Quantifying Uncertainty in Integrated Catchment Studies

Marie Curie Initial Training Networks (ITN)
FP7-PEOPLE-2013-ITN

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What is QUICS?

EU-funded project (4 million Euro):

Marie-Curie Initial Training Network (ITN)

Started 1st June 2014

Project partners:

The University Of Sheffield.

University of BRISTOL

TU Delft Delft University of Technology

Aquafin

WATERWAYS

CH2MHILL.

WAGENINGEN UNIVERSITY WAGENINGEN UR

RUHR UNIVERSITÄT BOCHUM

RUB

Witteveen + Bos

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

UNIVERSIDADE DE COIMBRA

UNIVERSITÉ LAVAL

CTGA Centro Tecnológico de Gestão Ambiental

tudor PUBLIC RESEARCH CENTRE HENRI TUDOR

eawag aquatic research

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 607000.

Why?

- Big investments will be made across the EU ensure Water Framework Directive compliance
- Investment decisions are made based on model outputs
- Integrated catchment and water quality models are known to contain considerable uncertainty

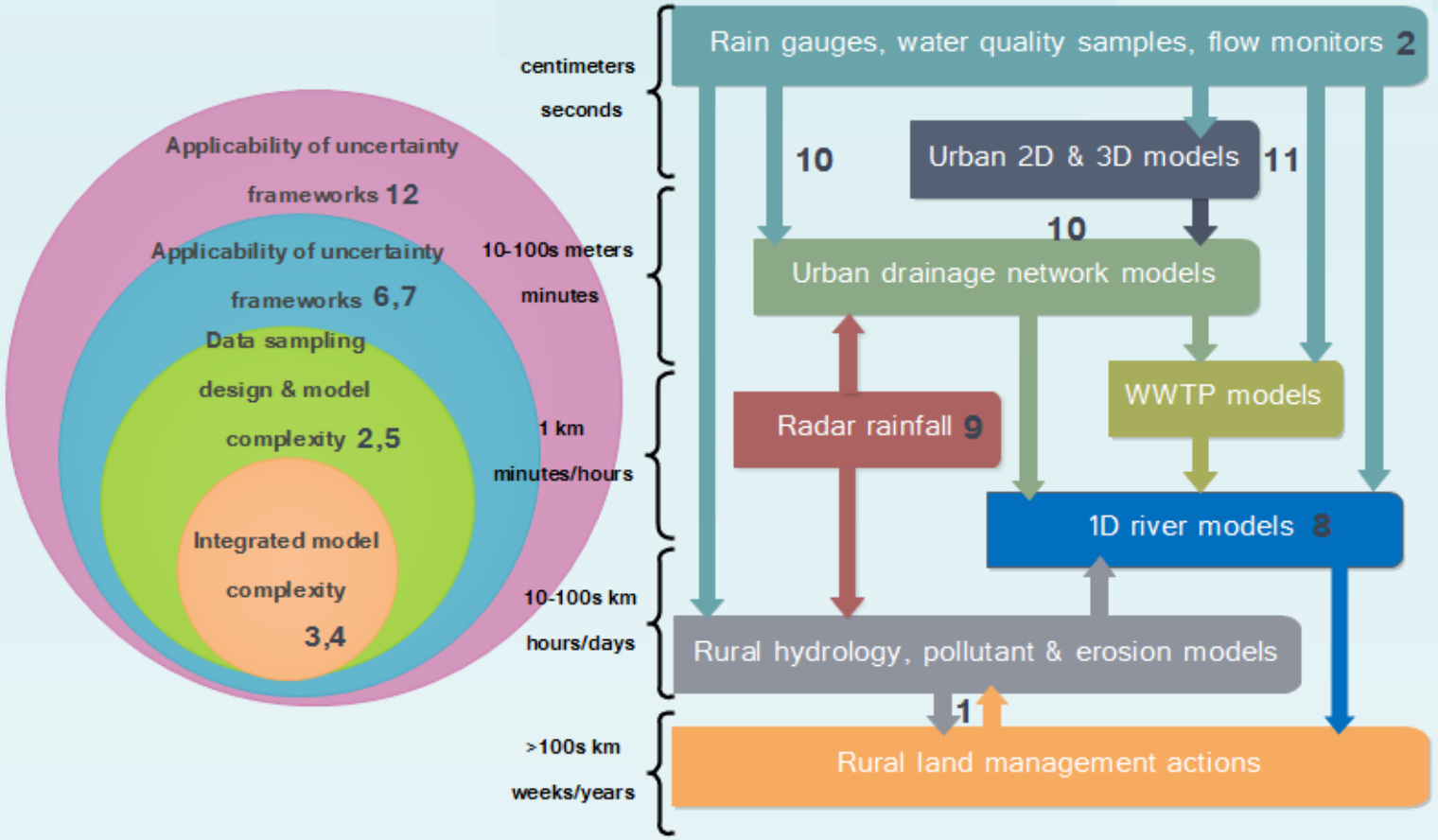


Objectives

- **Create a group of young researchers** that have a comprehensive understanding of uncertainty in integrated water quality management at the catchment level.
- Develop **new knowledge** on the levels of uncertainty in water quality predictions from integrated catchment models.
- Develop **new approaches on uncertainty analysis** quantification and propagation for water quality prediction within a catchment.
- Combine the acquired knowledge and methods in **new guidance and sophisticated tools** that can be used by practitioners' and public authorities to better understand and **justify the investment decisions they need to make as they implement the WFD**.

- **ITN consists of 12 Early Stage Researchers (PhD students) and 4 Experienced Researchers (Postdocs).**
- 12 projects, developing **new approaches on uncertainty analysis quantification and propagation for water quality prediction within a catchment**.
- QUICS will cover all significant temporal and spatial scales found in river basins and will develop new techniques to propagate uncertainties between different water quality process models.

Interaction of QUICS projects across different temporal and spatial scales in integrated catchment models



My research

- Quantifying uncertainties in the transport of pollutants in River
- Currently working on advection-dispersion processes
  - Most models use 1D ADE when simulating a pollution discharge from for instance a Combined Sewer Overflow
  - Models assume instantaneously fully mixed over the river cross section

But in reality…

CSOs are usually released at the river edge and take time to fully mix vertically and transversely

