



Forecast the evolution of groundwater levels by improving national piezometric network's data, and provide public access to almost real-time data (maps and curves). From the sensor to measured data dissemination : “la MétéEau des nappes”.

Bruno Mougin, Jérôme Nicolas, Stéphane Loigerot, Hélène Bessiere

► **To cite this version:**

Bruno Mougin, Jérôme Nicolas, Stéphane Loigerot, Hélène Bessiere. Forecast the evolution of groundwater levels by improving national piezometric network's data, and provide public access to almost real-time data (maps and curves). From the sensor to measured data dissemination : “la MétéEau des nappes”.. 43rd IAH International Congress “Groundwater and society: 60 years of IAH”, Sep 2016, Montpellier, France. hal-01379210

HAL Id: hal-01379210

<https://brgm.hal.science/hal-01379210>

Submitted on 11 Oct 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Forecast the evolution of groundwater levels by improving national piezometric network's data, and provide public access to almost real-time data (maps and curves). From the sensor to measured data dissemination : "la MétéEau des nappes".



Abstract n°1568 (Session 3.01 Groundwater data in the New Digital Age)

In front of current societal expectations and of climate-related events more and more marked (water resource's quantity and quality, pressures, climate change, drought, floods by water table rise, the need to have as quickly as possible recently measured data), the BRGM internal research project called "MétéEau des nappes" is trying to provide public access to almost real-time basic and improved data that comes from the French national piezometric network. The aim of this project is to couple these data with meteorological data and rivers discharge. The objective is also to show modelled and forecast groundwater levels (high and low) on maps and curves.

The "MétéEau des nappes" project

This project, led by a multidisciplinary team (hydrogeologists, computer scientists, and geostatistical engineers of the BRGM), deals with various scientific and technical problems :

- 1) storage and provision of basic data coming from more than 1400 sensors of groundwater levels (Nicolas et al., 2013) and from model forecast of the aquifers behavior,
- 2) development of interoperable communication tools / standards (Grellet et al., 2015) allowing exploitation and cross-referencing data from other networks (meteorology, river flow) to daily characterize in almost real-time quantitative state of groundwater resources (droughts and flooding).

