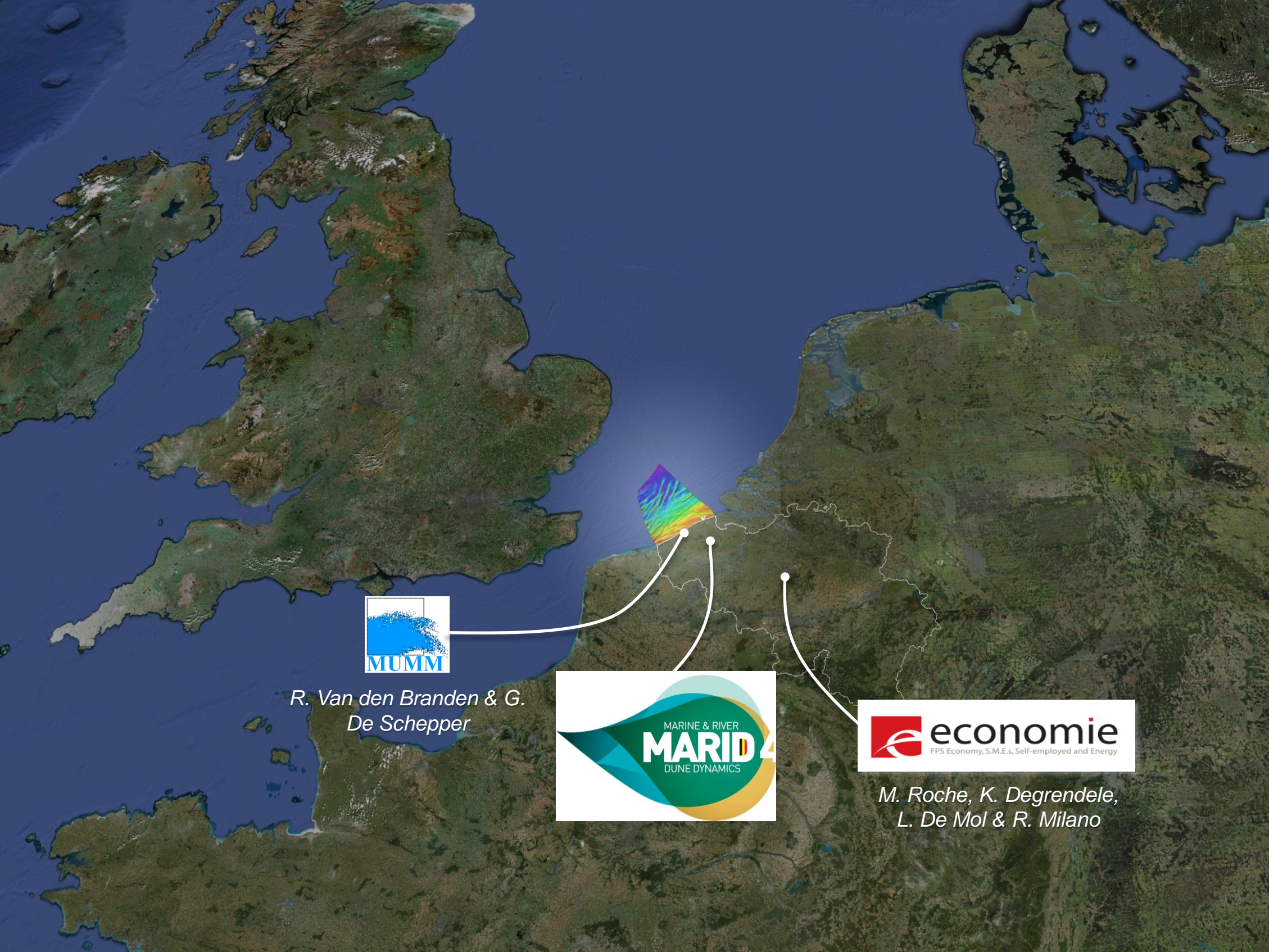




# **Essential facts of the monitoring of the sand extraction and its impact on the Flemish banks on the Belgian continental shelf from 2003 to 2012**



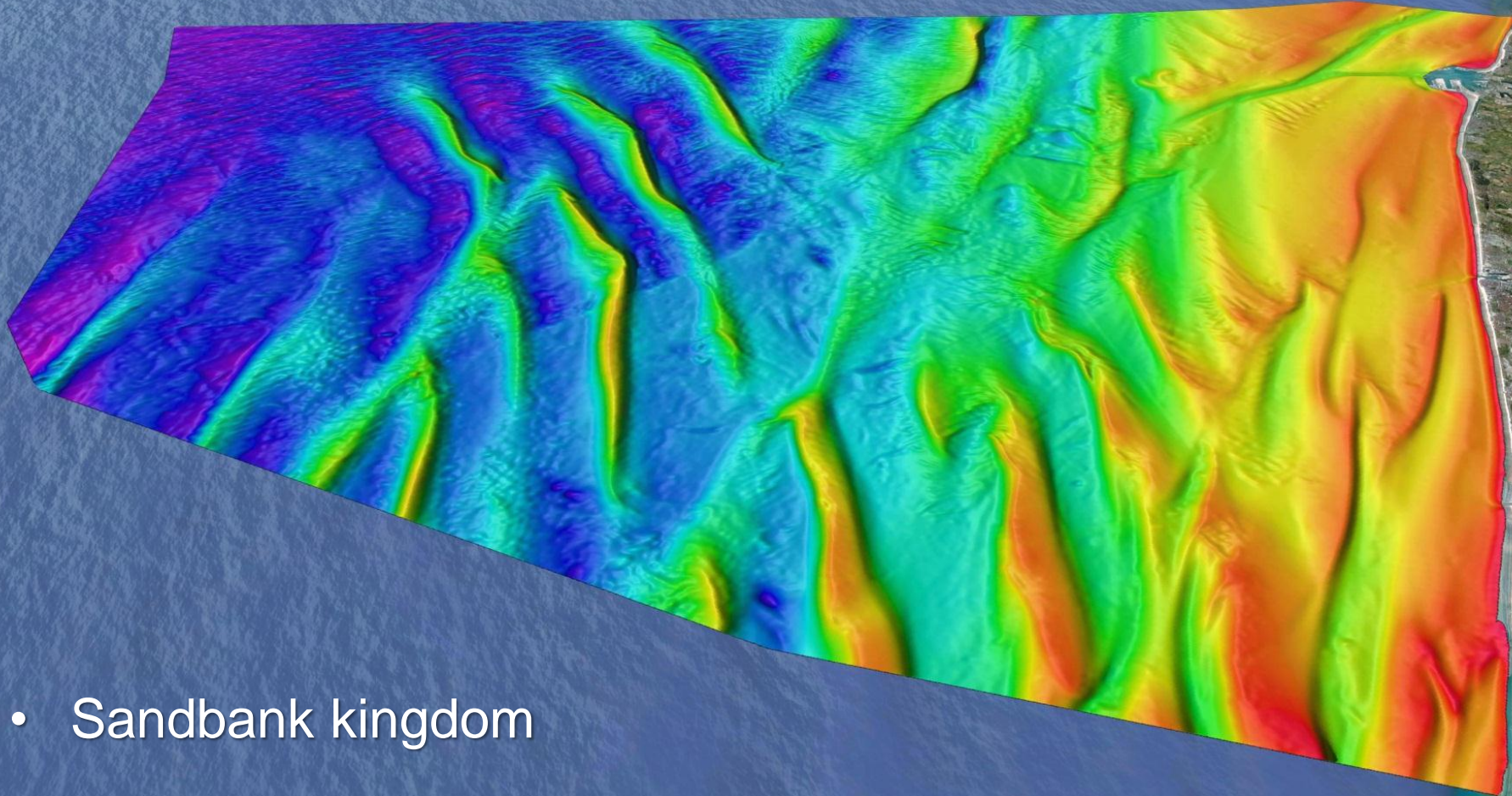
*R. Van den Branden & G.  
De Schepper*



*M. Roche, K. Degrendele,  
L. De Mol & R. Milano*

# The Belgian part of the North Sea:

- $\pm 3500 \text{ km}^2$ , max. depth  $\pm 50 \text{ m}$



- Sandbank kingdom
- Sand = €

Model 20 x 20m  
Data from:

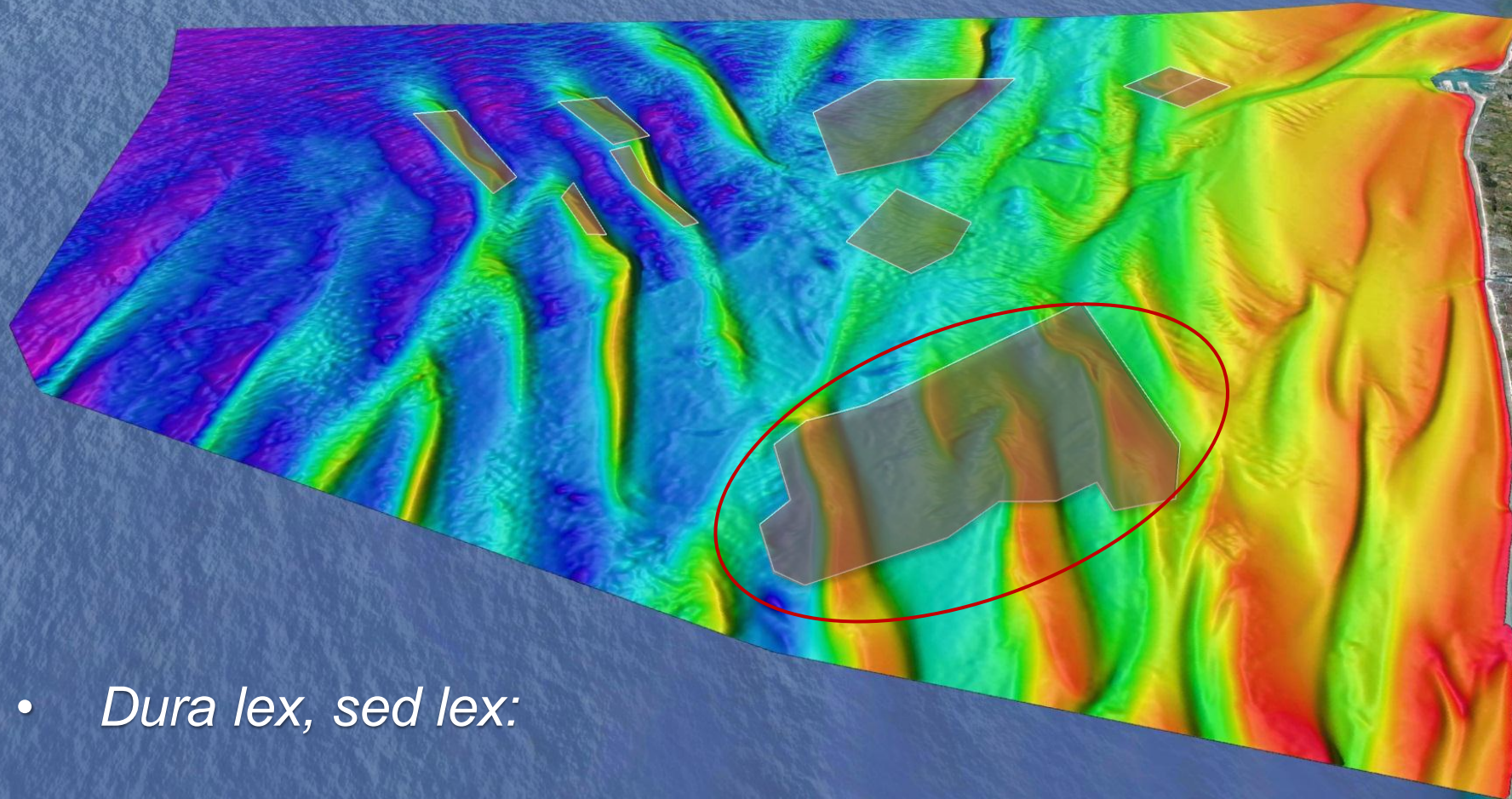


&



# Sand extraction:

- $2 \cdot 10^6 \text{ m}^3$  for building industry,  $1 \cdot 10^6 \text{ m}^3$  for beach replenishment;
- 80 % of sand for building industry from Flemish banks;



- *Dura lex, sed lex:*





Sandbank bathymetry

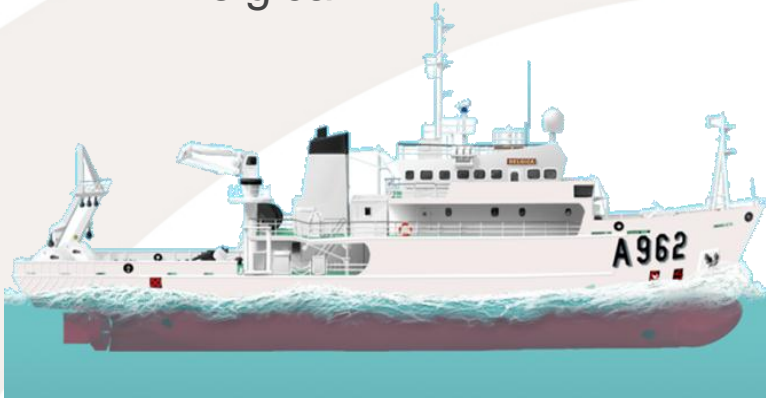


Monitoring both  
variables is required...

