The AquiFR hydrogeological modeling platform: evaluation of the 1958-2017 reanalysis for the main regional multilayer aquifers in France

Jean-Pierre Vergnes, Nadia Amraoui, Florence Habets, Nicolas Roux, Dominique Thiéry, Pascal Viennot

▶ To cite this version:

HAL Id: hal-01730224

https://hal-brgm.archives-ouvertes.fr/hal-01730224

Submitted on 13 Mar 2018

The AquiFR hydrogeological modeling platform: evaluation of the 1958-2017 reanalysis for the main regional multilayer aquifers in France.

Jean-Pierre Vergnes, BRGM, Orléans, France
Nadia Amraoui, BRGM, Orléans, France
Florence Habets, UMR 7619 Métis, UPMC, Paris, France
Nicolas Roux, CNRM-GAME Météo France, Toulouse, France
Dominique Thiery, BRGM, Orléans, France
Pascal Viennot, Centre de Géosciences MINES ParisTech, Fontainebleau, France

Key words: groundwater, hydrogeological modeling, long-term reanalysis

Abstract

The French Aqui-FR hydrogeological modeling platform gathers different hydrogeological models all together coupled with the SURFEX physically-based land surface model inside the same structure in order to provide useful information for water resources management [1]. The objective of this platform is to provide forecasts of the groundwater resources at 10-days ahead up to seasonal scale as well as long-term evolutions of hydrogeological variables for climate studies. This platform was built in order to gather competencies from the French national research organisms that developed the models inside the same integrated numerical tool. The current coverage of the models implemented in AquiFR is shown in Figure 1. They correspond to regional multilayers aquifers as well as karstic aquifers.

In this study, we present the evaluation of the 1958-2017 hydrogeological reanalysis performed with AquiFR for multiple regional multilayer aquifers included in this platform such as the multilayer aquifer of the Paris basin or the Poitou-Charentes region. These spatially distributed models were developed using either the EauDyssée hydrological platform [2] or the MARTHE groundwater modeling software [3]. The 8-km resolution SAFRAN hydrometeorological reanalysis [4] is used to provide the fluxes needed by the SURFEX land surface model to compute recharge and surface runoff that feed all the hydrogeological models [5]. The evaluation is made against a wide range of selected piezometers as well as gauging stations corresponding to the main simulated rivers. This evaluation is carried out in order to identify the potential of the platform to capture extreme events such as droughts or groundwater floodings in long-term simulations.

This reanalysis will allow to dispose of a referential state needed to evaluate future operational forecasts and long-term simulations related to climate changes. Further developments will also be considered, such as the inclusion of the hard rocks aquifers or the use of data assimilation for a better estimation of initial states in operational forecast.

References

[1] F. Habets *et al.*, « Aqui-FR, un système multi-modèle hydrogéologique à l'échelle nationale », *Géologues*, nᵒ 187, p. 105‑109, déc. 2015.

[2] F. Saleh, A. Ducharne, N. Flipo, L. Oudin, et E. Ledoux, « Impact of river bed morphology on discharge and water levels simulated by a 1D Saint–Venant hydraulic model at regional scale », *J. Hydrol.*, vol. 476, p. 169‑177, janv. 2013.

[3] D. Thiery, « Code de calcul MARTHE - Modélisation 3D des écoulements dans les hydrosystèmes - Notice d'utilisation de la version 7.5 Accès au document », BRGM, BRGM/RP-64554-FR, déc. 2015.

[4] J. Vidal, E. Martin, L. Franchistéguy, M. Baillon, et J. Soubeyroux, « A 50-year high-resolution atmospheric reanalysis over France with the Safran system », *Int. J. Climatol.*, vol. 30, nᵒ 11, p. 1627‑1644, sept. 2010.

