

Experimental estuaries in the Metronome

Morphodynamics, the problem of equilibrium and effects of sea level rise

Department: Physical Geography

Research group: Living Landscapes, in Coastal dynamics, Fluvial systems and Global change

Supervisor: Prof. dr. Maarten Kleinhans

Email address: m.g.kleinhans@uu.nl

Project description

In this project, you will contribute to conducting physical experiments that simulate entire river estuaries or tidal basins in the www.uu.nl/metronome in the new Earth Science Laboratory. The Metronome is a unique setup worldwide that was successfully used to create estuaries, tidal basins and deltas. Its outcomes are complementary to numerical modelling that our group does too. We investigate effects of sea level rise on these systems, both in the Holocene and in the future. We seek both explanations for the geological development of coastal plains (such as the Netherlands) and possibilities to adapt to future sea-level rise. Whilst we address fundamental questions about the formation and dynamics of channel networks and about equilibrium/steady state and tipping points for drowning in these systems, we also investigate and visualise effects of the shape and geometry of the estuary in determining the effects of sea-level rise for the Dutch Delta Committee. We have data of no sea-level rise control experiments.

You will conduct one of two kinds of experiments under sea-level rise with us: estuaries with fixed banks (and possibly dredging, which is a piece of cake in the lab) and self-formed estuaries with live vegetation and mud flats. The specific project will be tuned to your skillset and preferences (e.g. quantitative pattern analysis, vlogging for public and Delta Committee, sedimentary geology, or testing a numerical model to calculate flow in the experiments). For example, you could help to find and test creative solutions for fixing the banks so that we can test whether experiments show repeatable patterns or show chaos (in the sense of high sensitivity to initial conditions), which no one has been able to do in the lab so far.

You will collect data with our scanning systems, photography and keep your trained eyeballs peeled for surprises. Following the experiments, you will also help in collecting and collating the experiment data. This will be done in Matlab, Python and/or GIS. This subject is closely related to cutting-edge research themes of enthusiastic supervisors, a new PhD project, and, as successfully done in the past, we aim for publication in a journal. Please contact me for further questions.

Job requirements

Knowledge of river and coastal morphology, programming (Matlab/Python) and/or GIS are required. You are willing to work in a well-organised manner in close communication with the supervisor and the technicians, and you are precise in data collection protocols and storage. Unless the university is in total lockdown due to COVID-19, the lab is open for experiments, keeping in mind lab regulations. A background in fluvial geomorphology and/or geology/sedimentology and/or civil/environmental engineering (dredging, constraining etc.), and gardening or do-it-yourself could be beneficial.