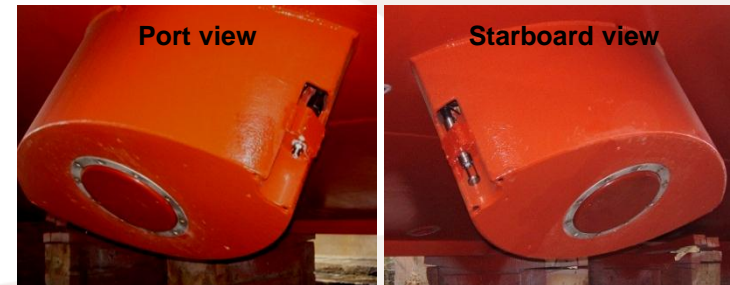
Extraction

# Monitoring the sandbanks with MBES

## 1. RV Belgica

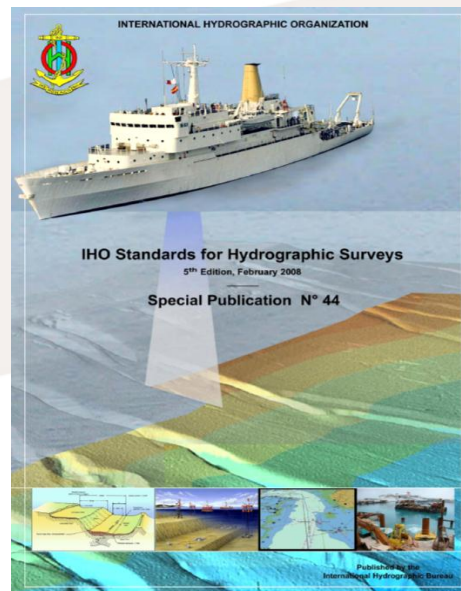


## 2. Kongsberg EM3002 Dual (300 kHz) + DGPS, gyro and motion sensors



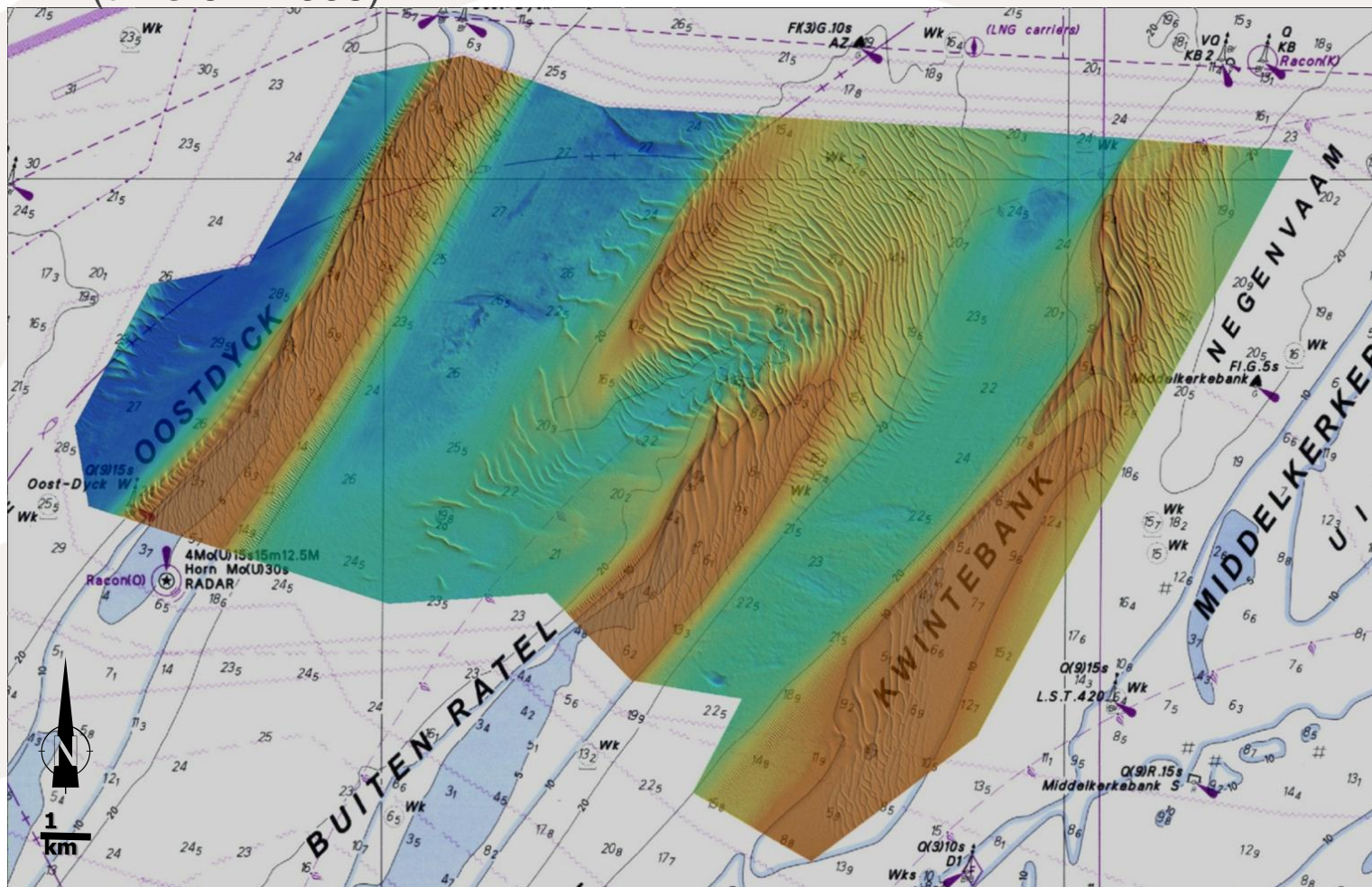
## 3. Regular quality control

→ IHO S44 special order ✓



