

Toulouse
-
France

2013 INTERNATIONAL SWAT

WORKSHOPS & CONFERENCE

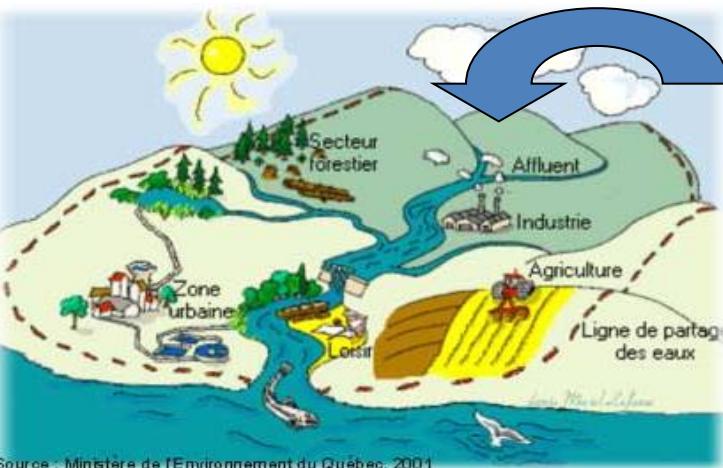
July
15th-19th
2013



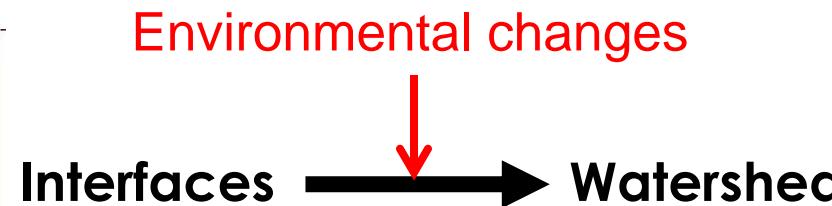
Garonne river project modelling : An overview

SANCHEZ-PEREZ, J.M., SAUVAGE, S., CHEA, R., SUN, X.,
GROUSSON, Y., BERNARD-JANNIN, L., HONG, Y., GARNEAU, C.,
UHART, A., PAYOUX, J., SRINIVASAN, R.
and collaborators

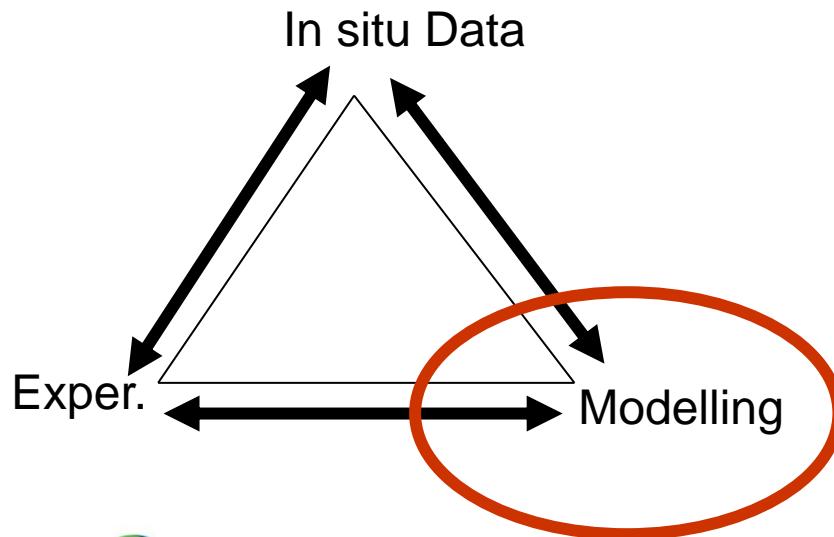
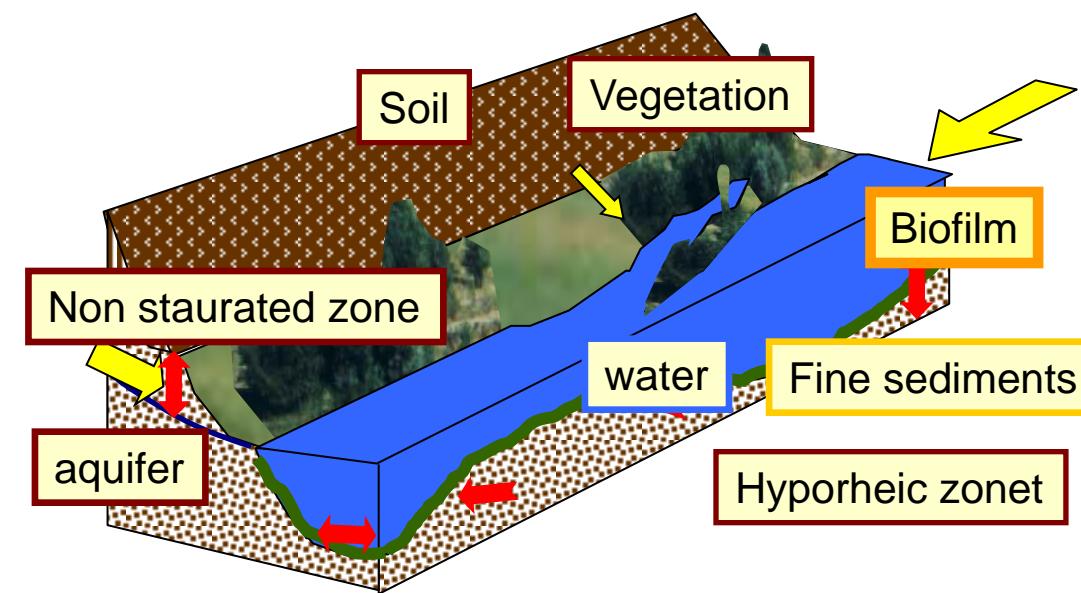




