Utrecht University

SEAWAD

Sediment transport in the Ameland tidal inlet system: Insights from field data and model simulations

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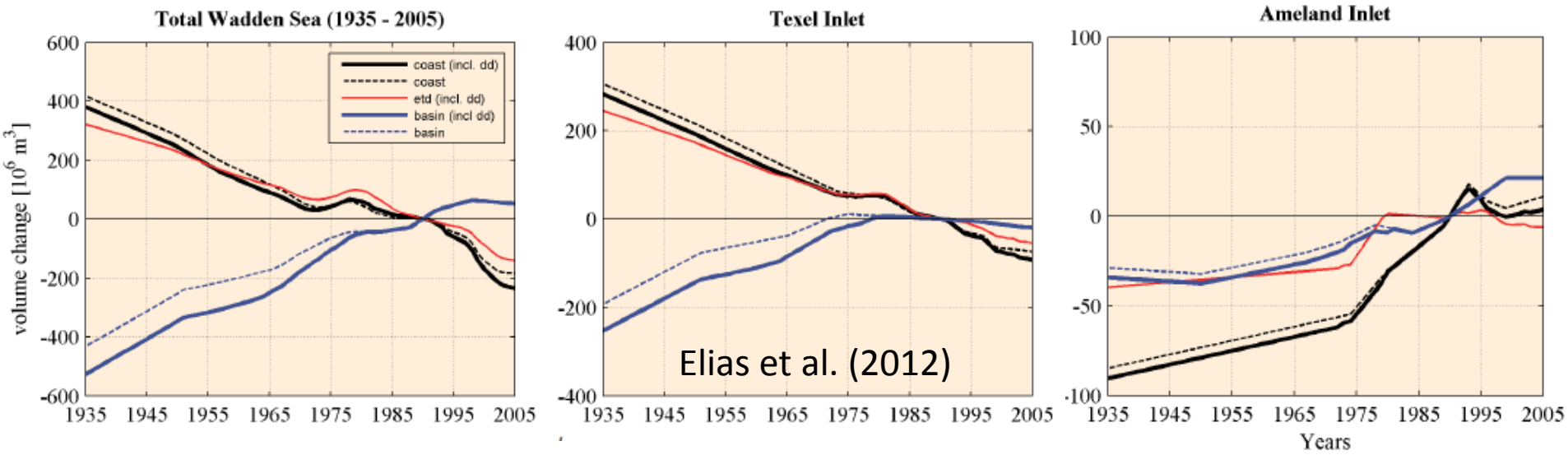
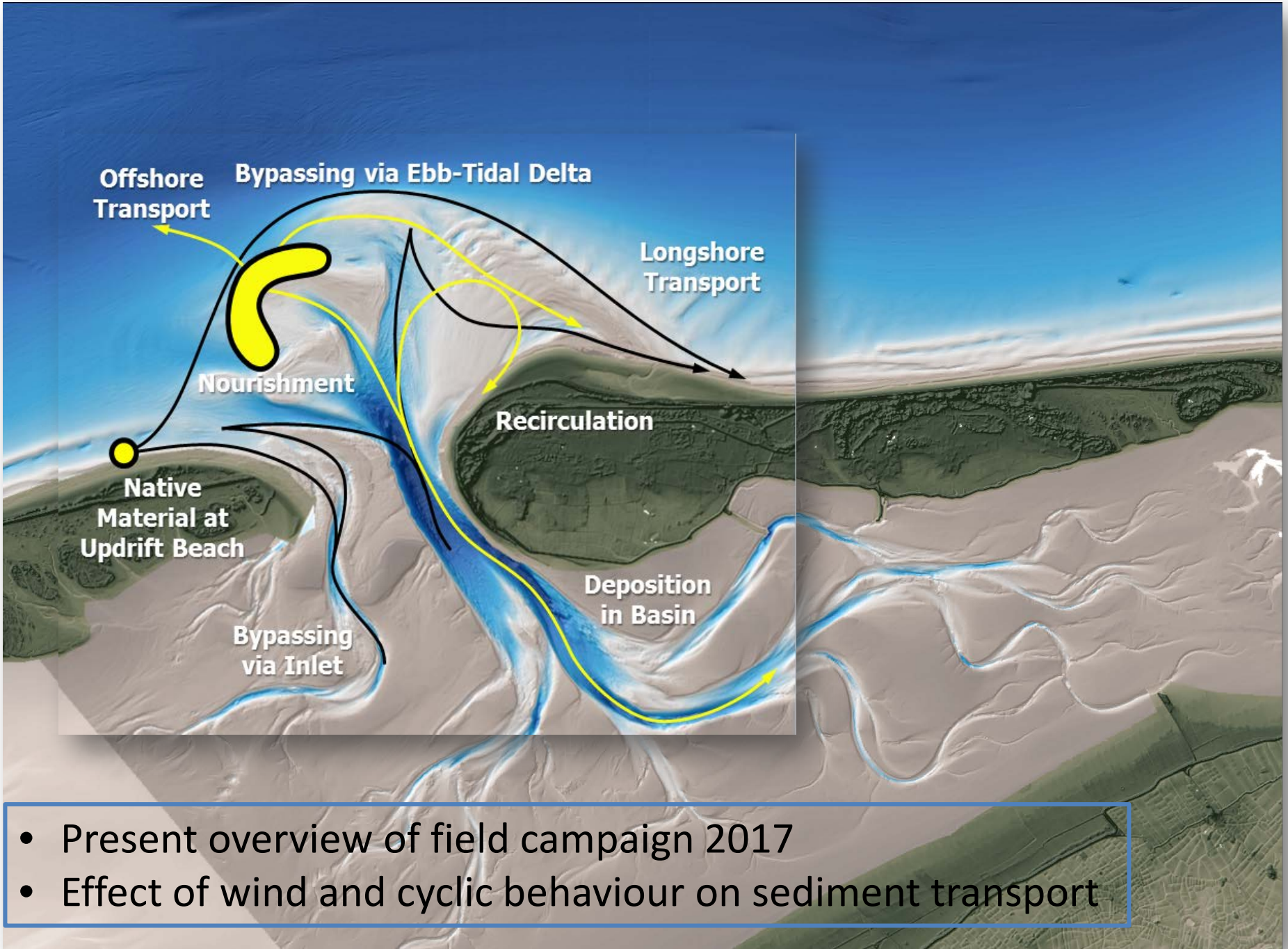
1. Utrecht University, 2. Delft University of Technology, 3. Deltares, 4. Rijkswaterstaat, 5. Twente University, 6. Data2Day

UNIVERSITY OF TWENTE.

NWO

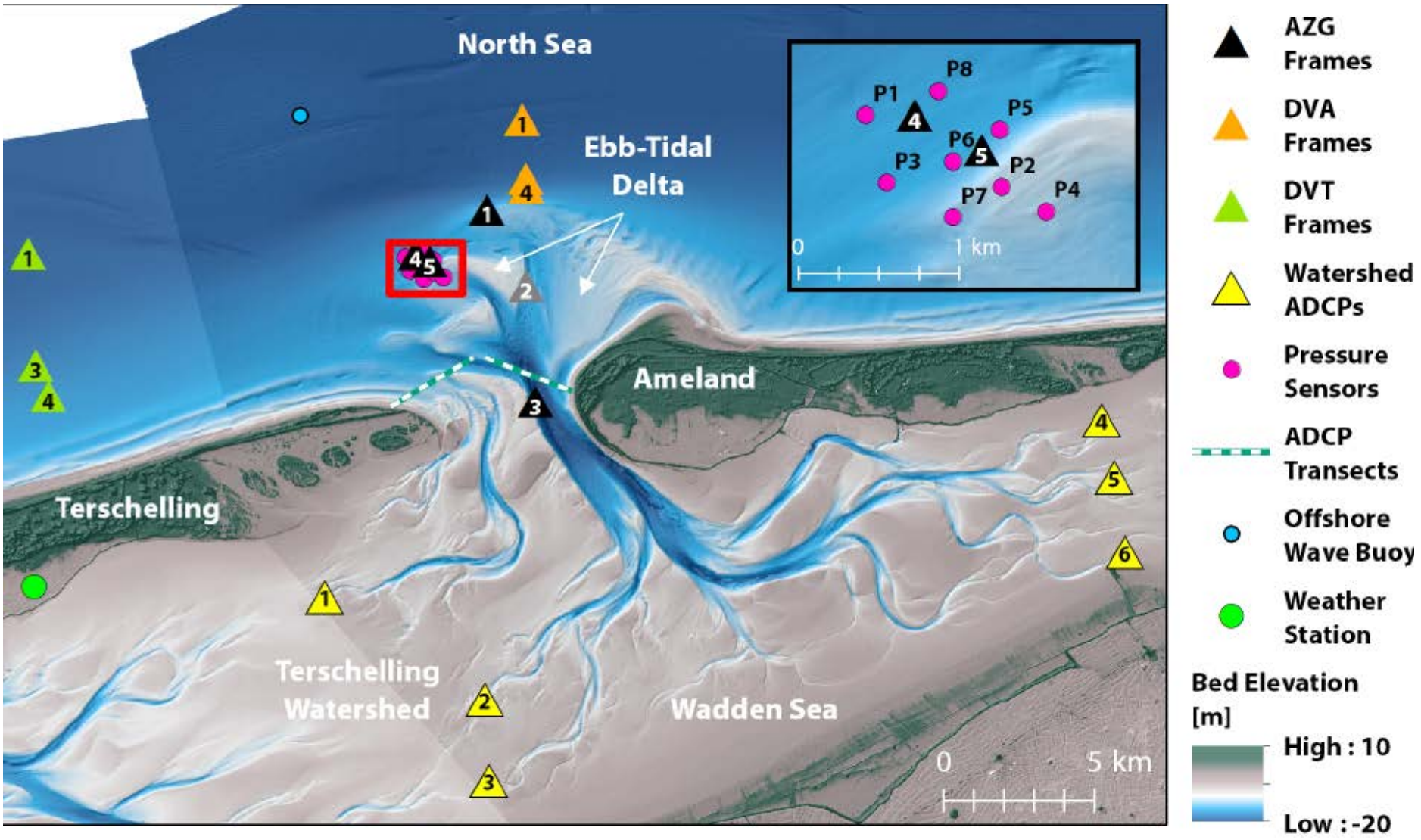


- Ebb-tidal deltas protect against storm waves and are source of sediment.
- Ebb-tidal deltas losing sediment volume; but not all.
- Can we nourish the ebb-tidal delta?
- **Research questions Seawad:**
  - What are the sediment pathways and how does it depend on grain size? Stuart Pearson
  - How does interaction of waves and currents influence sediment transport? Floris de Wit
  - What are bed-forms on the delta and how do they interact with hydrodynamics and sediment transport? Laura Brakenhoff
  - What is benthic species distribution on ebb-tidal delta? Harriëte Holzhauer
  - What's driving long-term cyclic evolution and how will it be influenced by a nourishment? Klaas Lenstra (NWO The New Delta project)

