

# BUDGET

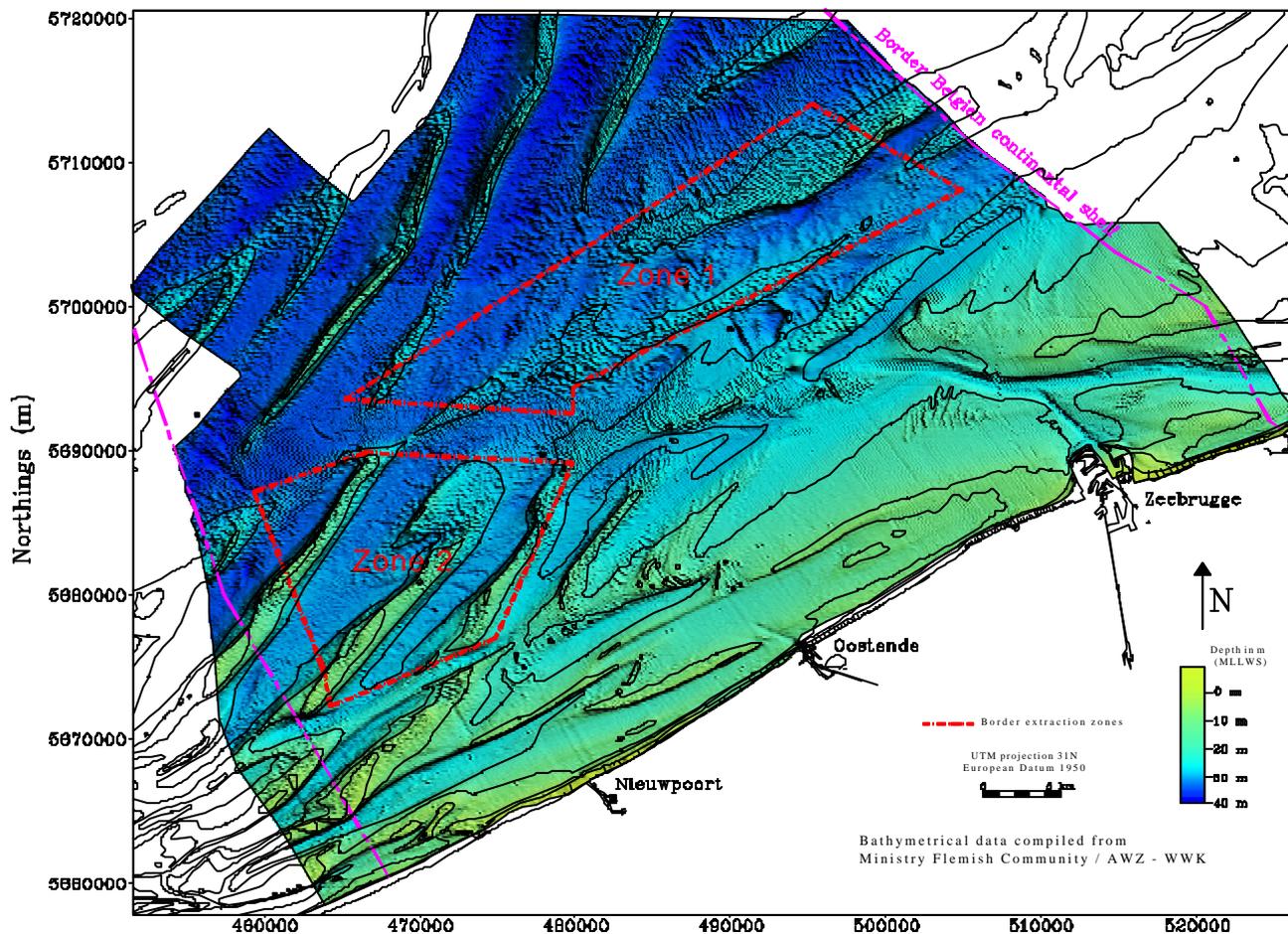
Investigation of natural sand transport on the  
Belgian continental shelf

Funded by Federal Office for Scientific, Technical and  
Cultural Affairs

Program: Sustainable Management of the North Sea

# BUDGET

- Two major partners:
  - Magelas
  - Renard Centre of Marine Geology (RCMG)
- Two subcontractors:
  - Management Unit of the North Sea Mathematical Models (MUMM)
  - Research Unit Sedimentary Geology and Engineering Geology (SGEG)



