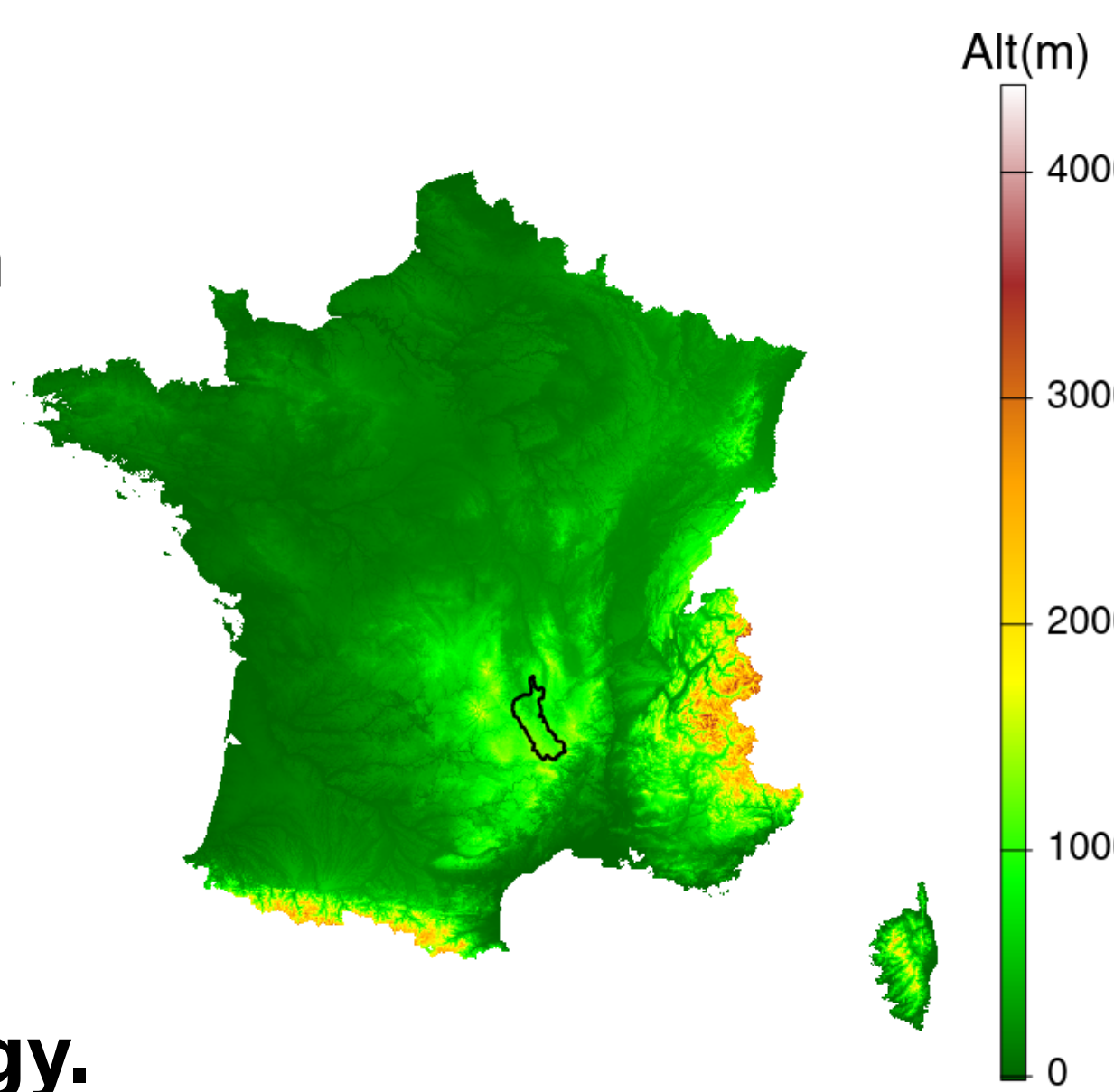


1. Introduction and Study area

This PhD project aims to develop a framework to analyze the historical hydrological evolution of an anthropized catchment (Haut Allier, France) over the periods:

