DUNE IN FRONT OF A DIKE

1D CASE

AeoLiS short course

CS 2023 New Orleans

fwo

KU LEUVEN

Glenn Strypsteen

- Civil engineer
- Phd in Coastal Engineering

The Belgian coast is a sandy coast

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Nuisance of wind-blown sand

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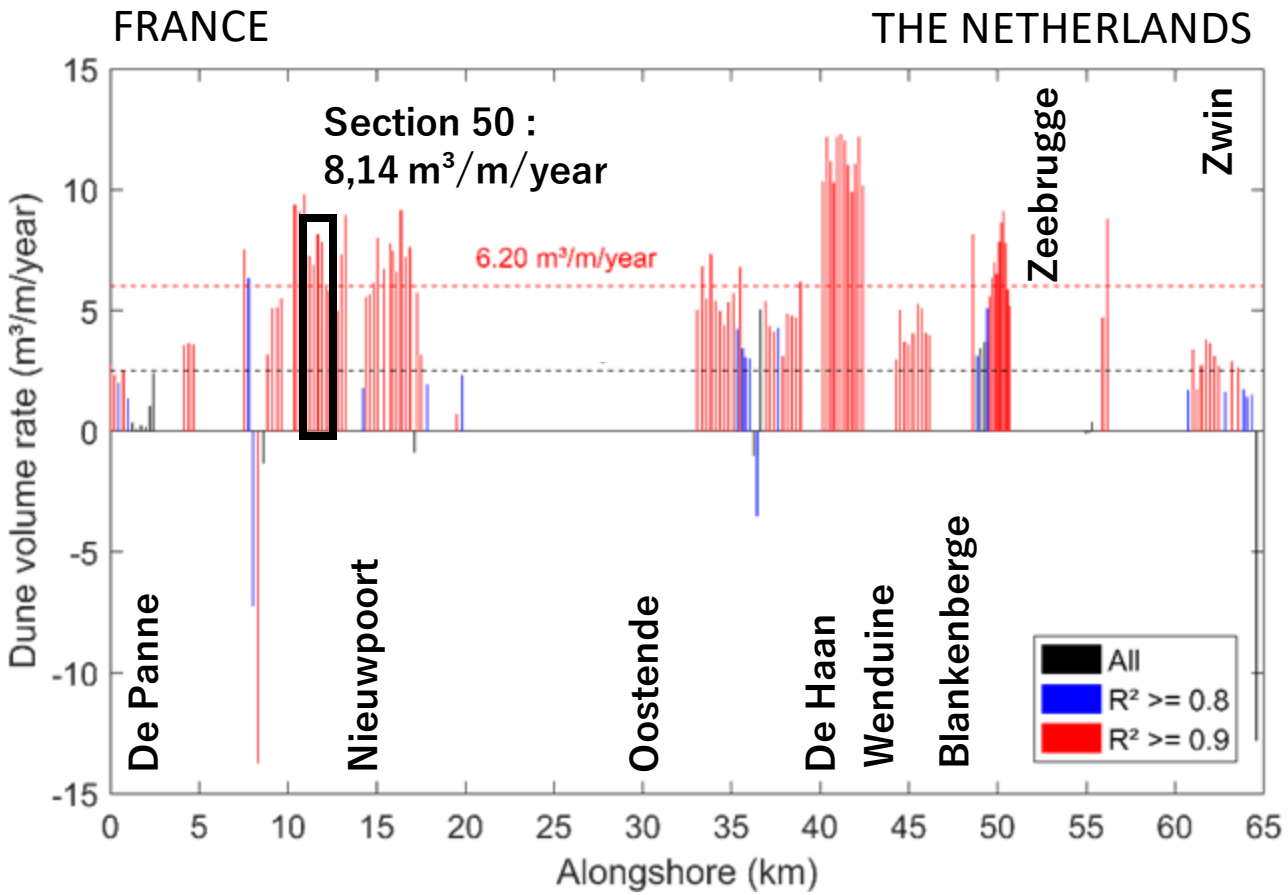
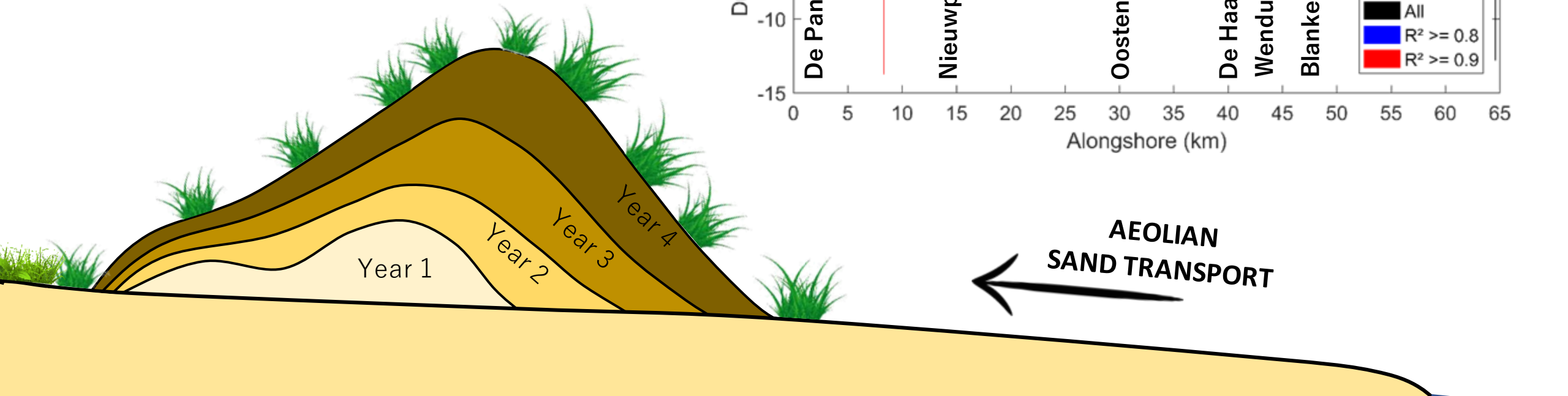
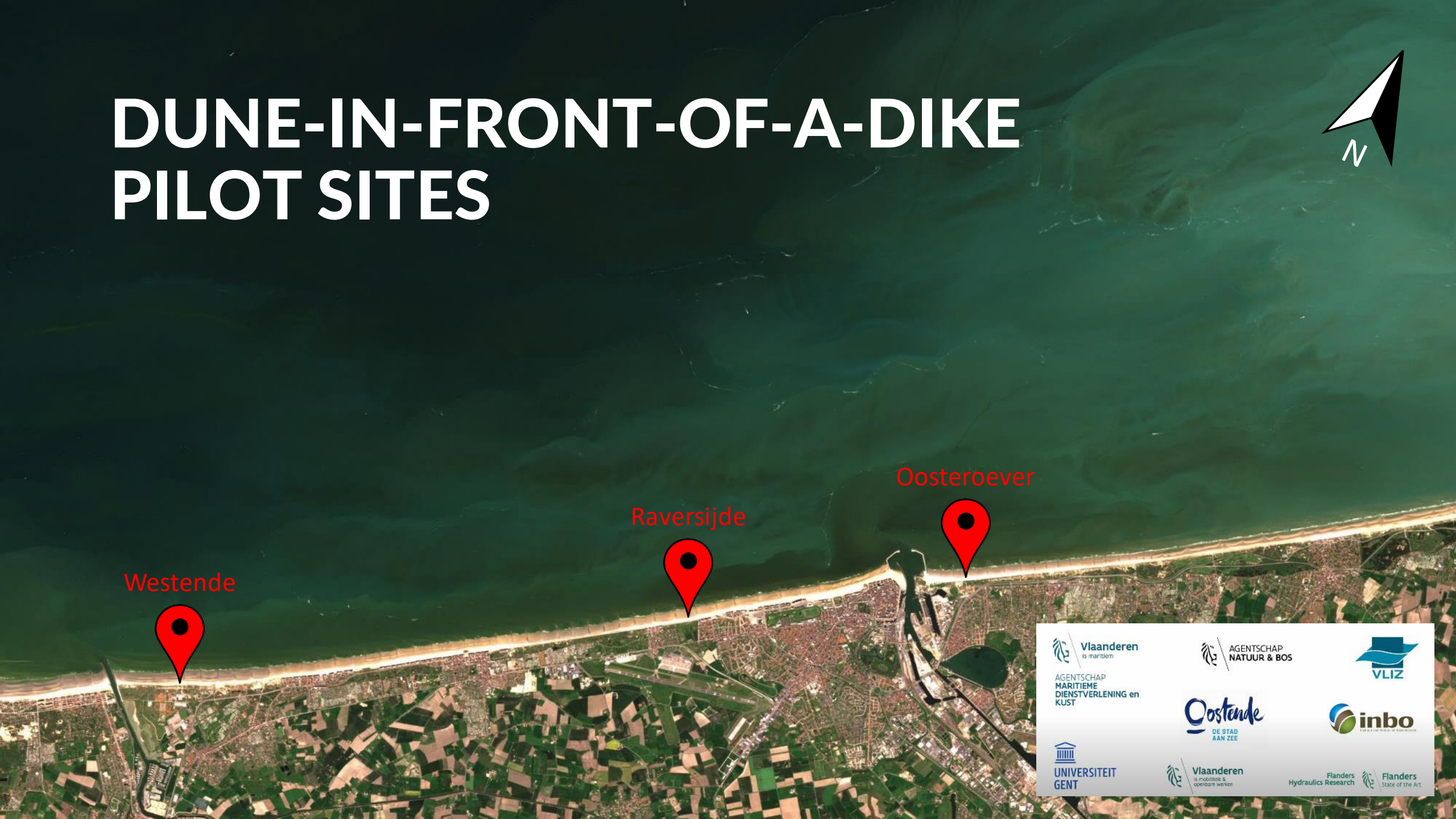
Our natural dunes grow





