



Results of the benchmarking on Tritium migration through the Loire river

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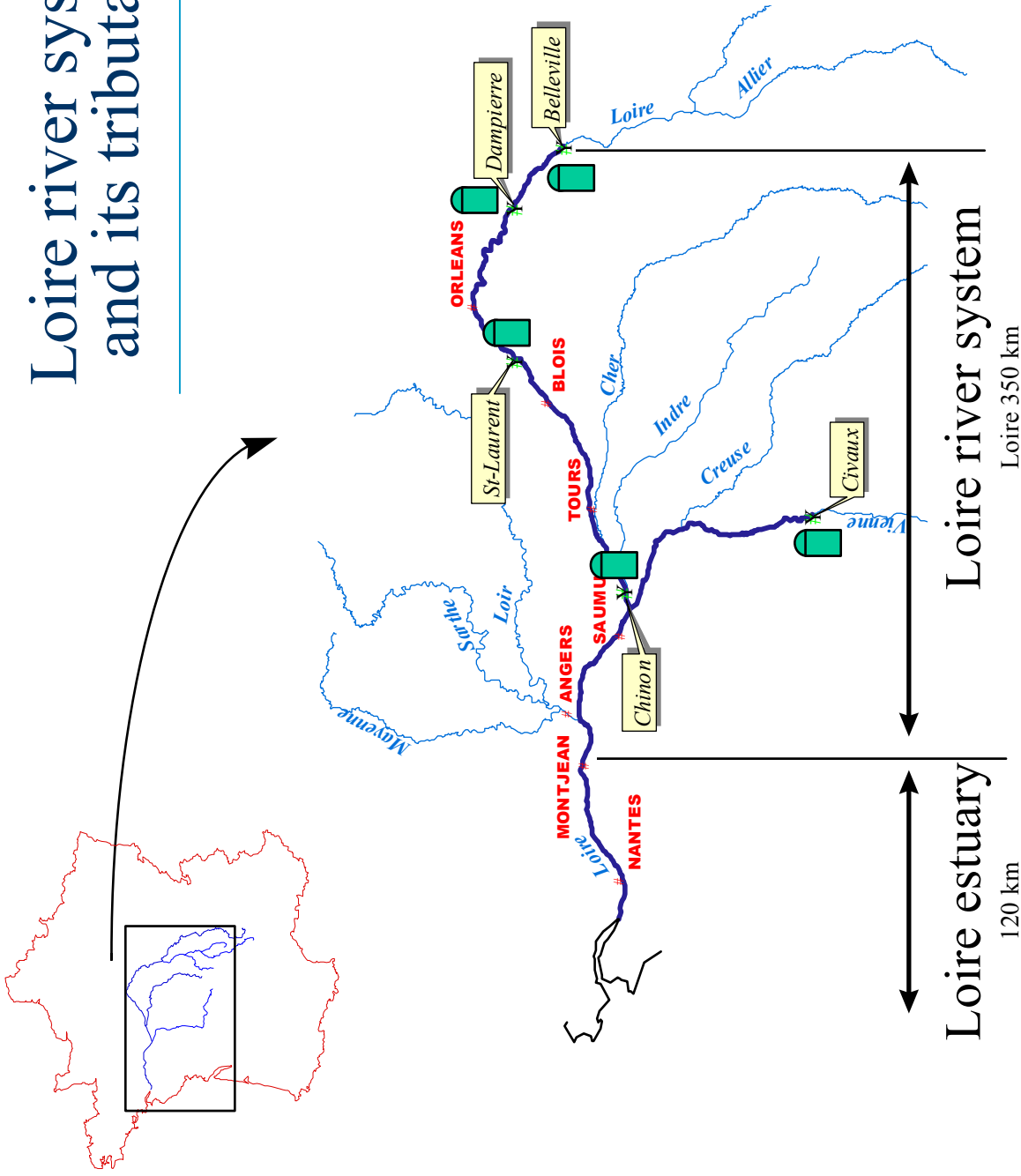
EMRAS Working Group 'Model Validation for Radionuclide Transport in the Aquatic Systems'
November 2004



Studied system

- Loire river system and its main tributaries (France), represented by punctual discharges
- Domain length \cong 350 km, from Belleville to MontJean (entrance of the estuary)
- Particularities
 - 4 main tributaries
 - 5 Nuclear Power Plants, managed by Electricité de France (EDF)

Loire river system and its tributaries




Data given for the scenario (1)

Data to built the model :

- Description of the river system
⇒ position of the profiles, the weirs, the tributaries, the tritium discharges,... (relative positions),
- ASCII geometry file containing the profiles,
- ASCII files containing the weir laws,
- ASCII files containing all boundary conditions
⇒ flow rates, downstream water level and tritium discharges, with a time step of 1 hour.

