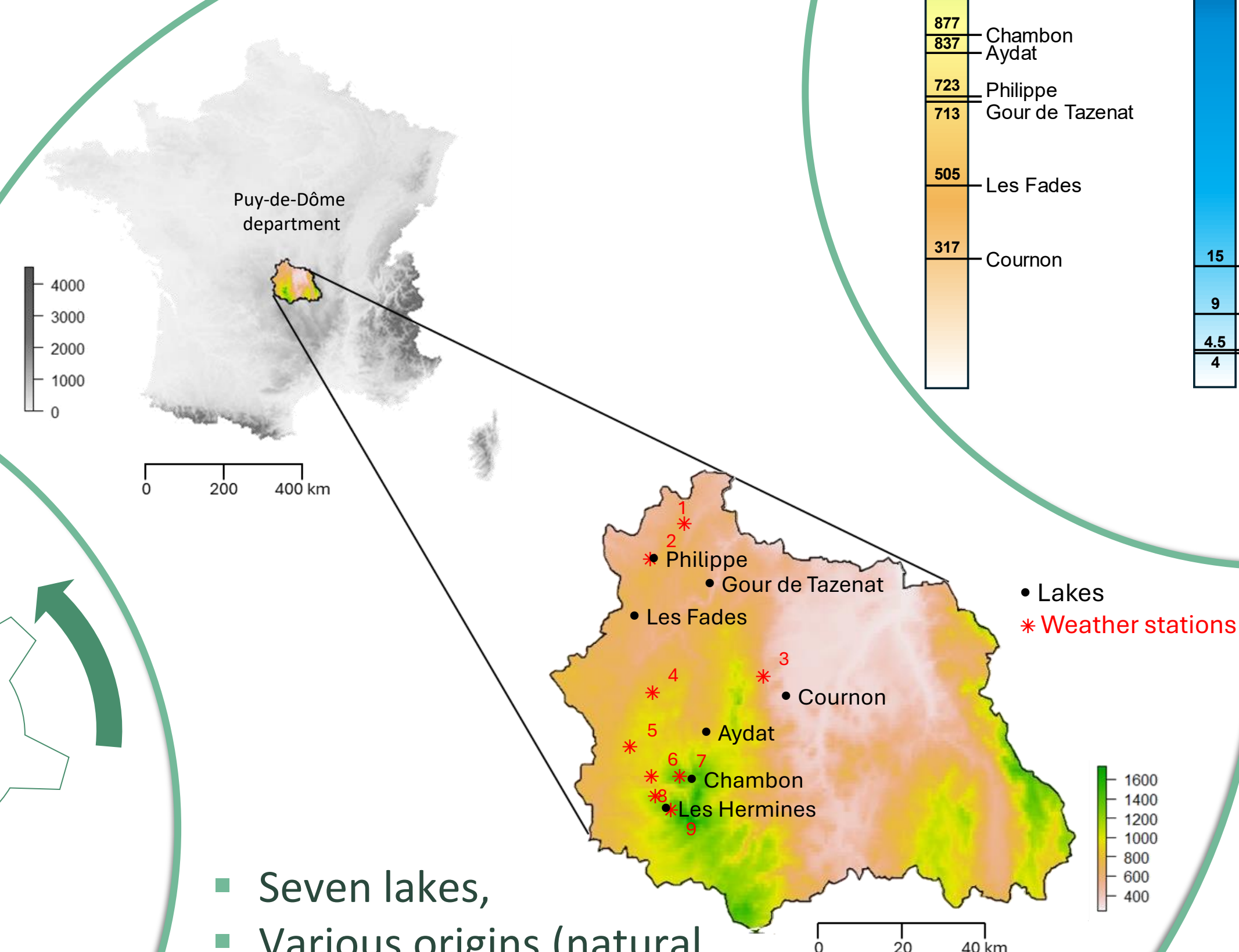
Objective

Understand the influence of morphometry of the 7 lakes/10 sites and environmental parameters on the cyanobacteria's diversity, particularly picocyanobacteria (less than 2 μm), which are little studied in freshwater lakes.