Source : Ministère de l'Environnement du Québec, 2001

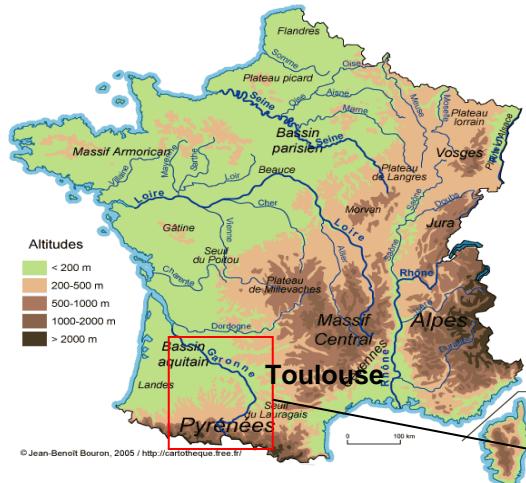


C, N, P, Pesticides, métals, organic pollutants



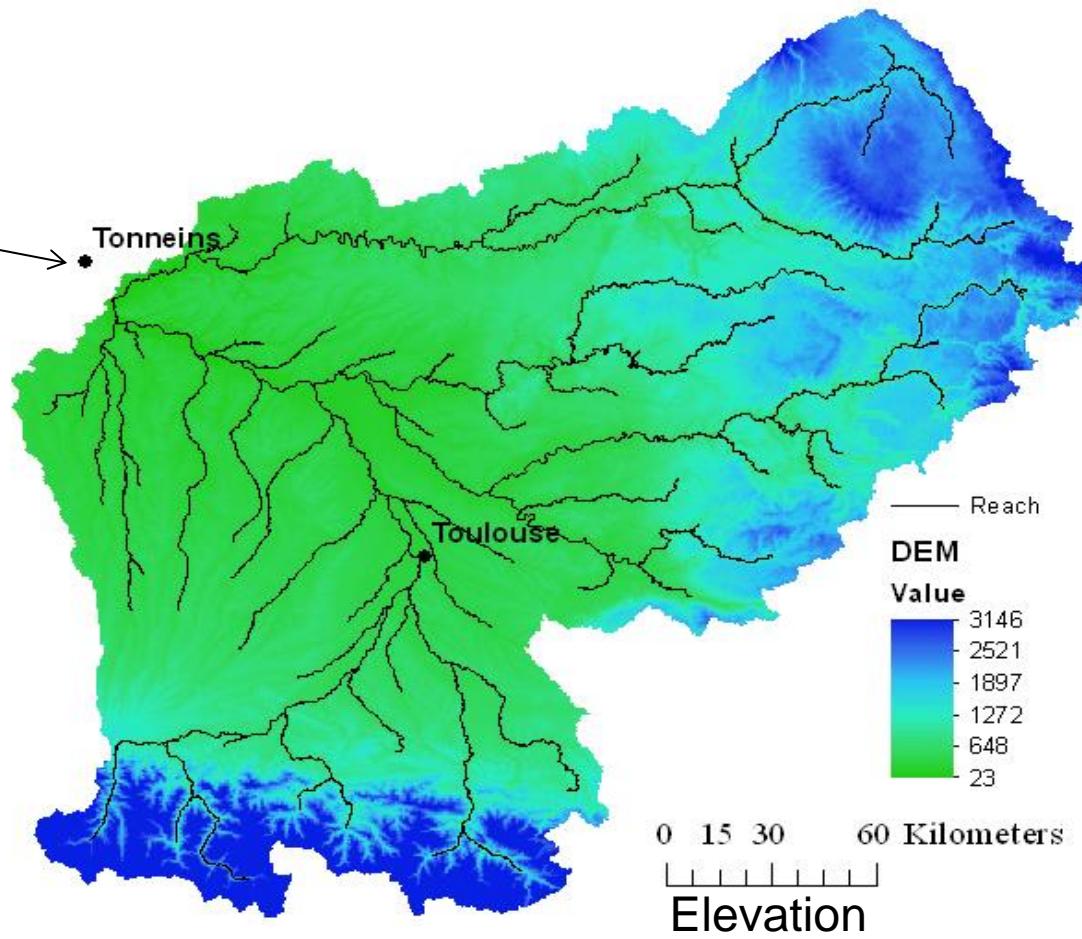
Biogeochemical processes in interfaces

Study area



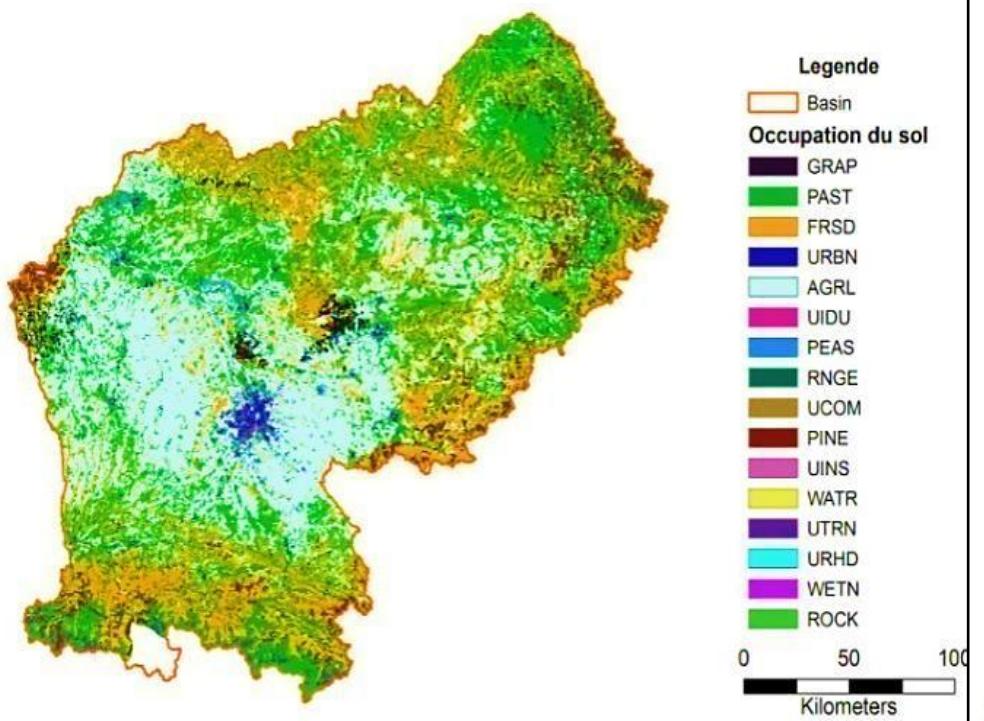
Surface Area : 49 834 km²

DEM: 90 m x 90 m

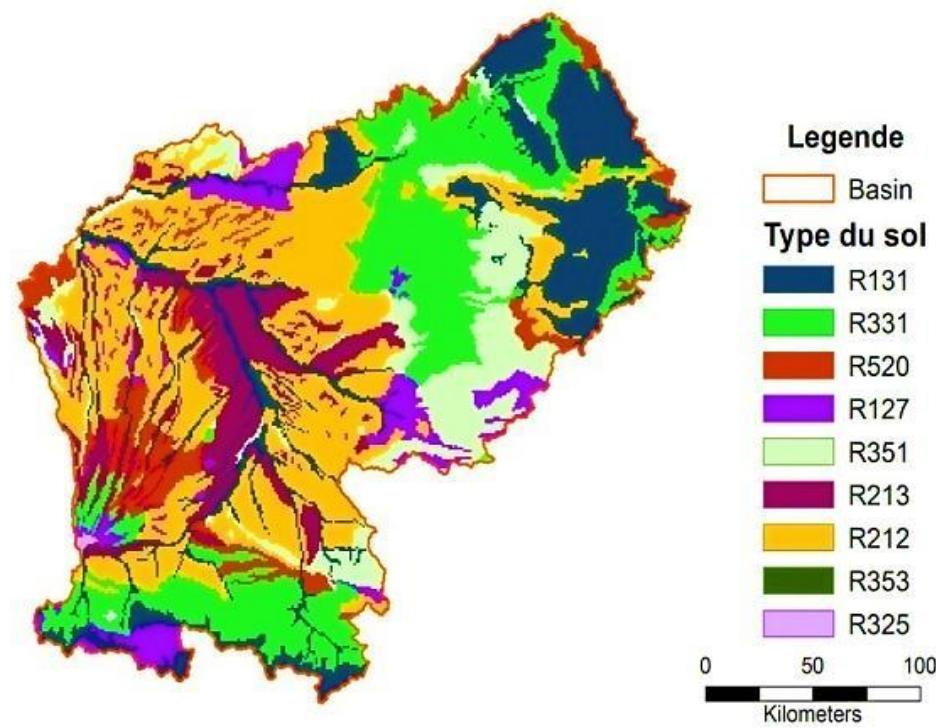


Study area

Land cover



Soil



Source: CORINE Land Cover (CLC) 2006. Scale : 1 000 000

16 classes:

- 45 %, agriculture (plaine alluvial)
- 18 %, pasture (amont, massif central)
- 32 %, de forest (amont du bassin)
- 5 %, others including urban areas

