

Flash flood warning at ungauged locations: can proxy data be useful to calibrate the hydrological model used?

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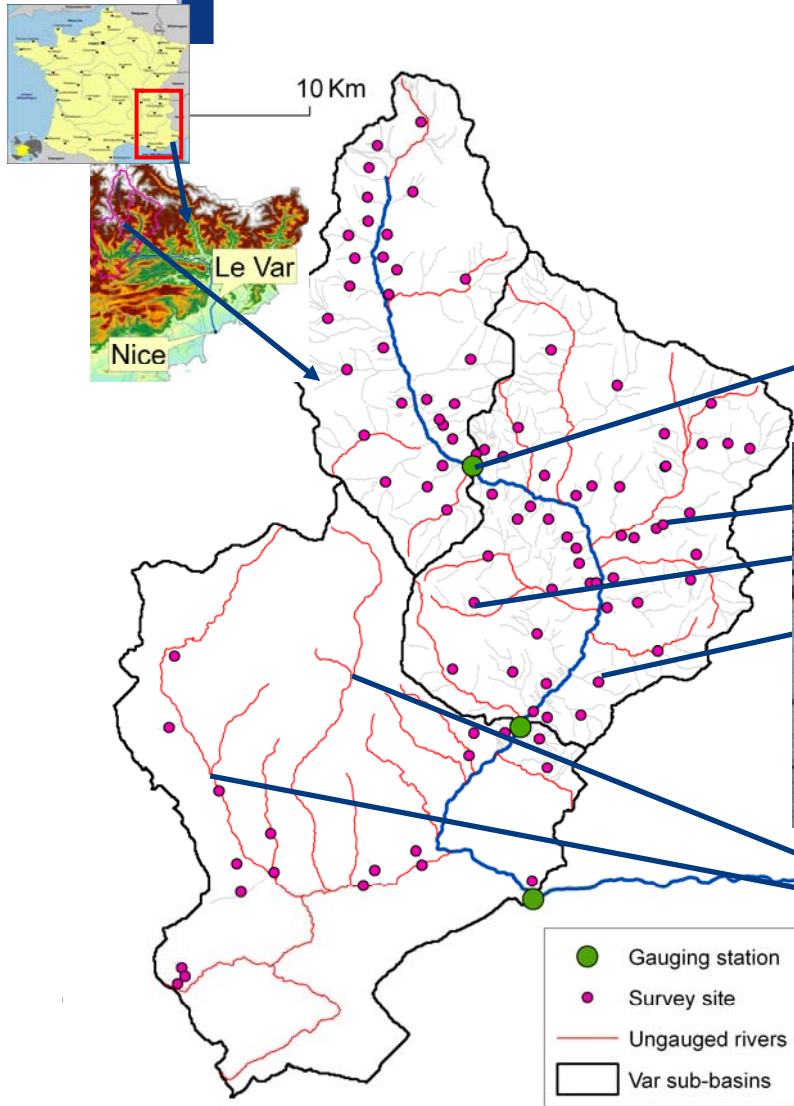


Ministère de l'Écologie, du Développement durable, des Transports et du Logement



METEO FRANCE
Toujours un temps d'avance

Problems with ungauged catchments



Gauged catchments

- Data available on target catchment

« Proxy data »

- Water mark
- Simple « Flooding » or « no-Flooding » information
- → Data available on target catchment



Ungauged catchments

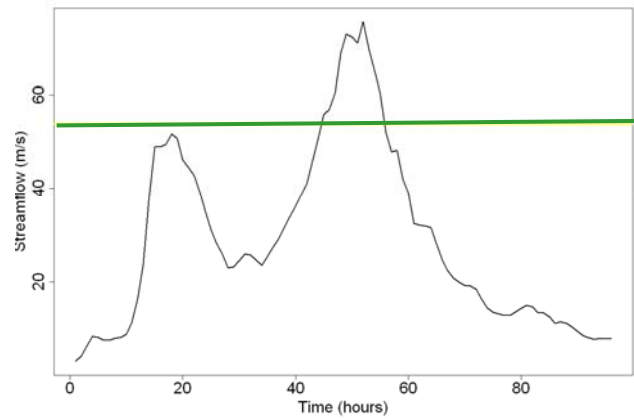
- No data on target catchment



In what way can « proxy data » be used for calibration of models?