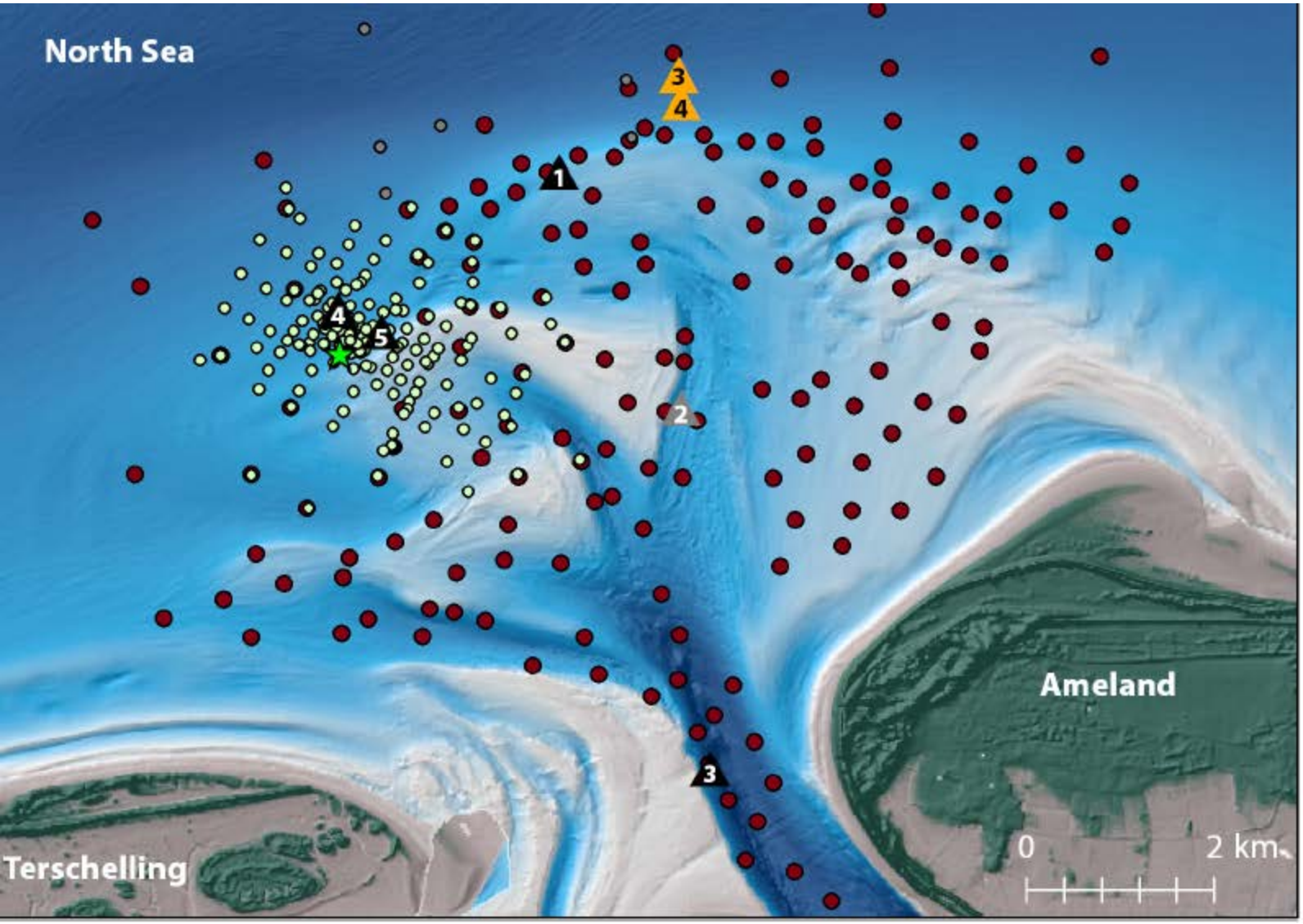


- Present overview of field campaign 2017
- Effect of wind and cyclic behaviour on sediment transport