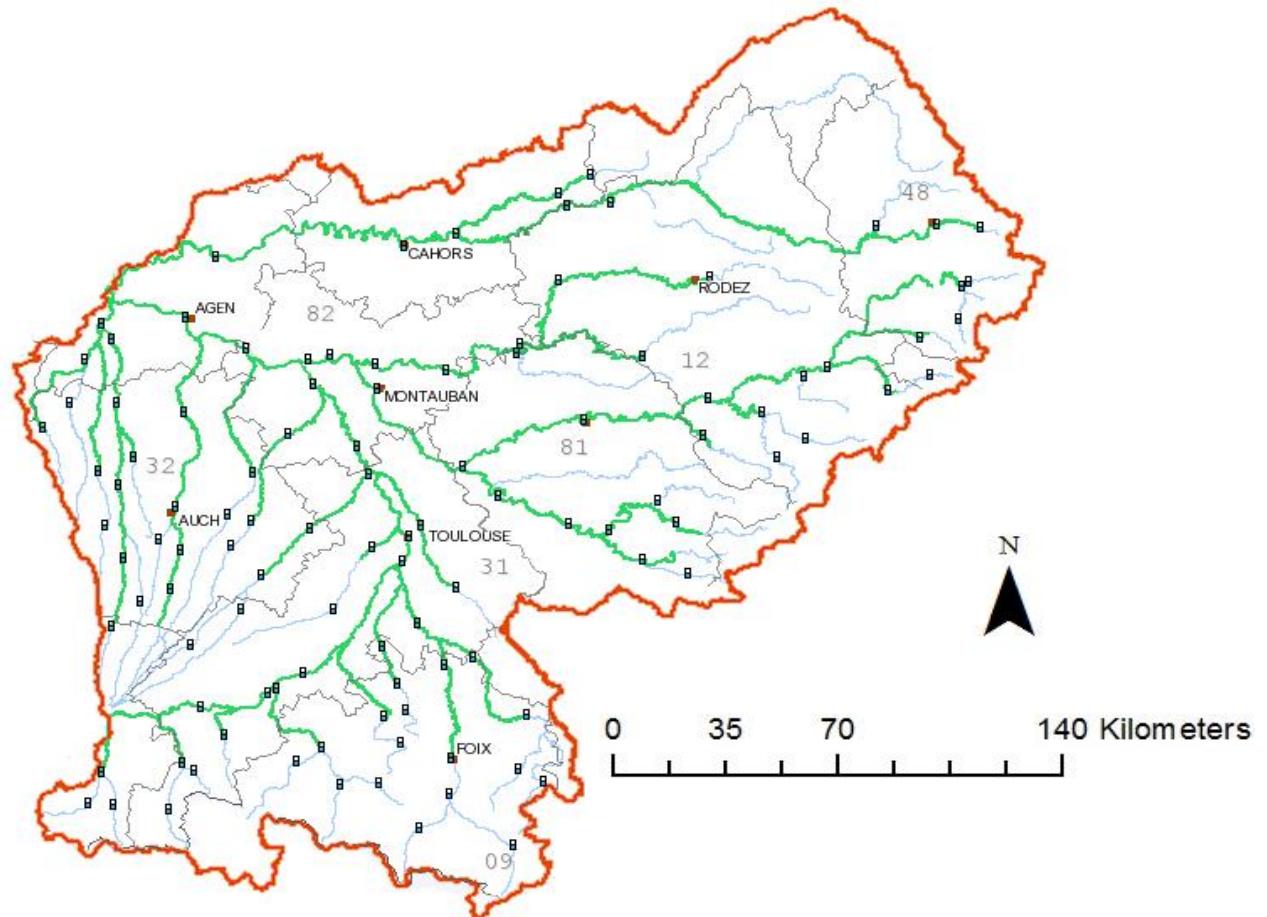
Data FAO 85: 27 soil classes, 9 dominant classes

GARONNE RIVER PROJECT : Data

...and a well known and monitored catchment

- HYDROLOGY:

Banque Hydro:
280 gauging stations on the
Watershed



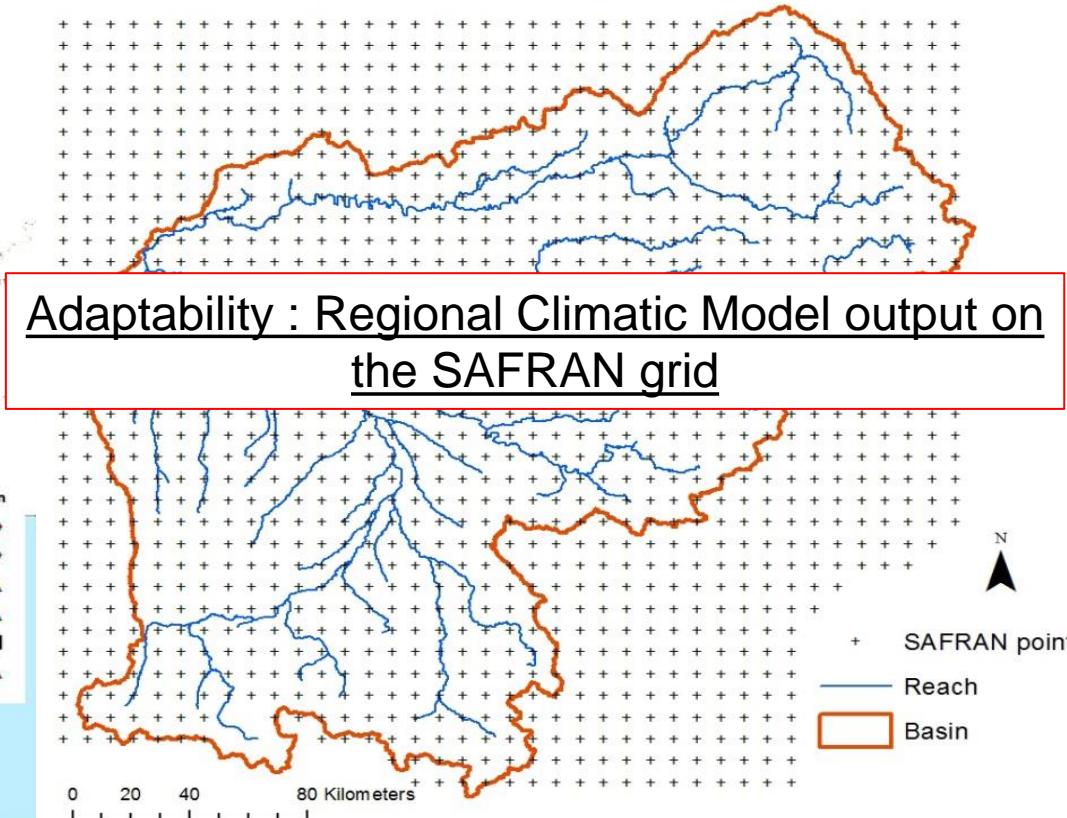
GARONNE RIVER PROJECT : Data

...and a well known and monitored catchment

- WEATHER:

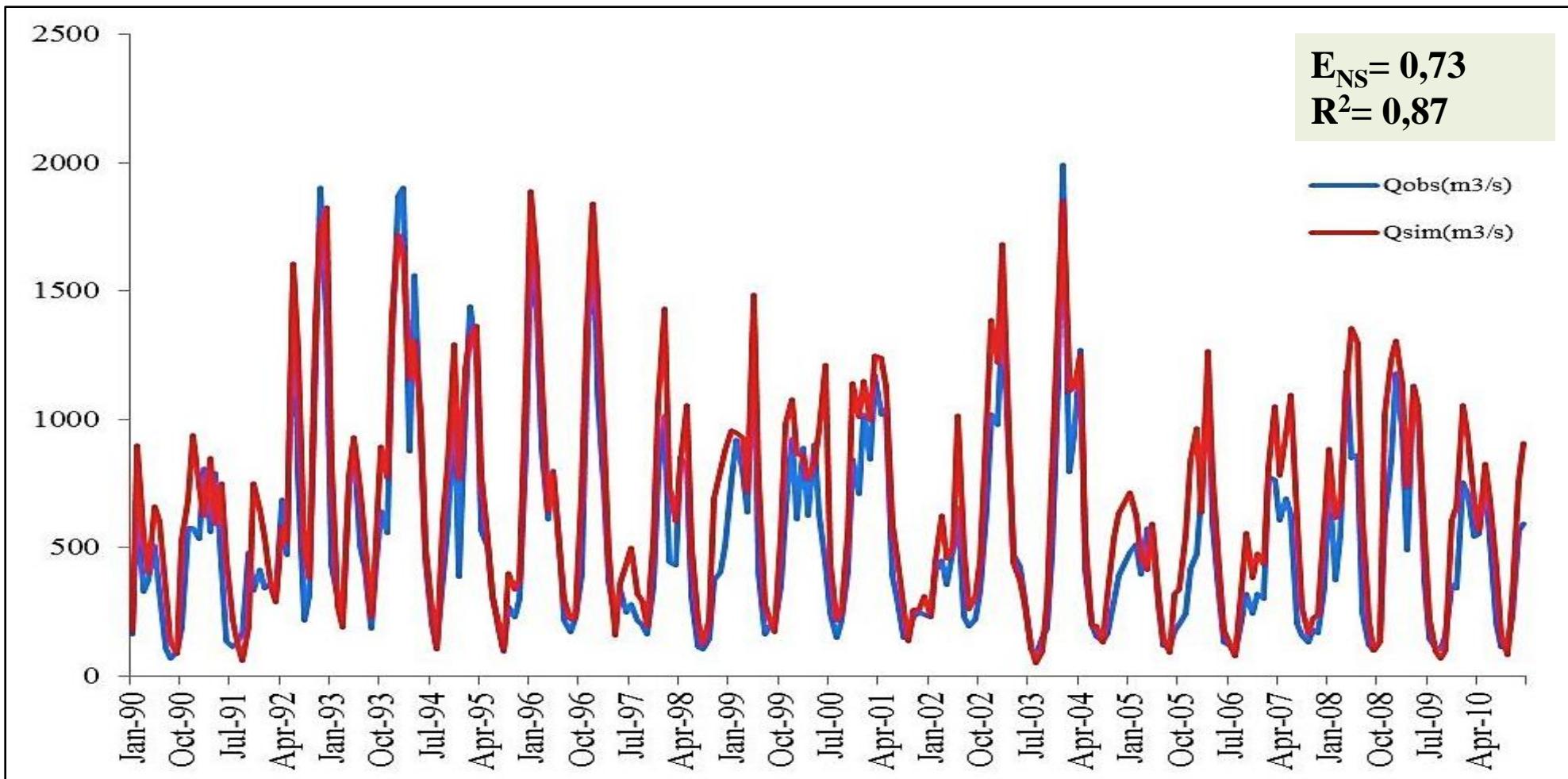


Météo France: more than 500 rain stations,
39 Weather Stations



Météo France SAFRAN grid:
Meso scale atmospheric analysis
system for surface variables (50 years)

Monthly river discharge simulated versus observed (1990-2010)

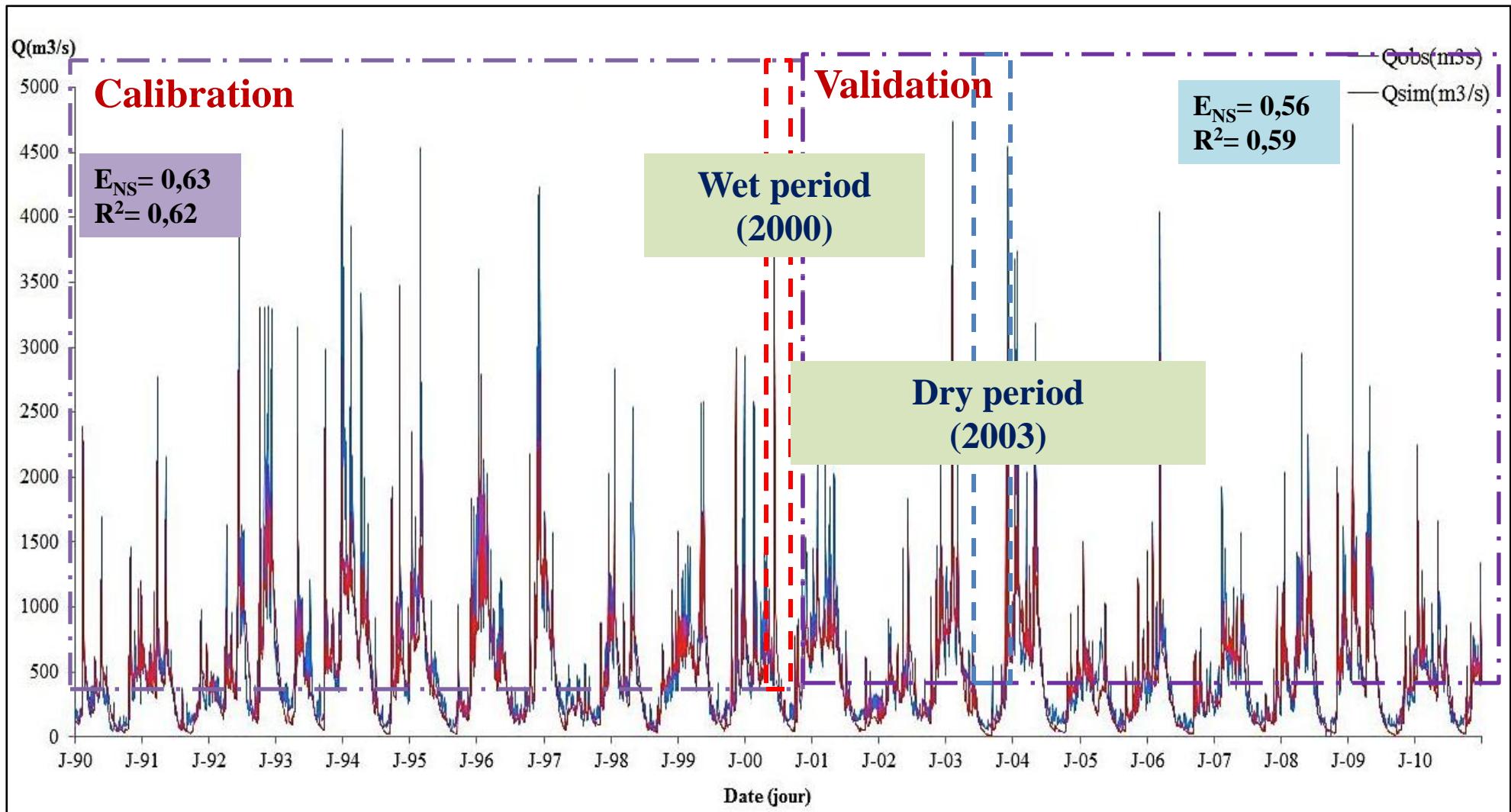


Rain: 950 mm

ET: 495 mm (52%)

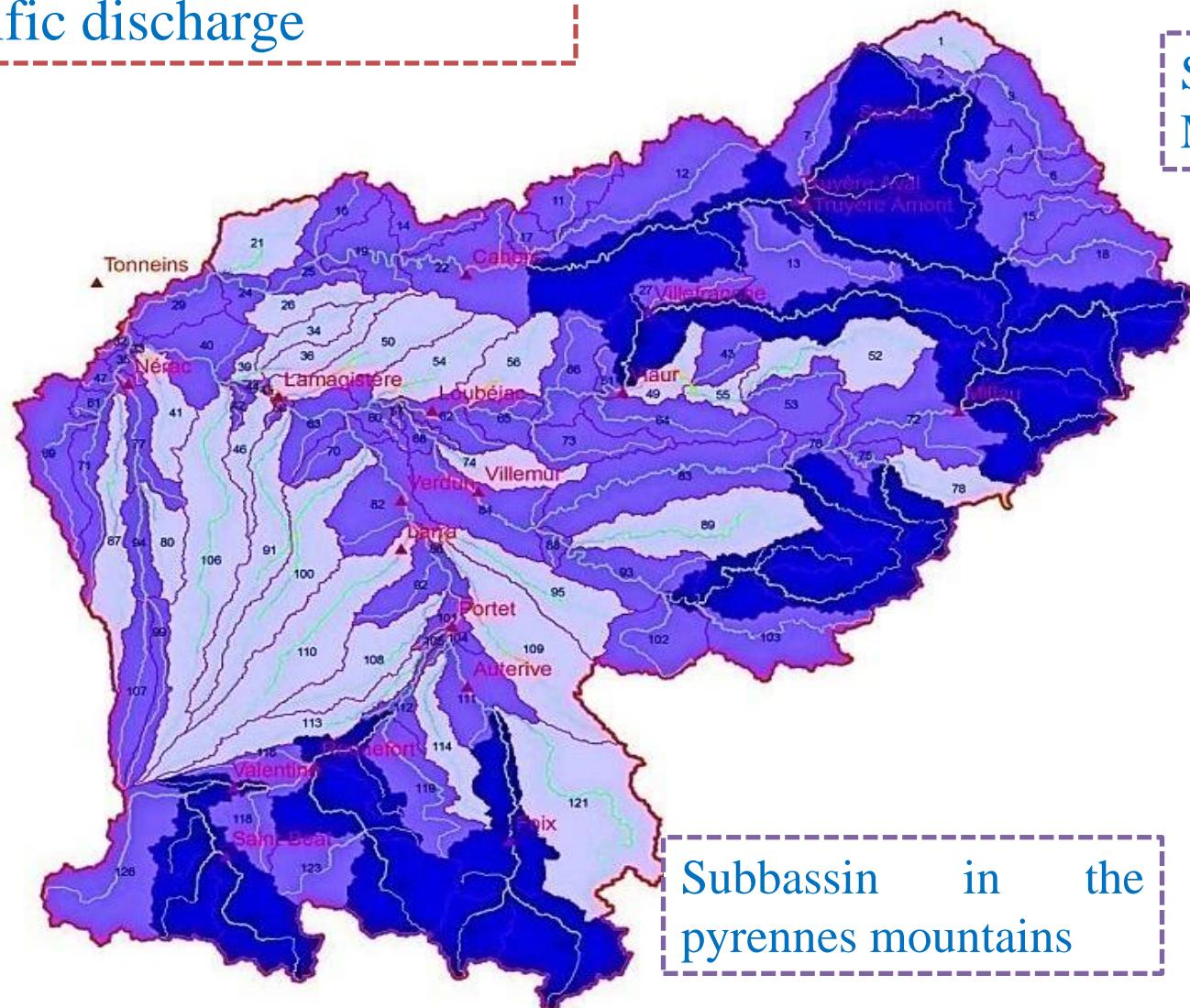
River discharge : 390 mm (observed 335 mm)

