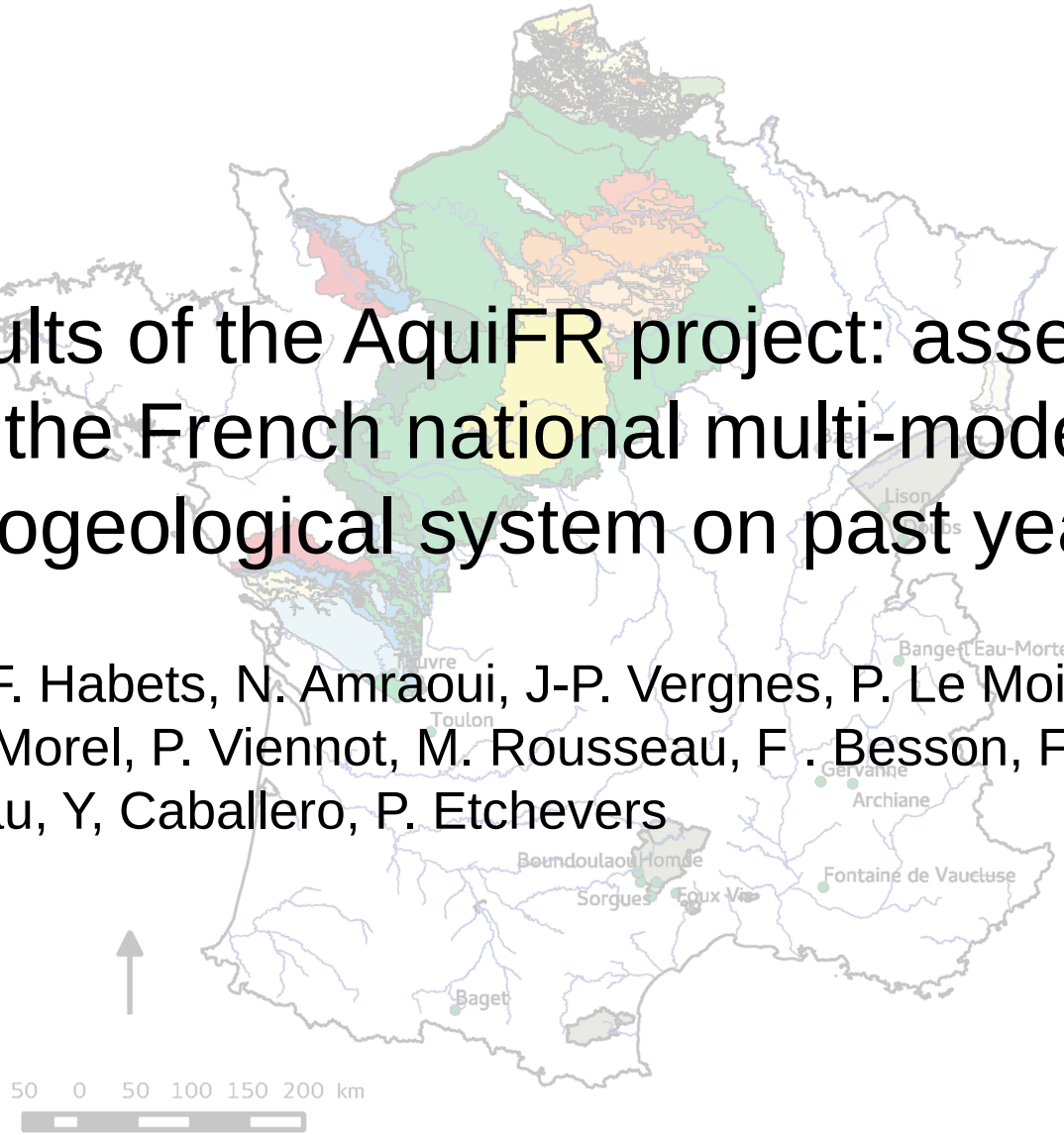
First results of the AquiFR project: assessment of the French national multi-model hydrogeological system on past years.

N. Roux, F. Habets, N. Amraoui, J-P. Vergnes, P. Le Moigne, D. Thièry, T. Morel, P. Viennot, M. Rousseau, F . Besson, F. Regimbeau, Y, Caballero, P. Etchevers



abstract 2659

25-29th September 2016
Montpellier, France
CORUM CONFERENCE CENTER
43rd IAH congress

Objectives

- Set up a durable hydrogeological modelling platform for the **monitoring** and **forecasting** of the **French groundwater resources**

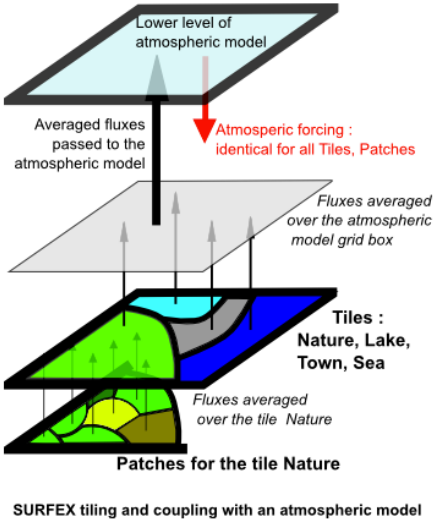
- Use of **previous regional** modelling studies and developments of new ones (bedrock aquifers)

- A **flexible** and efficient modelling tool (allowing the integration of different codes)

- Could also be used to easily assess climate change impact on hydrogeology in France

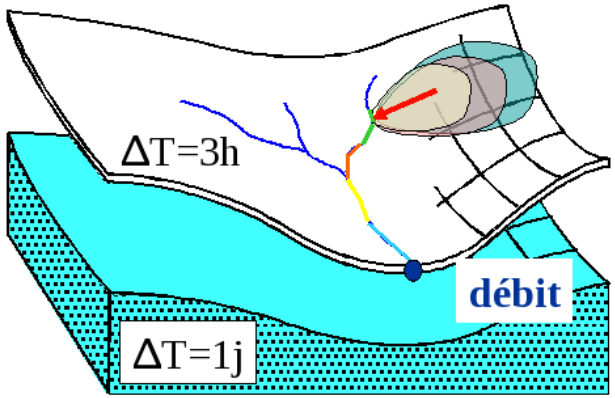
4 codes:

- Surfex (Meteo France)
  - Surface heat and water fluxes

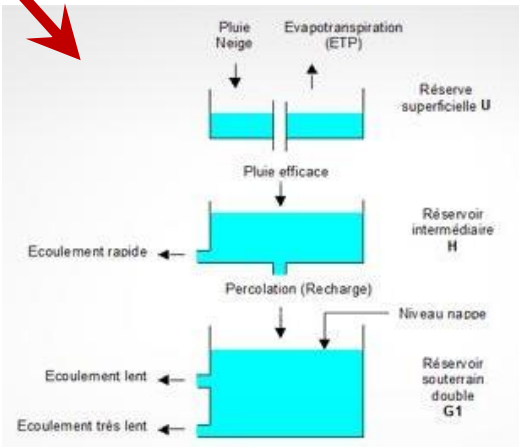


SURFEX tiling and coupling with an atmospheric model

- Eaudyssee (Mines Paristech) & Marthe (BRGM)
  - Hydrodynamic modelling



- Gardenia (BRGM)
  - Conceptual model for surface flow (karsts)



Use of the Open-PALM coupler

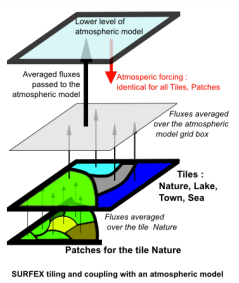
- Coupler: a software tool allowing the parallel execution and the intercommunication of programs not having been especially designed for that
- Easy set-up (already used with the Eaudyssee code)
- Flexibility
- High performance
- Fairly simple integration of new codes (from program to subroutines, module import and Palm instructions)

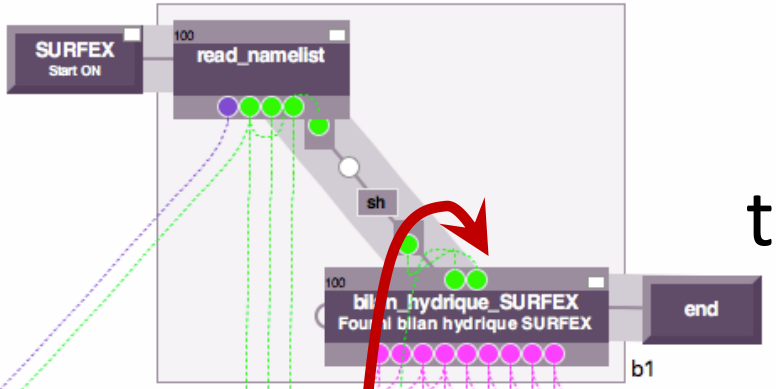
  – Example on a .f90 file:

```
USE palmlib     !*I The PALM interface
USE palm_user_param !*I The PALM constants
```

```
cl_space = 'one_double'
cl_object = 'main_dt_time'
CALL PALM_PUT(cl_space, cl_object, PL_NO_TIME, PL_NO_TAG, ZMAIN_DT_TIME, il_err)
```

AquiFR structure in the Open-Palm coupler

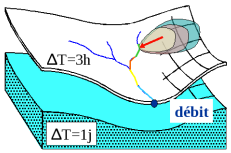


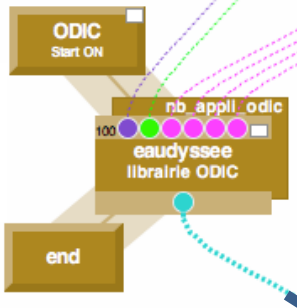


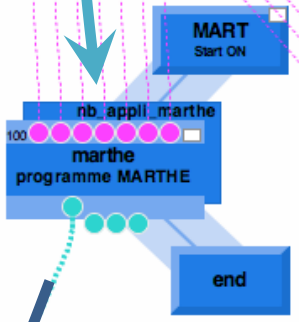
$t_n \rightarrow t_{n+1}$

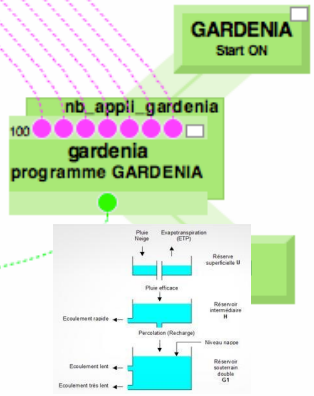
Atmospheric forcing/
Runoff, infiltration

Runoff, infiltration









Water head,
river ground water exchanges

Water flow

O-Palm

(http://www.cerfacs.fr/globc/PALM_WEB)

Modélisation des aquifères
de la plaine de Caen
et du bassin

Phase 2
calage du modèle h

Modélisation hydrogéologique des aquifères du Bajocien -
Bathonien dans le secteur des Bocages Normands

Céline MONTEIL

le 12 décembre 2011

Roussel (AESN-DBN),

Estimation de la contribution des principaux aquifères
du bassin
au fonctionnement hy

Modélisation de la nappe de la
Craie du Nord-Pas de Calais

Calage du modèle hydrodynamique
en régime transitoire

Contribution à la gestion des
prélèvements à la périphérie du
Marais Poitevin par modél
hydrodyna

Modélisation de la salure profonde
au droit et en aval du bassin

M/RP-60217-FR
eptembre 2011

Modélisation de la pollution nitrique des grands aquifères
ine-Normandie
masses d'eau

Modélisation mathématique du fonctionnement
hydrogéologique du bass

-oOo-

Représentation diffé
des aquifères du Te
/
Intégration des prélèvement

P.