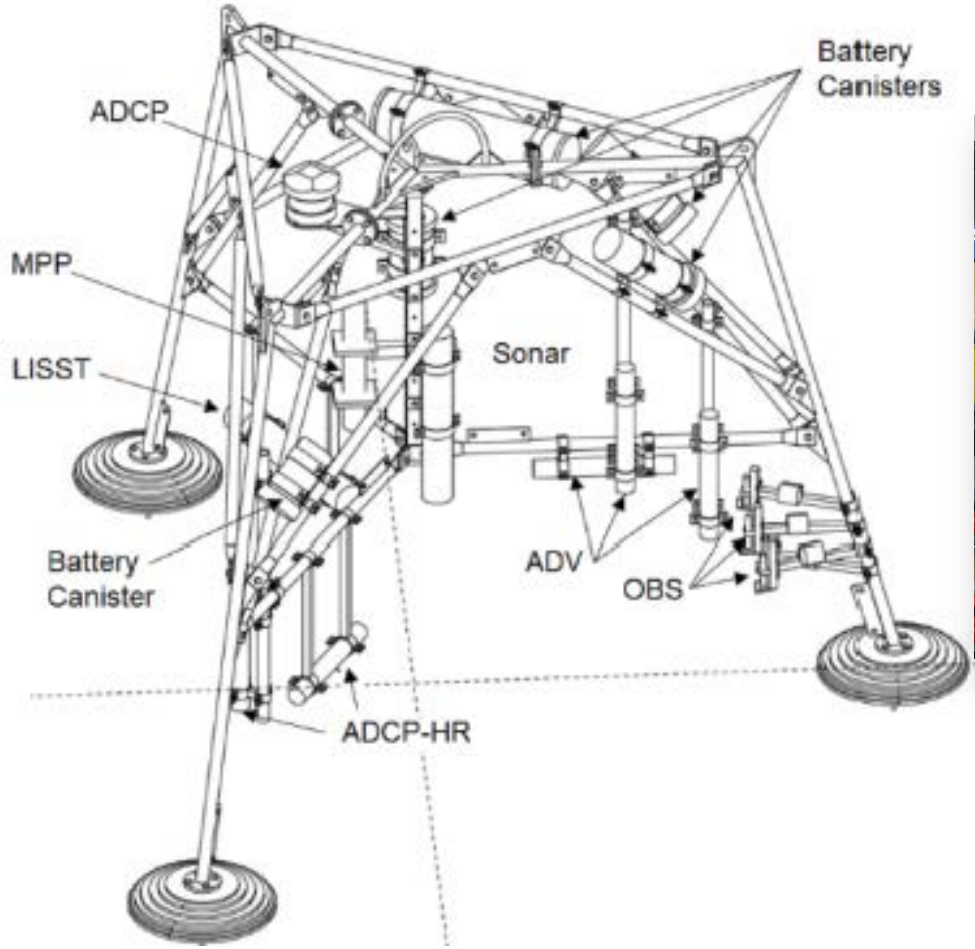
Set-up field campaign

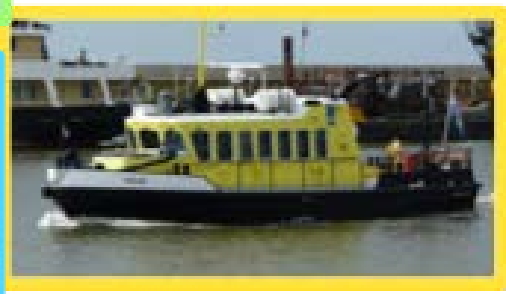


Set-up field campaign

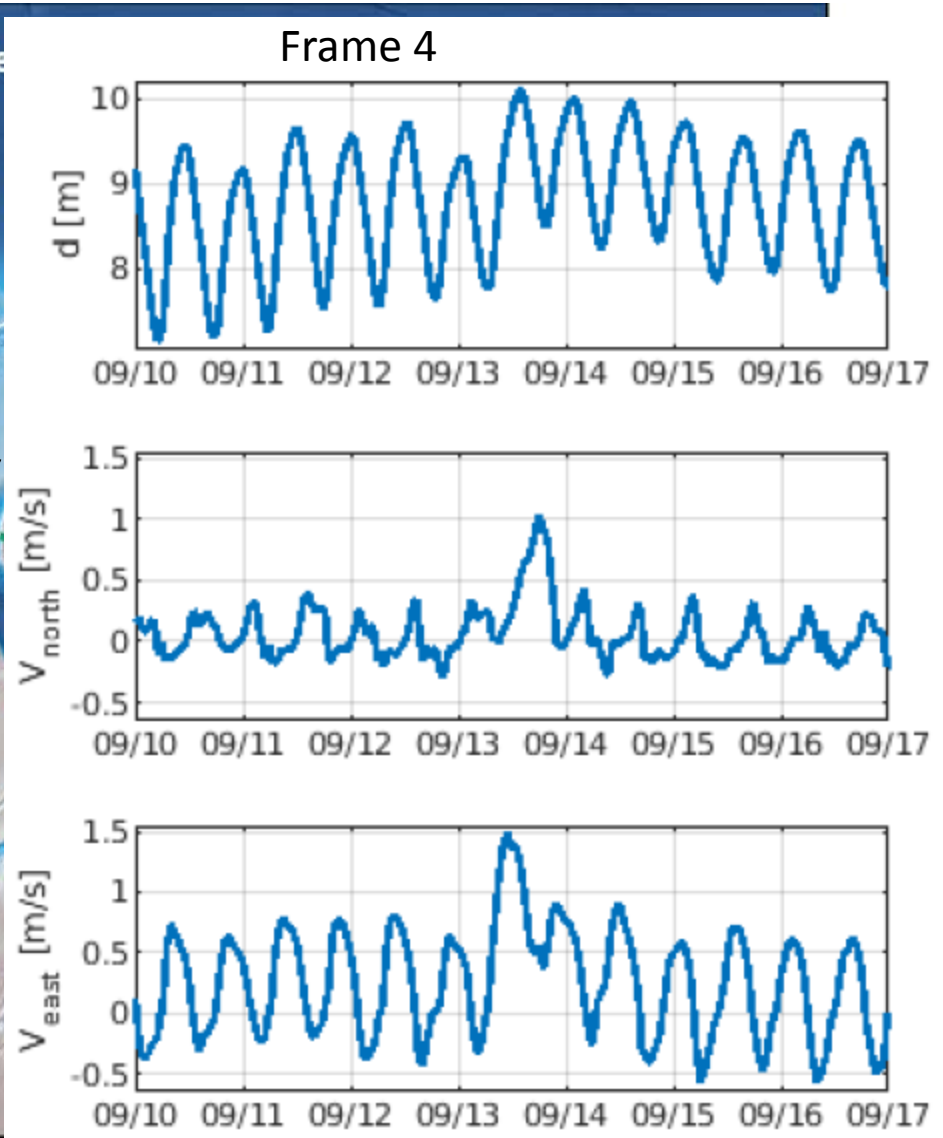


Measurement frames





Some results



AZG Frames

DVA Frames