Methodology

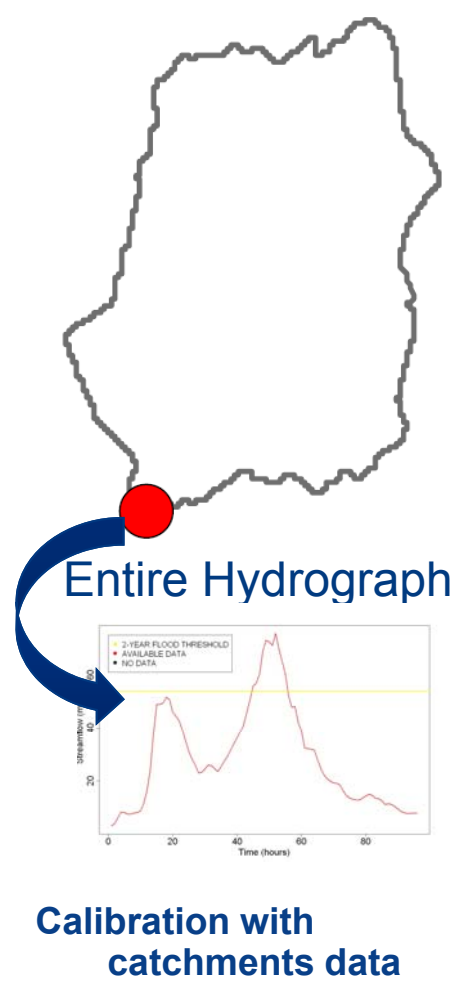
Virtual experiment: « proxy data » generated from entire discharge time series