Strypsteen et al. (2019). Dune evolution at decadal timescales and its relation with potential aeolian transport. Journal Of Marine Science And Engineering, 7 (10), 1-24.

DUNE-IN-FRONT-OF-A-DIKE PILOT SITES



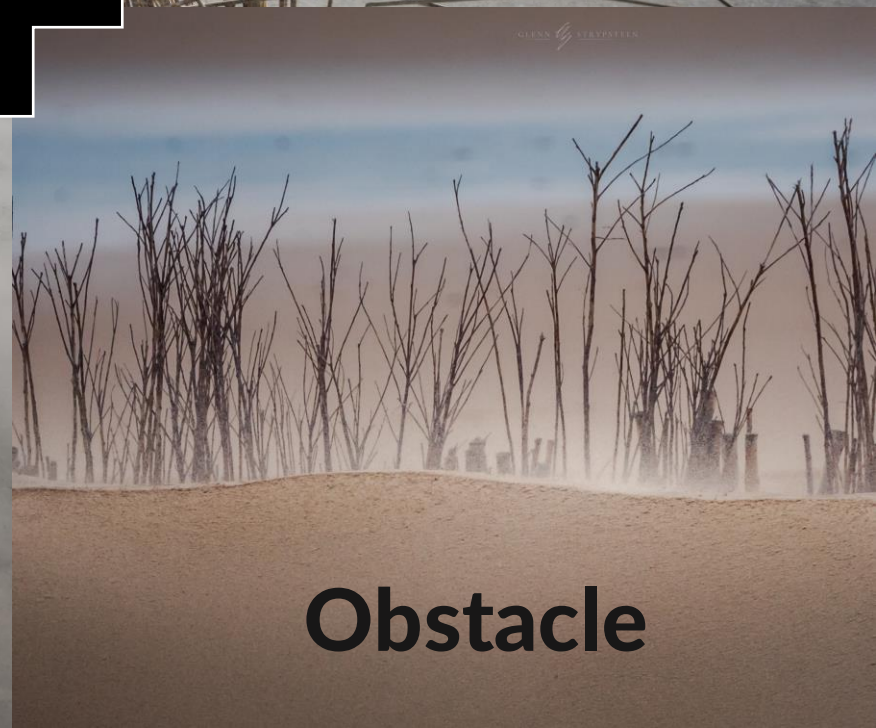
How to create dunes?

