Feedbacks between sediment input, bed state and threshold for motion in gravel-bed rivers: an experimental study

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Research Questions
- How do changes in sediment input impact bed state?
- How is the threshold for motion responding to changes in sediment input and bed state?

Experimental Setup

Experimental set-up

- Water tank
- Water recirculation pipe
- Return water pump
- Sediment catch basket
- Observation room
- Sediment feed randomizer
- Sediment feed conveyor
- Mobile bed
- Experimental channel
- High resolution camera
- LED lights

18-m long, 1-m wide 2.2-% steep flume
280 h of experiment at constant flow (65 L/s)
7 runs of 40 h each with different sediment supply regimes

Bed state

- grain clusters continuously formed and evolved
- surface grain-size distribution coarsened immediately, but after that it did not change much (except shortly after sediment pulses)

Threshold for motion

- the threshold for motion evaluated with different methods changed during the experiment in response to sediment supply and bed structuring with an overall increasing trend
- the trend in the threshold for motion (panels a-d) tracked closely the trend in the total shear stress (panel e)
- interdependence between sediment input, bed state (structuring and threshold) and bed shear stress

Main Findings
- Bed grain-size distribution was relatively stable: surface fining caused by sediment input did not last for long
- Grain clusters continuously formed and evolved
- Changes in the threshold for motion tracked changes in bed shear stress
- An increases in ed structuring, an increase in the bed shear stress and the threshold for motion led to increased channel stability

References: