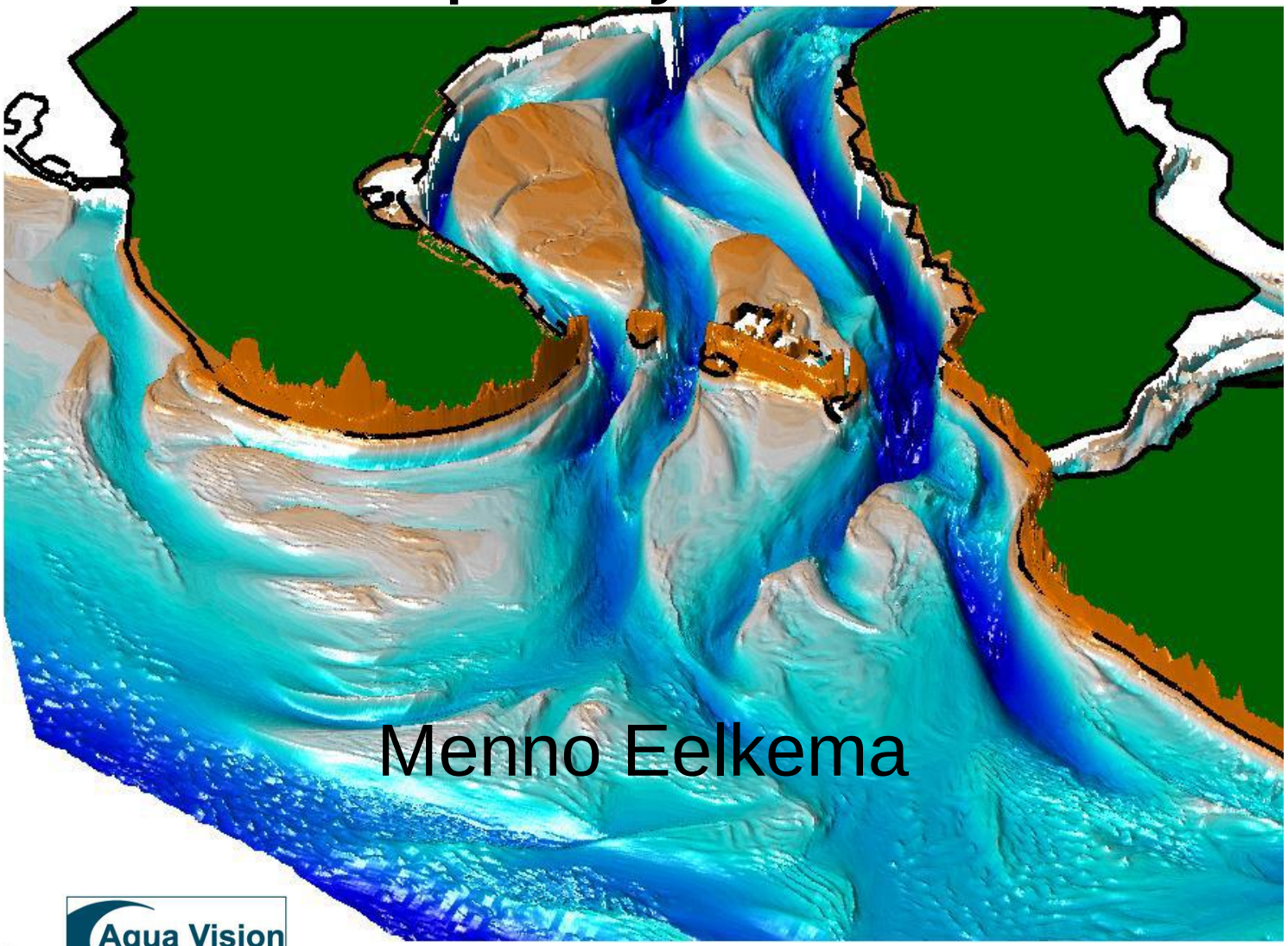
Eastern Scheldt Inlet Morphodynamics



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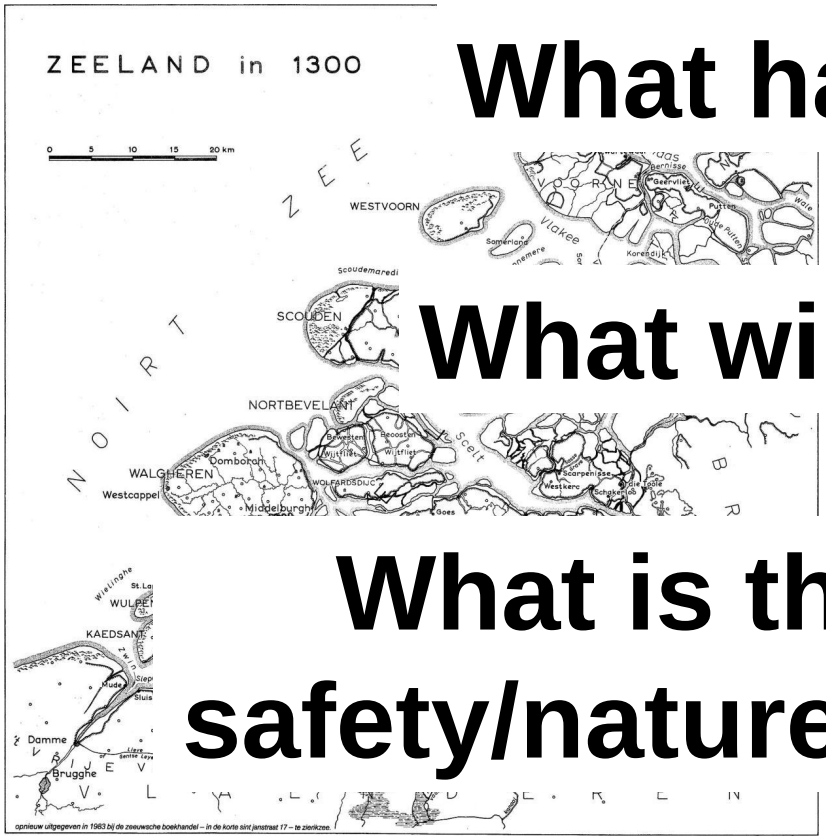
Presentation contents

- Introduction
- History of the Eastern Scheldt estuary (1300-1950)
- The first phase of the Delta Plan (1950-1986)
- The effect of the Storm Surge Barrier (1986-2013)
- Conclusions (2013-?)

