



**DUNE DEVELOPMENT AT THE  
HONDSBOSSCHE AND PETTEMER DUNES  
AND INFLUENCES OF ARTIFICIAL RELIEF FEATURES**

**An EcoShape project**

Maarten Jansen MSc, Willem Bodde, Marije Smit, Anne Verheijen, Bert vd Valk,  
Jakolien Leenders,

## Team HPD EcoShape

- Sonja Ouwerkerk, Jakolien Leenders (HKV)
- Marije Smit, Willem Bodde, Maarten Jansen, Anne Verheijen (Witteveen+Bos)
- Alma de Groot (Wageningen Marine Research)
- Bert van der Valk (Deltares)
- Nina Smits, Rik Huiskes, Daisy de Vries, Loek Kuiters (Wageningen Environmental Research)
- Georgette Lagendijk, Michaela Scholl (WUR)
- Peter Brandenburg (Van Oord)
- Marloes Wittebrood, Petra Goessen (HHNK)

# Introduction

2009

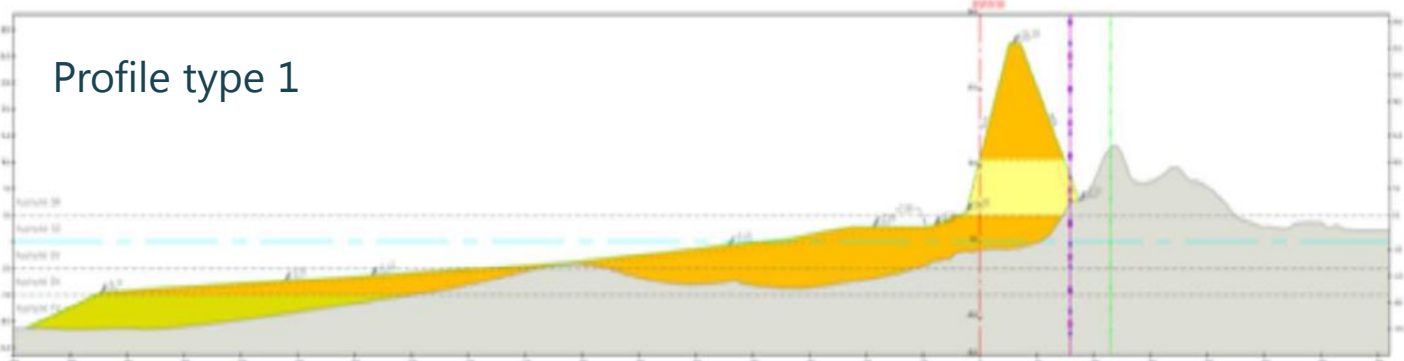


2016

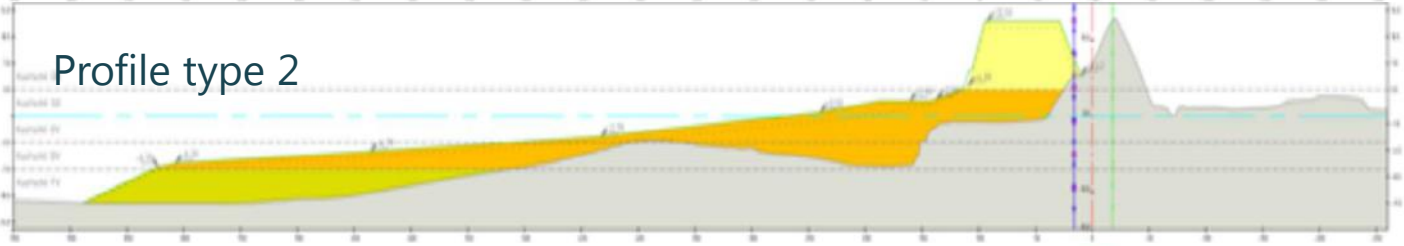


# Design of the

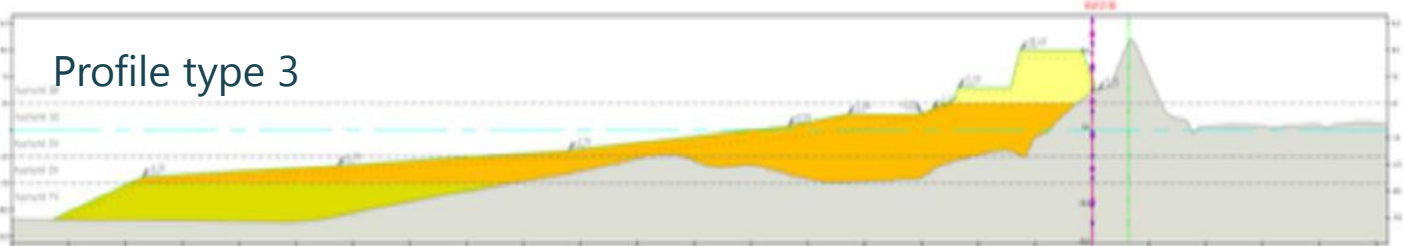
Profile type 1



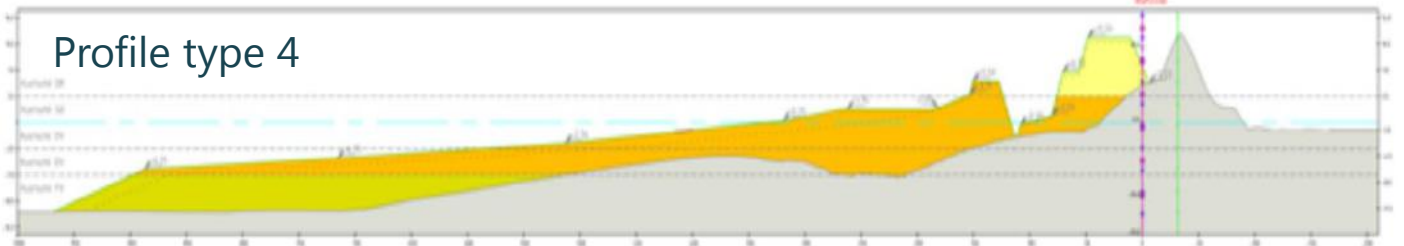
Profile type 2



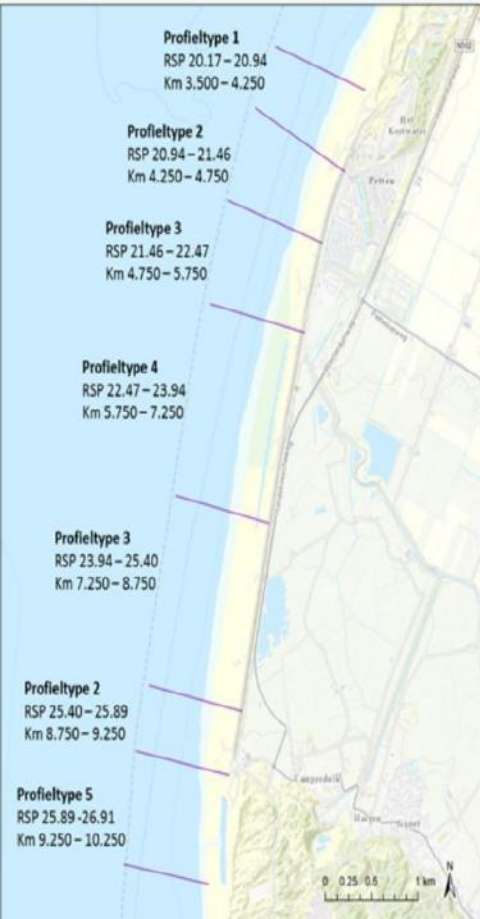
Profile type 3



Profile type 4



Profile type 5



## EcoShape study

Improvement of the design:

