# Sea sand in a 360° perspective

Proceedings study day

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Rue du Progrès 50
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# 1. Joint acoustic and sediment fingerprinting during a period of intensified sand extraction in sector 4a on the Noordhinder sandbank

*Kint Lars*[*1], Degrendele Koen[2], Roche Marc[2], Barette Florian[2], Van Lancker Vera[1]*

[*]*Presenting author: lkint@naturalsciences.be*

[1]*Royal Belgian Institute of Natural Sciences, Operational Directorate Natural Environment (OD Nature), Vautierstraat 29, 1000 Brussel, Belgium*

[2]*FPS Economy, S.M.E.s, Self-employed and Energy, Directorate-General Quality and Safety, Continental Shelf Service (COPCO), Koning Albert II-laan 16, 1000 Brussel, Belgium*

In the Hinder Bank area, sand extraction is permitted in four dedicated zones. Most activities took place on the Oosthinder (sector 4c), where repetitive sediment sampling has been performed to validate the acoustic data series and to account for spatial variability across sandbanks. Recently, sand extraction on the Noordhinder (sector 4a) has been intensified as this sector has been designated as a future wind-farm area (Marine Spatial Plan of 2020-2026). In the first three months of 2021, more sand was extracted than in the past three years combined.

During the penultimate campaign of the RV Belgica A962, COPCO and OD Nature jointly collected acoustic and sediment information in sector 4a. Multibeam echosounder (MBES) and backscatter (BS) data with spatial coverage of 15.85 km² were acquired, and 20 Reineck box cores were taken, subsampled and sliced every centimetre to validate the acoustic facies. Good spatial representation across the entire sandbank was achieved, both within, near and outside the intensively dredged areas.

Backscatter values were extracted within the incidence angles of ± 30° to 50° that best distinguish between different sediment types. Sediment parameters such as mean, sorting, clay-silt-sand-gravel percentages were calculated from the complete grain-size distribution for each sliced subsample. Organic matter and carbonate content are available as well.

Preliminary results of the processed acoustic and analysed sediment data are presented in this poster, both separately and jointly. The datasets provide insight into sediment changes due to natural variability and sand extraction. Ultimate goal is the unravelling of sediment-acoustic data relationships to optimise remote monitoring of heavily extracted areas.

**Keywords**: Noordhinder, sector 4a, acoustic facies, sediment properties, intensified sand extraction

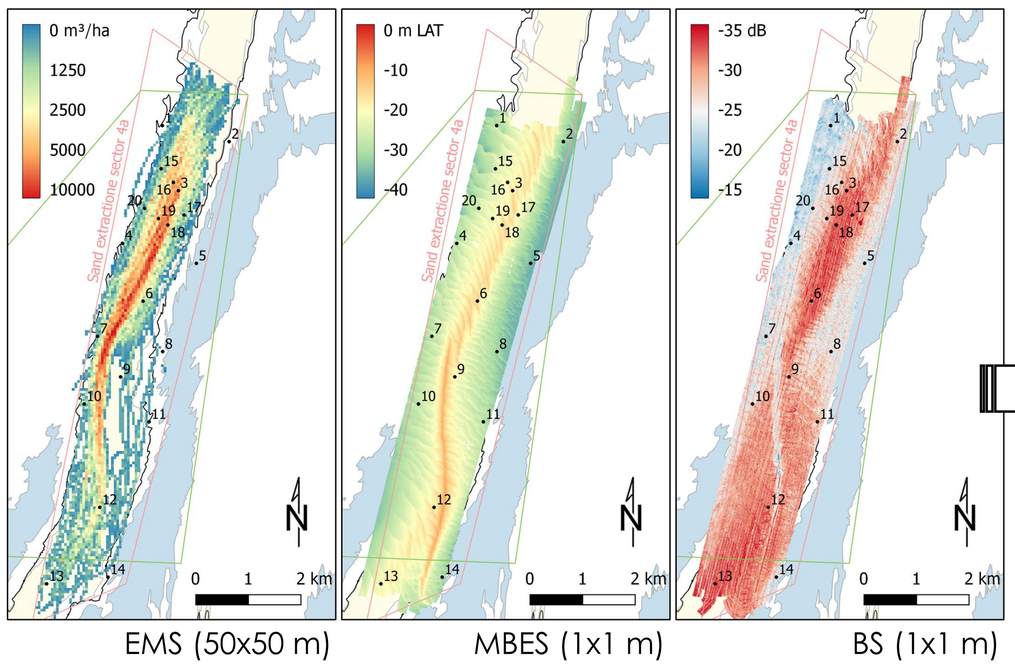
# Joint acoustic and sediment fingerprinting during a period of intensified sand extraction in sector 4a - Noordhinder sandbank