Sand

+

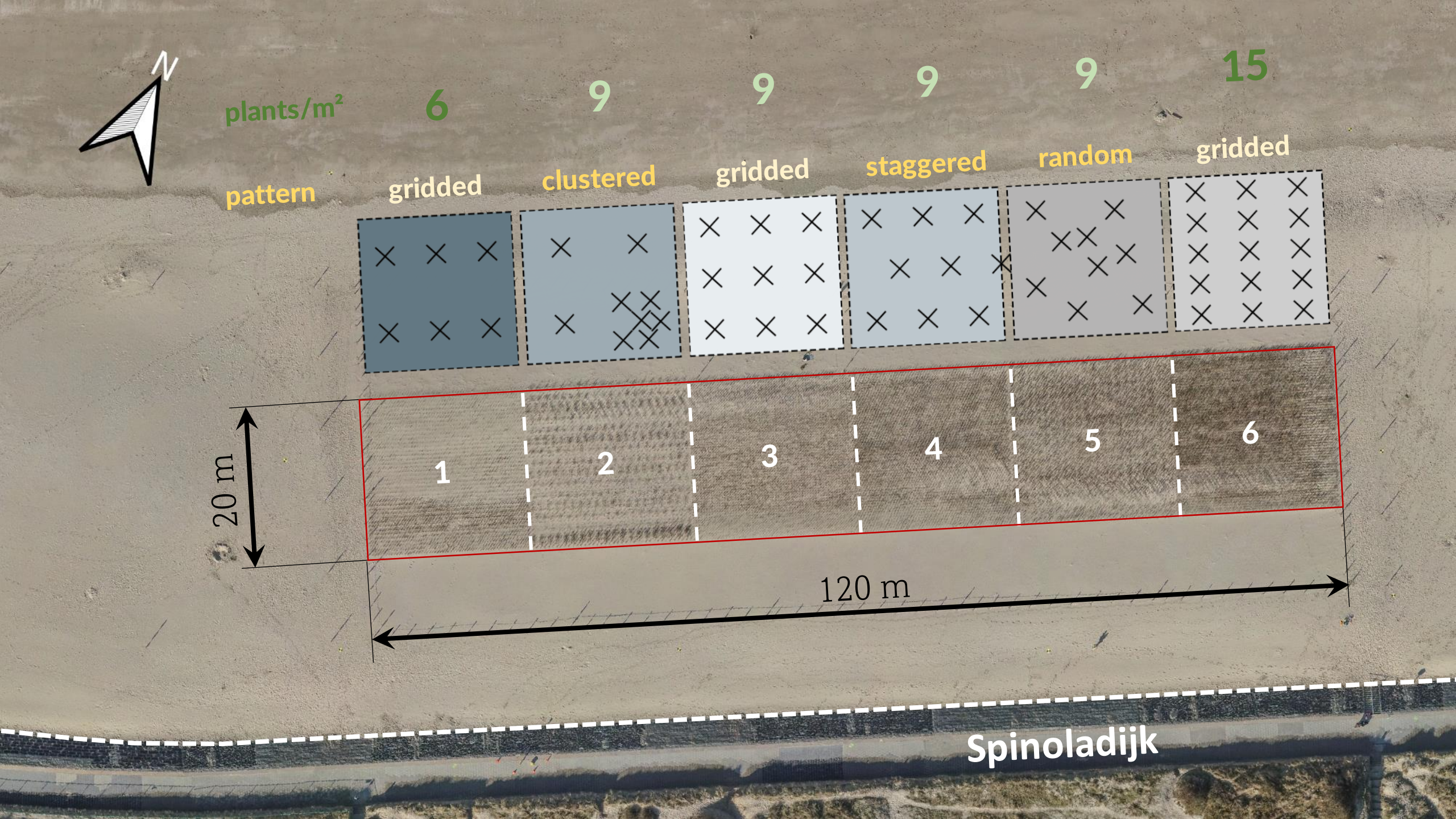
Wind

+



Obstacle

© Glenn Strypsteen
Vlaanderen
is maritiem
AGENTSCHAP
MARITIEME
DIENSTVERLENING en
KUST
Oostende
DE STAD
AAN ZEE
VLIZ
KU LEUVEN
AGENTSCHAP
NATUUR & BOS
inbo
Instituut voor Natuur- en Bosonderzoek
UNIVERSITEIT
GENT
Vlaanderen
is mobiliteit &
openbare werken
Flanders Hydraulics
Flanders
State of the Art


N
plants/m²
6
9
9
9
9
15
pattern
gridded
clustered
gridded
staggered
random
gridded
1
2
3
4
5
6
20 m
120 m
Spinoladijk