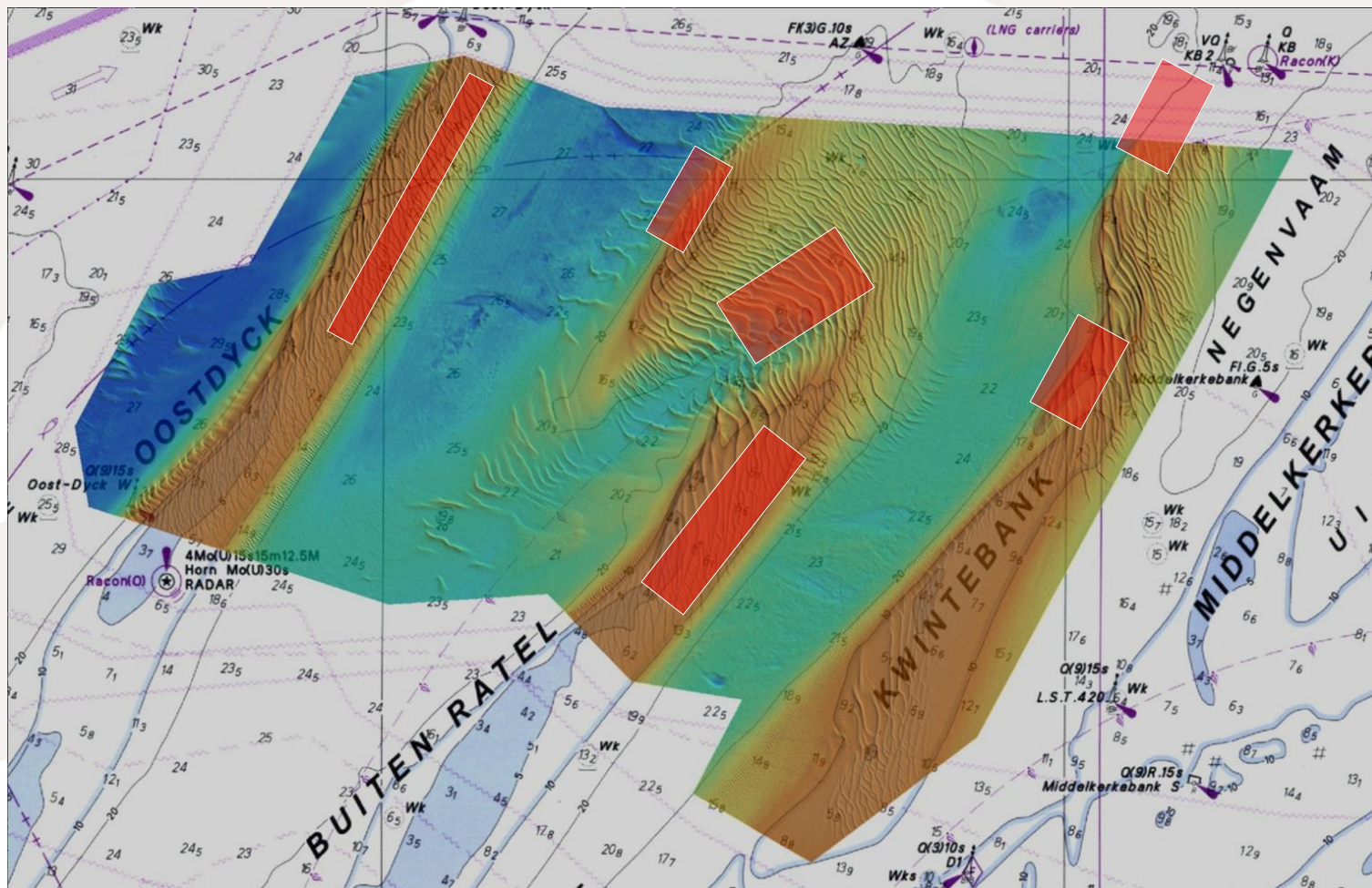
# Monitoring the sandbanks with MBES

## 4. Reference surface (time 0 = 2003)



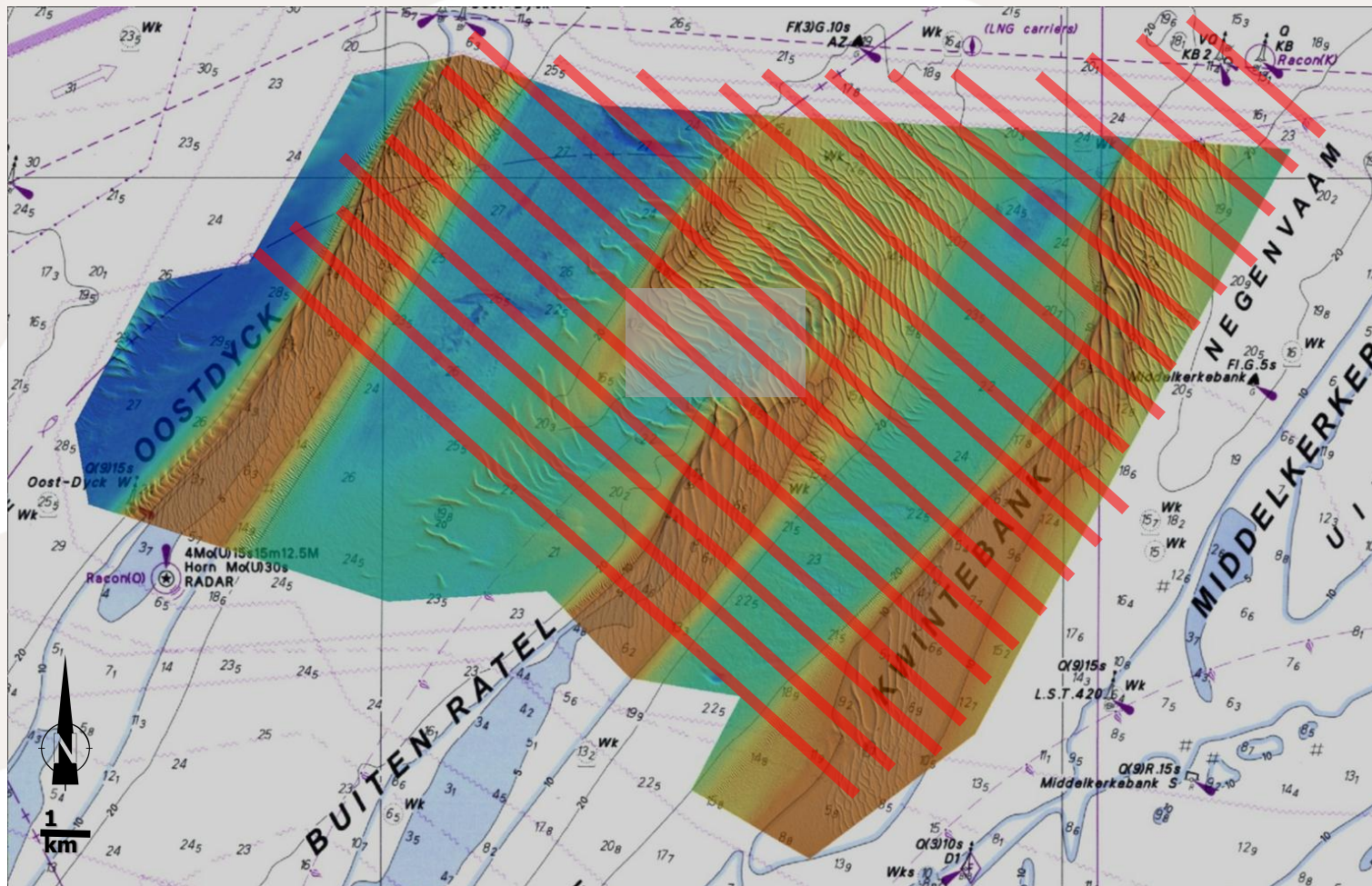
# Monitoring the sandbanks with MBES

- On highly dredged areas:
- High resolution and full coverage
  - But local and time consuming