Daily river discharge, simulated versus observed (1990-2010)



Specific discharge

Sub-bassin in the Massif Central



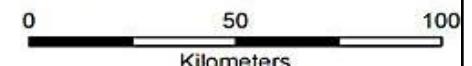
Legende

- ▲ Station de jaugeage
- Reach
- Watershed
- LongestPath
- Basin

Débit spécifique

$Q_s(\text{L/s/km}^2)$

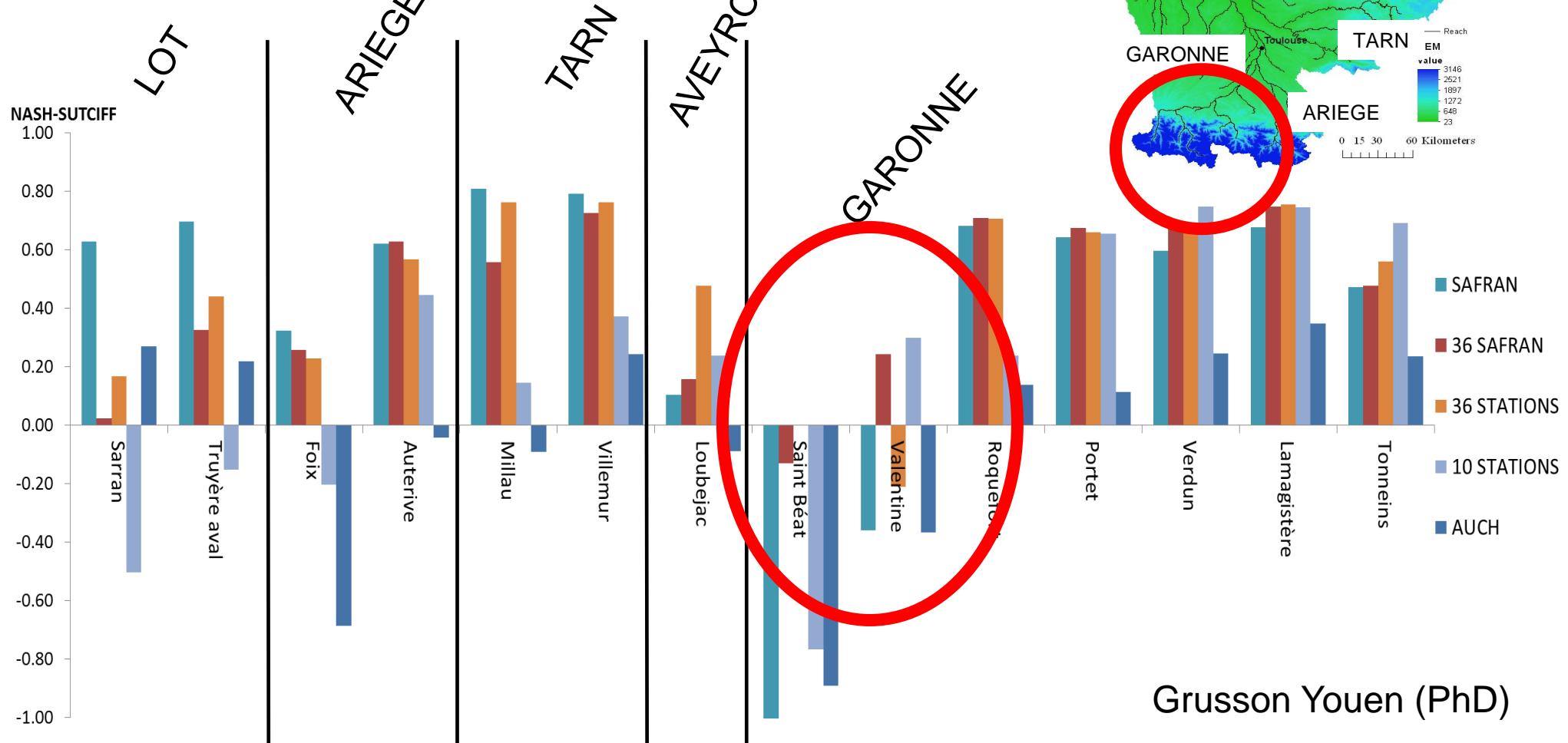
- 0.43 - 0.99
- 1.00 - 1.99
- 2.00 - 3.50