Introduction



What happened?

What will happen?

What is the impact on safety/nature/economy/etc?

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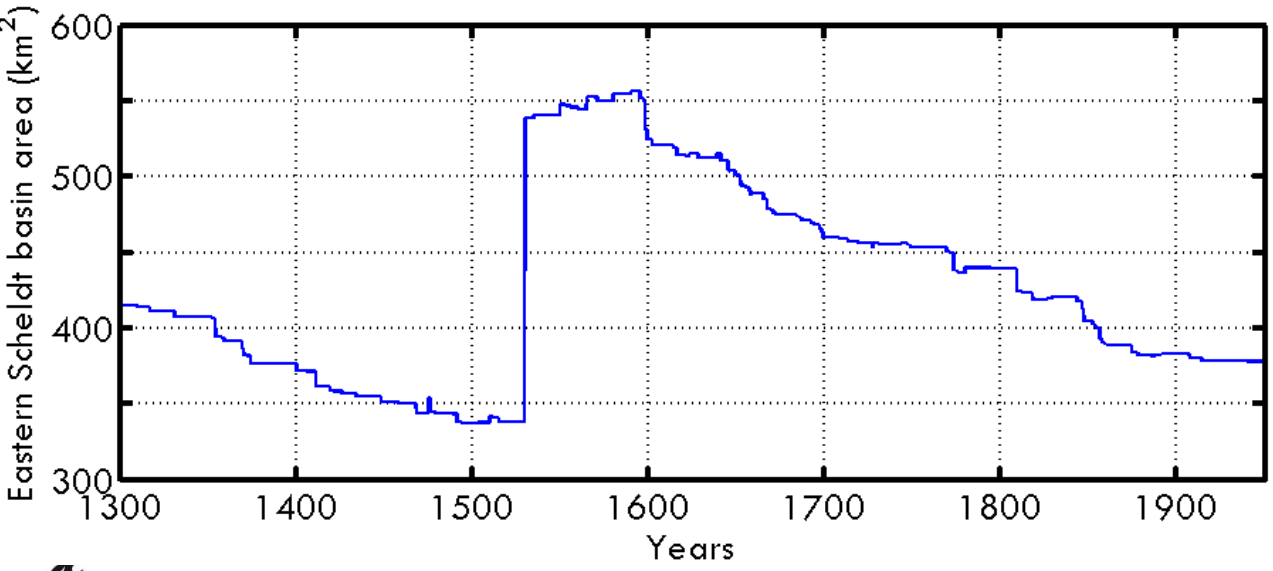
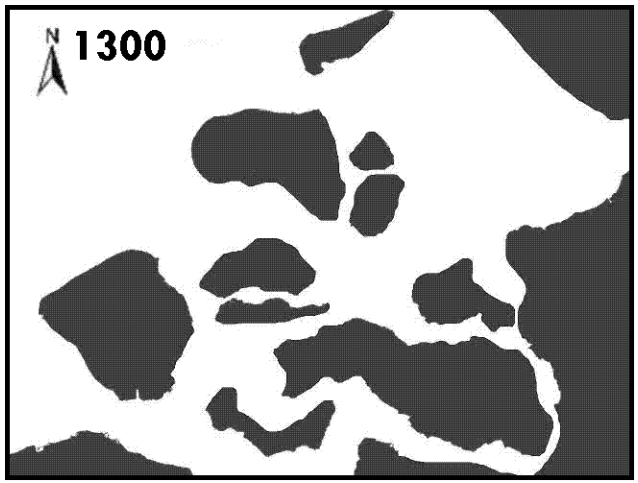
History of the Eastern Scheldt

1300 - 1950

History of the Eastern Scheldt

- Original mouth of the Scheldt River
- Local inhabitants have been reclaiming land since the middle ages
- Storm surges caused deep polders to be lost
- Largest change came with the flooding of Zuid Beveland in 1530 AD