Synthesis of the exercise

- Simulation of the dispersion of Tritium discharges in the whole Loire river system (~ 350 km)
 - Reproduction of the real hydraulic conditions, from July to December 1999
- 
- Comparison between calculated tritium concentration and measurements at Angers
 - Inter-comparison between the different models at different points along the river

Models tested on the scenario

- **CASTEAUR**

IRSN, France

4 runs : 3 steady runs with Casteaur v0.0 (simplified 1D model) with max/mean/min flow rates, 1 unsteady run with Casteaur v0.1 (“box model”)

- **MASCARET – TRACER** module

EDF, France

- **MOIRA+** – MARTE module

ENEA, Italy

3 runs : standard monthly data, customised monthly data, customised hourly data

- **RIVTOX**

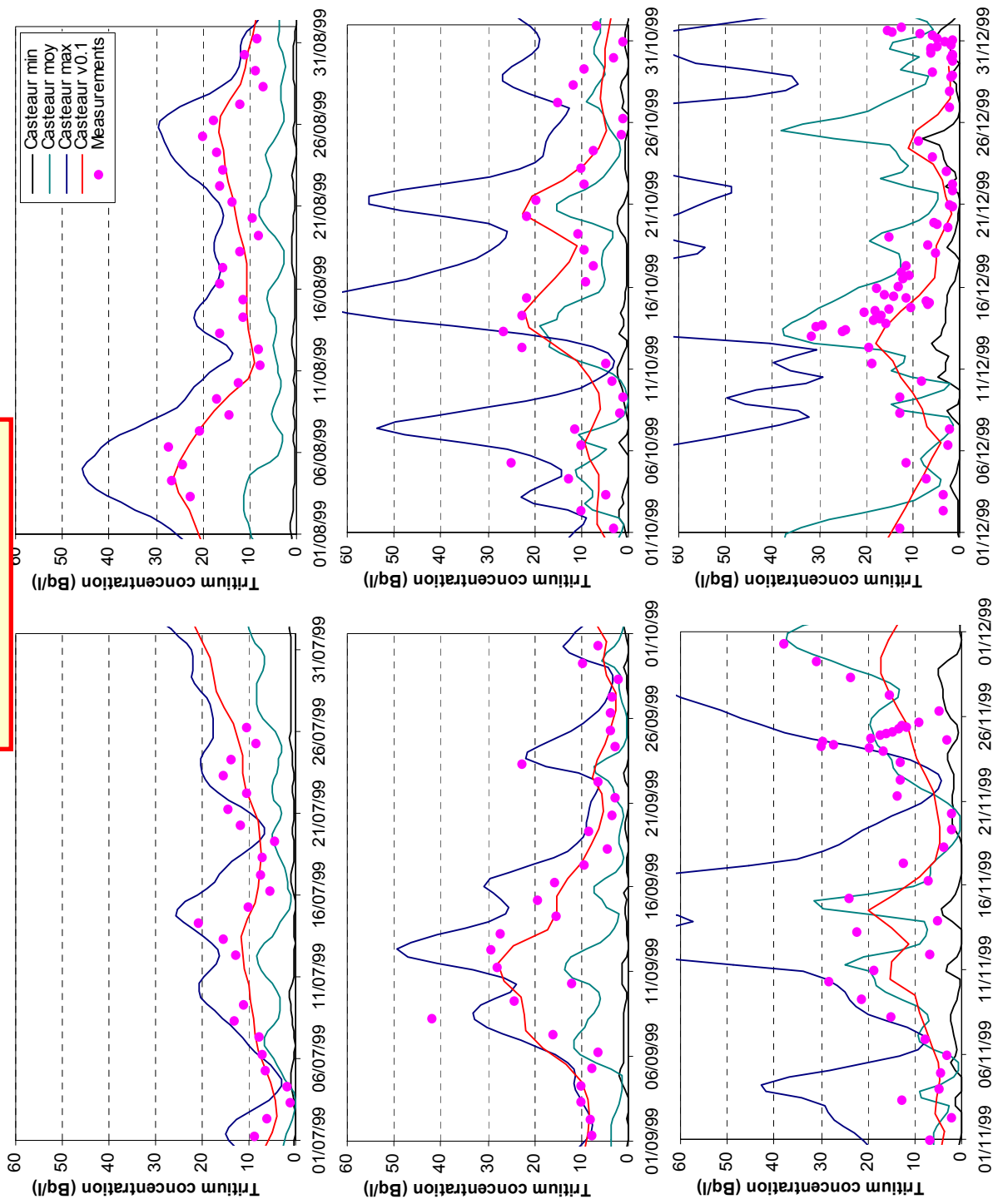
IMMSP, Ukraine



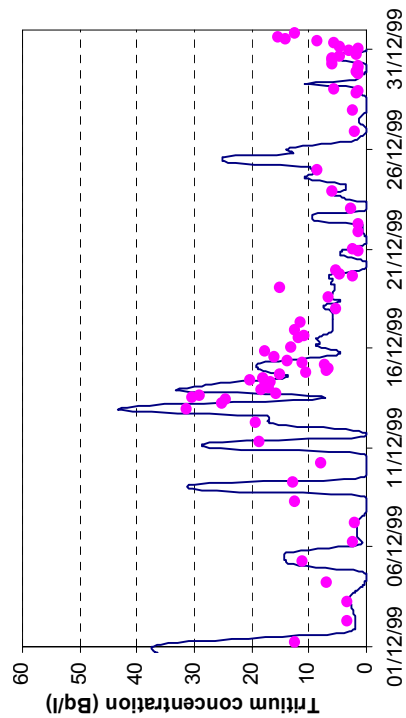
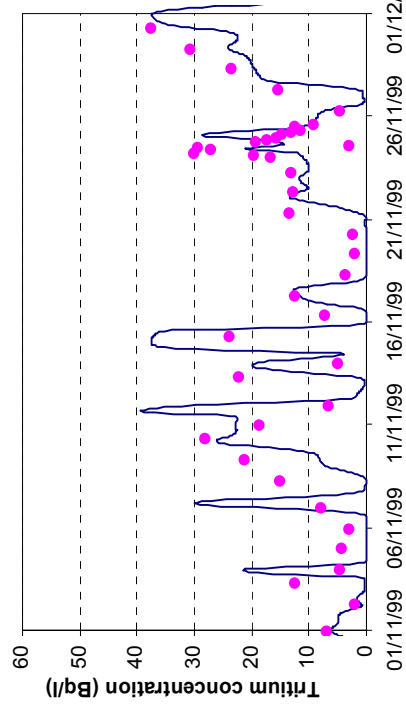
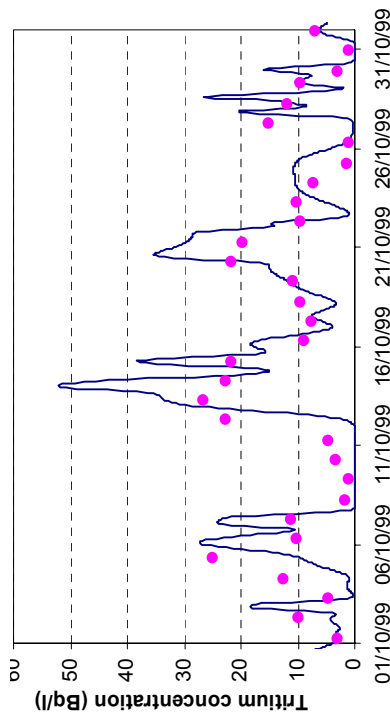
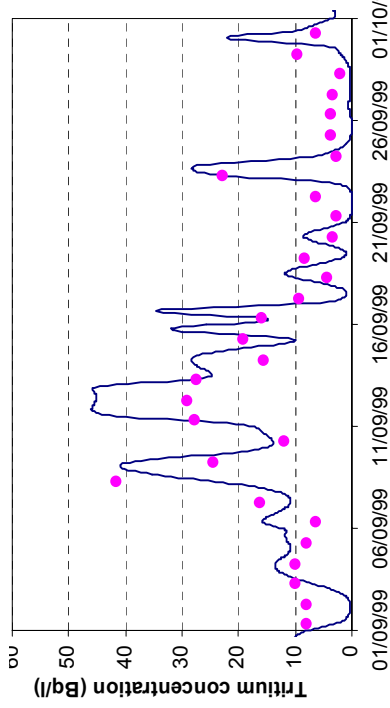
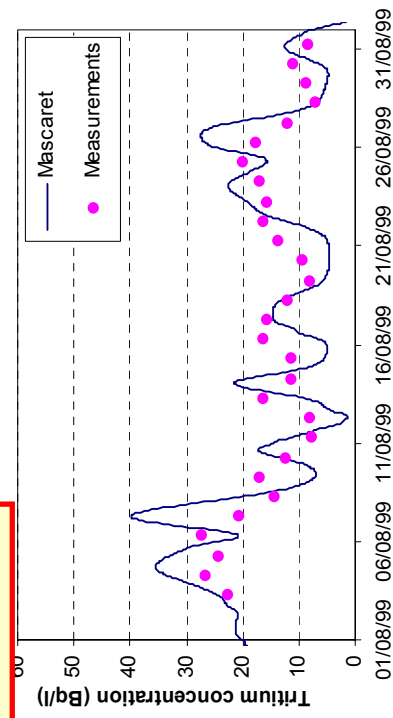
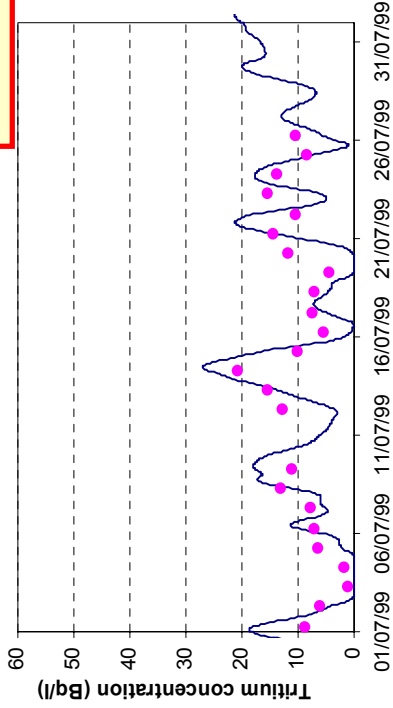
Comparisons between calculated concentrations and measurements (at Angers) for each model

