



CAMELS-FR: A large sample hydroclimatic dataset for France to explore hydrological diversity and support model benchmarking

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► To cite this version:

Olivier Delaigue, Pierre Brigode, Vazken Andréassian, Charles Perrin, Pierre Etchevers, et al.. CAMELS-FR: A large sample hydroclimatic dataset for France to explore hydrological diversity and support model benchmarking. IAHS-2022 Scientific Assembly, May 2022, Montpellier, France. hal-03687235

HAL Id: hal-03687235

<https://hal.inrae.fr/hal-03687235>

Submitted on 3 Jun 2022

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CAMELS-FR (*CHAMEAU*)

A large sample hydroclimatic dataset for France to explore hydrological diversity and support model benchmarking

Olivier Delaigue¹, Pierre Brigode^{1,2}, Vazken Andréassian¹, Charles Perrin¹, Pierre Etchevers³, Jean-Michel Soubeyroux³, Bruno Janet⁴, & Nans Addor^{5,6}

¹ Université Paris-Saclay, INRAE, UR HYCAR, Antony, France

² Université Côte d'Azur, Observatoire de la Côte d'Azur, CNRS, IRD, Géoazur, Sophia-Antipolis, France

³ Météo-France, Toulouse, France

⁴ SCHAPI, Toulouse, France

⁵ Geography, College of Life and Environmental Sciences, University of Exeter, Exeter, UK

⁶ Fathom, Square Works, Bristol, UK

olivier.delaigue@inrae.fr
webgr.inrae.fr



Context

Large sample hydrology

Generalization of sound model evaluation and testing practices based on various types of split-sample tests

CAMELS international initiative

- Facilitate reproducible hydrological research by the use of large datasets

CAMELS datasets already published

- USA
- Chili
- Great-Britain
- Australia
- Brazil

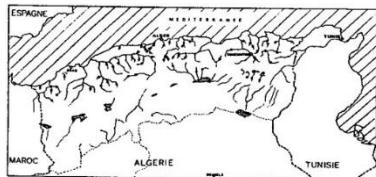
Other datasets are being finalized

- France
- Germany

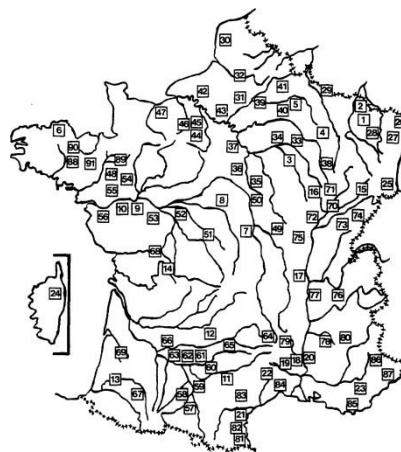
Context

Large sample hydrology expertise at INRAE (France)

Increasing number of studies conducted on large datasets over the last three decades



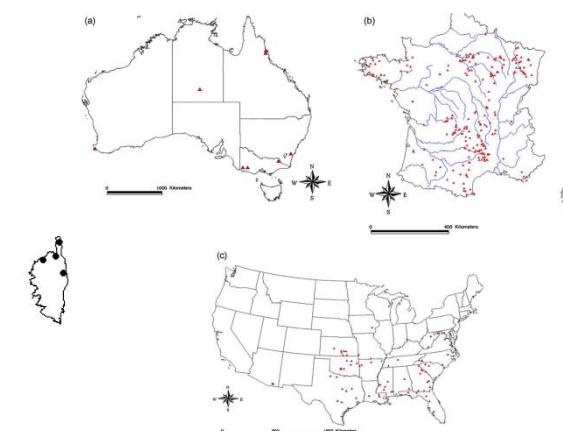
63 catchments in Algeria
(Kabouya et al., 1991)



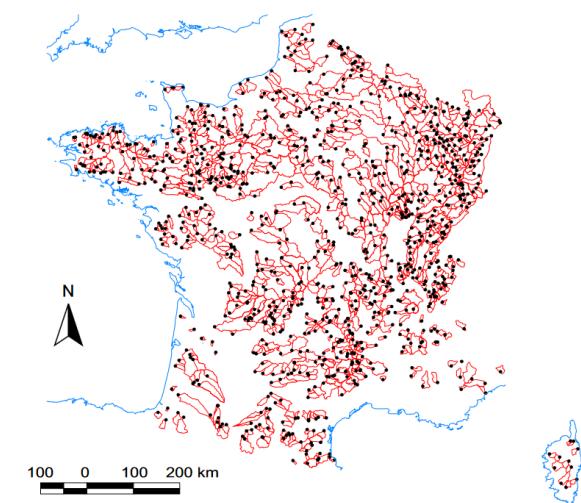
91 catchments in France
(Makhlof et al., 1994)



140 catchments in France
(Edijatno et al., 1999)



308 catchments in Australia, France & USA
(Oudin et al., 2005)



1040 catchments in France
(Le Moine, 2008)

