Hydraulics and morphology near longitudinal training dams

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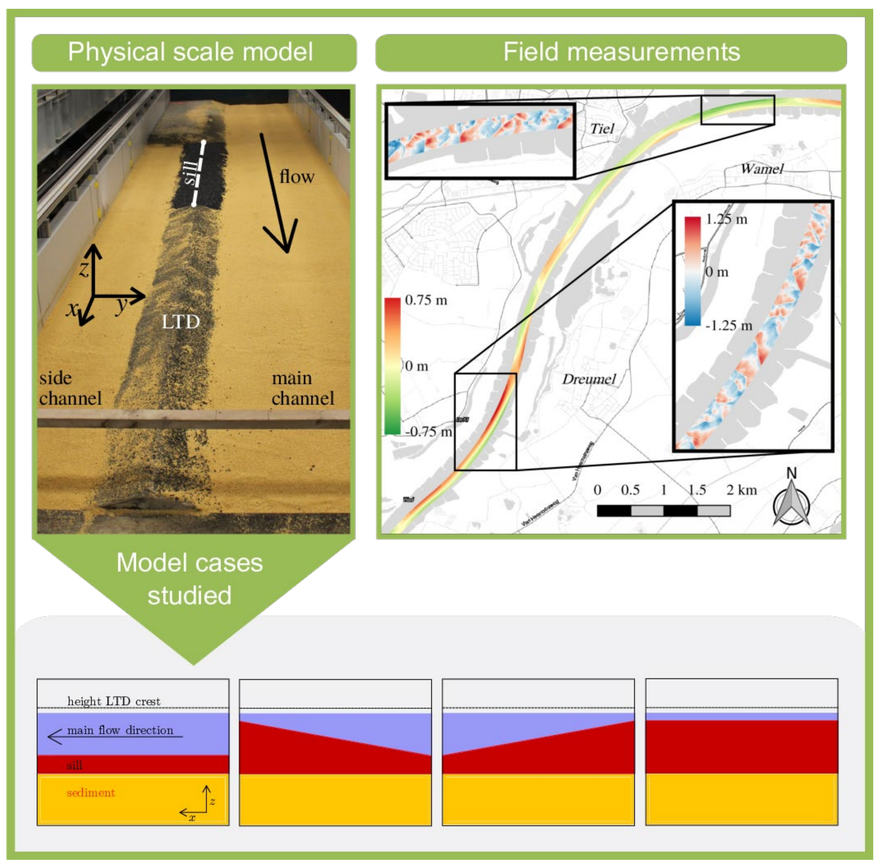
Challenge

To mitigate climate change effects, longitudinal training dams (LTDs) are implemented in the inner bend of a 10 km river stretch in the Waal River. These dams aim at increasing the flow depth in the navigation channel during low water levels and to decrease high water levels. Despite LTDs being present for several years already, in-depth knowledge on how these structures regulate water and sediment flows is still lacking.

Flow velocity measurements performed with both vertical ADCP (left, spatial coverage) and horizontal ADCP (right, temporal coverage).

Innovative components

- Development and testing of a 3-D line laser scanner for bed level measurements during flume experiments.
- Studying the effect of geometry of the upstream side channel sill on water and sediment division over the channels, by using a scale model in a laboratory flume.
- An extensive morphological dataset of the Waal River is studied for the effect of LTDs on bed forms.
- An extensive dataset of flow velocity in space and time is gathered to study details of inflow into the side channel.



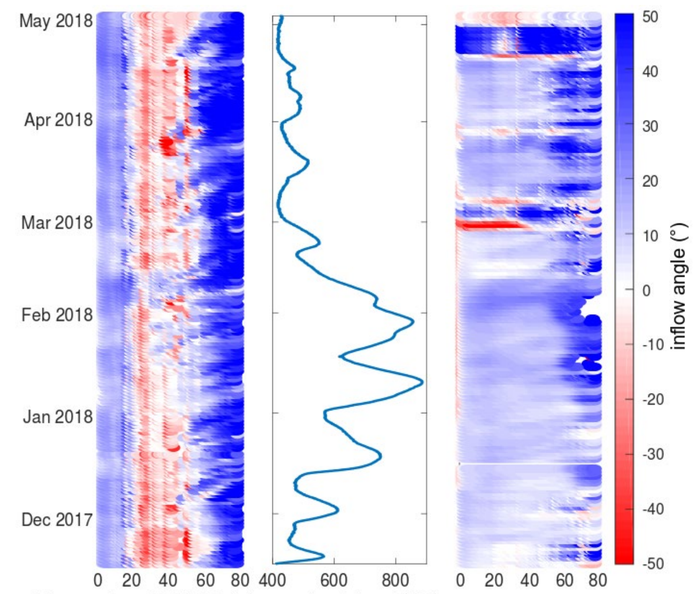
A physical scale model is used to study the effect of the upstream sill geometry on flow division and sedimentation/erosion. In the field, an extensive morphological dataset is used containing dunes and bars.

For whom and where?

The general results are useful for river managers. Laboratory methods are applicable in movable bed flume experiments. Advisors and scientists studying flow and sediment transport over an oblique weir will also benefit from this study.

Application development and findings

- By choosing an appropriate sill geometry at the side channel intake, water and sediment division can be regulated. A downstream decreasing sill height is most promising as
  - settled sediment erodes again during high water;
  - discharge division matches best with design goals.
- Dunes in the Waal River show large spatial and temporal variability, partially correlated to the underlying bed topography. LTD construction hardly effects dune dynamics.
- Over a small part of the intake sill a reverse flow from side to main channel is observed, pointing at some kind of recirculation (work in progress).



Flow angle variation over part of the sill, with blue representing flow into the side channel. Both 1m (left) and 2.75m (right) above the sill.

Status for day-to-day practice

Currently the outcomes are specific for the pilot in the Waal River. For application in different settings, careful consideration of which processes are dominant is important.

Next steps

To be able to use the knowledge efficiently for future LTD constructions, implementation of LTDs in numerical models and testing against observations is important.

Interested?

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Explore more in the Hydraulics and morphology near longitudinal training dams project description

A1 Project

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