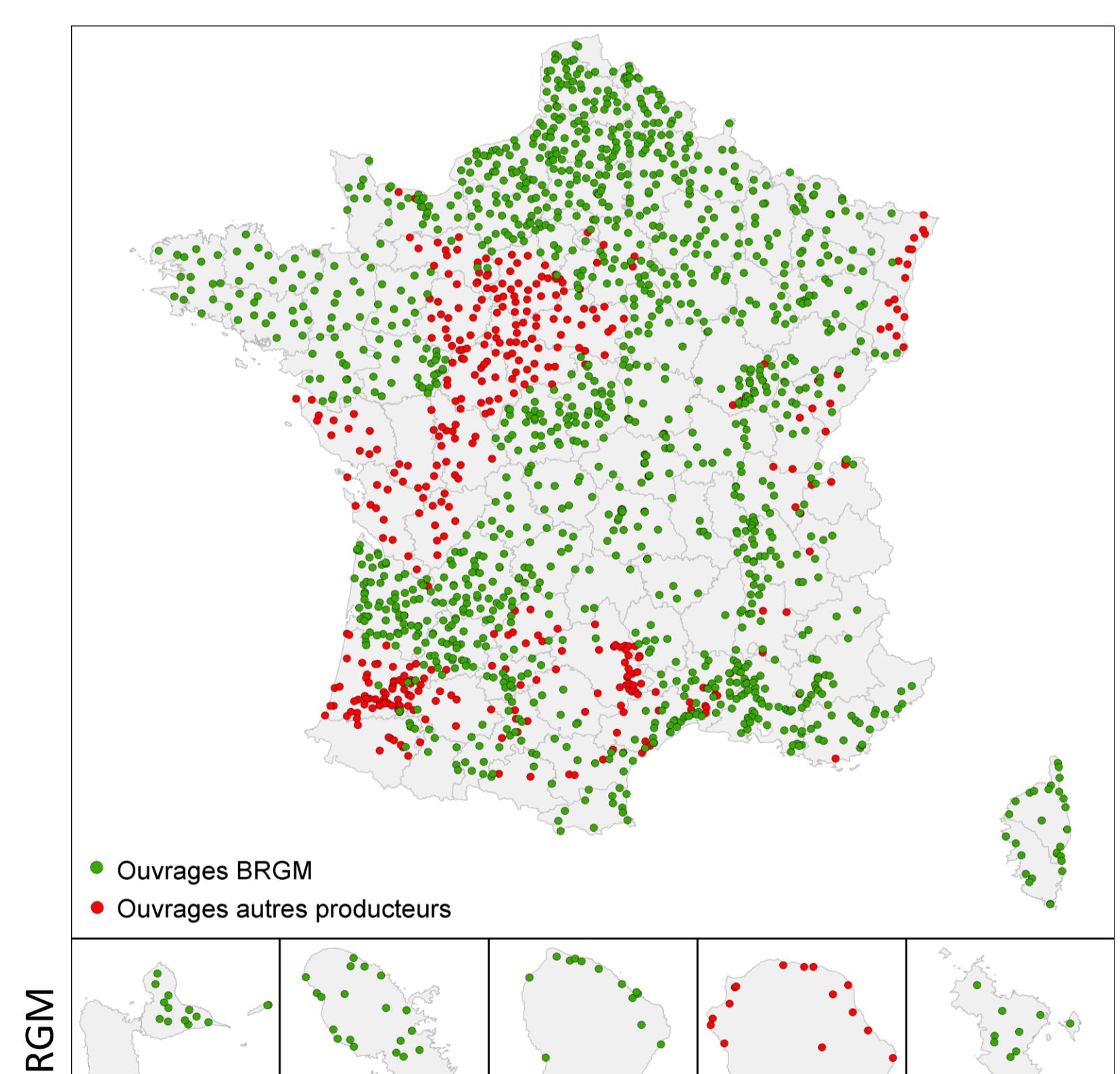
Work done in 2015 :

- inventory of global models done by the BRGM for various aims (rainfall-runoff or rainfall-runoff-piezometric level models)
- selection of 7 study areas, collection, development or updating of models
- first equipment of regional sites in GPRS (real-time data)
- edition a demo prototype tool for providing and visualizing data, beginning writing its technical and functional specifications
- technical exchanges with Météo-France and SCHAPI on meteorological and hydrometric data
- work on sensors interoperability and providing environmental data (Sensor Observation Service, Sensor Web Enablement)