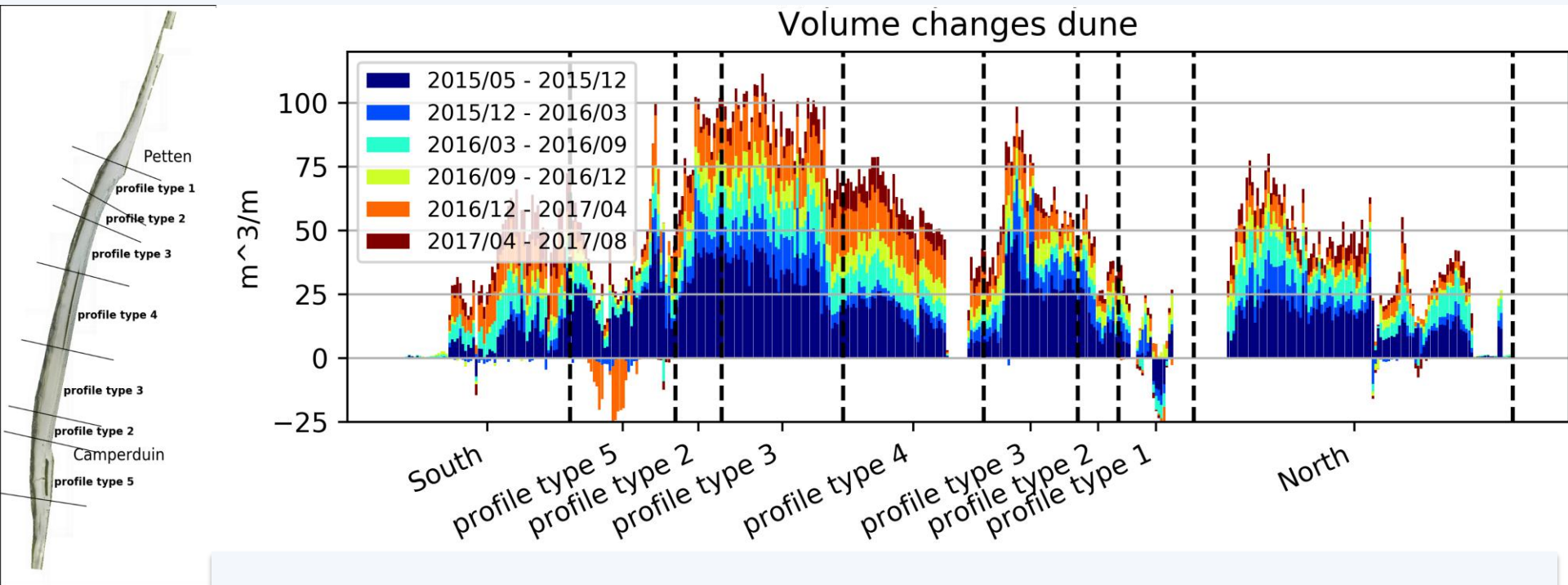
- What is the accumulation/erosion volume (m<sup>3</sup>/yr) of sand in the dune
- What are the local effects on dune morphology of design features such as
  - dune profile shape
  - artificial relief features
  - brushwood screens
  - vegetation



## Methodology

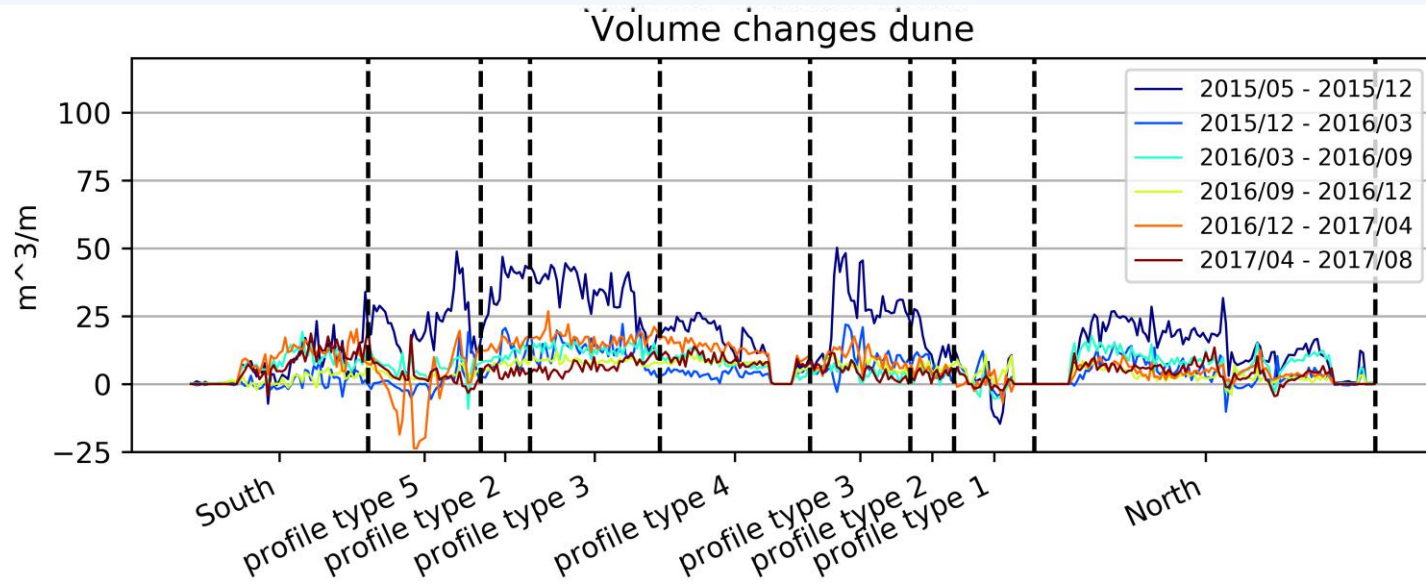
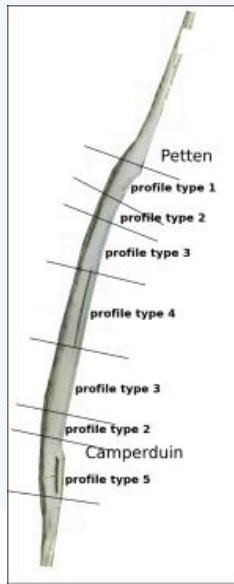
- Monitoring
  - LIDAR : May'15, Dec'15, Mar'16, Sep'16, Dec'16, Apr'17, Aug'17
  - Drones
  - Monitoring vegetation
- Expert field visits
- Modelling
- Workshops

# Accumulation/erosion volumes



## Accumulation/erosion volumes

- Almost everywhere accumulation
- Especially in south and middle part of the HPD
- Profile 2 and 3 have the most accumulation
- Profile 1 and profile 5 show erosion
- In the first 7 months the most accumulation
- Tends to stabilize

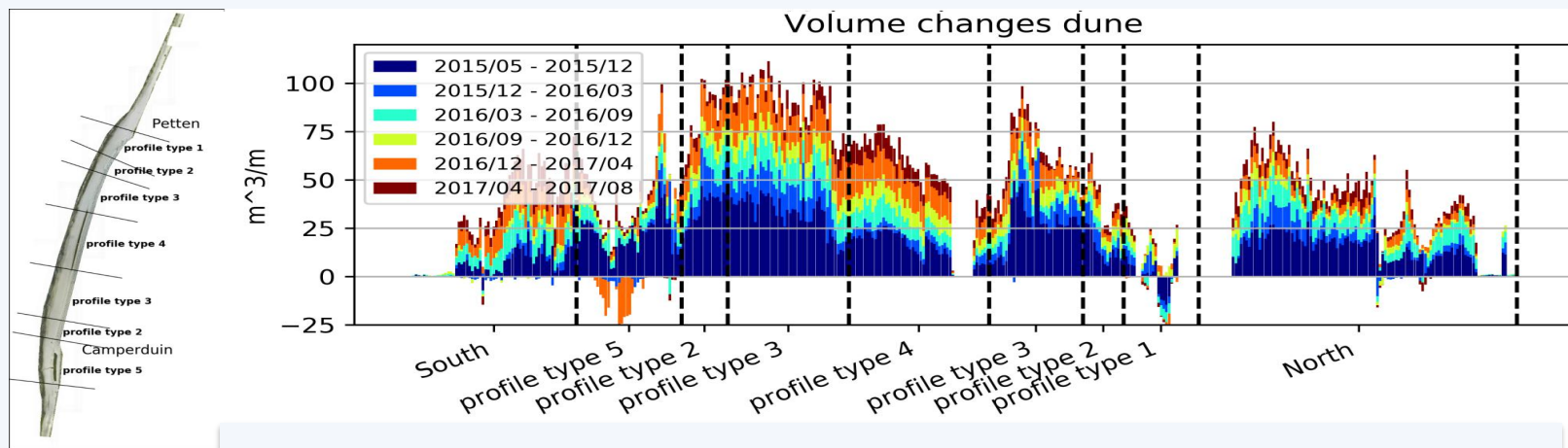


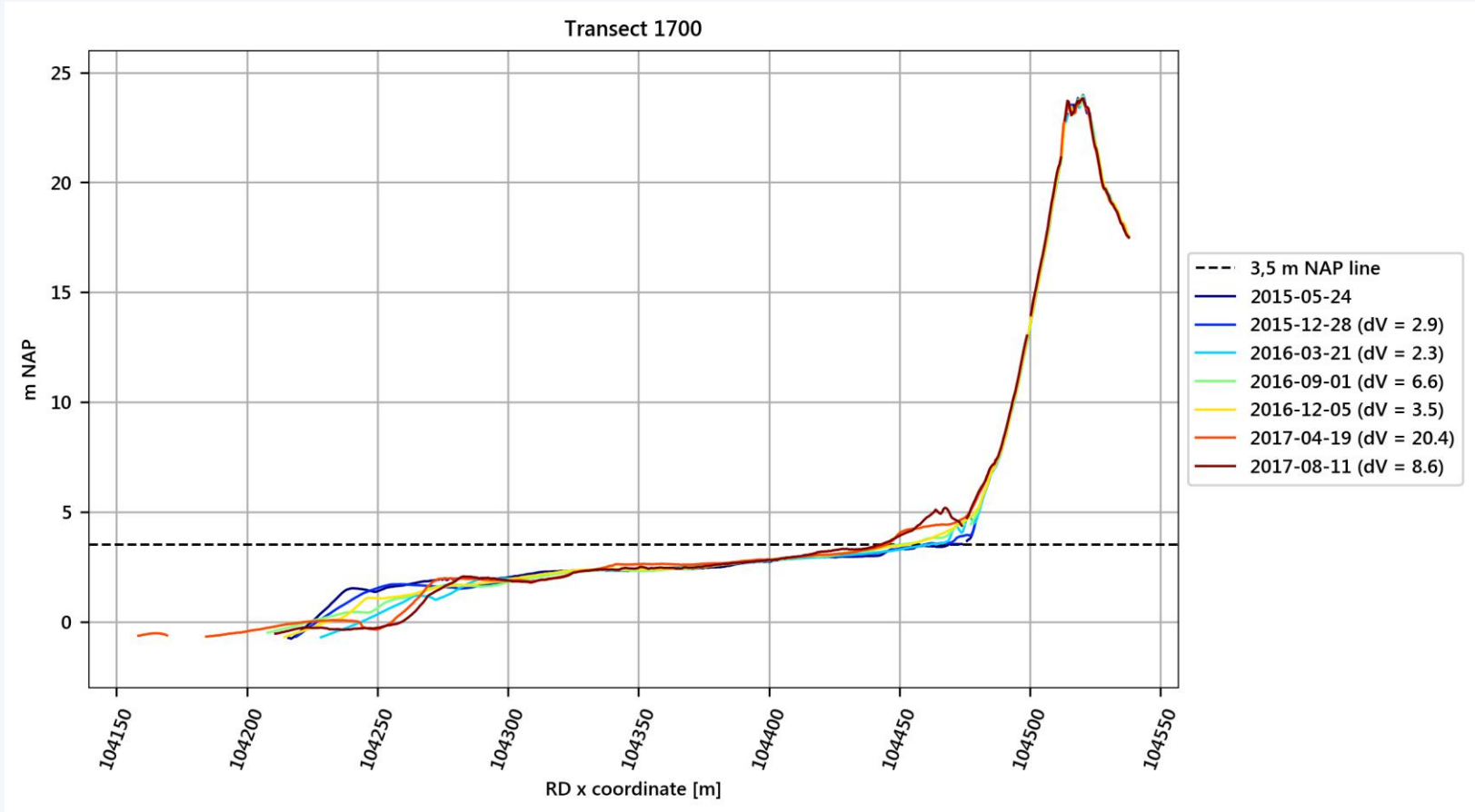