# Why BUDGET?

- Variety of sediment dynamic studies exists carried out by a large number of institutions
- Each study was carried out with a specific technique on a specific location
- Each study presents results which are valid on a specific time and space scale

# MAIN OBJECTIVES

- Collect all pieces of information concerning sedimentology, morphology, geology and sediment dynamic processes on the BCS
- Analyse the information critically
- Define gaps in knowledge and make recommendations for future research

# QUESTIONS?

- Which paths does the sediment follow on the BCS ?
- What is the influence of external factors such as storms on the tide-induced transport?
- Can a realistic sediment budget be calculated for the BCS?

# RESULTS

- Inventory of sediment transport studies
- Overview map (information on sedimentology, geology, morphology, hydrography, sediment transport directions,...)
- Critical analysis of results and conclusions

# INVENTORY OF DATA

Inventory of quantitative, qualitative studies

Results had to be presented as clear as possible:



Realisation of an easy-reference handbook:  
summary of each study on one page with fixed  
layout and classified per method

# INVENTORY OF DATA

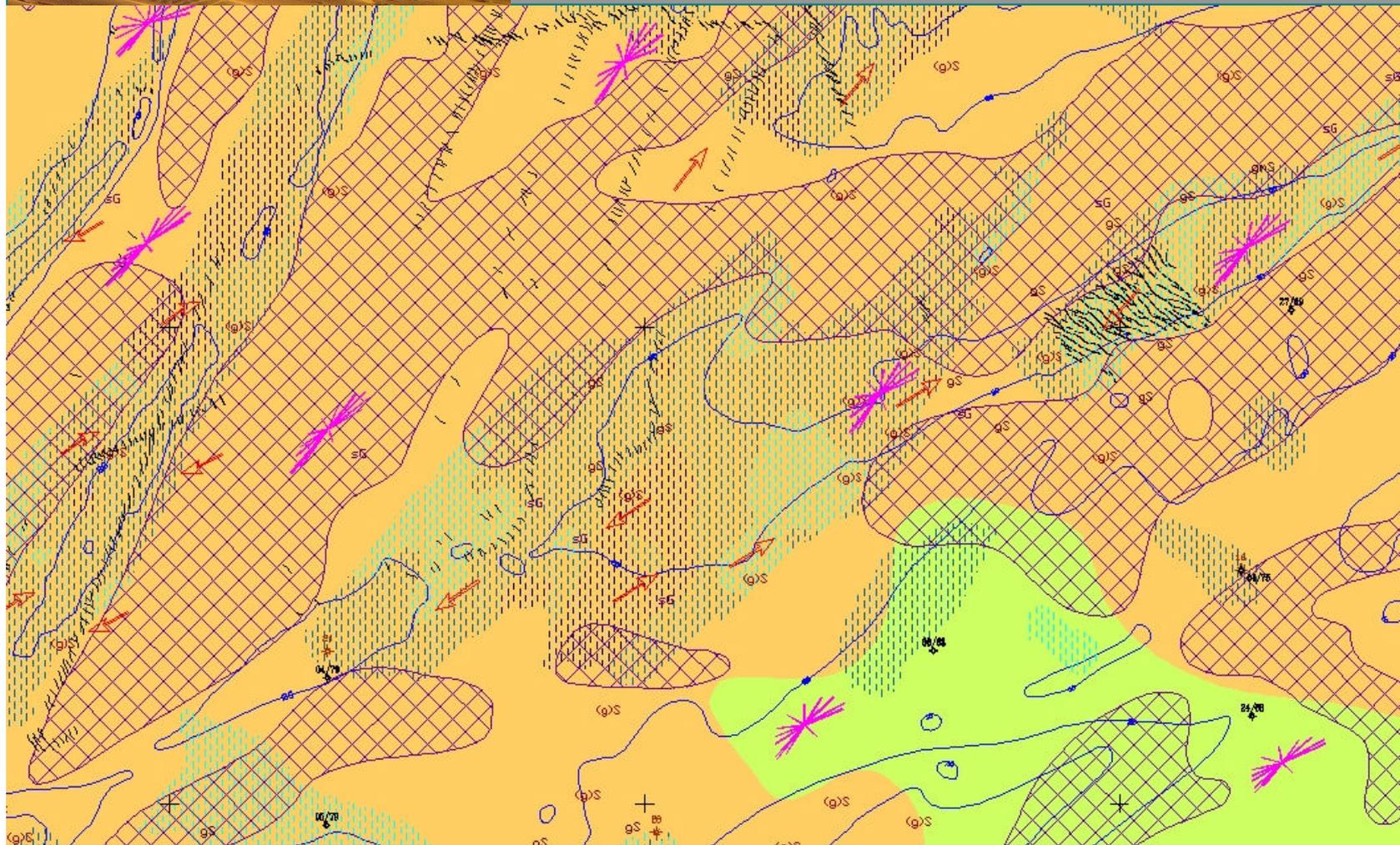
A one-page summary is presented for each study with information on:

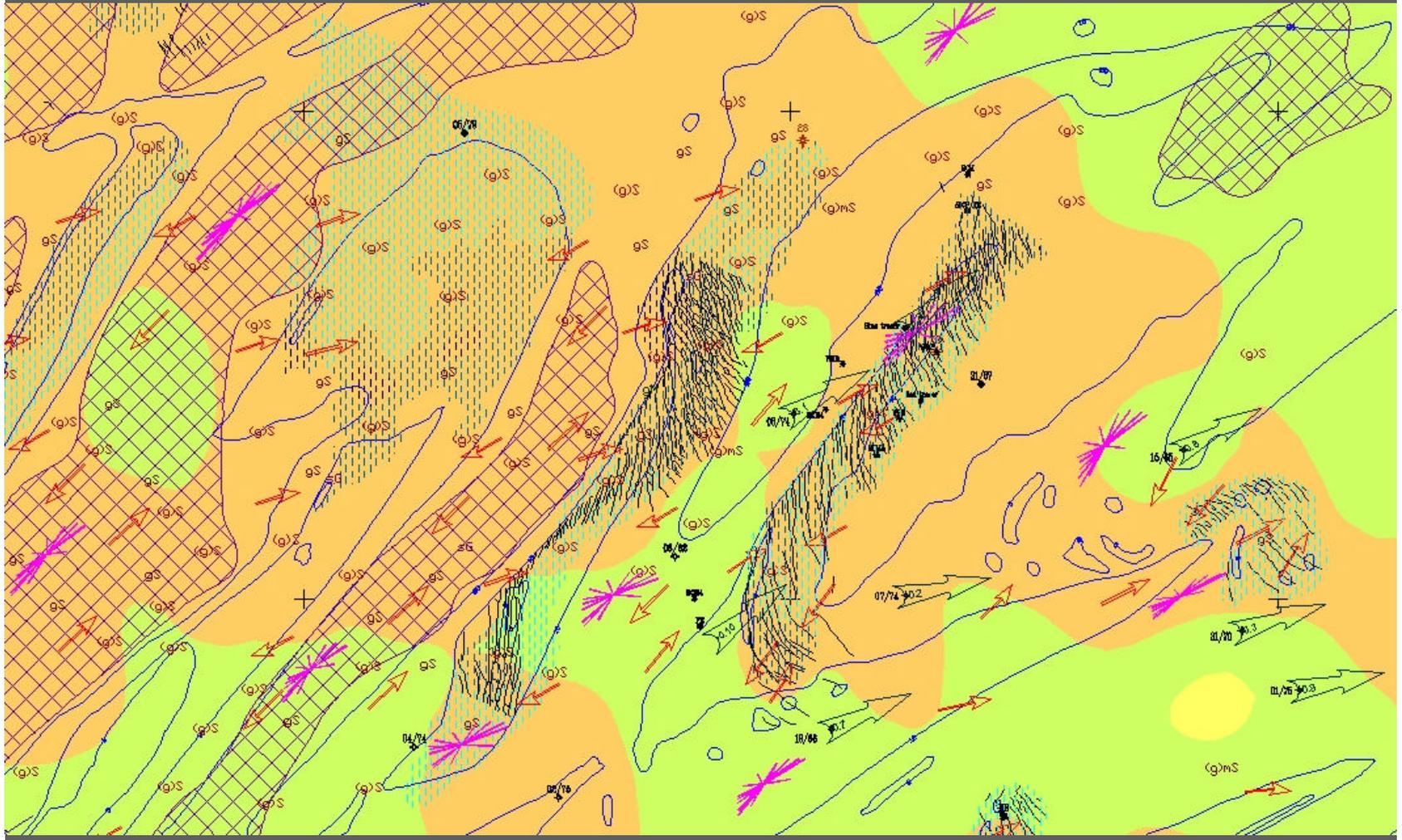
- description of results
- deduced sediment direction
- publication
- Time scale
- Space scale

