
ANR AGENCE NATIONALE DE LA RECHERCHE

# Prediflood: A French research project aiming at developing a road submersion warning system for flash flood prone areas (2009-2012)

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Pacte

LTHE

Cemagref Sciences, eaux & territoires

METEO FRANCE Toujours un temps d'avance

# Outline

1. Objectives
2. The project
3. Methodological aspects
4. Preliminary results

# I. Objectives of the project (1)



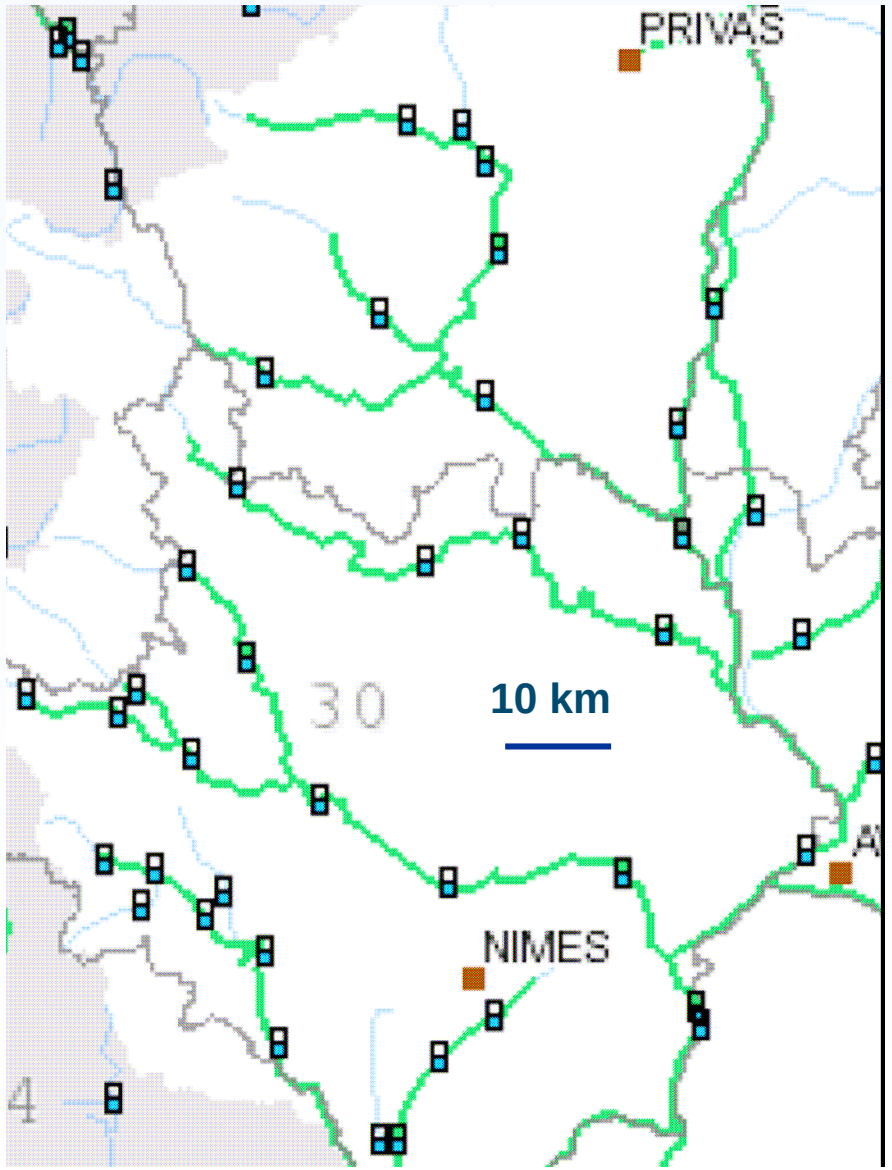
In flash flood prone areas :

- The road network is affected at first
- Almost half of the victims are car passengers.

