

Morphodynamics of the Meuse: following fine sediments through a gravel bed river

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Project description

Gravel bed rivers are dynamic and interesting systems. They do not only contain gravel, but also transport fine sediment. Depending on the hydraulic conditions, the fine sediment can be transported in suspension, deposited between the coarse river bed material or re-suspended into the water column. As a consequence of these dynamics, the river bed composition and its permeability changes over time. This affects the interaction between the water column and hyporheic (sub-surface) flow, bringing implications for e.g. the incision rate, flood safety, and nature. It is therefore relevant to understand, monitor and potentially intervene in these still poorly understood morphodynamic processes.

The aim of this project is to understand at which morphological units and under which hydraulic conditions fine sediments deposit and re-suspend. Our study case is the Common Meuse (Limburg, The Netherlands), the only gravel bed river reach in the Netherlands. The river bed is hypothesised to be clogged by fine sediments, but we do not know where and to which extend. To change this, we conduct both field and lab work.

You will do fieldwork over the width and length of the river reach to map where and how much fine sediment is present on and in the river bed. During this fieldwork, multiple data collection methods will be used. Examples are (underwater) photography, pebble baskets and a recently developed ice core technique using CO₂-ice. Together we will think of a smart set-up that allows us to create insight in both the small scale variation and the river reach trends. Data analysis includes interpolating the findings from the field to area covering images. Outside of the Earth Simulation Lab we have plenty of sediment from the river ready to use for tests focussed on when and how the fine sediment deposits/resuspends. We dive deeper into the separate effects of sand, silt and clay and the way they are distributed on or in the gravel. These insights will give us ideas about the processes underlying the situation we observe in the field.

This project is closely related to the research of the supervisors and will help Rijkswaterstaat improve the management of the Common Meuse river reach. There is room to specify the exact research questions based on your interests and ideas.

Job requirements

Enthusiasm about digging through gravel and fine sediments in the field and/or lab. Willingness to work together during data collection and communicate regularly with the supervisors and technicians. Precise in data collection/processing and respectful of safety regulations. Basic knowledge of morphodynamics and some experience with programming (Matlab/Python). Boat handling would be a bonus skill for the project. Together we can choose the exact direction of this project based on your skills and interests.