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Olivier Delaigue, David Dorchies, Guillaume Thirel

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The airGR galaxy

Hydrological tools around GR models



Olivier Delaigue¹, David Dorchie², Guillaume Thirel¹

1: Université Paris-Saclay, INRAE, HYCAR – Antony, France

2: G-EAU, Univ. Montpellier, AgroParisTech, BRGM, CIRAD, IRD, INRAE, Institut Agro – Montpellier, France

GR is a family of lumped hydrological models designed for flow simulation at various time steps. The models are freely available in an R package called airGR (<https://hydrogr.github.io/airGR>). airGR goes along with other R packages which allow performing data assimilation, modelling integrated water resources management, and teaching hydrological modelling.

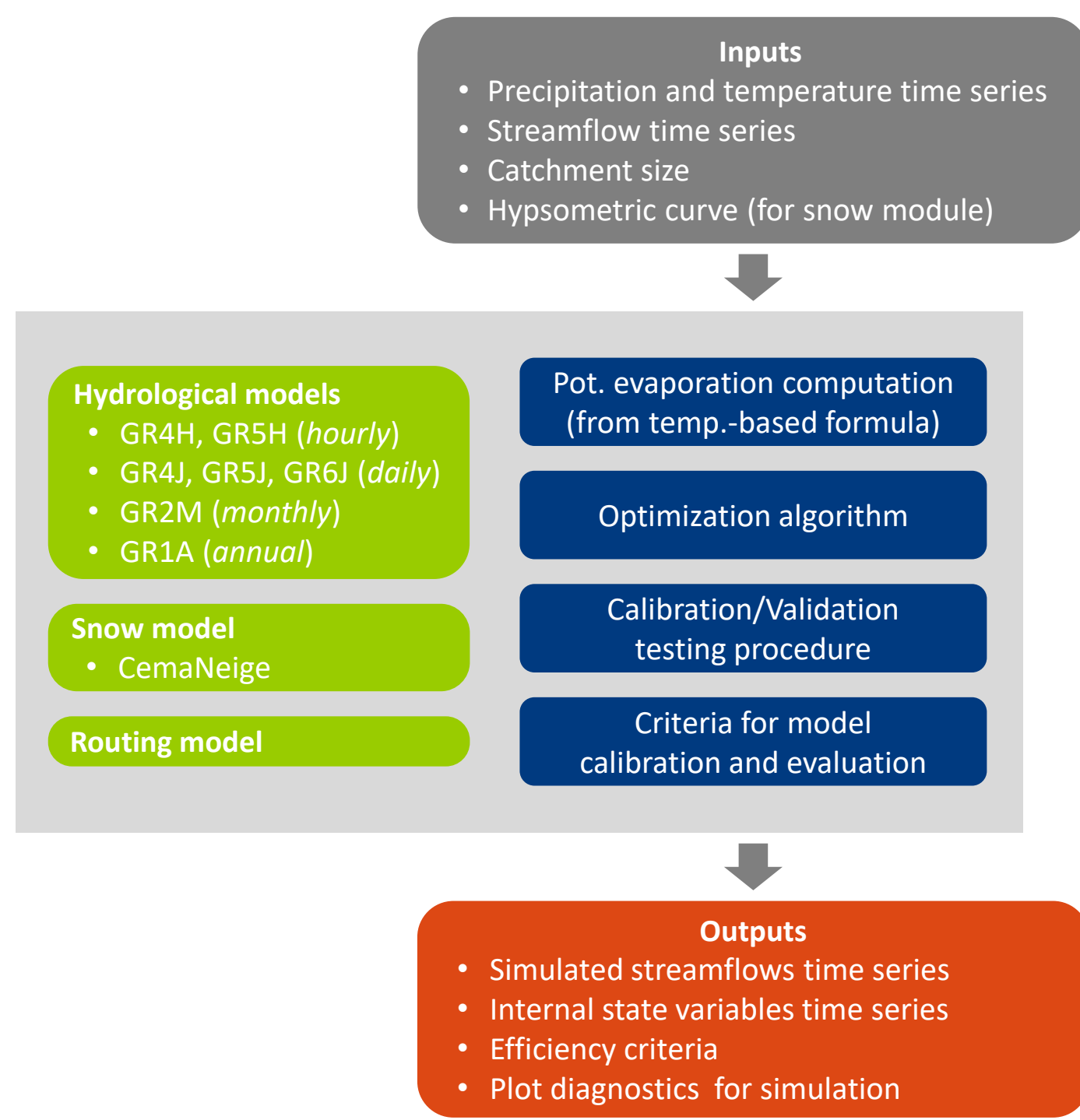
GR hydrological models

- ▶ Designed with the objective to be as efficient as possible for flow simulation at various time steps (from hourly to annual)
- ▶ Warranted complexity structures and limited data requirements
- ▶ Can be applied to a wide range of conditions, including snowy catchments (CemaNeige snow routine included)