# I. Objectives of the project (2)

**Existing forecasting networks limited to the main streams !**

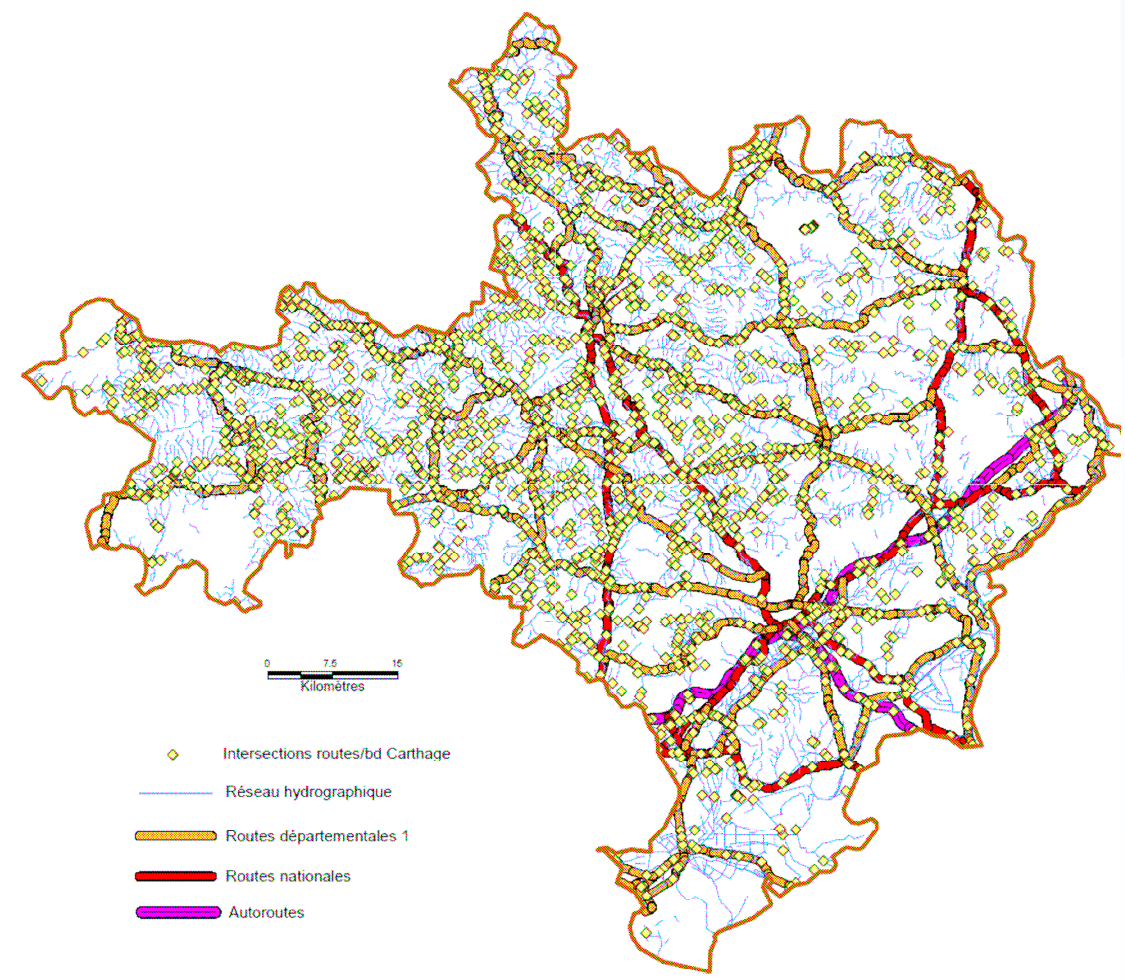
**Example of the Gard**



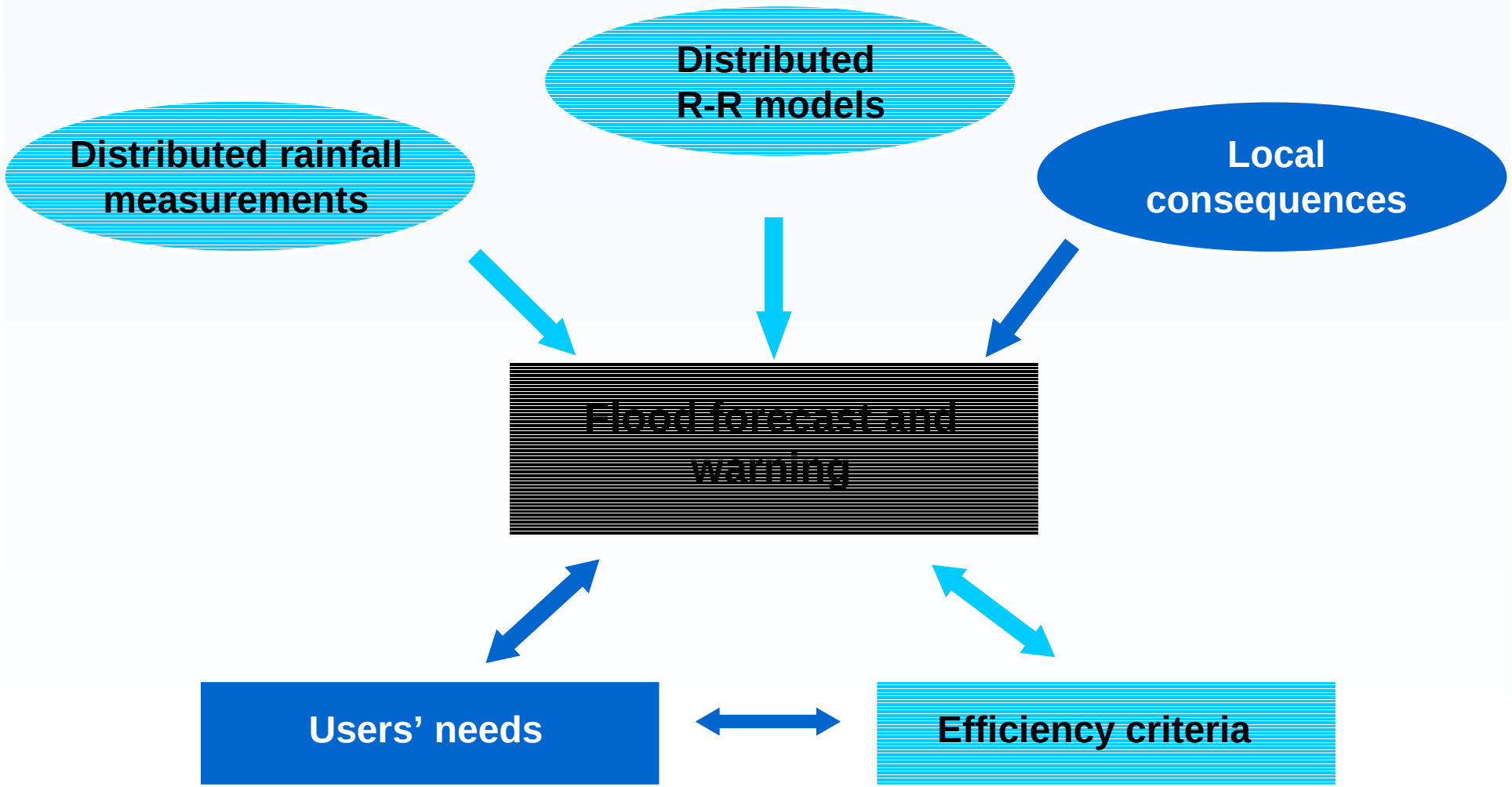
# I. Objectives of the project (3)

