Estimating ship-induced sediment transport in confined waters

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Background

- Dredging and disposing of accumulated sediments from waterways are expensive tasks for federal authorities.
- Physical transport processes and the impact of passing ships on these processes are not fully explored yet.
- Moving ships have an influence on the turbidity by resuspending sediments which can then be transported by prevailing currents, but:
  - How large is the ship-induced proportion of the totally transported sediment volume in a waterway?

Kiel Canal field campaign

- Three probes at the canal bed (turbidity, pressure, 3D flow velocity; see example in Fig. 4), recording for 8 days.
- AIS recorder at a nearby bridge (length, width, draft, speed/course over ground, position, ship identifier).
- ADCP flow/SSC profiles (ship-based).

Elbe field campaign and preliminary results

- Six probes at the canal bed (same setup as for the Kiel Canal campaign), recording for 16 days (see Fig. 7).
- Estimation of the ship-induced proportion of the totally transported sediment volume similar to the Kiel Canal method.
  - Tidal currents are the major cause of sediment resuspension and transportation. Preliminary result: the ship-induced proportion is ~2%.

Take-home messages

- A proportion of about 10% of the entirely transported sediment can be attributed to ship-induced resuspension under laboratory-like conditions in the Kiel Canal.
- Especially tidal but also discharge flows in the Elbe river dominate the transport regime. The ship-induced proportion of the totally transported sediment volume is ~2%.

References


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