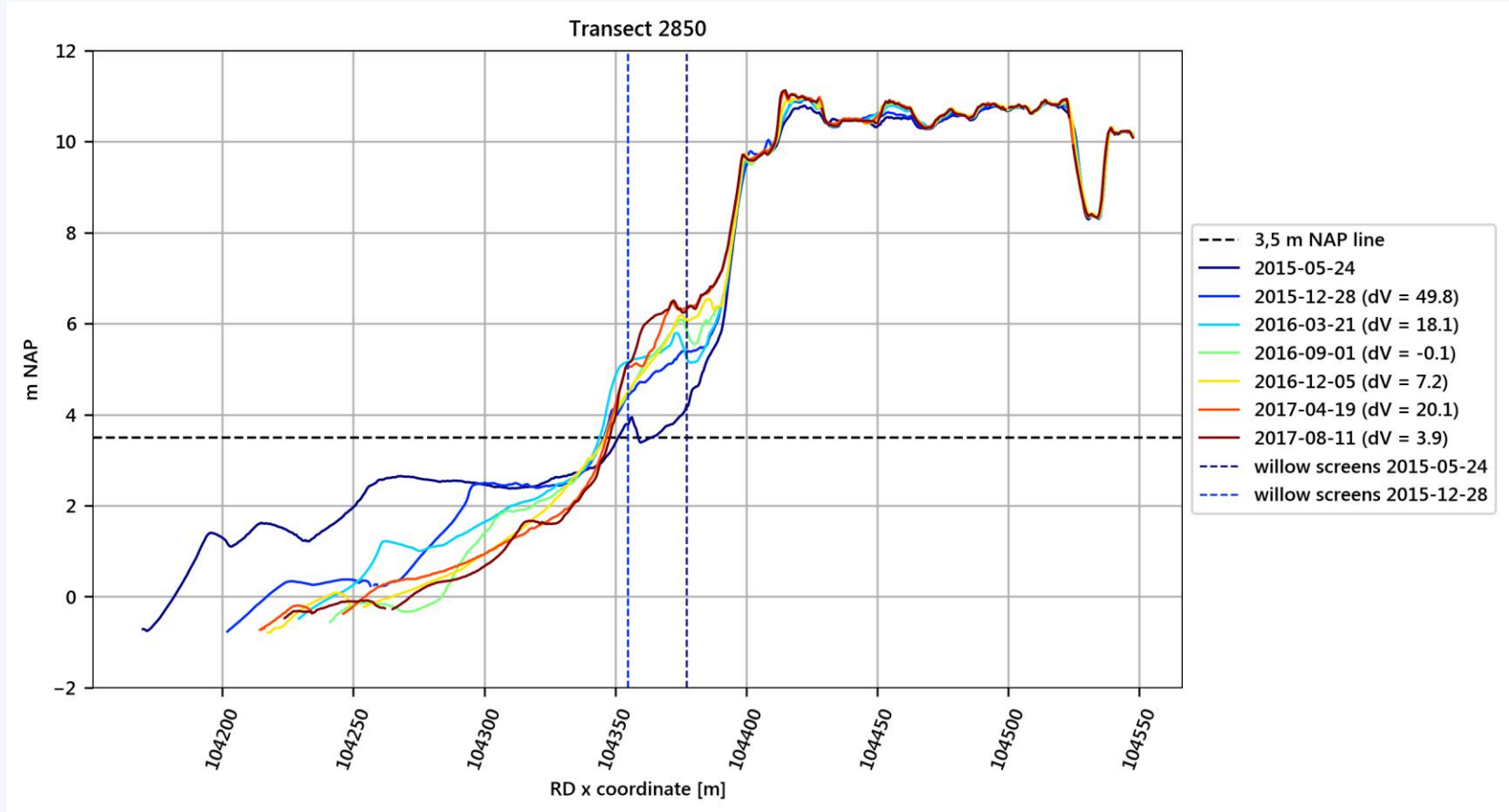
# Accumulation/erosion volumes

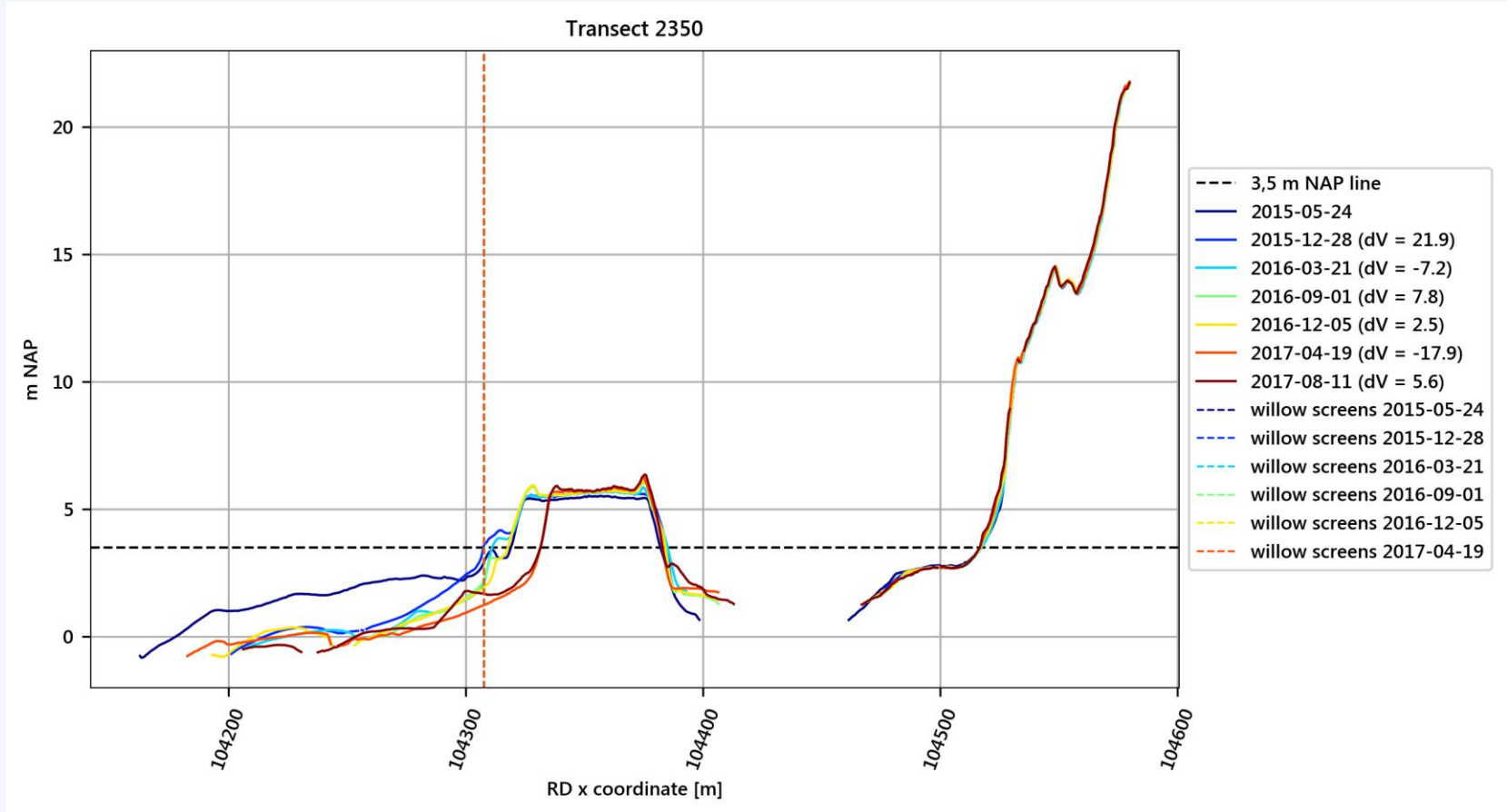
## Differences between North and South

- Influence of Construction method (South => North), duration more than one year
- Vegetation (south more vegetation) (differences in 2016)
- Grain size (S: 229 mu, N: 327 mu)
- Orientation of the coast