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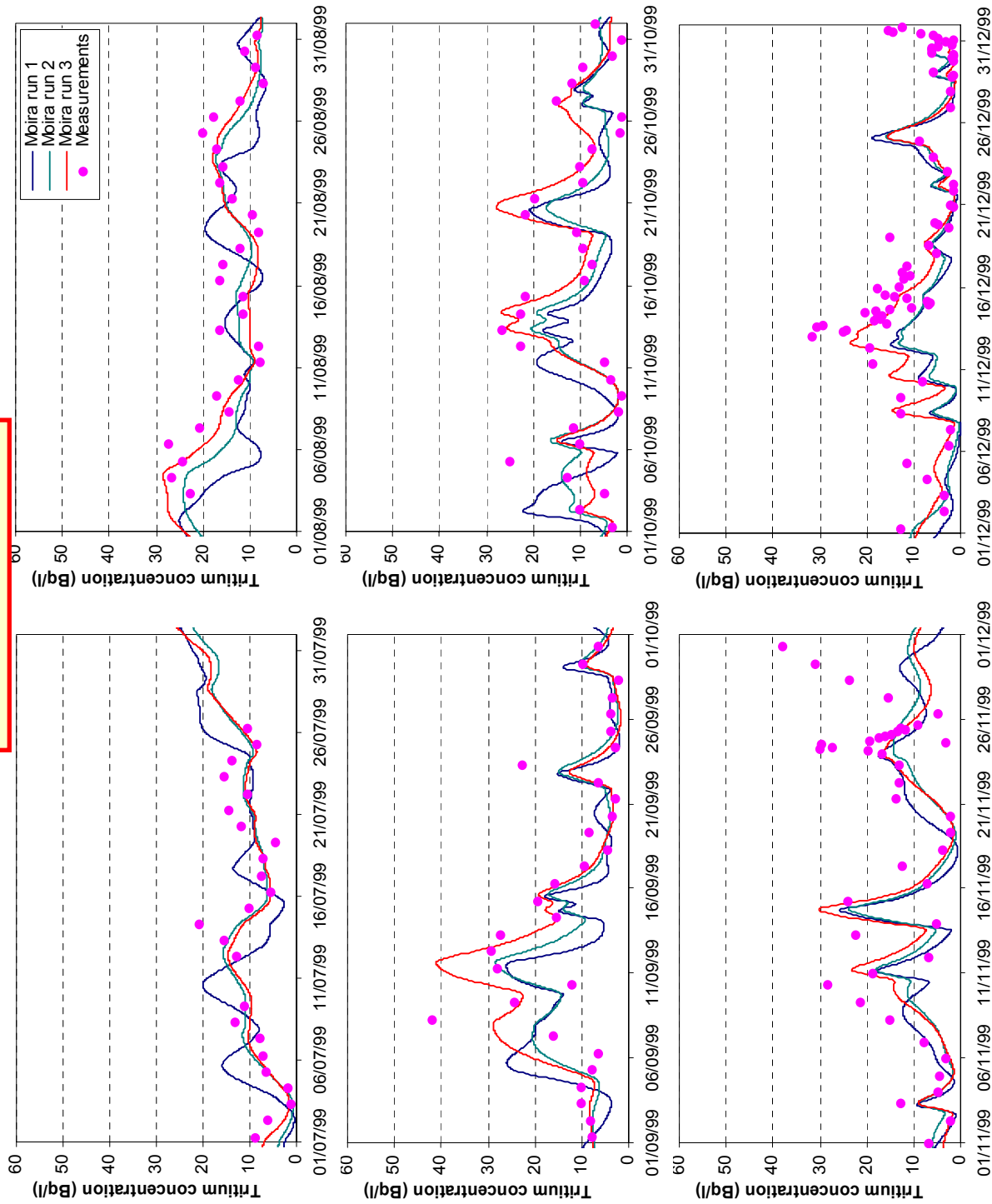
CASTEAUR