DVT Frames

Watershed ADCPs

Pressure Sensors

ADCP Transects

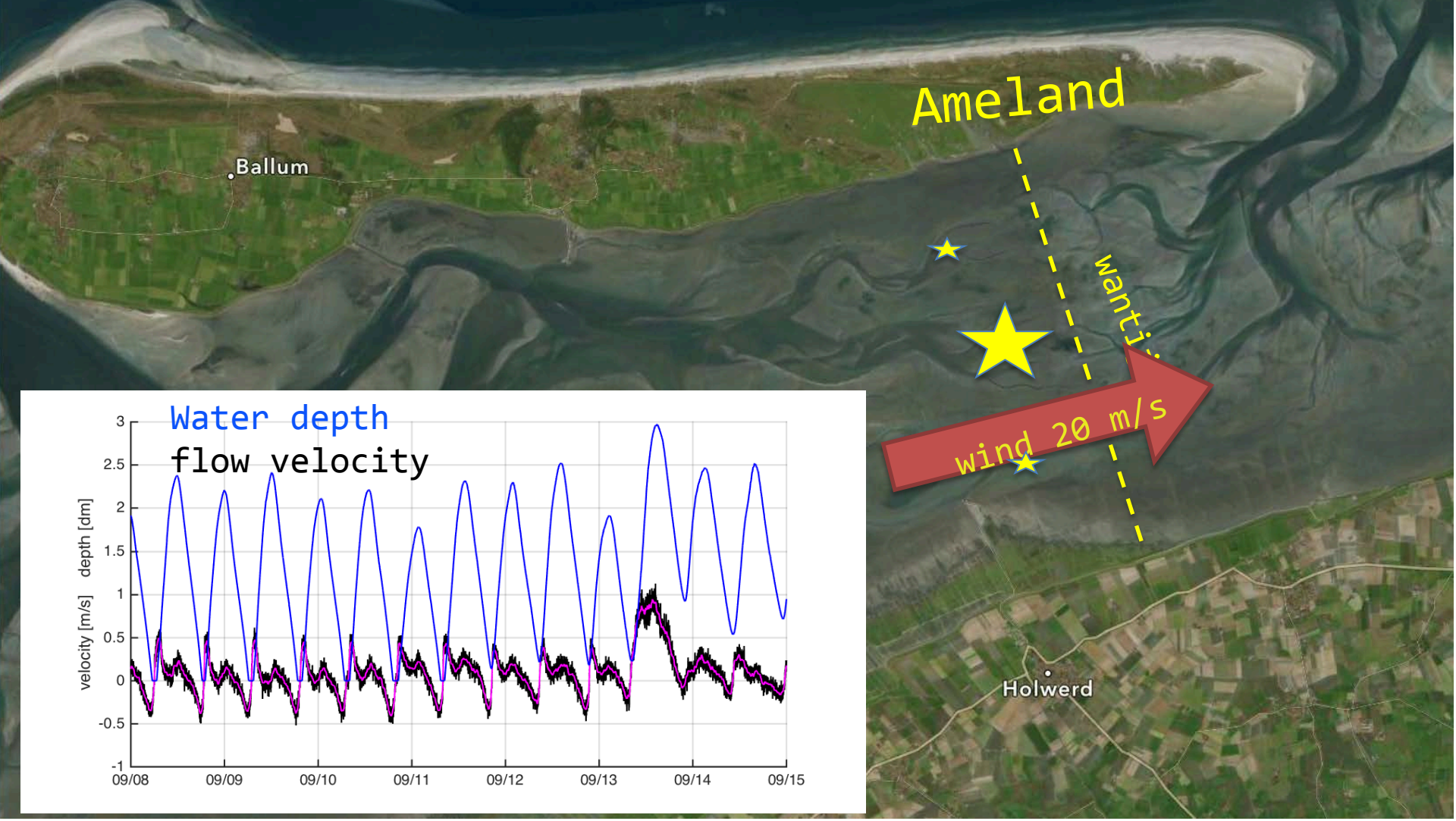
Offshore Wave Buoy

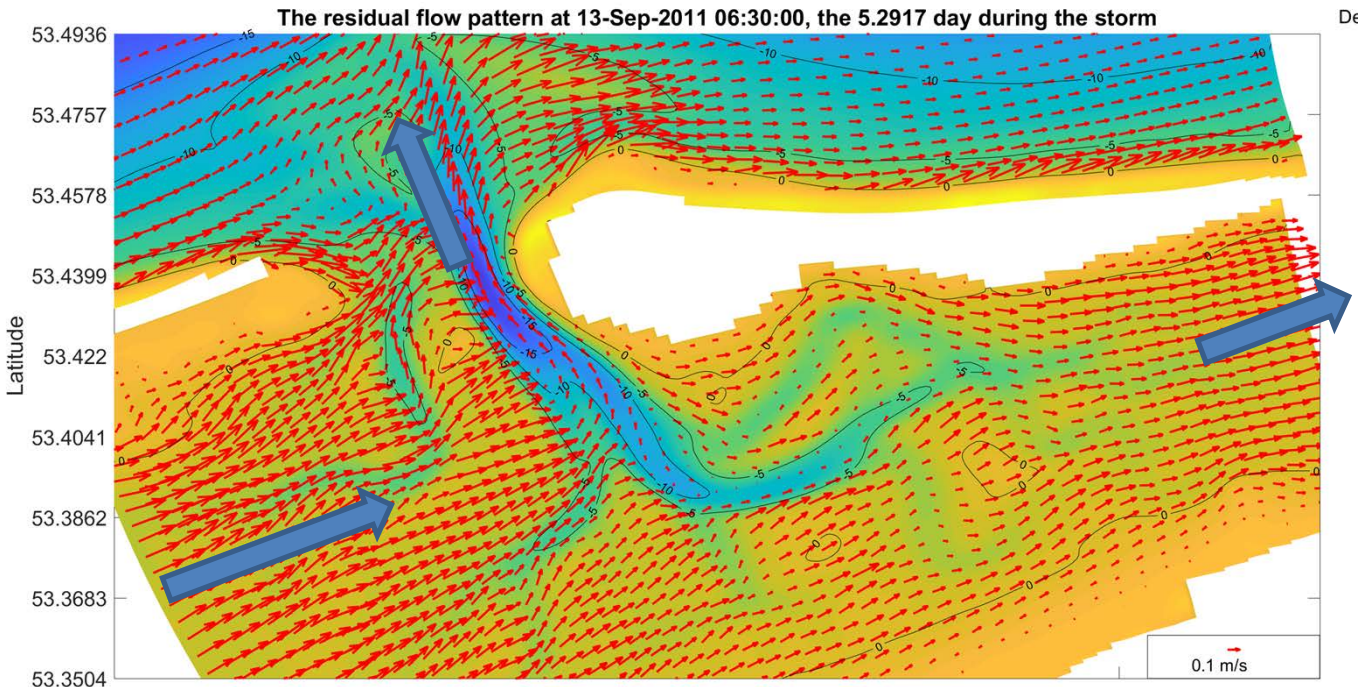
Weather Station

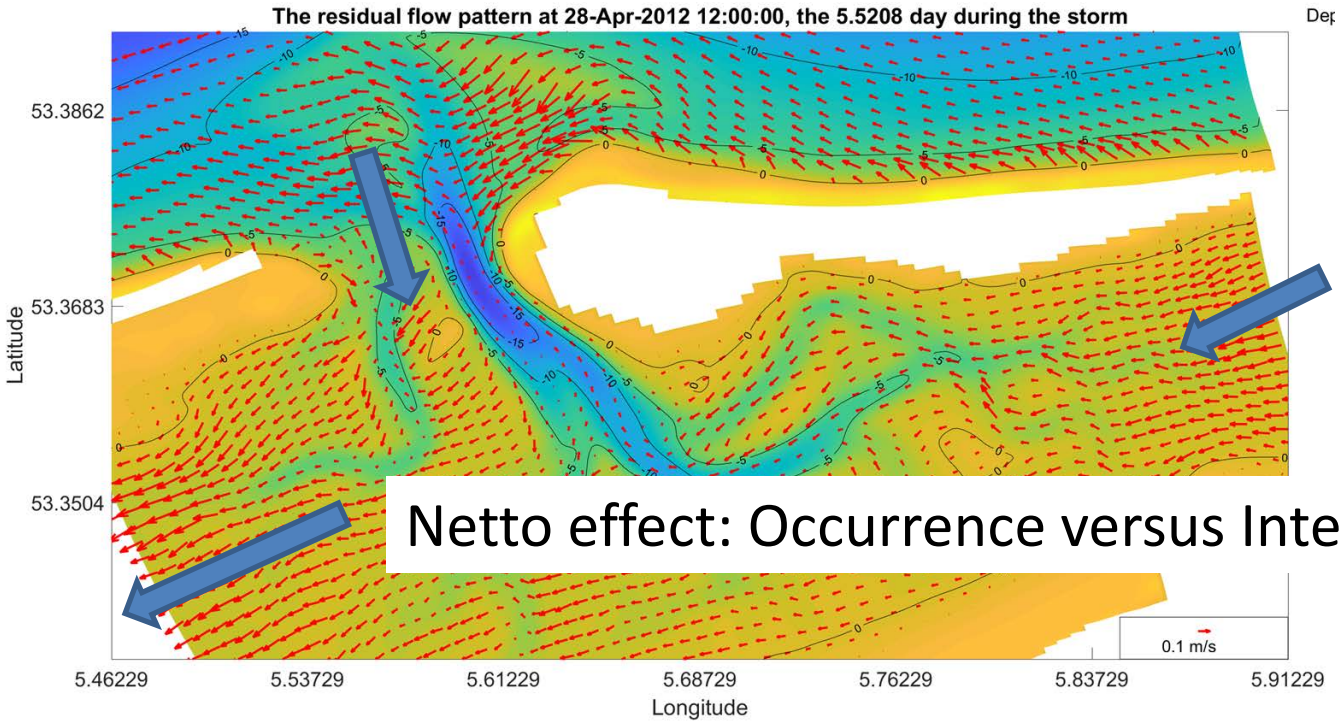
Elevation