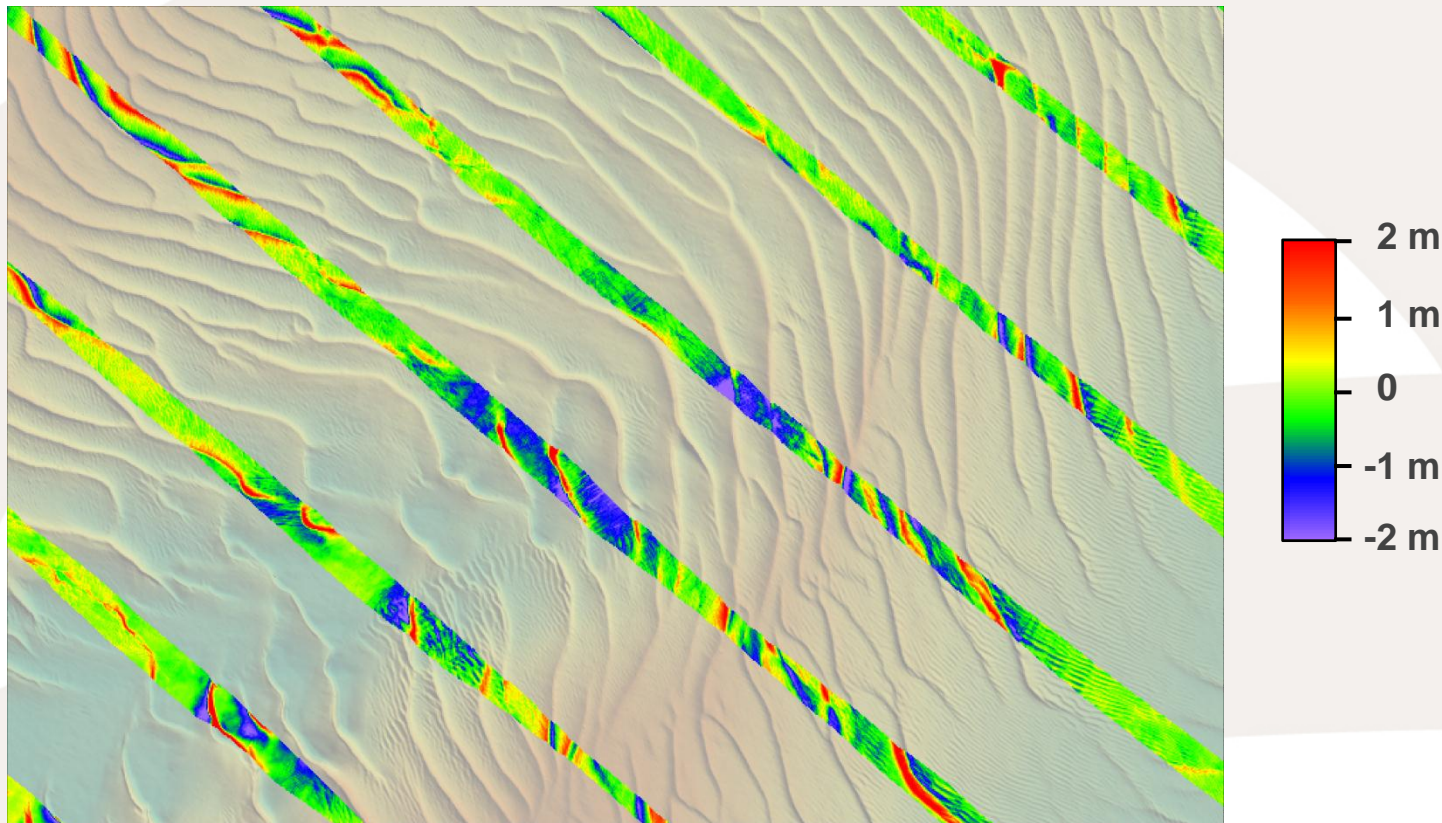


# Monitoring the sandbanks with MBES

- Monitoring along “DECCA” lines:
- Fast
  - Global but fragmented



# Monitoring the sandbanks with MBES

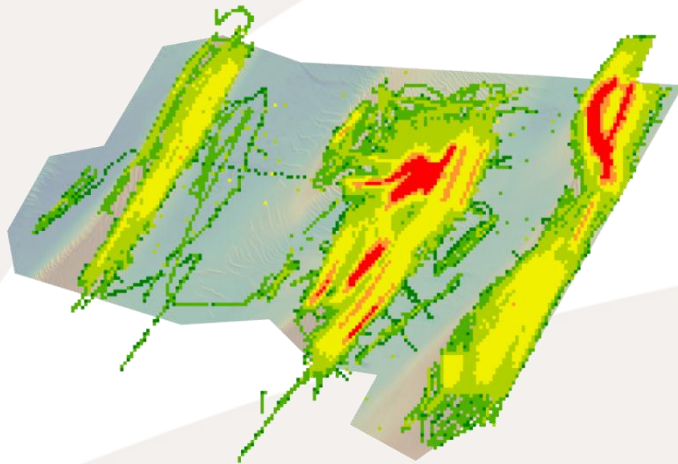


△ Bathymetry

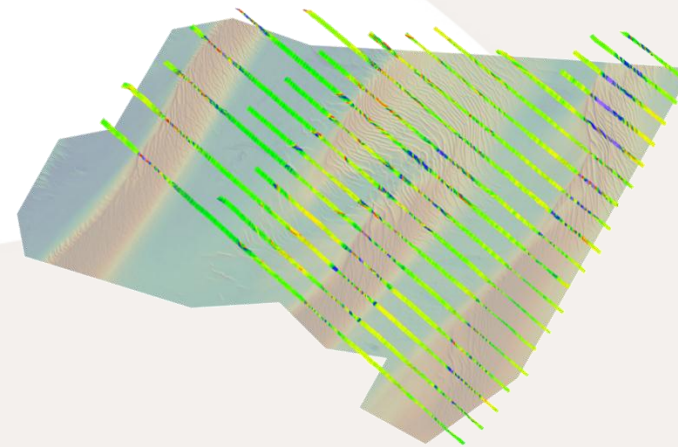
“DECCA” lines 2011 – reference model 2003