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1300 - 1950

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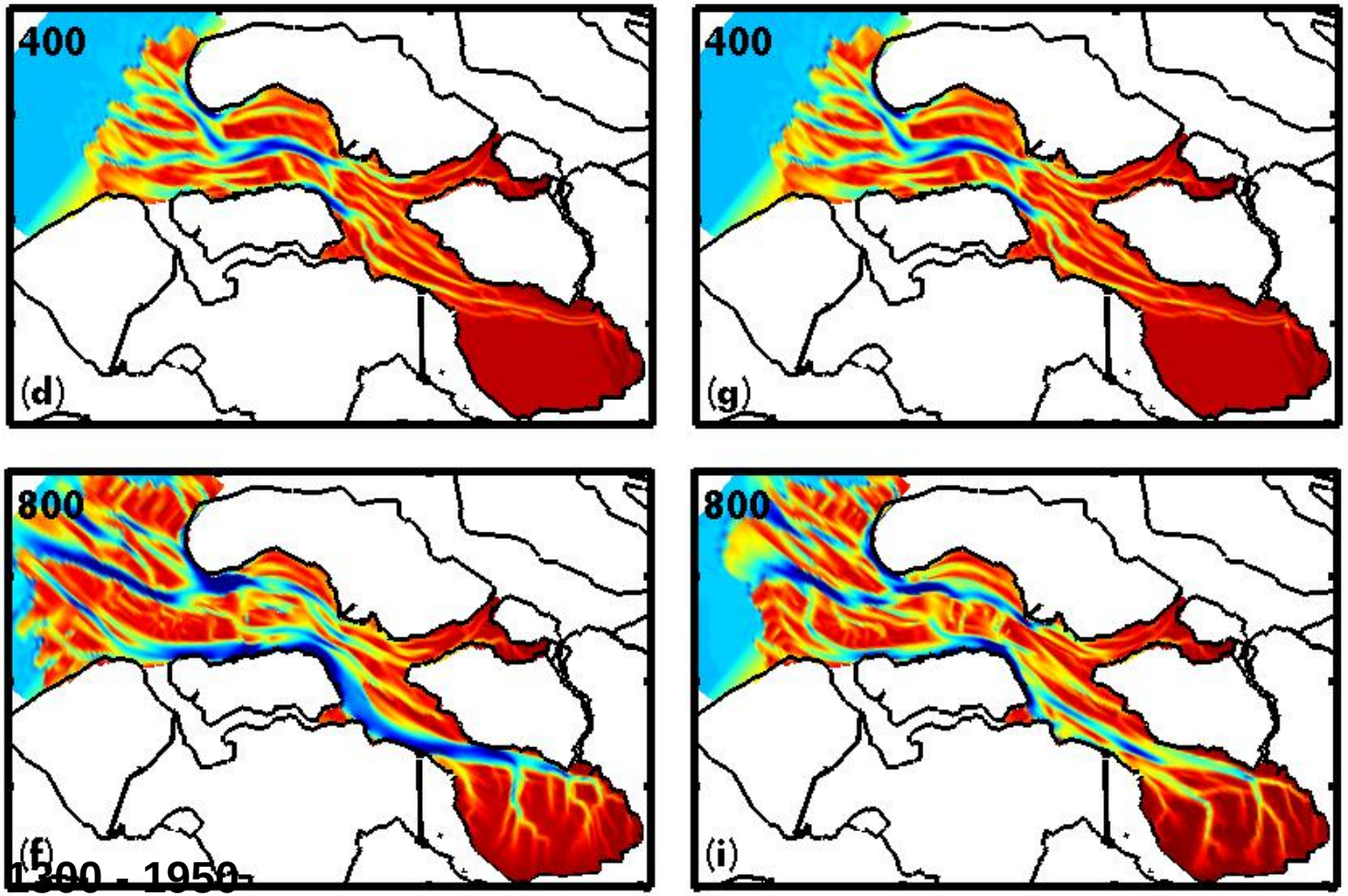
History of the Eastern Scheldt

Flooding of Zuid Beveland

- Increase in tidal prism caused large export
- Clay layer underneath Zuid Beveland tempered export

Model results

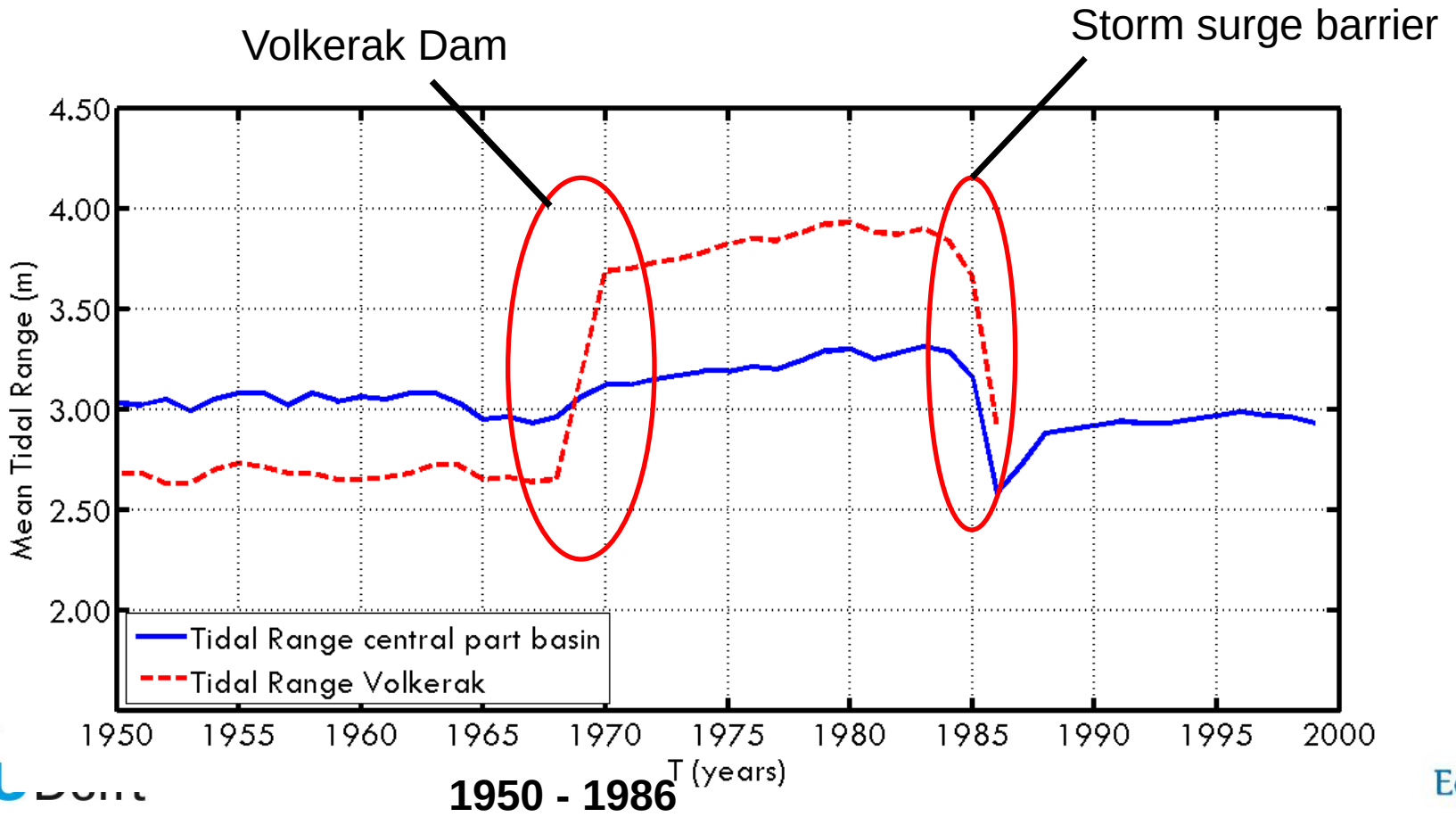


Storm surge 1953: Deltaplan!