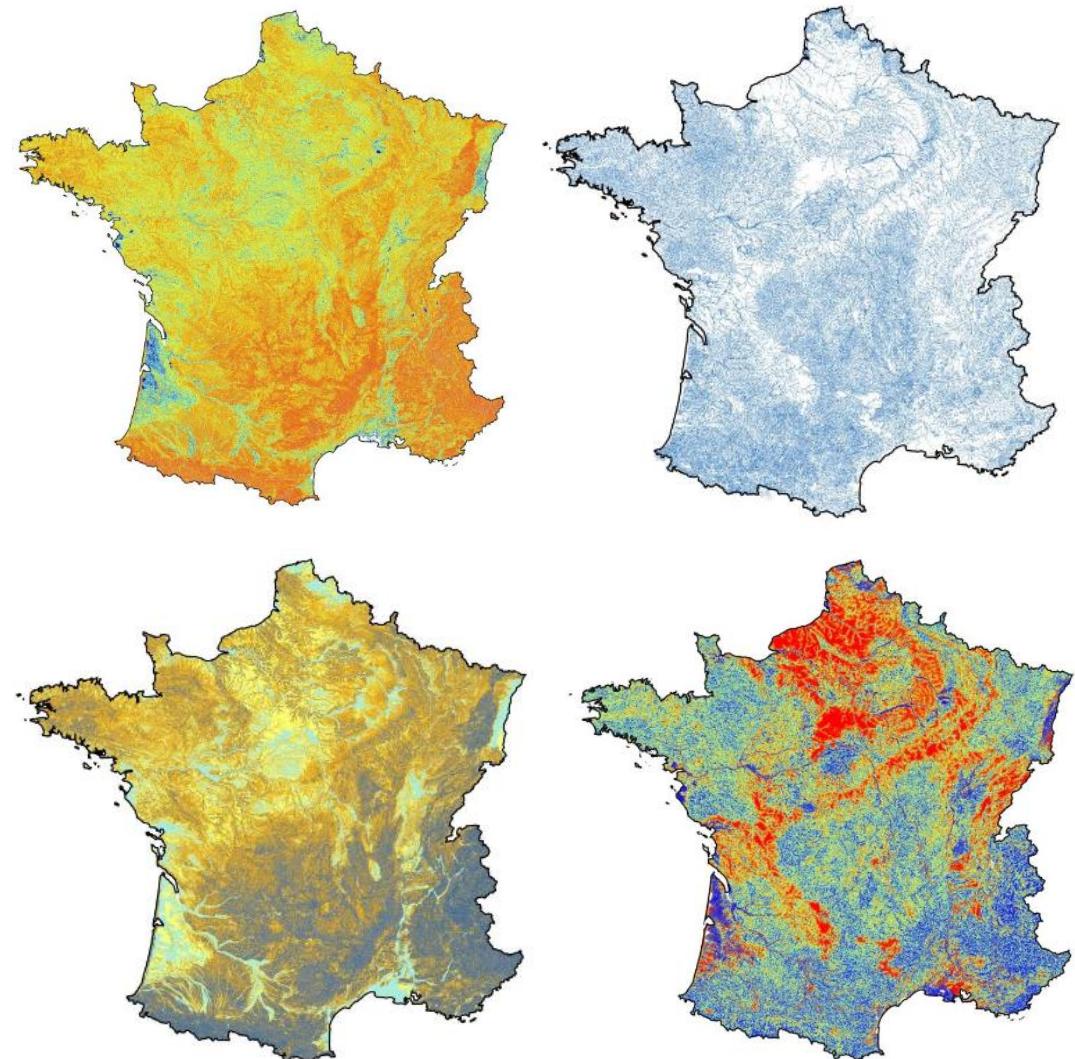
Context

Hydrological tourism?

According to the UNWTO

France is on the top of the world tourism rankings not only because of the beauty of Paris or the Mont-Saint-Michel or because of the quality of wines but also because of the diversity of the landscapes

An ideal playground for hydrologists!



MEDDE (2014).

The CAMELS-FR (CHAMEAU) dataset

Data sources

Automated chain fed by national data products (Delaigue *et al.*, 2020)

Time series (1970-2019)

- Topography indices
 - Elevation and slope distributions
 - Drainage density
 - Topographic index
 - etc.
- Land cover
- Daily climatic data
 - Solid and liquid precipitation time series
 - Potential evapotranspiration time series
 - Temperature time series
 - etc.
- Daily hydrological data
 - Streamflow time series
 - Data quality flag

The CAMELS-FR (CHAMEAU) dataset

Climatic data

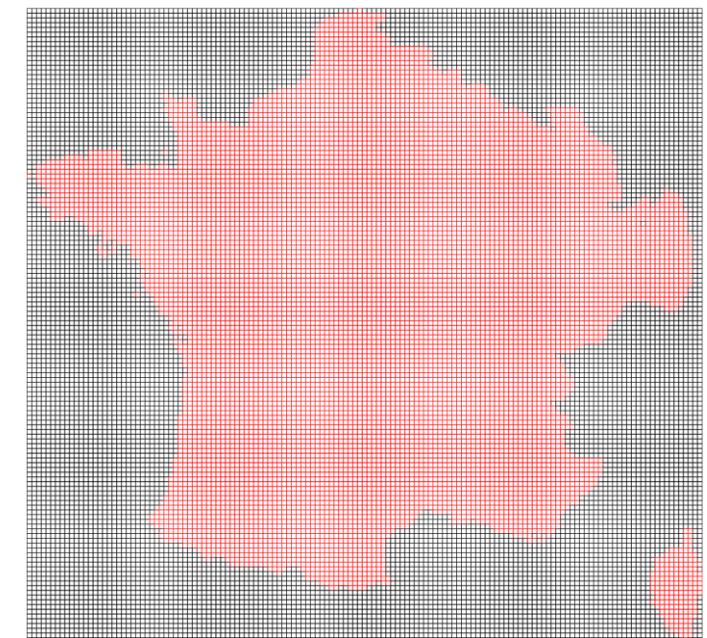
Météo-France's SAFRAN atmospheric reanalysis at daily time step