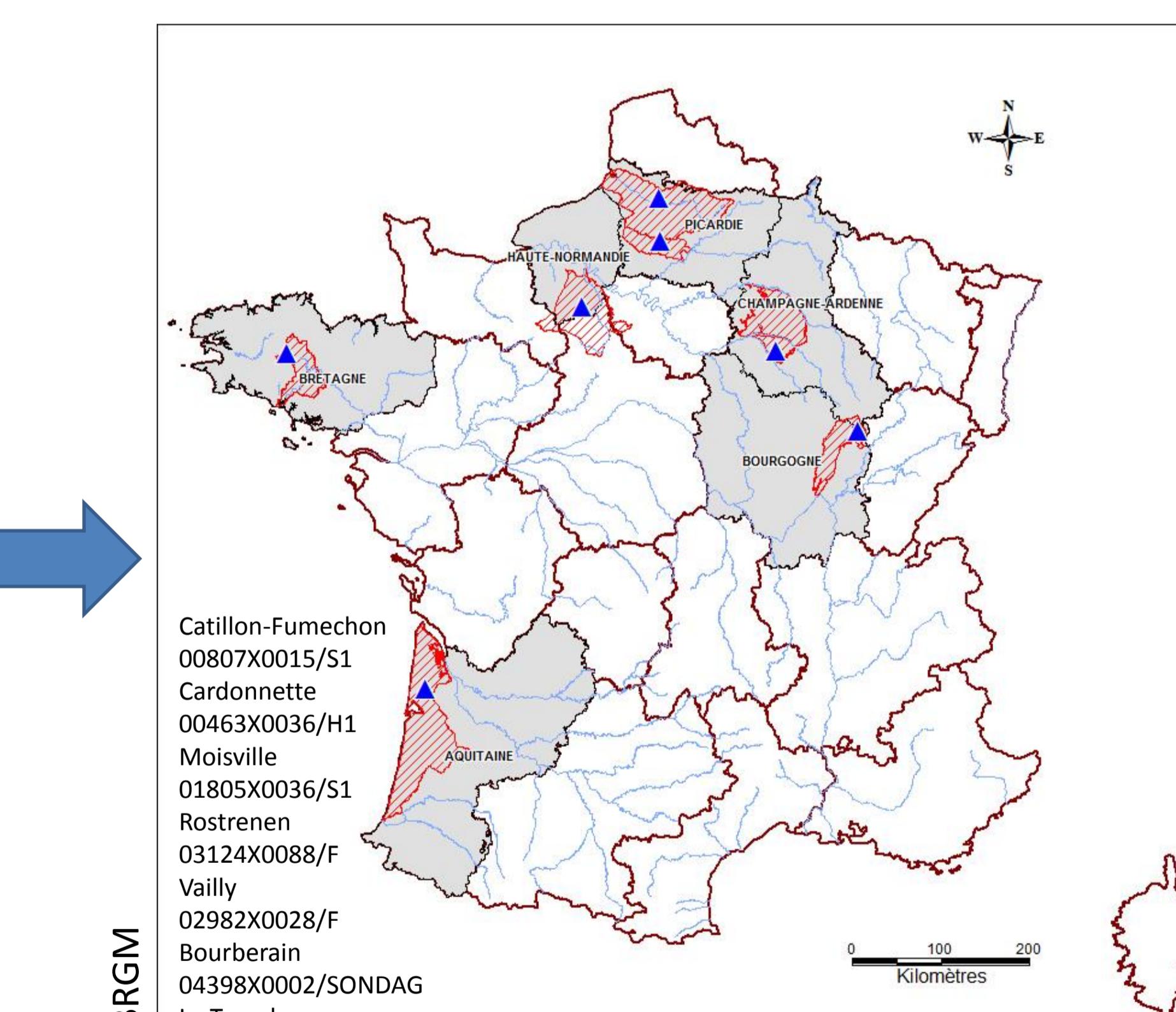
A response to the French stakeholders needs

After 3 years of project (2015-2016-2017), a practical and innovative tool could be set up. It would allow varied uses : from a simple display of current and future groundwater table by water's stakeholders (French SAGE's moderators, technicians of river catchments), to the improvement of the water use management during high or low water levels by State's Services (for example : prefect order of water restriction).

Among the French stakeholders interested in this initiative, we can also indicate : Water agencies, DREAL, DDT, Regions and Departments, Association of Municipalities, Industrial water producers...