Subbassin in the pyrennes mountains



CLIMATE CHANGE : Suitable Weather Data

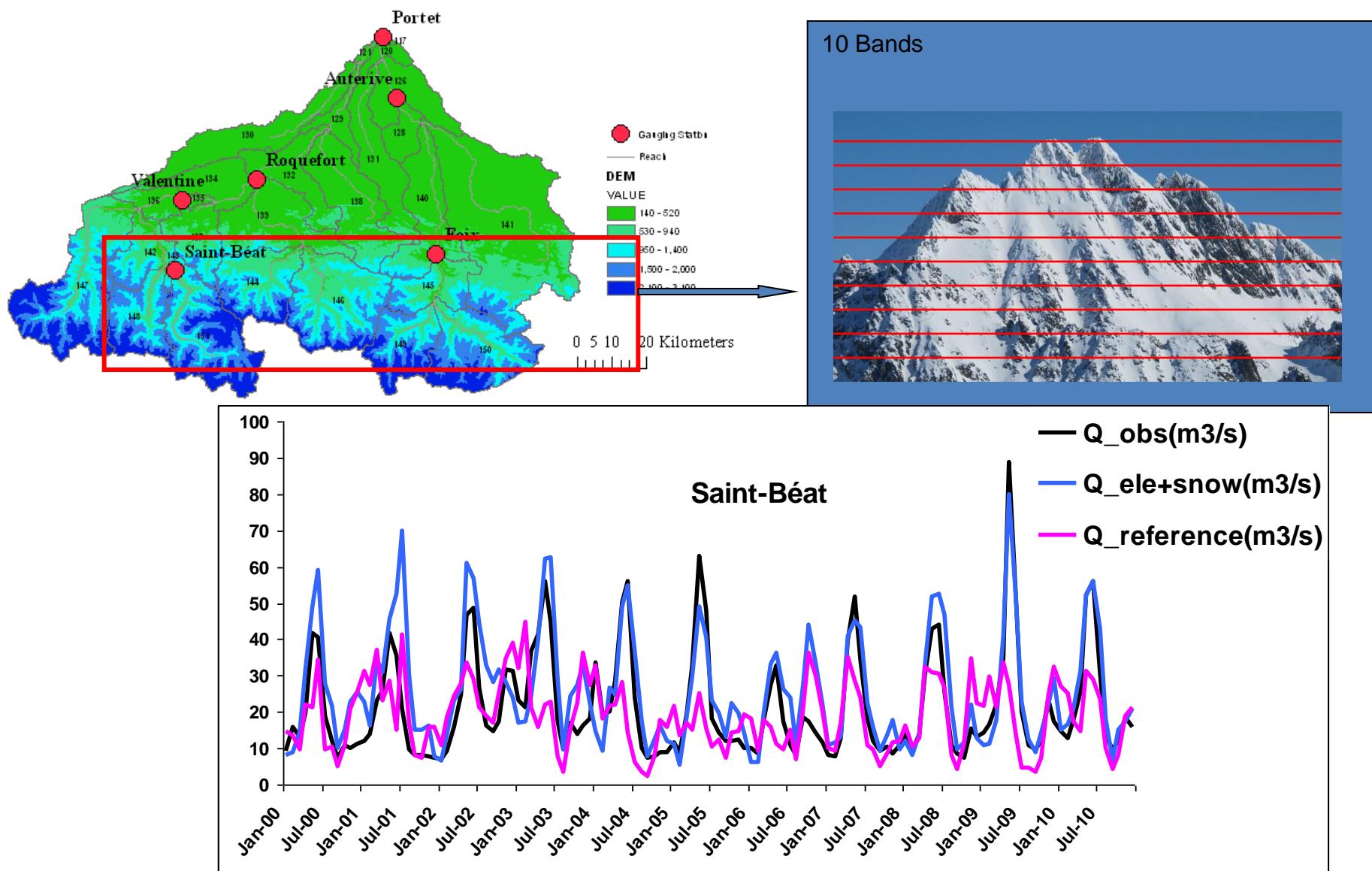


Grusson Youen (PhD)

Nash-Sutcliffe Evolution as a function of weather data spacial density

RESULTS : ELAVATIONS BANDS

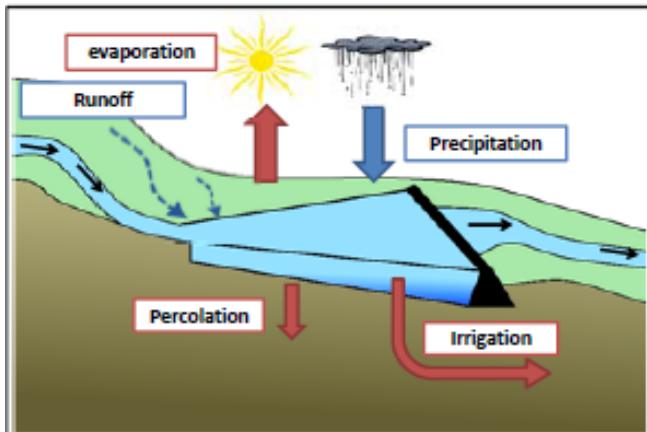
GARONNE RIVER PROJET



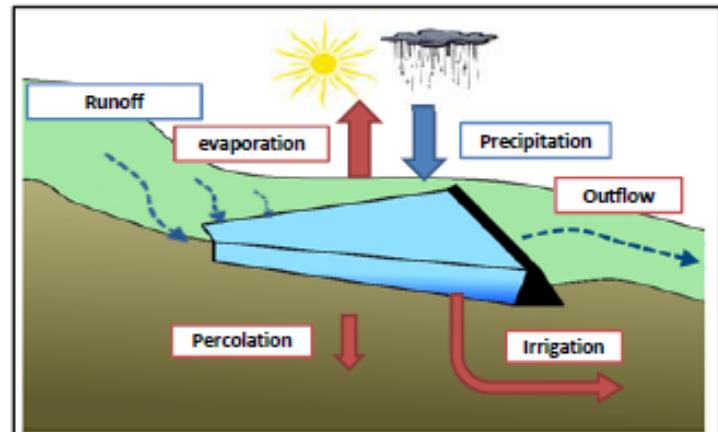
Sun Xiaoling (PhD)

Around 20 000 hills lakes in the Garonne catchment

Hill reservoir connected



Hill reservoir disconnected



$$V = V_{stored} + V_{flowin} - V_{flowout} + V_{precip} - V_{evap} - V_{seep} - V_{irrig}$$

$$V_{flowin} = fr_{imp} \cdot Flow_{av}$$

fr_{imp} : fraction of the subbasin river flow draining into the impoundment

$Flow_{av}$: downstream river flow

$$V_{precip} = 10 \cdot R_{day} \cdot SA$$

$$V_{seep} = 240 \cdot K_{sat} \cdot SA$$

$$V_{flowout} = 0$$

$$V_{flowout} = V - V_{max}$$

$$V_{evap} = 10 \cdot \eta \cdot E_0 \cdot SA$$

$$V_{irrig} = V_{initial} / 120$$

$$si \ V < V_{max}$$

$$si \ V > V_{max}$$

$$V_{flowin} = fr_{imp} \cdot 10 \cdot (Q_{surf} + Q_{gw} + Q_{lat}) \cdot (Area - SA)$$