**Assets spread over the territory : about 5000 road sections exposed to flooding in the Gard.**

**Need for highly distributed forecasts**



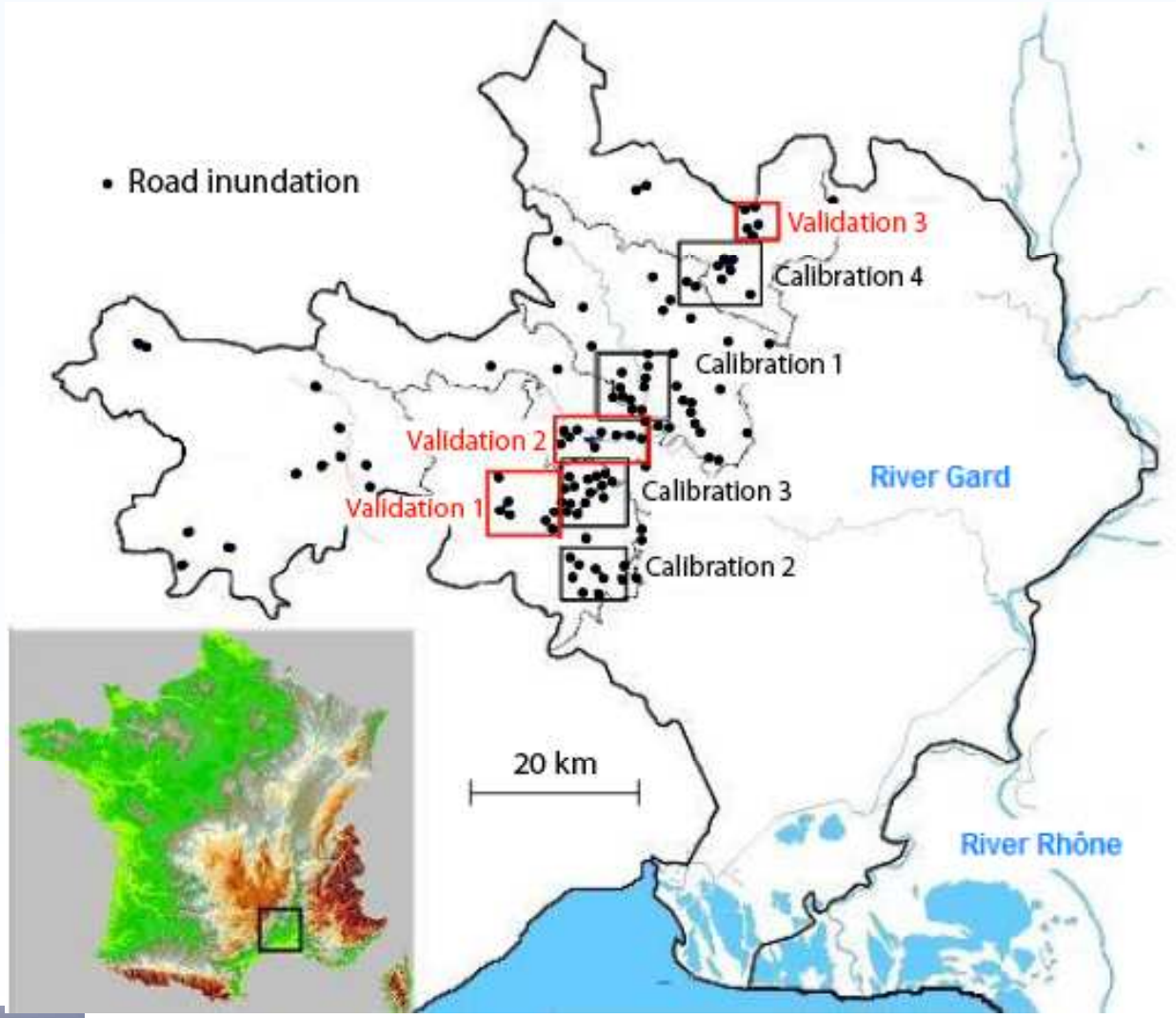
# II. The project: What is new ?



