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Cross-referencing catchment data: how R can provide essential tools for the development of hydrological models for flood prediction

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Cross-referencing catchment data:
how R can provide essential tools for the development of hydrological models for flood prediction

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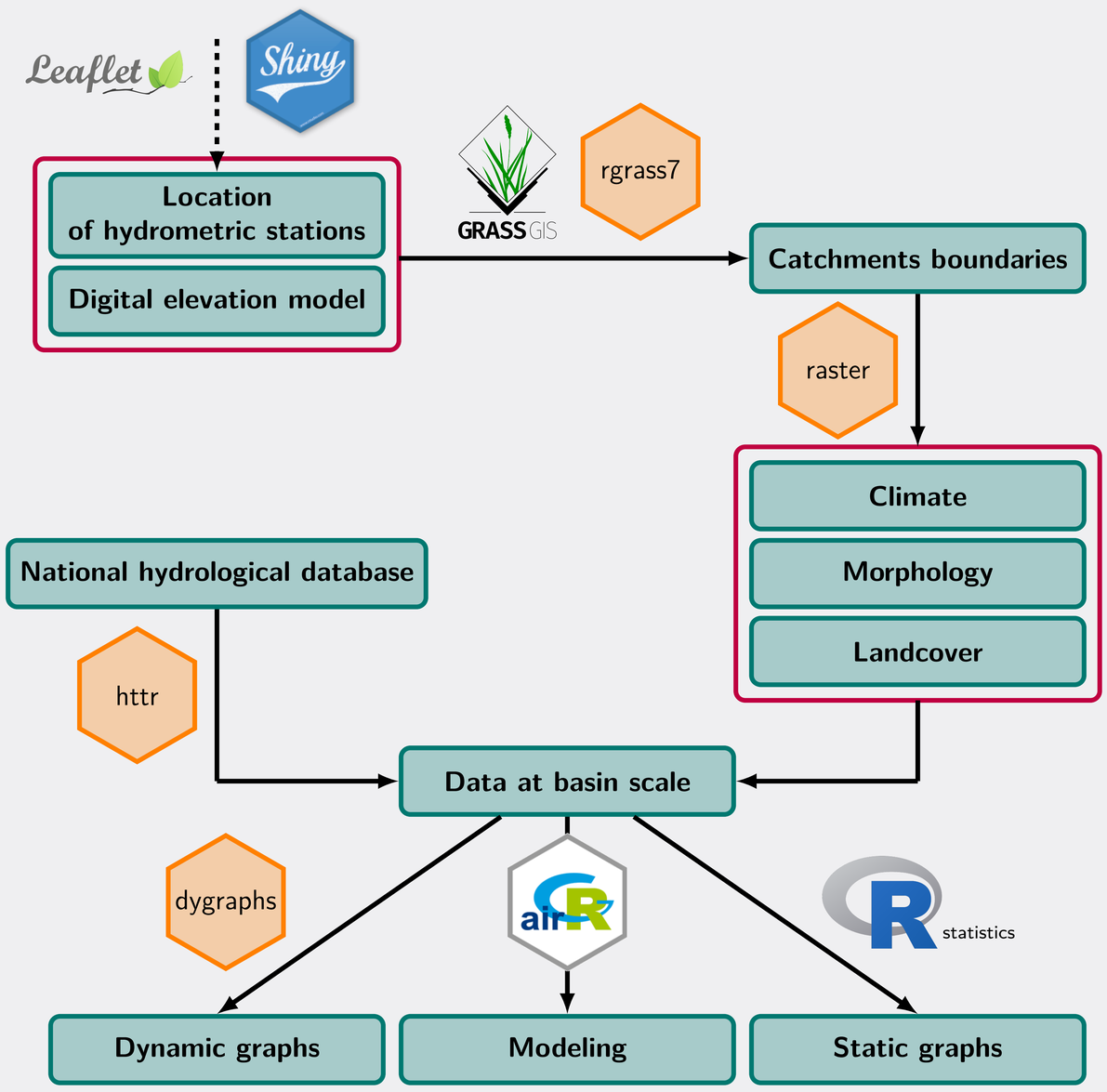
Hydrologists seek to better understand the processes involved in the catchment response to meteorological events using hydrological models. Model development requires databases combining hydrological, climatic and physical data. Large catchment databases have been developed at Irstea (Antony, France) over the last 30 years. A project was launched in the last years to automate the construction of these databases.