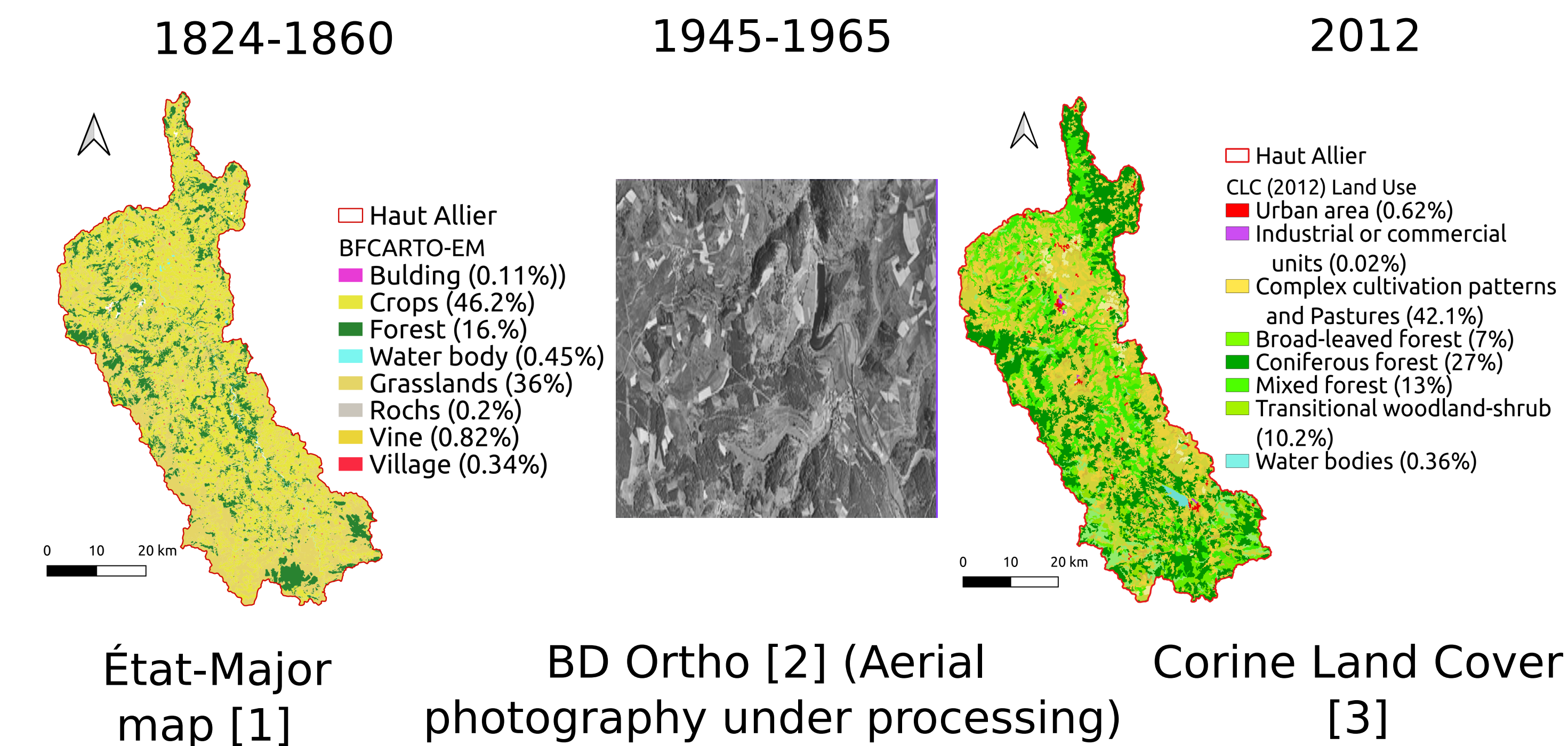
- 1871-1900 (P1)
- 1941-1970 (P2)
- 1991-2020 (P3)

and to propose a methodology to quantify the impact of human influence on the catchment's hydrology.