- Mesoscale analysis system of near-surface atmospheric variables
- Use of ground observations, combined with data from meteorological models



Parameters interpolated on a regular grid (8×8 km)

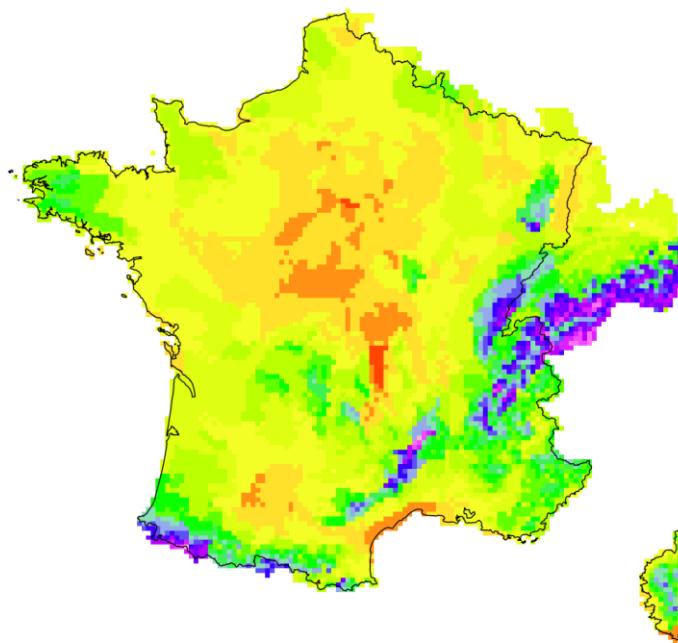
- solid and liquid precipitation
- temperature
- potential evaporation
- humidity
- wind
- water equivalent of snow
- solar & infrared radiation



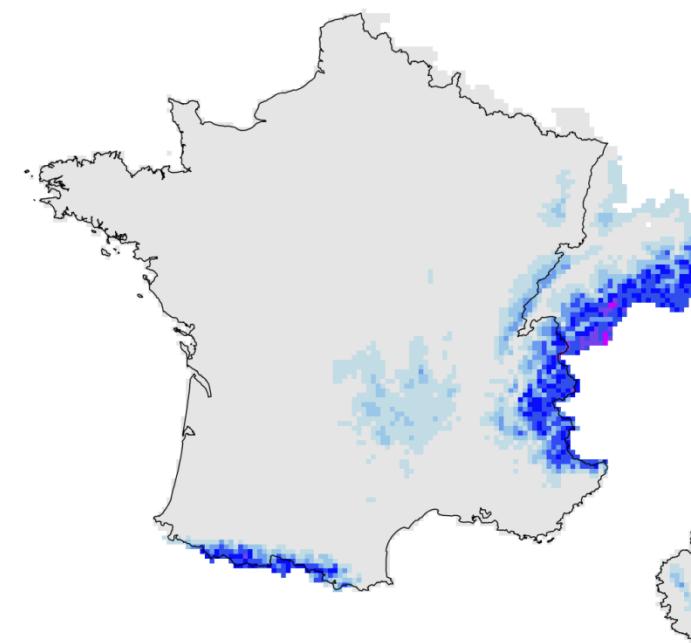
The CAMELS-FR (CHAMEAU) dataset

Examples of climatic variables

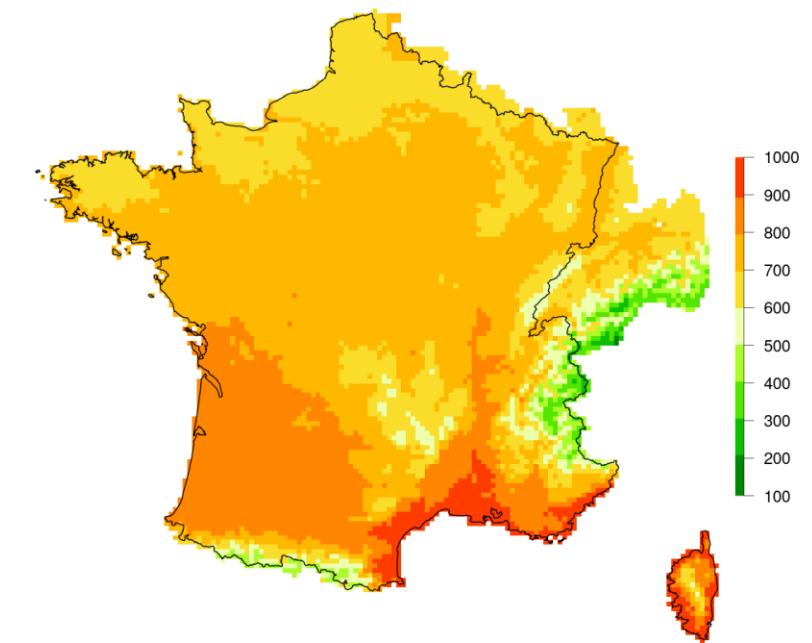
Precipitation (mm/yr)