# Correlation EMS values *versus* DECCA data

Extracted volume (m<sup>3</sup>/ha)  
from the EMS data



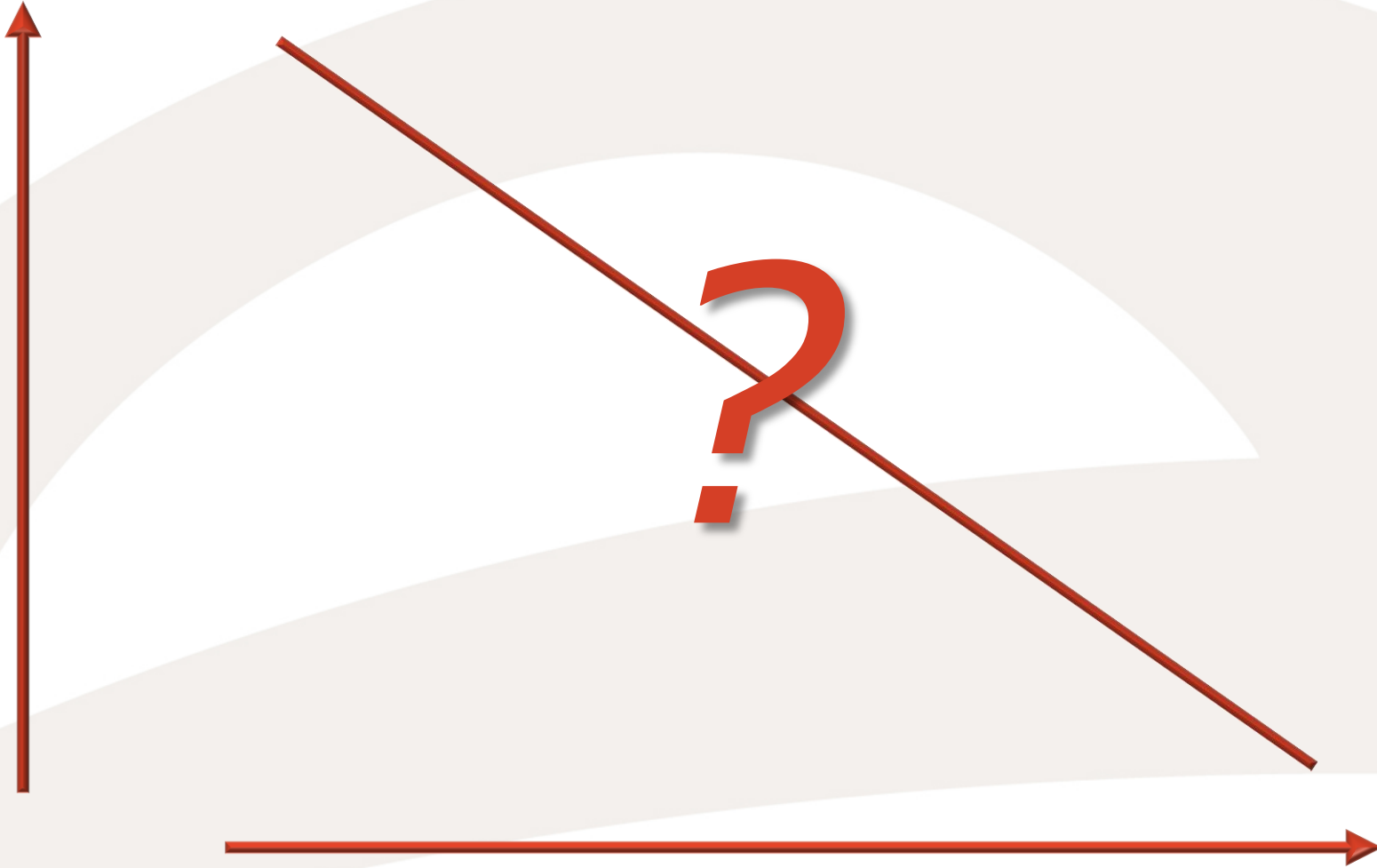
MBES data  $\Delta$  Bathymetry (m)  
DECCA - reference model 2003



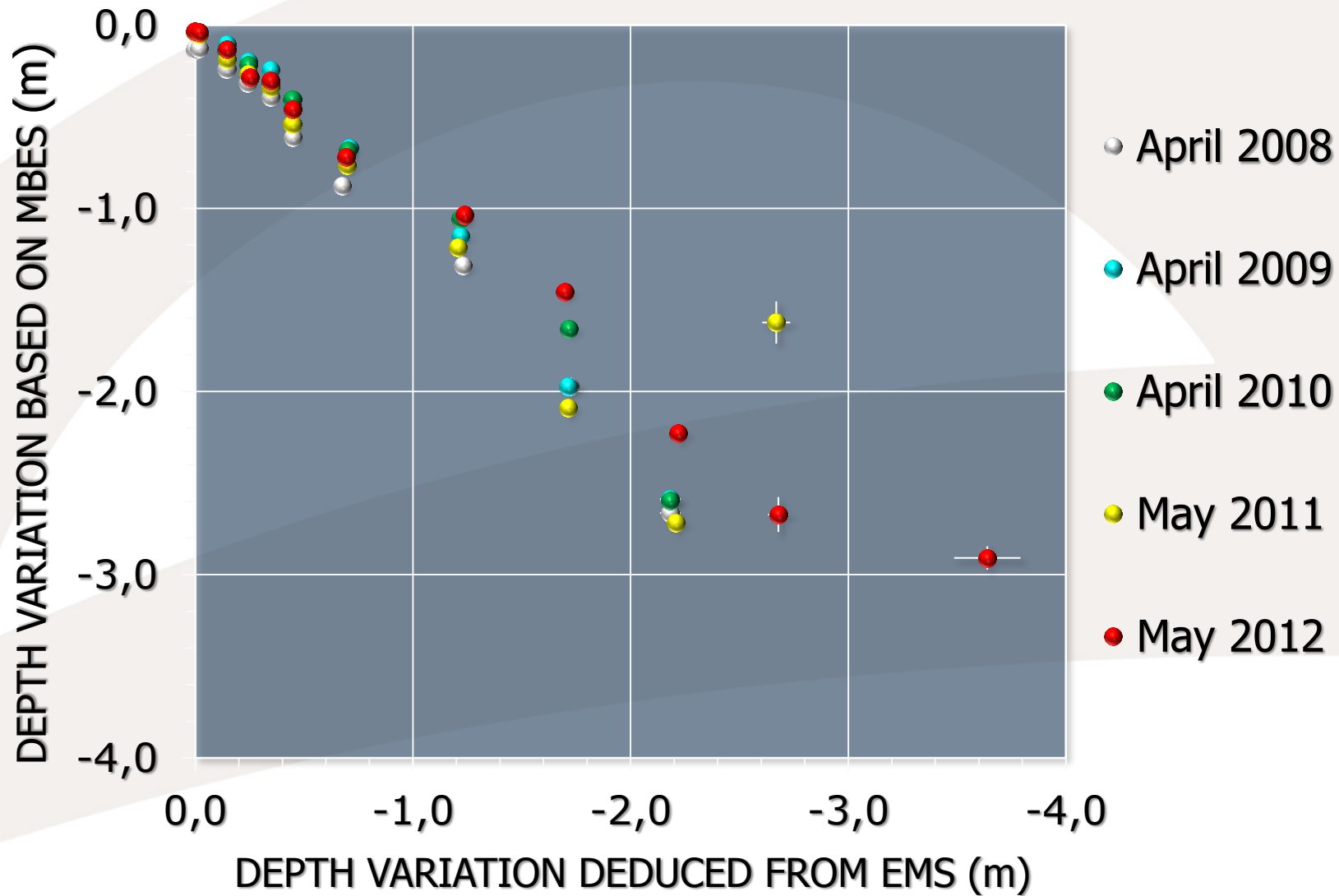
Crossing the 2 datasets in GIS (see extended abstract for details):

