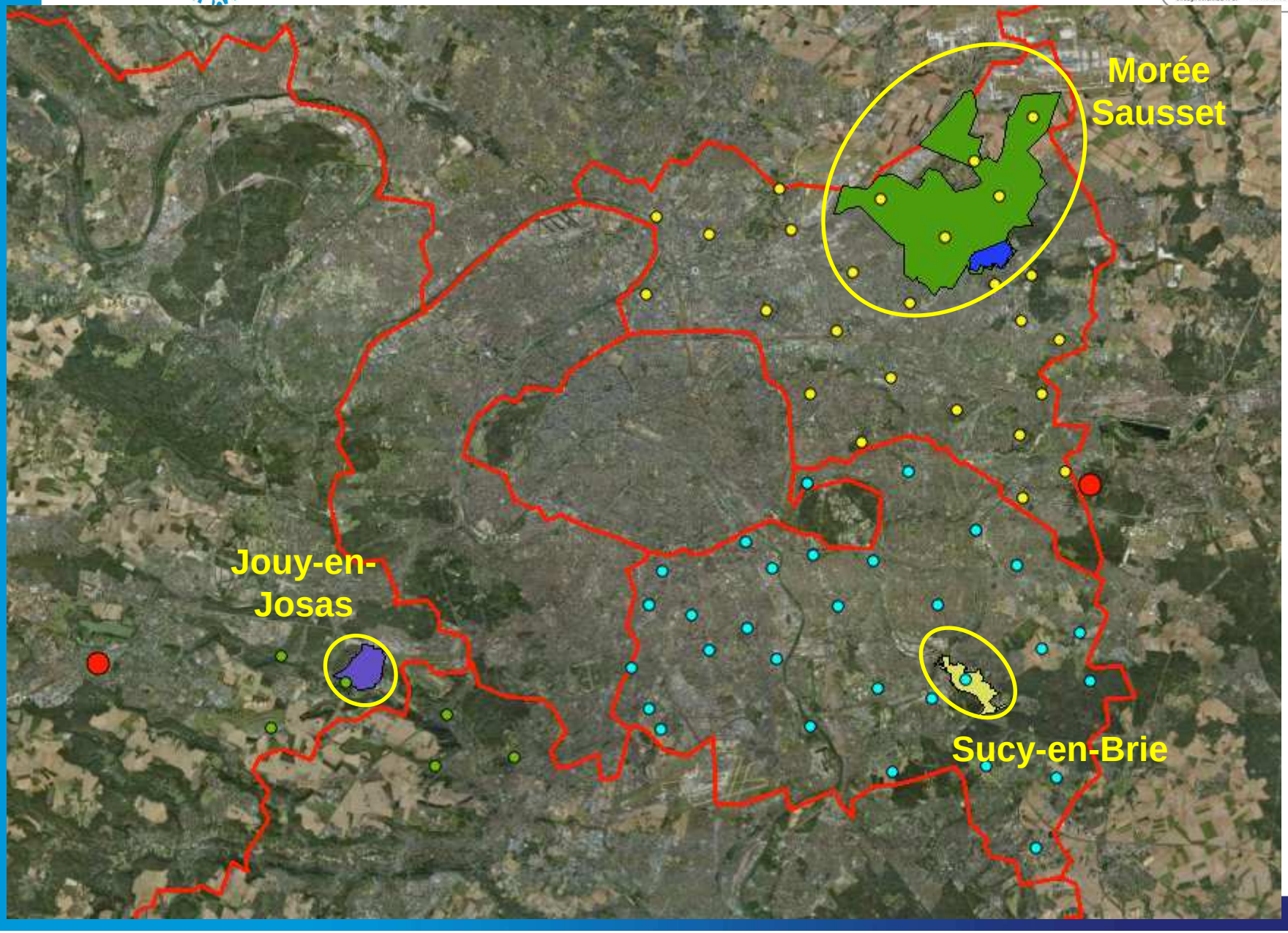
WP3 update

RainGain Project Meeting, Antwerpen, 31 March - 2 April 2014

ENPC : A. Gires, A. Giangola-Murzyn, J.-B. Abbes, J. Richard, I. Tchiguirinskaia, D. Schertzer
Val-de-Marne : A. Ichiba, P. Bompard
Seine-Saint-Denis : N. Stantic, F. Chaumeau, V. Lanier

Pilot locations



Sucy-en-Brie catchment : comparison Multi-Hydro / Canoe

Comparing two hydrological models

CANOE and MULTIHYDRO

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

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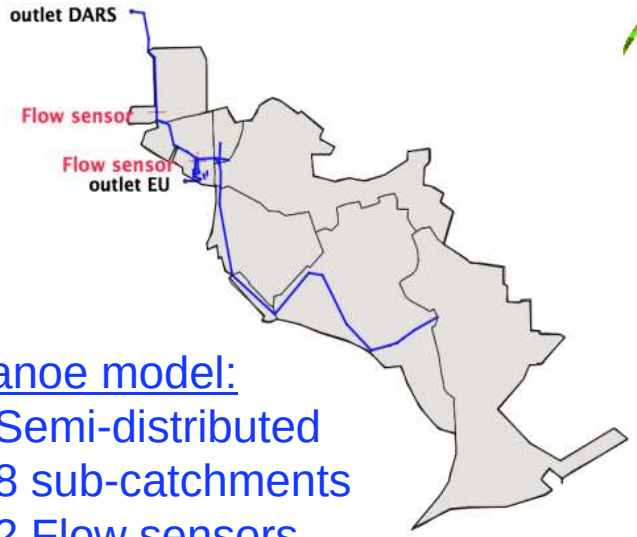
Objectives:

- Validate the two models: MultiHydro and Canoe using different types of rainfall data
- Compare two modelling approches (Semi-distributed and Totally distributed)



10m : 68%

5m : 58%

2m : 47%

canoe model:

- Semi-distributed
- 8 sub-catchments
- 2 Flow sensors
- Imp = 35%

MultiHydro model:

- Fully-distributed
- available at three resolutions:10m - 5m - 2m

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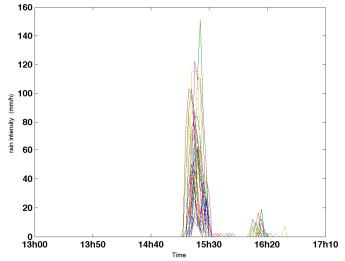
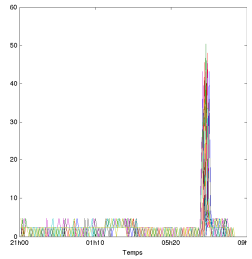
Raingauge data: (31 raingauges)

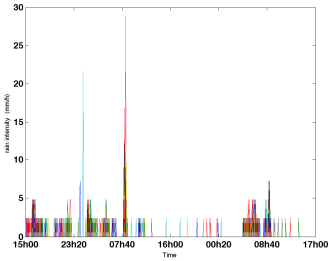
19/06/2013



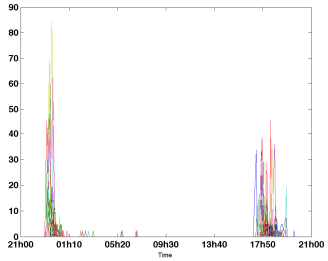
15/12/2011



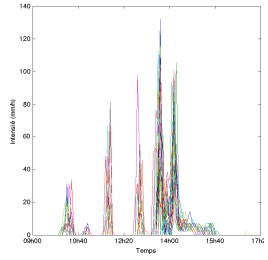
08/11/2013



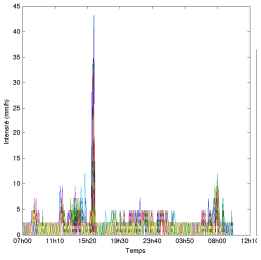