High : 10

Low : -20

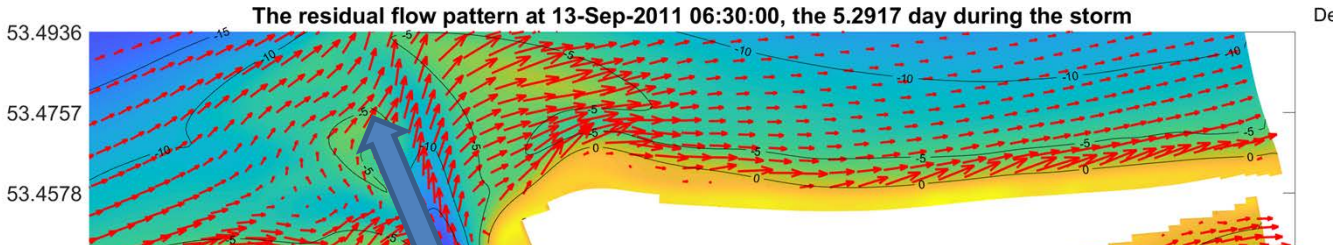

Ameland
Ballum
wanti
wind 20 m/s
Holwerd
Water depth
flow velocity
velocity [m/s] depth [dm]
3
2.5
2
1.5
1
0.5
0
-0.5
-1
09/08
09/09
09/10
09/11
09/12
09/13
09/14
09/15