# OVERVIEW MAP - 1

Map contains information on:

- Characteristics of the BCS
  - surficial sediment
  - bedforms (large dunes)
  - presence of shallow tertiary deposits
  - current ellipses

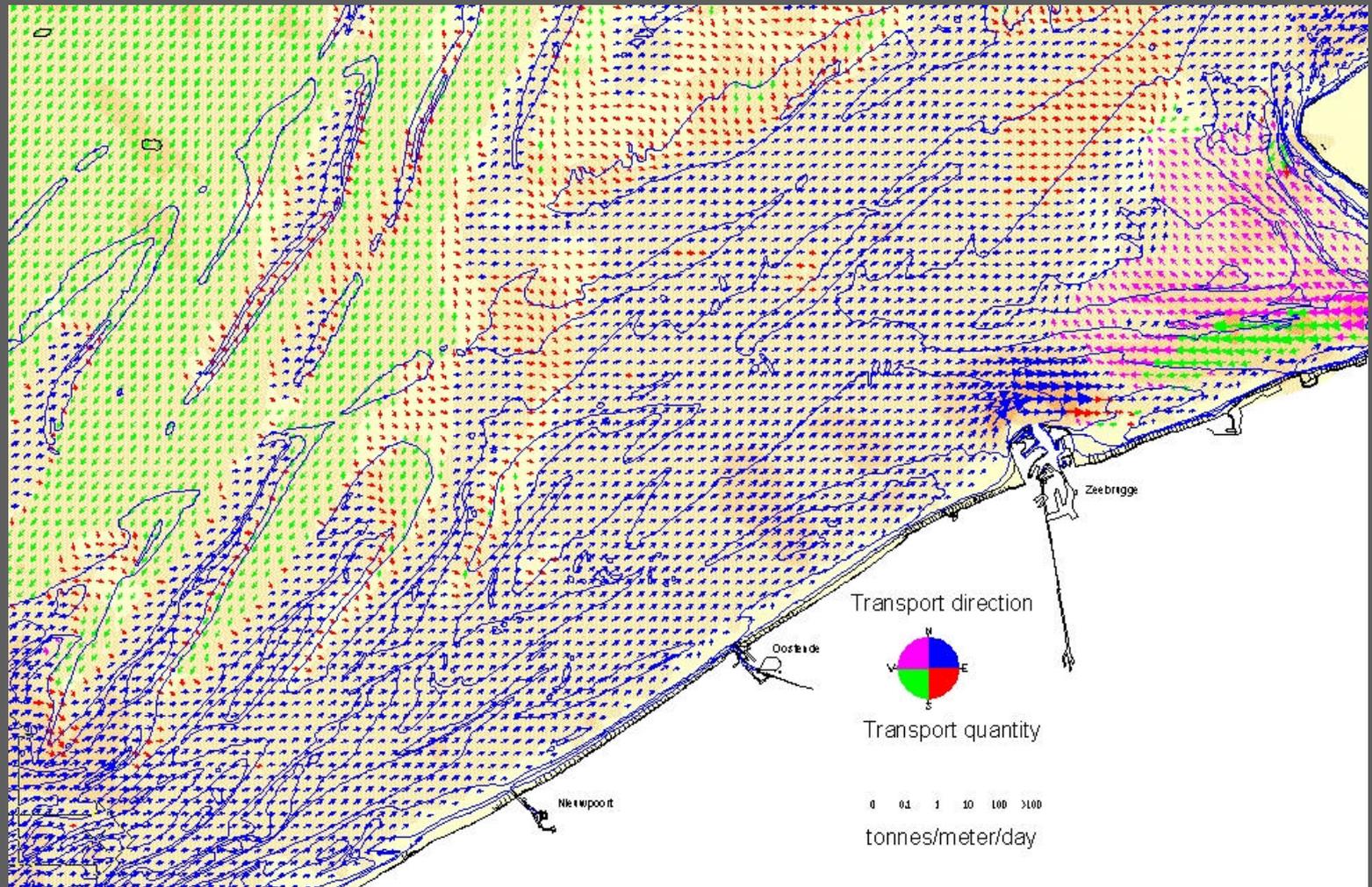




# OVERVIEW MAP - 2

- Results of residual sediment transport
  - directions of residual transport based on different methods
  - quantitative information on residual transport
    - bed-load
    - suspension load
  - modelling results