2. Catchment evolution since 19th century

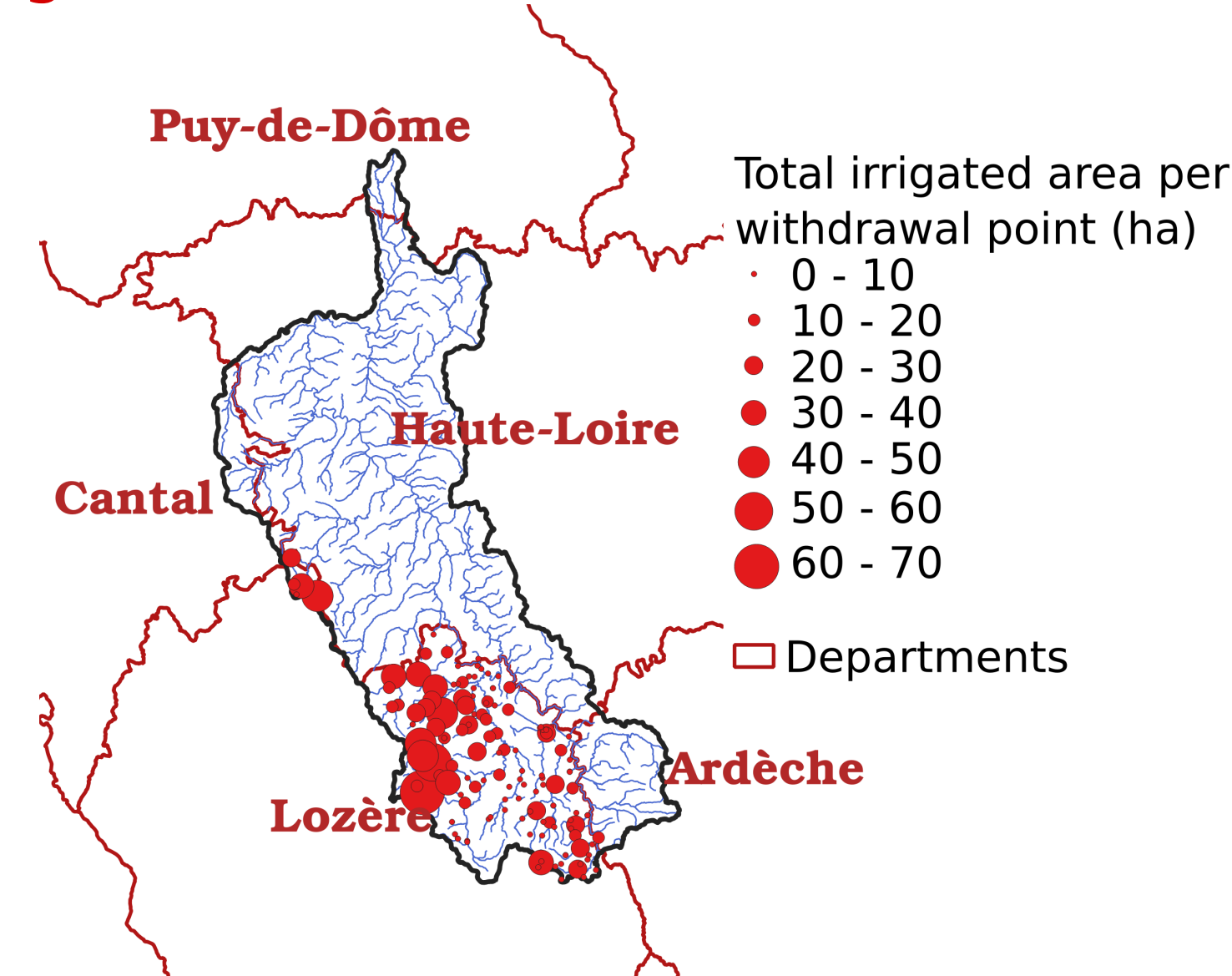
2.1. Land Use



Forest cover increased from 16% (19th century) to 47% (21st century), while agricultural land declined and crop diversified.

