STOCHASTIC APPROACH TO THE NUMERICAL MODELLING OF FLUVIAL MORPHODYNAMICS

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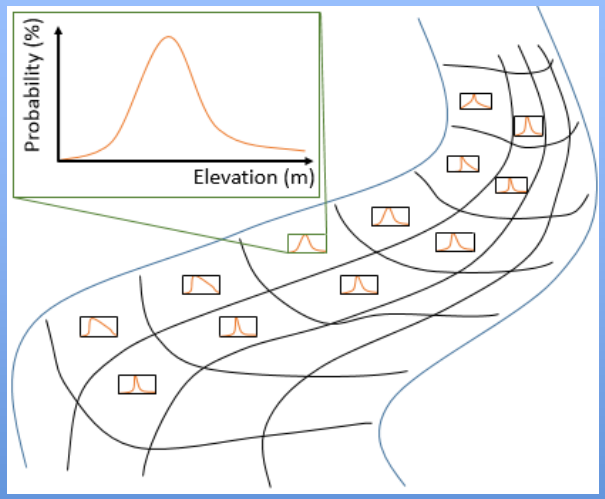
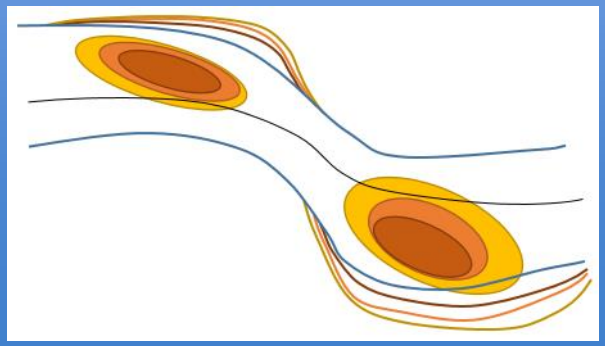
GOAL





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METHODOLOGY FOR STOCHASTICALLY GENERATING MODEL INPUT

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EXISTING NUMERICAL HYDRODYNAMIC AND MORPHODYNAMIC MODELS

APPLICATION

- Statistical Analysis of Erosion and Deposition Evolution
- Safety Analysis of Near-Bank Infrastructures

But also:

- Design of Bank Protection Structures
- Forecasting of Morphodynamics
- Flood Risk Analysis
- Etc.