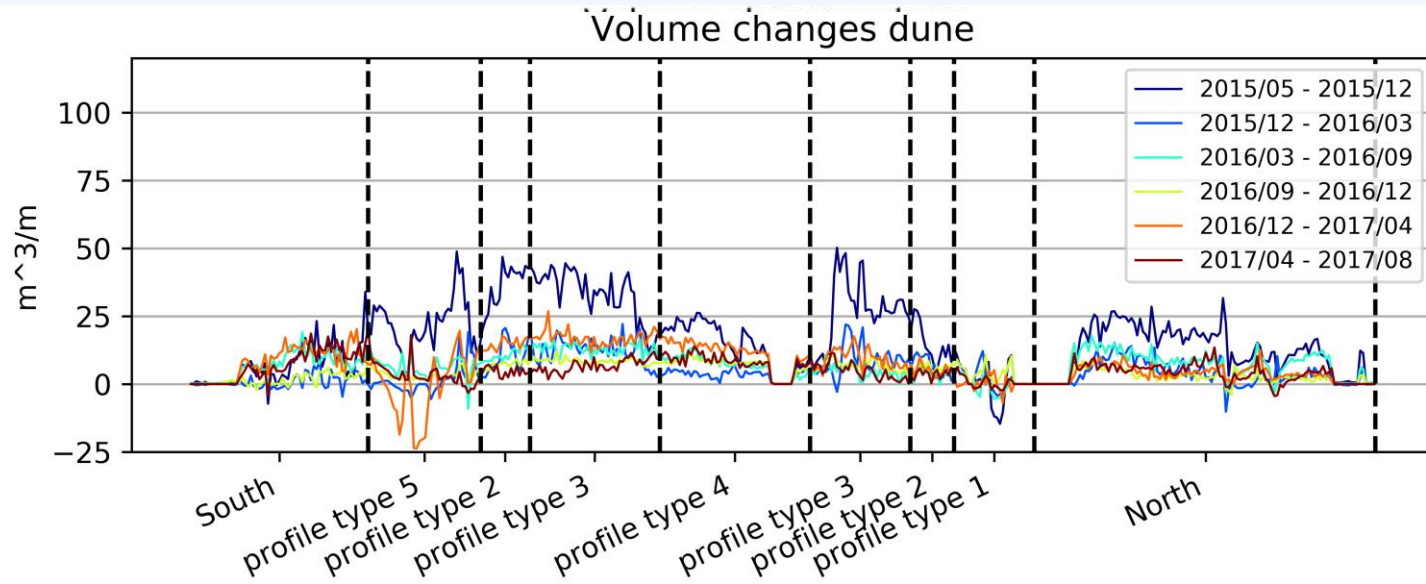
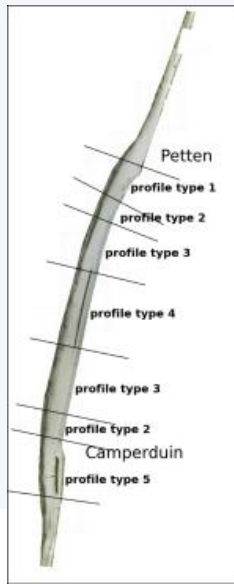






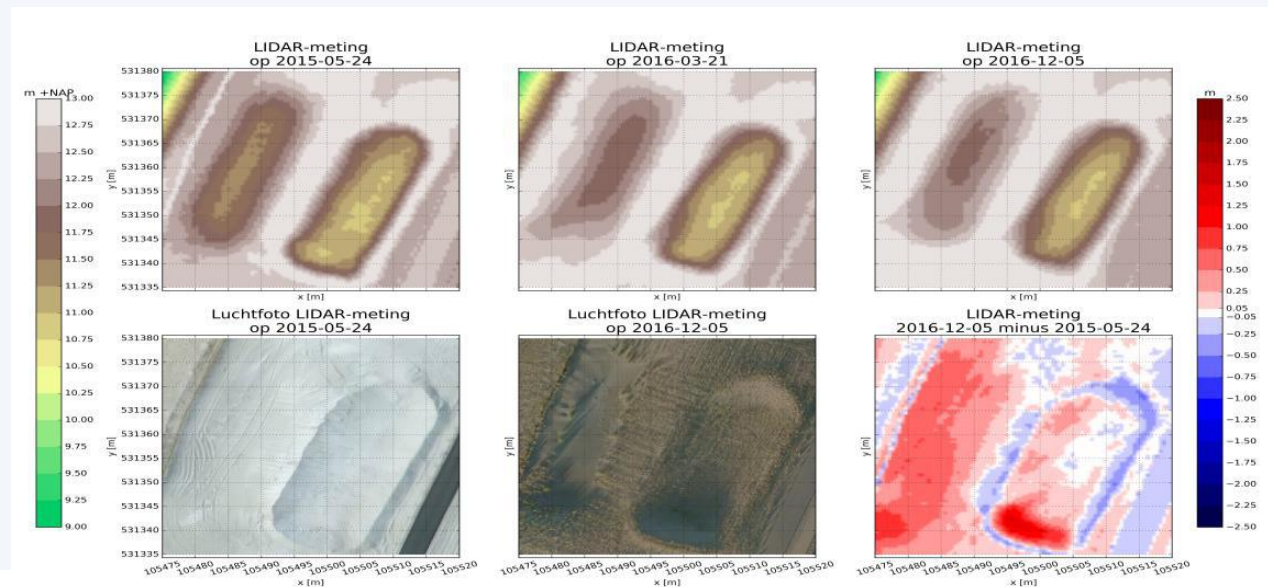
# Conclusions

- Accumulation of the volume of dunes
- Tends to stabilize
- Profile types do matter
- Good vegetation helps the accumulation
- Extra features like brushwood screens, sand pits will help