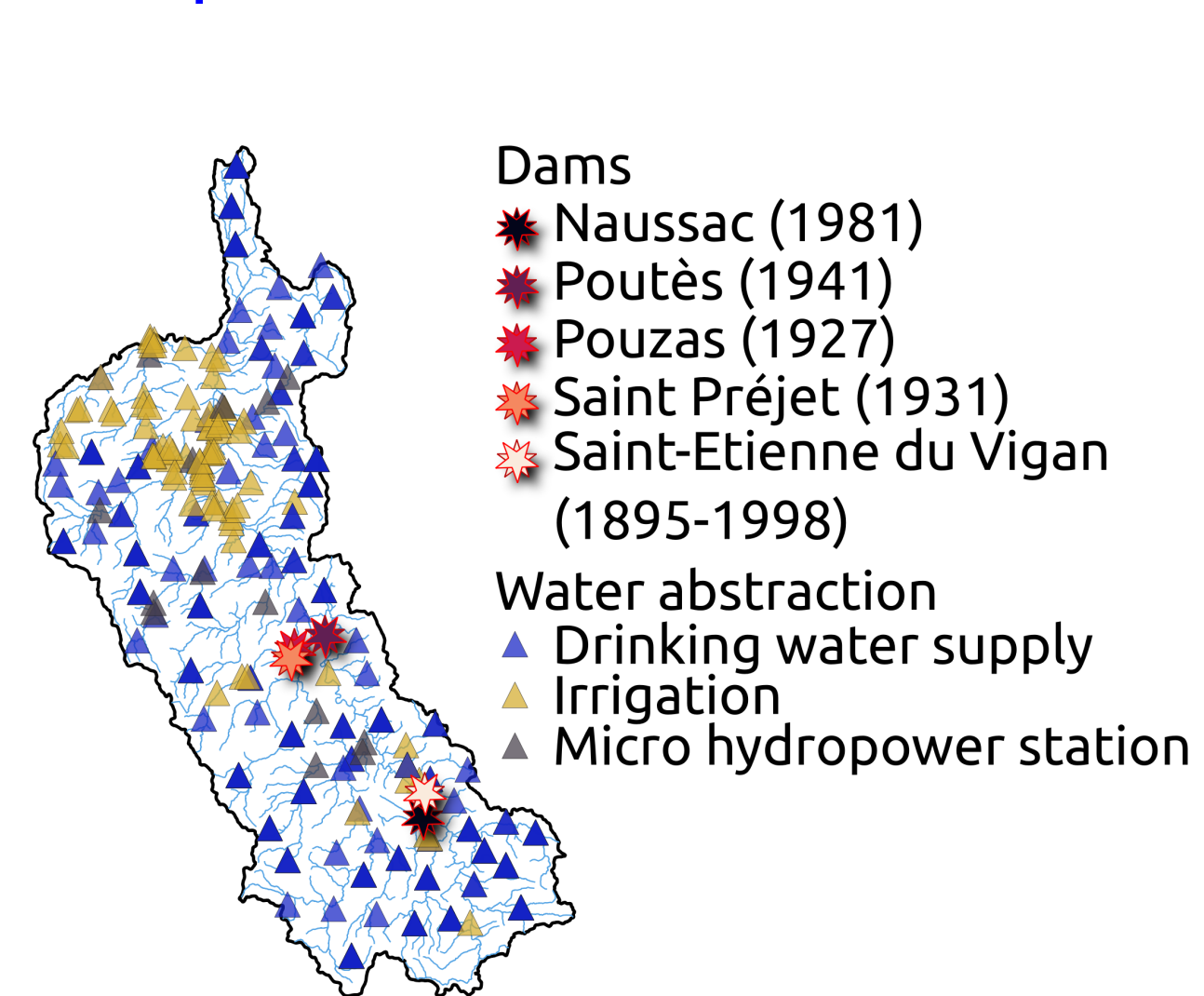
2.2. Water uses

Agricultural statistics (19th c.)



- Irrigated area available for Lozère, [4], other departments in progress
- Agricultural yields data and crops surfaces over P1, P2 and P3 under analysis

Multiple water uses (20th c.)

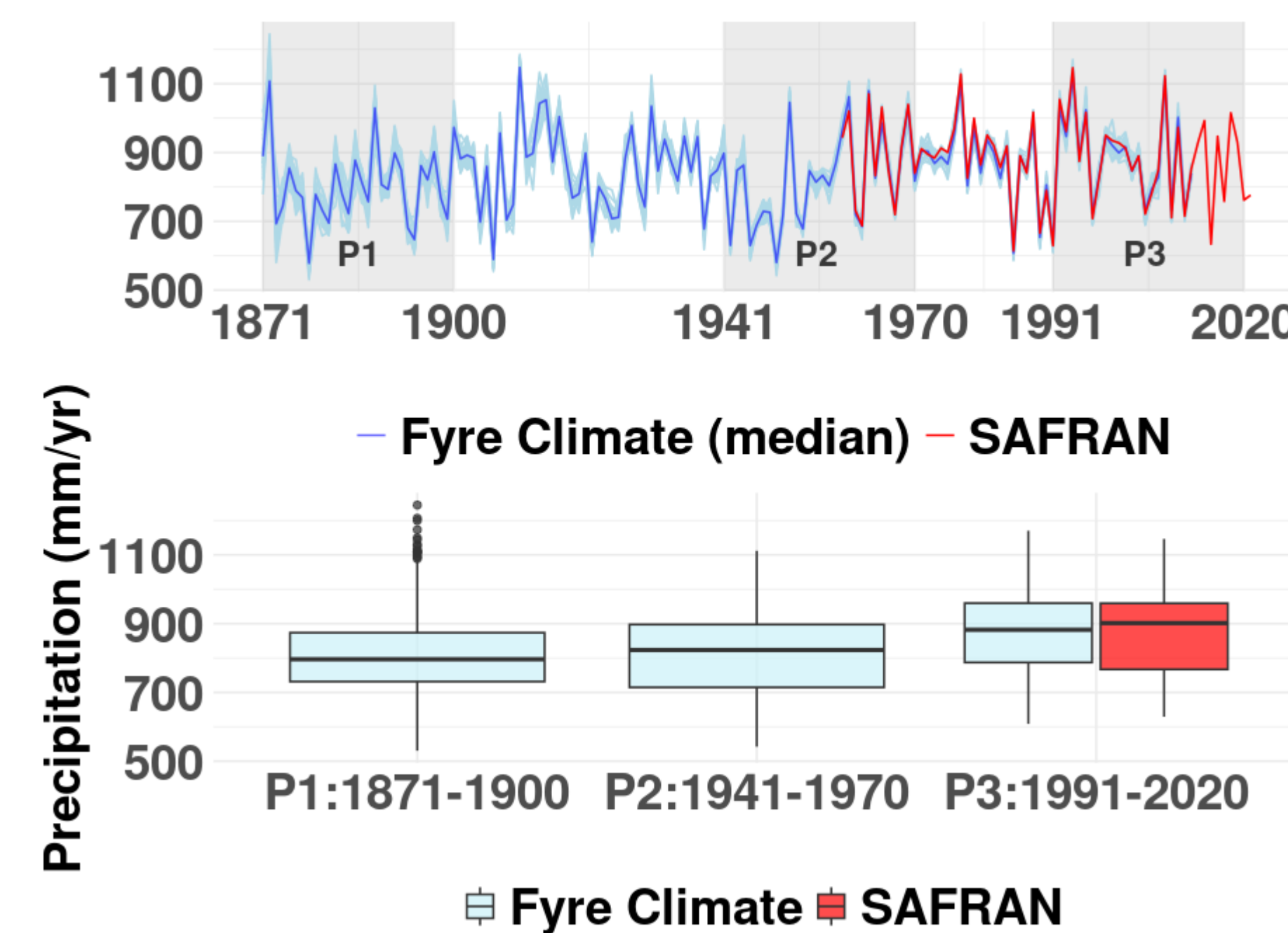


- Construction of dams from 1895 → 1981
- Drinking water consumption data only available over P3 [5]