Solid precip. fraction (%)



Evapotranspiration (mm/yr)

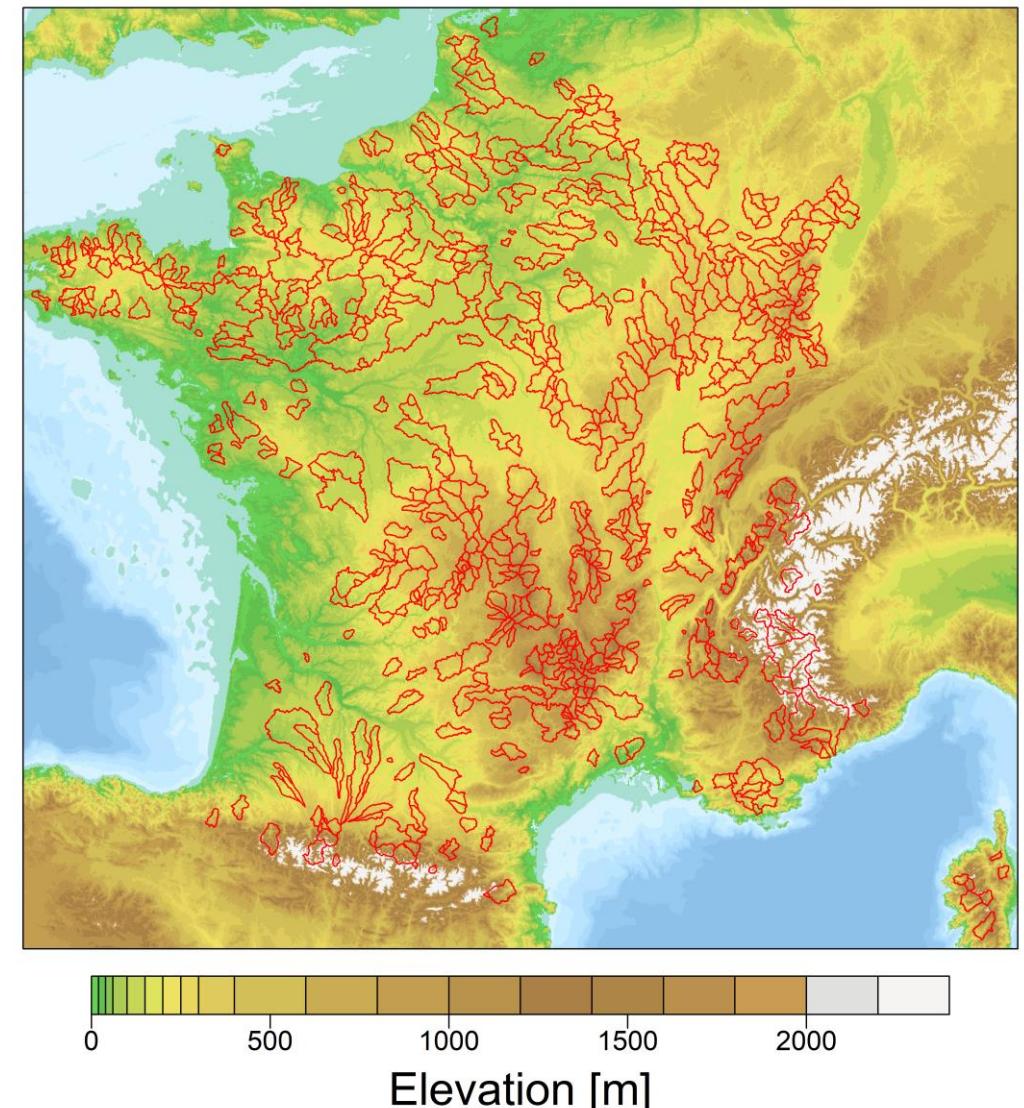


The CAMELS-FR (CHAMEAU) dataset

Catchment selection (*v1.0*)