Mise à jour du modèle
des hautes eaux de la Somme

Rapport final

BRGM/RP-53211-FR
juin 2004

nodèles hydrogéologiques
sin de la Seine

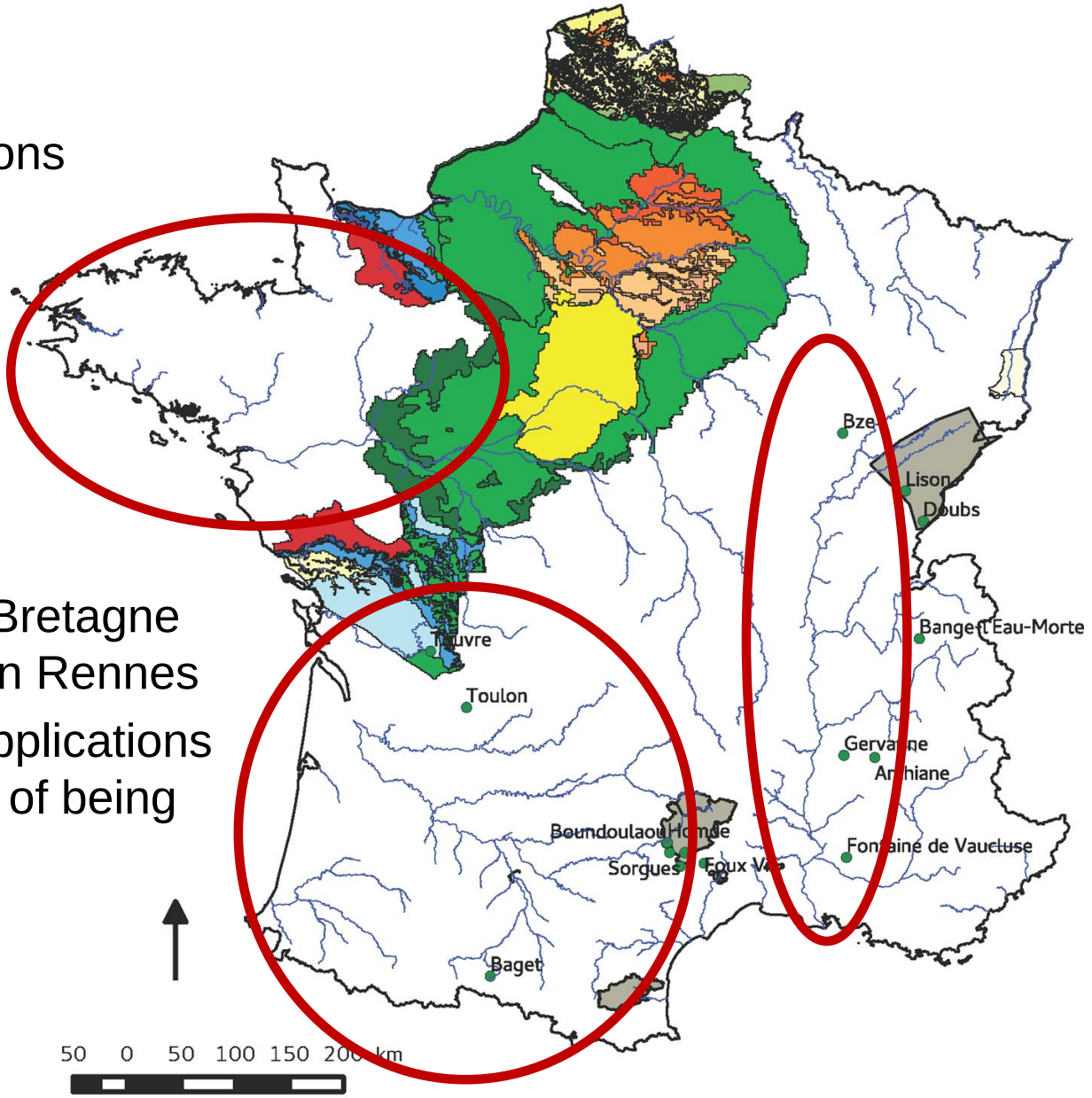
t final

N COUPLED
STREAM-AQUIFER SYSTEMS

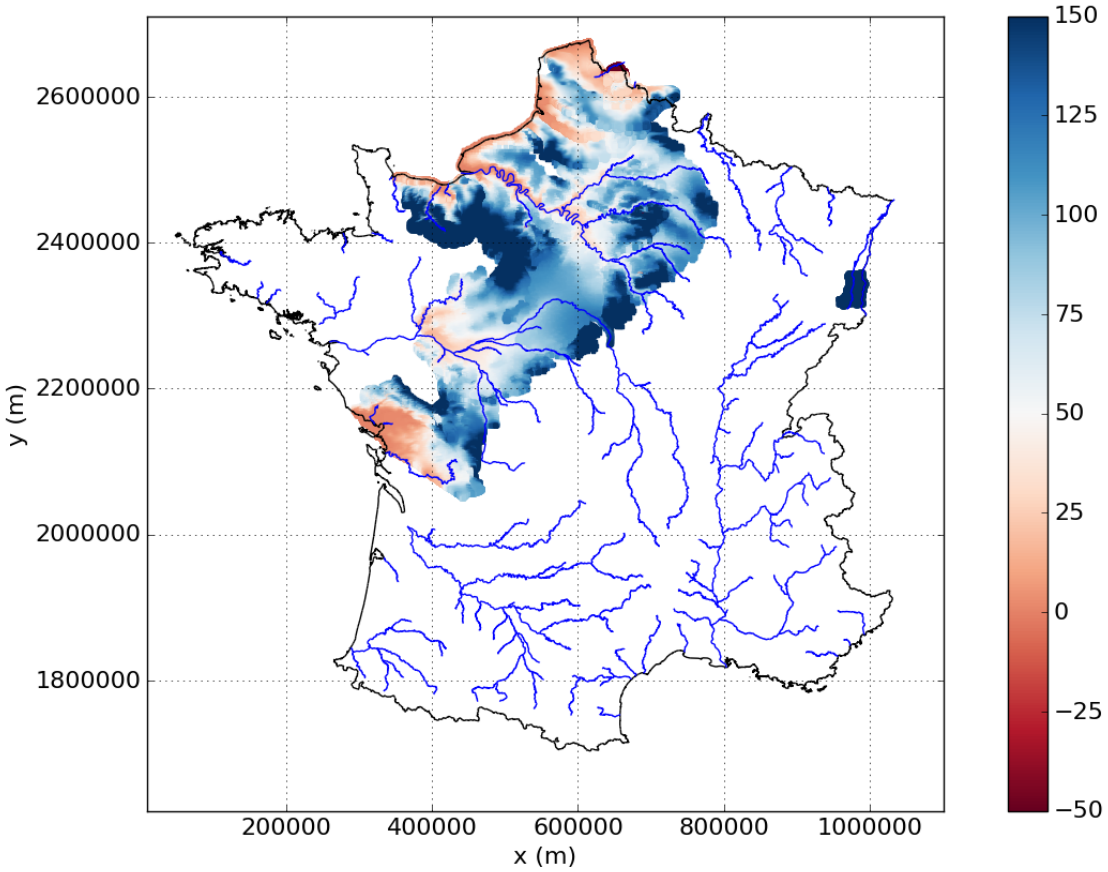
submitted by **SERDAR KORKMAZ** in partial fulfillment of the requirements for the

Current extension of the AquiFR applications

- 13 aquifers applications
  - 8 Eaudyssee
    - 450 000 grid cells
  - 6 Marthe
    - 1 200 000 grid cells
- 6 karst applications
- dt = 1day
- 125m < dx < 1000m
- Bedrock aquifers of Bretagne under development in Rennes
- Rhone & Garonne applications are to in the process of being included

