KIT GRACE Science School

Hydrodynamic modelling with Delft3D

Date: May 2 – May 4, 2018

Place: Building **50.31**, Room 322, Gotthard-Franz-Str. 3

Time: 9.00 am - 5.00 pm

Lecturer: Prof. Tobias Bleninger

Credits: 2

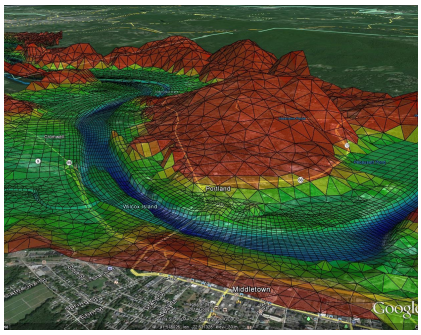
Background

Hydrodynamic modelling is an essential method to study scenarios for hydro-environmental problems, such as pollutant or cooling water discharges, sediment transport, lake eutrophication, river training, etc.

Delft3D is a world leading 3D modelling suite to investigate hydrodynamics, sediment transport and morphology and water quality for fluvial, estuarine and coastal environments. Since 2011, the Delft3D flow (FLOW), morphology (MOR) and waves (WAVE) modules are available in open source.

The hydrodynamic module Delft3D-FLOW is a multidimensional hydrodynamic simulation program that calculates non-steady flow and transport phenomena resulting from tidal and meteorological forcing. The primary purpose of the computational model Delft3D-FLOW is to solve various one-, two- and three-dimensional, time-dependent, non-linear partial differential equations related to hydrostatic and non-hydrostatic free-surface flow problems on a structured orthogonal grid to cover problems with complicated geometry.

The equations are formulated in orthogonal curvilinear co-ordinates on a plane or in spherical coordinates on the globe. The hydrodynamic module is based on the shallow water equations. The equations are solved with a robust and highly accurate solution procedure.



Some supported features are

- Propagation of long waves (barotropic flow);
- Density gradients due to a non-uniform temperature and salinity concentration distribution (density driven flows);
- Transport of dissolved material and pollutants;
- Transport of sediments, including erosion, sedimentation and bed load transport;
- Many options for boundary conditions, such as water level, velocity and discharge boundaries
- Simulation of drying and flooding of inter-tidal flats;
- Turbulence modelling to account for the vertical turbulent viscosity and diffusivity;
- Online visualisation of model parameters enabling the production of animations.

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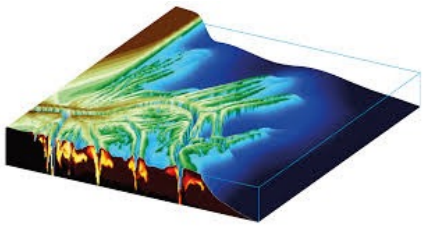
Contents and objective of the course

Running a depth-averaged and 3-dimensional hydrodynamic model.

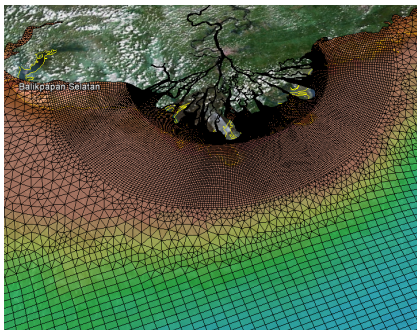
Course subjects:

- Revision of governing equations of Fluid Mechanics for environmental systems
- Revision of numerical methods and stability, as well as data handling
- Introduction into grid generation;
- Introduction on bathymetry interpolation;
- Modelling hydrodynamics and temperature;
- Introduction on post processing



Lecturer

Tobias Bleninger, is Professor (2011) for Environmental Fluid Mechanics, and Applied Mathematics at the Department of Environmental Engineering of the Federal University of Paraná (UFPR) in Curitiba, Brazil. He is a Civil Engineer (2000) from the Karlsruhe Institute of Technology (KIT), Germany, where he did his Doctor in Environmental Fluid Mechanics (2006) and lead the research group of Environmental Fluid Mechanics of the Institute for Hydromechanics (2007-2011). Tobias Bleninger has experience in Hydraulics and Fluid Mechanics, with focus on physical and numerical modelling of Mixing and Transport Processes of Environmental Fluid Systems. A special topic are mixing studies for submarine outfalls using and coupling the models CORMIX and Delft3D, as well as transport phenomena in hydropower reservoirs, and waterway fluvial hydraulics.



Requirements

Each participant should bring his/her own notebook (operational system: windows) for the hands-on exercises.

References

More information on Delft3D: http://oss.deltares.nl/web/delft3d/home

Registration

Please register via online form.

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