Spreading of sediment due to underwater blasting and dredging - DTU Orbit (13/12/2018)

Spreading of sediment due to underwater blasting and dredging: Field observations from quay Construction in Sisimiut, Greenland

The primary objectives of this study were to quantify the spreading of suspended sediment from underwater blasting and subsequent dredging of bedrock and to understand the physical processes governing the spreading of suspended sediment due to underwater blasting. The investigations were carried out in connection with the construction of a new quay at the existing harbour of Sisimiut, Greenland. Subsequent to the largest of a series of underwater blasts, the distribution of suspended sediment in the water column at and around the construction site was observed using a CTD (Conductivity, Temperature, Depth) equipped with a turbidity meter. The observations show that sediment was brought into suspension near the surface and at internal density gradients in the water column, where it became subject to prevailing flow conditions. The observations further show what was probably a turbidity current, flowing down the steeply sloping seabed away from the construction site. The spreading of sediment due to this turbidity current could not be assessed, but could have been considerable. Observations made using sediment traps over much of the period of construction show that the total spreading of sediment was roughly the same for blasting of bedrock and dredging of the blasted material and that much of the sediment that was brought into suspension settled near the construction site. Furthermore, these observations indicate that blasting leads to a wider spreading of sediment, but that dredging leads to a wider spreading of the organic part of the sediment. Almost all material less than 2 μm, including surficial clay minerals and much organic material, was transported away from the construction site and its vicinity, which could imply mobilization and export of pollutants. Environmental impacts of suspended sediment from underwater blasting, which could include coverage of the benthos or increased turbidity, can be managed by timing the blast favourably relative to currents, waves and stratification. It is argued that the environmental impact of blasting can be minimized by decreasing or maybe even increasing the spreading of sediment, depending on, e.g., the resilience of the flora and fauna and the surficial sediment and the pollution therein.

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