2.3. Climate

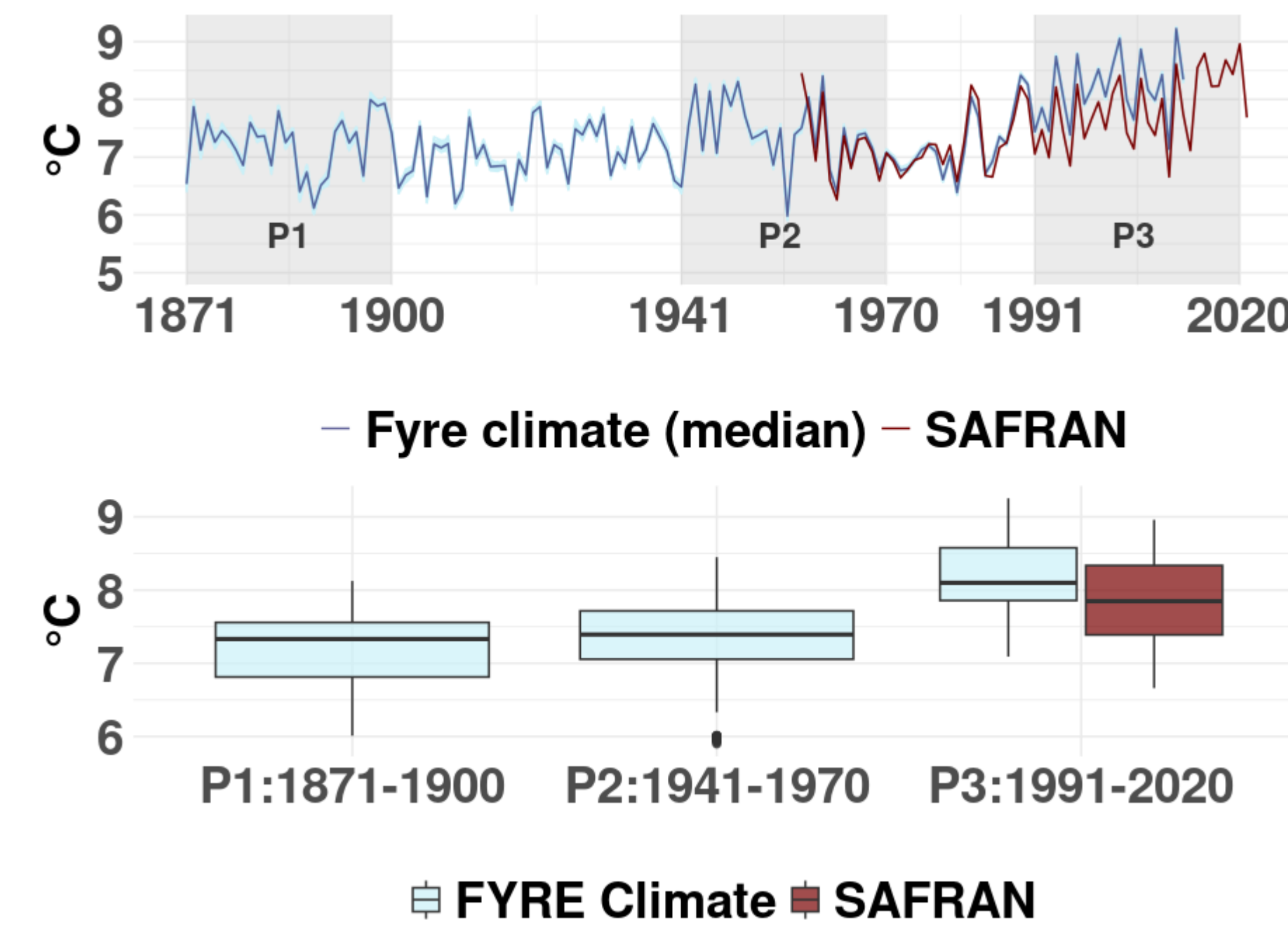
- 2 Reanalysis datasets: **Fyre Climate (1870-2012)** [6]
- **SAFRAN (1958- Today)** [7]

• Precipitation



Slight increase over P3 compared to earlier periods.