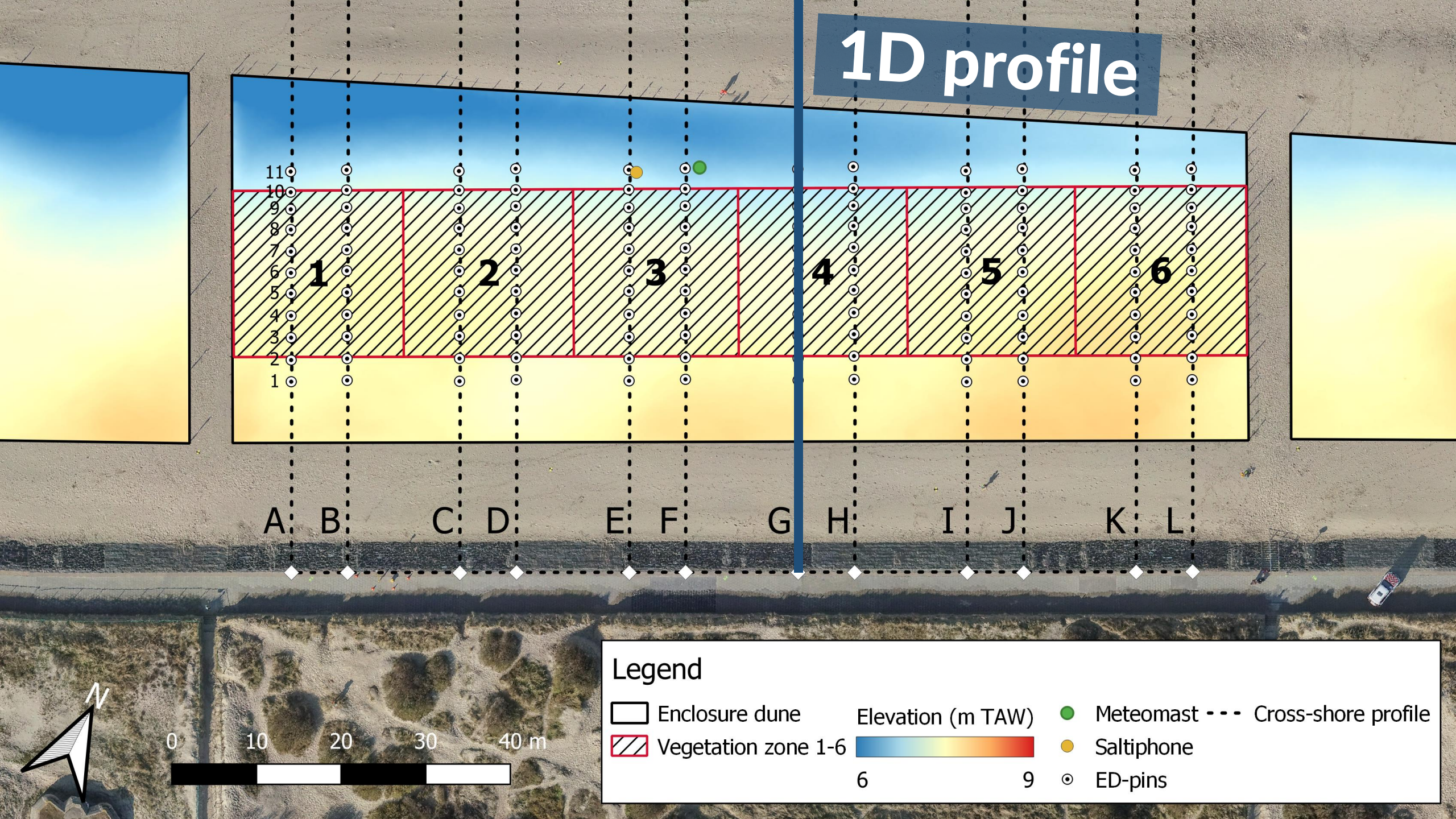
March 2021

November 2022

Goal

- Understanding the effect of different processes for simulation of a new artificial coastal dune field in 1D:

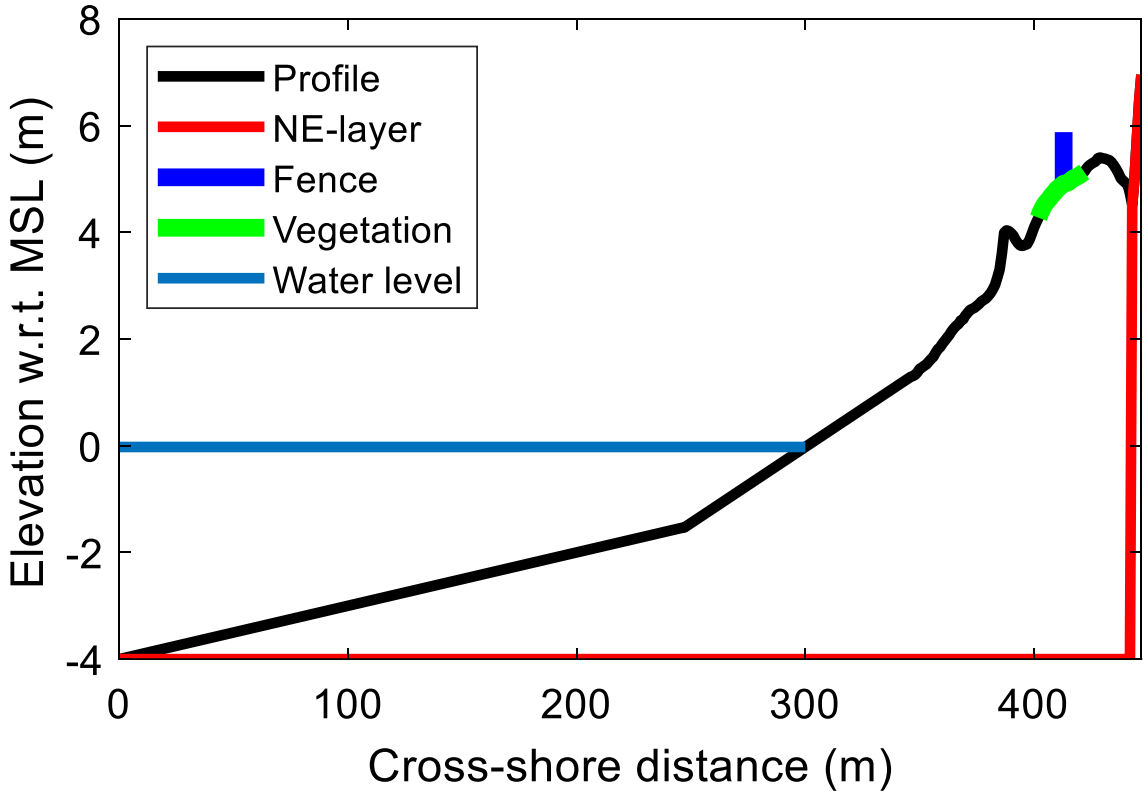
  1. Base case (no management strategy)
  2. Influence of moisture
  3. Influence of sand fence
  4. Influence of vegetation