# II. The project: The case study

**Gard region:**

**Data set of recorded road submersions**



# II. The project: Initial results

## Promising initial results

**PhD thesis P-A. Versini (2007)**
(Versini et al., NHESS,2010a and 2010b)


# II. The project: The partners

**LCPC - *Division Eau et Environnement***

**CNRS – UMR LTHE**

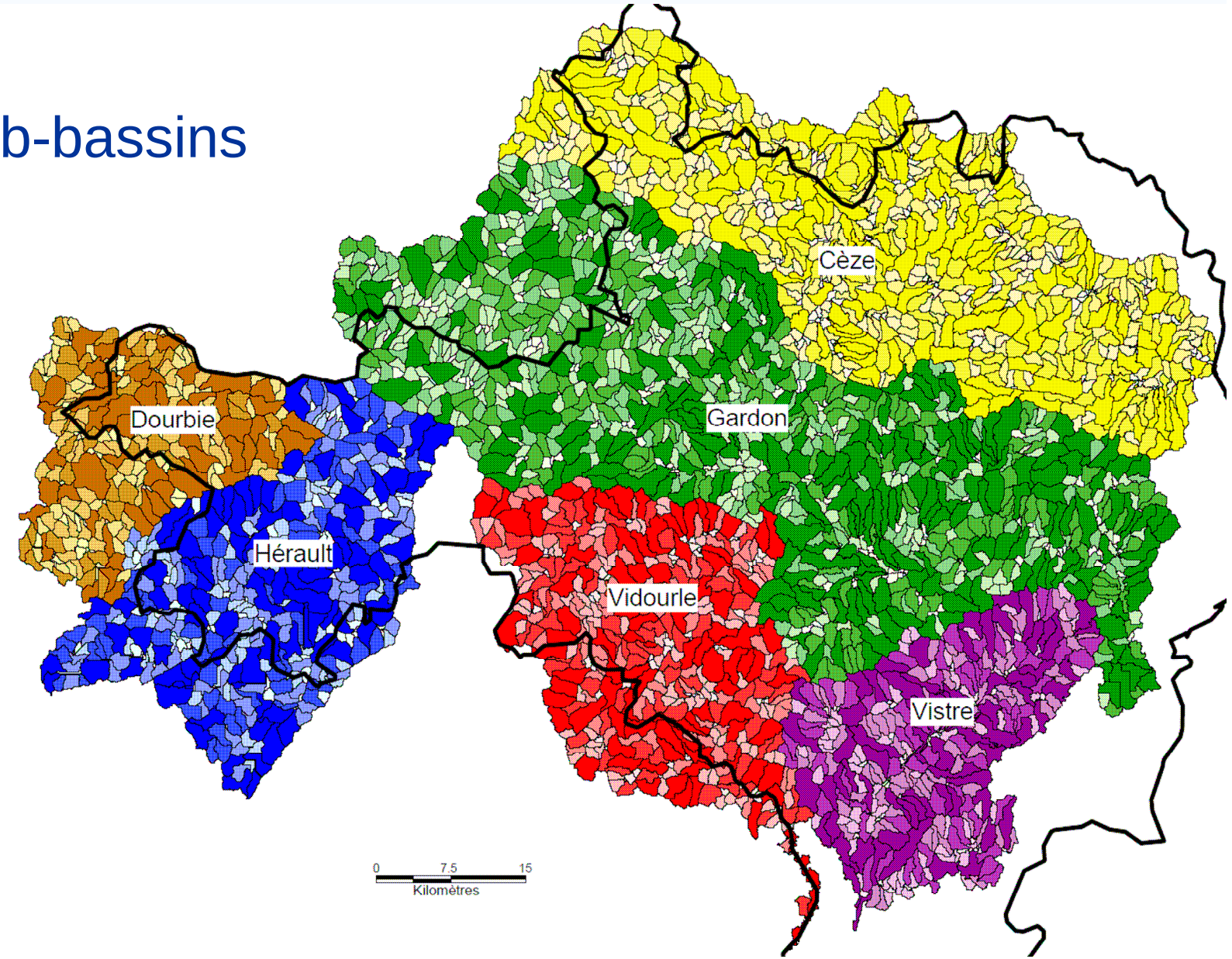
**CNRS – UMR PACTE**

**Cemagref – Aix en Provence**

**Meteo France - CNRM**

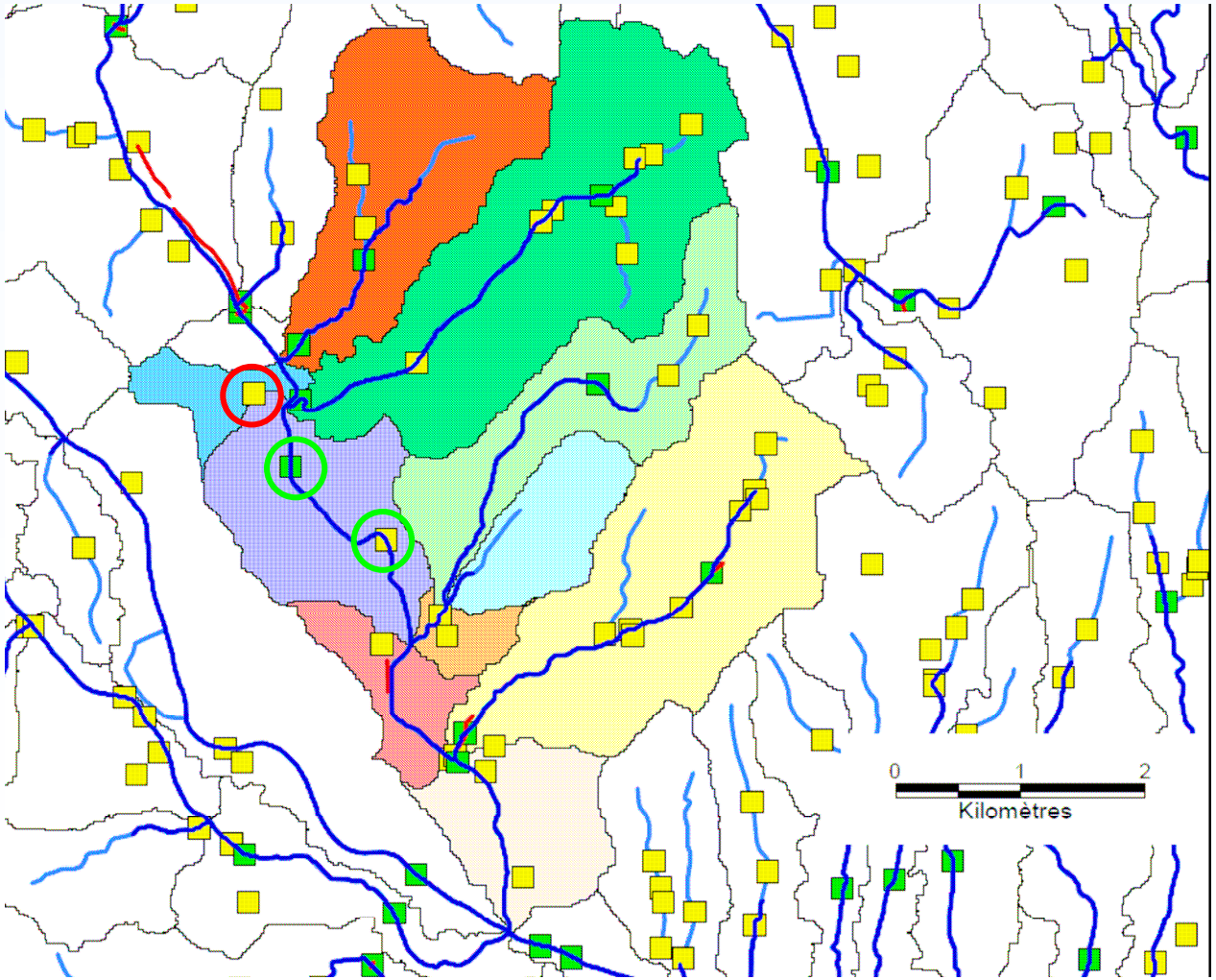
# III. Methodology: A distributed RR model