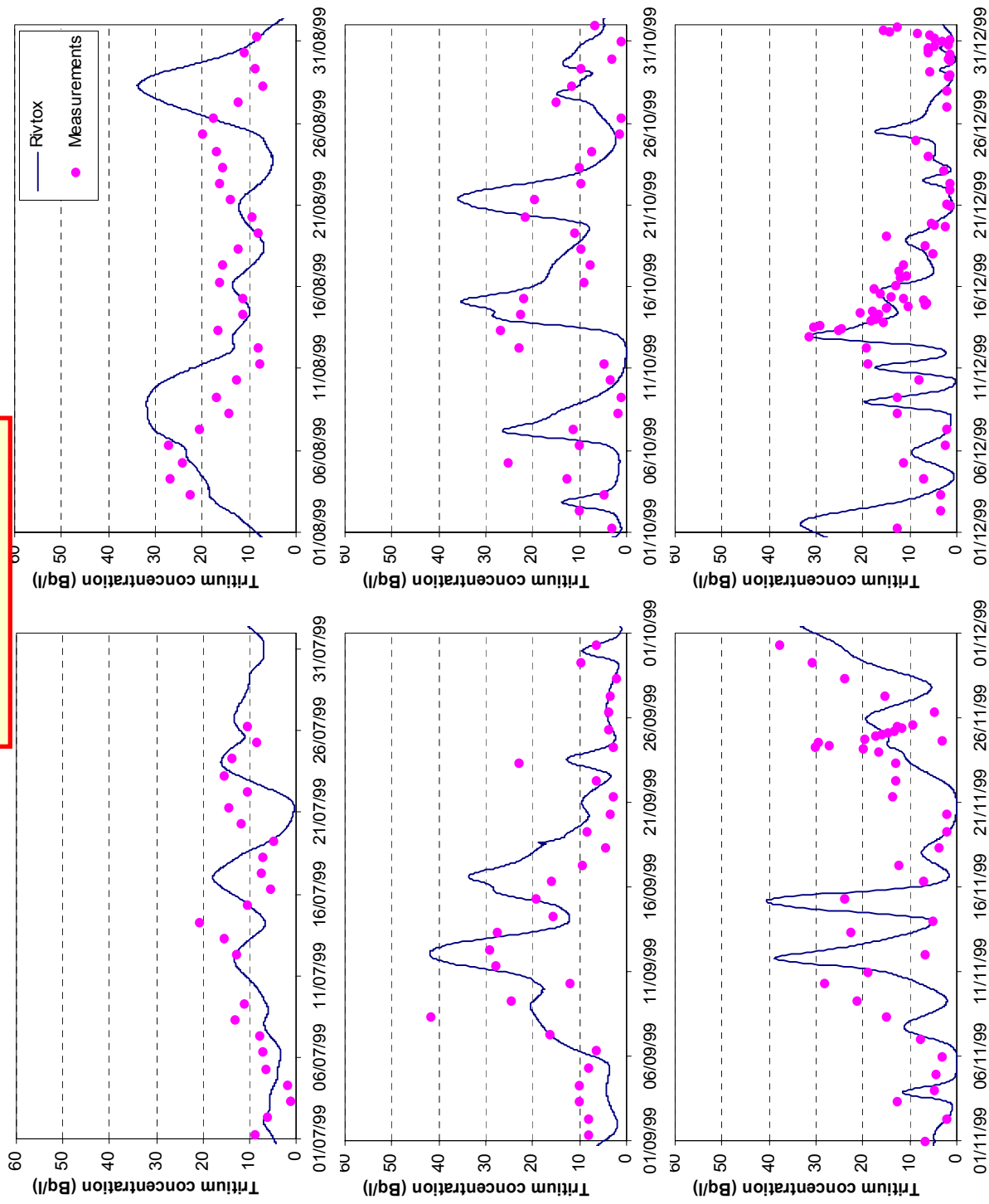
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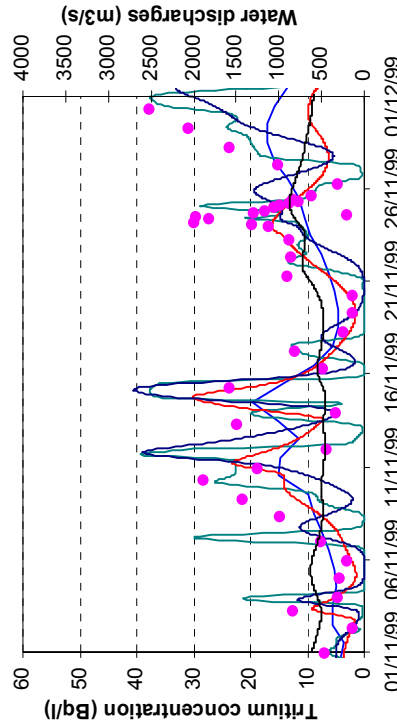
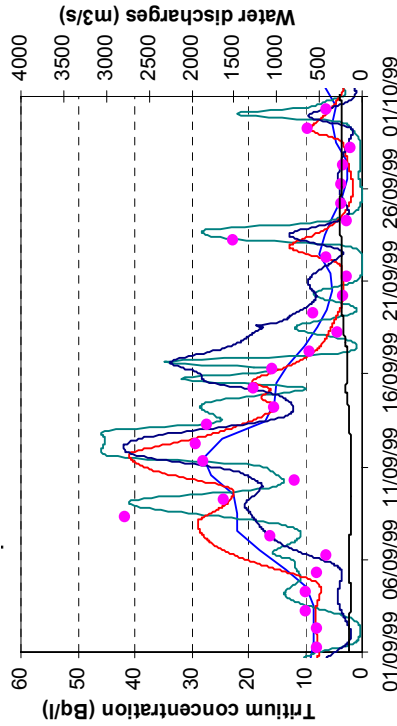
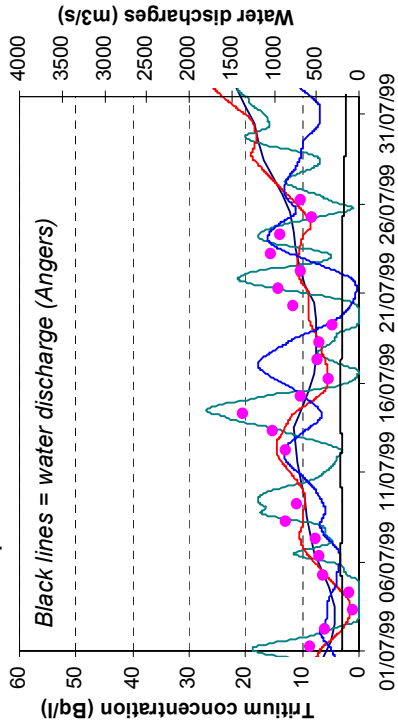
MOIRA +