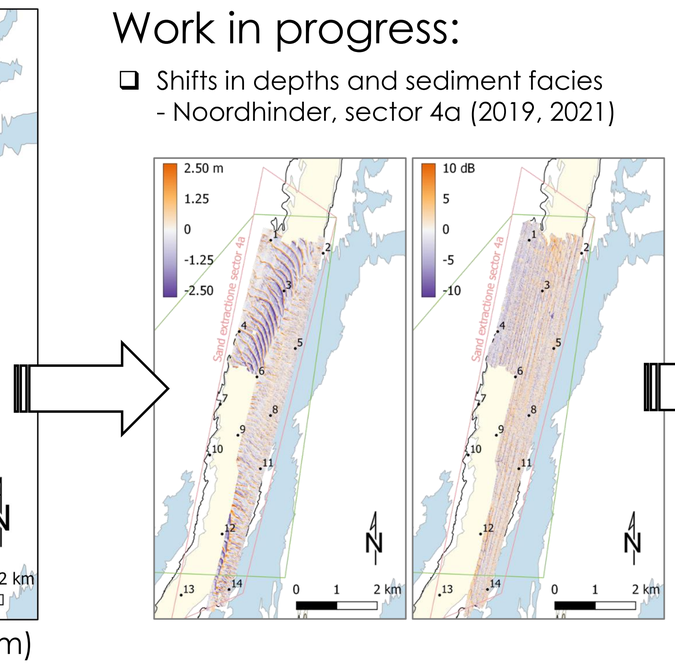

Lars Kint[1]*, Vera Van Lancker[1], Koen Degrendele[2], Marc Roche[2], Florian Barette[2]

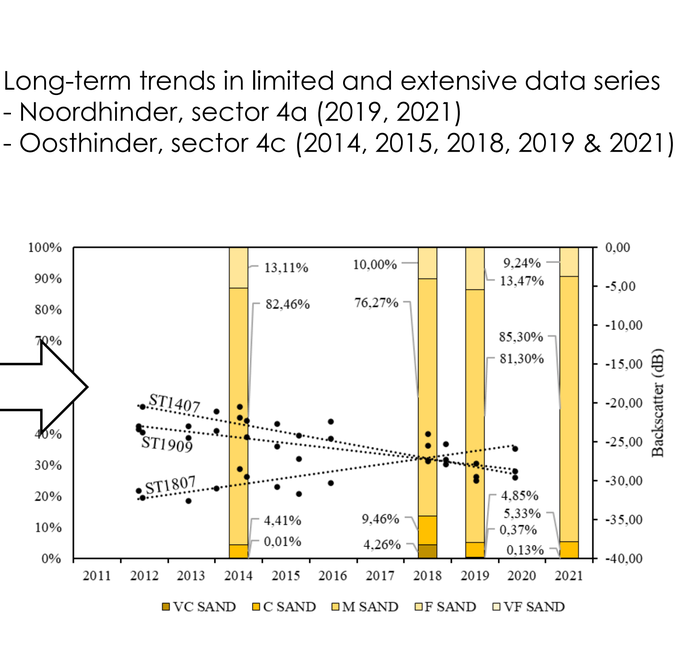
FPS Economy, S.M.E.s, Self-employed and Energy

[1]Royal Belgian Institute of Natural Sciences (RBINS) - Operational Directorate Natural Environment (OD Nature),
[2]FPS Economy, S.M.E.s, Self-employed and Energy, Directorate-General Quality and Safety, Continental Shelf Service (COPCO)


✓ Validation of jointly collected acoustic and sediment data
- Noordhinder, sector 4a (2021)




## Work in progress:

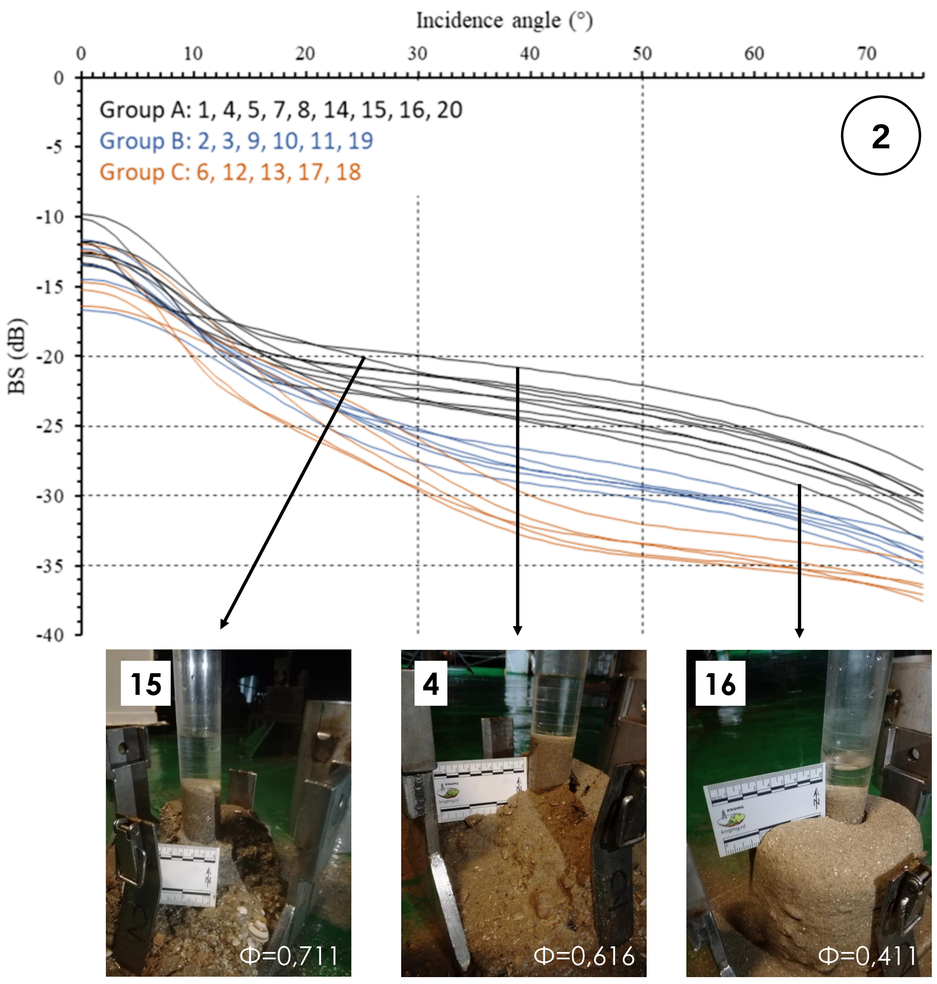
- ❑ Shifts in depths and sediment facies
  - Noordhinder, sector 4a (2019, 2021)
- ❑ Long-term trends in limited and extensive data series
  - Noordhinder, sector 4a (2019, 2021)
  - Oosthinder, sector 4c (2014, 2015, 2018, 2019 & 2021)