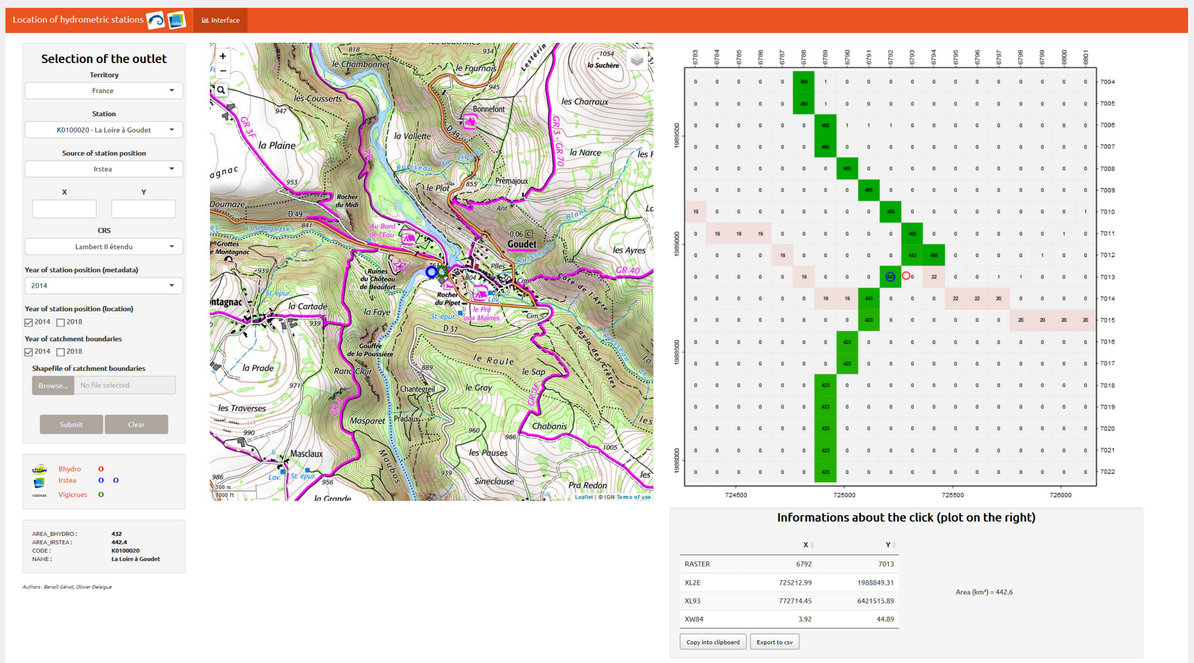
Building hydrological database

- Extracting water flow data from online databases
- Checking the location of hydrometric stations
- Delineating catchments boundaries using topographic information
- Aggregating data (climate, morphology) at the catchment scale
- Synthesis production (plots, metadata, summary sheets)
- Maintaining data ready to use for modeling applications