1950 - 1986

The first phase of the Delta Plan

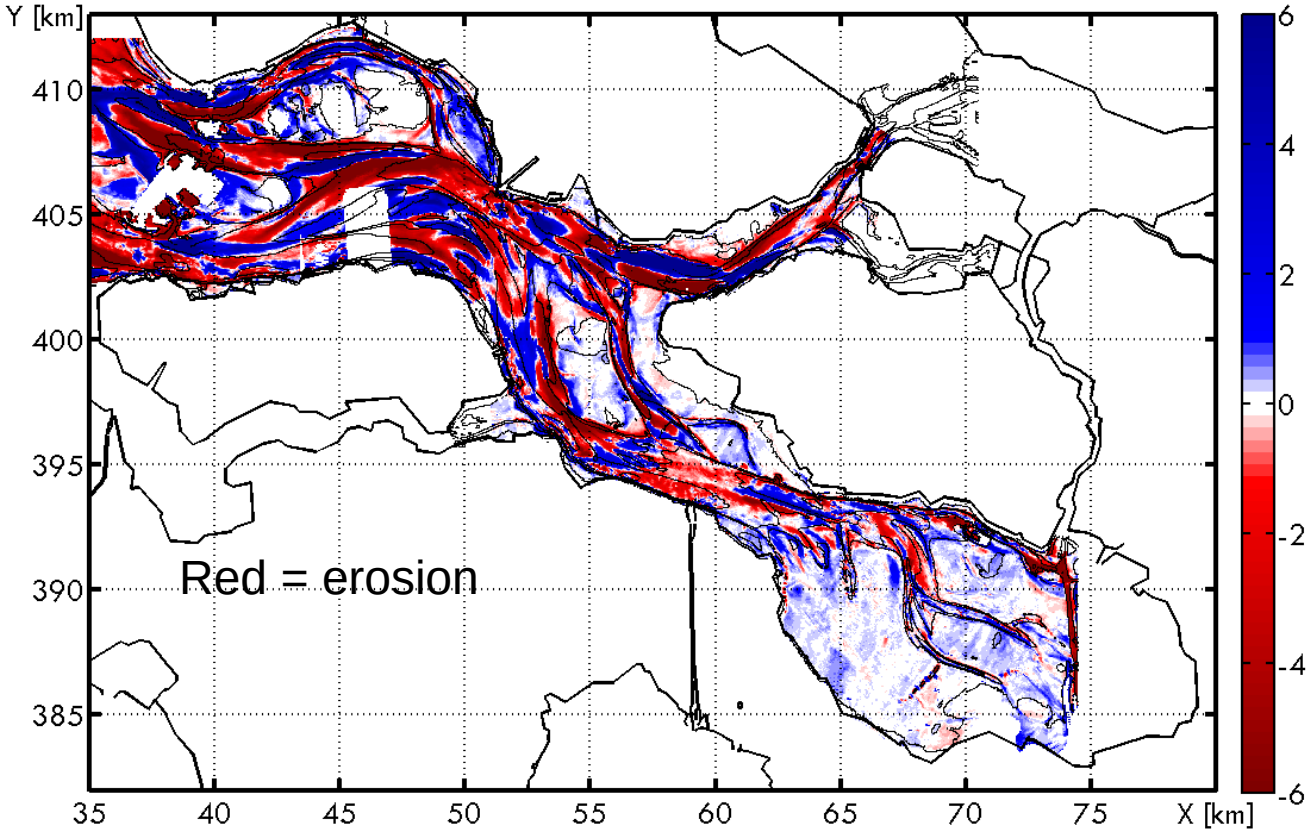
- Dams in the Volkerak and Grevelingen closed off the basin
- Tidal range and currents became larger