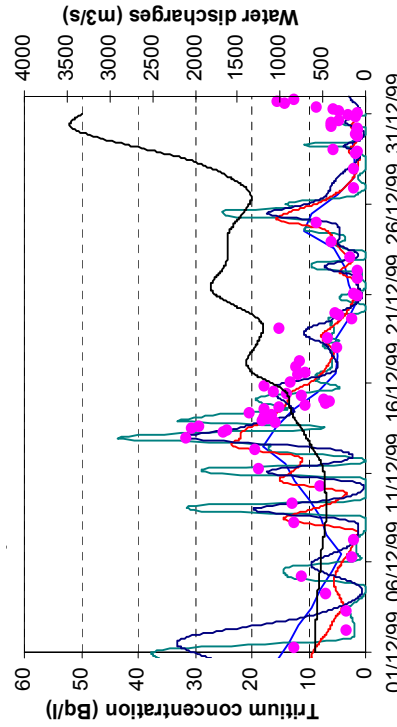
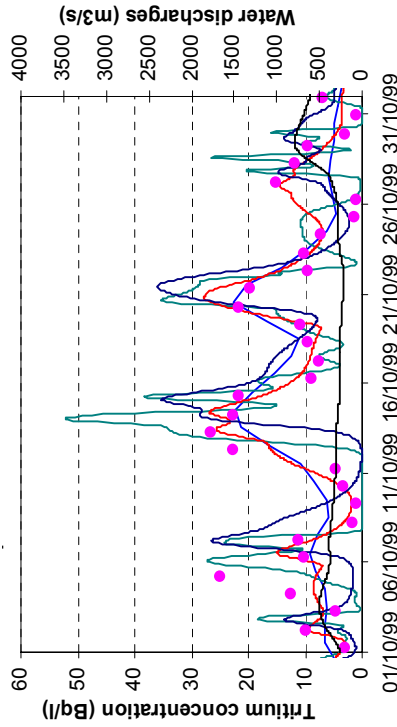
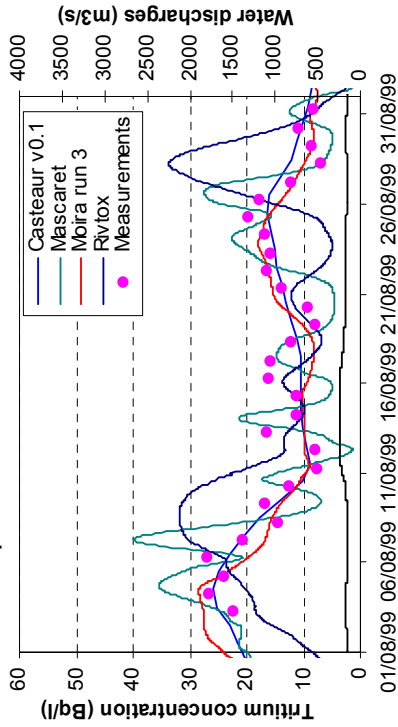
RIVTOX