Processing chain with involved R packages

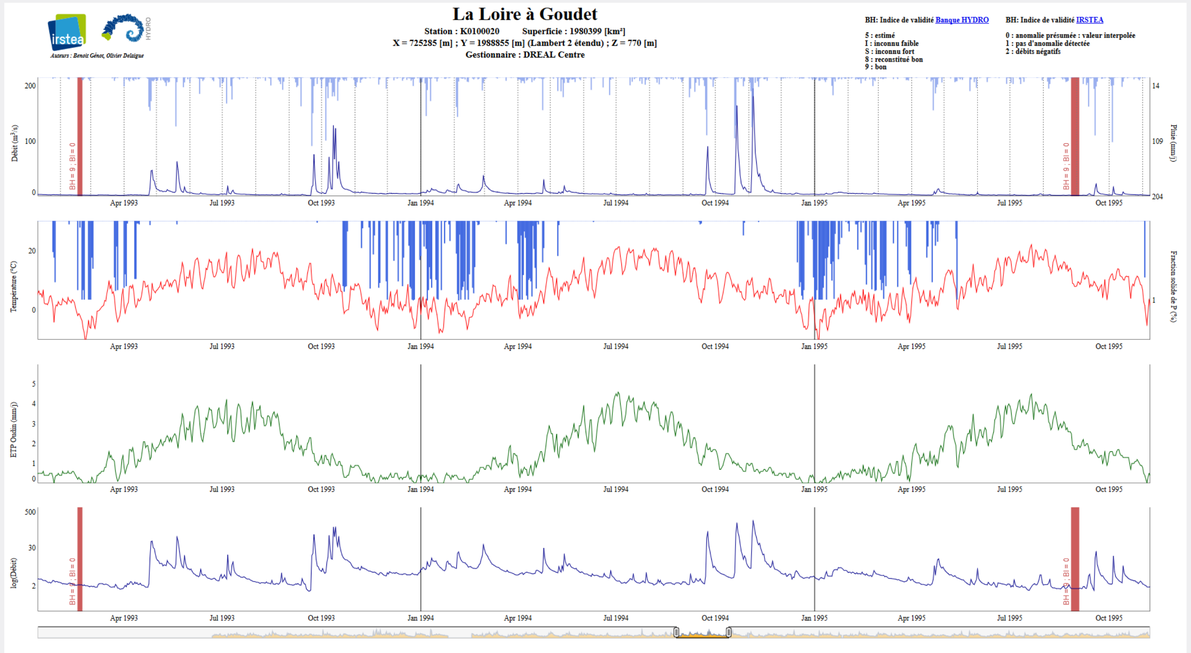


Shiny app for checking the location of stations



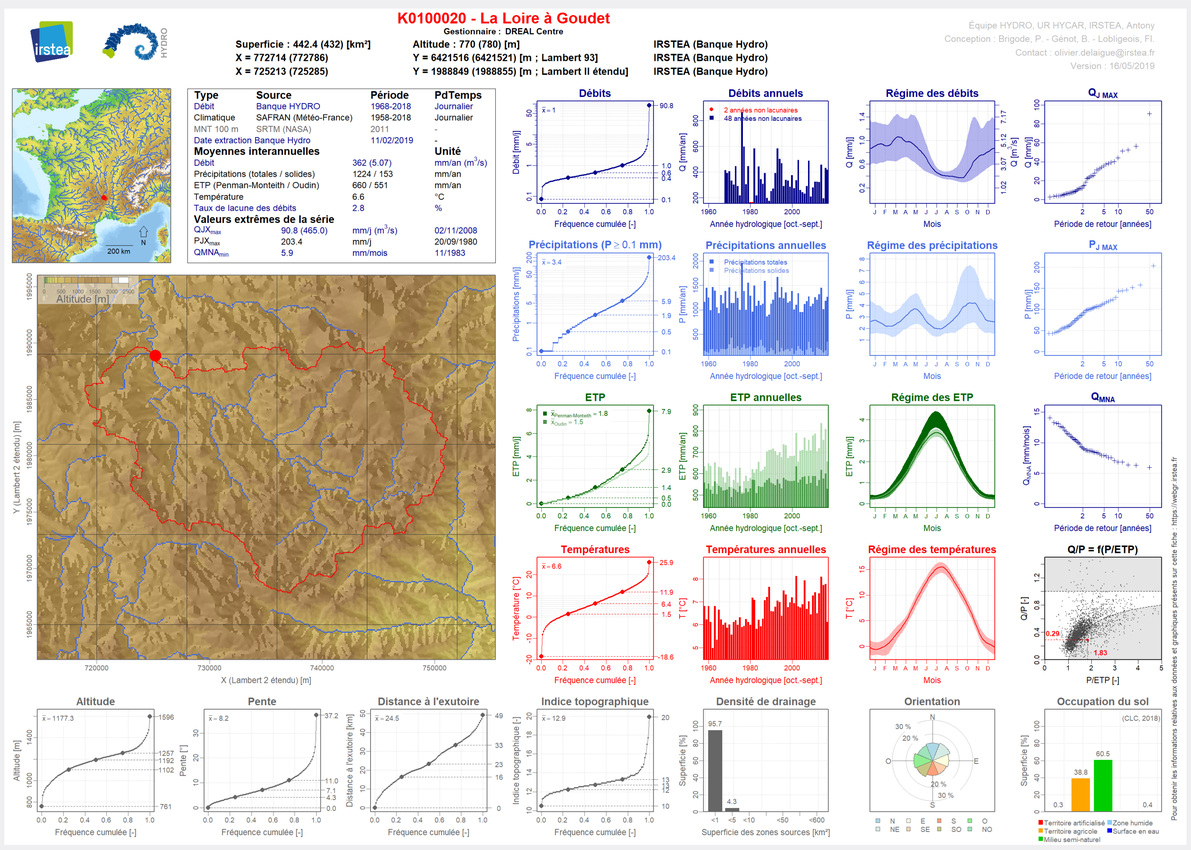
- Leaflet maps and upstream drainage are linked with common coordinates in a shiny app which greatly facilitates the process of detecting errors in the spatial location of gauging stations

Dynamic visualization



- Dynamic plots provided thanks to dygraphs facilitate the visual analysis of long times series
- Simultaneous analysis of several variables over a period thanks to links between graphs

Synthetic information



- Production of synthetic sheets showing the main characteristics on the hydrology, topography and climate of the catchment
- Approximately four thousand catchments over France available online at https://webgr.irstea.fr/en/activities/database-1-2/
- Widely used by various stakeholders in the field of hydrology

References

- Delaigue, O., Génot, B., Lebecherel, L., Brigode, P., Bourgin, P.Y. (2019). Hydroclimatic database at the scale of France. IRSTEA, UR HYCAR, Hydrology group, Antony. URL: https://webgr.irstea.fr/en/activities/database-1-2/

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