1950 - 1986

The first phase of the Delta Plan

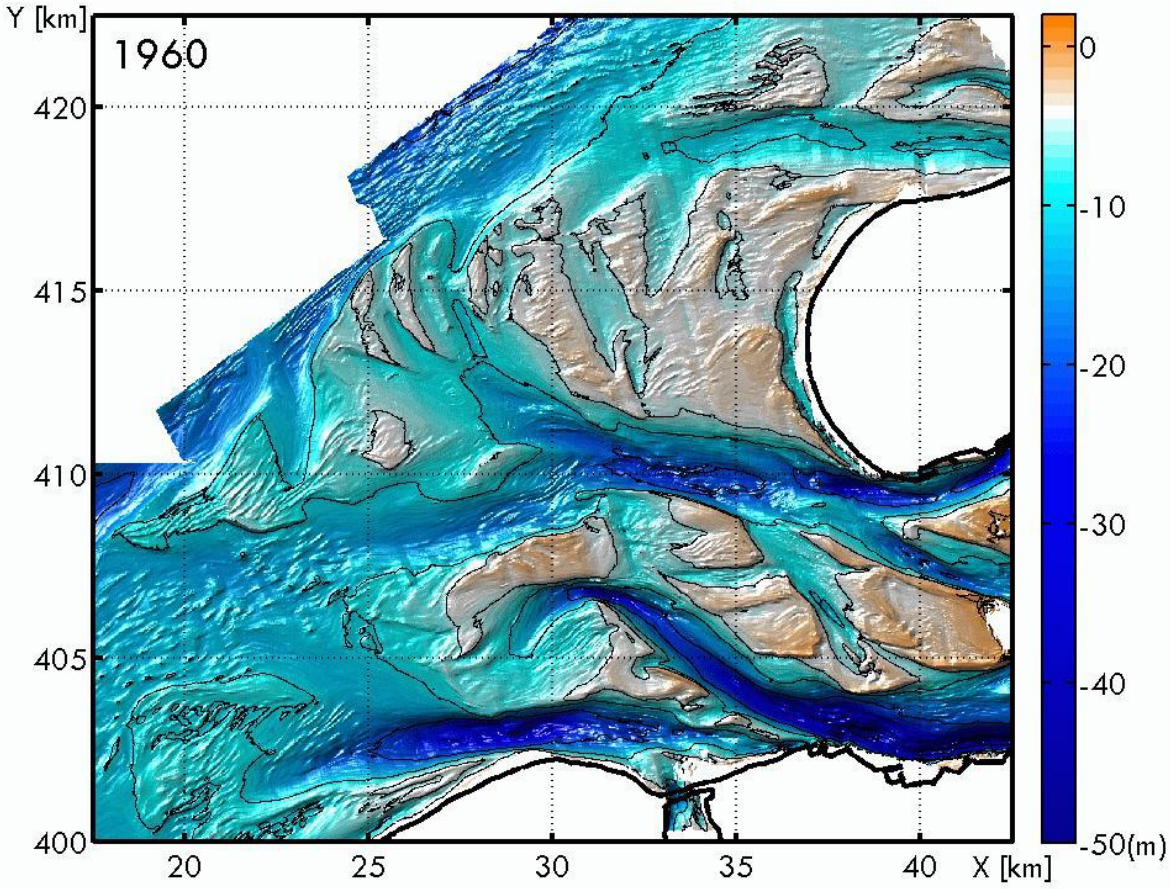
- Basin wants to get rid of a lot of sand
- Channels grow larger, tidal flats grow higher



1950 - 1986

The first phase of the Delta Plan

- Ebb-tidal delta receives a lot of sand
- High morphological activity



1950 - 1986

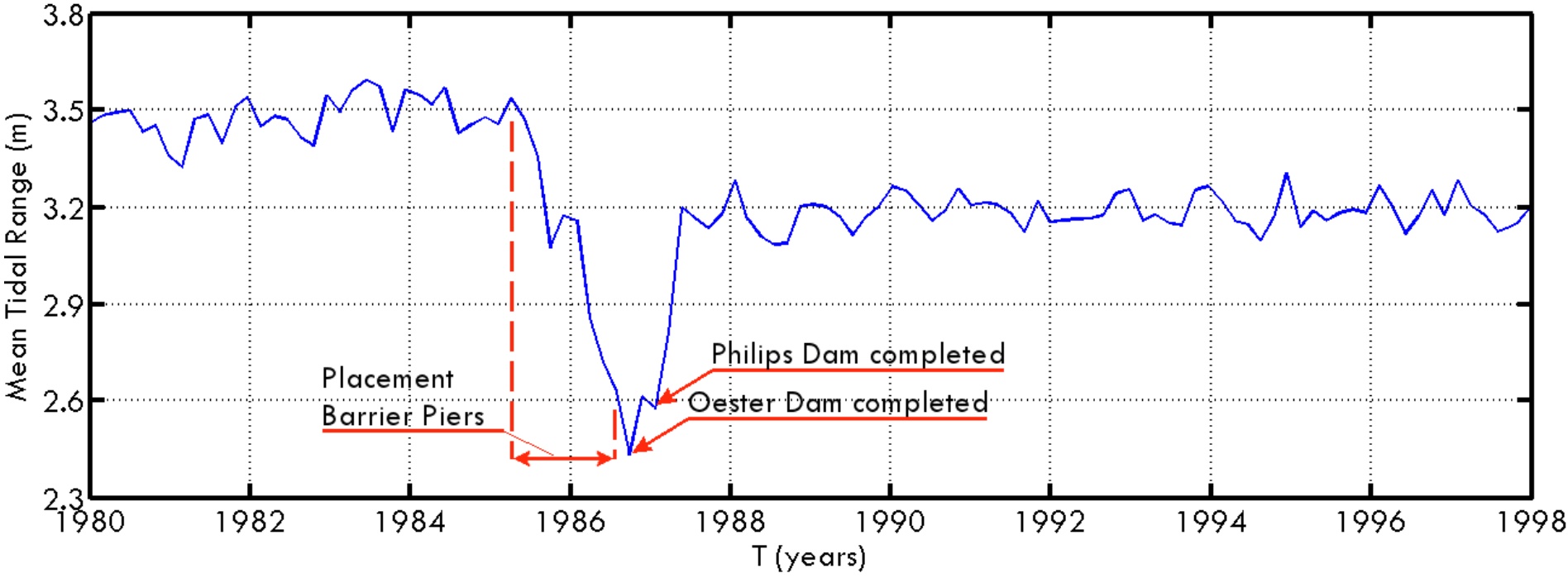
The Storm-Surge Barrier

Storm surge barrier:

- Reduces the inlet cross-section from 80000 to 16000 m^2
- Dissipates a lot of tidal energy