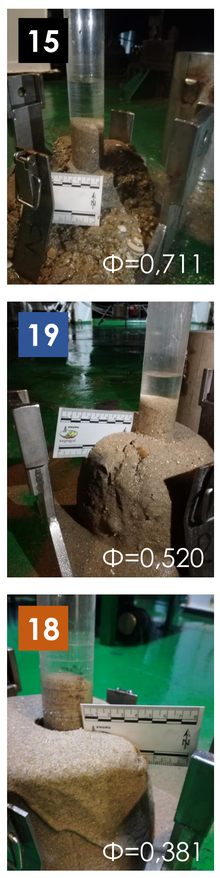
## Marine geological setting

At the end of March 2021, during the penultimate campaign of the RV Belgica A962, COPCO and OD Nature jointly collected acoustic and sediment information in **sector 4a, Noordhinder**. **Multibeam echosounder (MBES) and backscatter (BS)** data with spatial coverage of **15.85 km²** were acquired, and **20 Reineck box cores** were taken, subsampled and sliced every centimetre to validate the acoustic facies. Good spatial representation across the entire sandbank was achieved, both within, near and outside the intensively dredged areas.

## Processed acoustic and analysed sediment results

- ❑ Grouping of the physical samples according to (1) extraction intensity and quantity, (2) acoustic facies, (3) morphological properties, and (4) sediment characteristics
- ❑ The acoustic facies best reflect sediment sorting of the Reineck subsamples
  - Group A and B remain difficult to distinguish (moderately well to well sorted)
  - Group C with BS values of -30 to -35 dB at incidence angles between 30° and 50° corresponds to sorting of less than 0.35 (very well sorted)
- ❑ OM, $CaCO_3$ and percentages of medium and coarse sand affect sorting to various degrees, and consequently BS decibels
- ❑ Spatial variability and increased uncertainty in positioning of sediment sampling complicate validation