MSc thesis Xu (2019) Delft3D-SWAN

Netto effect: Occurrence versus Intensity



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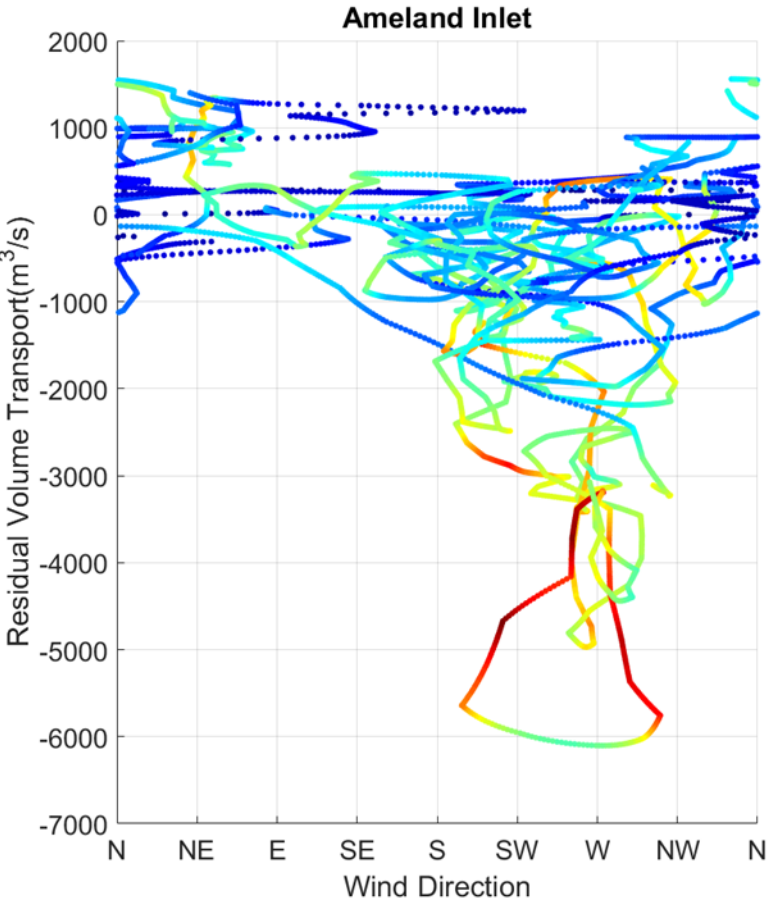
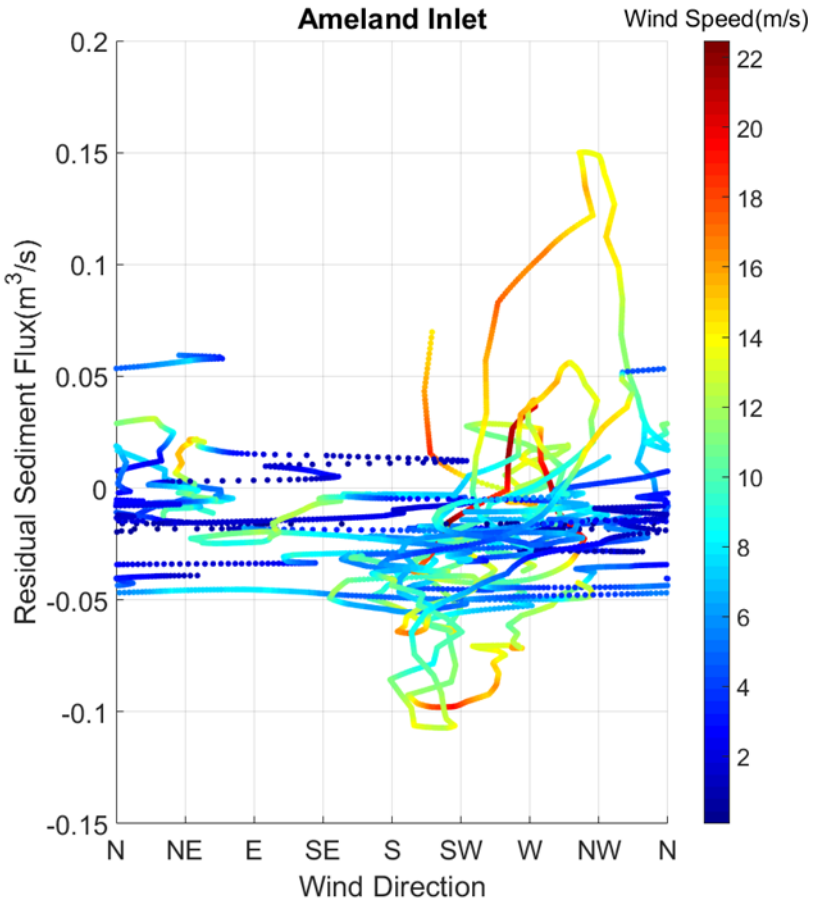
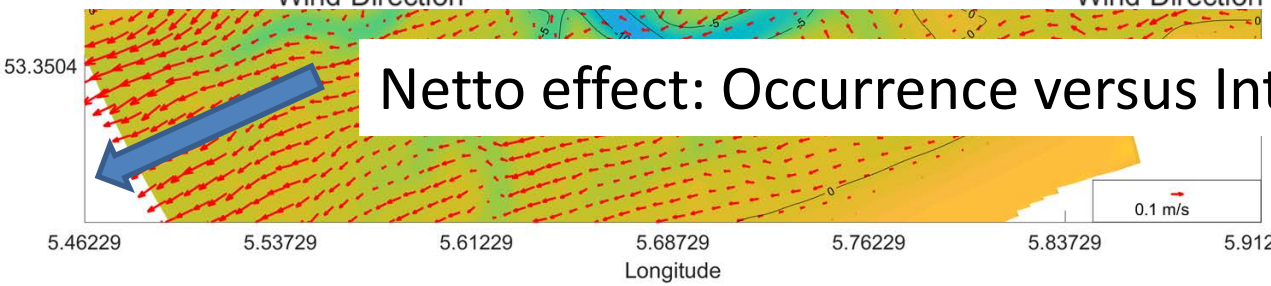
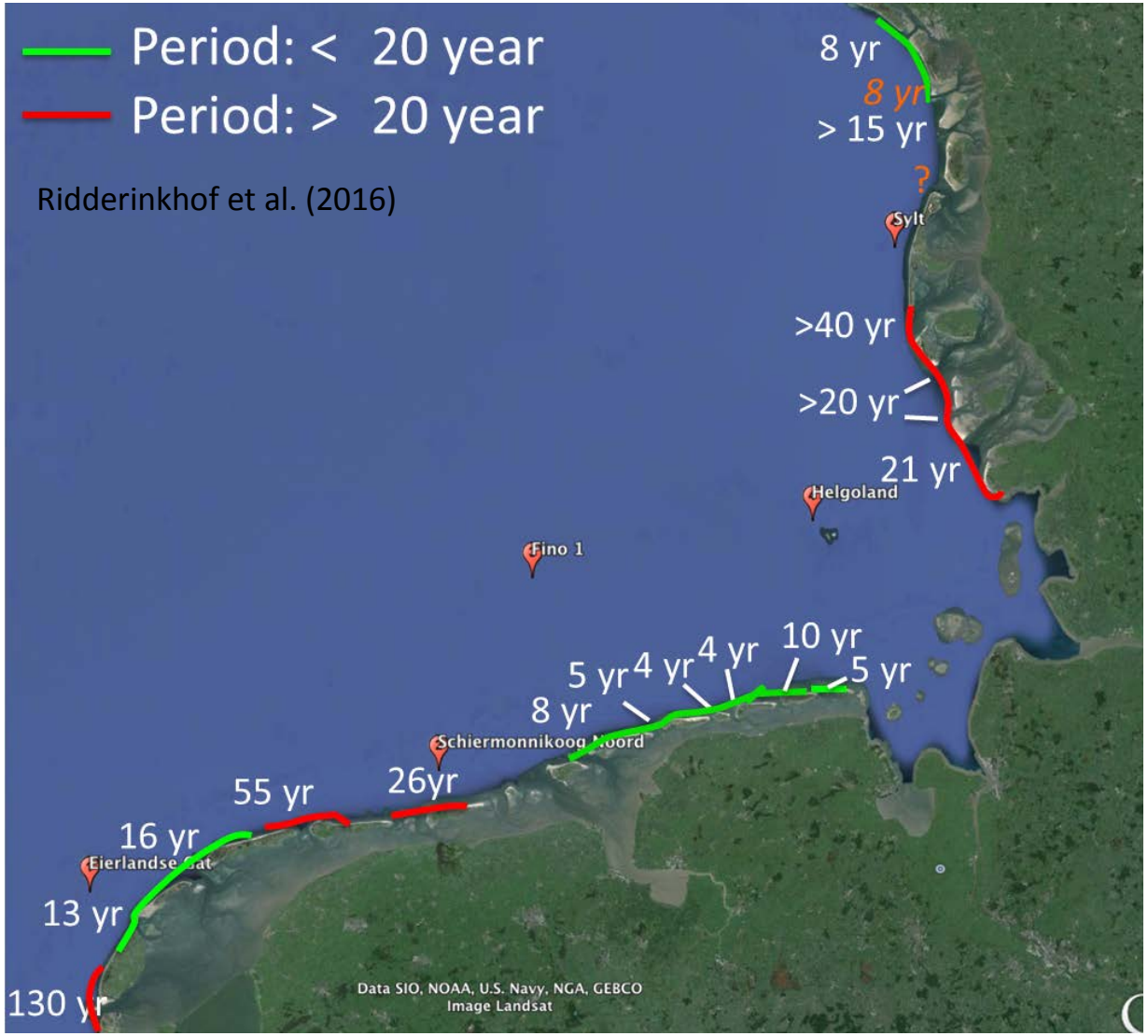