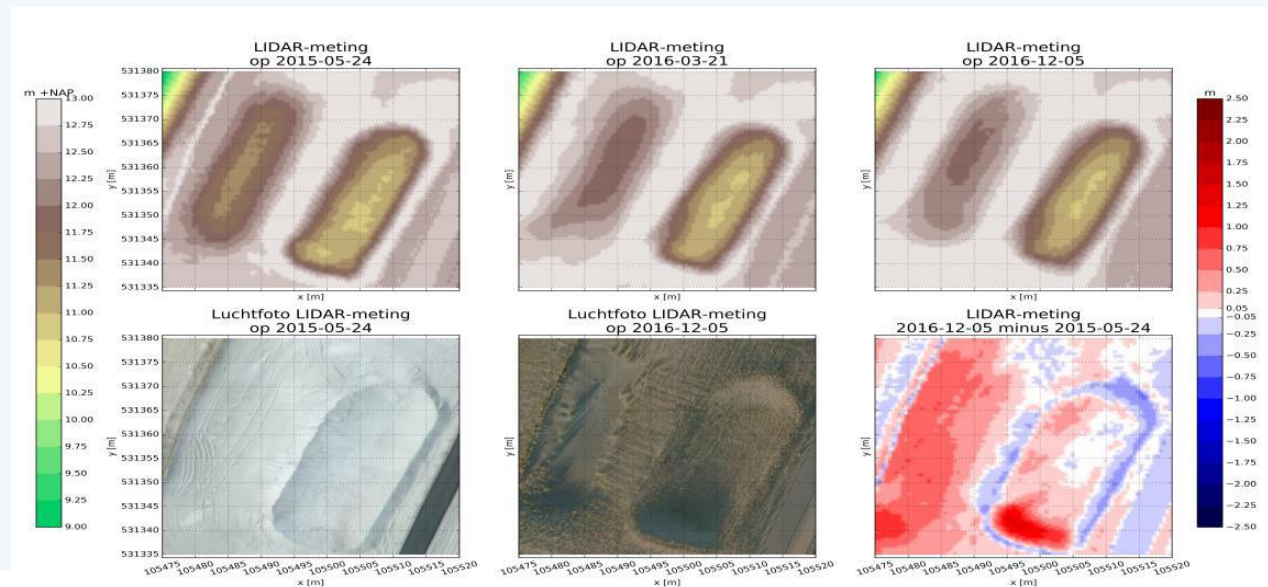
## Methodology artificial relief features

- Artificially made pits: deep pits and shallow pits
- Large pits and small pits
- Distance 20m to 100m from dike
- Comparison with reference locations

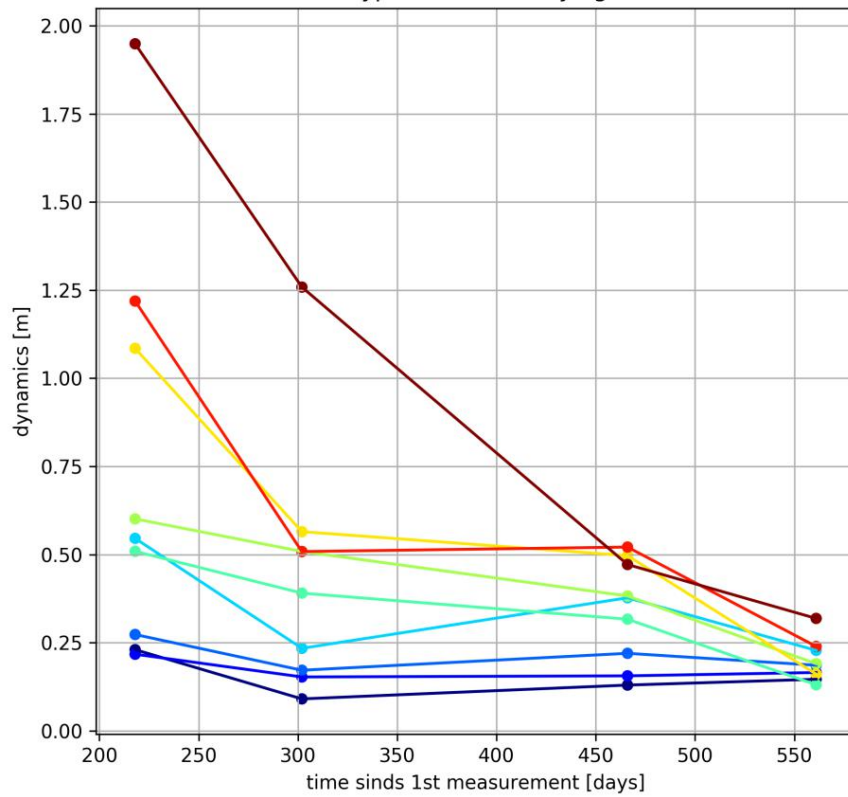


## Methodology artificial relief features

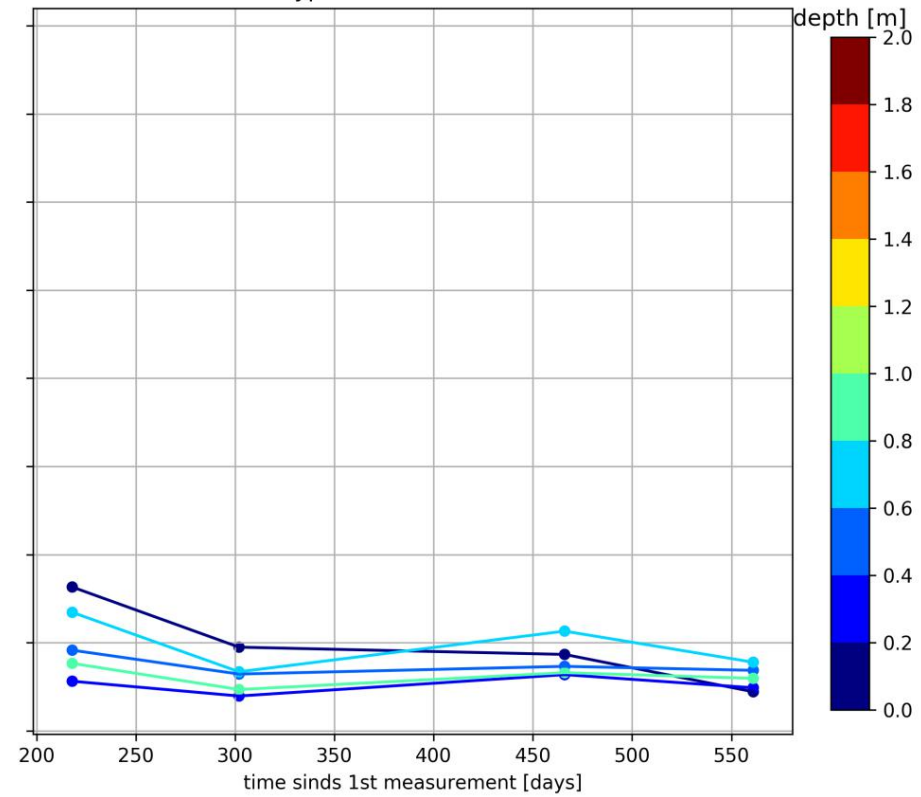
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Profile type 2 South low lying areas

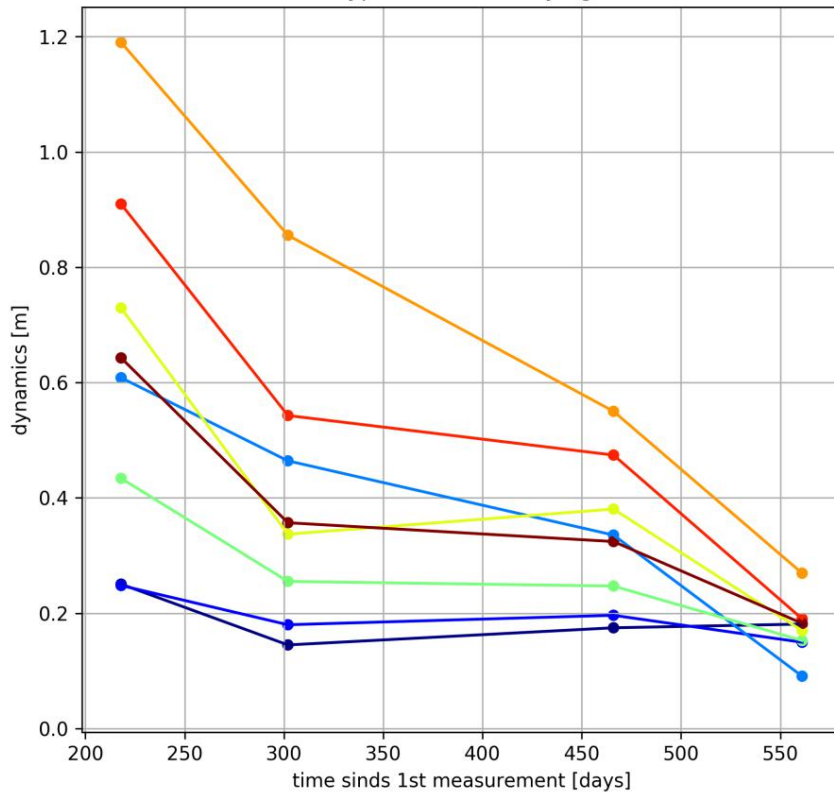


Profile type 2 South reference areas

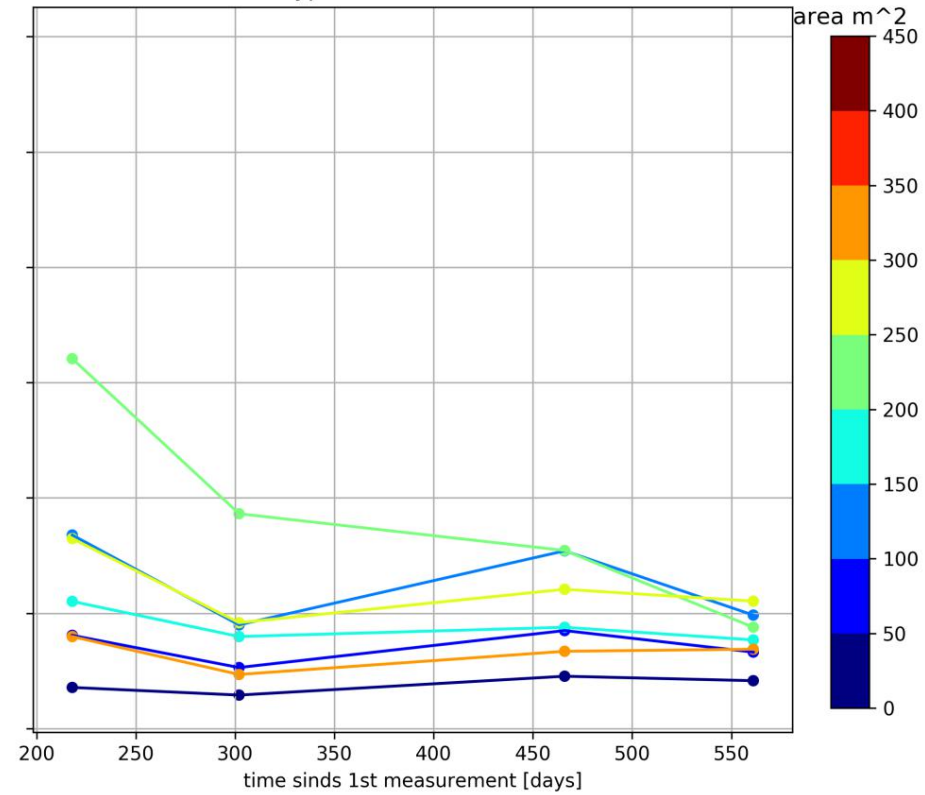




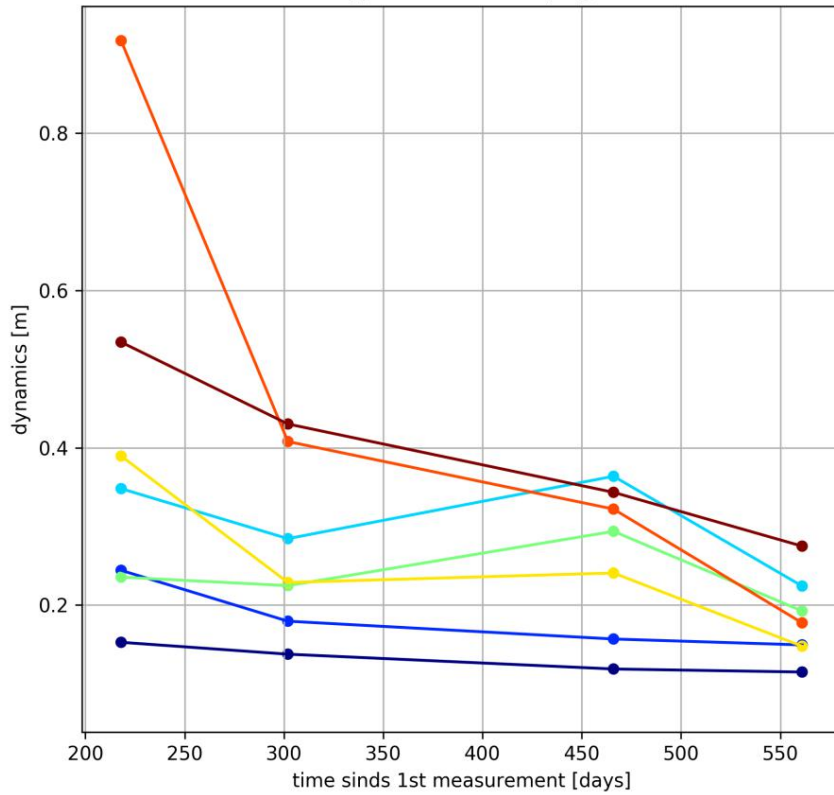
Profile type 2 South low lying areas



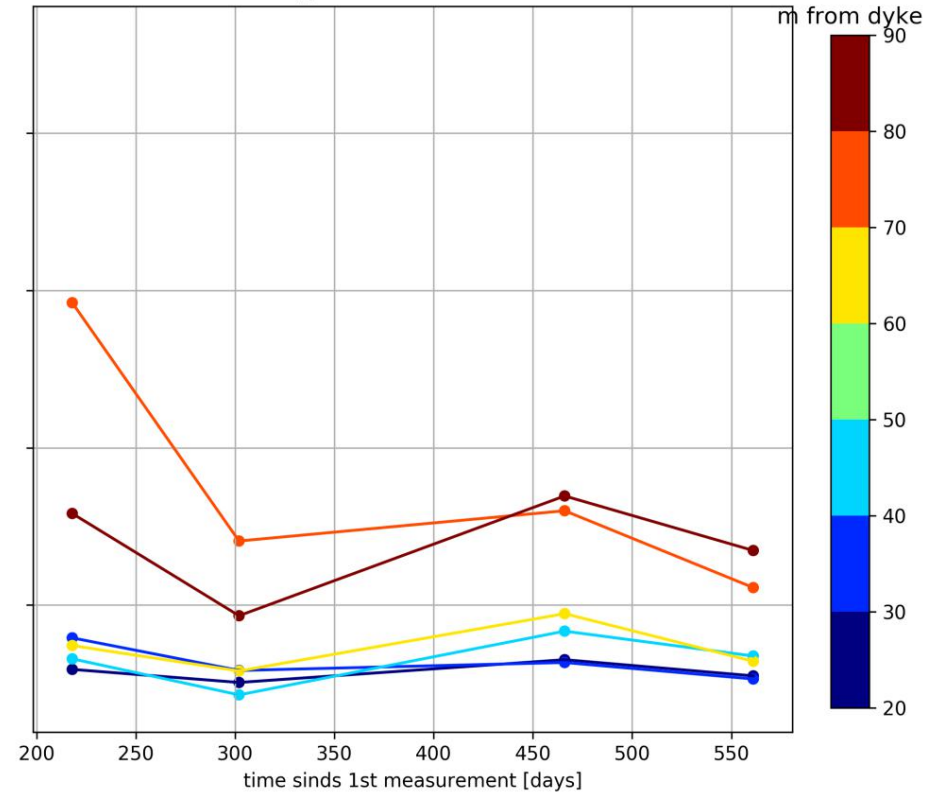
Profile type 2 South reference areas



Profile type 2 South low lying areas



Profile type 2 South reference areas



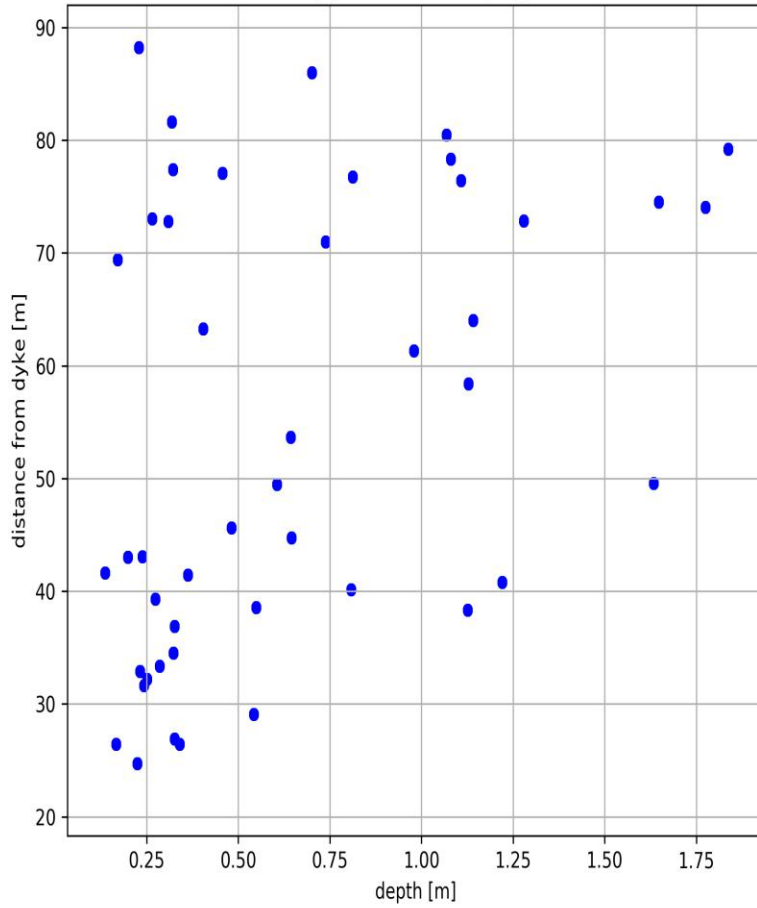
## Results artificial relief features

- Dynamic behaviour reduces in time