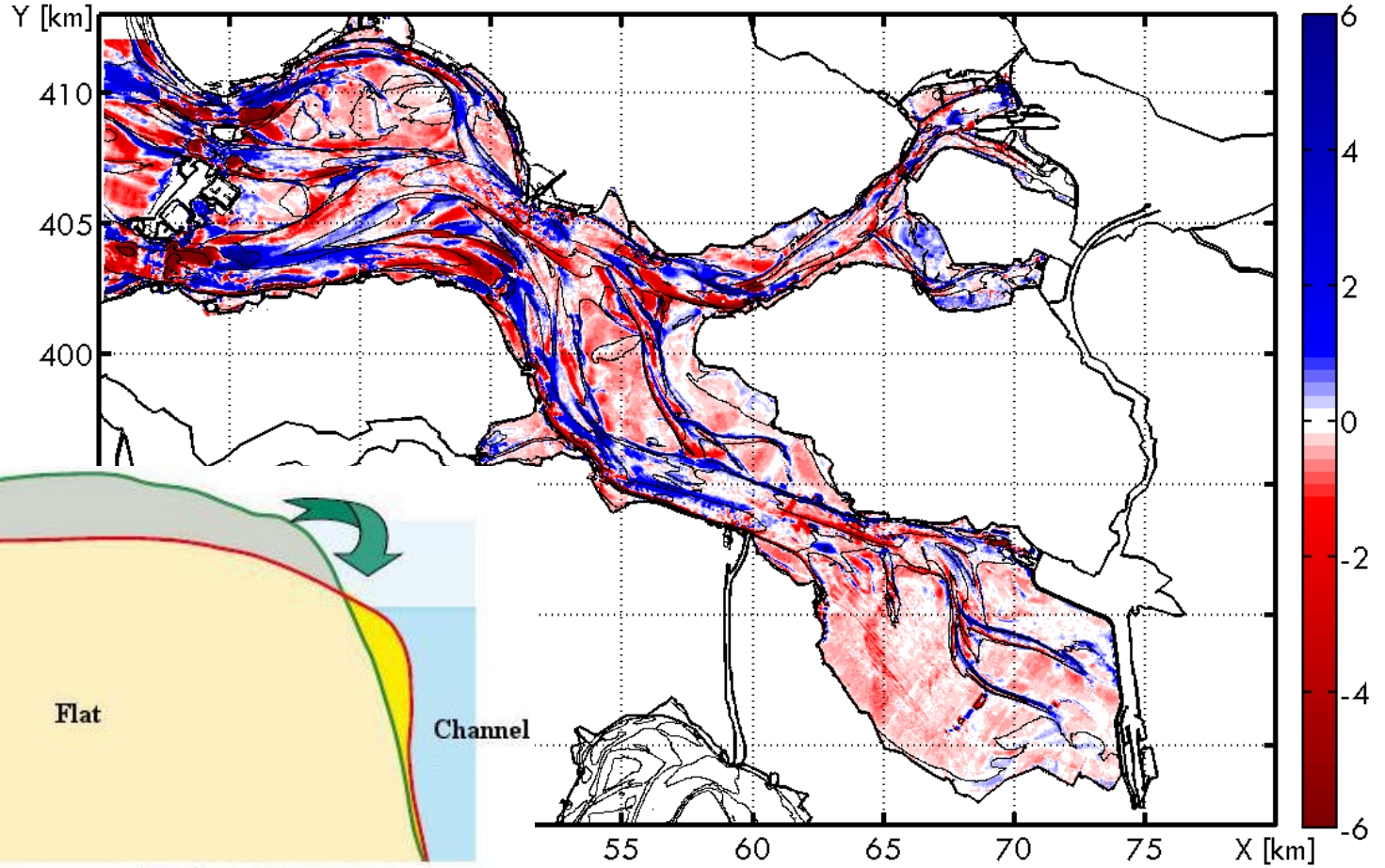
The effects of the storm surge barrier

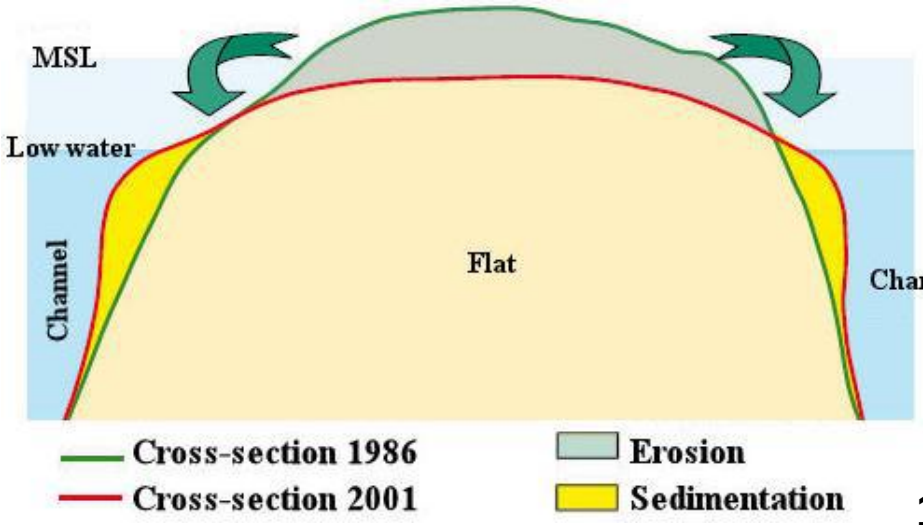
- Storm surge barrier causes reduction of the tide
- Back-barrier dams cut off the back end of the basin
- Tidal prism decreases (1200 to 900 million m^3/tide)



The effects of the storm surge barrier

- Tidal flats no longer receive enough sand from the channels
- Wind waves break down the flats