Method

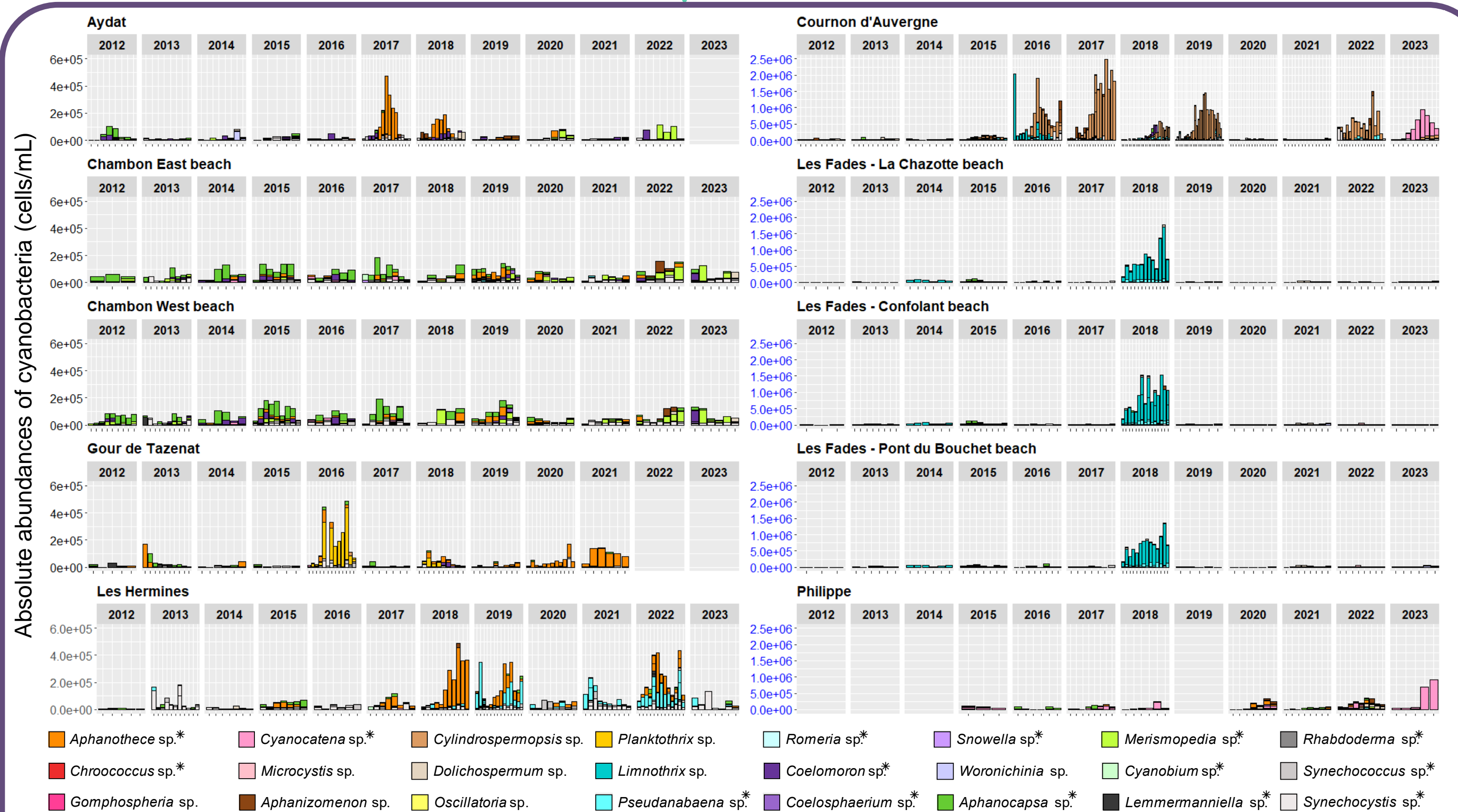


Studied sites

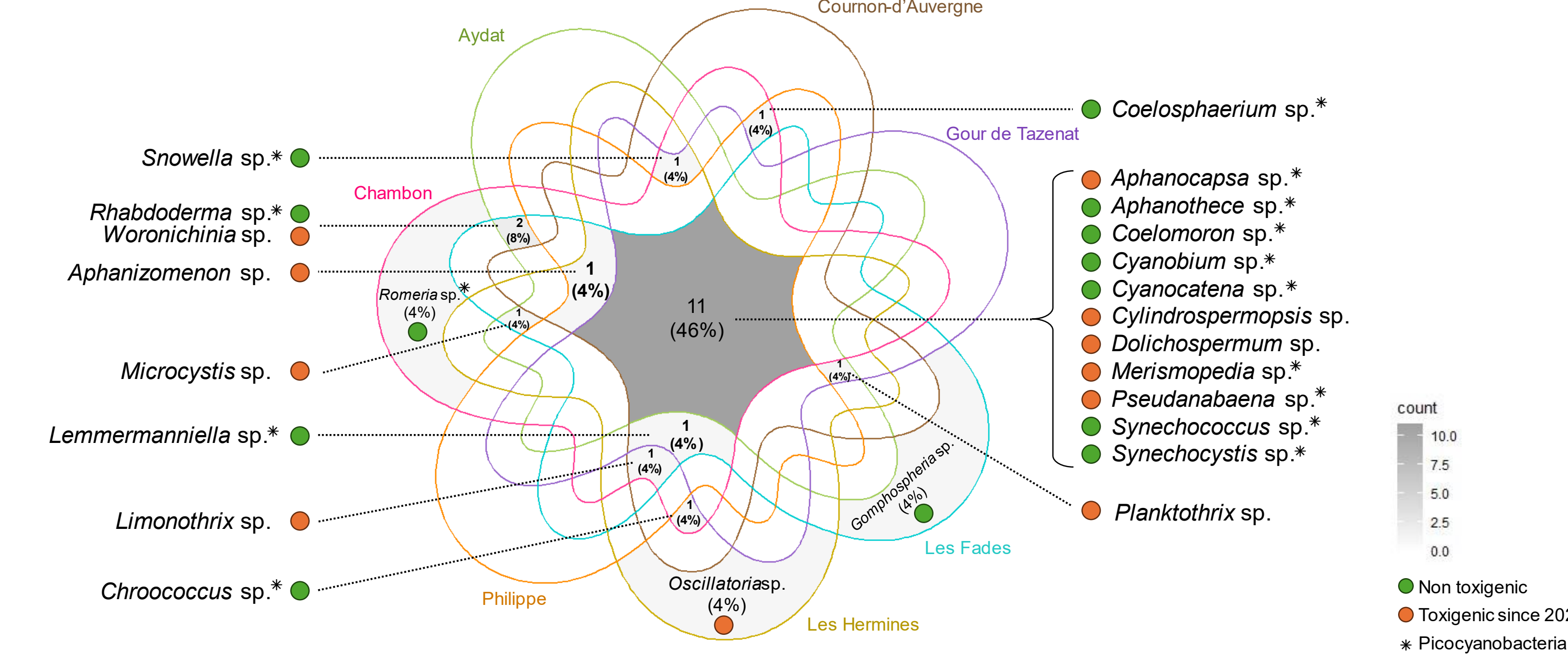


- Seven lakes,
- Various origins (natural, volcanic, man-made),
- Ten bathing areas previously closed due to toxigenic cyanobacteria.