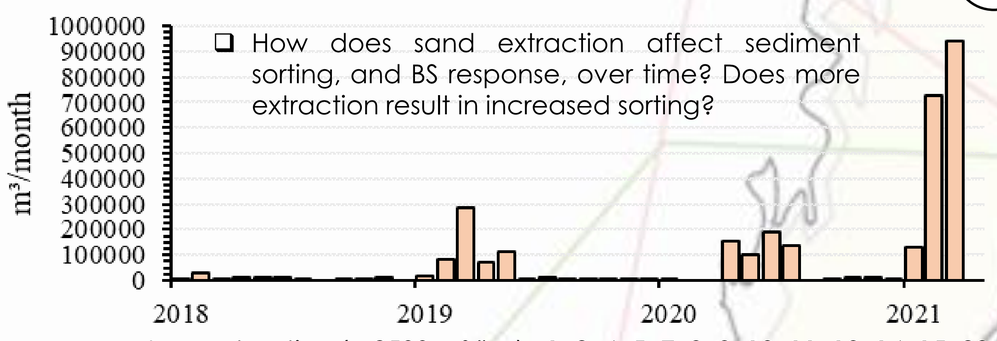




**Reduction in backscatter values reflects improved sorting (Montereale Gavazzi et al. 2018)**

**Spatial variability of physical sediment samples complicates validation of the acoustic facies**

1

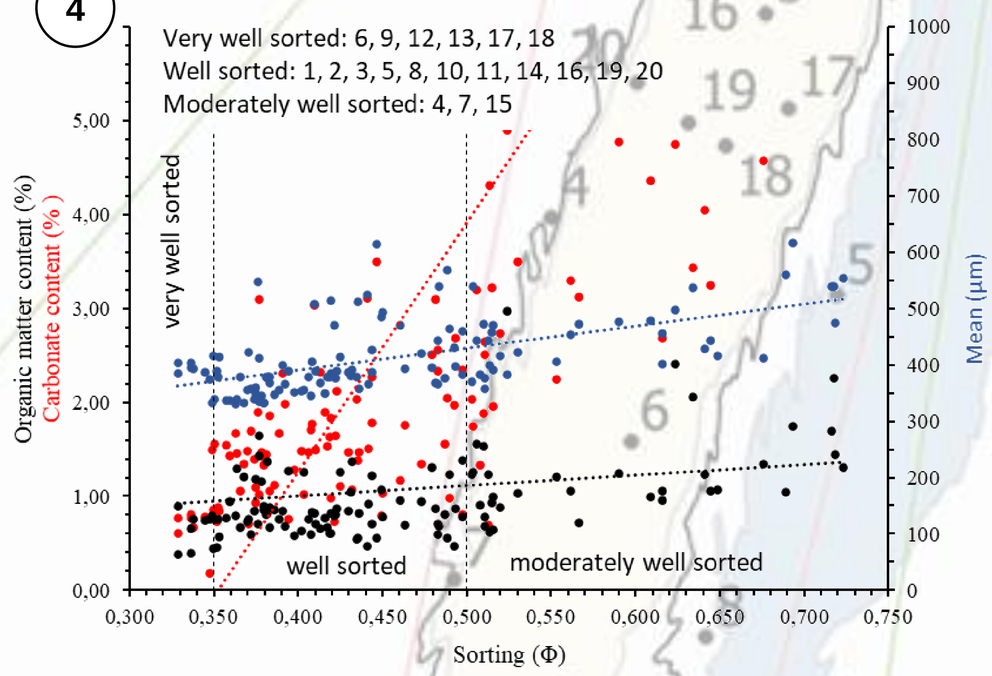
**Sand extraction in sector 4a**

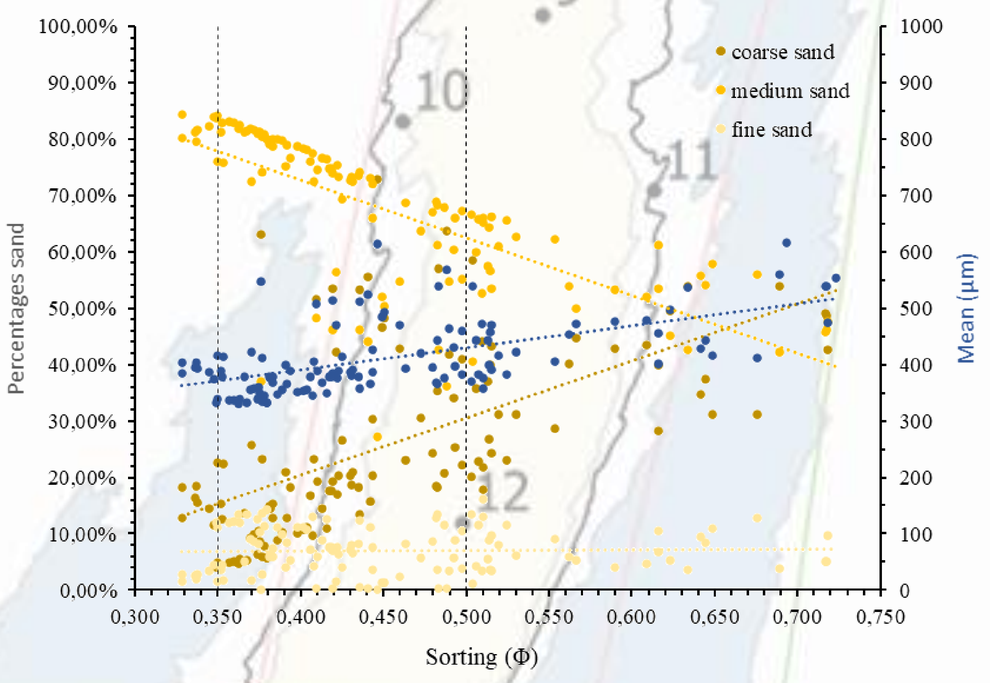



- ❑ How does sand extraction affect sediment sorting, and BS response, over time? Does more extraction result in increased sorting?

Low extraction (< 2500 m³/ha) : 1, 2, 4, 5, 7, 8, 9, 10, 11, 13, 14, 15, 20
Medium extraction (2500-5000 m³/ha) : 6, 12, 17
High extraction (> 5000 m³/ha): 3, 16, 18, 19

4




Crest: 3, 6, 9, 12, 13, 15, 16, 17, 18, 19, 20
Slope (stoss): 1, 4, 7; 10
Slope (lee): 2, 8, 11, 14
Trough: 5

3

- ❑ How does the geomorphological nature of the sandbank affect the acoustic signals and sediment properties? At first glance, there is no clear relationship with the bathymetric position index (BPI) on a broad scale. A more detailed terrain analysis at a fine scale (cfr. sand waves) is required…