- Deeper or larger pits are more dynamic
- Shallow pits (< 1m) show the same behaviour as reference locations
- Distance is hardly correlated with dynamic behaviour

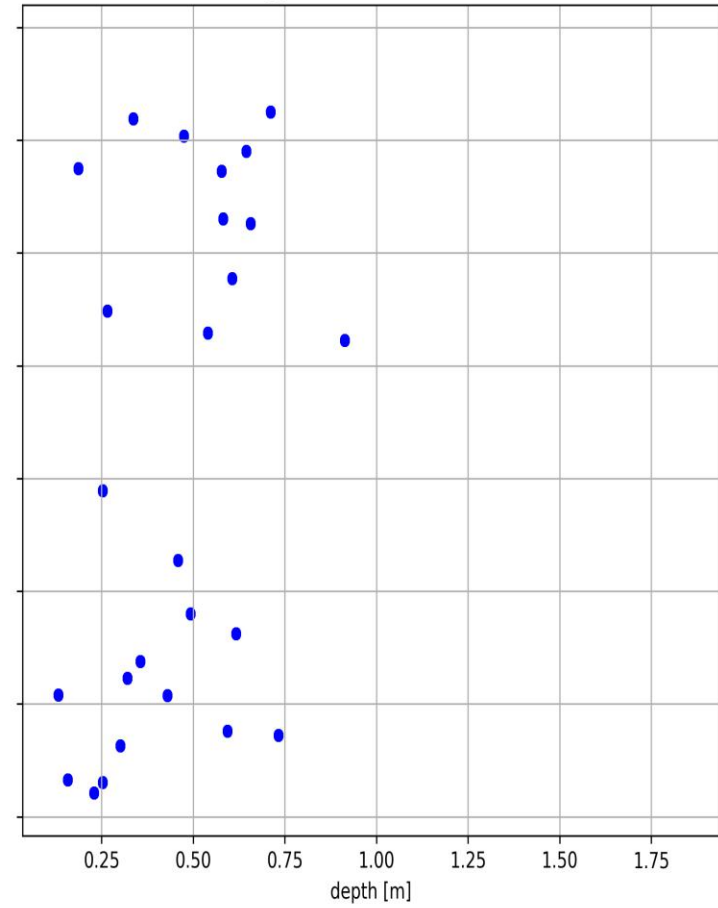


[www.witteveenbos.com](http://www.witteveenbos.com)

Profile type 2 South low lying areas



Profile type 2 South reference areas



## Results artificial relief features (north south)

- Profile 2 south
  - D50=229 mu
  - Good vegetation
- Profile 2 north
  - D50=327 mu
  - Poor vegetation