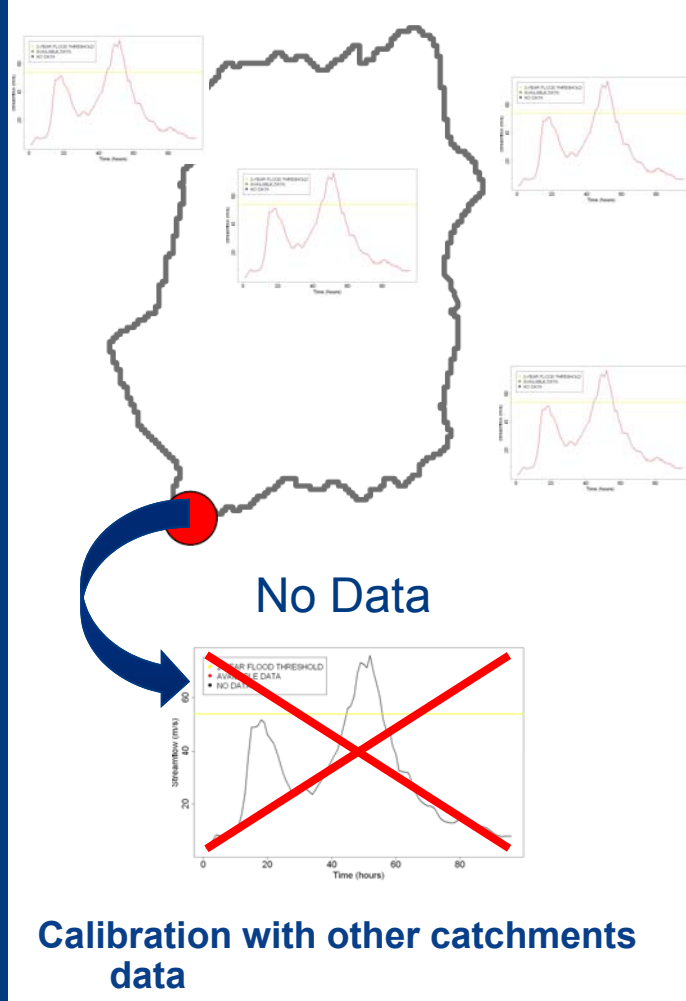
Flood date

Different cases

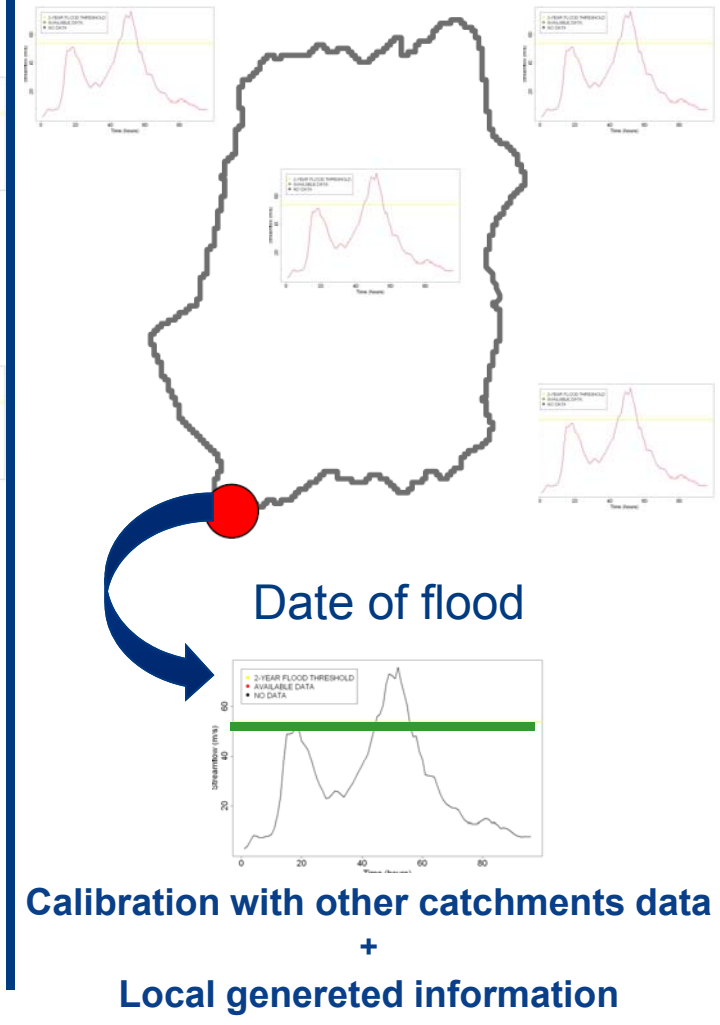
A) Gauged case



B) Ungauged case



C) Local « proxy data » case



Hydrological Model

Simple conceptual model (GR)