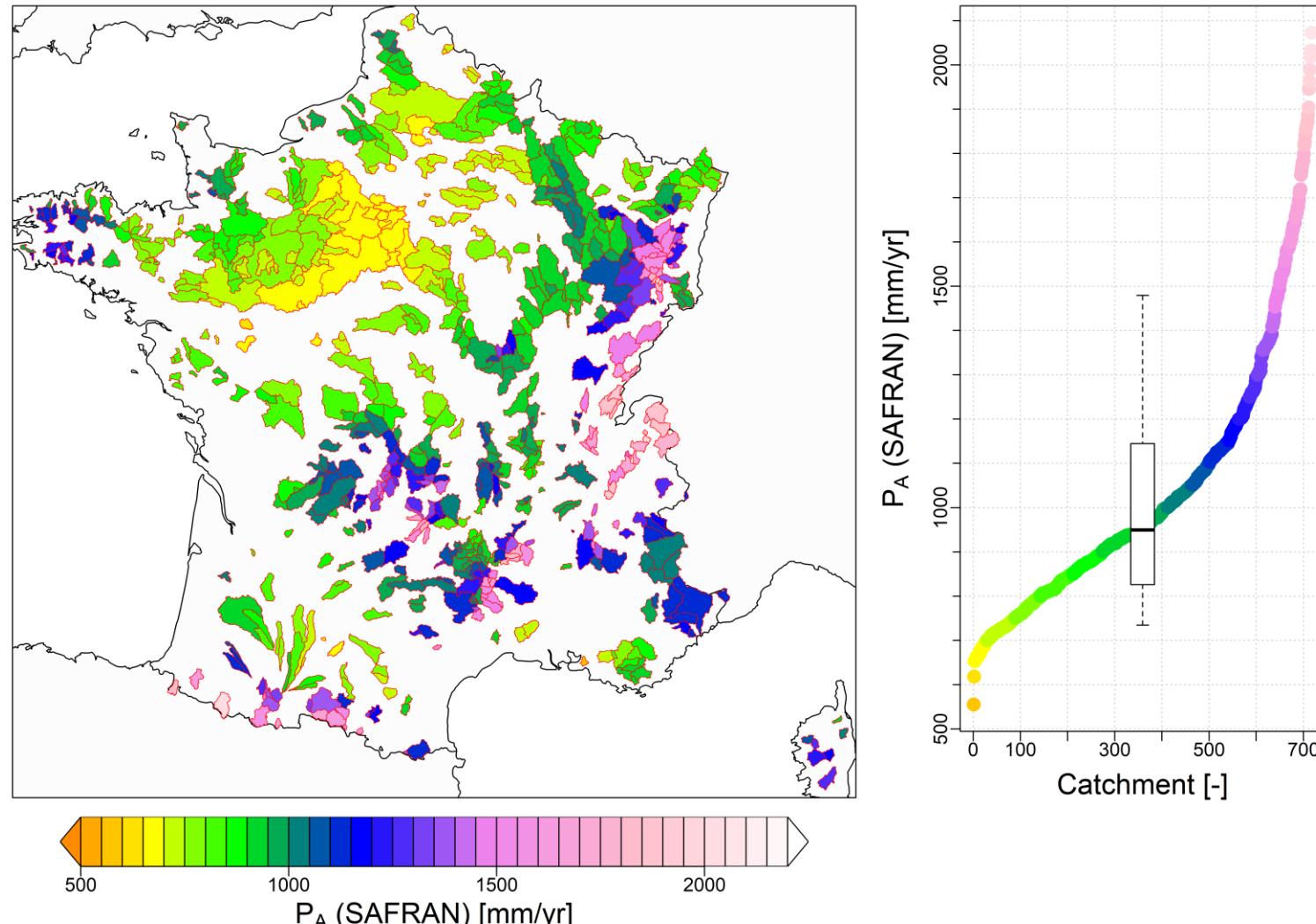
717 catchments

1. At least 30 years with limited missing data (< 20 %) over the 1970-2019 period
2. Limited identified upstream influences (< 10 mm)
3. Manual verification of gaging station location
4. Visual analysis of flow time series