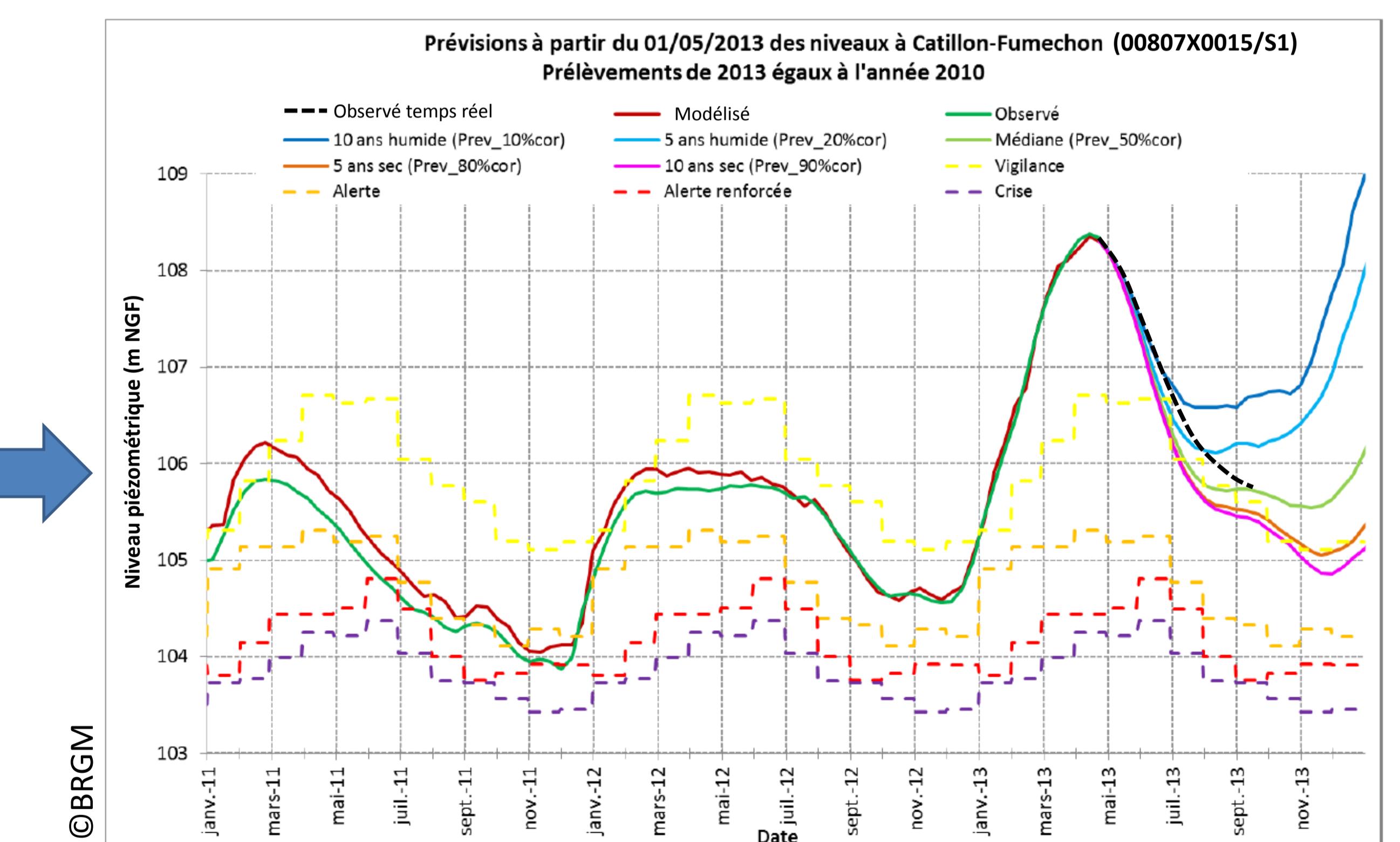
French national piezometric network
(1700 stations including
1400 managed by the BRGM)