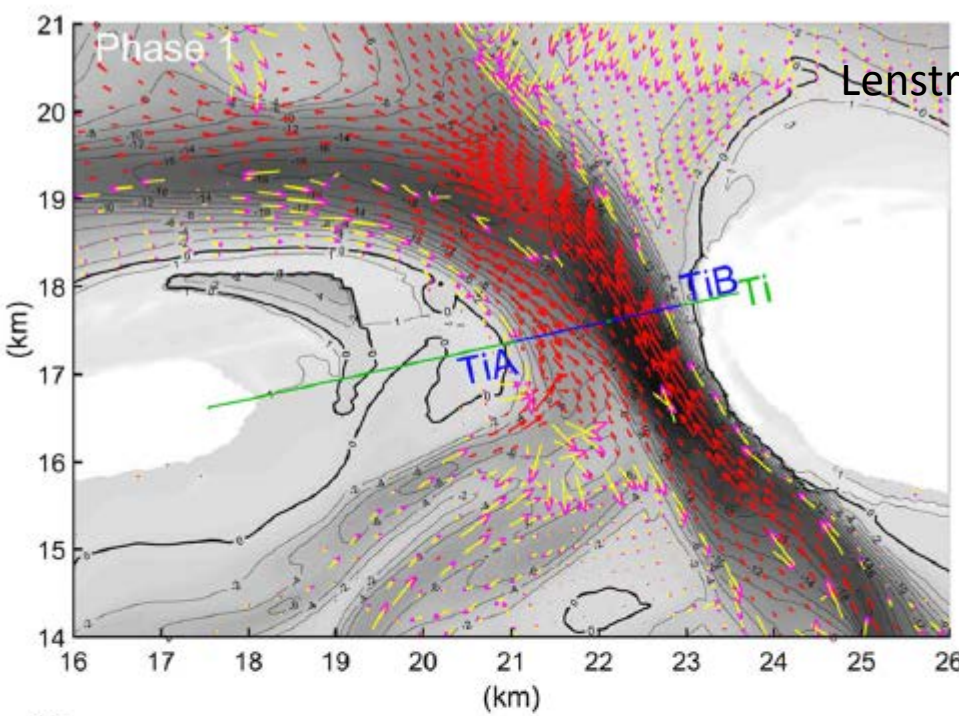


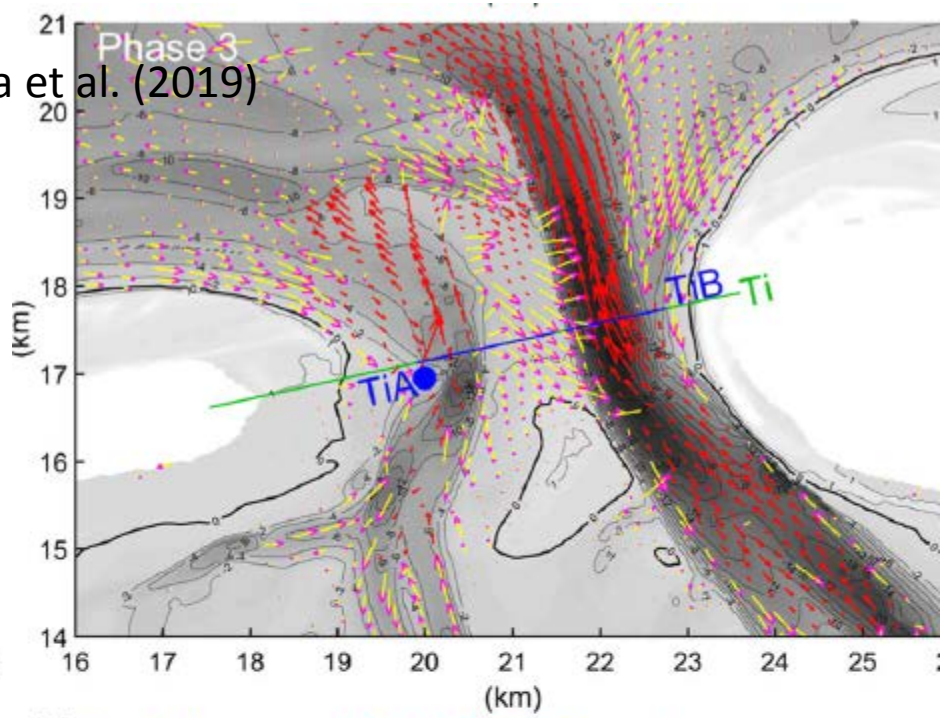
Netto effect: Occurrence versus Intensity

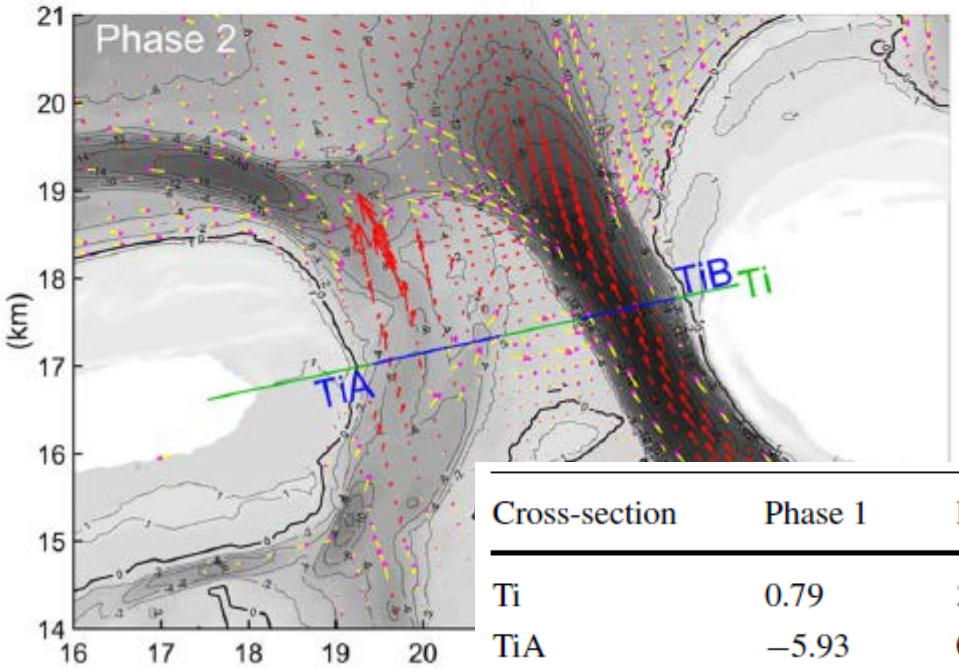
Effect of cyclic behaviour on sediment transport

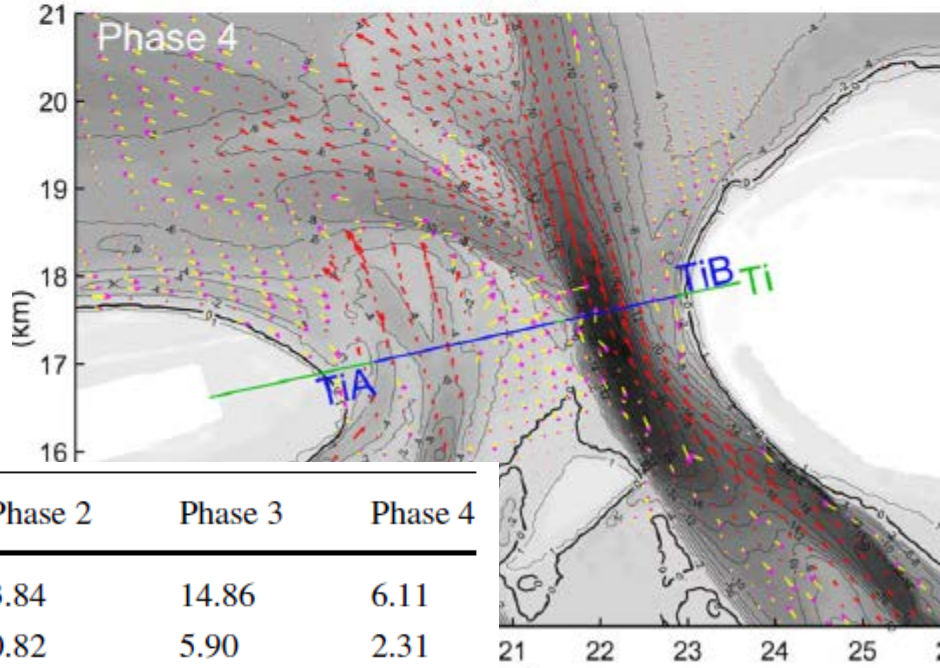


Lenstra et al. (2019)









Cross-section	Phase 1	Phase 2	Phase 3	Phase 4
Ti	0.79	3.84	14.86	6.11
TiA	−5.93	0.82	5.90	2.31
TiB	6.81	2.97	7.71	2.84

Summary and outlook

- We have extensive data set. Data will be open from October 2019.
- Net exchange of sediment depends on wind speed and direction, and on bathymetry of ebb-tidal delta.

NEXT

- Klaas Lenstra on why ebb-tidal deltas are cyclic and how this is influenced by nourishments.
- Pieter Roos on dynamics of multiple inlet systems.
- Laura Brakenhoff on local bed forms at Ameland etd.
- Gerald Herrling on transport pathways of different sediment fractions.