

Sediment release during dredging in relation to natural sediment transport

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Introduction: The discharge of fines during dredging and the impact of fines on seafloor habitats is an important aspect in environmental impact assessments. The scientific community lacks information on resuspension of fines (e.g. buffering of fine material in the upper sediment layer during summer), the release of fines from the overflow during dredging and the net effect of this release on the sediment bed. As a result, various projects have suffered from delay due to unanswered questions on the environmental effects of dredging.

Methods: To determine the relation between sediment release and resuspension of fines from the sediment, a method is proposed that measures the amount and composition of sediments released during dredging and that maps the composition of sediments on the seafloor before and after dredging.

We have developed a metering system that measures the concentration and composition (sand/clay ratio) of sediments. The systems allows for real-time measurements in the overflow of a hopper dredger and can be used for mapping the concentration of fines in seafloor sediments.

The system has been demonstrated in a pilot experiment during dredging operations near the harbor of Rotterdam (the Netherlands) and has been applied successfully to determine the transport of silt from a dredge-spoil disposal site located in the North Sea.

Results: Real-time measurements of sediment release from an overflow of a hopper dredger show the variation in the release of fine materials during a dredging cycle (fig 1).

Successive maps of the clay content of the seafloor before and after disposal of dredge spoil have been compared to estimate the transport of fines from this location. In a similar way, long term monitoring of the clay content of the seafloor can help to quantify natural dynamics due to resuspension (fig 2).

Discussion: A major concern in environmental impact assessments of dredging near Rotterdam Harbour, or sand extraction from the North sea is the potential release of fines towards the Wadden Sea.

Our vision is that the effects of dredging on the environment, should be related to the impact of the dynamics of nature itself.

The two innovative sensor systems provide the means to quantify the release of fine sediments during dredging and to quantify the behavior of fines sediments on and in the upper layer of the seafloor. The paper will present how these sensor systems can relate effects of dredging to the natural variability of fine material in the seabed sediments.

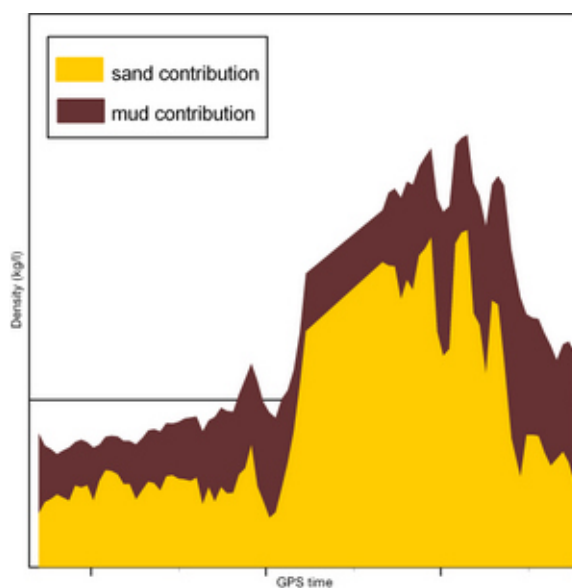


Fig. 1: Variation in density, mud content and sand content during a dredging cycle.

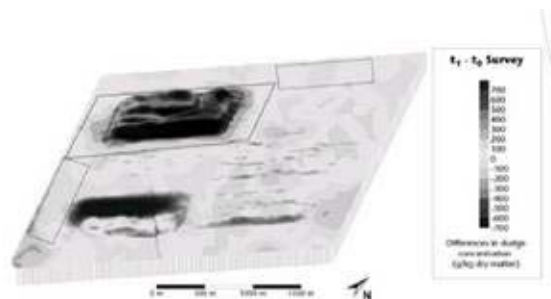


Fig.2: Change in silt content between two sediment mapping surveys.