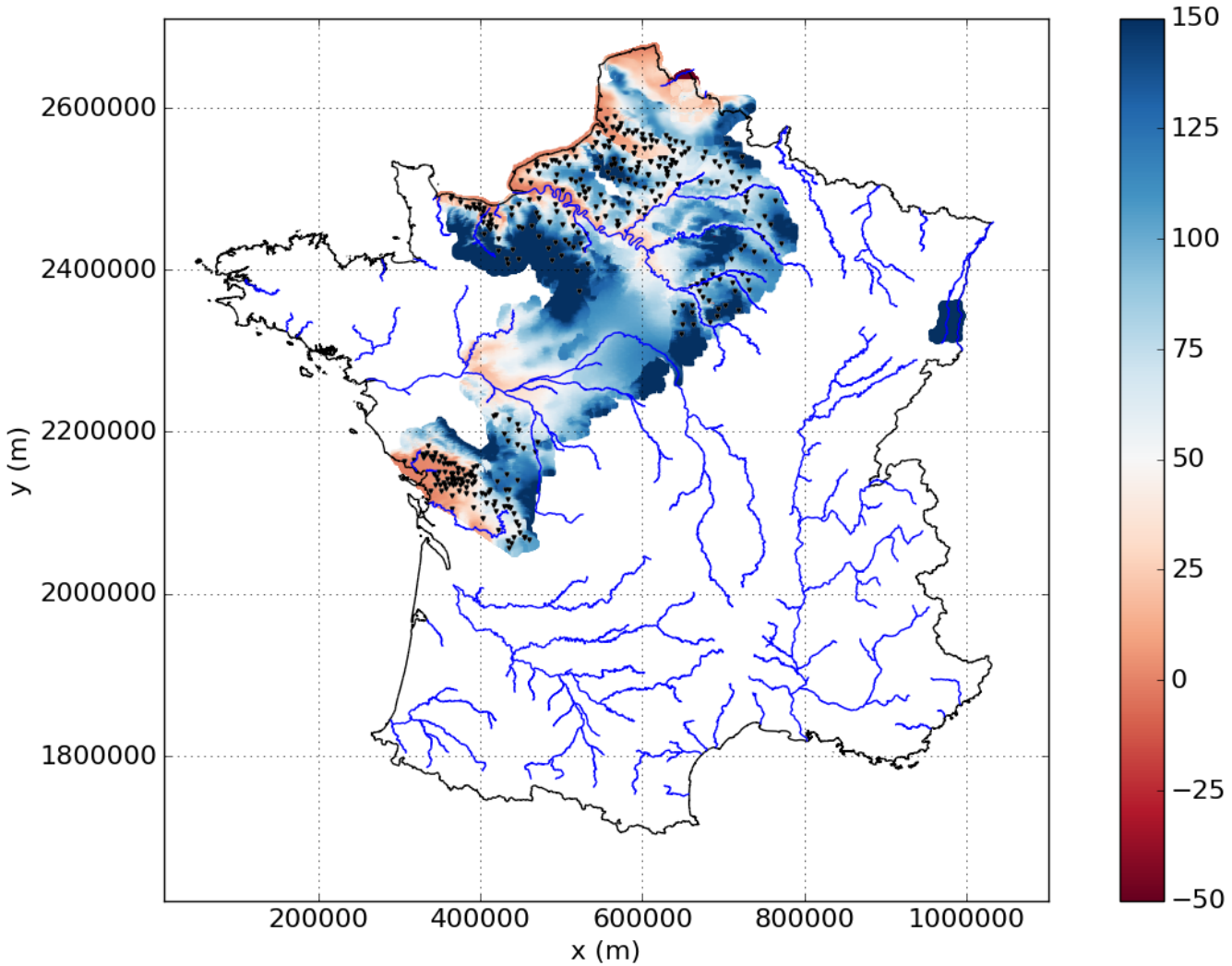


Preliminary results: water head maps

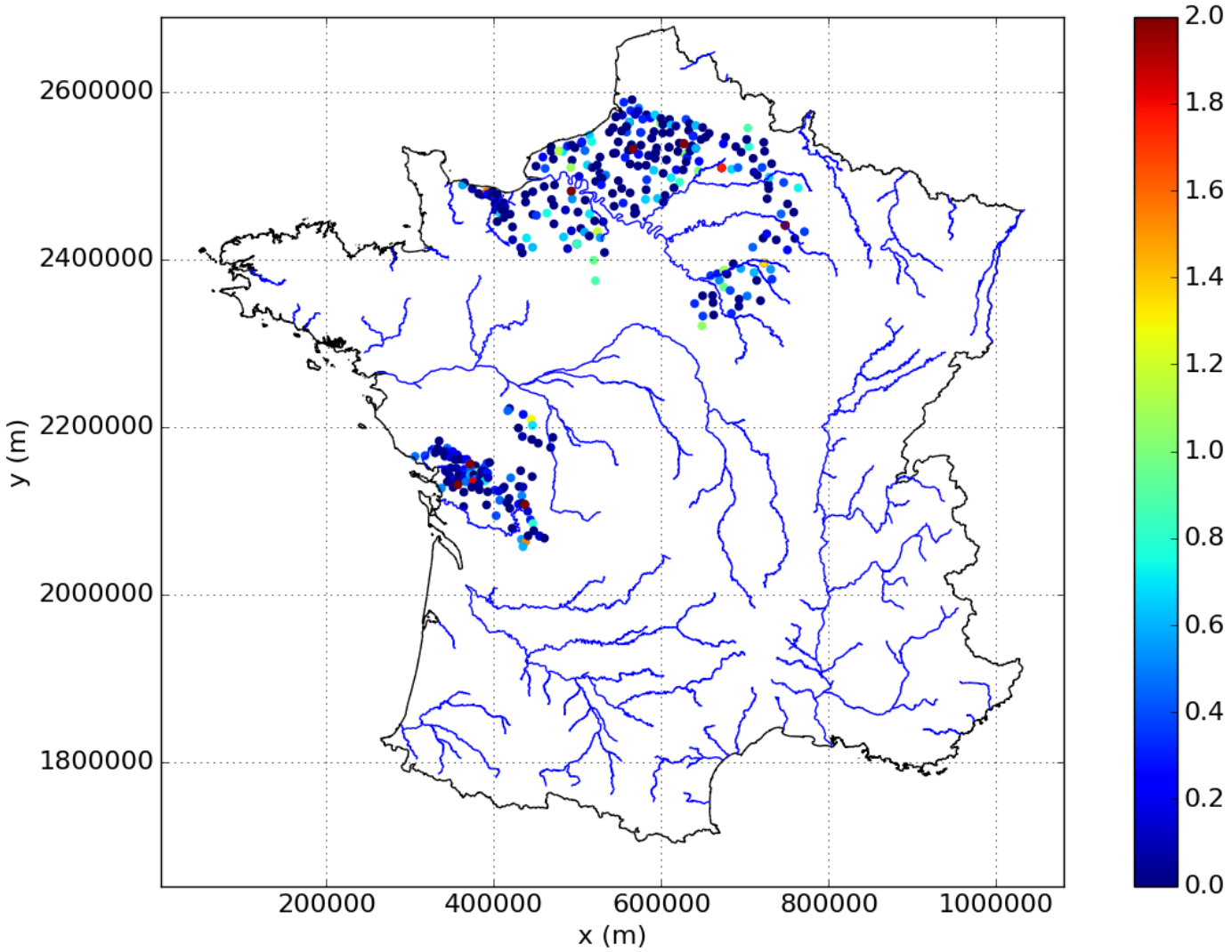


- Need for global re-evaluation

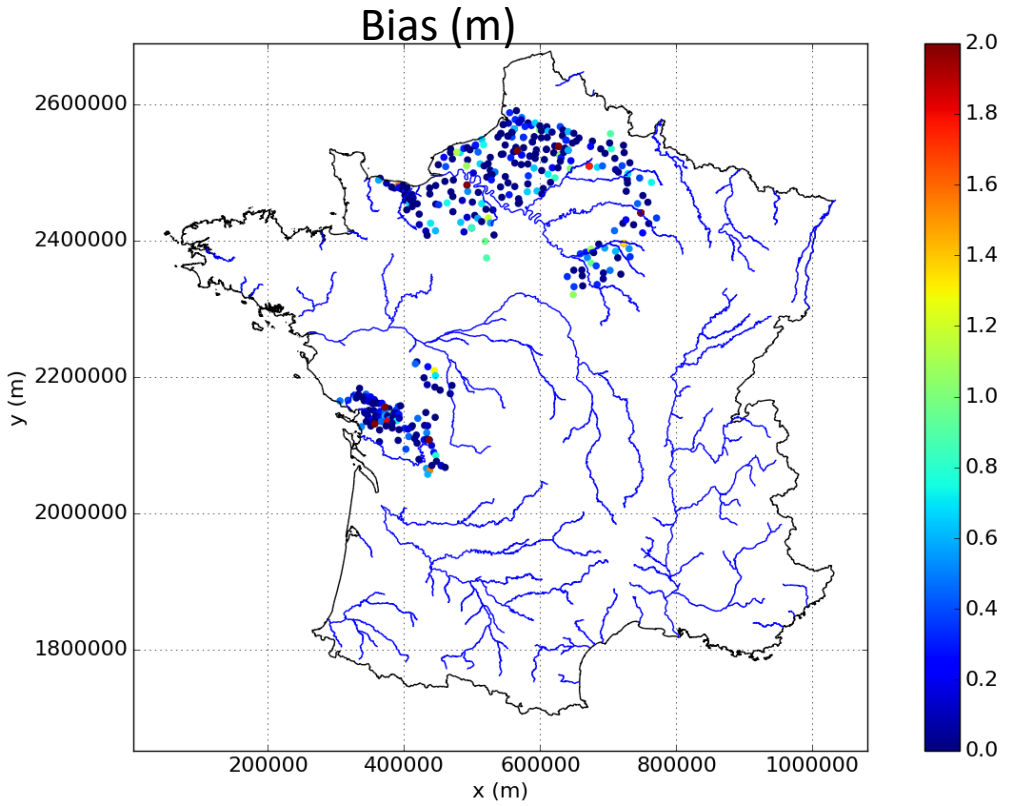