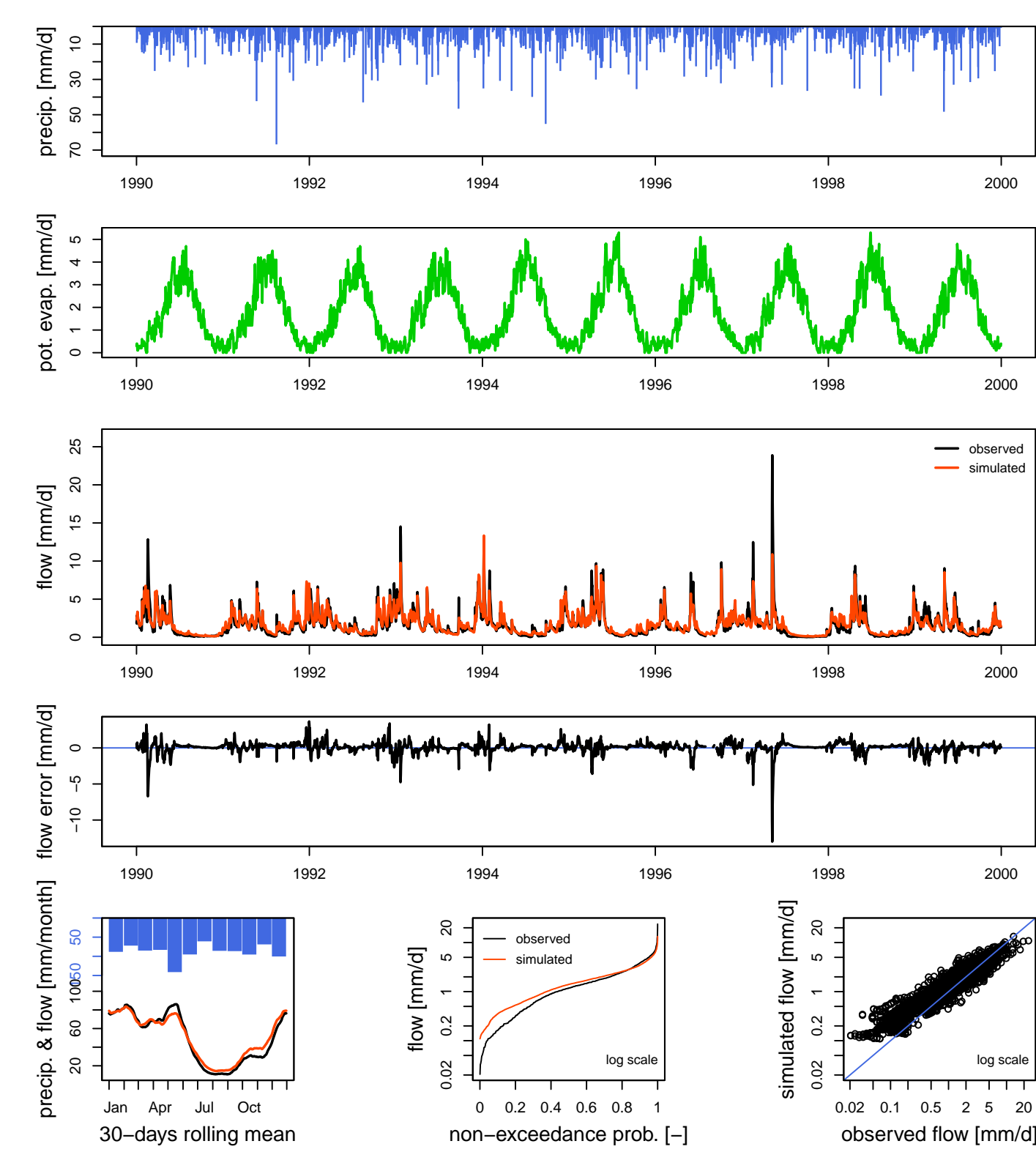
airGR galaxy tools



Main components of the airGR R-package



airGR R-package plot diagnostics example

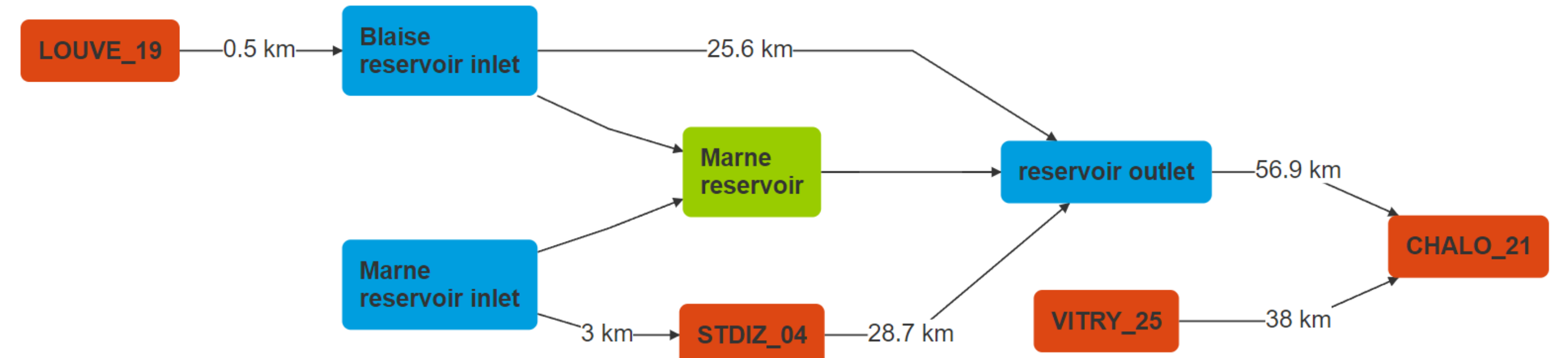


airGRiwm R-package

IAHS2022-105 | S4

- ▶ Simplifies the semi-distribution mode of the airGR package
- ▶ Integrates human influences and their managements