3288 sub-bassins




Predifloo

# III. Methodology: A distributed RR model




Road-stream crossings

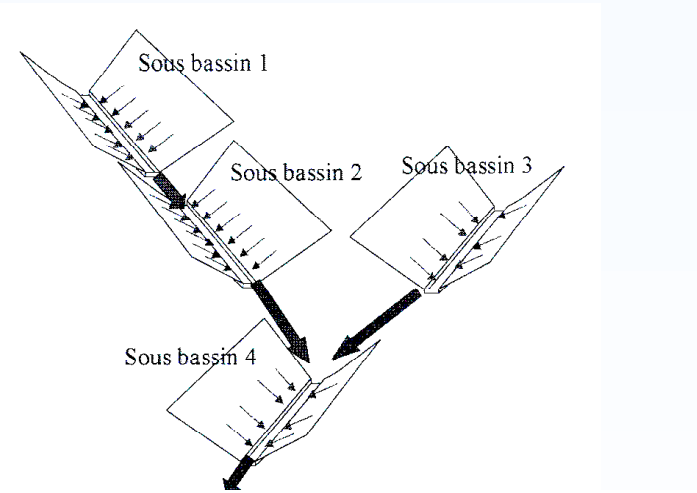
Road-river crossings (1km²)

# III. Methodology: Example of a RR model

Used in the Aude and Gard (Gaume 2002), Israël (Rozalis *et al.*, 2010)

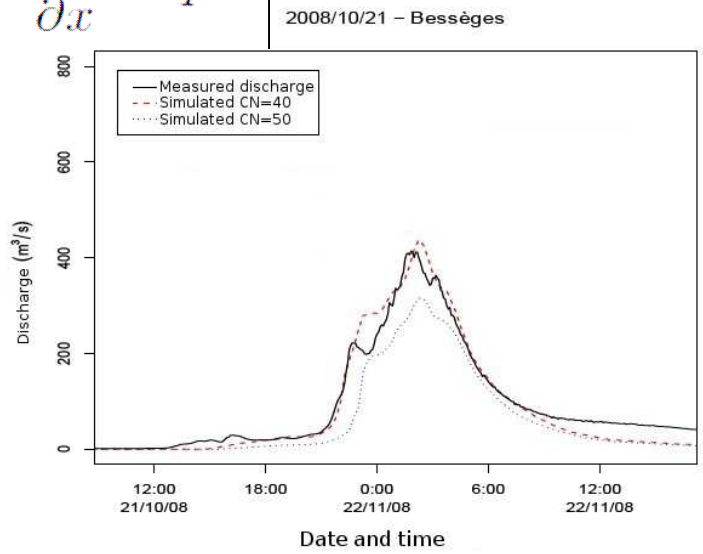
- Runoff production (SCS-CN): 1 param.

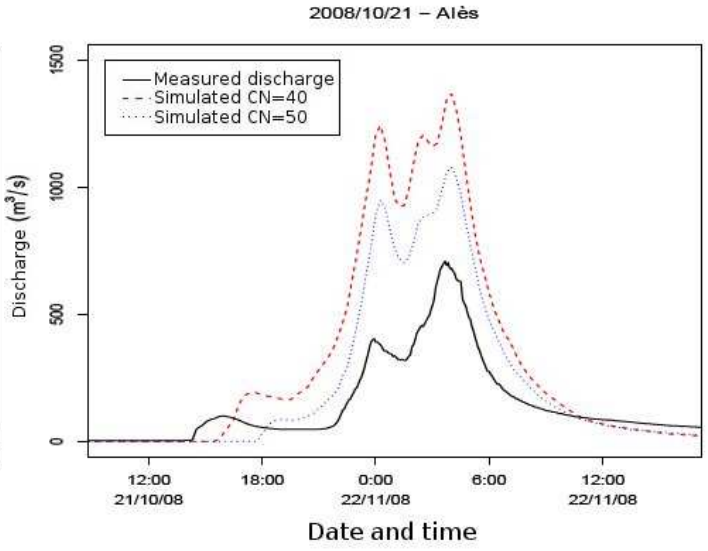
$$Q(t) = \frac{(P(t) - 0.2S)^2}{(P(t) + 0.8S)}$$




- Runoff transfer (kinematic wave): 1 param.

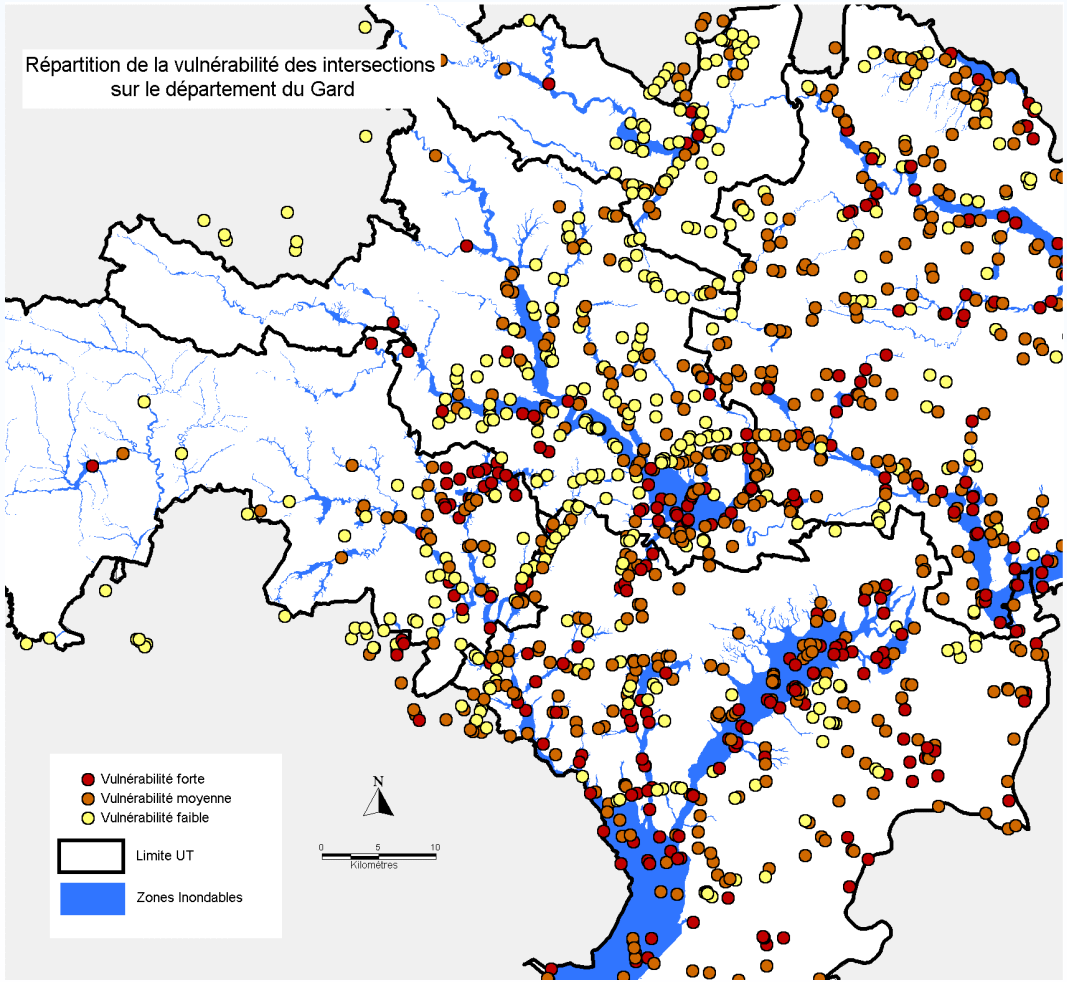
$$\frac{\partial A}{\partial Q}\frac{\partial Q}{\partial t} + \frac{\partial Q}{\partial x} = q$$