# CRITICAL ANALYSIS

- Analysis of data and methodologies
  - comparison of results obtained with each technique
    - estimation of time and space scale
    - evaluation of restrictions and cautions
    - determination of external factors

# CRITICAL ANALYSIS

## Methods used on the BCS

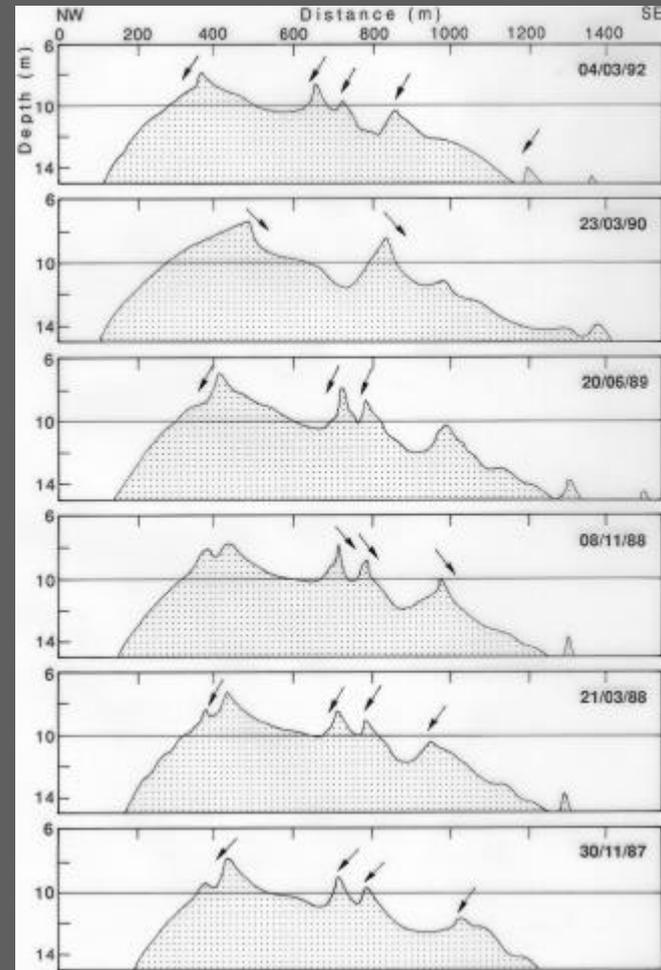
- asymmetry of bedforms
- tracers (artificial and natural)
- suspension measurements
- sediment. differentiation (STA, fraction analysis)
- Sediment transport models

# CRITICAL ANALYSIS

- asymmetry of bedforms has been used by many authors to deduce residual sediment directions
- can this method always be used?
- are there restrictions?

Time-series reveal the complexity of the behaviour of bedforms

Example: sections through a same track across a sandbank



# CRITICAL ANALYSIS

- asymmetry of the bedforms is induced by the tidal currents
- nearly all large dunes can change their asymmetry and present an ebb-asymmetry or a flood-asymmetry
- observed switches in asymmetry are caused by changes in hydro-meteorological conditions
- a difference has therefore to be made between the bedforms in an “equilibrium” state and the bedforms whose asymmetry has been altered by specific hydro-meteo conditions

# CRITICAL ANALYSIS

Can bedforms be used?