Stochastic Model Input

Main Variables

Streamflow

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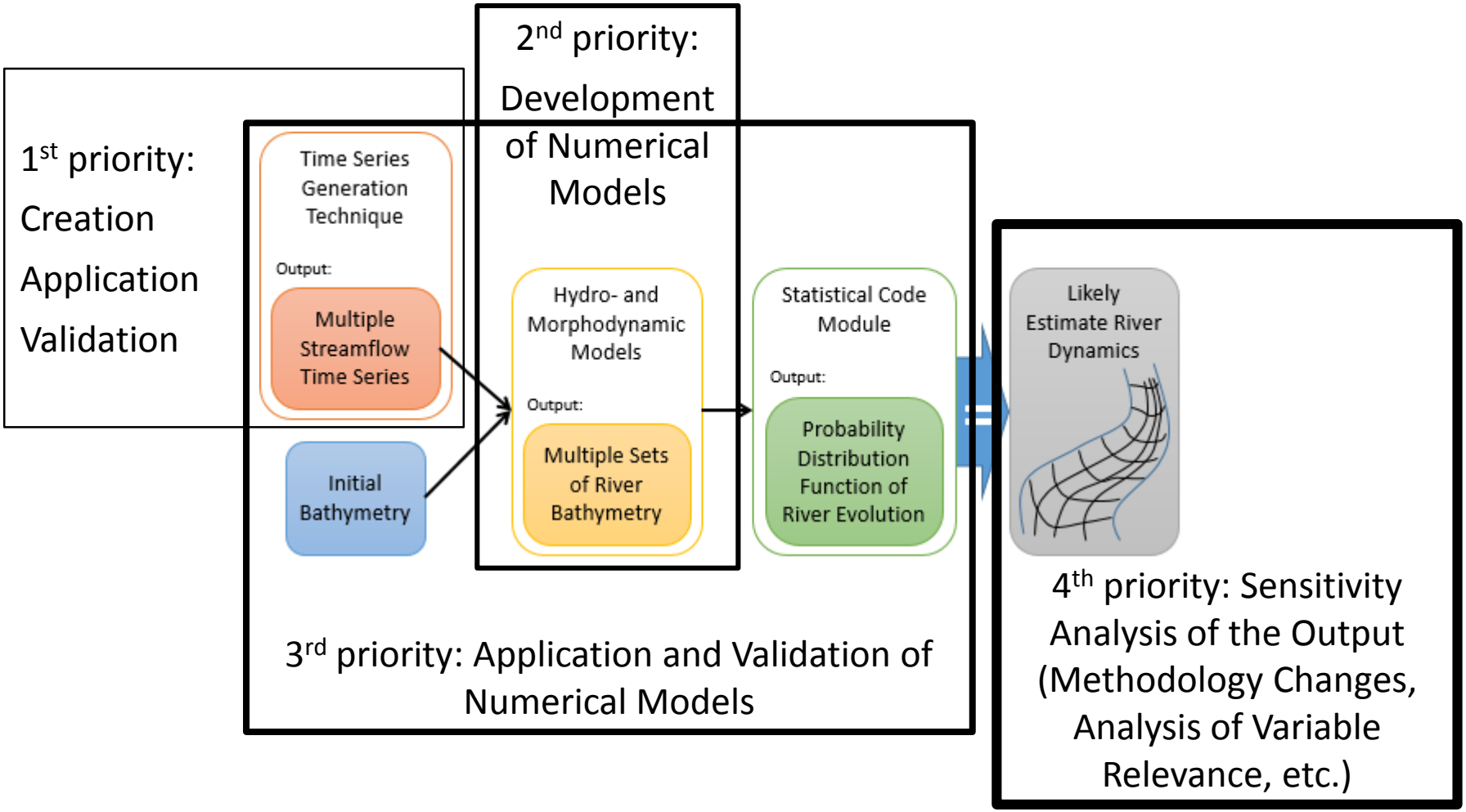
Sediment Inflow

SENSITIVITY ANALYSIS OF OTHER MORPHODYNAMICS-RELATED VARIABLES

Main Objectives



Work Plan

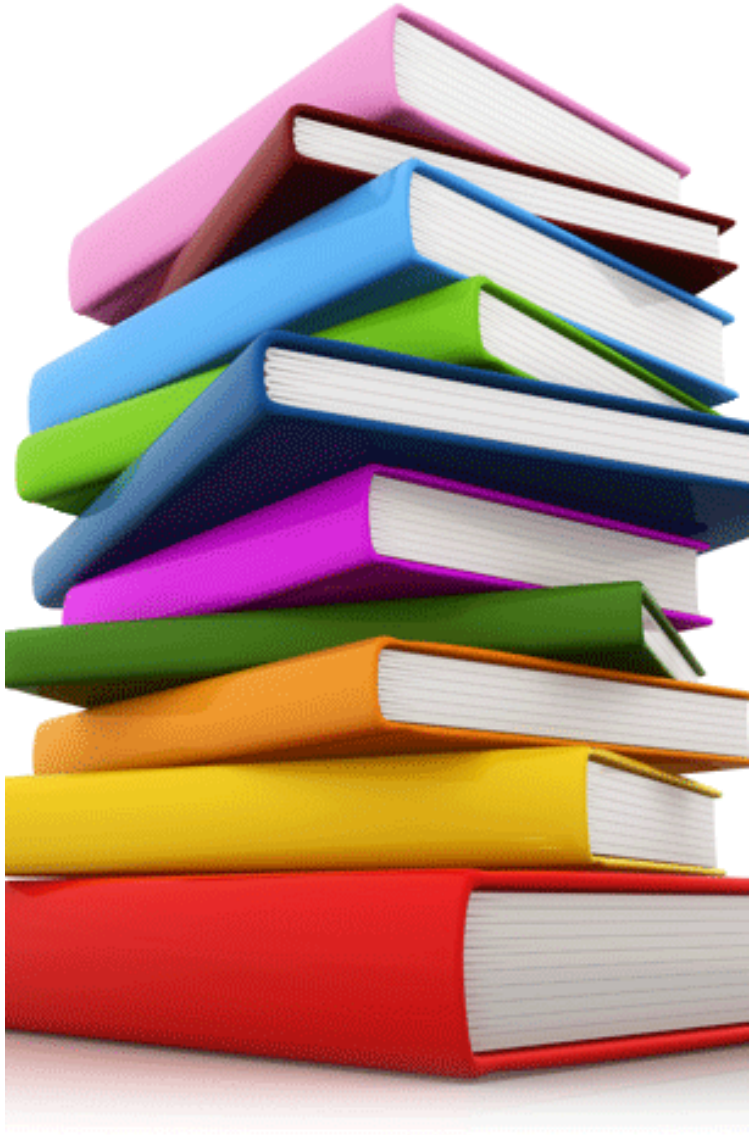
- Collection of in-situ information from case study(ies)
- Collection of historical records