fr_{imp} : fraction of the subbasin area draining into the impoundment

Q : flow generated in a subbasin

$Area$: subbasin area

SA : surface area of the water body

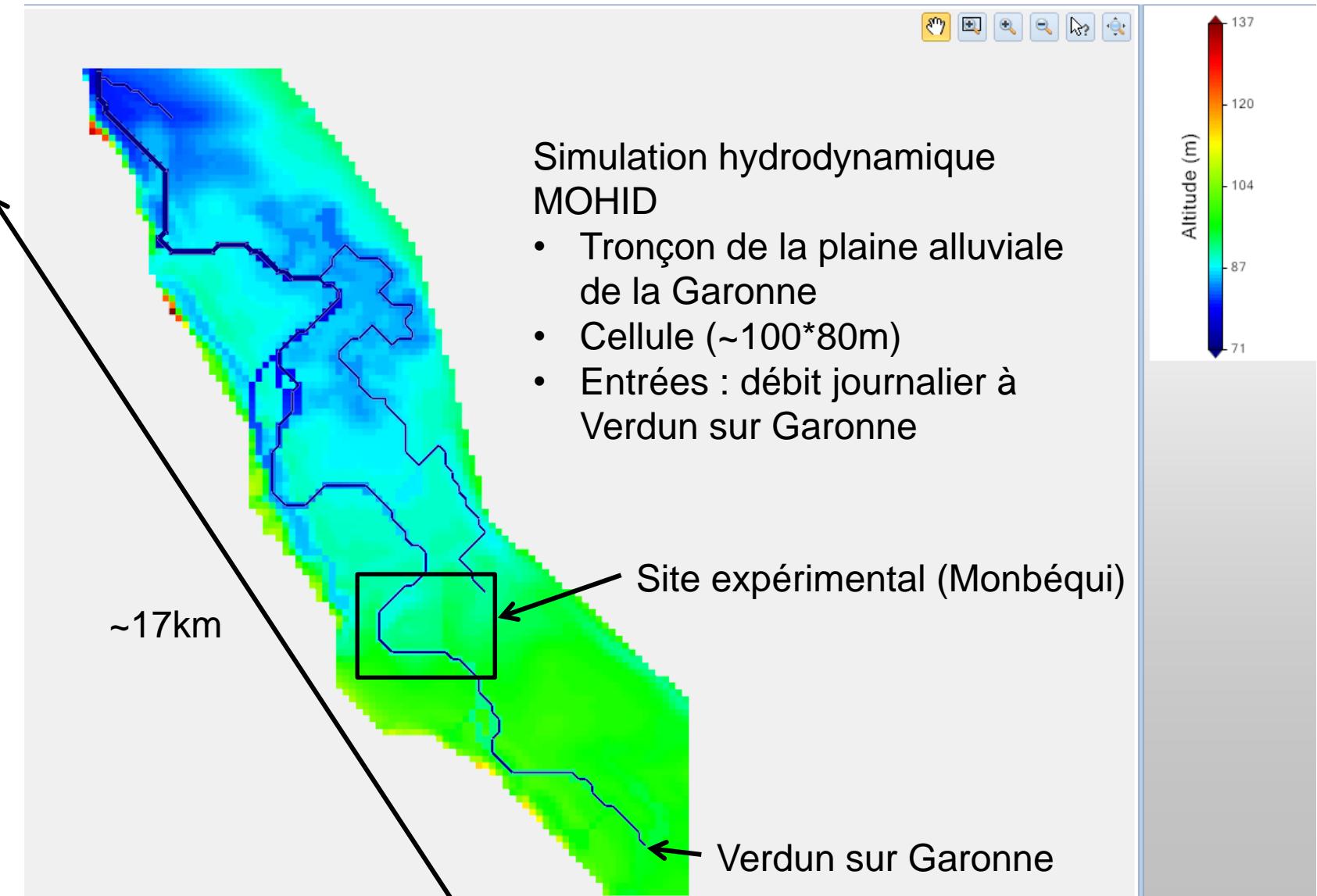
V_{max} = maximum storage volume

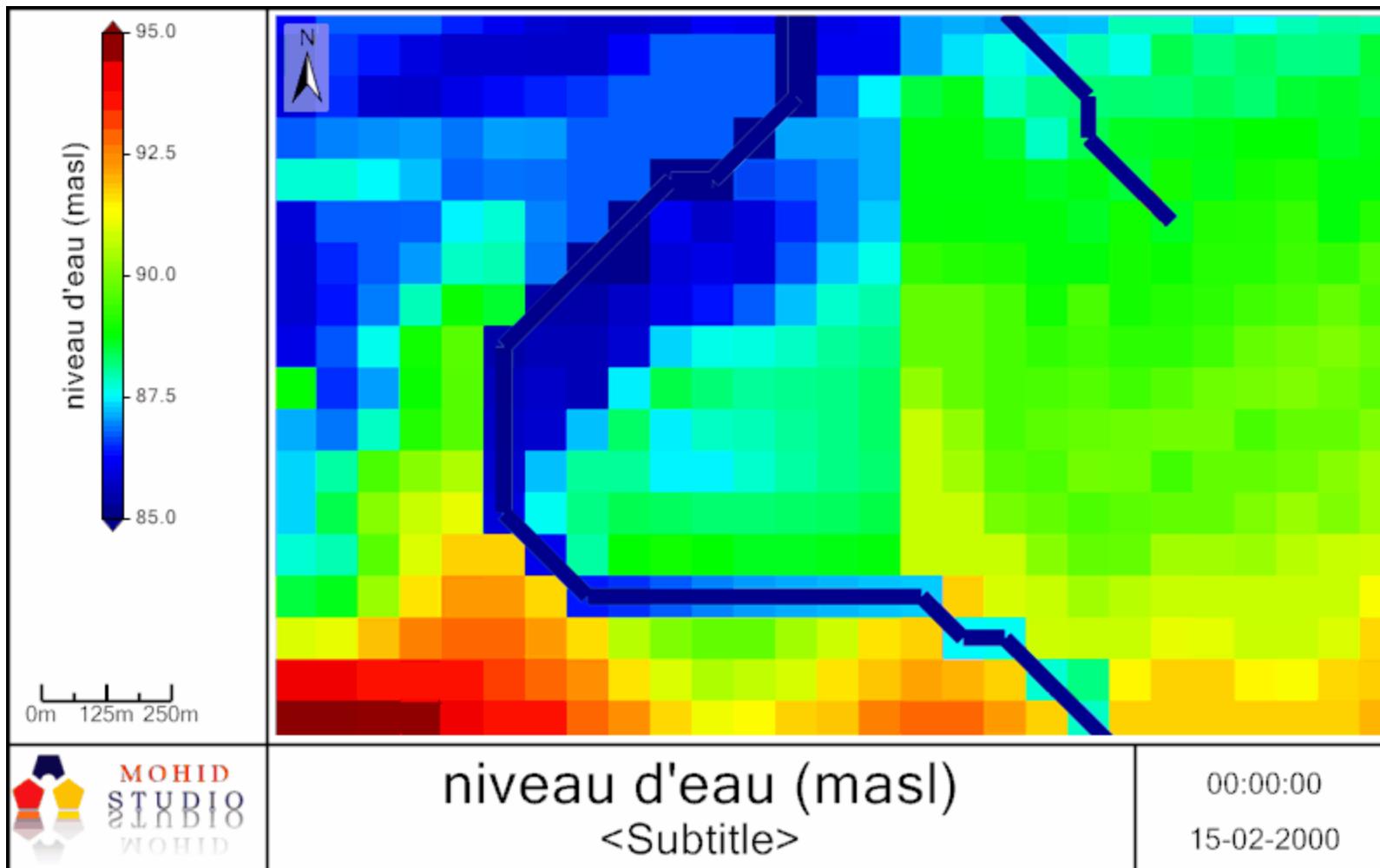
E_0 = potential evapotranspiration for a given day

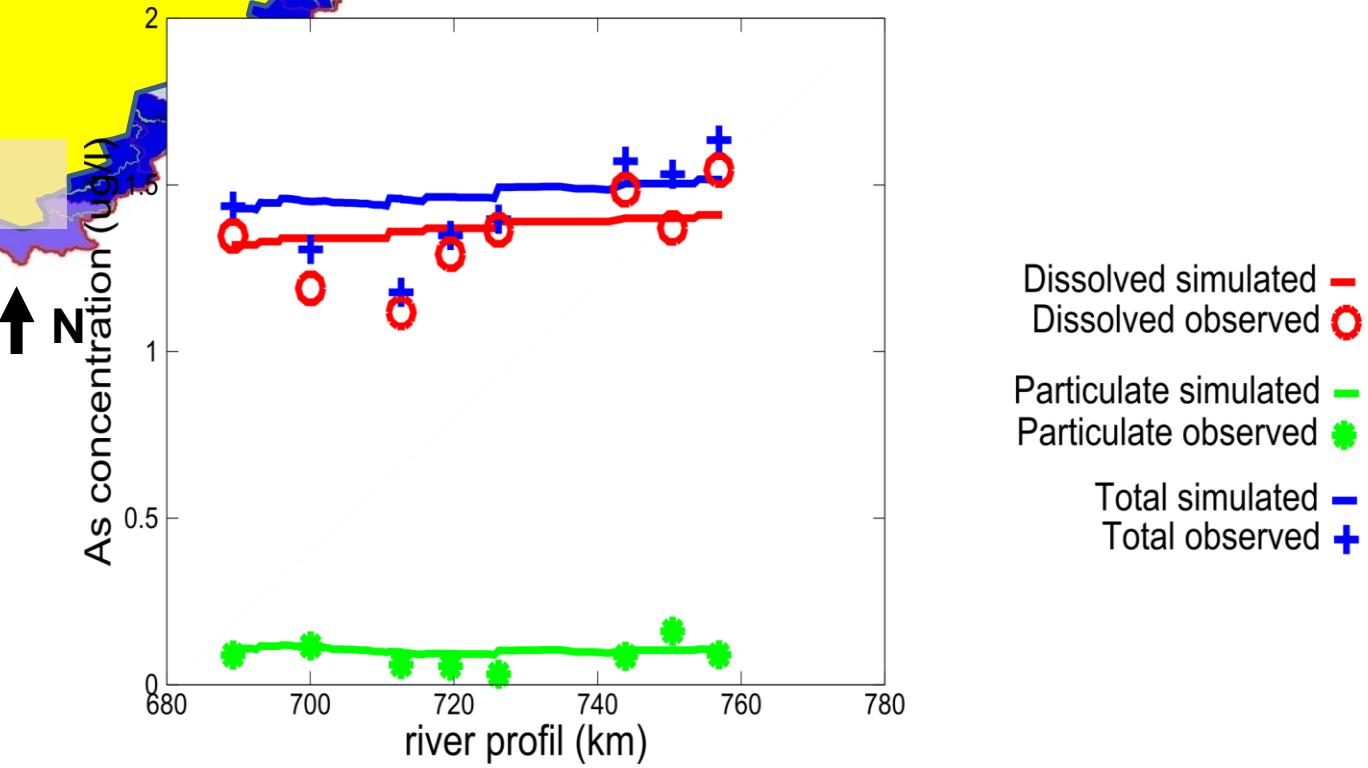
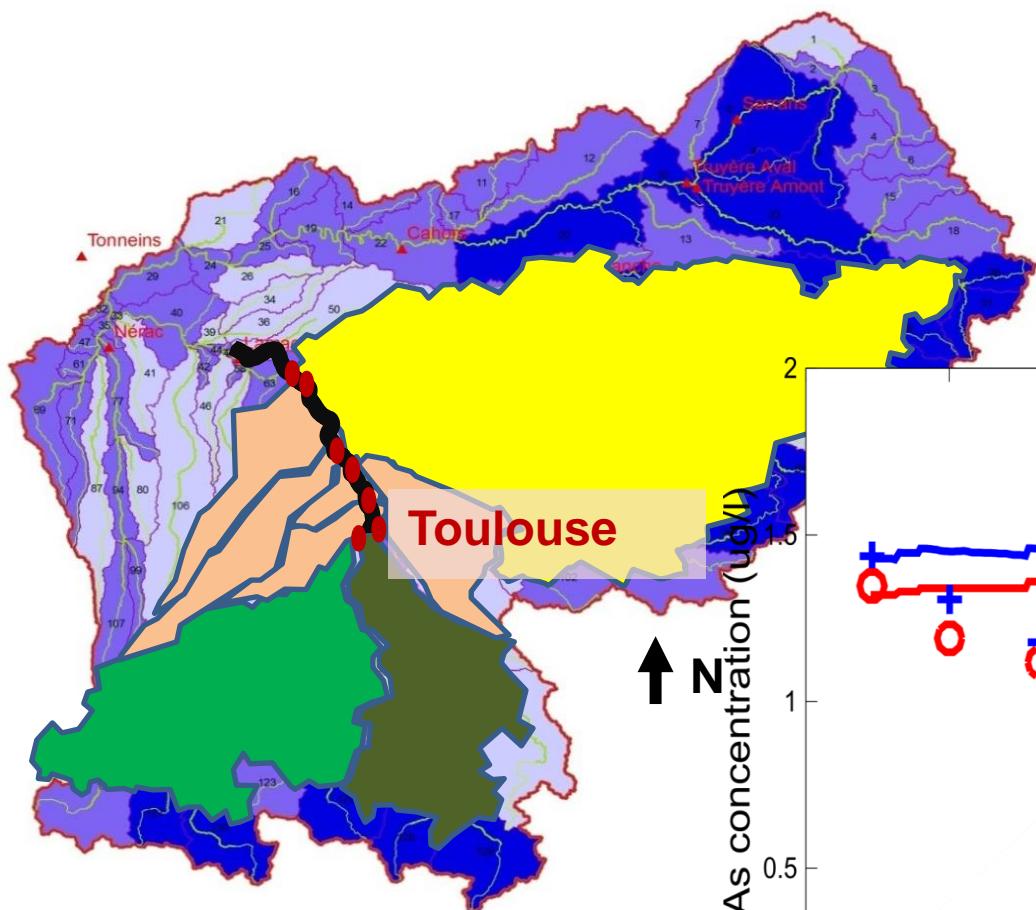
R_{day} = amount of precipitation falling on a given day