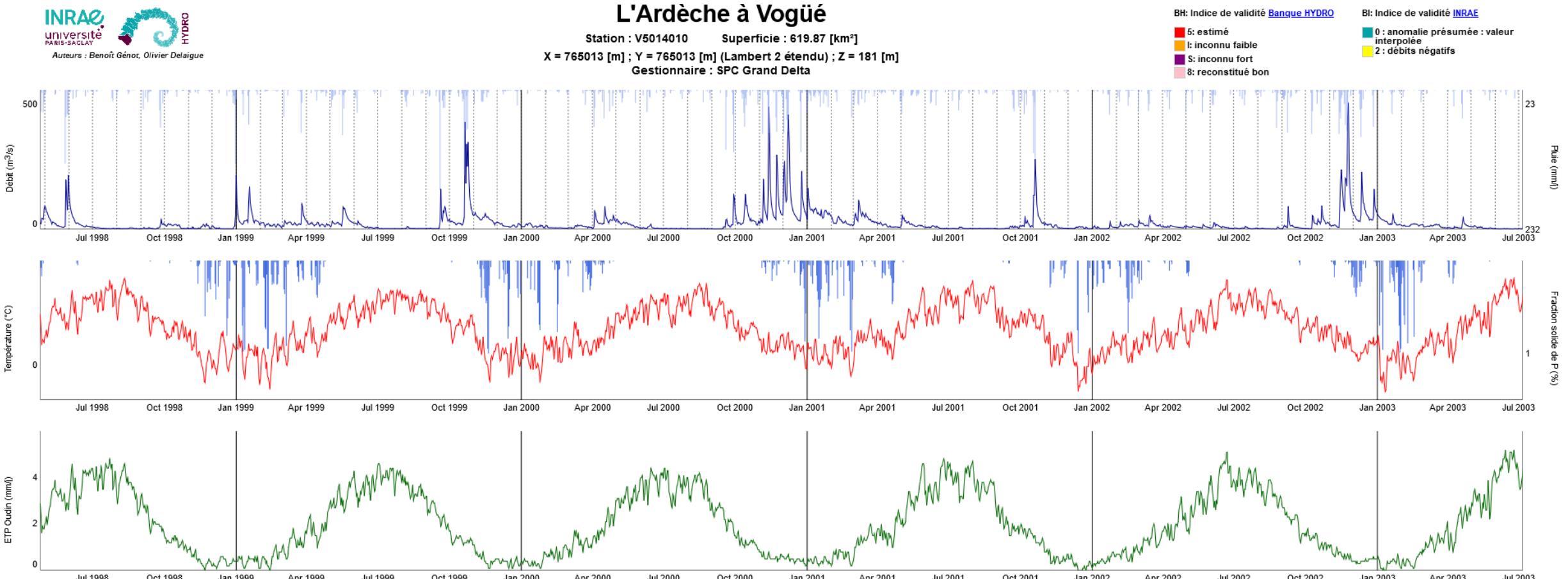
The CAMELS-FR (CHAMEAU) dataset

Catchment selection (*v1.0*): mean annual precipitation



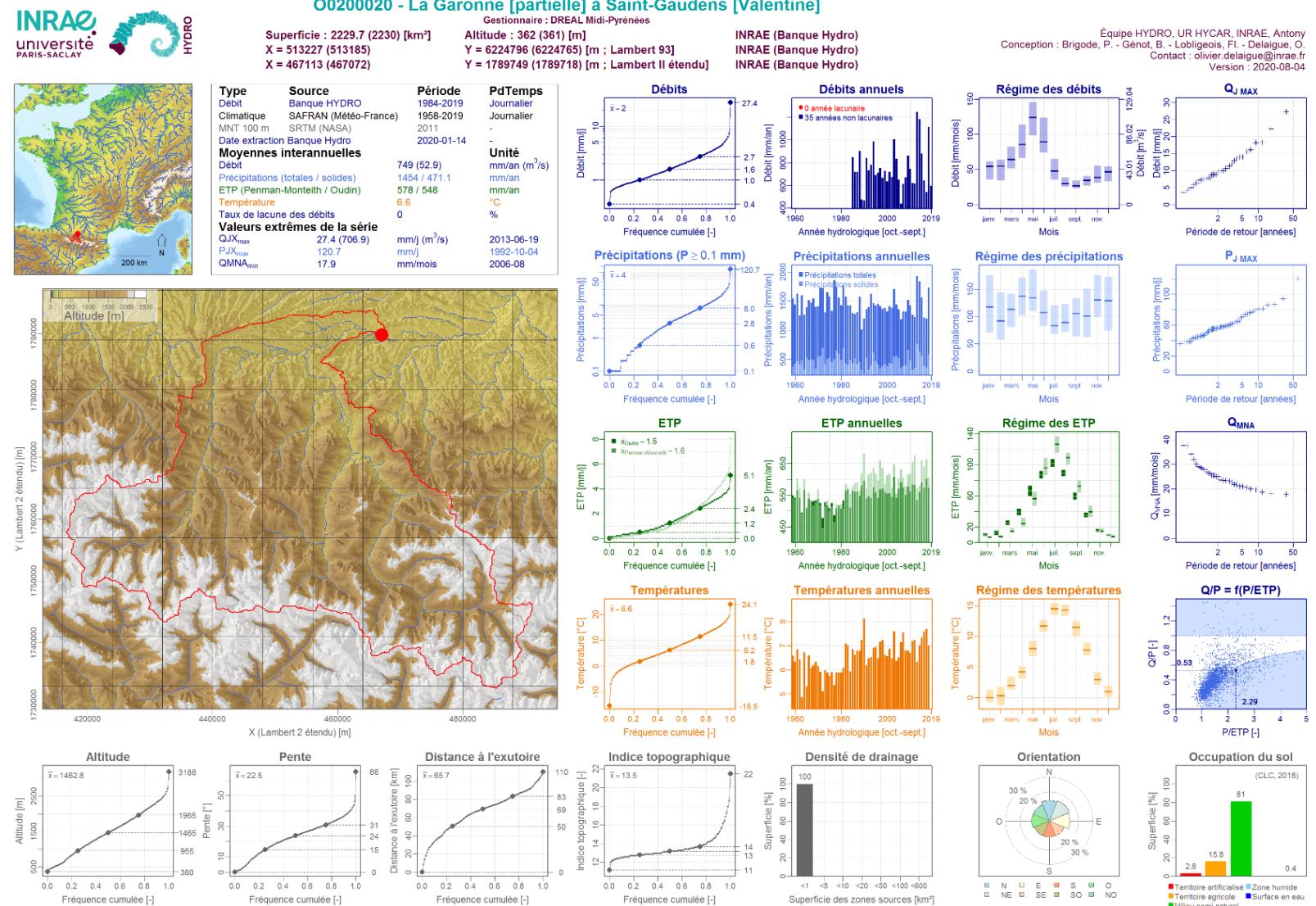
The CAMELS-FR (CHAMEAU) dataset

ChameauGraphs - dynamic graphs of time series



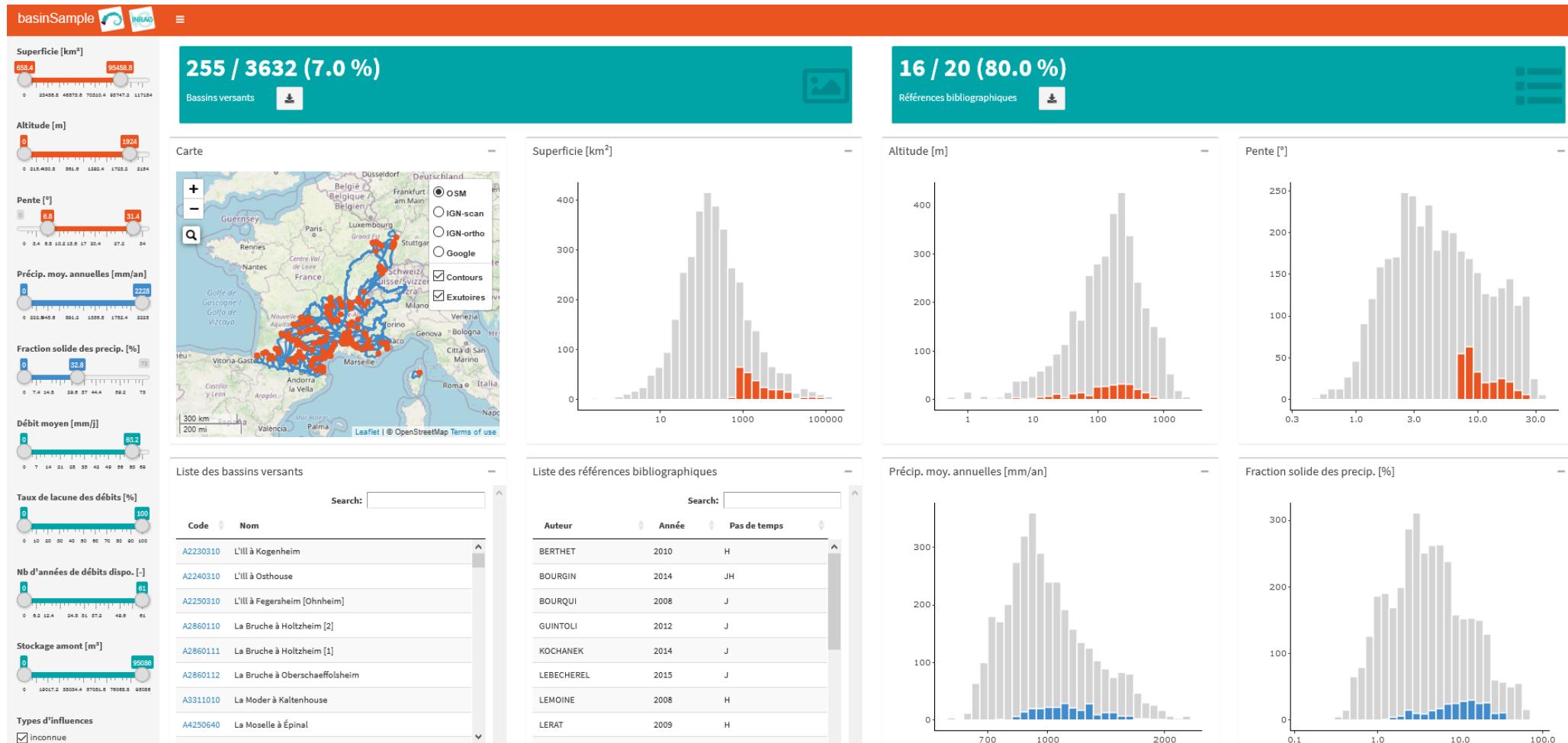
The CAMELS-FR (CHAMEAU) dataset

ChameauSums - Graphical summary sheets provided



The CAMELS-FR (CHAMEAU) dataset

ChameauSampler - A web app to help users select catchments



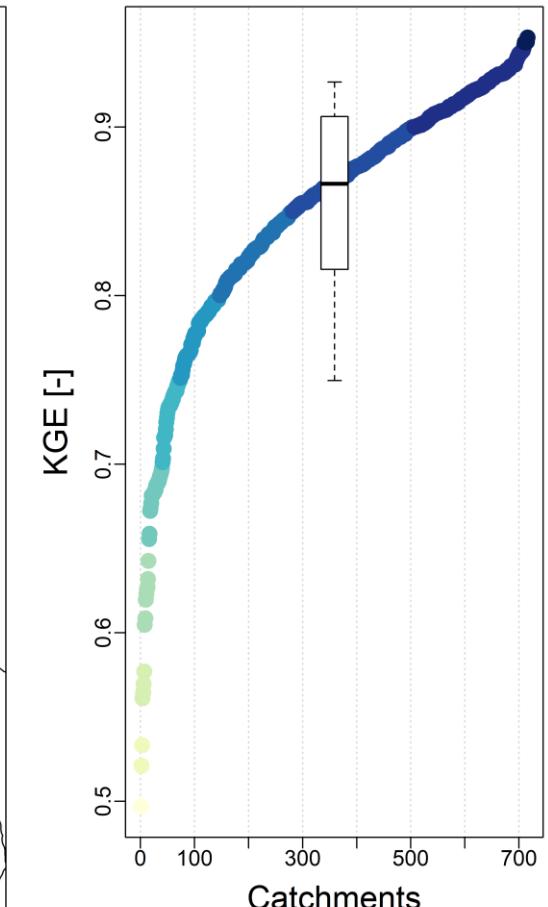
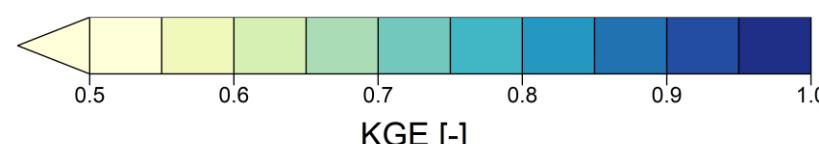
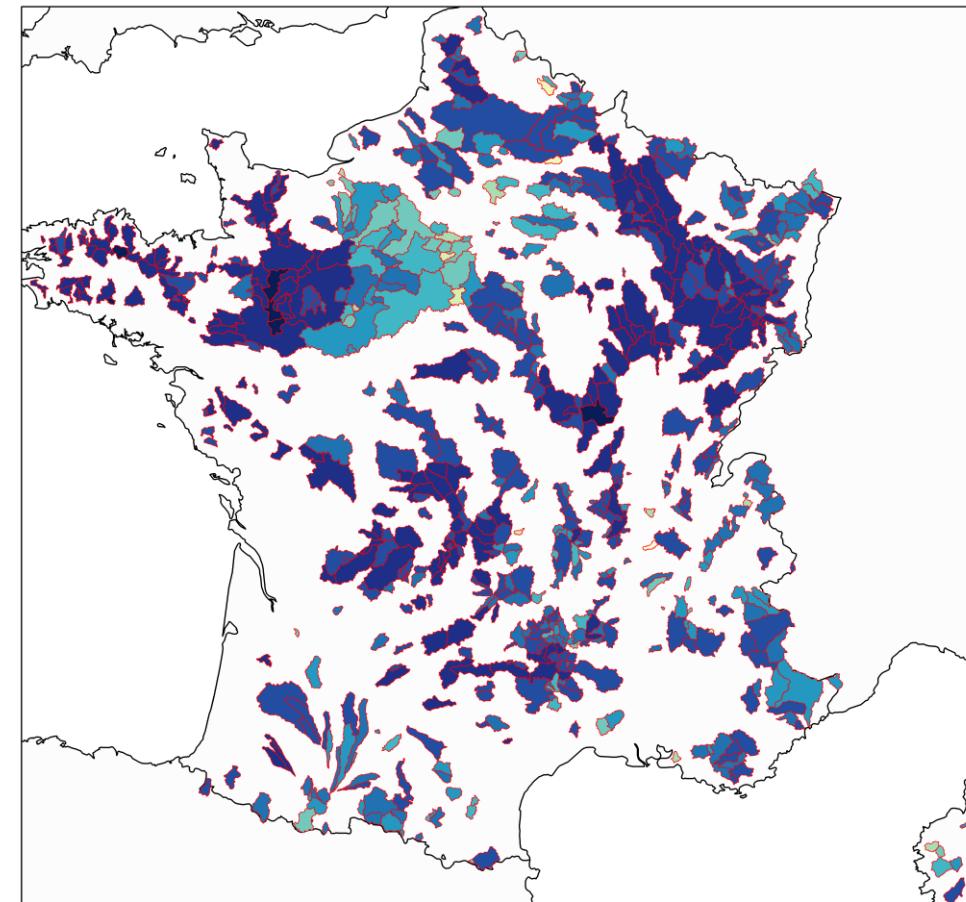
Available on sunshine.inrae.fr

The CAMELS-FR (CHAMEAU) dataset

Model performances

GR4J

Calibration efficiency (KGE)



The CAMELS-FR (CHAMEAU) dataset

CAMELS-FR is a **living** dataset!

- Updating time series
- Enlarge the number of catchments
- Tagging flow measurement characteristics updated by the data producer

CAMELS-FR has an upgradeable DOI (v1.0, v2.0...) to insure reproducible analysis

The CAMELS-FR (CHAMEAU) dataset