Reanalysis using historical water level records (around 400 so far and more a being processed)

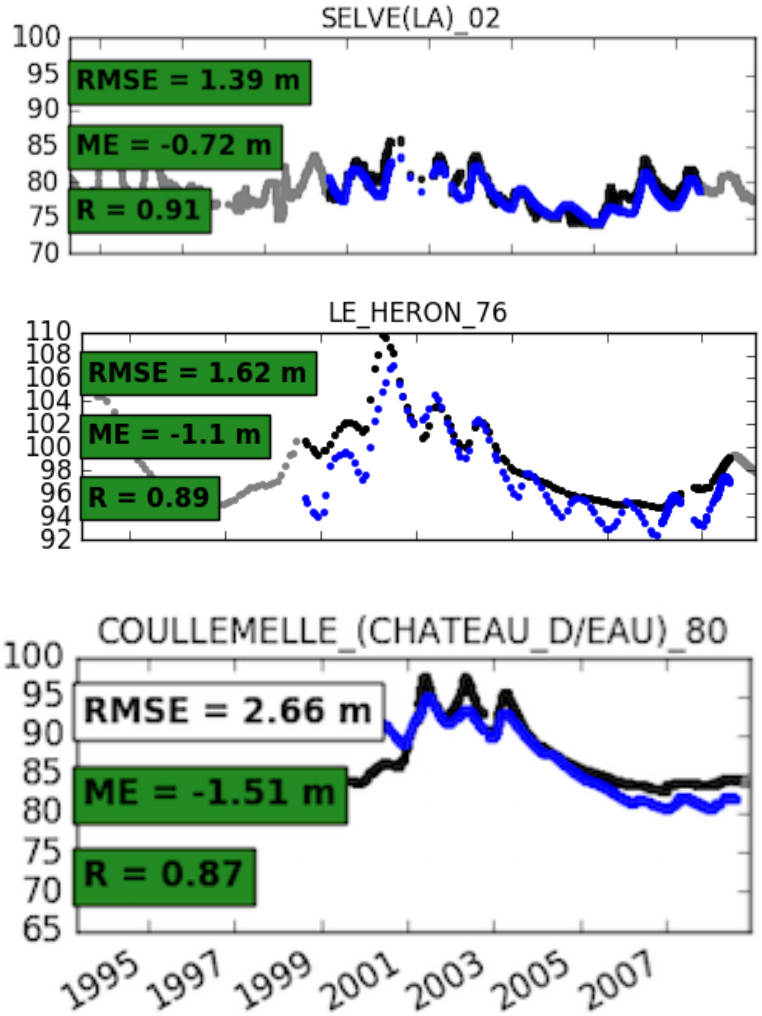


Evaluation through reanalysis: Bias map (m)



