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Chloé Roger, Ophélie Fovet, Isabelle Braud, Manuela Grippa, Basile Hector, Jérôme Molénat, T. Datry, Stéphane Audry, Flora Branger, Nathalie Folton, et al.

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Which hydrological signatures of streams and rivers intermittence to identify causes and ecological consequences?



Roger C., Fovet O., Braud I., Grippa M., Hector B., Molénat J., Audry S., Branger F., Folton N., Le Bouteiller C., Nord G., Probst A., Probst J-L., Raclot D., Riotte J., Ruiz L., Zitouna R. and Datry T.



The aim of this project was to identify hydrological signatures which allow to quantify the intermittence of small headwaters watersheds of OZCAR network, in terms of frequency, duration and calendar. We then tried to identify the causes of this intermittence by a systemic approach, by mobilizing additional metrics (hydrological and climatic). And finally, we tried to connect hydrological signatures of intermittence to ecological data, to identify potential impacts of dry events on ecological abundance of macro-invertebrates.

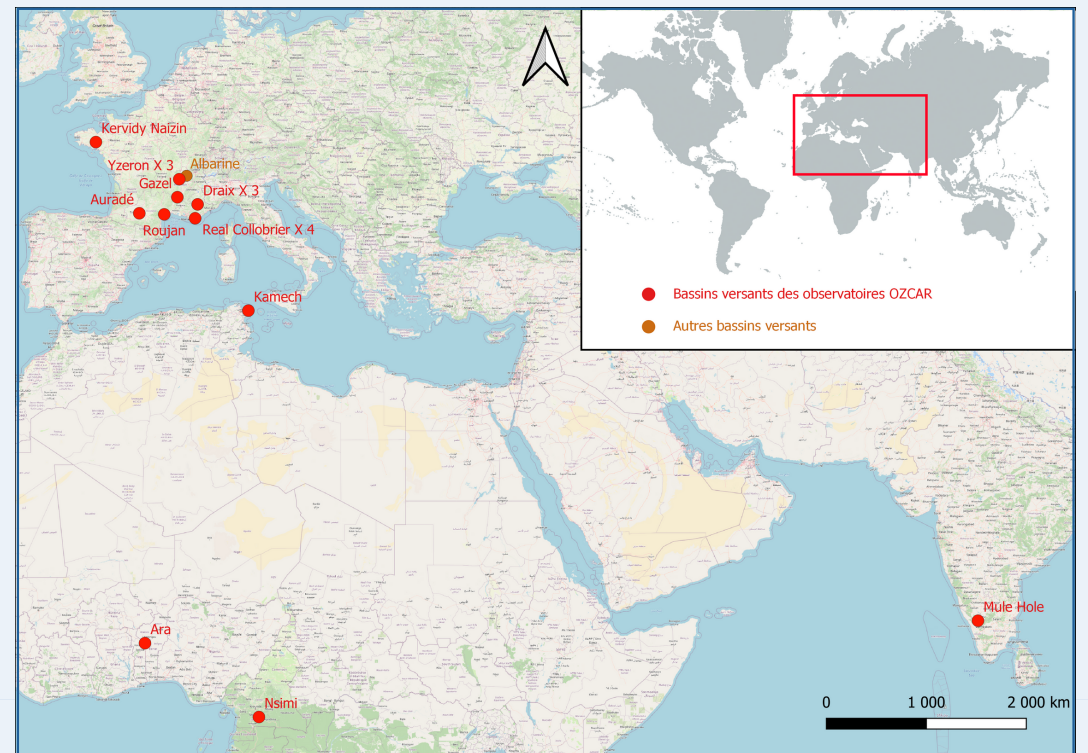


Figure 1 : Location of the study sites

Materials and methods

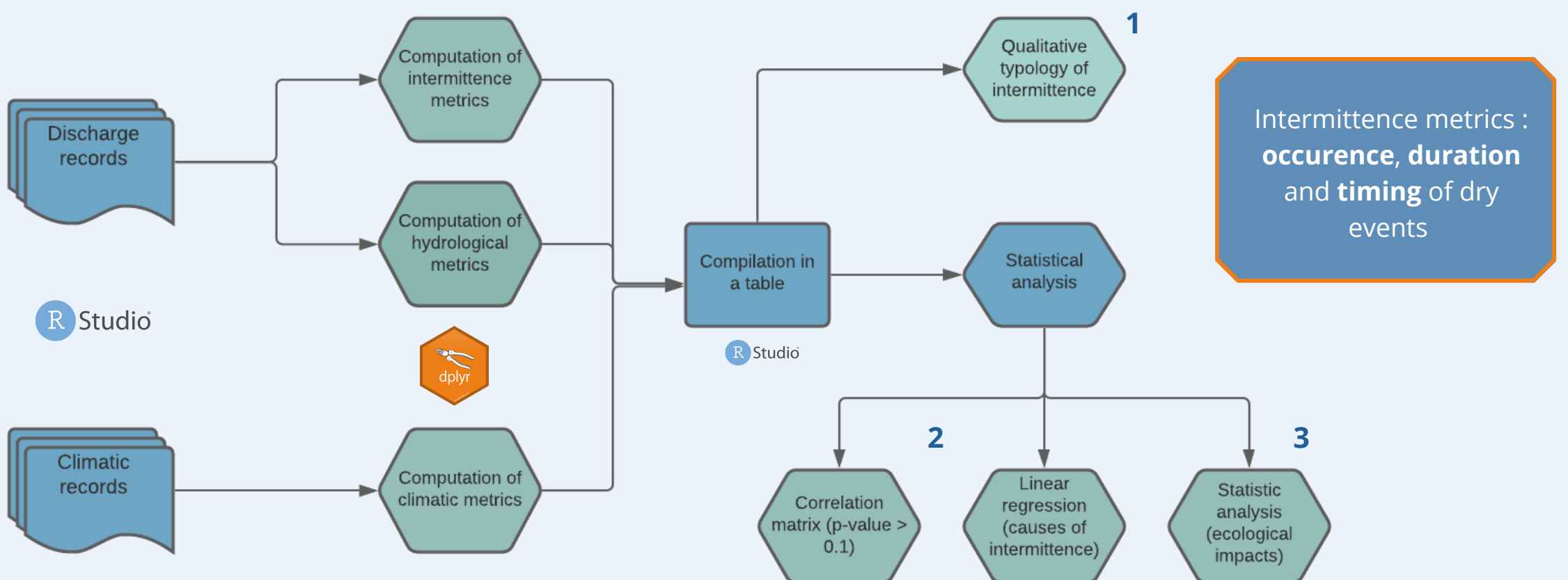


Figure 2 : Processing chain followed for the realization of the study.

Results and perspectives

1 3 types of intermittence identified

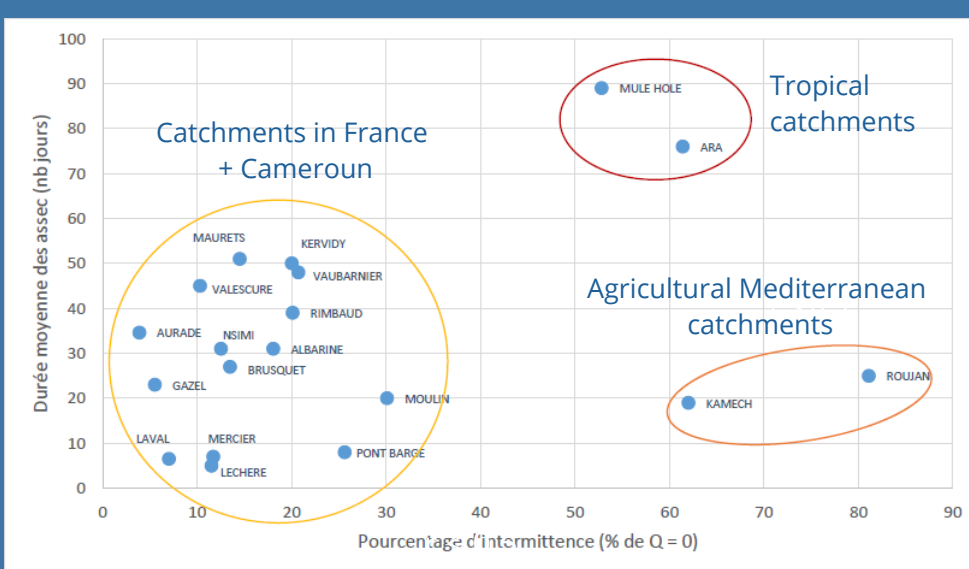


Figure 3 : Duration characteristics depending on dryness frequency for all basins. Circled in red: High frequency and duration. Circled in orange: High frequency, but low duration. Circled in yellow: Low to moderate frequency and duration.