28/09/2013



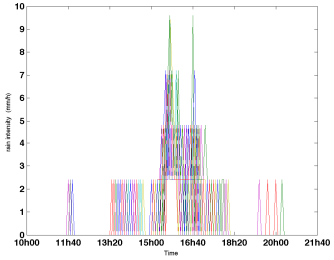
14/07/2010



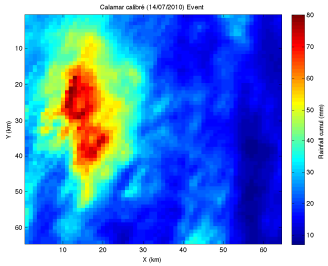
15/08/2010

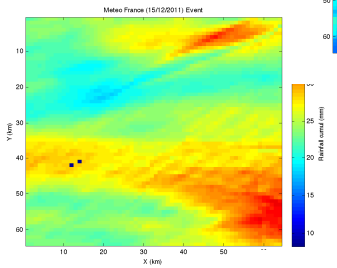


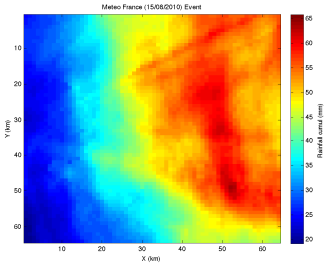
16/10/2013



Radar data : 3 products

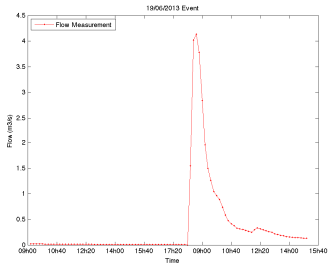


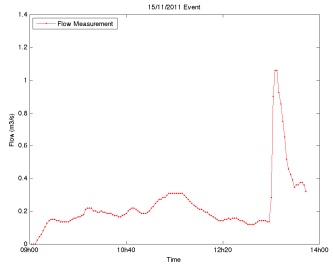


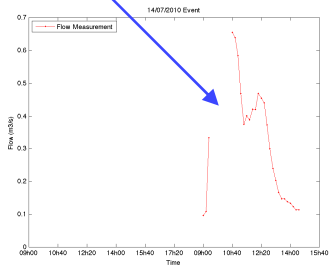


Flow measurement

missing data







Comparing two hydrological models

CANOE and MULTIHYDRO

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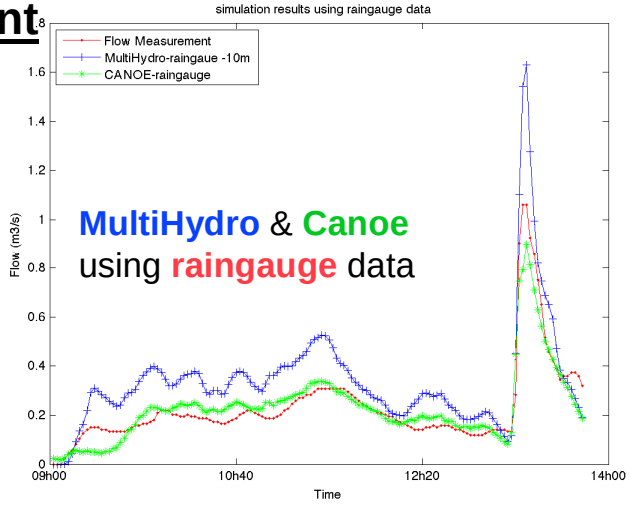
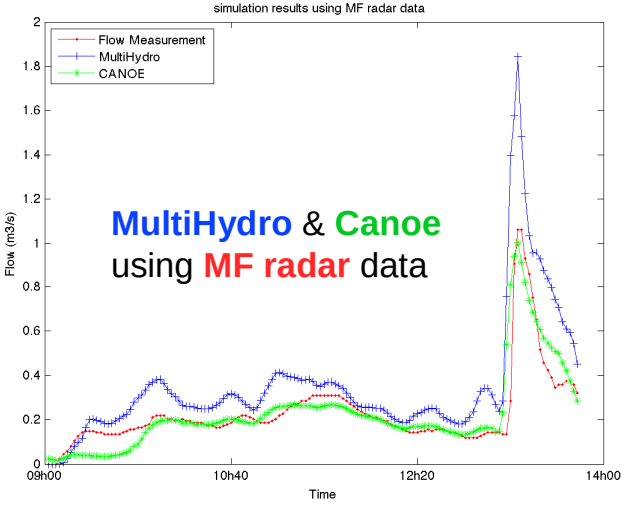
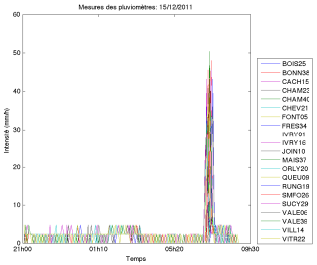
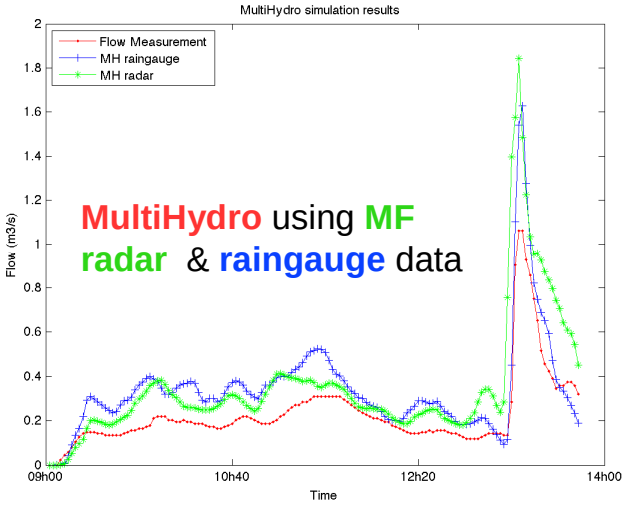
Results: 15/11/2011 event