1D profile
11
10
9
8
7
6
5
4
3
2
1
1
2
3
4
5
6
A
B
C
D
E
F
G
H
I
J
K
L
N
0
10
20
30
40 m
Legend
Enclosure dune
Vegetation zone 1-6
Elevation (m TAW)
6
9
Meteomast
Saltiphone
ED-pins
Cross-shore profile

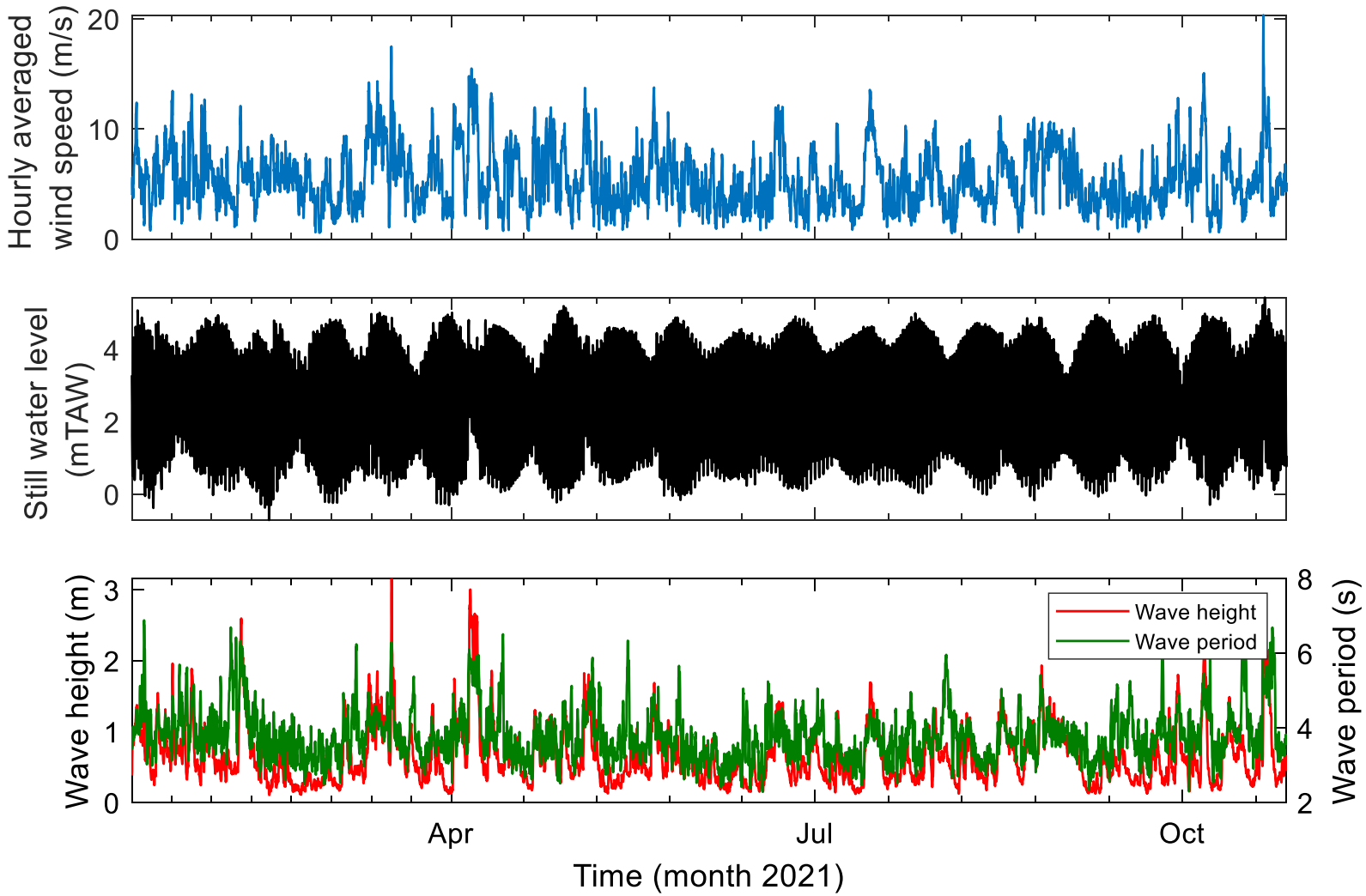
Model setup

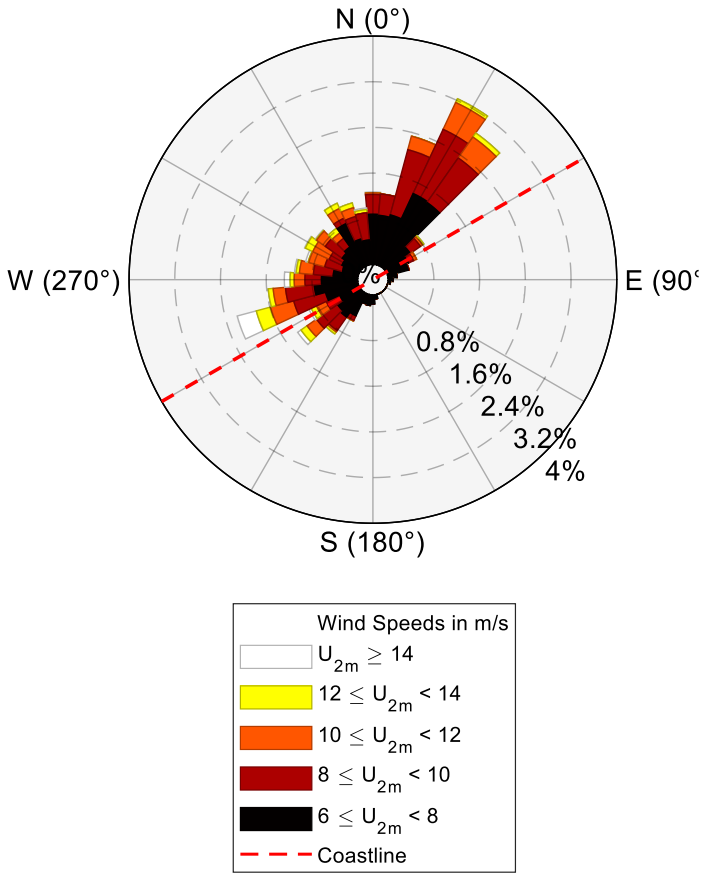
Runtime
1. 3min30sec
2. 9min40sec
3. 25sec
4. 6min

- Timeframe: February – October 2021
- Timestep: 1 hour
- Model domain: 447 m cross-shore
- NE-layer: dike
- Cases:
  1. NO veg, NO moisture, NO fence
  2. NO veg, moisture, NO fence
  3. NO veg, NO moisture, fence
  4. Veg, NO moisture, NO fence
- Vegetation: 58% cover, 1 m/year burial
- Fence: 1 m high
- Processes: Wave, tide, runup, transport, threshold, wind, bedupdate, wet_bed_reset, NO shear
- Other input: wind, tide, waves, grain size (d_{50} = 250 µm)



Input – Environmental conditions





Questions?