2 Interlocking of levels to identify causes

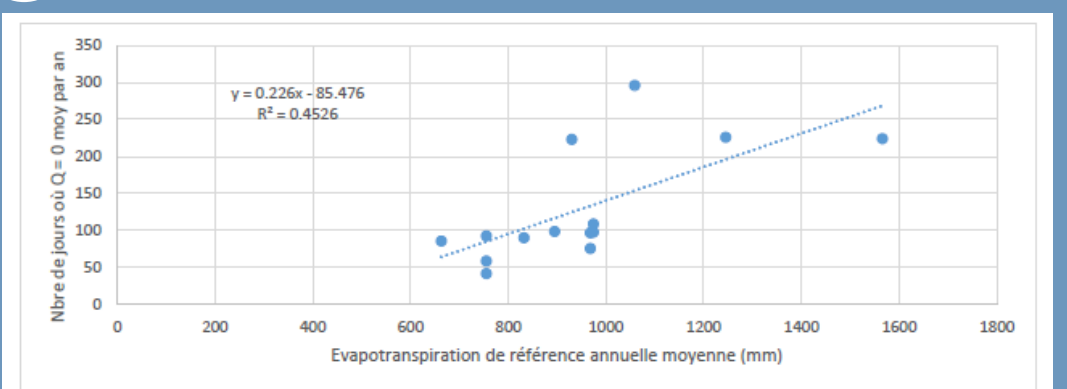


Figure 4 : Linear regression of annual ET0 and dryness frequency.

- Major determinants of intermittence : **climatic variables** ($r = 0.8, -0.8, 0.6$)
- Secondary determinants : hydrological **connectivity to groundwater** ($r = 0.5$)
- Tertiary determinants : **specific components of watershed** (e.g. : vegetation) $r < 0.5$

3 Ecological impacts

Lack of aquatic ecological data **co-located** with hydrological measurements which challenges the OZCAR-RI

Need for a **coordinated sampling protocol** consistent with the cycles of aquatic species and the hydrological seasonal dynamics

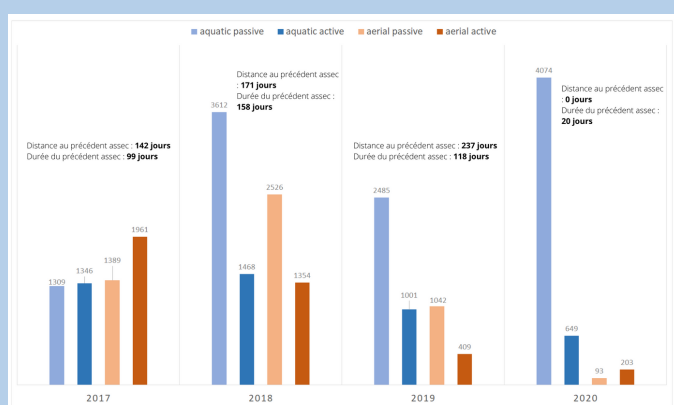


Figure 5 : Taxonomic abundance of macro invertebrates for each habitat and behavioral modality. In light blue, passive aquatic species. In dark blue, active aquatic species. In light orange, passive aerial species. In dark orange, active aerial species.

4 Discussions and perspectives

- Analyzing **2nd order factors** within the French catchments
- Analyzing trends on the dry period characteristics (Roujan, Kamech, Reals, + Houay Pano)
- Needs for catchment **storage capacity** and storage estimates (piezometry, geophysics)
- Describing the **spatial dynamics** of hydrological intermittence (remotely sensed data e.g. altimetry, thermic images)