



Background

Braided rivers are relatively easily formed in the lab, whereas dynamic meandering rivers have never sustained beyond initial bend formation. Meandering rivers are generally single-thread and dynamic in the sense that their bends migrate through bank erosion, which is equalled by floodplain formation on the other side of the channel. Despite numerous field and model studies, the necessary and formative conditions for meandering remain unclear until now.

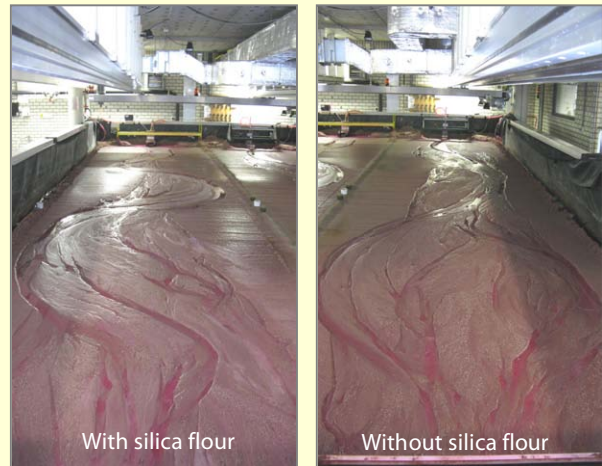
Objective

To experimentally test:

1. How floodplain formation causes braided or meandering river patterns.
2. How floodplain forms and how cohesion influences the occurrence of chute cutoffs and bend development.



Experimental setup



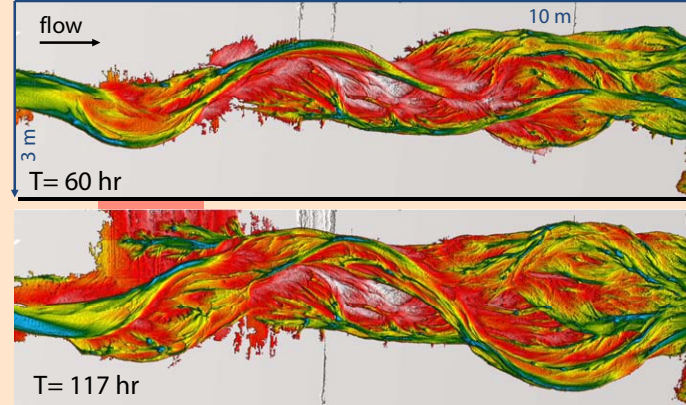
Eurotank facility: looking upstream

- Flume dimensions: 10 x 3 m
- 2 parallel experiments
- Slope = 0.01 m/m
- Discharge hydrograph:
 $Q_{low} = 0.25$ L/s for 2.5 hrs
 $Q_{high} = 0.5$ L/s for 0.5 hr
- Initial bed material consist of poorly sorted sand
- Continuous perturbation upstream
- Laser line scanner (resolution 0.7 mm)
- High-resolution camera (deposition of silica, grain-sizes)
- 2 experiments With/ without cohesive floodplain material
- Addition of 0.5 L silica flour for experiment with cohesive floodplain material during floods

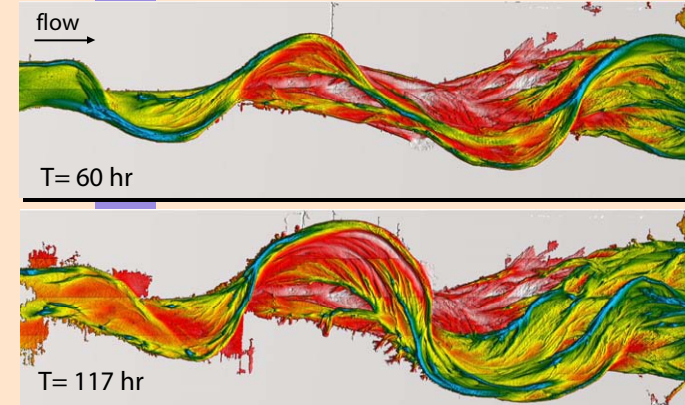
Results

Braided river forms in the experiment **without** cohesive floodplain-filling material