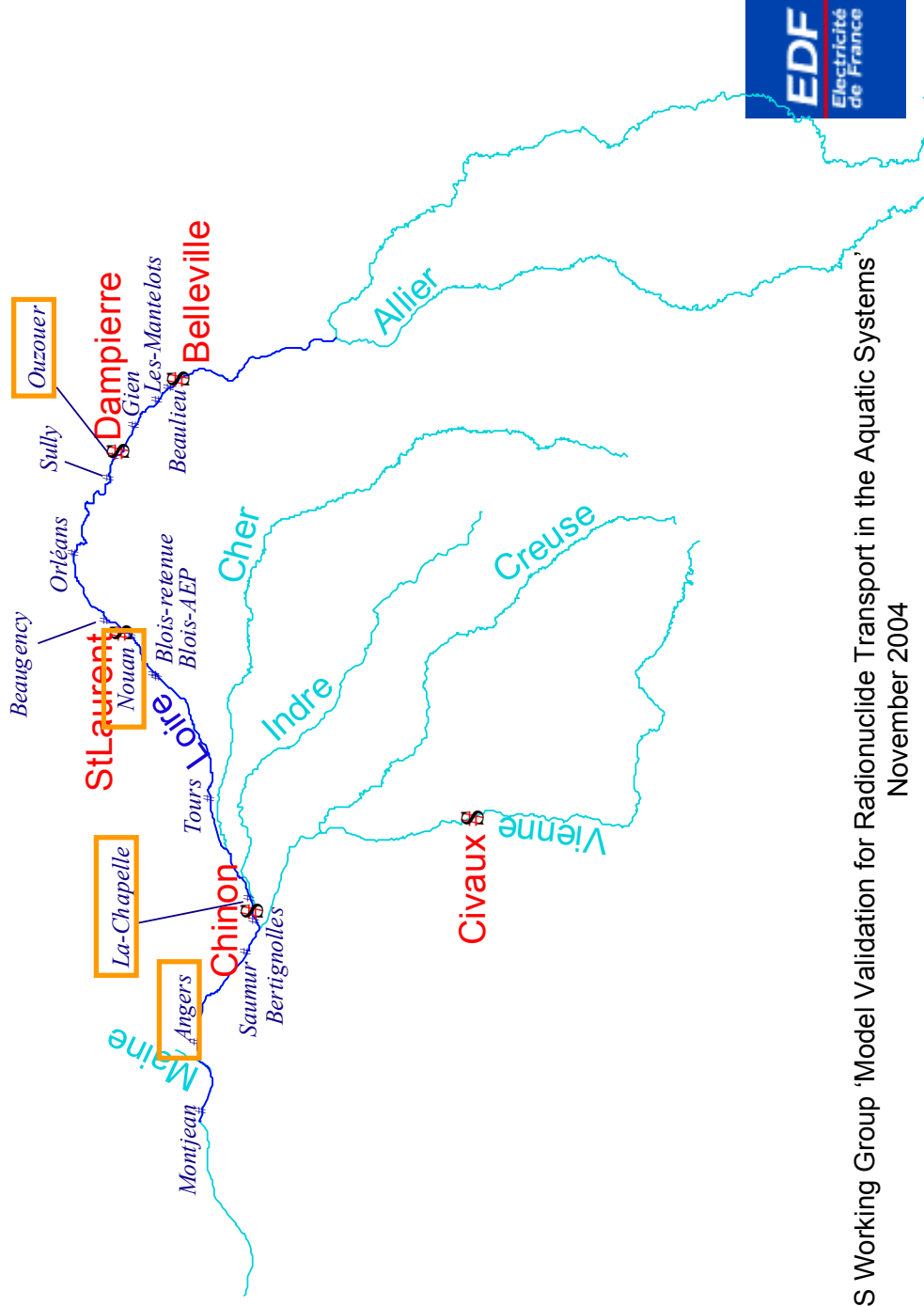
Comparison measurements and model results



