Onderwerp BSc-eindwerk

1 student

Waterbouwkunde

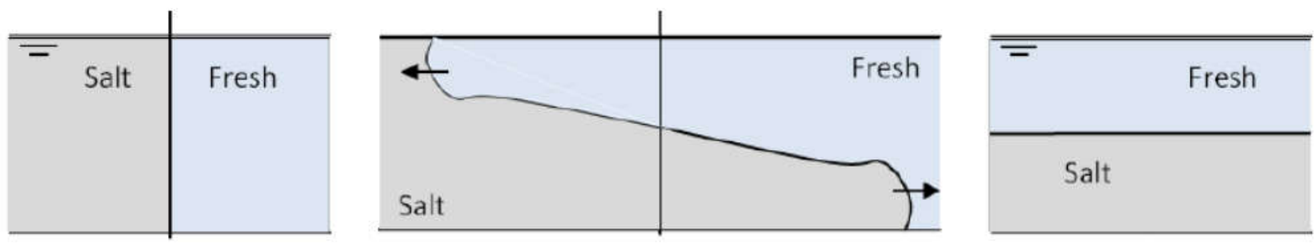
sectie Environmental Fluid Mechanics

Quantifying numerical diffusion and dispersion of the D-Flow FM model using lock-exchange experiments

supervisors: L.M. Keijzer (PhD candidate) and J. Pietrzak (professor)

Density differences in water are caused by variations in temperature and salinity and induce currents. It leads for example to salt intrusion in the Rhine-Meuse Delta, which can damage the drinking water supply in the Netherlands. Moreover, large-scale coastal interventions such as Tweede Maasvlakte or the Sand Engine are also strongly influenced by density-driven currents. Therefore, it is important to understand and predict these currents accurately, which we do using models.

One of these models is D-Flow FM, which is developed by Deltares. But computational models also introduce artificial numerical artefacts, such as numerical diffusion and dispersion. In order to model the mixing between salt and fresh water correctly, it is important to know the amount of numerical diffusion and dispersion that is produced by the model.



During this project, you will set up a lock-exchange experiment in D-Flow FM to investigate the amount of numerical diffusion and dispersion. In the lock-exchange experiment, you will simulate the density-driven flow that occurs after you open the lock. Due to the density difference, fresh water flows over salt water, while salt water flows underneath fresh water. You will vary the range of parameters to explore the sensitivity of the results (grid resolution, time step).

Your results will contribute to more accurate modelling of, e.g., salt intrusion in the Rhine-Meuse Delta using D-Flow FM.

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