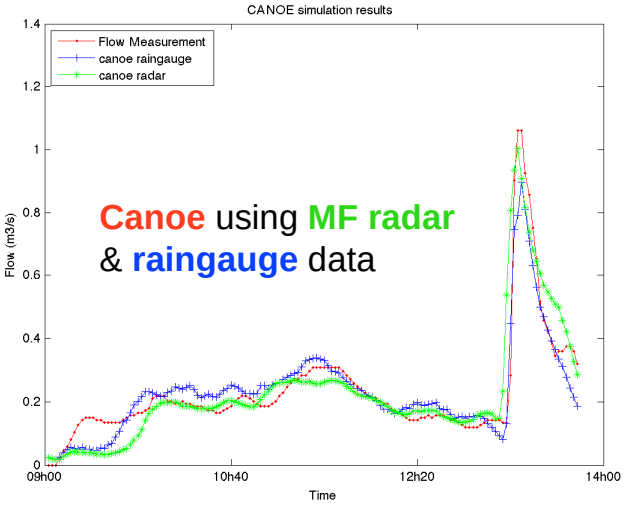




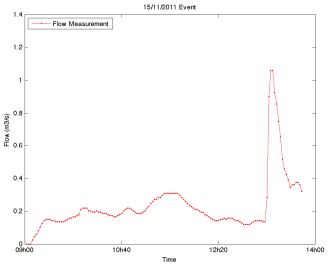
Rainfall







Flow Measurement



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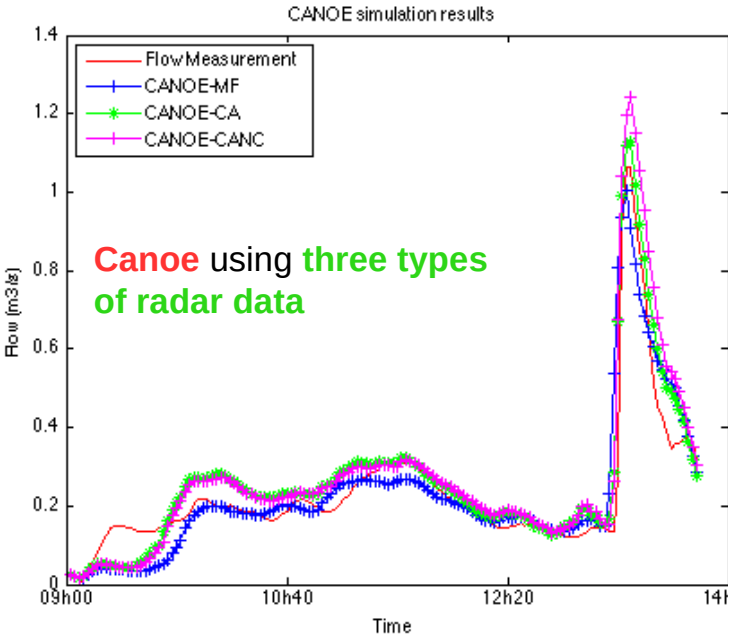

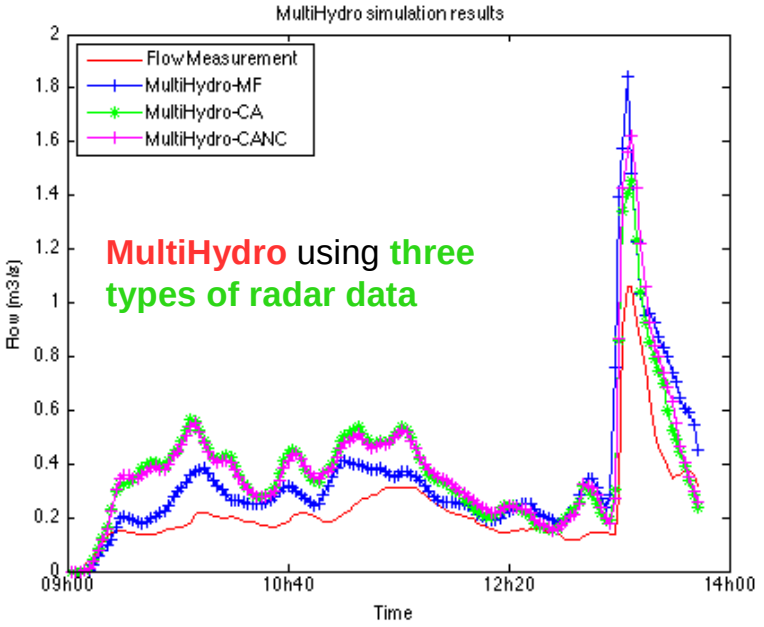

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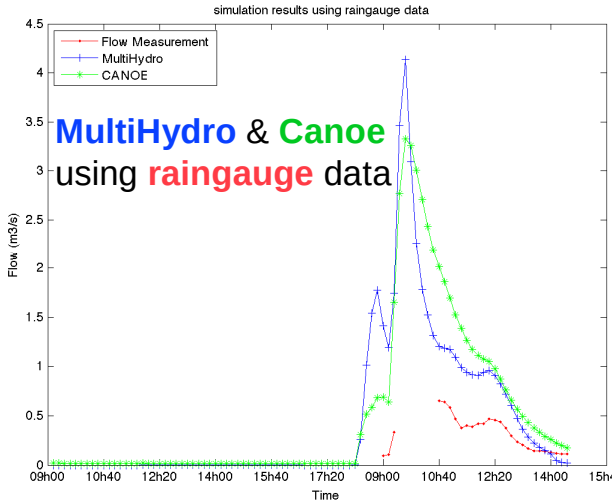
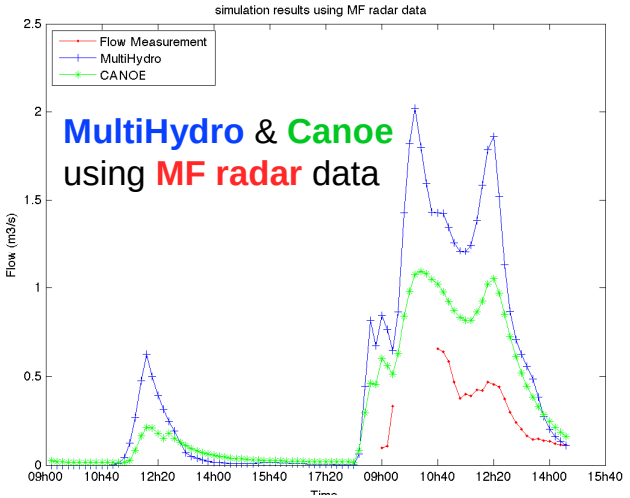
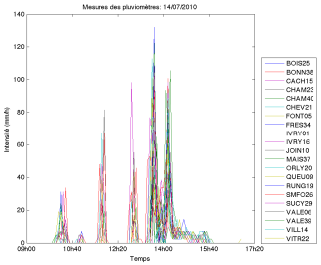
INTERREG IVB

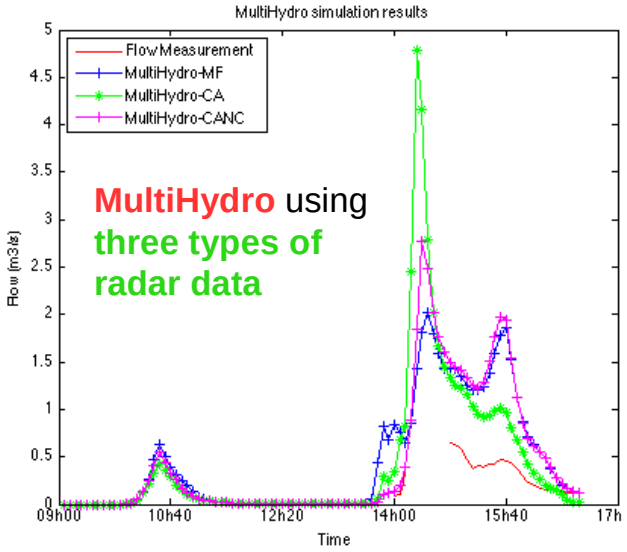
Results: 14/07/2010 event

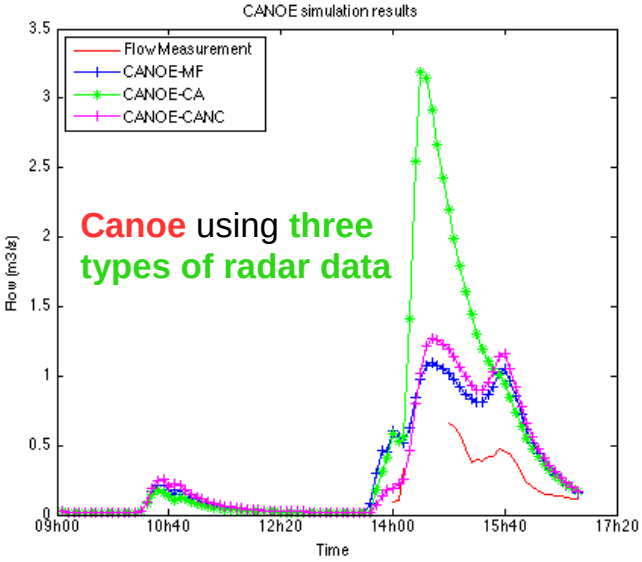




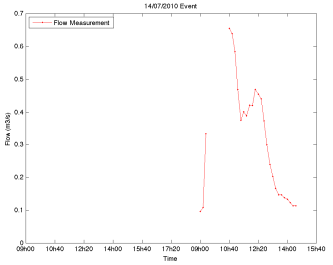
Rainfall







Flow Measurement



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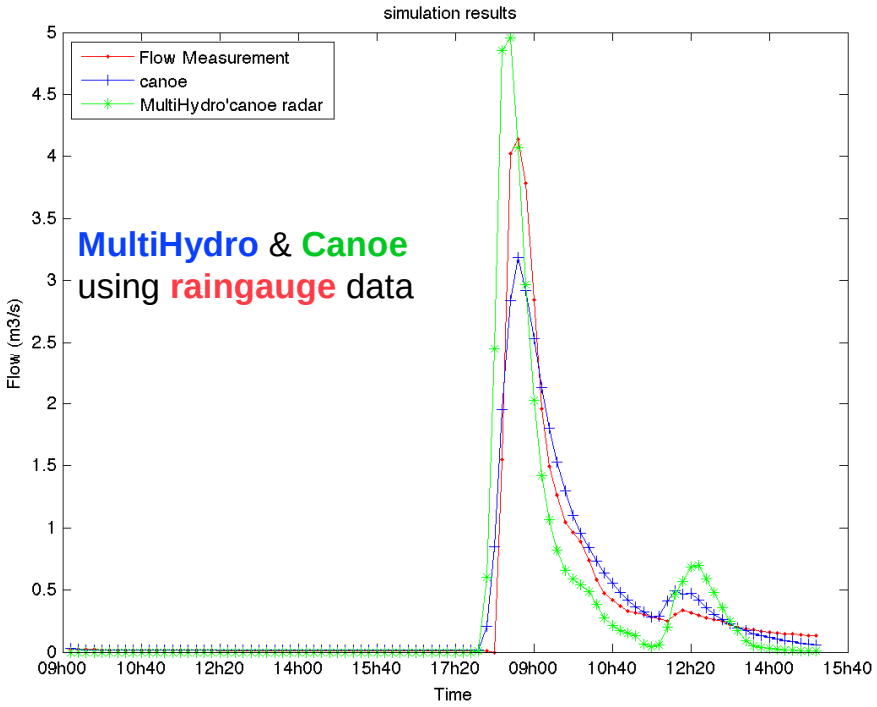
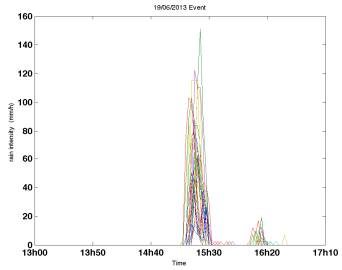
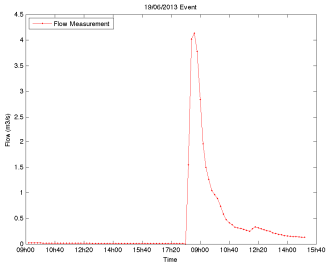
Results: 19/06/2013 event



