

Conceptual model of object burial in turbid waters on a sandy seabed

Matthias Baeye⁽¹⁾, Michael Fettweis⁽¹⁾, Frederic Francken⁽¹⁾, Dries Van den Eynde⁽¹⁾, Vera Van Lancker⁽¹⁾

1. Royal Belgian Institute of Natural Sciences - Management Unit of the North Sea
Mathematical Models (MUMM)- Gulledelle 100, B-1200 Brussels, Belgium
E-mail: m.baeye@mumm.ac.be

ABSTRACT

Highly turbid waters are characterized by high-concentrated suspensions of fine-grained sediments near the seabed. The dynamics of these fluffy mud layers on a sandy seabed have been studied in the turbid Belgian nearshore area using a test mine in combination with an instrumented, benthic tripod lander (Baeye et al. 2012). The latter measured currents and suspended particulate matter (SPM) concentration using optical (OBS) and acoustic devices (ADP, ADV). Besides time series of current velocities and acoustic amplitude, the ADV (5MHz) and ADP (3MHz) were configured to also measure and store the distance between the sensor and the seabed, i.e. seabed evolution (altimetry). Further, the optical sensors, integrated in the mine, also measured seabed evolution, or in this case burial-and-exposure cycles, as a function of hydrodynamic and meteorological conditions. Typically, near-bed hydrodynamics and SPM dynamics are dominated by tidal forcing. Maximal ebb and flood currents induce alternately scour at the mine's ends, and increased SPM concentrations. Further, short-term burial-and-exposure events (few hours) throughout the tidal cycle were also revealed: during slack water (reduced current speeds) the SPM settles massively and the mine is buried; after slack tide (increasing currents) re-suspension of this high-concentrated fluffy mud layer occurs, and the mine is again 'visible' with a scour pit at one end. The temporal pattern of this burial mechanism (ephemeral muddy bedform) mimics the cyclicity of the lutocline as recorded by ADV and ADP altimetry. A significant modification of the tidal forcing results from alongshore advection due to wind-induced flows and wave-induced re-suspension; these modifications can cause the

fluffy mud layer to persist through some tidal cycles. In these conditions, the risk of long burial events is highest for mines, and objects in general, present in the nearshore area.

REFERENCES

Baeye M, Fettweis M, Legrand S, Dupont Y, Van Lancker V. 2012. Mine burial in the seabed of high-turbidity area - Findings of a first experiment. *Continental Shelf Research* 43, 107–119. doi:10.1016/j.csr.2012.05.009