# III. Methodology: A flooding susceptibility rating

- **4 Levels of susceptibility**
- **Return period of flooding**
- **Calibrated against PICH**

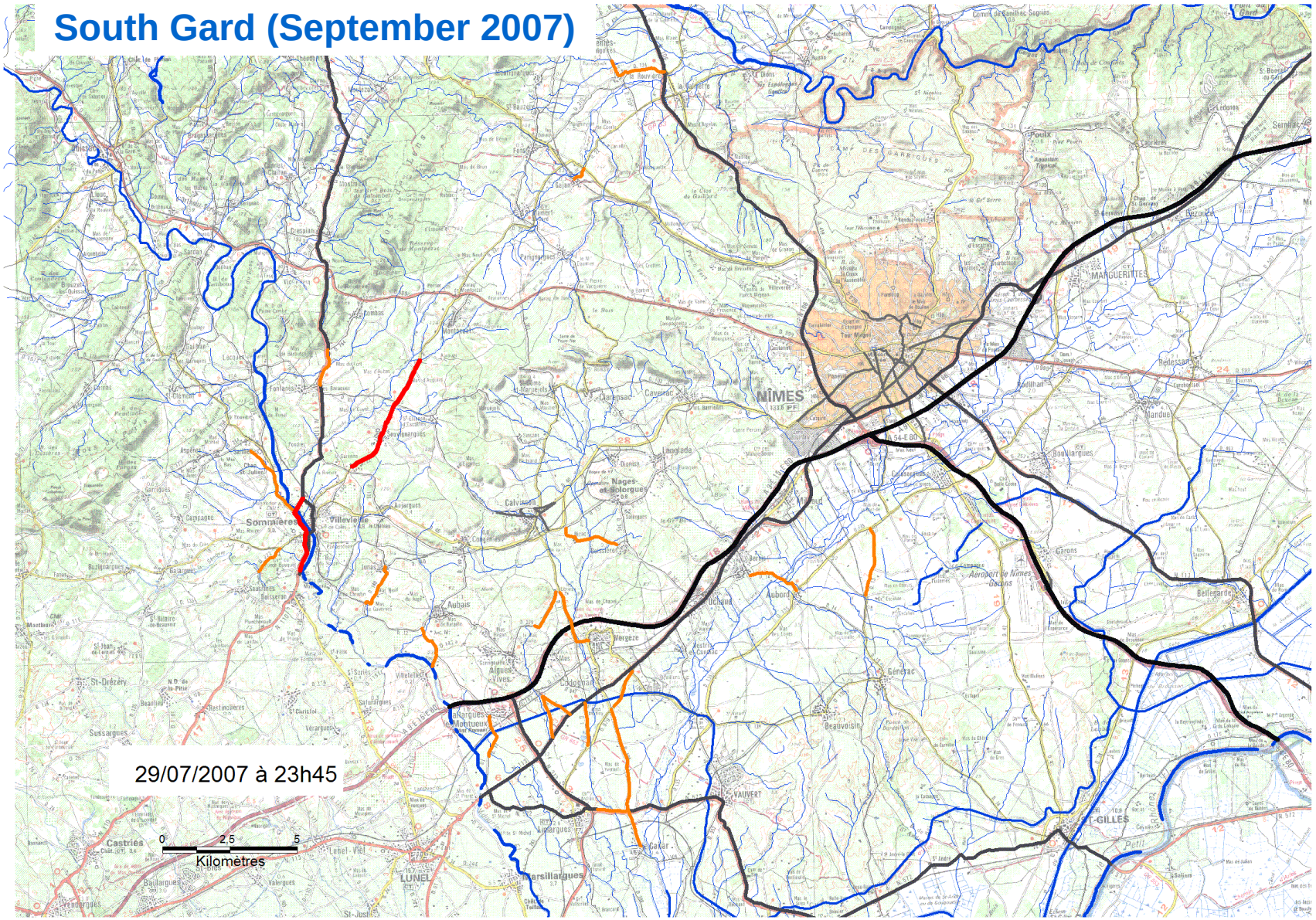



Prediflood

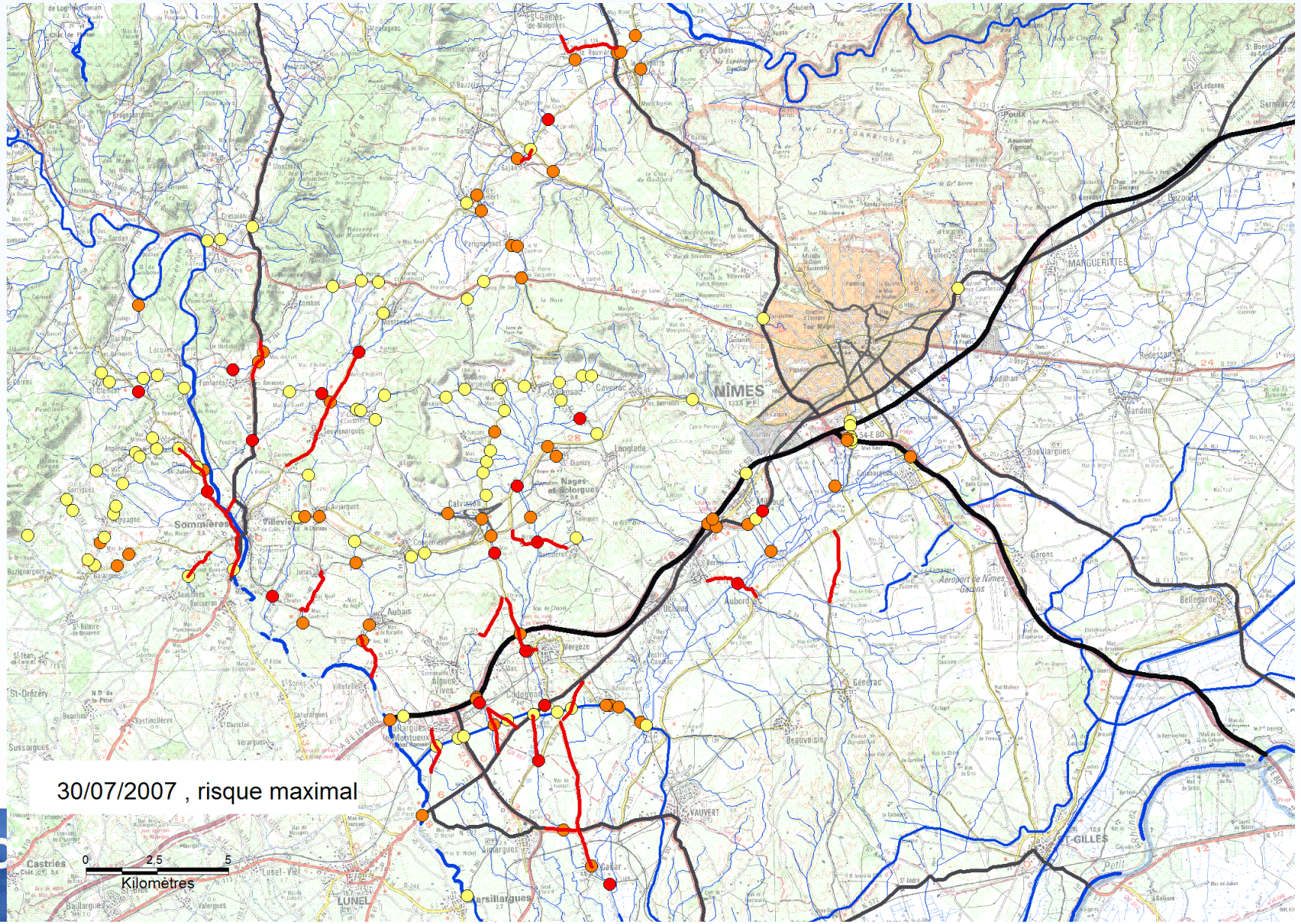
# IV. Preliminary results (1)

| Date | Sub. | Rain | Efficiency | | False alarm | | Chronology | |
|---|---|---|---|---|---|---|---|---|
| | | | Low | High | Low | High | Low | High |
| 21/11/03 | 6 | 150 | 100% | 100% | 4% | 15% | – | – |
| 29/11/03 | 7 | 180 | 100% | 100% | 25% | 30% | 85% | 100% |
| 17/12/03 | 0 | 60 | – | – | – | – | – | – |
| 03/11/04 | 0 | 100 | – | – | | – | – | ~ |
| 06/09/05 | 31 | 300 | 58% | 93% | 19% | 27% | 75% | 80% |