Evaluation through reanalysis: 1999 > 2008



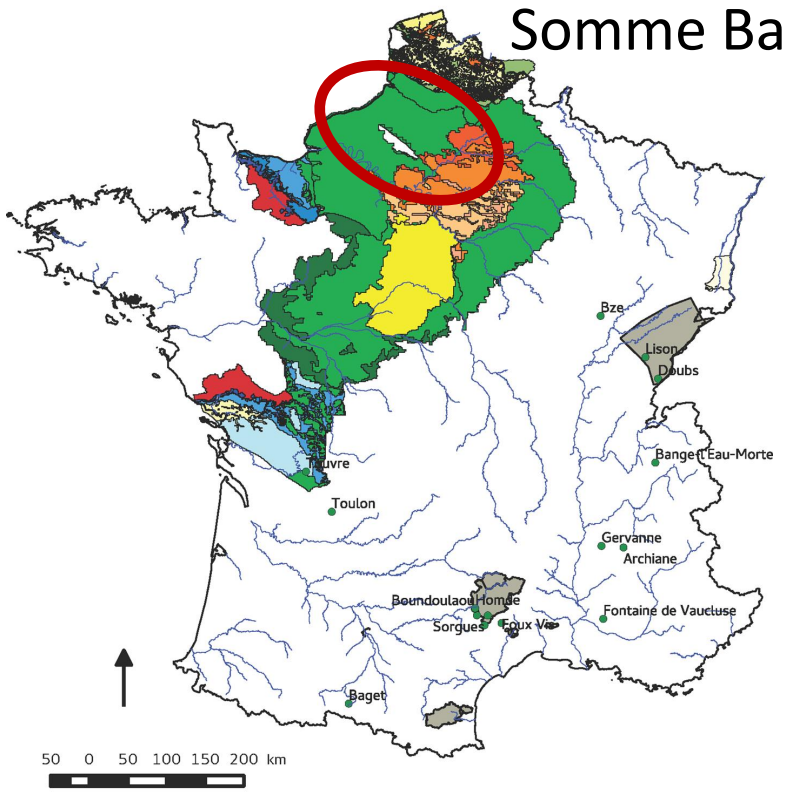


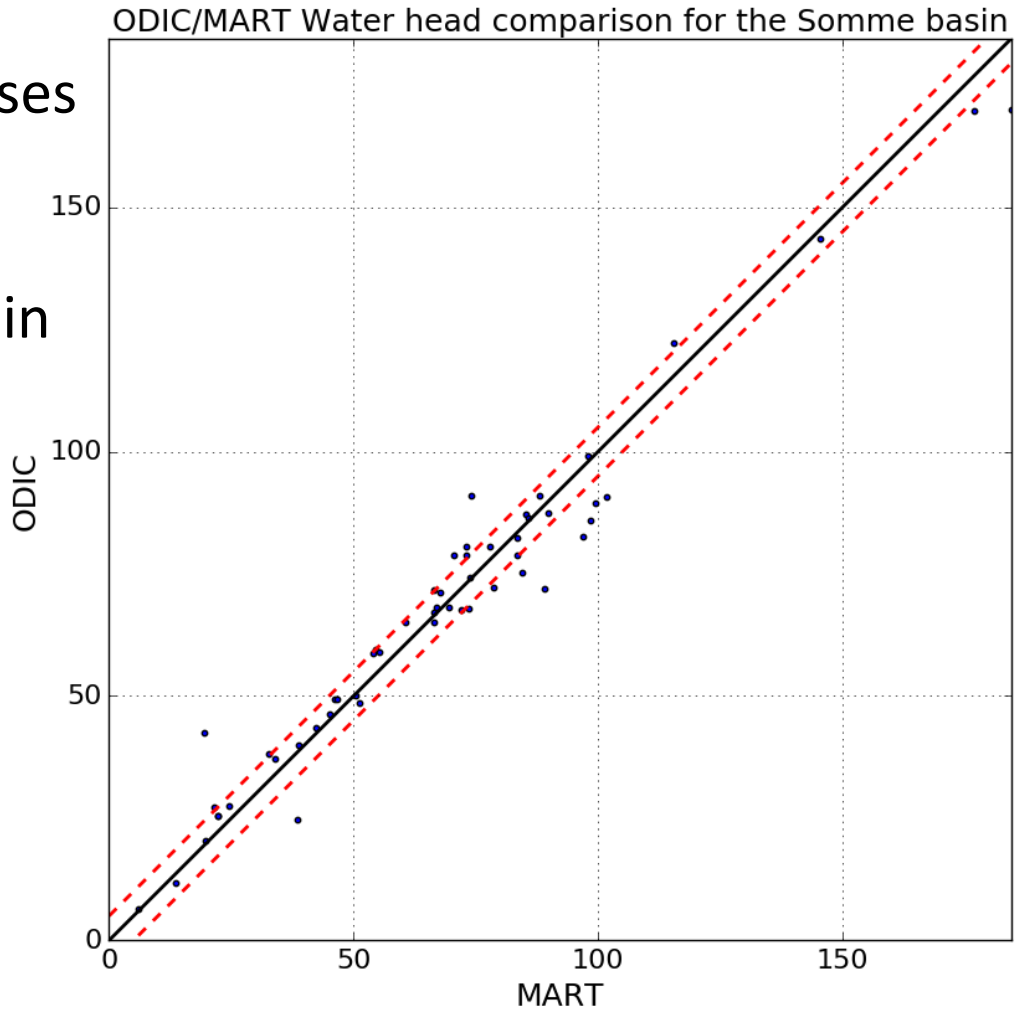
Ongoing work...