Cyanobacterial composition and temporal dynamics

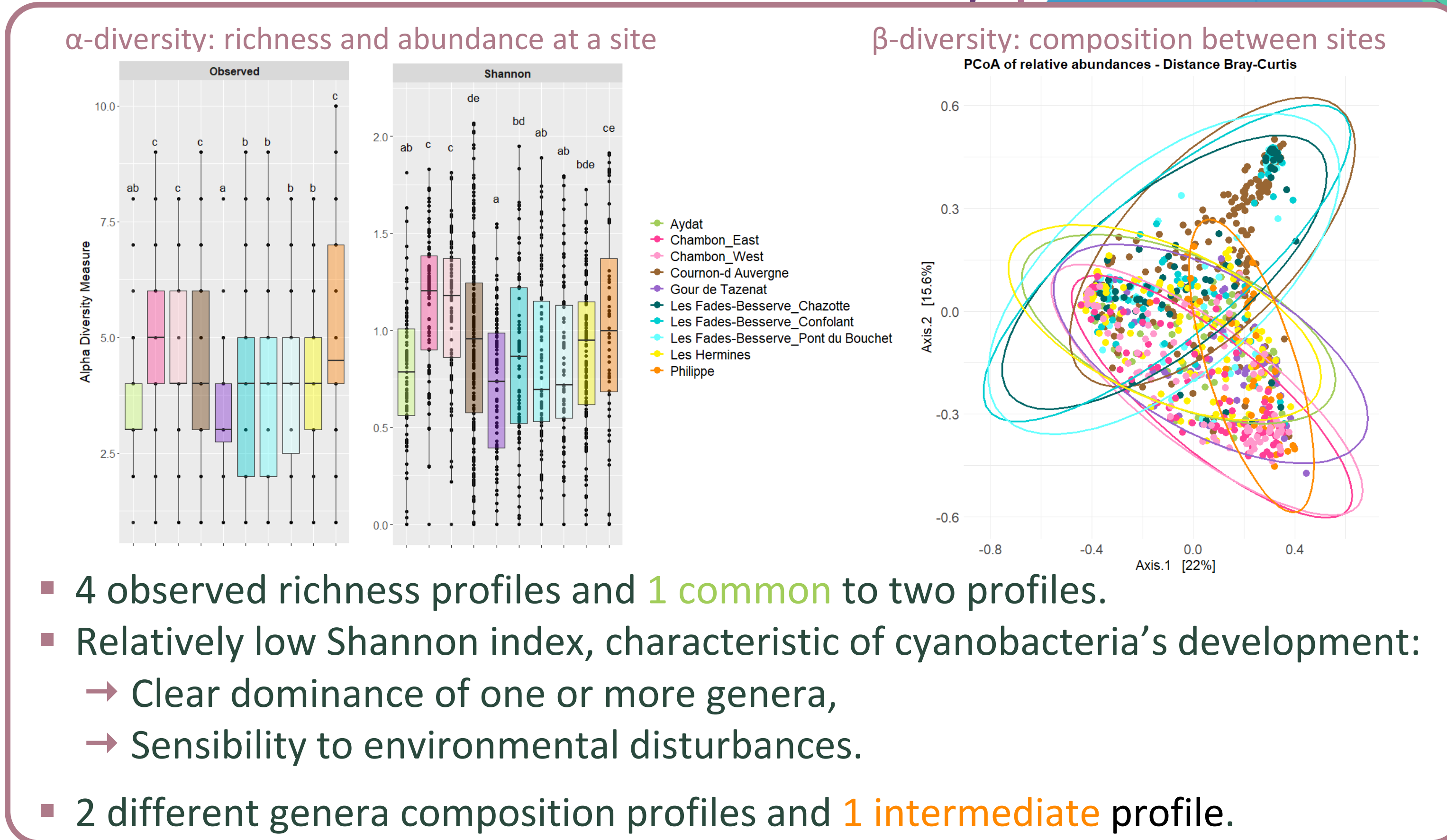


- Blooms unique in time, periodicity and composition for each lake.