• Temperature

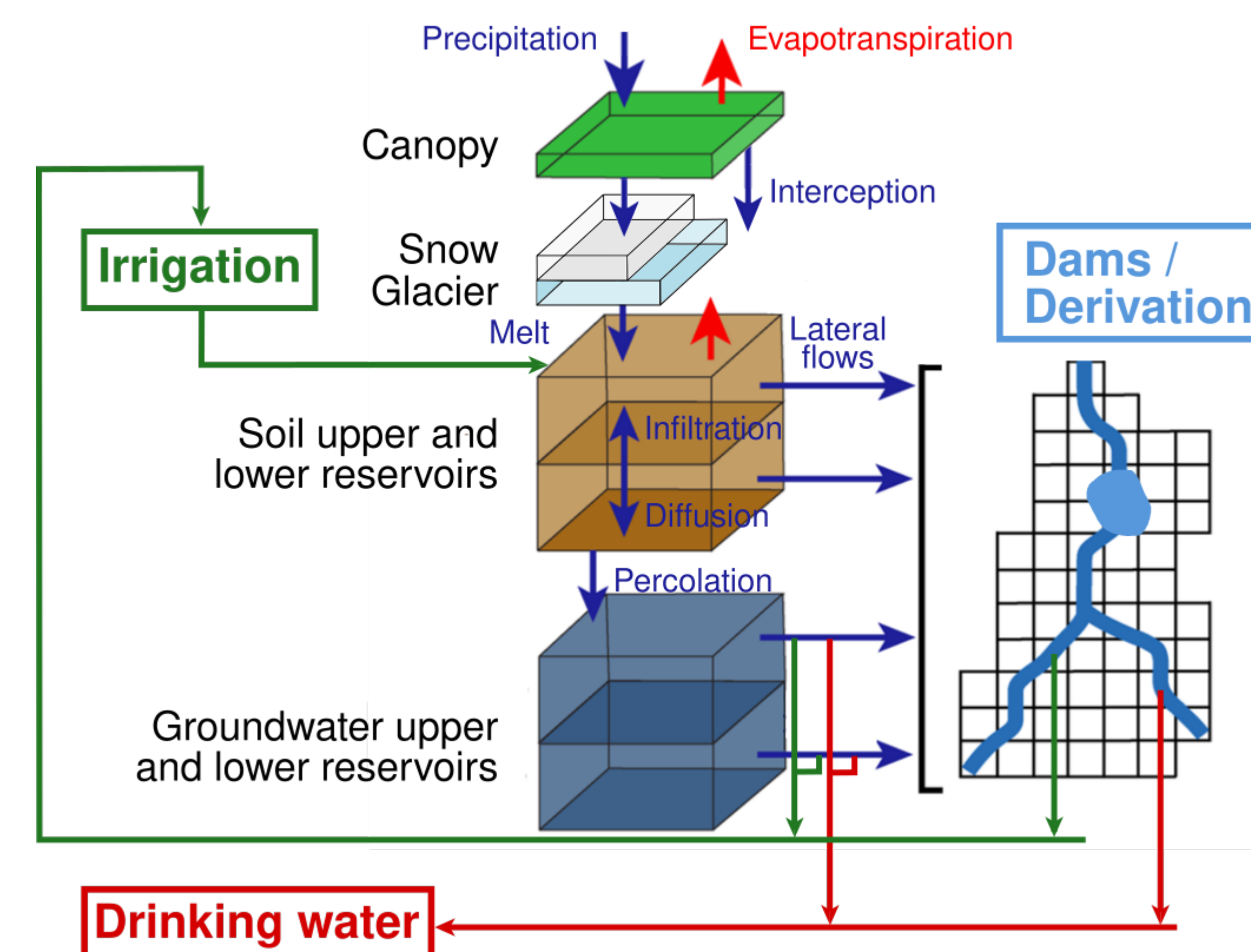


A clear warming trend

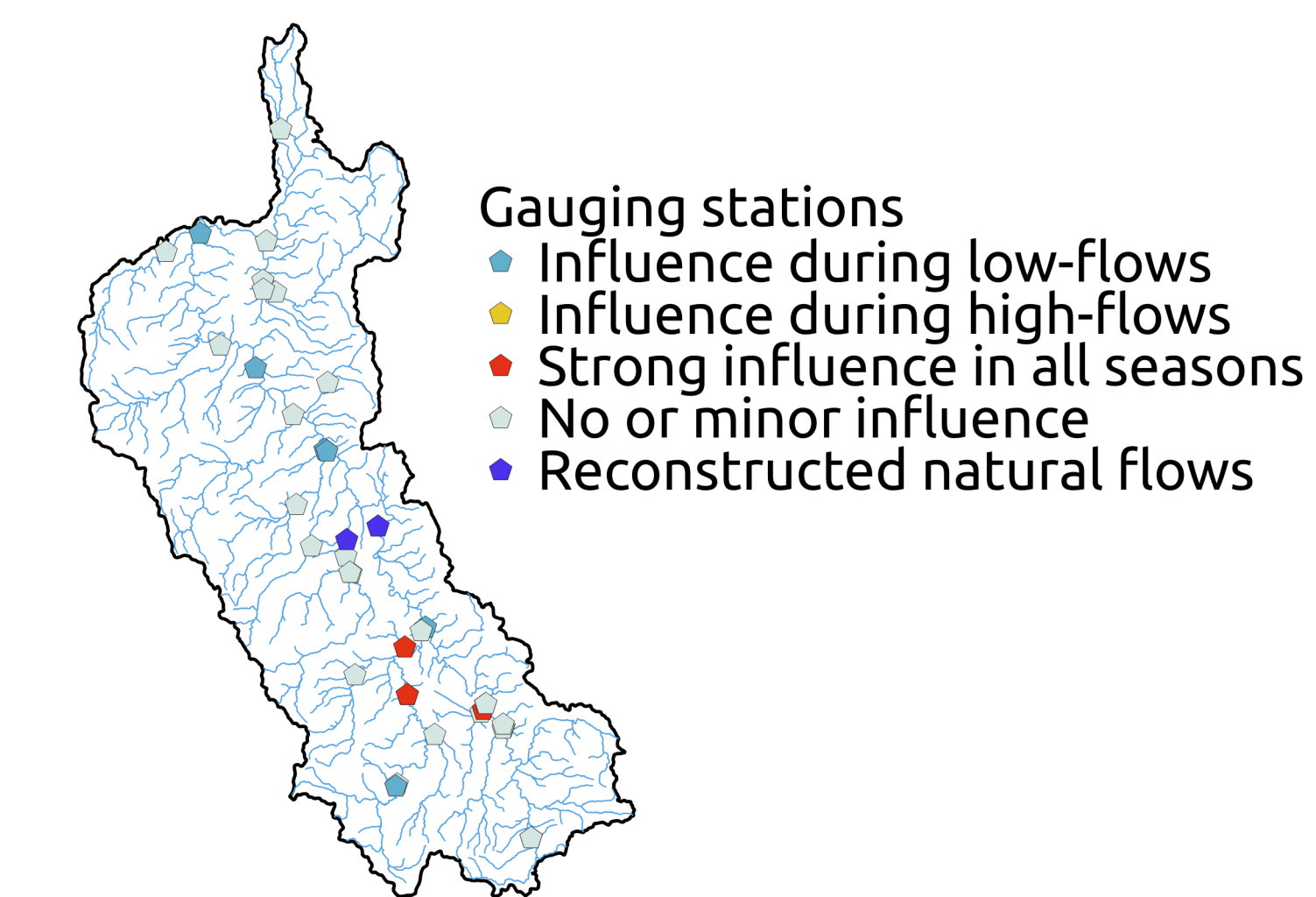
Fyre Climate warmer than SAFRAN over P3

3. Hydrological modelling

3.1. Spatially distributed model J2000 [8] with water uses [9]