Yes, but

- impact of external factors has to be filtered out
  - several observations could be necessary
  - concentrate on the very large features
- respect time and space scale in which conclusions are valid

# CRITICAL ANALYSIS

## Time and space scale

micro scale: hours up to days; 0.1 - 1 m

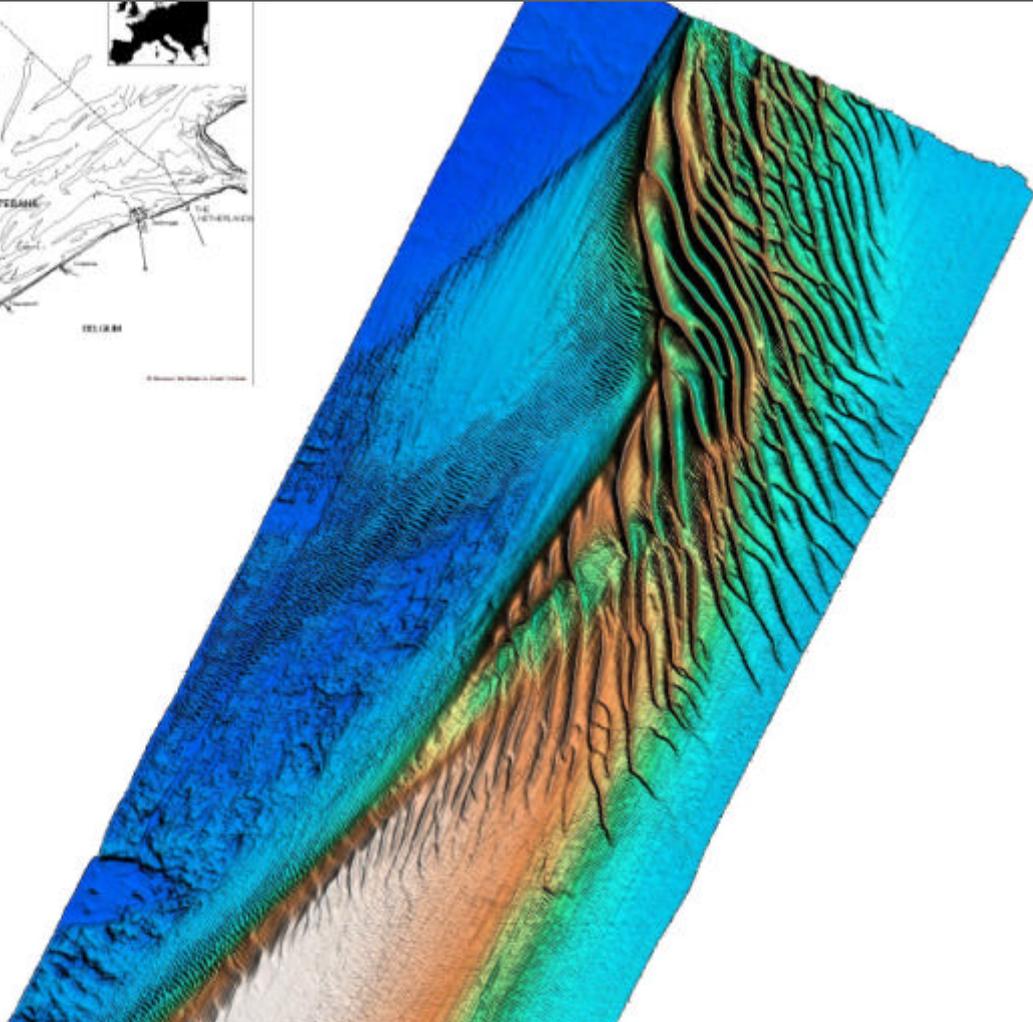
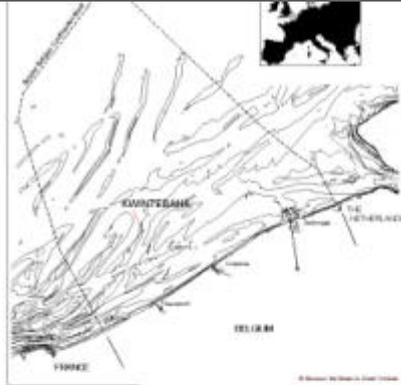
meso scale: days to weeks; 1 - 100 m