1986 - 2013

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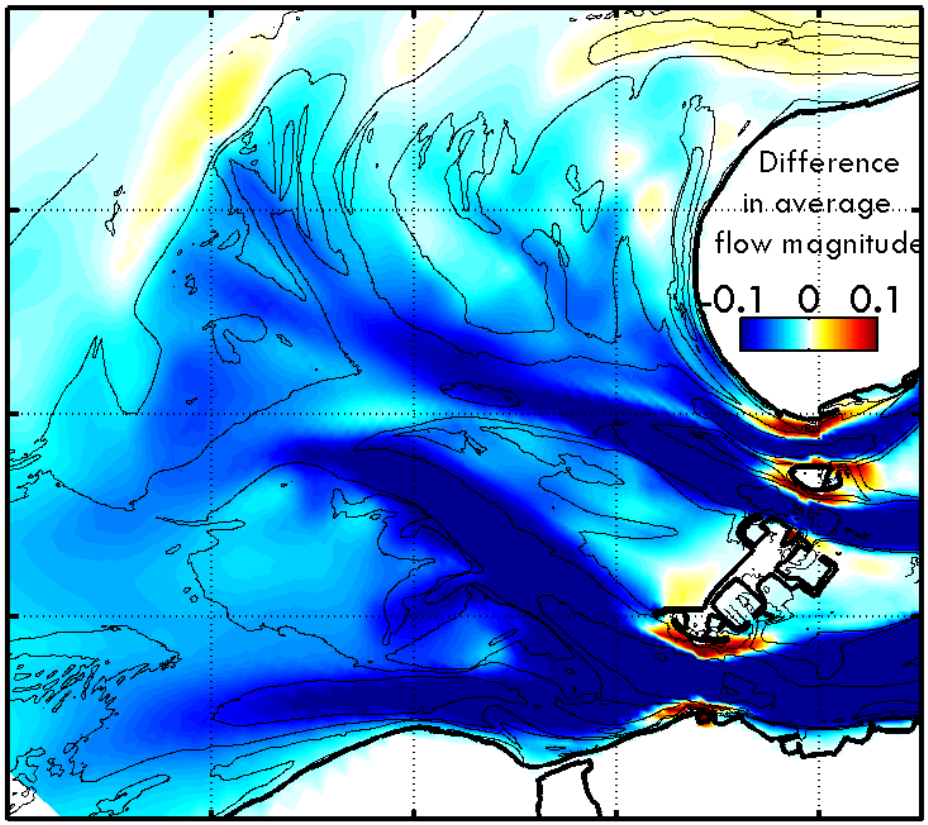
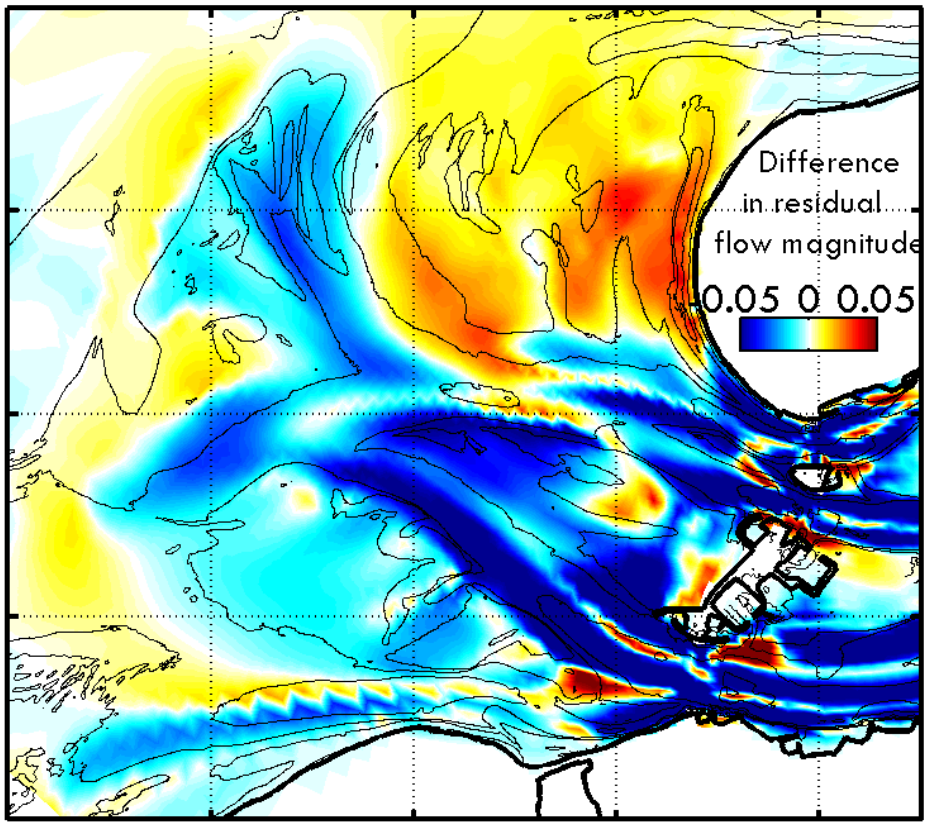
The effects of the storm surge barrier

- Average flow magnitudes decrease
- Balance between along-shore and cross-shore currents changes
- Virtually no sediment exchange through the barrier





