Stability of river bifurcations from bedload to suspended load dominated conditions

**Research group**
River and delta morphodynamics

**Tjalling de Haas and Maarten G. Kleinhans**
tjallingdehaas@gmail.com

**Introduction**

- Bifurcations unstable?
- Difference between gravel- and sand-bed rivers?

**Model**

- 1D network model with Y-shaped bifurcation:
  - Gradually varied flow, bedload transport and morphological change
  - Width: \( f(Q) \), mass conserved
  - Flow and sediment division: transverse slope effect and spiral flow effect caused by bend

**Problem definition**

- Opposite trend gravel- and sand-bed rivers
- Hypothesis: connected by optimum?

**Results**

**Model scenarios**

- Bifurcations unbalanced:
  1. Bend at bifurcation
  2. Gradient advantage
- Mobility increased:
  a. Discharge
  b. Channel gradient
  c. Particle size
- Sediment transport
  — Including threshold for sediment motion
  — Excluding threshold for sediment motion

**Conclusions**

- Threshold for motion \( \rightarrow \) Optimum
- Gravel-bed rivers \( \rightarrow \) Shields stress lower than optimum
- Sand-bed rivers \( \rightarrow \) Shields stress higher than optimum
- Opposite trend explained!

**Acknowledgements**

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- Molengraaff Funding
- Thanks to E. Lavooi, Dr. B. Makaske, prof. D.G. Smith and W.M. van Dijk for their help during the fieldwork

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