[5] V. Masson *et al.*, « The SURFEXv7.2 land and ocean surface platform for coupled or offline simulation of earth surface variables and fluxes », *Geosci. Model Dev.*, vol. 6, nᵒ 4, p. 929‑960, juill. 2013.
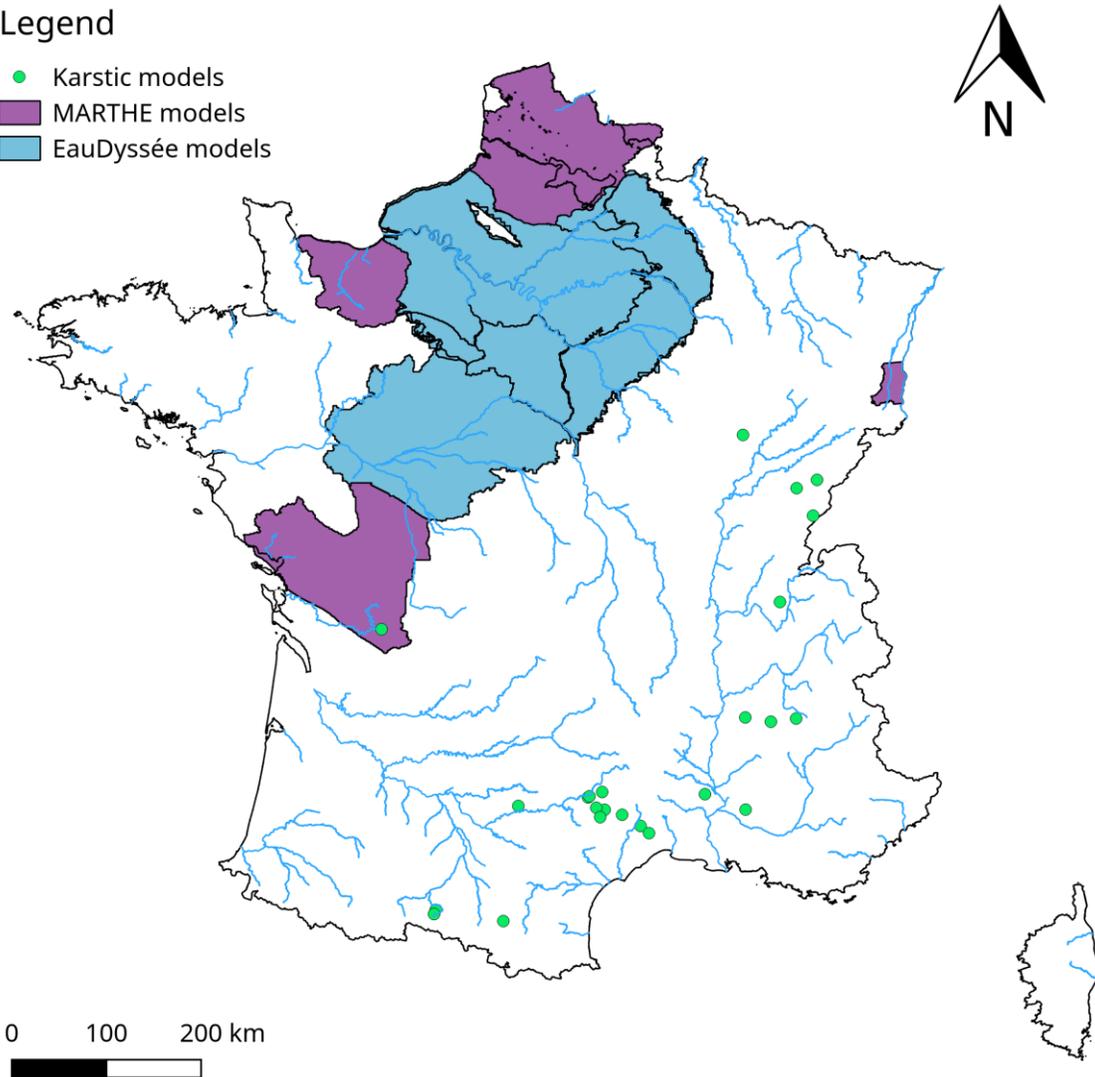
Figure 1: Models currently implemented in the AquiFR hydrogeological modeling platform.