Rainfall



Flow Measurement



Implementation and validation of Multi-Hydro in Jouy-en-Josas

Jouy-en-Josas catchment

Sharp slope

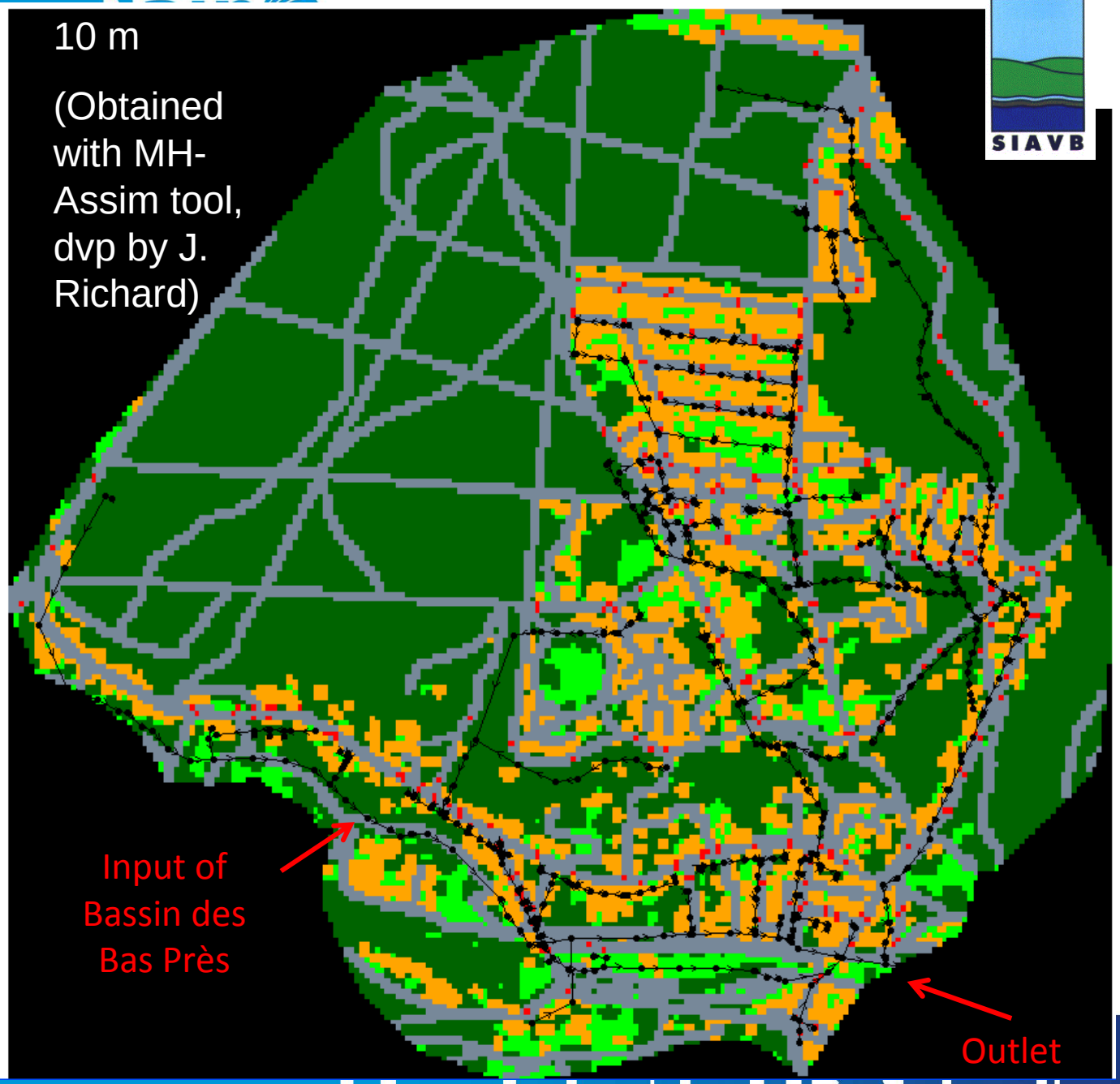
Bièvre river

RER C Station

Kinder garden

Hillside from the valley

- 3.1 km² area / Great slopes (~100m of elevation difference) / various land use



SIAVB

VEOLIA

J.B. Abbes (ENPC student) part time internship (March – June 2014)

Done :

- Refinement of catchment limits
- Multi-hydro update (inputting a river flow)

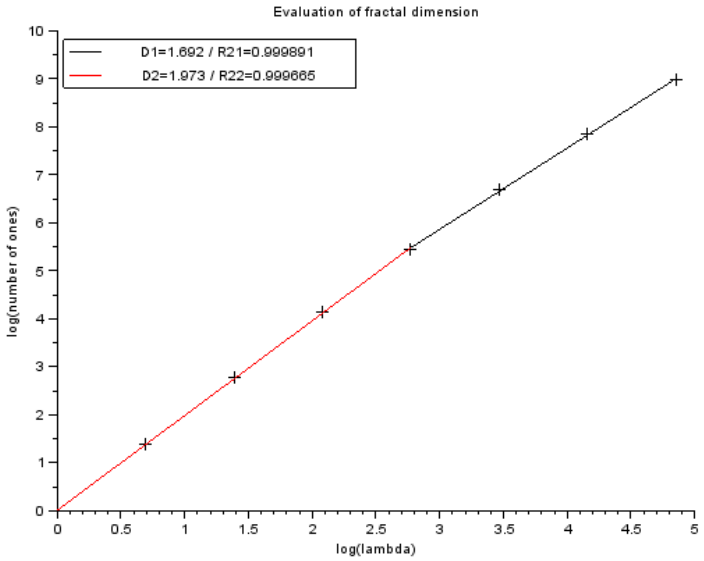
To be done:

-Validation of MH on 4 rainfall events

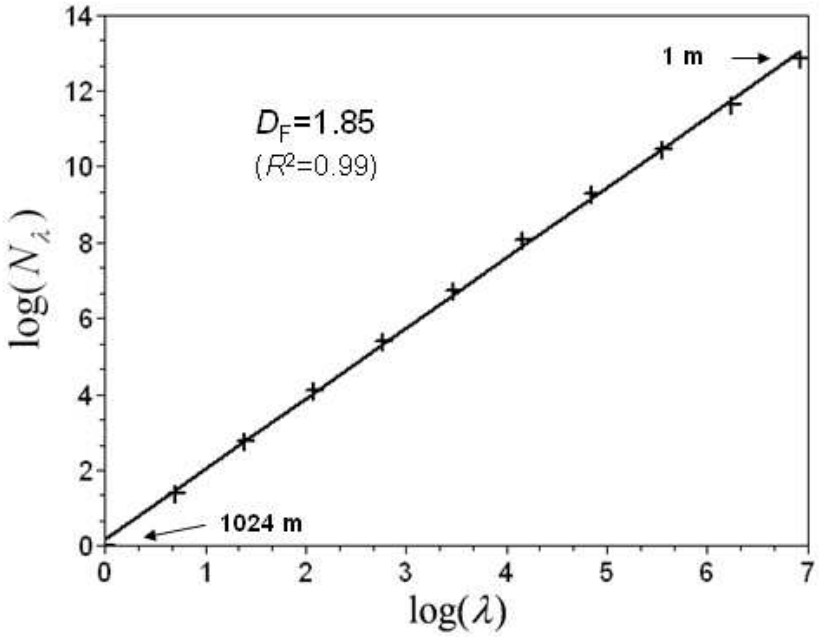
- Sensitivity to small scale variability of intputs

Fractal dimension

Impervious area, Jouy (roads+houses)

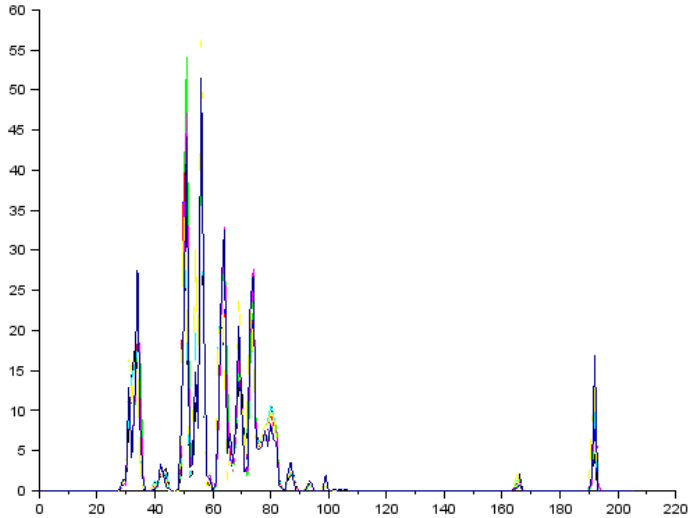


Comparison with Kodak catchment (Gires, 2012)