K_{sat} = amount of precipitation falling on a given day

η = an evaporation coefficient



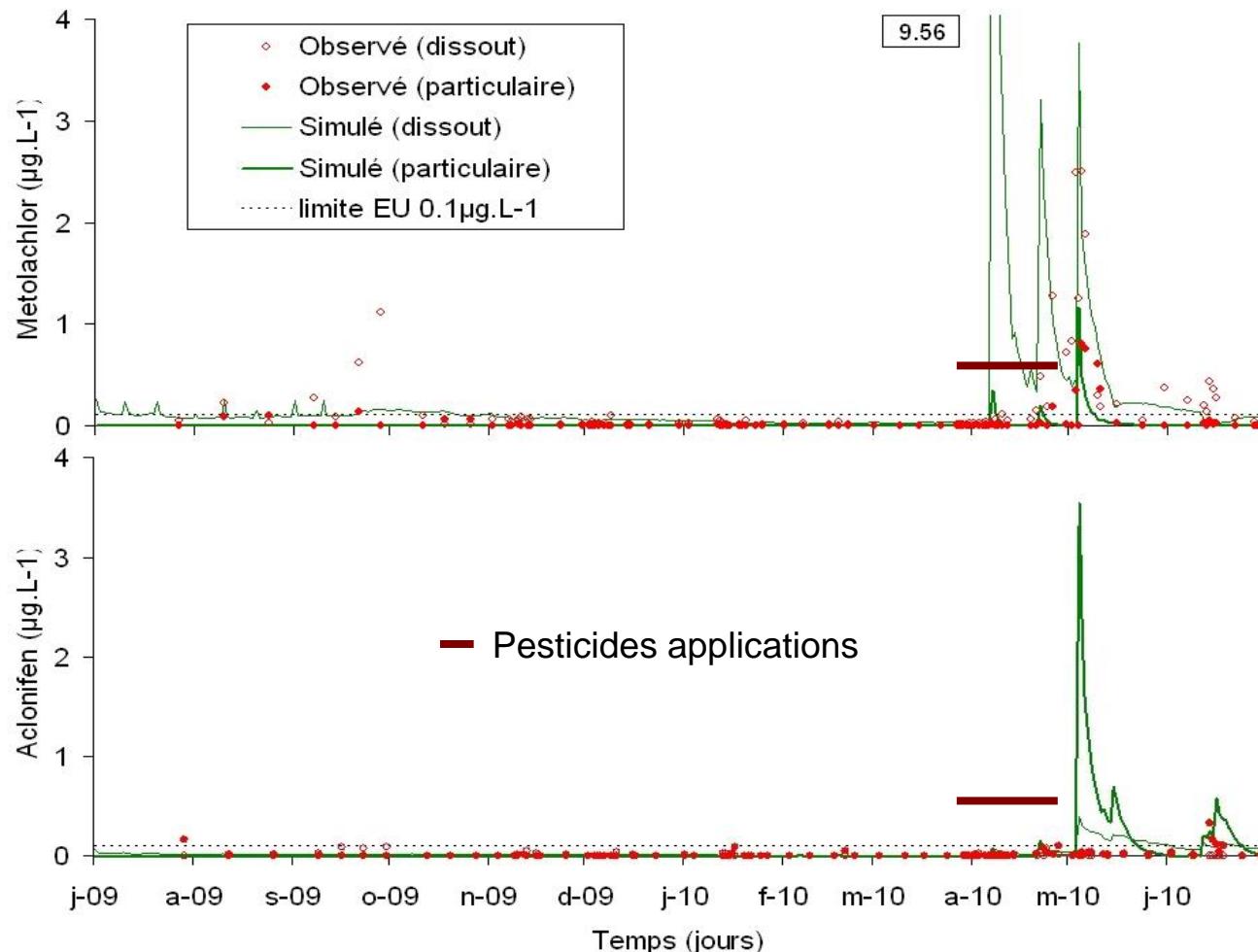




RESULTS : PESTICIDES SIMULATIONS

GARONNE RIVER PROJET

	Parameters	Name in SWAT		File	Metolachlor	Aclonifen
Partition sol	SK _{oc}	K _{oc}	mg.kg ⁻¹ /mg.L ⁻¹	pest.dat	200.0	8203.0
	CK _{oc}	CHPST_KOC	m ³ .g ⁻¹	.swq	2.5x10 ⁻⁴	7.2x10 ⁻³
Partition rivière	Soil half-life	HLIFE_S	days	pest.dat	90	90
	Degradation rate	CHPST/SEDPST REA	days ⁻¹	.swq	0.025	0.025



Boithias (2012)

Modelling DOC, POC including biofilm

$FDOC = 0.0040 Q - 8.76 \text{ Slope} + 0.095 \text{ SoilC}$

$POC\% = 9.40/(cTSS - 5) + 2.07$

Modelling pesticides and metals (kd)

Modelling the effect of riparian zones in water quality

Improve in-stream processes in SWAT
(hyporheic zone, interaction with the aquifers, floodplain,
hydromorphology).