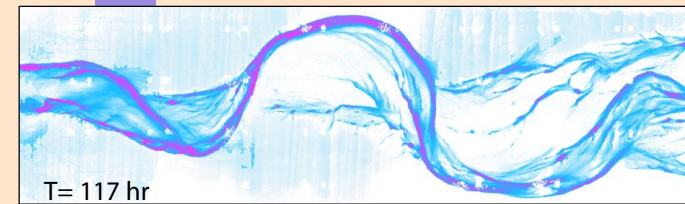
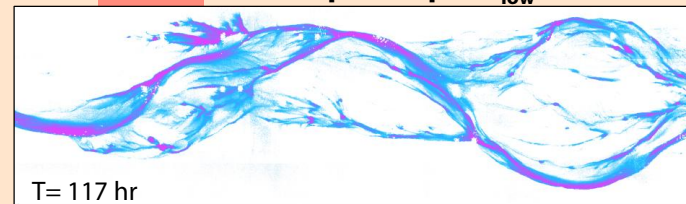
Digital Elevation Models



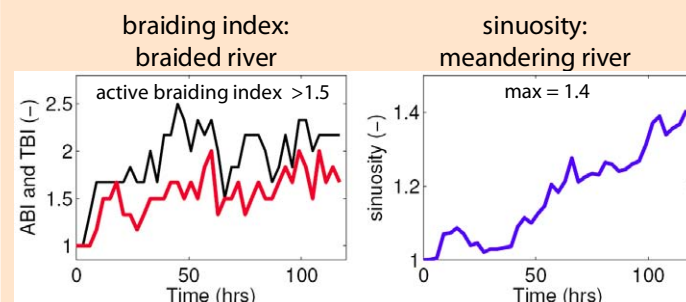
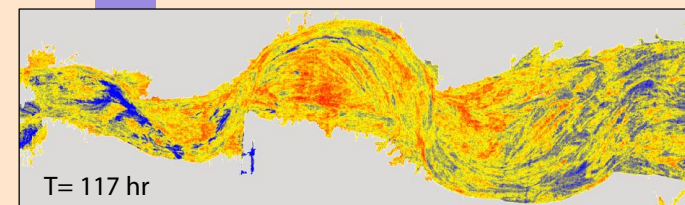
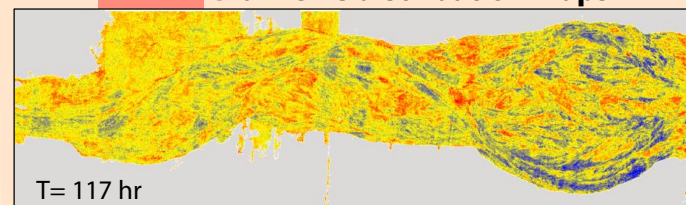
Meandering river forms in the experiment **with** cohesive floodplain-filling material



Waterdepth maps (Q_{low})



Grain-size distribution maps



Silica map



Research group
River and delta morphodynamics

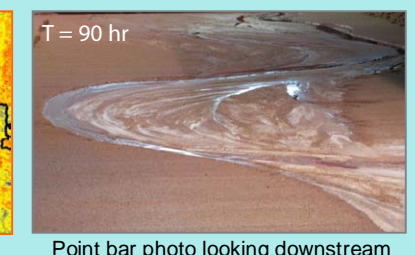
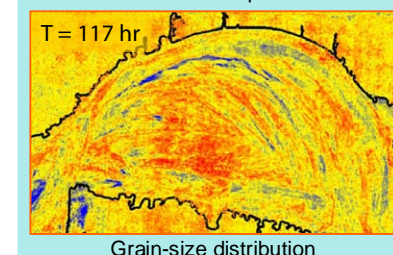
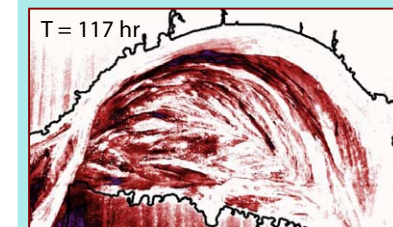
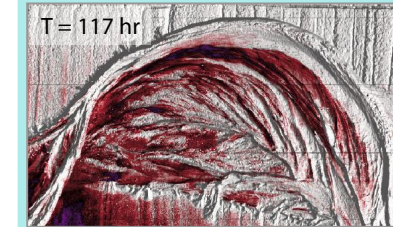
Floodplain fines

Deposition:

- Lower swales of the point bar
- Outer bank by overbank flow
- On the abandoned crevasse channels
- As a thin cohesive layer.

Erosion:

- No headcut formation and propagation on the point bar
- No chute channel incision as critical shear stresses increased due to cohesion
- Decrease in chute cutoffs



Conclusions

- Without cohesive floodplain material a braided river forms.
- With cohesive floodplain material the channel developed to a meandering river with sinuosity of 1.4
- Cohesive material decreases bank erosion rate and prevents the occurrence of chute cutoffs.
- Cohesive floodplain-filling material settles continuously on the lower point bar morphology and during overbank flow on the outer bank.

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Photos, DEMs and a video
<http://goo.gl/fY4wv>