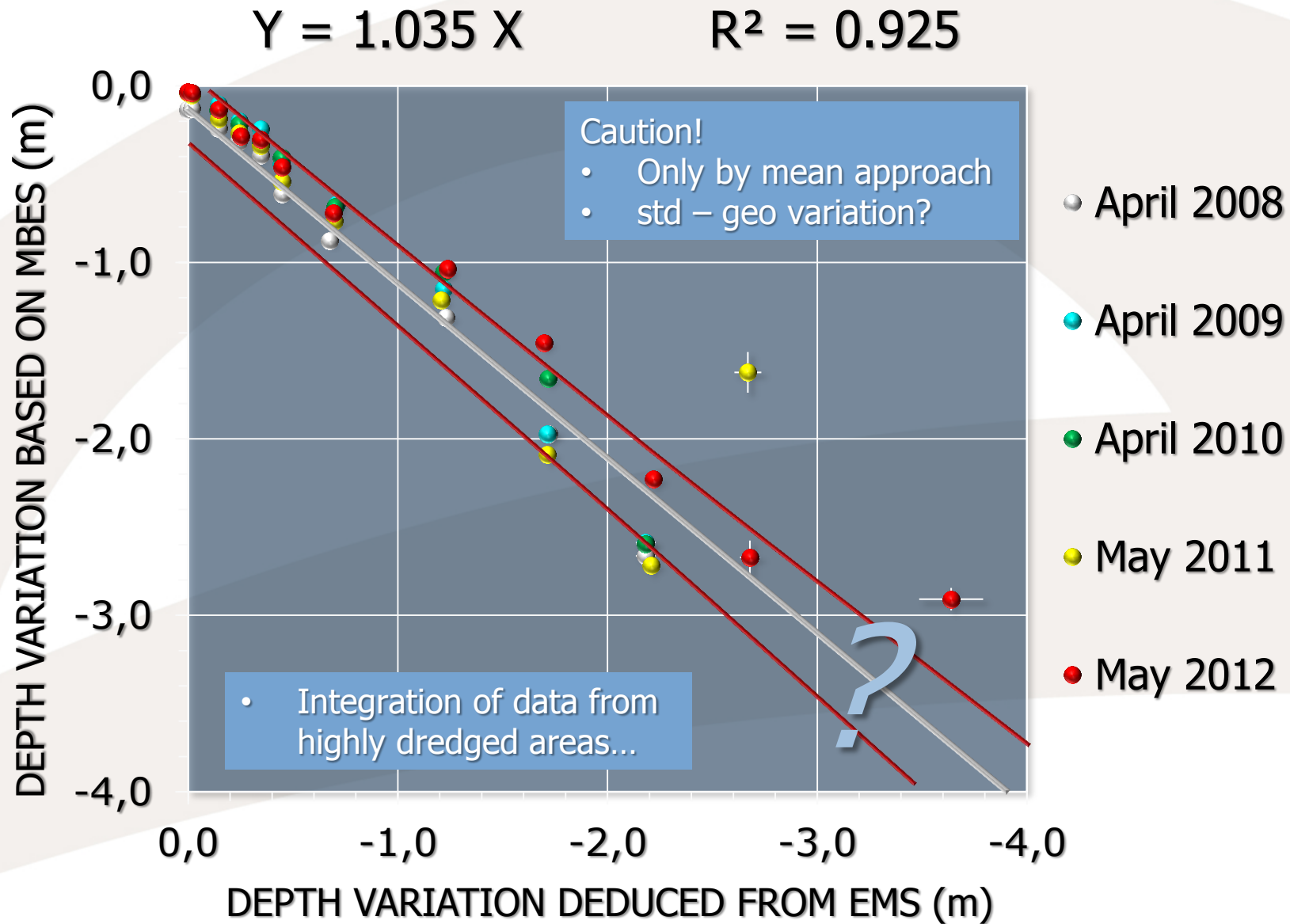
EMS VOLUME INTERVALS (10 <sup>3</sup> m <sup>3</sup> /ha)	BATHYMETRIC DIFFERENCE DEDUCED FROM EMS			BATHYMETRIC DIFFERENCE BASED ON MBES MEASUREMENTS		
	mean	std	nb grid cells	mean	std	nb grid cells

Sandbank bathymetry



Extraction





*Next episode in MARID V...*

*Thank you  
for your attention!*