First steps towards 3D numerical modeling of the river Elbe with SSIIM

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Programmversions

Software

Project-Area

Topics of Research

Model and Base data

First Results

Perspective

http://folk.ntnu.no/nilsol/ssiim

SSIIM 1

SSIIM 2

Finite Volumen

RANS

structured grid

no adaptive grid

unstructured grid

adaptive grid

Steady modelling

Unsteady modelling
River Elbe (Wittenberg)

Software

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Geometry:

km 207 – 222 (15km)
2,5 km wide floodplain,
Vegetation and old river parts,
Groynes and other civil structures
Goals

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Results

Perspective

- Waterdepths, -level
  Velocity
  Streamdiversity

- Bed level changes,
  Bed Load
  Substrate-,
  Structurediversity,
Preprocessing

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- Digital elevation model
- Measured waterlevels and associated discharges (time series)
- Spatial allocation of the sediment distribution (SedDB)
- Suspended load (SchwebDB)
- Informations about Vegetation
- Spatial – temporal discretisation
Discharge

Calibration with fixed bed:

HQ5 = 1740 m³/s (steady)

Flood 2006 March to April
(1 Month unsteady)
Unstructured Grid

Number of Cells = 5,000,000 - 8,000,000

Cellsize = 3.75 m

Max. Vertical cell distribution = 6 cells
**Vegetation/ Roughness**

**Software**

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**Topics of Research**

**Model and Base data**

**First Results**

**Perspective**

Nikuradse-Roughness:
- river = 0.06 m
- grasland = 0.225 m
- forrest = 0.265 m
- groynes = 1.00 m
Topics of Research

Model and Base data

Exact positions based on on the groynes register from the Waterways and Shipping Administration of the Federal Goverment.

First Results

Perspective

What is erodible?
Sediment distribution

Software

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Topics of Research

Base data

First Results

Perspective
Velocity

Software

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Model and Base data

First Results

Perspective

Depth-averaged velocity: 0 0.75 1.5 2.25 3
### Froude Number

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#### First Results

![Froude number image]

- **Froude number:** 0, 0.25, 0.5, 0.75, 1

#### Perspective

- Further analysis and research is needed to fully understand the implications of the Froude number in this context.
Future development

Software

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• Morphological preceding (fractionate transport with 12 sediment sizes)
• Implementation of sediment distribution in 2 layers (0-10 cm and 10 – 200 cm )
• Coupling of both models (hydraulics and morphological)
• Implementation of different approaches for the porosity based on the sediment distribution
• Approach for the calculation of the roughness in the riverchannel width (3 x d90) and fixed values in the floodplain
Thank you