airGRiwm R-package network diagram

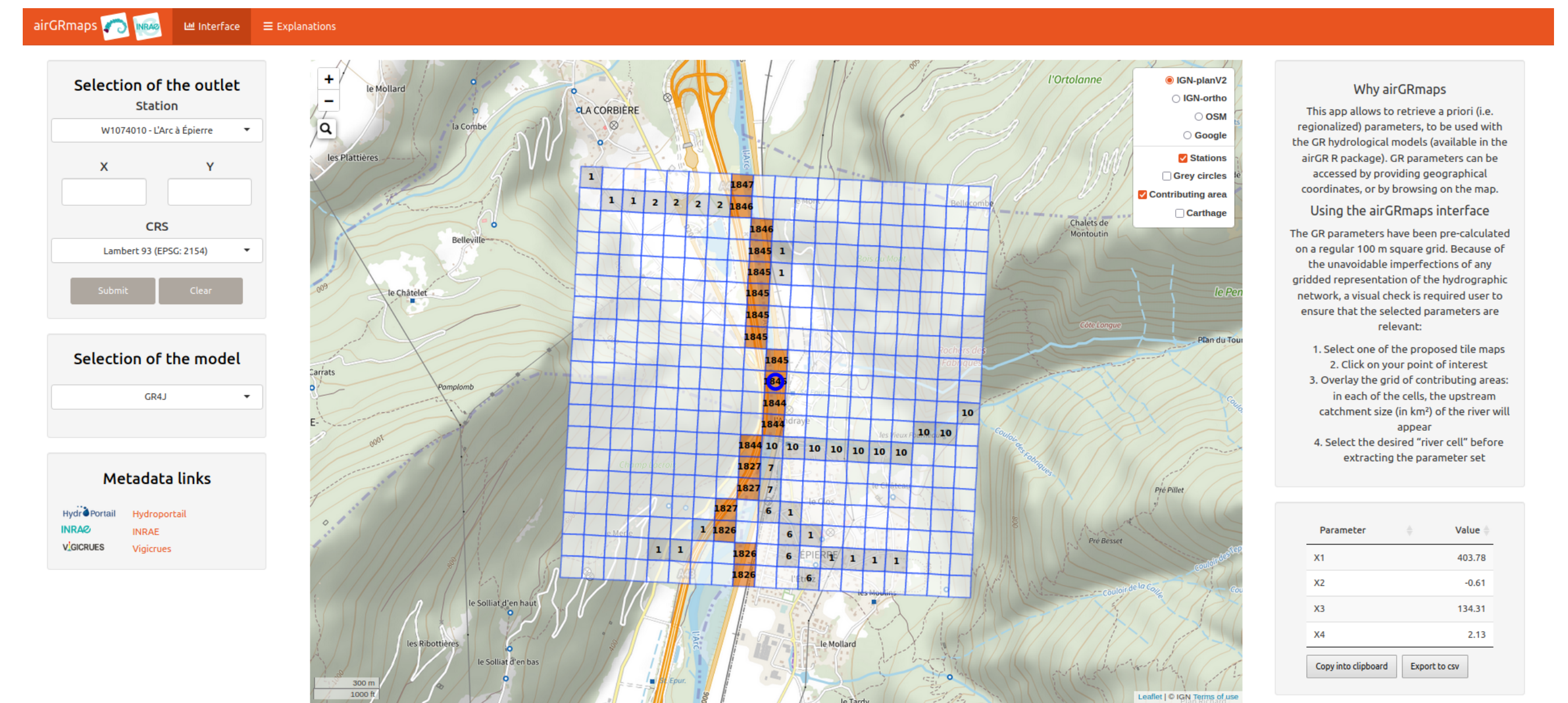


airGRmaps GUI

sunshine.inrae.fr

- ▶ Parameter maps over France for GR4J & GR5J models for ungauged basins available soon through a Shiny interface

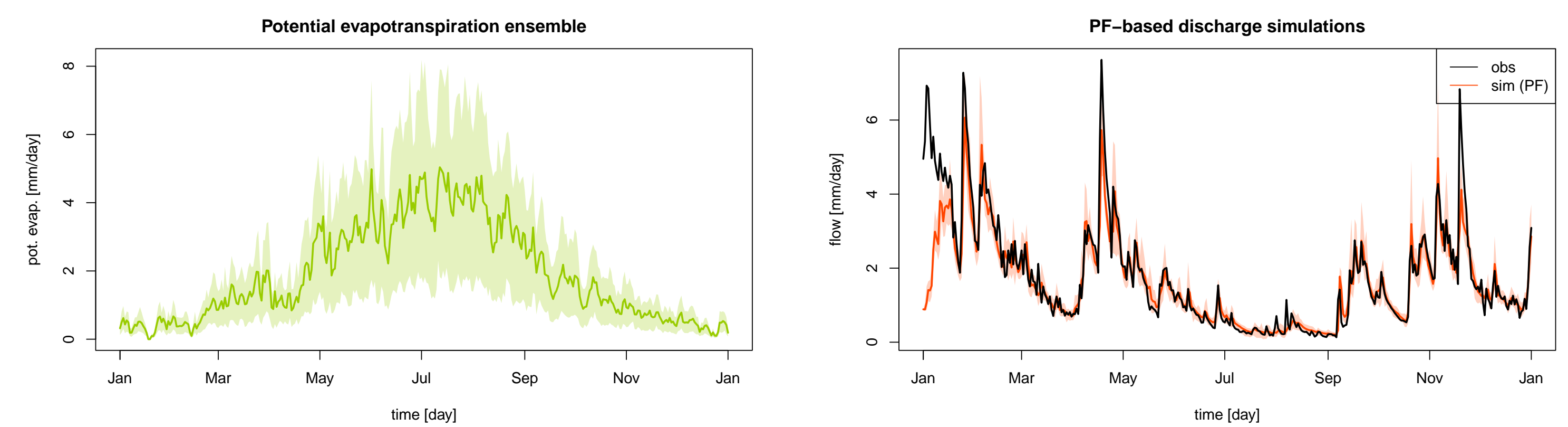
airGRmaps GUI to get parameter values of GR4J or GR5J all over France



airGRdatassim R-package

- ▶ Models:
 - ▷ only daily hydrological models (GR4J, GR5J & GR6J)
- ▶ Methods:
 - ▷ Ensemble Kalman Filter (EnKF)
 - ▷ Particle Filter (PF)
- ▶ Assimilated variable:
 - ▷ streamflow
- ▶ Specific perturbation procedures:
 - ▷ meteorological forcing uncertainties
 - ▷ model states

