

# LONG-TERM INFLUENCE OF MARITIME ACCESS WORKS ON THE DISTRIBUTION OF COHESIVE SEDIMENTS

M. FETTWEIS, J.-S. HOUZIAUX<sup>1</sup>, I. DU FOUR<sup>2,4</sup>, V. VAN LANCKER<sup>1,2</sup>, C. BAETEMAN<sup>3</sup>, M. MATHYS<sup>2,5</sup>, D. VAN DEN EYNDE<sup>1</sup>, F. FRANCKEN<sup>1</sup>

<sup>1</sup> Royal Belgian Institute of Natural Science (RBINS), Management Unit of the North Sea Mathematical Models (MUMM), Gulledele 100, 1200 Brussels, Belgium, E-mail: [m.fettweis@mumm.ac.be](mailto:m.fettweis@mumm.ac.be)

<sup>2</sup> Ghent University, Renard Centre of Marine Geology (RCMG), Krijgslaan 281, SB, 9000 Gent, Belgium

<sup>3</sup> Royal Belgian Institute of Natural Science (RBINS), Geological Survey of Belgium, Jennerstraat 13, 1000 Brussels, Belgium

<sup>4</sup> present address: International Polar Foundation

<sup>5</sup> present address: International Marine and Dredging Consultants

Most of the coast of the southern North Sea has had a long history of human impact, due mainly to coastal defence and harbour infrastructure works. The latter are associated with the deepening of navigation channels and harbour entrances, and disposal of dredged material at designated sites.

The manner in which the system reacts to large engineering works needs to be understood to ensure cost-effective operations at sea, to better gauge the human footprint, and to develop environmental policies aiming at a more sustainable management of the marine environment.

The aim of the study is to use historic (100 years old) and recent sediment and bathymetric data to evaluate the impact of maritime access works on the distribution of cohesive sediments along the Belgian–Dutch coast.



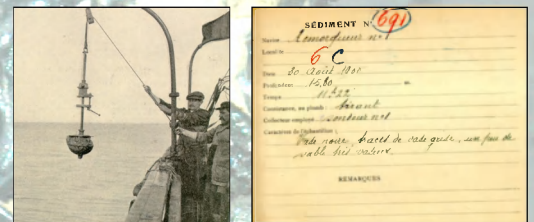
**Mud samples from the Belgian coastal area (from left up to right down):**

- mud pebbles
- layered Holocene mud
- fluid mud from the port of Zeebrugge
- thin fluffy layer
- recent mud above medium consolidated mud
- recent to very soft mud

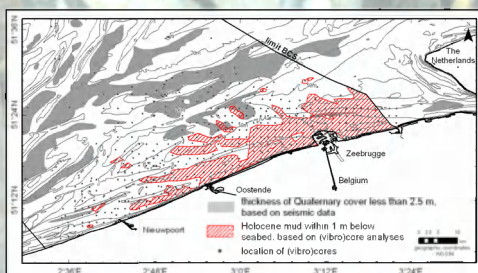
## METHOD

The comparison of historic and recent sediment distributions was based mainly on detailed field descriptions of sediment samples in combination with bathymetric maps. Four characteristic features of cohesive sediment distribution were identified which occur in both the historic and recent datasets: clay pebbles, stiff mud, soft mud and liquid mud. These sediment types are related to consolidation and/or erosion/deposition processes and can, therefore, provide an estimate of the relative age of the sediments.

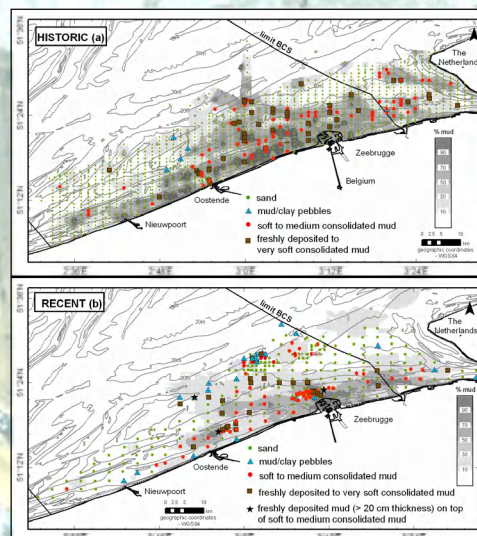
The recent sediment samples were collected from on board the R/V *Belgica* between 2000 and 2004 using a van Veen grab and a box corer. The historical sediment distribution was mapped based on sediment samples collected by G. Gilson in the first decade of the 20th century. Detailed field descriptions of the sediment samples are available. The bathymetric maps of Stessels (1866) and Urban (1909) were used to link the occurrence of cohesive sediments to morphological changes.



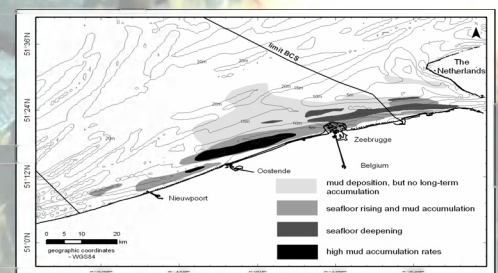
**Gilson's ground collector overfilled with mud (Photo from around 1900) and extract from Gilson's field log book.**



**Map of Holocene deposits.**



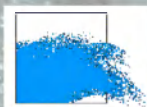
**Cohesive sediment facies and mud content: historic (beginning of 20<sup>th</sup> century) and recent. The bathymetry in both figures is from 2003.**



**Combined long-term trends in mud deposition and morphology, inferred from bathymetric changes for the period 1866–1911, and from historical sediment sample descriptions.**

## CONCLUSION

- Historical data can provide reliable baseline information for the assessment of long-term human-induced changes.
- Layers of fresh to softly consolidated mud reconstructed for the beginning of the 20th century were the result of natural morphological processes. Today, layers of fresh mud are concentrated in areas with high human impact.
- More Holocene mud probably outcrops today than at the beginning of the 20th century and that, as a consequence, erosion of these layers is more prominent today.
- The Zeebrugge port extension and associated works have thus in all likelihood increased the amount of fine-grained sediment released into the North Sea, a process ongoing today



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