



Vlaanderen
is mobiliteit &
openbare werken



MOZES - MOrfologische interactie tussen de ZEebodem en het Strand

Results 2nd project year | Numerical modelling (WP2-4)

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Deltares
Enabling Delta Life




anteagroup



**Utrecht
University**

WP 3 – Natural feeding of the beach by shoreface connected ridges

- First project year:
 - The Scaldis-coast and FlemCo models were applied to investigate the longshore sediment transport along the Flemish coast and the sediment pathways in the area of the shoreface-connected sand ridges.
 - The predicted longshore transport was significantly larger in the Scaldis-coast compared to the FlemCo model.
 - While the predicted sediment pathways showed a distinct cross-shore component in the area of the sand ridges (indicating a natural feeding of the beaches in these areas) in the FlemCo model, the pathways were mainly parallel to the coast according to the Scaldis-coast model.

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- Second project year:
 - Application of both models based realistic wave and wind boundary conditions with various model forcing combinations (tide, waves and wind) and comparison of
 - longshore sediment transport incl. its cross-shore distribution,
 - wave heights and directions,
 - tide and wave induced longshore currents.
 - Application of both models based on non-realistic constant wave and wind boundary conditions with full model forcing (tide, waves and wind) and comparison of
 - longshore sediment transport,
 - wave heights and directions.

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Realistic wave and wind boundary conditions with various model forcing combinations

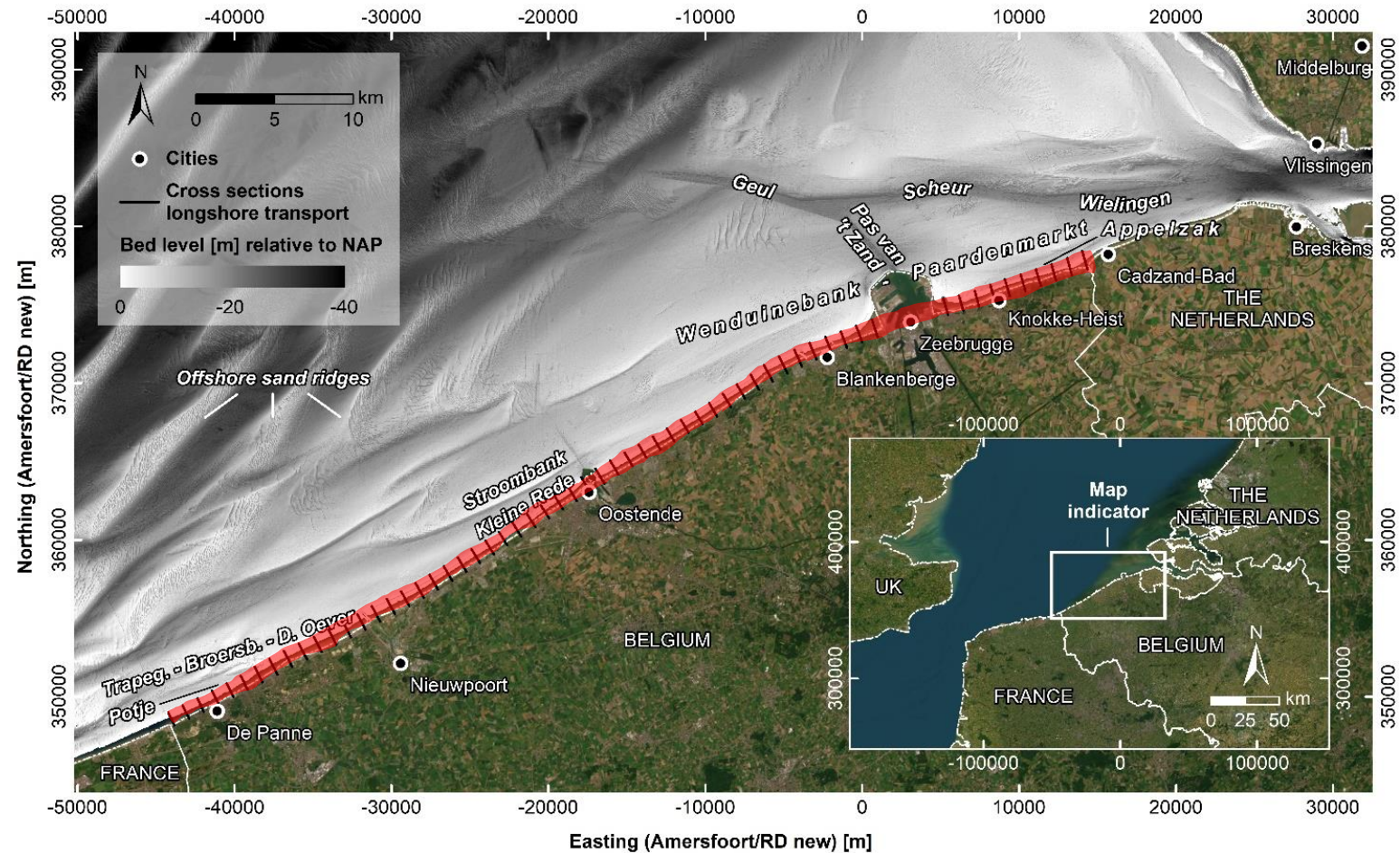
→ Run overview:

Scaldis-Coast Run ID	FlemCo Run ID	Tidal forcing	Wave forcing	Wind forcing
MO6_004	049b	On	Off	Off
MO6_008	050b	On	Off	On
MO6_005	051b	Off	On	Off
MO6_007	052b	Off	On	On
MO6_003	048b	On	On	Off
MO6_009	047b	On	On	On

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Realistic wave and wind boundary conditions with various model forcing combinations:

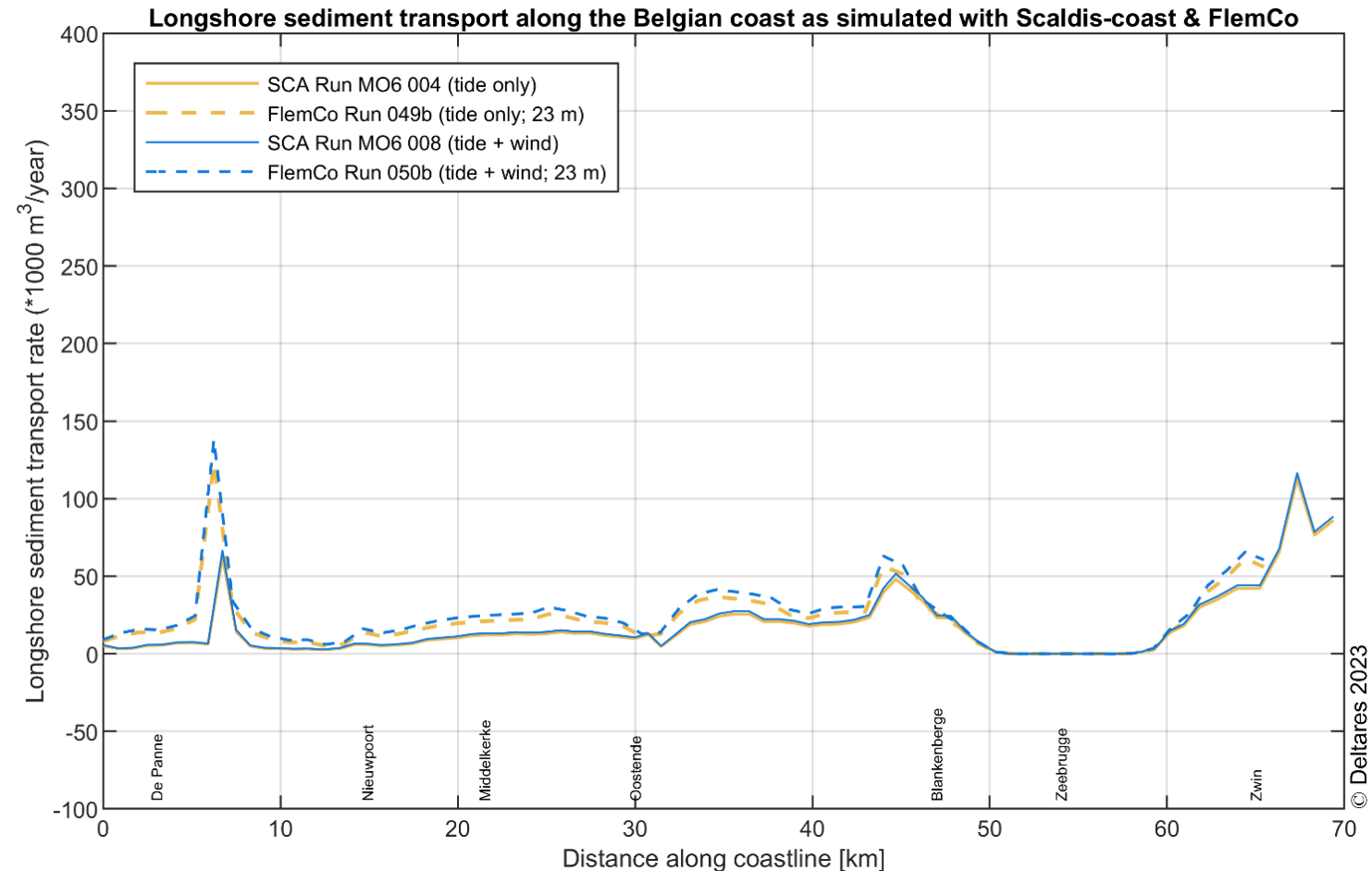
→ Sediment transport in the ca. 750 m wide nearshore zone (between the beach and approximately the -5 m TAW/-7.33 m NAP contour) of the Belgian coast



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Realistic wave and wind boundary conditions with various model forcing combinations:

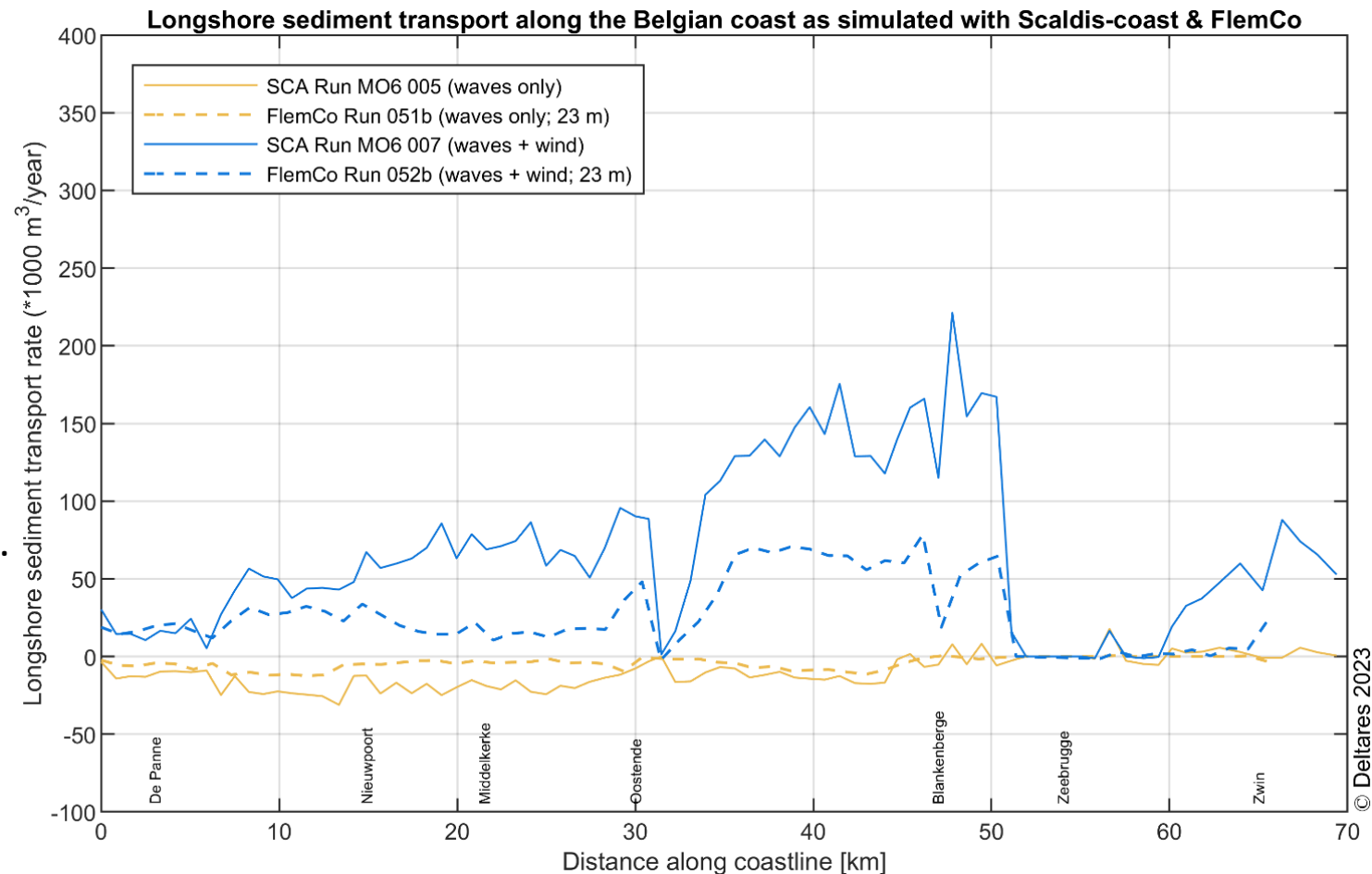
- Tide only forcing:
larger tide-induced
longshore
transport in
FlemCo than in
Scaldis-coast
- Wind has little
impact on tide-
induced longshore
transport



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Realistic wave and wind boundary conditions with various model forcing combinations:

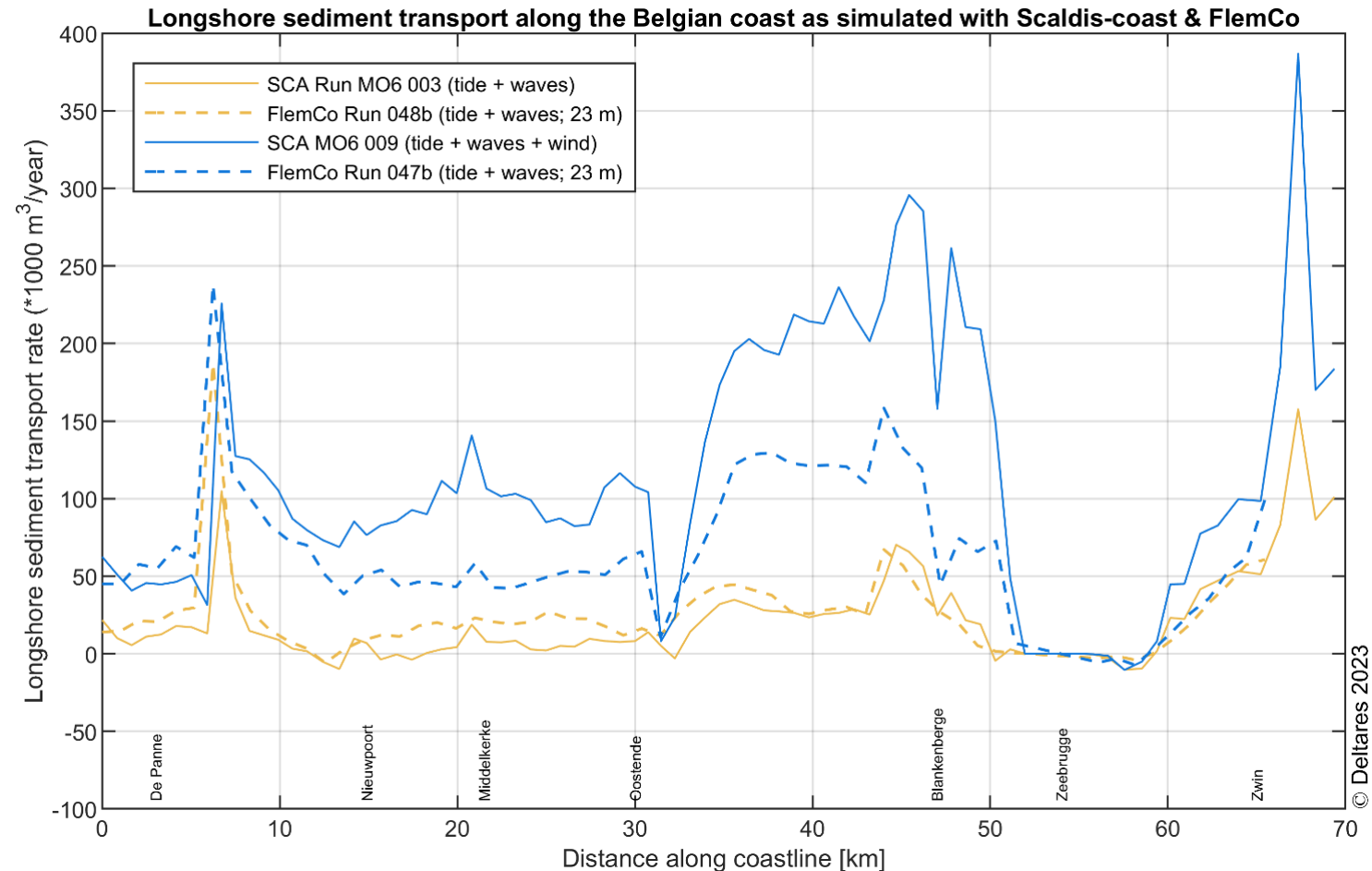
- Waves only forcing: negative, i.e. westward longshore transport
- Wind together with wind forcing results in clearly higher longshore (eastward) transport
- Transport becomes sign. larger in Scaldis than in FlemCo, when wind is added



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Realistic wave and wind boundary conditions with various model forcing combinations:

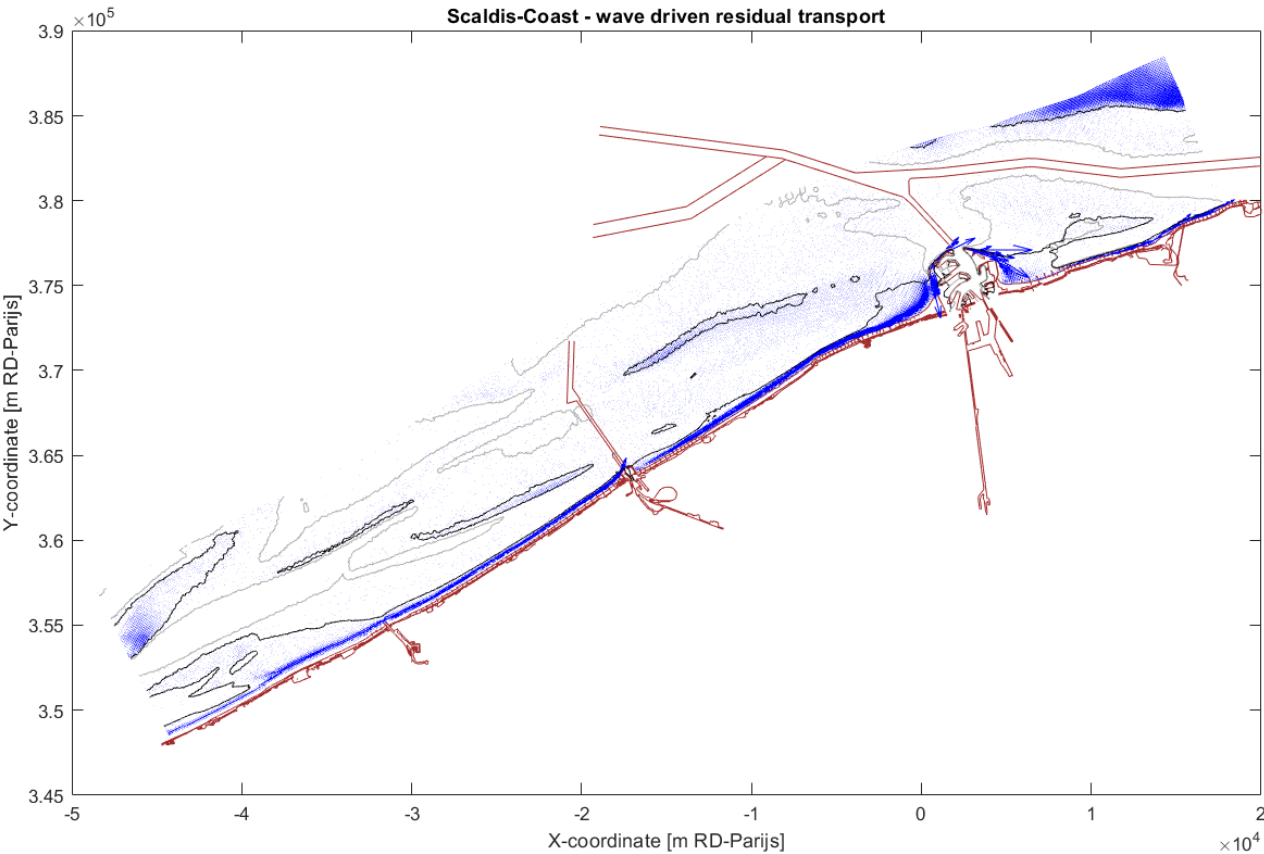
- Tide + wave forcing results in similar transports in both models
- When wind is added, transport increases by up to factor 4 in FlemCo but by up to factor 10 in Scaldis
- Effect of wind on waves but not on tide responsible for discrepancy between models