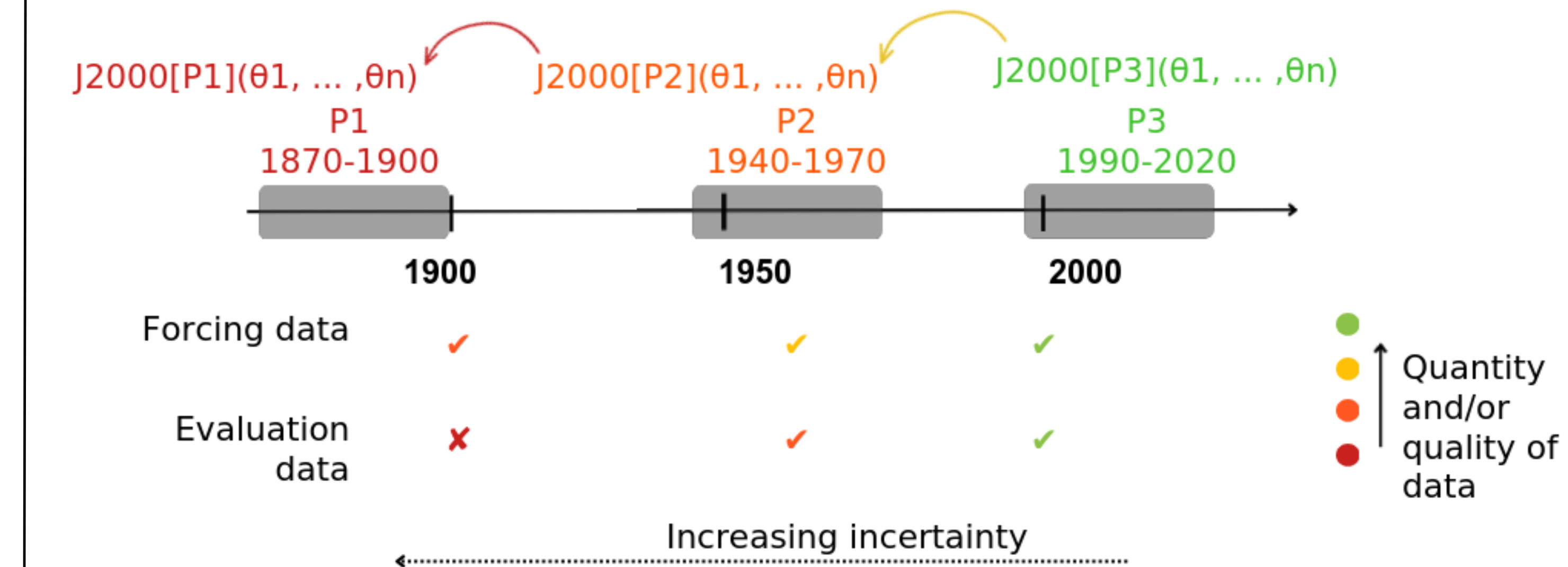
3.2. Calibration and evolution of a multi-impact hydrological model over P3 (1991-2020)



1) Simulation and evaluation on gauging stations where influence is considered null or weak.