How to retrieve the data?

Freely available to the scientific community (partnership Météo-France & SCHAPI)
on <https://data.inrae.fr/>

The screenshot shows the INRAE Data portal interface. At the top, there is a navigation bar with links for Recherche, À propos, Guide d'utilisation, Support, Français, S'inscrire, and Se connecter. Below the navigation bar, the page title is "HYCAR (www.inrae.fr)". The breadcrumb navigation shows "Portail Data INRAE > INRAE >". On the right side, there are links for Contact and Partager. The main content area features a search bar with "Chercher dans ce dataverse..." and a "Chercher" button, along with a "Recherche avancée" link. To the left of the search bar, there are filters for "Dataverses (0)", "Datasets (11)" (which is checked), and "Fichiers (4)". Below these filters are sections for "Année de publication" (2021: 3, 2020: 8), "Data Origin" (observational data: 2), "Kind of Data" (Software: 4, Dataset: 3, Model: 2, Other: 2, Image: 1), and "Author Name" (Delaigue, Olivier: 7, Ansart, Patrick: 2, Azougui, Abdelkader: 2, Blanchouin, Arnaud: 2, Brigode, Pierre: 2). The search results are displayed in a grid format. The first result is "R functions to compute potential evaporation" by LEMAITRE-BASSET, THIBAULT, 2021, which describes R functions to compute potential evaporation using six different formulas. The second result is "A joint database of French catchments and piezometers" by PELLETIER, ANTOINE, 2021, which describes a database of streamflow and groundwater level data. The third result is "airGRdatassim: Ensemble-Based Data Assimilation in GR Hydrological Models. R package version 0.1.3." by Piazzesi, Gaia; Delaigue, Olivier, 2021, which provides tools for assimilating observed discharges in daily GR hydrological models. The fourth result is "Hydrology modelling R packages: codes for simulating streamflow using one parameter set" by Blanchouin, Arnaud, 2021, which consists of two functions for assimilating observed discharges via Ensemble Kalman filter or Particle filter.