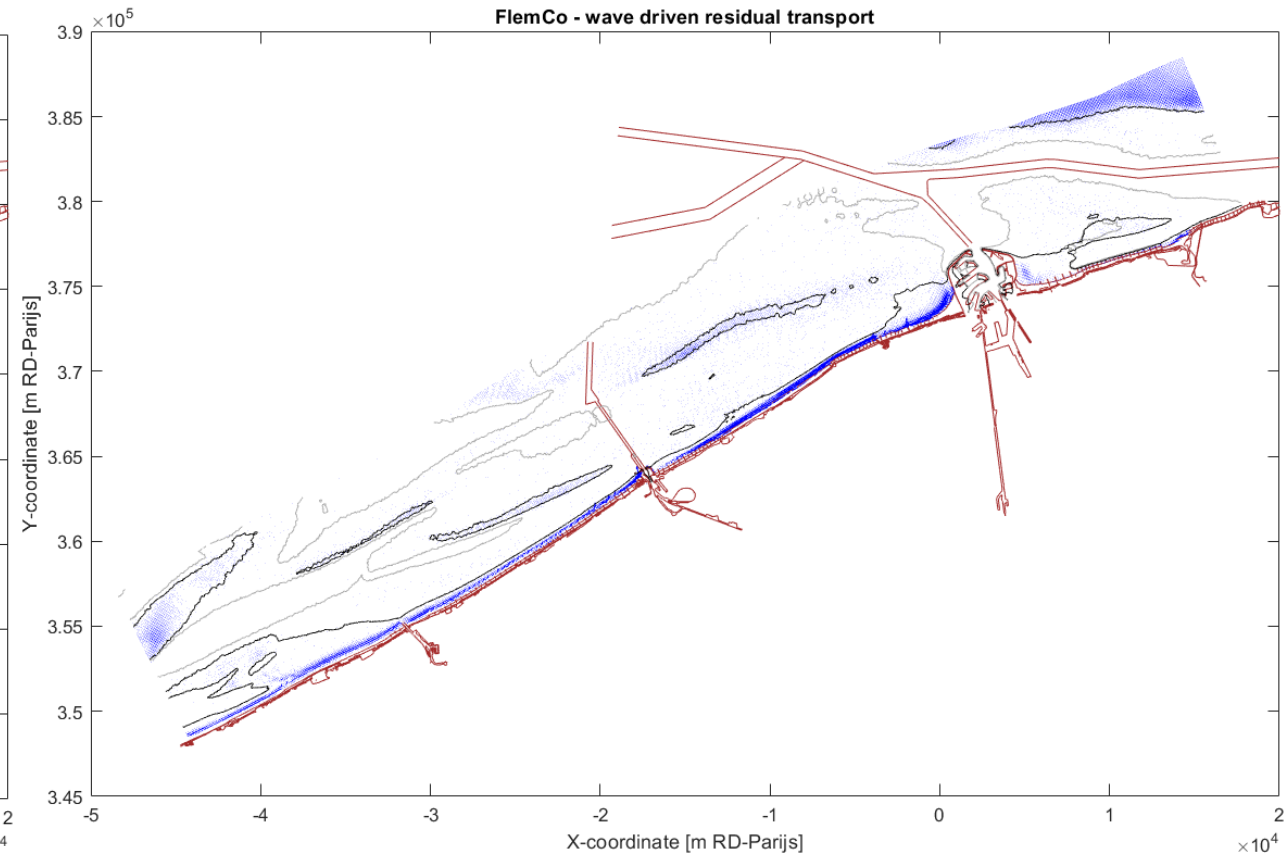
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Realistic wave and wind boundary conditions – wave driven residual transport:

Scaldis-coast



Flemco

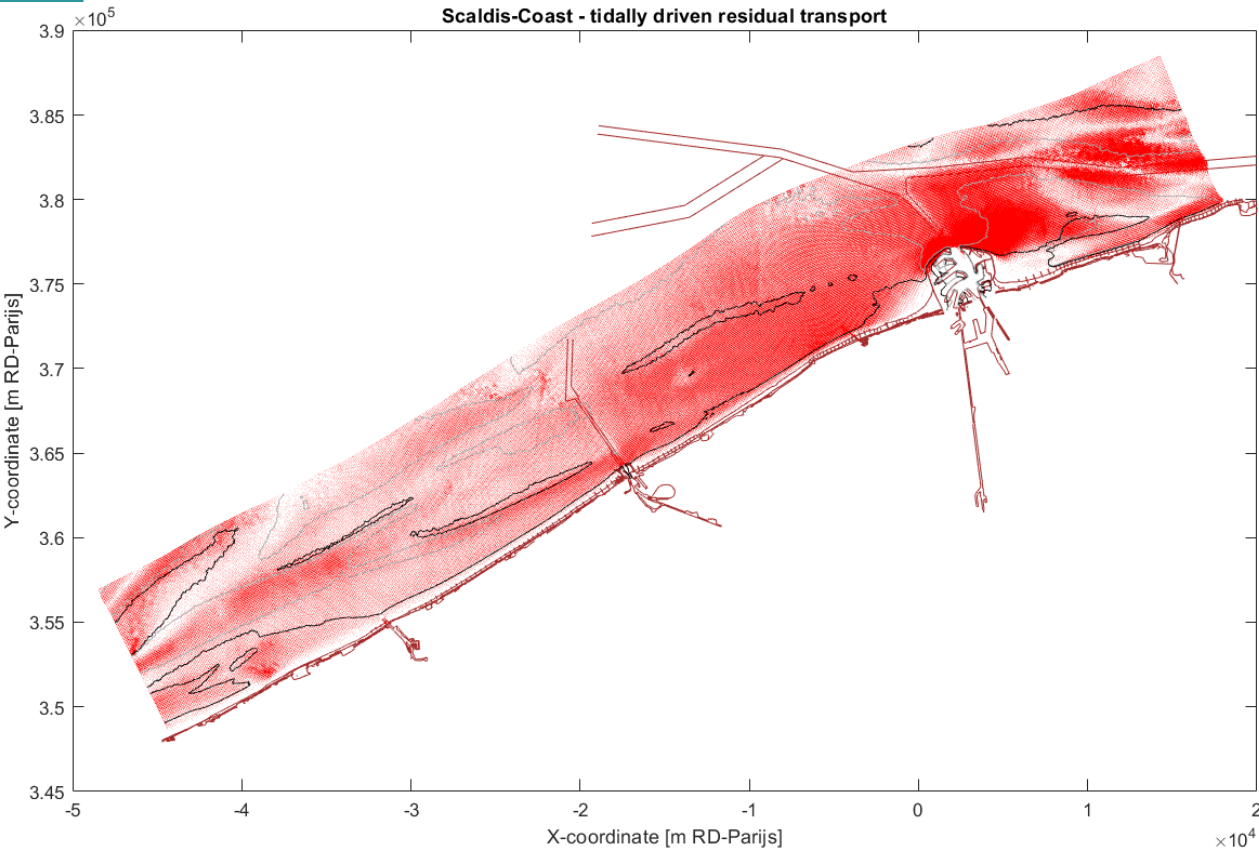


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Realistic wave and wind boundary conditions – tidally driven residual transport:

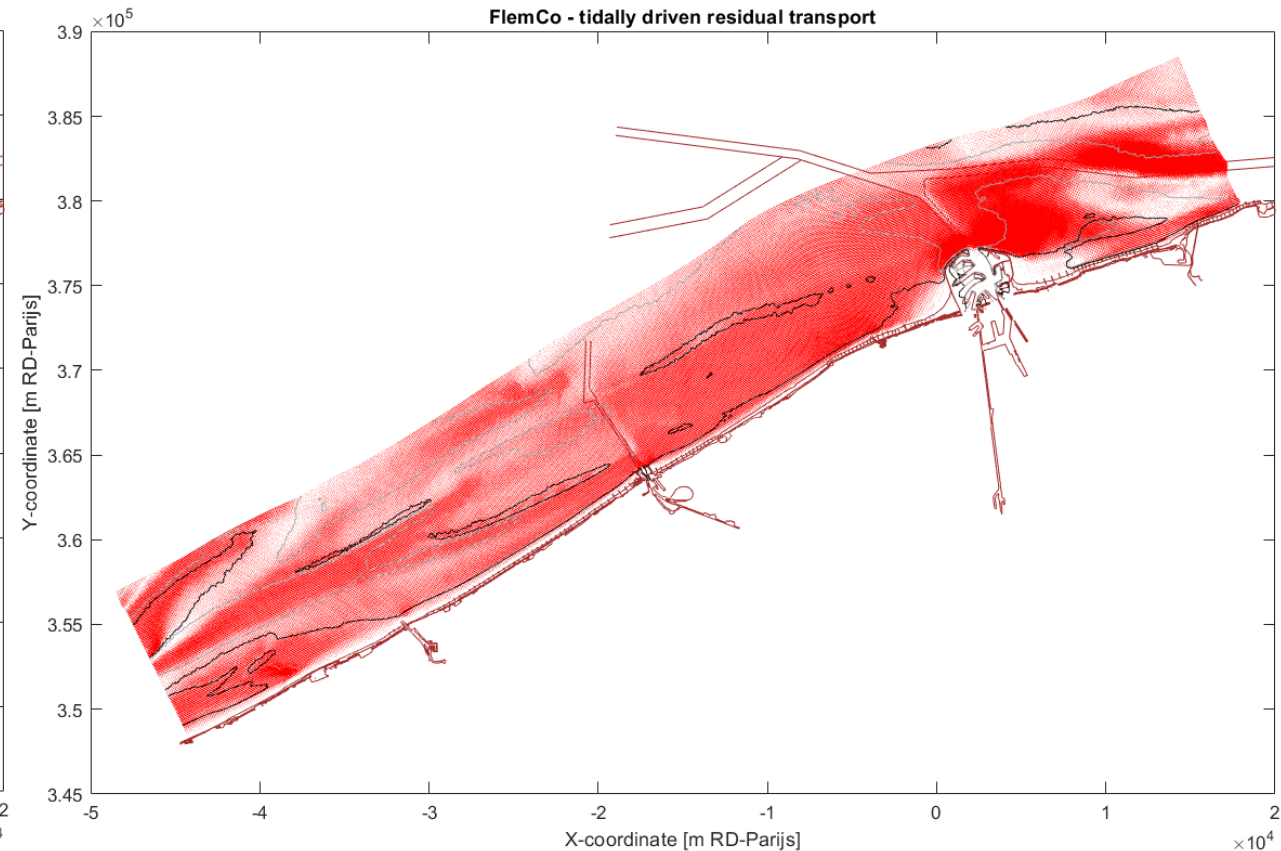
Scaldis-coast

Scaldis-Coast - tidally driven residual transport



Flemco

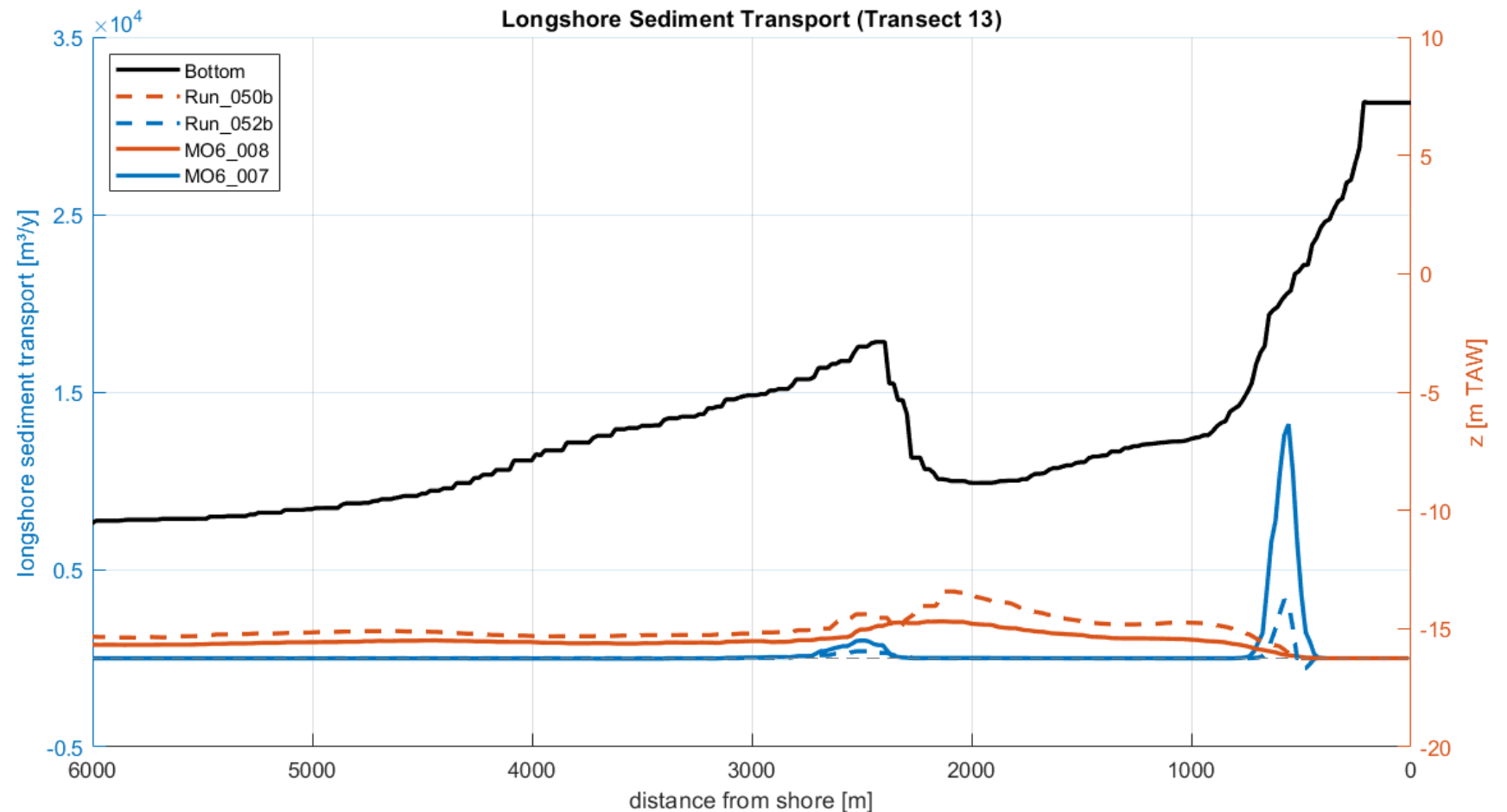
FlemCo - tidally driven residual transport



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Realistic wave and wind boundary conditions with various model forcing combinations:

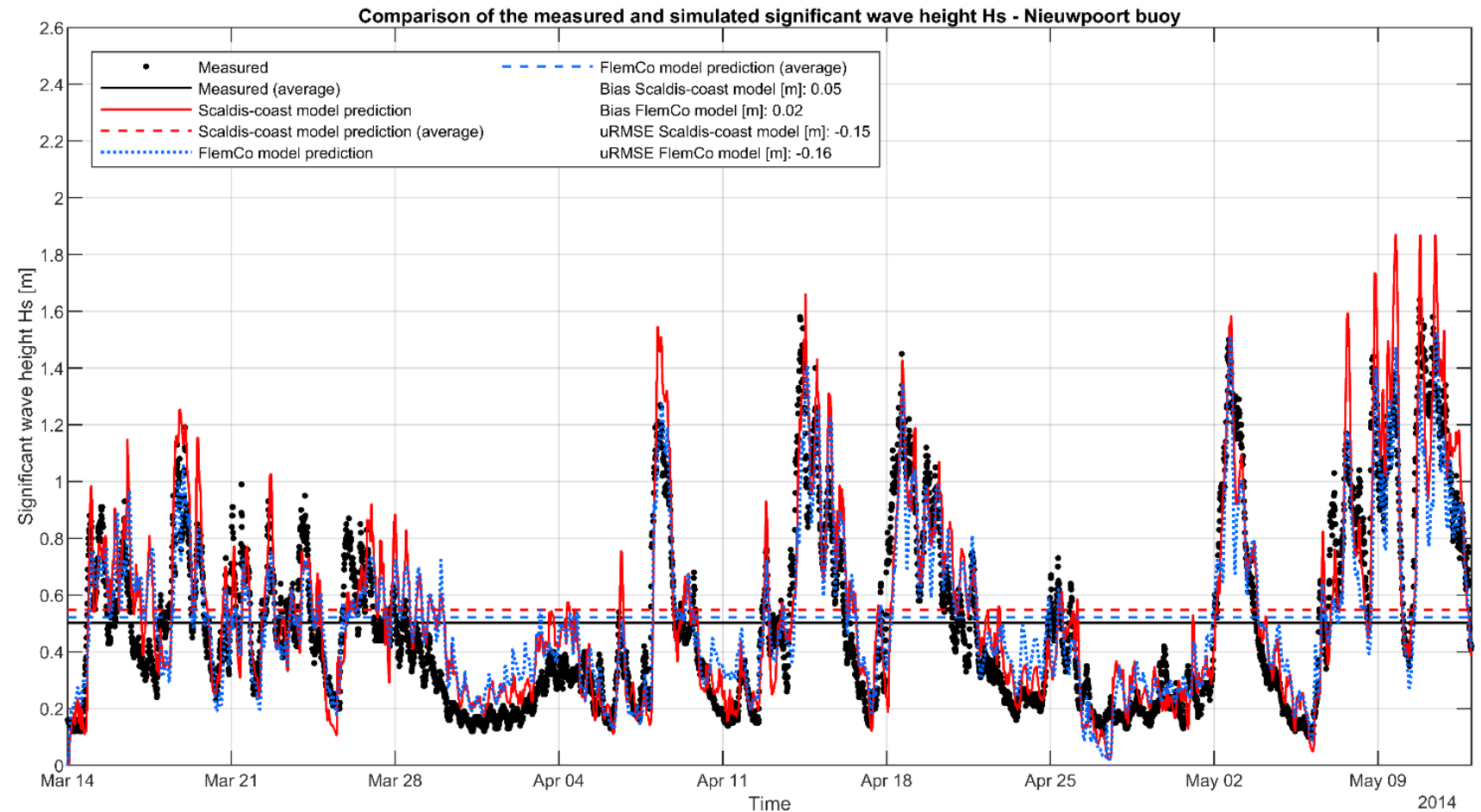
- First peak related to wave-induced longshore transport
- Second, smaller peak related to tide-induced longshore transport
- Characteristic profiles for the Belgian coast
- Sign. larger wave-related peak in Scaldis-coast than in FlemCo



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Realistic wave and wind boundary conditions with various model forcing combinations:

- Systematic overestimation of wave height peaks (esp. for waves from the western sector) in Scaldis-coast
- Systematic overestimation of small wave heights in FlemCo

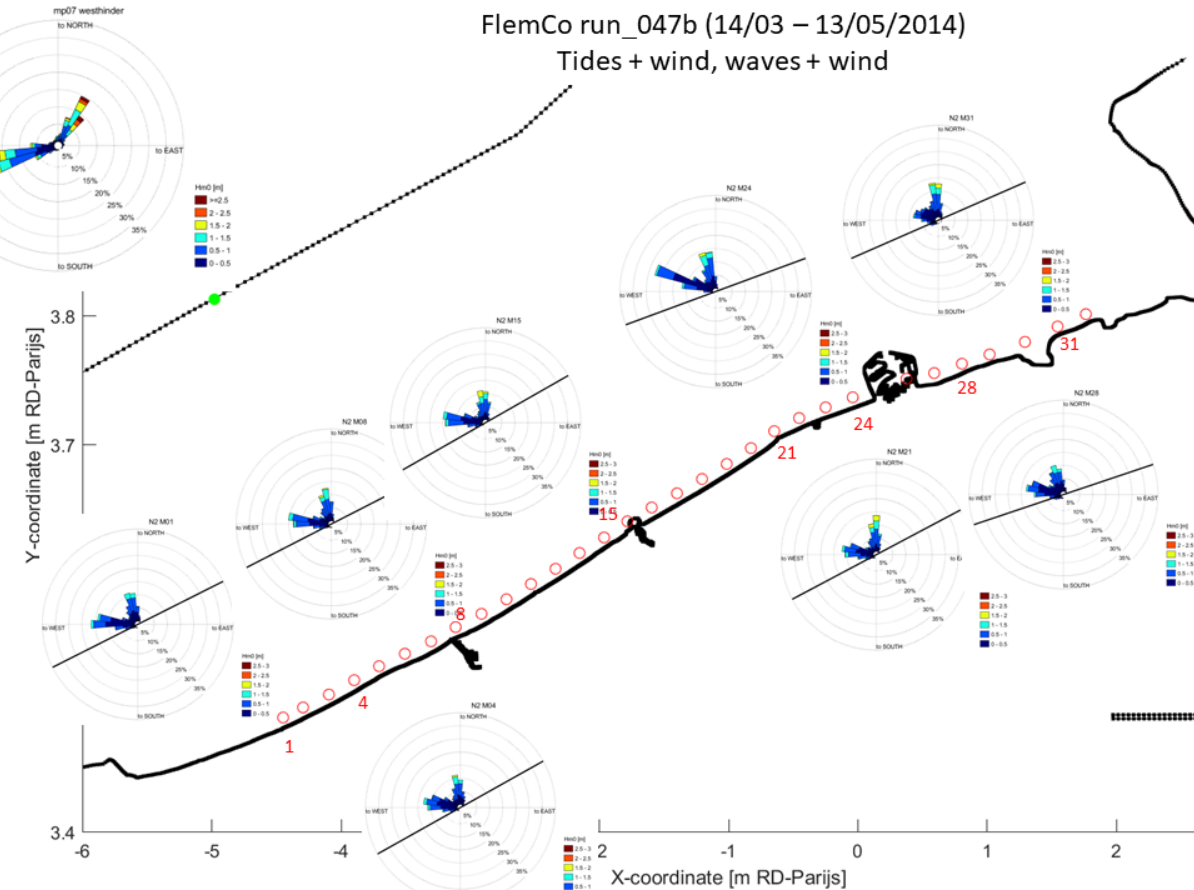
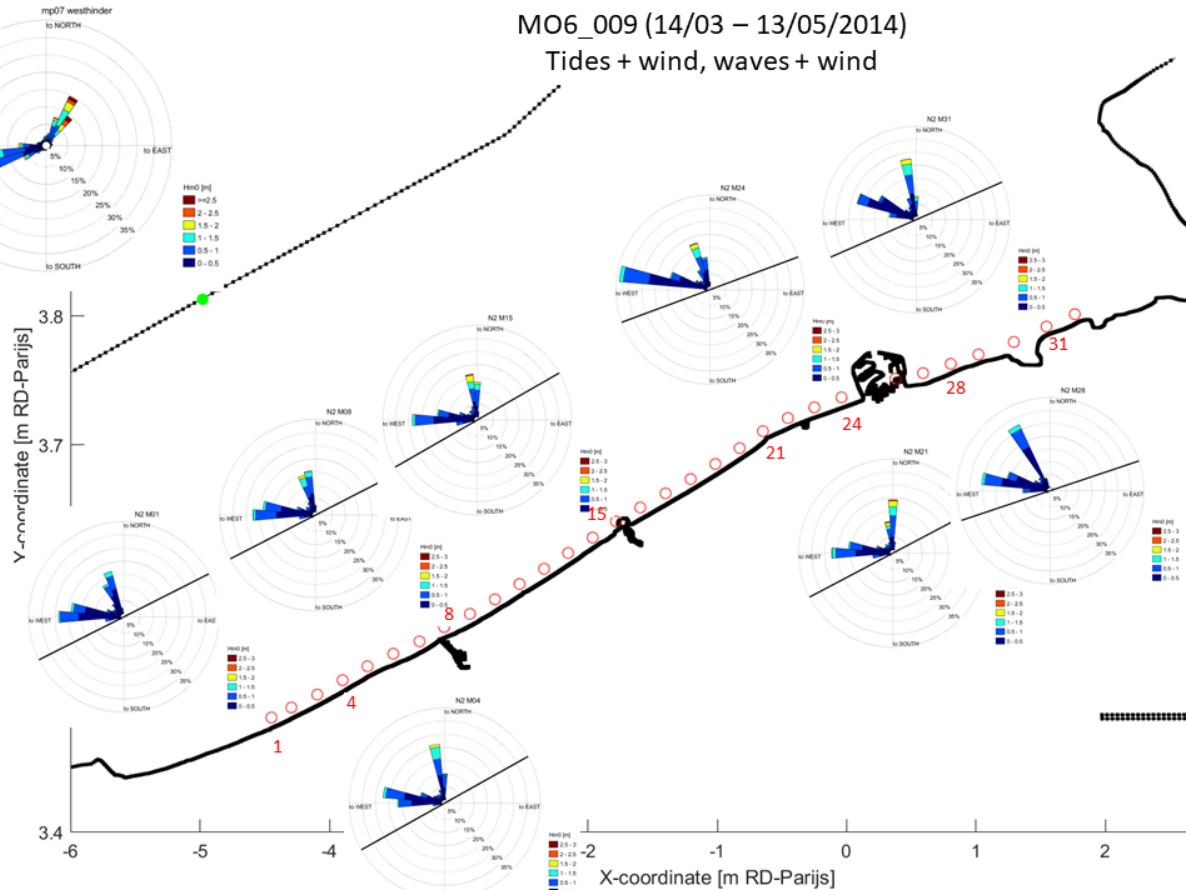


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Realistic wave and wind boundary conditions with various model forcing combinations:

Scaldis-coast

FlemCo

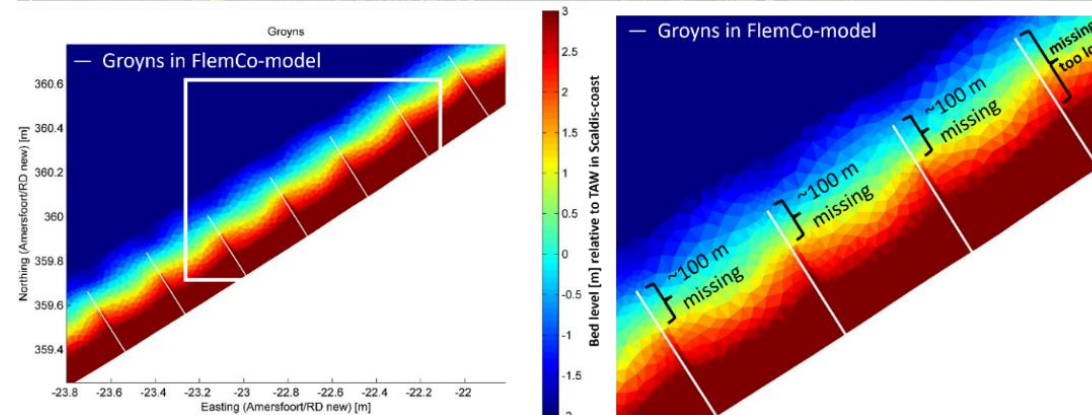
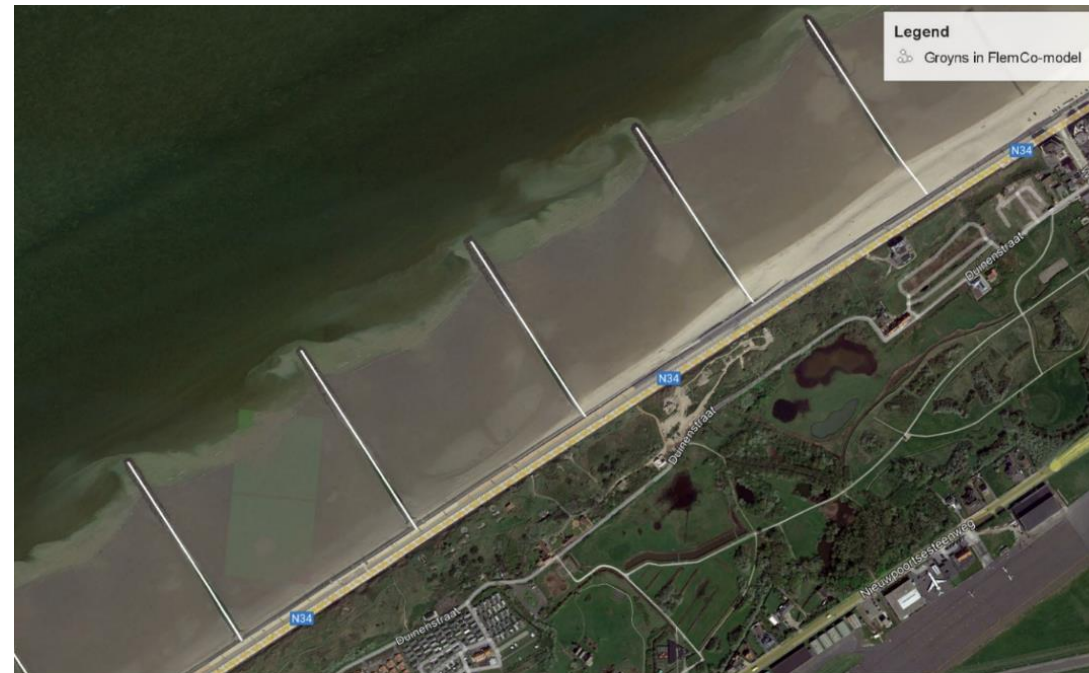


→ Stronger spreading and smaller wave peaks in FlemCo compared to Scaldis-coast

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Realistic wave and wind boundary conditions with various model forcing combinations:

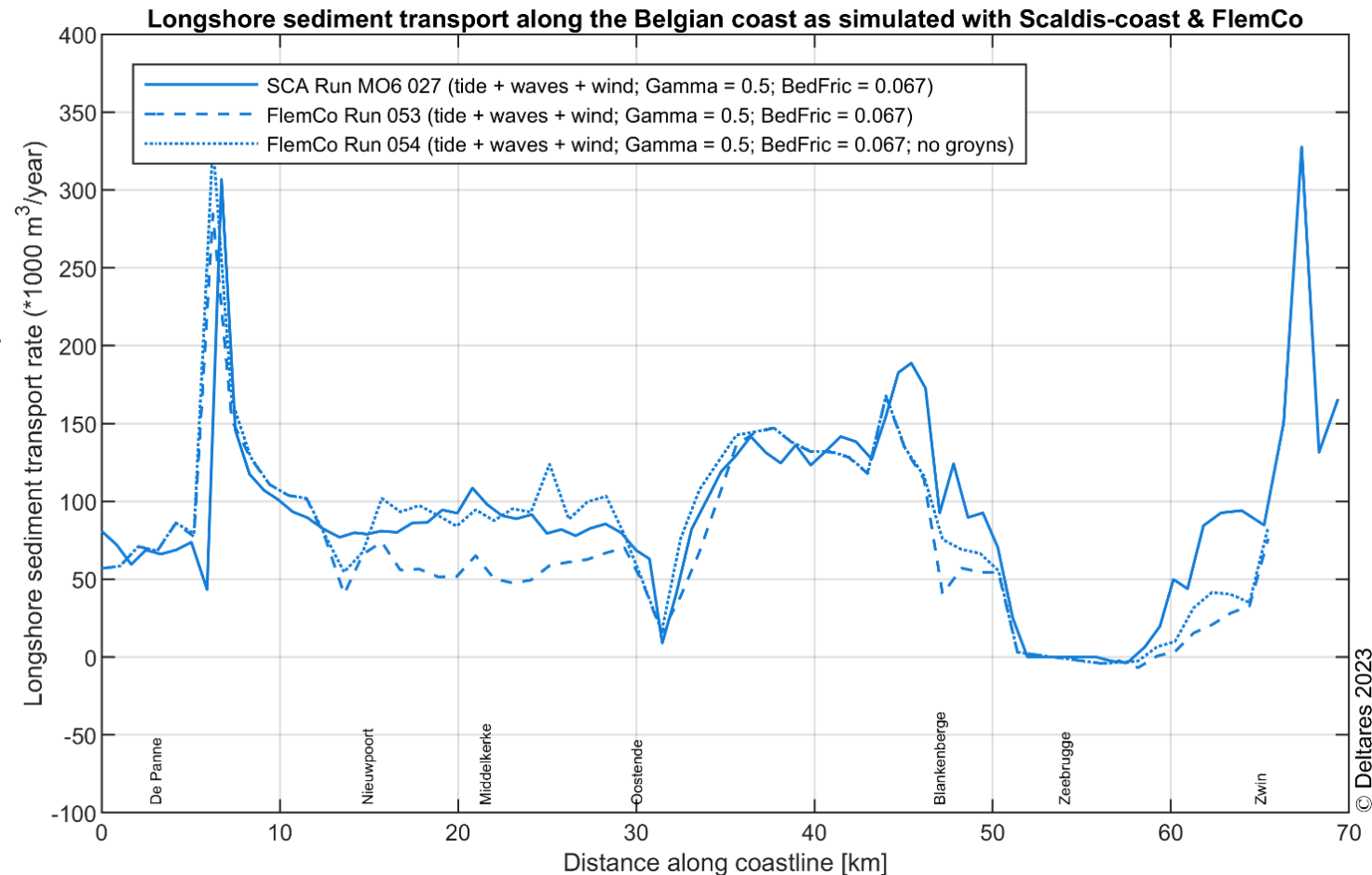
→ Groynes along the Belgian coast are significantly smaller in dimension (length and height) in Scaldis-coast compared to FlemCo:



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Non-realistic, constant wave and wind boundary conditions with full model forcing:

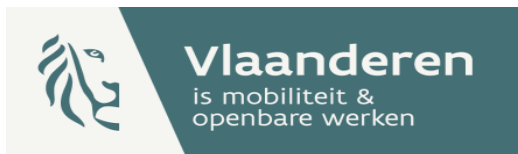
- Based on constant wave/wind forcing and on same settings for BedFric and BreakerIndex: similar longshore transport in both models (except for Nieuwpoort-Oostende & Appelzak)
- When groynes are removed in FlemCo: very similar longshore transports in both models



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- Conclusions:
 - It is mainly the wave related longshore sediment transport that differs between the two models.
 - Differences in the wave related longshore transport mainly occur as soon as wind is added to the models
 - results in higher wave height peaks and more dominant western wave direction in Scaldis-coast
 - results in more pronounced wave-induced longshore current and by longshore transport.
 - Discrepancies of predicted waves in Scaldis-coast and FlemCo are related to
 - different applied wave models (TOMAWAC/SWAN),
 - different applied wave model settings (esp. lower BedFric, higher BreakerIndex in Scaldis-coast
 - smaller groynes in Scaldis-coast compared to FlemCo

Thank you



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