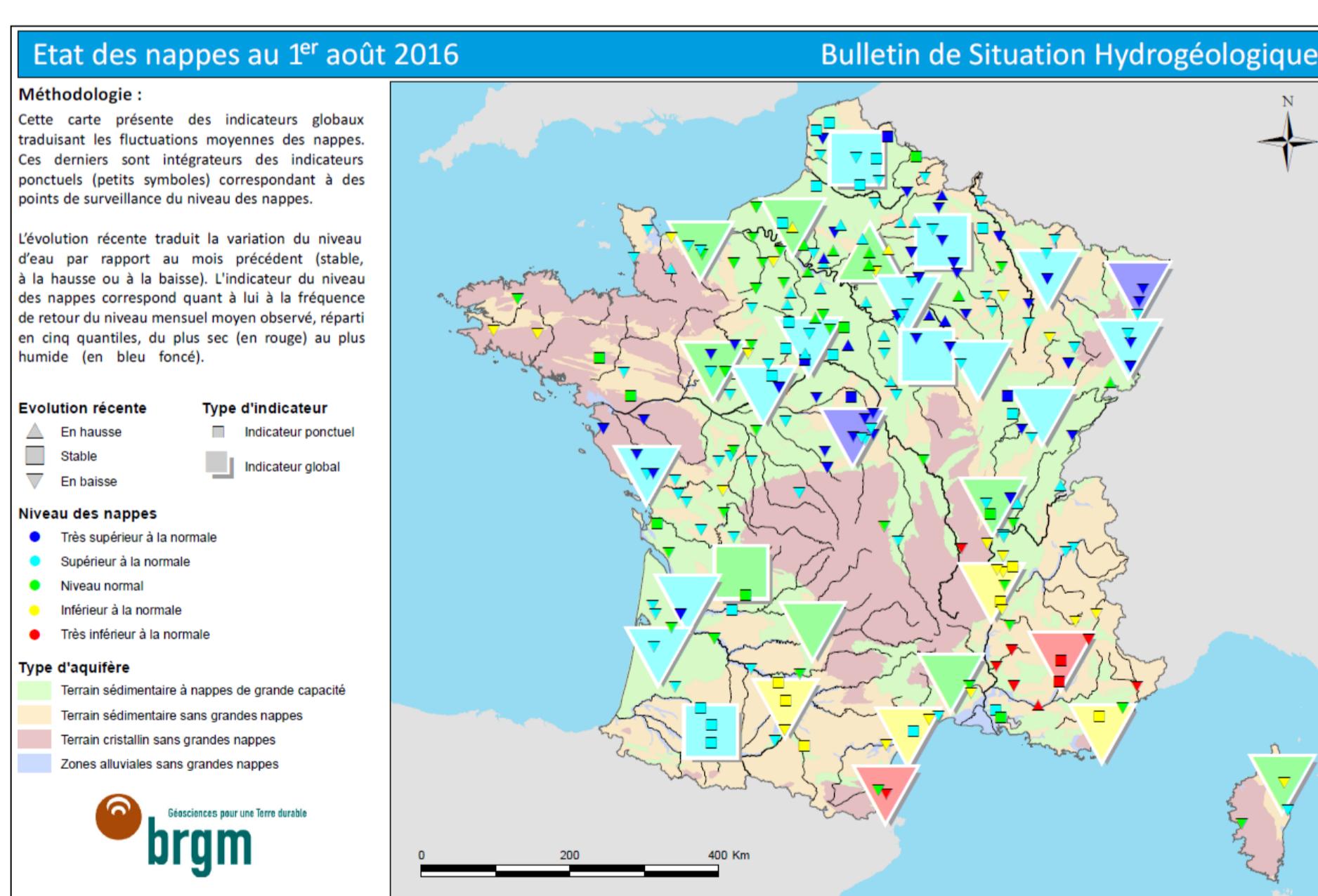
Selection of 7 representative stations
on 6 French regions, 7 groundwater bodies,
and 4 geological formations



Borehole equipped with real-time
data transmission sensor (GPRS)



Updating model (Bault et al., 2013) and creation of forecasts.
Comparison of groundwater levels observed in real-time
and forecast results.



French groundwater's level situation
at the end of July, 2016

Forecast
in 2 months ?

References (in French)

- (1) b.mougin@brgm.fr, BRGM Direction régionale Bretagne, Rennes, France
 (2) BRGM Direction Eau Environnement et Ecotechnologie, Orléans, France
 (3) BRGM Direction des Systèmes d'Information, Orléans, France
- V. Bault et H. Bessière (2013) - Prévision des niveaux piézométriques et des débits d'étiage de 2013 sur quatre bassins versants en Picardie. Rapport final BRGM/RP-62449-FR
 S. Grellet, S. Loigerot, J. Nicolas (2015) - Les standards d'interopérabilité des capteurs pour répondre aux problématiques métiers de la Direction Eau, Environnement & Ecotechnologie (D3E) du BRGM - Colloque Séries Interopérables et Systèmes de Traitement 24-25 sept. 2015 Marseille (France) (<http://sist15.sciencesconf.org/>)
 J. Nicolas, F. Verley, L. Chery (2013) - La mesure et la surveillance des niveaux d'eau dans les eaux souterraines : une décennie d'évolutions en France. « Géologues » n°178, p. 58-62