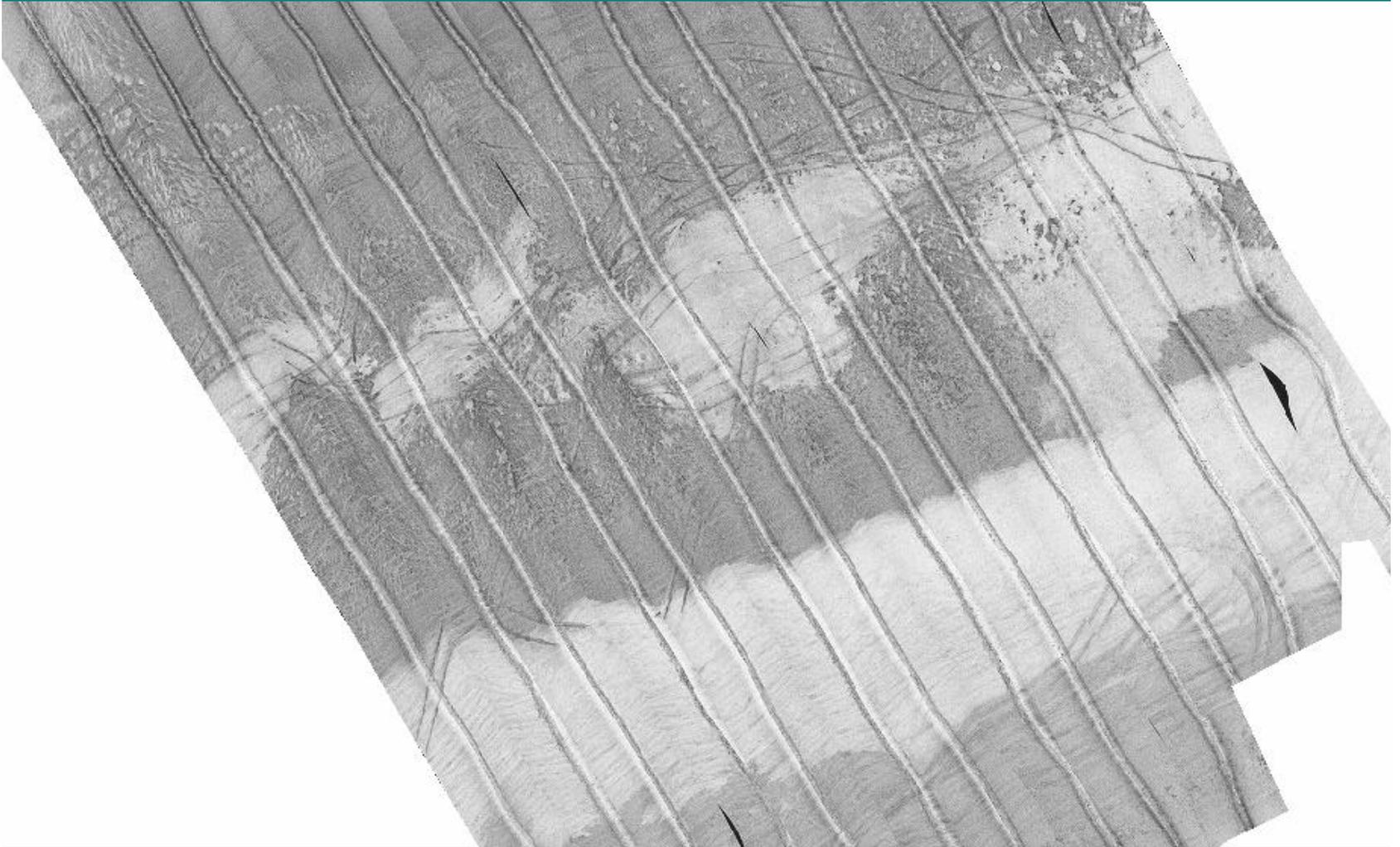
macro scale: weeks to months; 100 m - 1 km

mega scale: years to decades; 1 - 100 km

# RECOMMENDATIONS

- For an optimal policy regarding a sustainable use of the marine seabed resources, it would be important to produce a number of detailed seabed maps that would reveal the sedimentological constitution and the morphological structures of the BCS
- Multibeam and side-scan sonar would have to be used extensively for bedform mapping and acoustic sediment characterisation





# BUDGET

OSTC

Belgian Navy

Belgian Geological Survey

Dutch Naval Office

Ghent University, Marine Biology Section

Ghent University, Research Unit for Marine and Coastal  
Geomorphology

Jan Tytgat

Ministry of Economic Affairs, Marine Sand fund

Ministry of the Flemish Community, Waterways Coast Division

TNO Geo Marien en Kust (NL)

University of Lille (FR)