- More piezometer analysis
- Water flow stations comparison

Comparison between the two codes

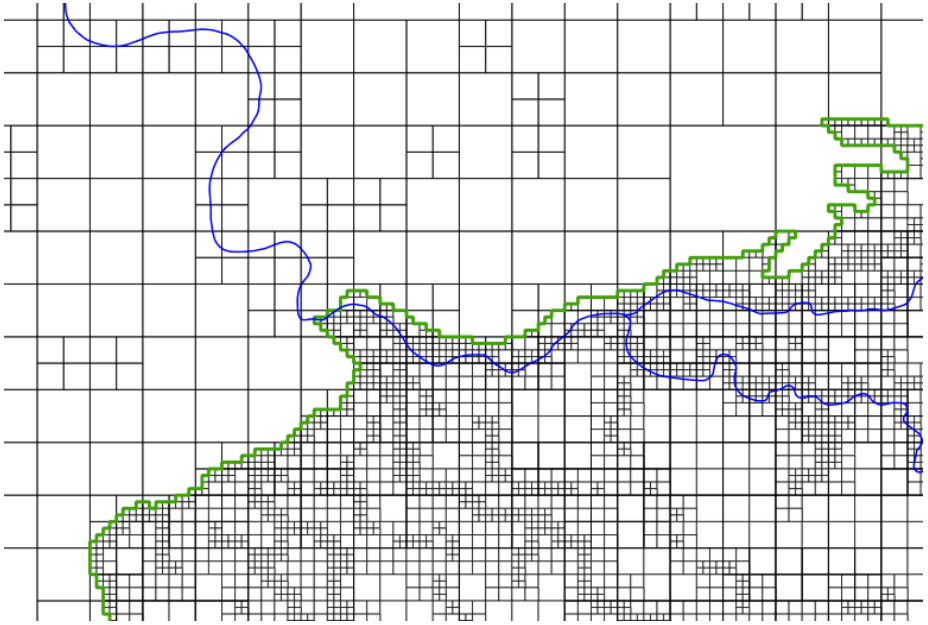
- Different calibration processes (time periods and piezometers)





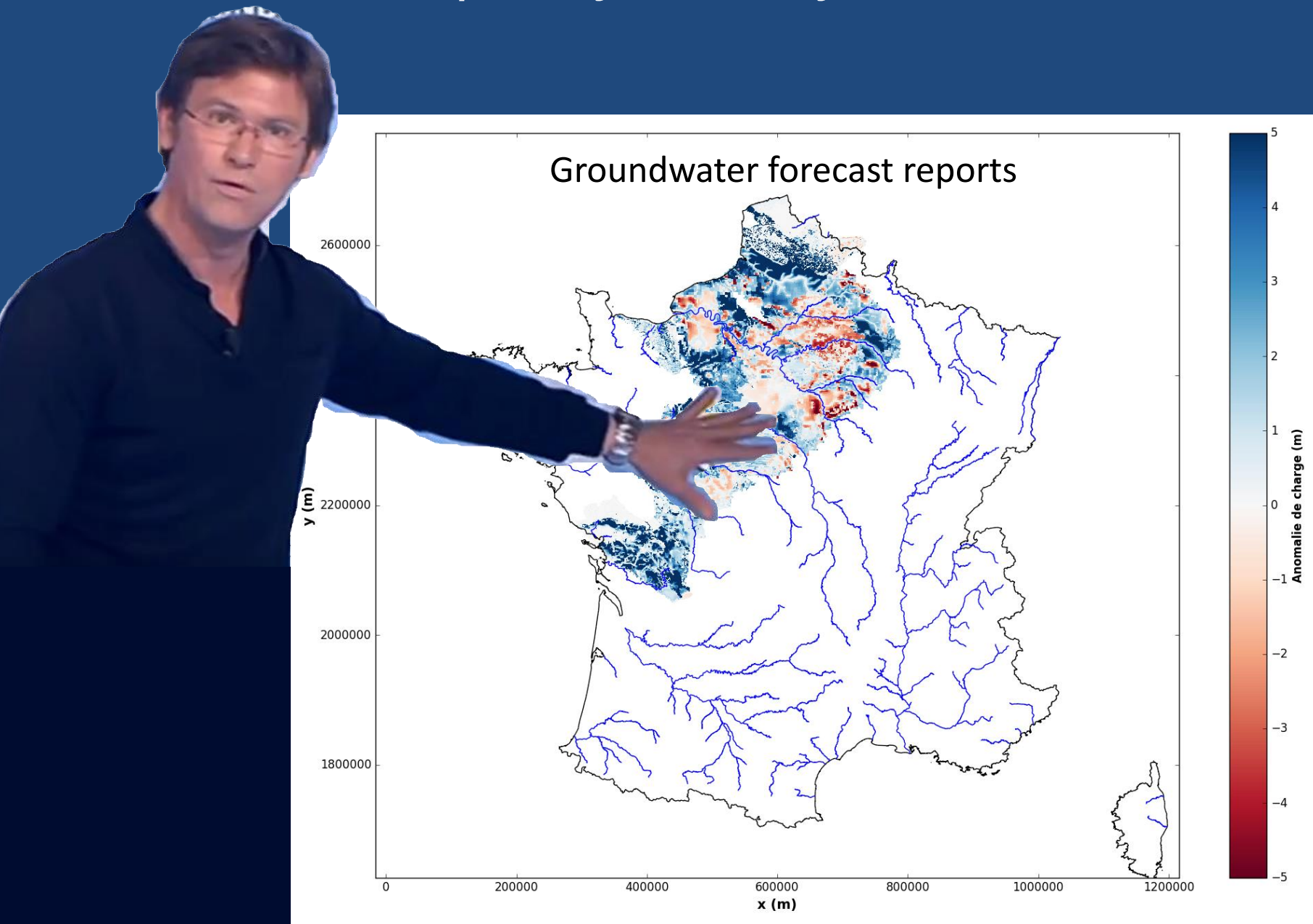
Future tasks…

- Continue the reanalysis further back in time (water abstraction records are uncertain), ongoing
- Implement the water table feedback in Surfex (land surface model)
- Assessment of forecast capabilities through hind cast (from 10 days up to the seasonal scale), before ensemble forecasting
- Using a common routing river network for all the applications as the transfers times can differ with various resolutions.



(Difference of resolution between two chalk application in the Seine basin)

And hopefully one day, on national TV…



And hopefully one day, on national TV…