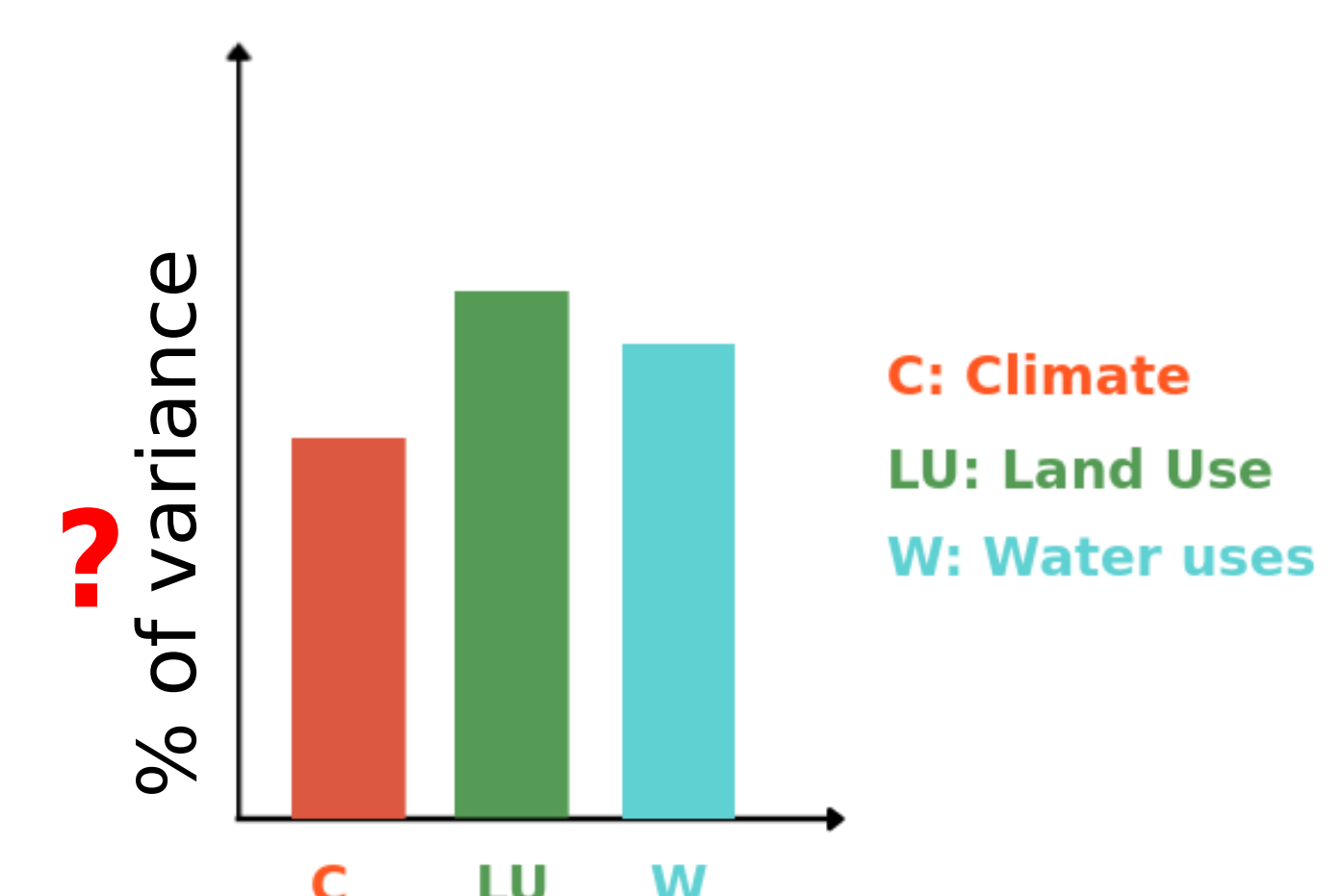
2) Simulation and evaluation on influenced gauging stations.

3.3. Historical reconstruction of P2 and P1



3.4. Quantification of the types of influences on hydrology

- Combinaison of different influences to make ensemble simulations
- Sensitivity analysis on hydrological indicators or components of hydrological balance



4. Conclusion

- Available datasets are heterogeneous, differing in temporal coverage and sources.
- Model parameterization is challenging particularly for historical periods when observations are rare.

5. References