Treatment

- Stochastic Series Generation
- Development of the hydro- and morphodynamic models
  - Model Selection and Integration
- Application of the methodology
  - Calibration, Application and Analysis
- Sensitivity analysis
  - Analysis of Variable Relevance
  - Etc.
- Structural Safety Analysis

Literature Review

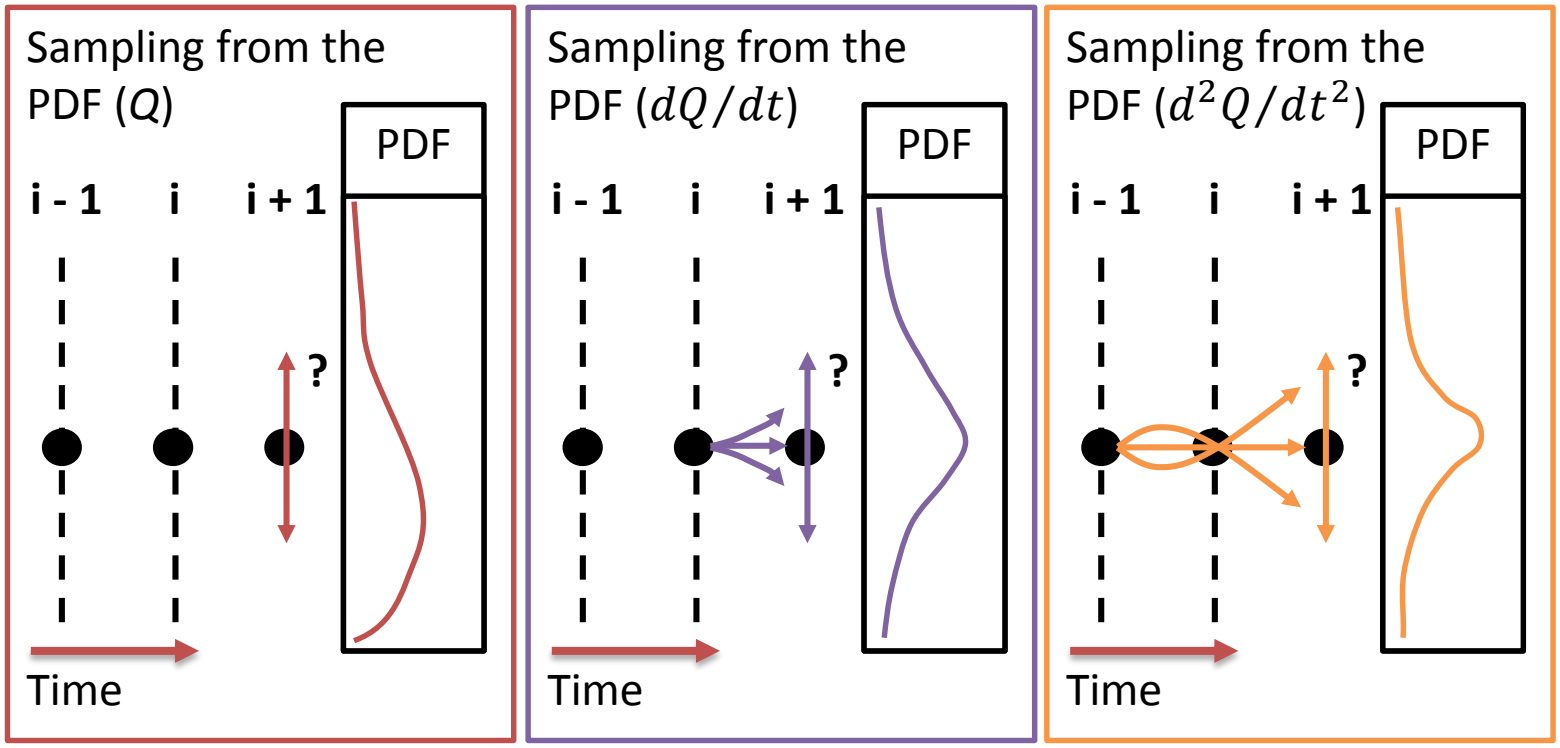
- Stochastic Generation of Time Series
- Numerical Modelling of Hydro- and Morphodynamics (& stochastic)
  - Models
  - Grids
  - Systems of equations
  - Equation Discretization
  - Etc.
- Statistical Analysis of Discrete Data



