STORMS: A CHALLENGE OF KNOWLEDGE
Papili Sonia¹, Thomas Wever², Yves Dupont³

Introduction

Dealing with storms is always a fascinating matter. They are uncontrollable and destructive. It is not always possible to get real data measurements during a storm due to the large magnitudes involved. Having recording instruments deployed on the seafloor and properly working, gave the rare opportunity to observe and analyze the storm impact directly on the seafloor.

Area of investigation

The experimental area named Wandelaar (blue circle in figure 1) is located at 12 km distance from the port of Zeebrugge in the vicinity of the main navigation channel on the Belgian part of the North Sea. It is a sandy shallow water area characterized by the presence of small to large dunes (senso Ashley, 1990), of up to 2 m in height.

Measuring instrument

The Burial Recording Mine (BRM) is an experimental instrument recording presence or absence of sediment at programmed time recording. With its 3 rings of 24 LED bridges (sensors) equally spaced on its sides and its centre detects the sediment height surrounding itself once is deployed on the sea-floor. It has a length of 1.70 m, diameter of 0.47 m and weight in air of 500 Kg. Accelerometers inside the object monitor the pitch and the roll and their variation in time.

Conclusion

During both storms wave affecting the seafloor caused reduced burial (i.e., sediment coverage) of the BRM. After the storms increased burial of 60% (October) and 80% (November) was observed. The high storm waves eroded sediment in the vicinity of the BRM and created scour holes at both ends. Once the scour holes merged to form one, the BRM rests on a small sediment cone. Upon collapse of the cone the BRM rolls into the bigger scour hole. During the sedimentation phase this new deeper hole is filled and causes a higher percentage of buried volume.

Storm 1

The hydrological and meteorological data were analyzed to evaluate the two storms affecting the area during the experiment. The threshold necessary to initiate movement of sand grains on the seafloor was calculated. The threshold orbital velocity for sediment motion is used to calculate the corresponding required critical wave height.

The calculated curves were compared with the measured wave height, percentage of sediment volume around the object, and current measurements.

Storm 2

References


Current data by Ministry of the Flemish Community, Maritime Services, Coastal Division/Hydrography

Hydro-meteo data by IVAMDK - afdeling Kust - Meetnet Vlaamse Banken

Acknowledgements

I would like to thank The Belgian Navy, founder of this research. Prof. Dr. M. De Batist and Dr. Vera Van Lancker, promotor and co-promotor of the related PhD research; Ralf Ludher, from the German Navy; all my colleagues from the Belgian Navy and from Ghent University.