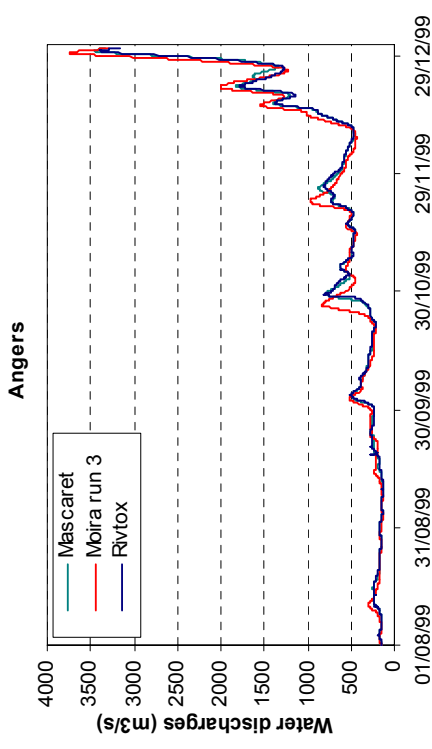
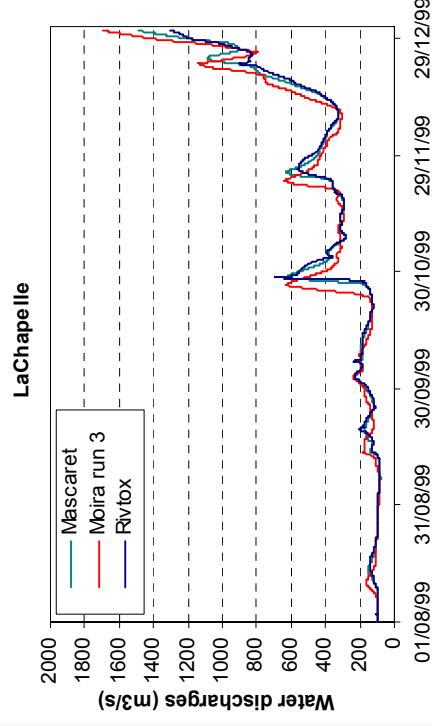
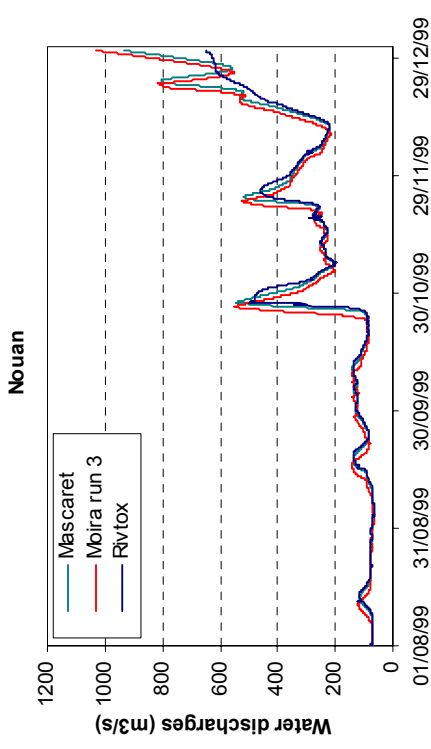
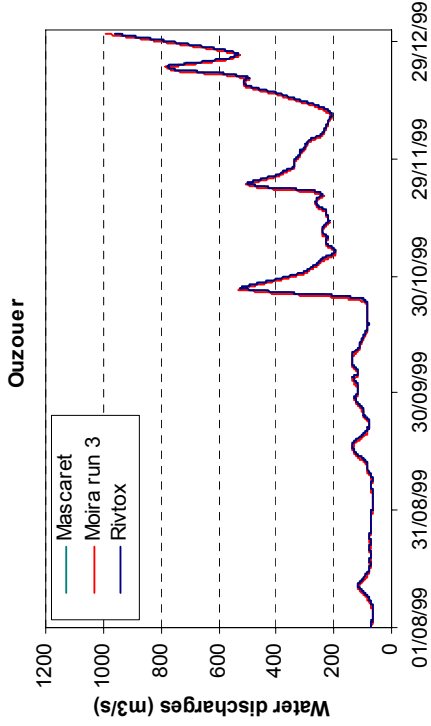
Comparison measurements and model results



Inter-comparisons of the different models at several stations along the Loire river



Flow rates



Ongoing work ...

- Improving the results of each model ?
- Summarizing the exercise on the Loire scenario by a technical **report** containing :
 - A description of each model and simulations tested (space and time steps, numerical methods, data used to calibrate the simulation, customization, computation time...)
 - Comparisons between model results and measurements
 - Inter-comparisons between the different models tested
- New scenario on a portion of the Loire river ?
 - Resuspension and erosion of ^{60}Co or ^{110m}Ag taking into account interactions with suspended matter and sediments
(*not before the end of 2005*)