# IV. Preliminary results (2)



# IV. Preliminary results (3)



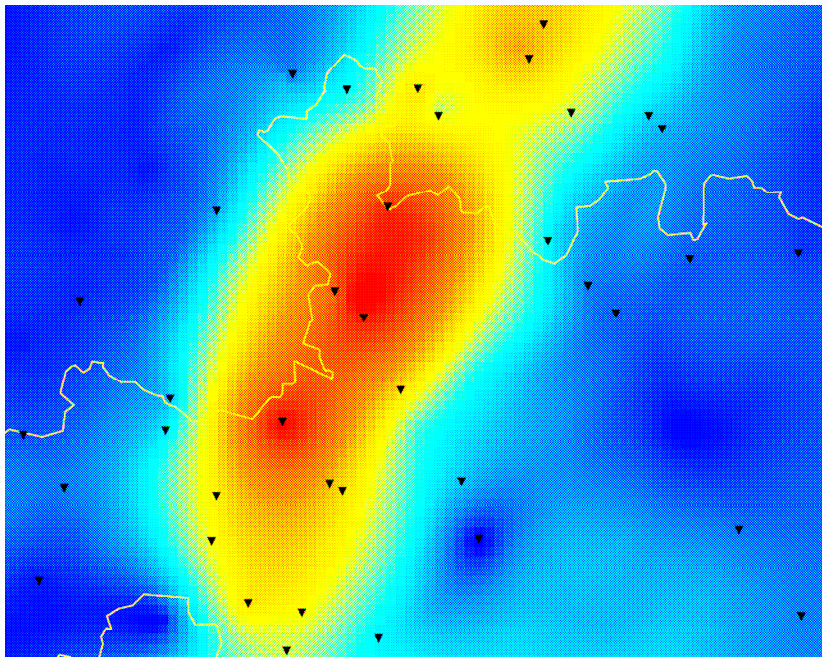

30/07/2007 , risque maximal

# Conclusions

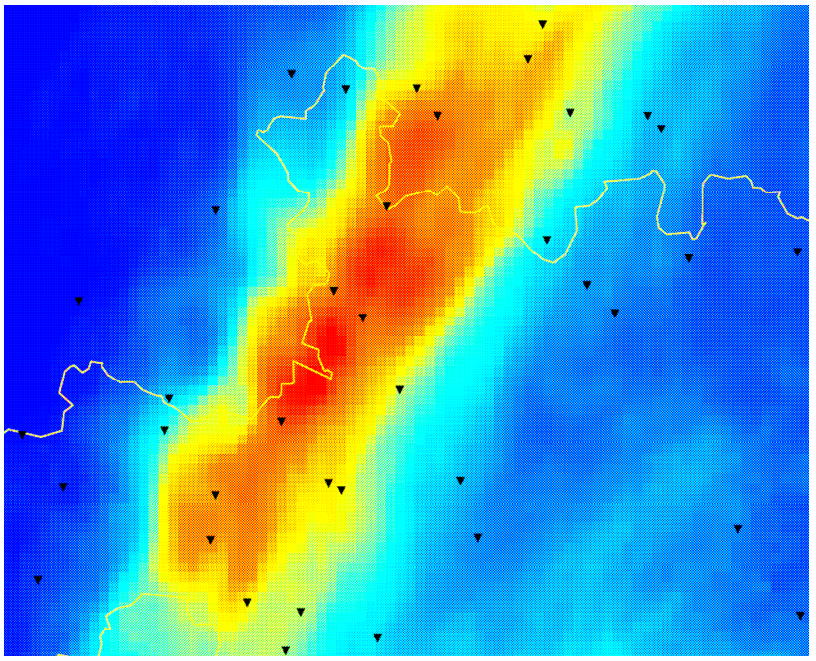
**Real improvements seem reachable in flood forecasting**

**If we go off the beaten track !**

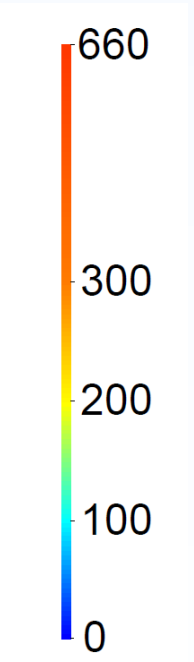
# IV. Preliminary results: radar versus kriging (4)



Kriging



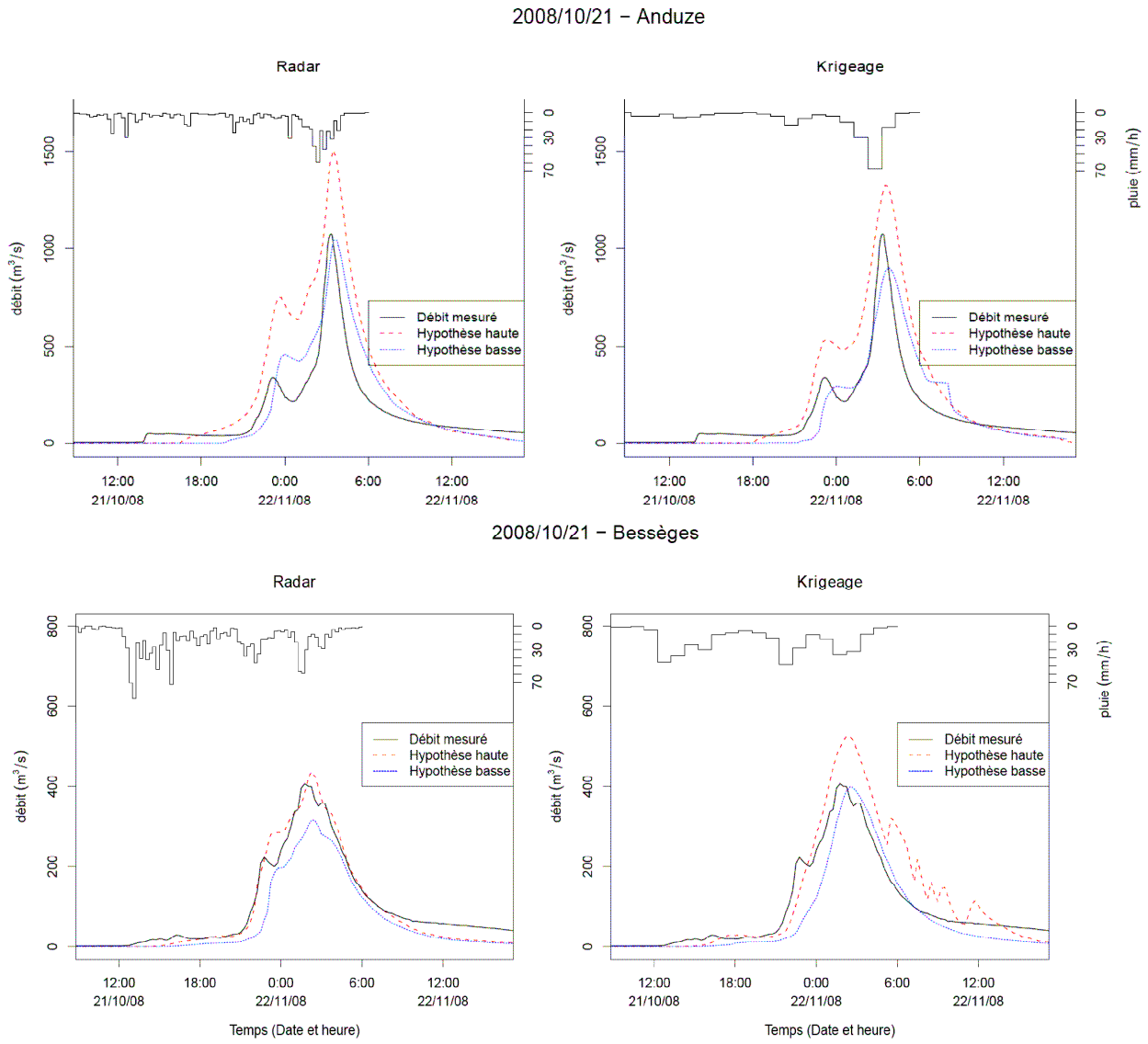
Radar




▼ Rain gauges

OHMCV

# IV. Preliminary results: radar versus kriging (5)




**Anduze (10/2008)**

**Kriging : *Nash=0.812***
**Radar : *Nash=0.786***

**Bessèges (10/2008)**

**Kriging : *Nash=0.848***
**Radar : *Nash=0.952***