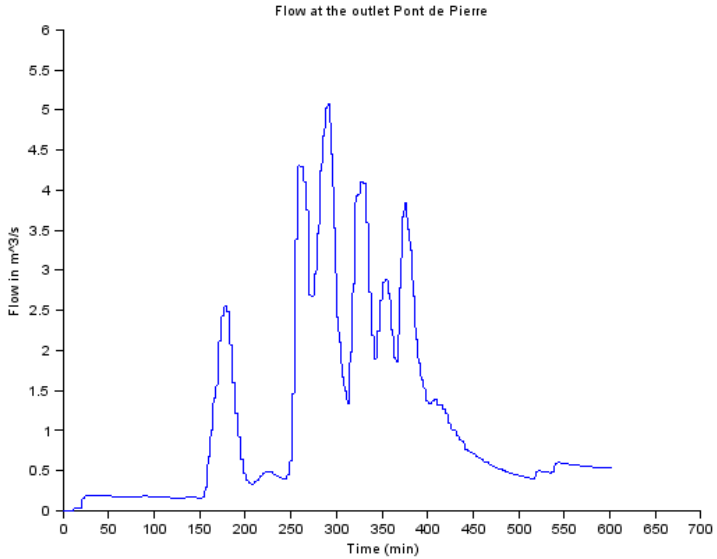


14th July 2010 event

Rainfall intensity



Time step of 5min



Combined spatio-temporal multifractal analysis of radar rainfall and simulated surface runoff on the Kodak Catchment

Kodak catchment

Uncertainty associated with small scale rainfall variability

Methodology

(i) Generation of an ensemble of realistic downscaled rainfall fields (virtual X-band) :

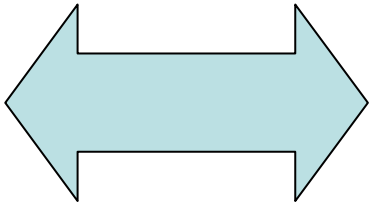
- Multifractal analysis of rainfall data
- Downscaling with the help of discrete universal multifractal cascades

(ii) Simulation of the corresponding ensembles of hydrographs :

- Use of operational hydrological/hydraulic urban models

(iii) Analysis of the ensembles :

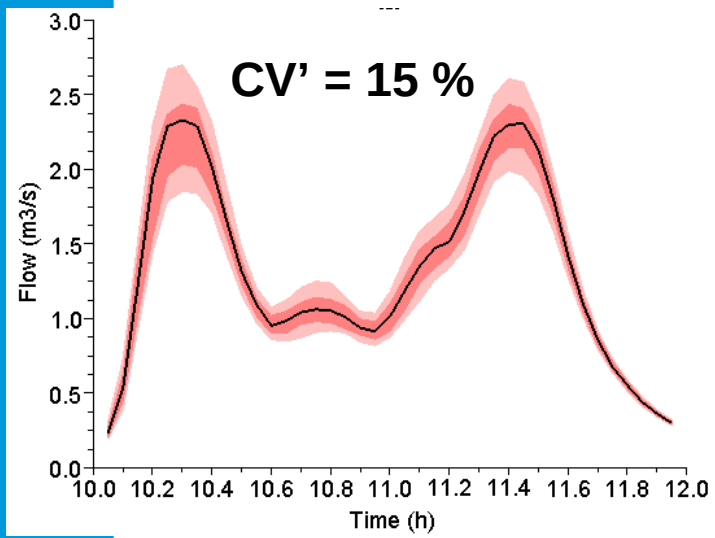
Variability among the 100 samples



Uncertainty due to the unknown high resolution rainfall variability

Uncertainty associated with small scale rainfall variability

Simulated flow for the outlet of the Kodak Catchment (MH 10 m) for 15 Dec. 2011 event



With α=1.8 and C_1=0.1

Sensitivity to the UM parameters used in the downscaling process

	$\alpha = 1.8$ $C_1 = 0.1$ ($\gamma_s = 0.50$)	$\alpha = 1.8$ $C_1 = 0.05$ ($\gamma_s = 0.36$)	$\alpha = 1.4$ $C_1 = 0.1$ ($\gamma_s = 0.43$)	$\alpha = 0.6$ $C_1 = 0.1$ ($\gamma_s = 0.22$)
Up-stream conduit	42.9	30.3	46.4	39.3
Middle conduit	16.7	13.5	15.7	14.3
Outlet	18.2	9.7	14.0	12.4

Multifractal analysis of MH outputs (first tests)

Synthetic rainfall event
- 42 min
- 17 mm event with a cumulated -
- resolution of 10 m x 10 m x 20 s

-**Transfer of scaling features**

-**Rather stable during the event**

-**Scaling lost after the event**