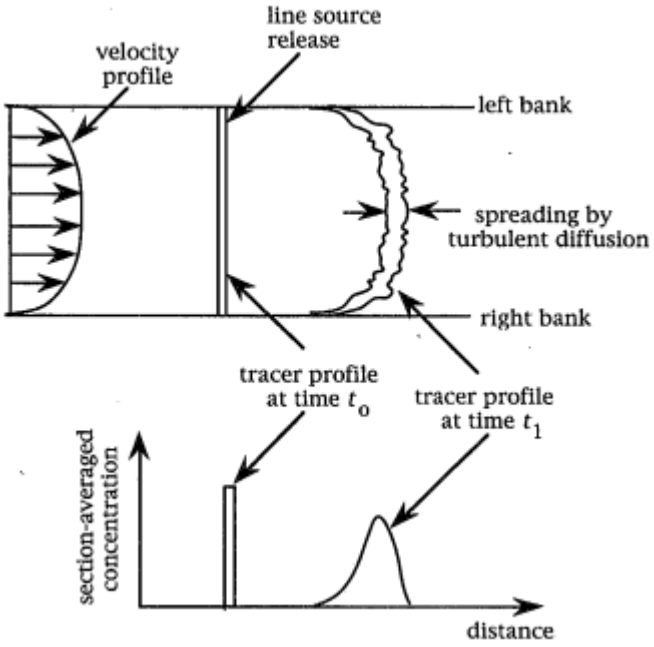
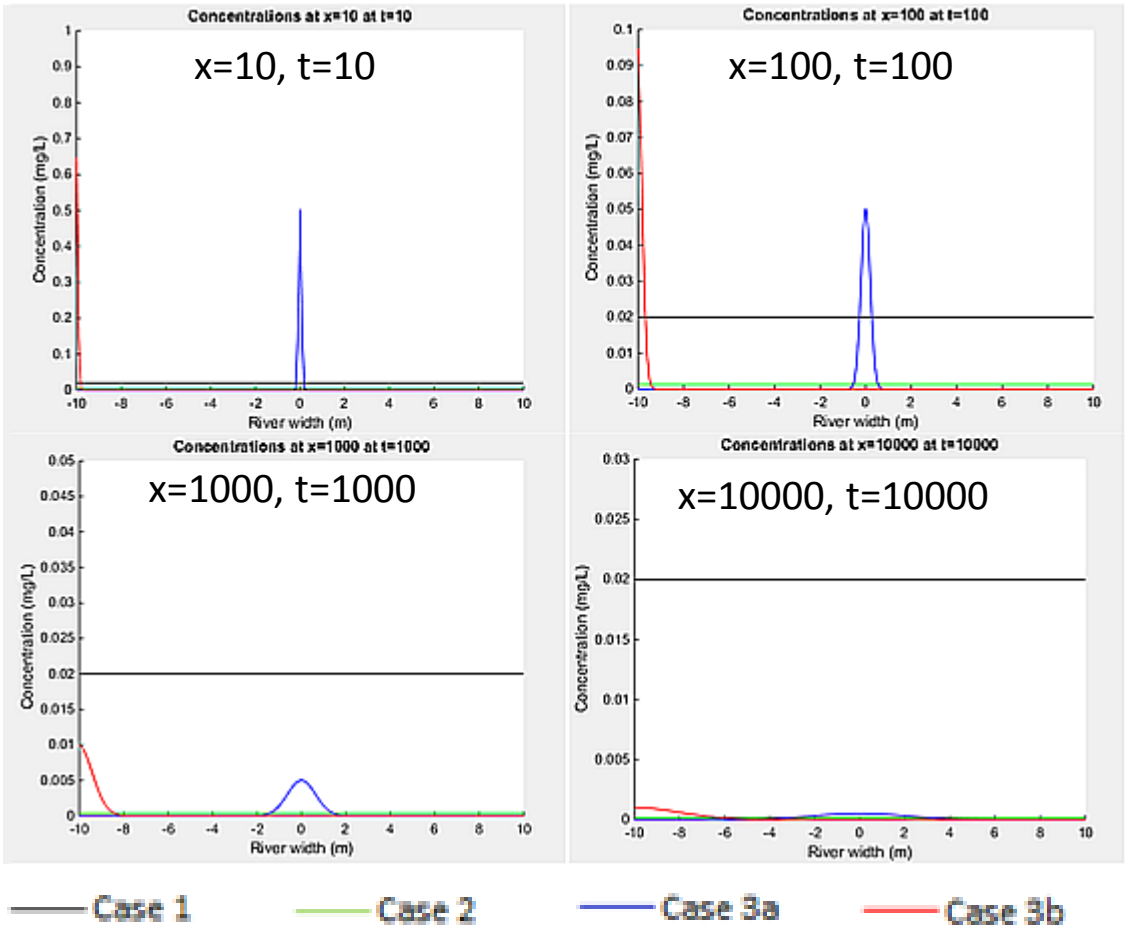


Photo taken from www.cfa.harvard.edu
Diagram from J.C. Rutherford (1994)

My research

Transverse concentration profiles
at different longitudinal locations and times



Studying 4 cases:

1) Only advection
2) Longitudinal advection and dispersion
3) Longitudinal advection and dispersion, and transverse dispersion from
   a) Bank release
   b) Centre of the stream

Model discharge as a time series input

Include parameter decay coefficient

Varying river velocity during wet weather

Compare to real data and commercial models

THANK YOU!