Stochastic Generation of Streamflow Series (Pt. 1)

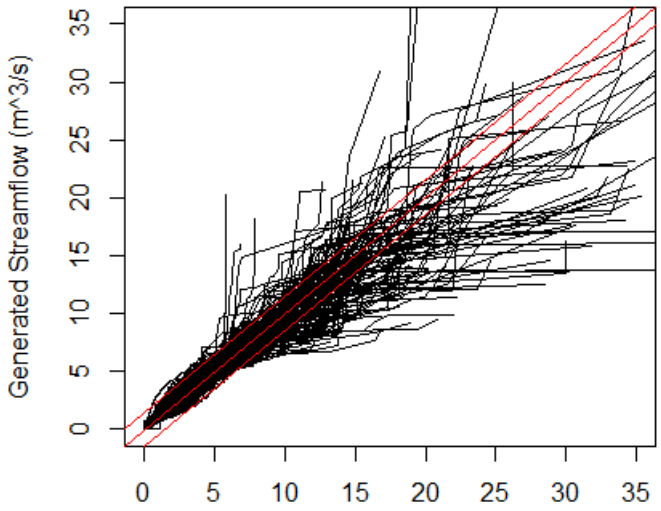
Theoretical Concept

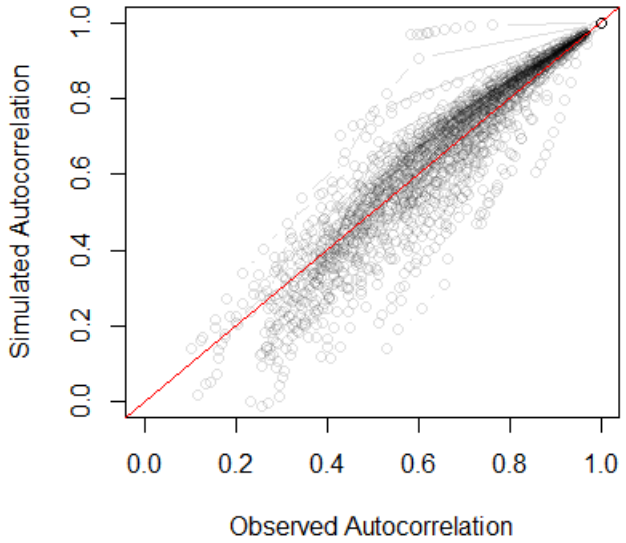
$$Q(t) = q + {dq}/{dt} + {d^2q}/{dt^2} + \cdots \Rightarrow Q(t) = f\left({d\,q}/{dt}, {d^2q}/{dt^2}, \ldots\right)$$



Stochastic Generation of Streamflow Series (Pt. 2)

- Good representation of the PDF;
- Reproduces complex autocorrelation structures;
- Unlimited series generation;





Future Work

Collection of Data on Case Study
(Mondego River)

Numerical Hydro- and Morphodynamic Models

Model Setup

Calibration

Application

Analysis of the Output

Thank you for your attention!

The End