- Event-based
- Input data: rainfall data
- No readjustment by streamflow

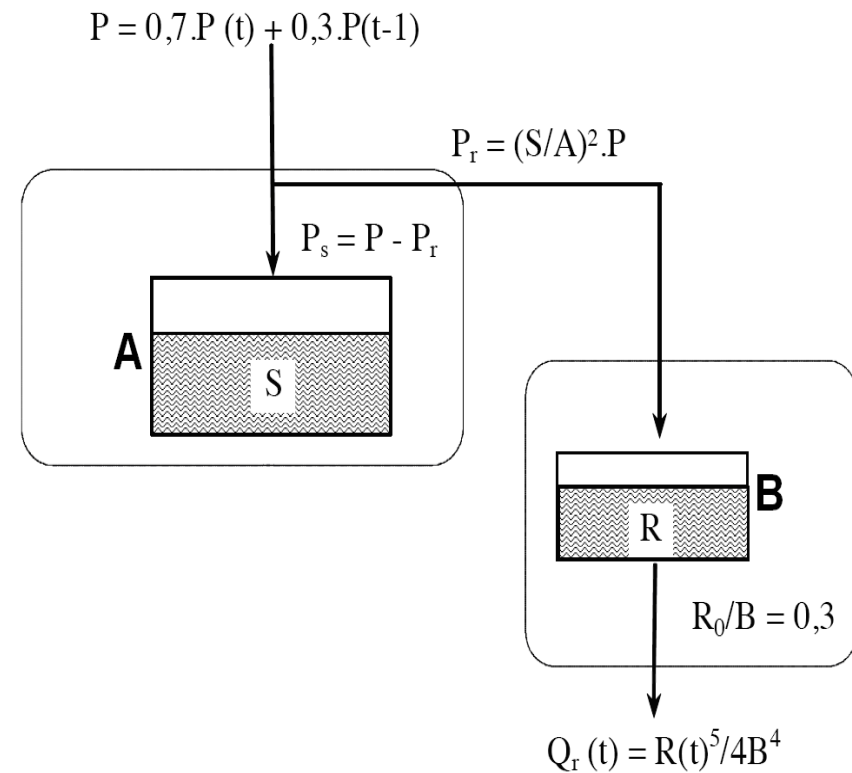
Lumped hourly model

2 reservoirs

- Production (A)
- Routing (B)

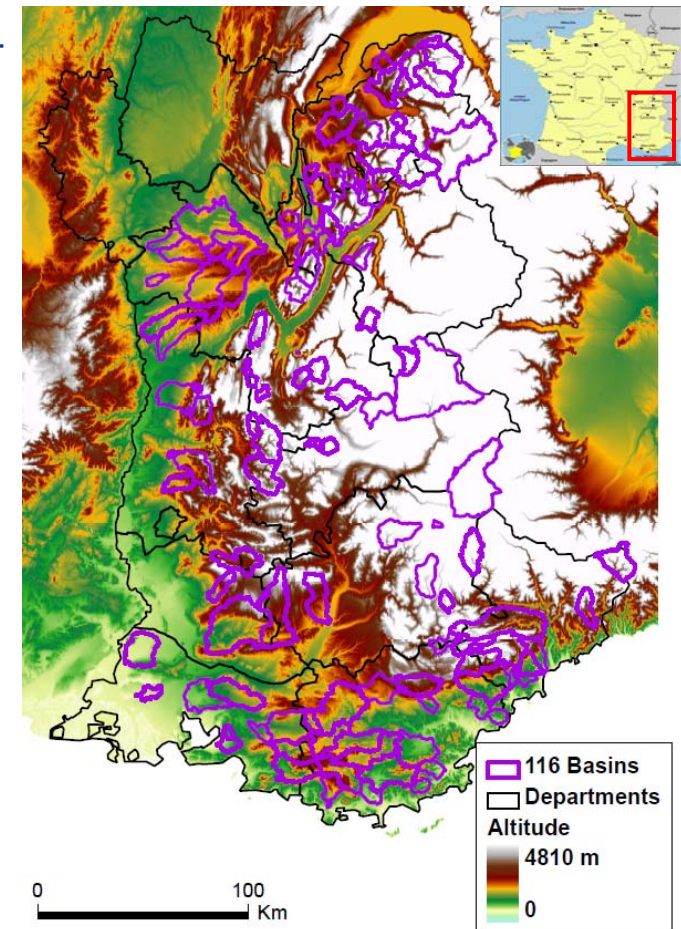
Initialization

- Soil moisture provided by a continuous Soil Moisture Accounting



Available data

- 116 catchments in the South East of France (5 km² – 1000 km²)
- a 10-year continuous hourly rainfall series (1997-2007)
- Split-Sample Test with event-based model:
 - Calibrated on about 6000 events (1997-2002)
 - Evaluated on about 5000 events (2002-2007)(events defined based on a rainfall threshold)