Perturbed PET & data assimilation simulation using the Particle Filter via airGRdatassim



baseflow R-package

- ▶ Computes hydrograph separation

airGRteaching GUI

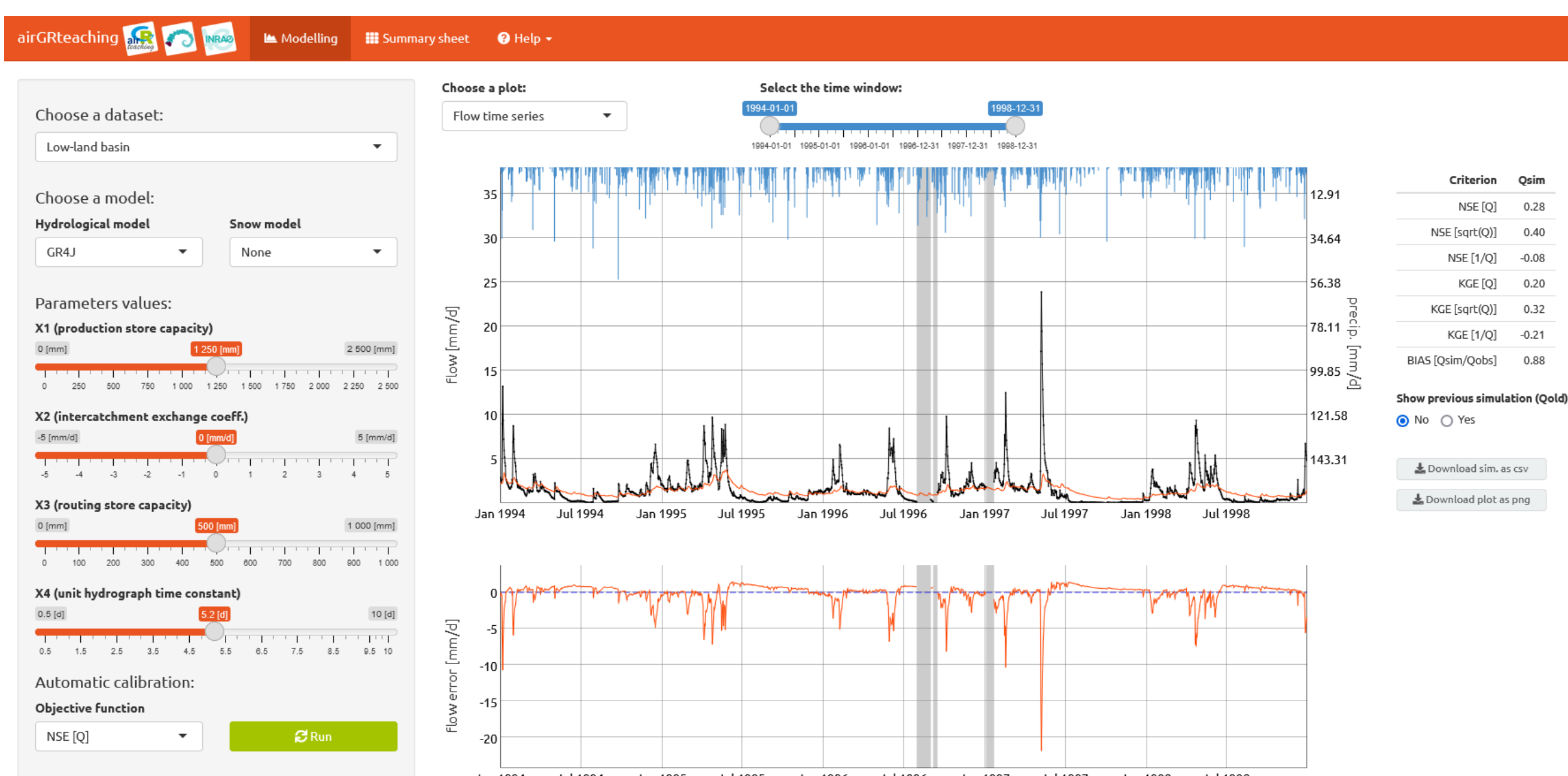
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- ▶ Manual parameter setting and interactive graphs
- ▶ Automatic setting of parameters
- ▶ Visualization of the internal states of the models

airGRteaching R-package

- ▶ Simplified functions for hydrological modelling
- ▶ Static and interactive graphs
- ▶ GUI running on user time series

airGRteaching GUI to learn hydrological modelling



References

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