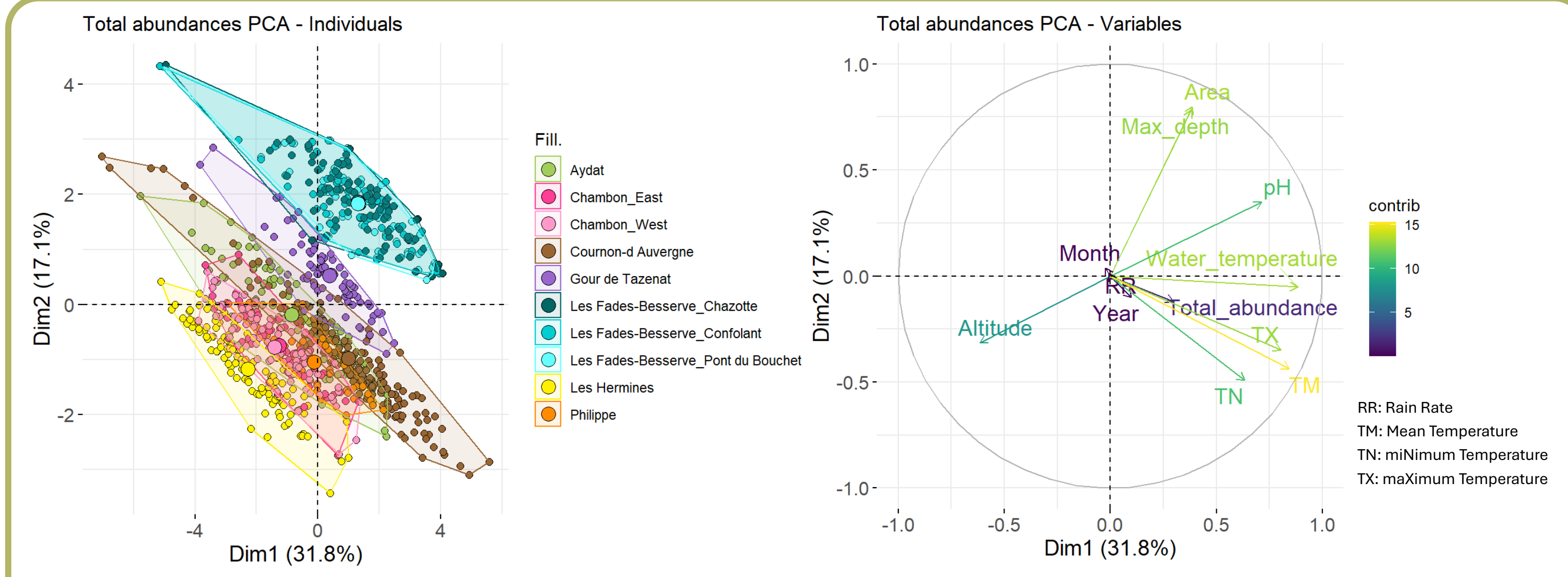
- 24 genera identified from 958 samples:
 - 11 toxigenic and 15 picocyanobacteria (<0.2 μm),
 - 11 common to all 10 sites.

Alpha and Beta diversities



- 4 observed richness profiles and 1 common to two profiles.
- Relatively low Shannon index, characteristic of cyanobacteria's development:
 - Clear dominance of one or more genera,
 - Sensibility to environmental disturbances.
- 2 different genera composition profiles and 1 intermediate profile.

Morphometry and Environment influence



- Morphometry influences differently the abundance of genera on Chambon, Les Hermines and Les Fades.
- Great influence of atmospheric temperature on Cournon data.

Conclusions

- Temporal dynamics of cyanobacteria are specific to each lake but similar between sites within the same lake.
- Many genera (46%) are common to all lakes.
- More than half of the genera are picocyanobacteria, which are often given little consideration: here, only three of them are toxicogenic in these lakes.
- While some sites show comparable richness in genera (α-diversity), the specific composition varies (β-diversity) (e.g. Cournon and Chambon).
- Conversely, the genera composing communities of some lakes are largely the same, but their abundance varies between them (e.g. Cournon and Les Fades).
- Lake morphometry has a major influence on the abundance of cyanobacteria from one lake to another, and environmental parameters influence the temporal distribution within a lake.