Evaluation Criterion: Critical Success Index (CSI)

- Criterion based on contingency table

		Forecast	
		YES	NO
Event	YES	Hit	Miss
	NO	False	No Alarm

- 3 criteria bounded (0 → 1):

Critical Success Index

$$CSI = \frac{H}{H + M + F}$$

Probability of detection

(POD)

$$POD = \frac{H}{H + M}$$

Success Rate

(SR)

$$SR = \frac{H}{H + F}$$

Observed value in the litterature:

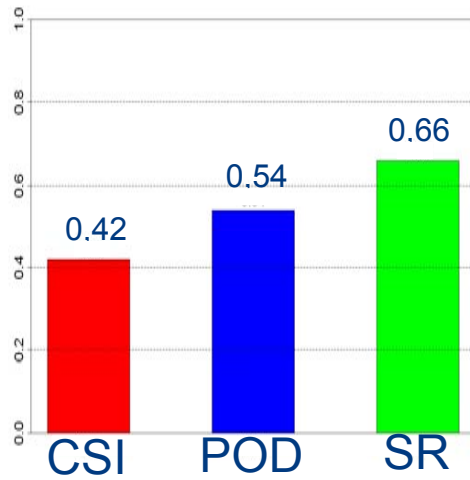
~0.3 → ~0.6

Norbiato, D., M. Borga, et al. (2009)

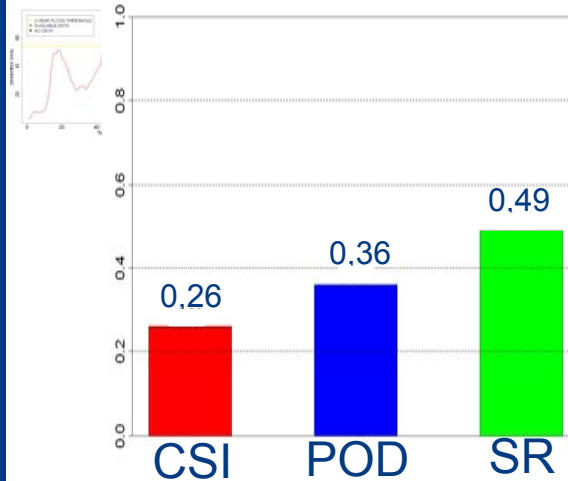


Results: validation on 5000 events

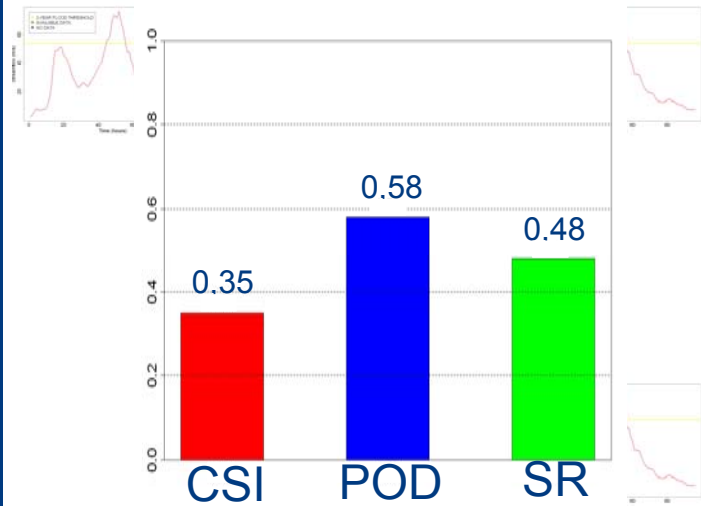
A) Gauged case



B) Ungauged case



C) Local « proxy data » case



Summary

- Preliminary work using virtual « proxy data »: date of flood extracted from $Q(t)$
- Local information about the date of the flood improves the results obtained by the « ungauged » case in term of CSI and POD

Upcoming works

- Next step: use of real « proxy data » to locally improve the model calibration