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1986 - 2013

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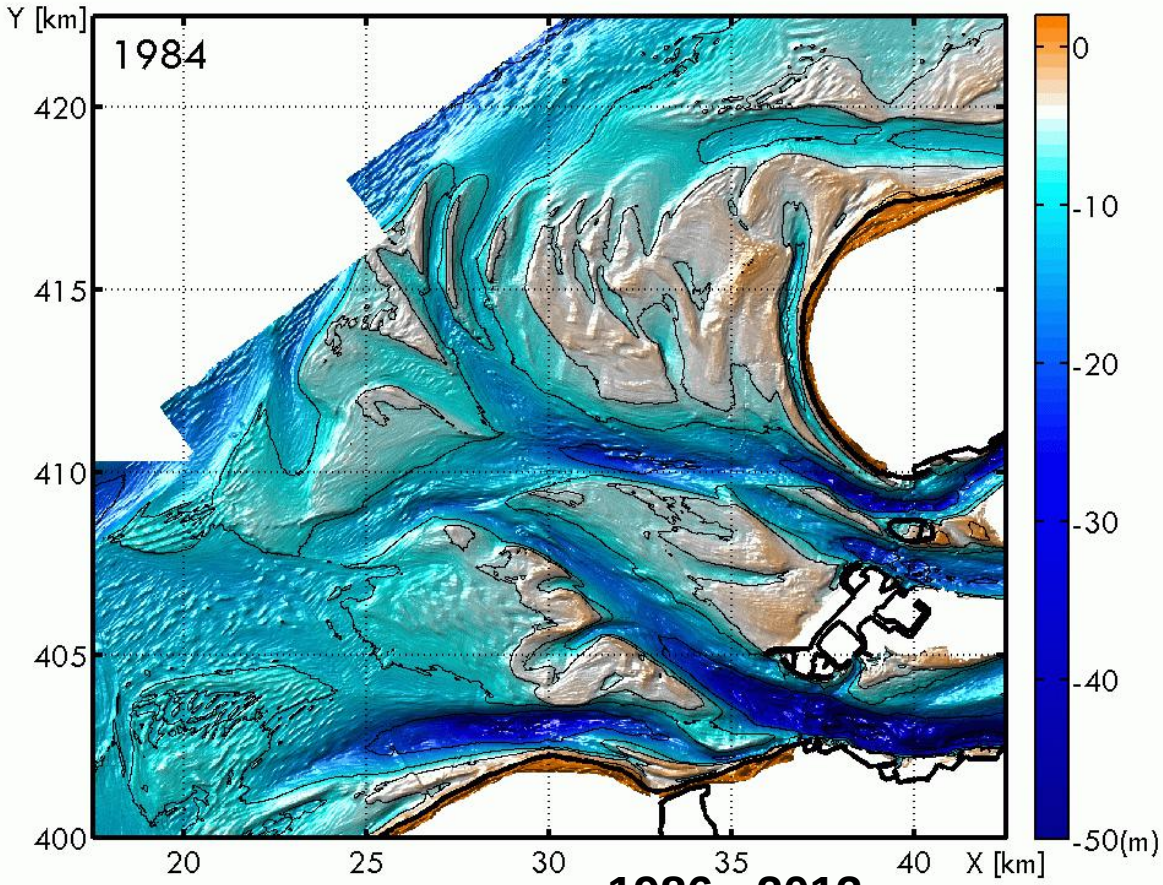
The effects of the storm surge barrier

Ebb-tidal Delta:

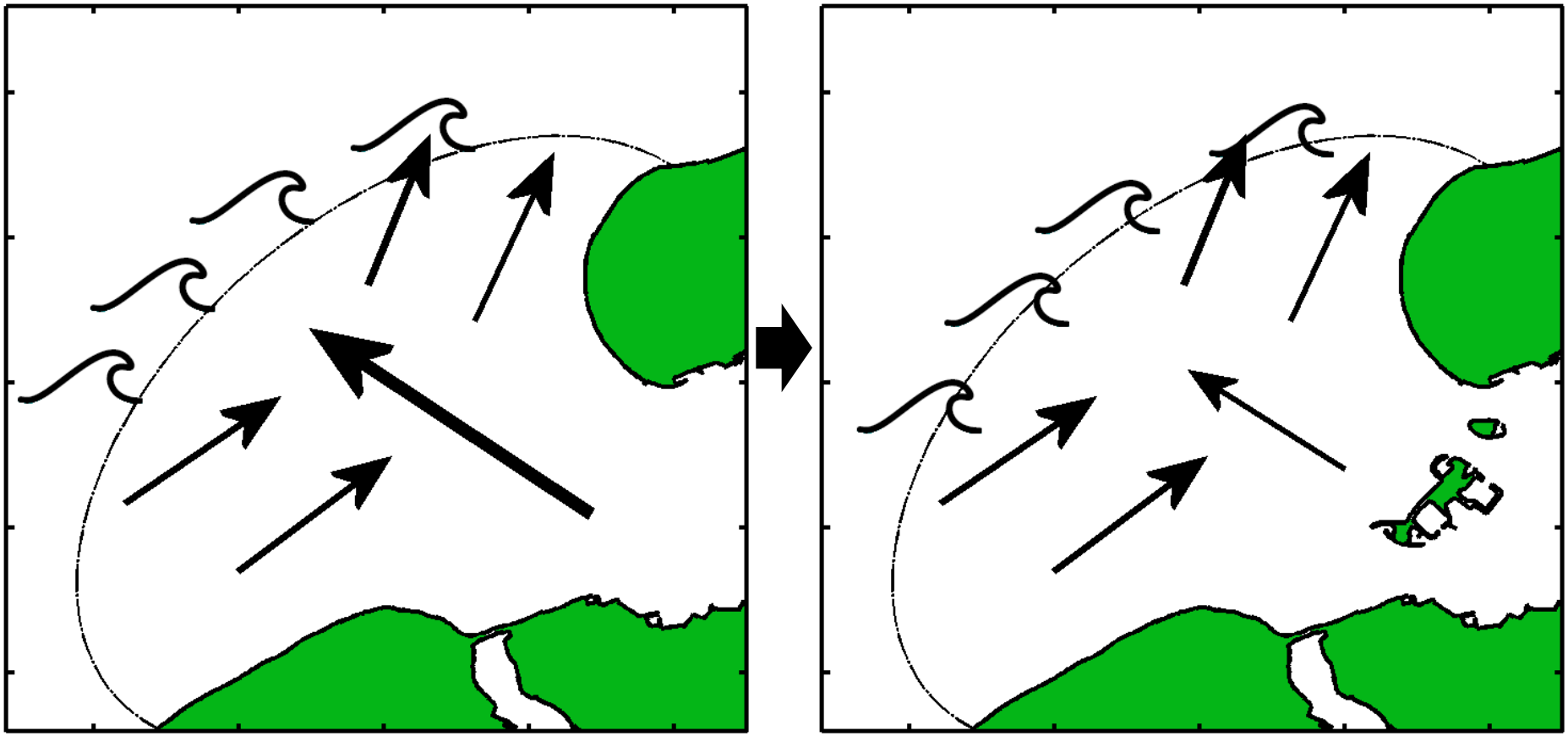
- Shallow parts lose sand, while channels gain sand
- Whole ebb-tidal delta rotates clockwise



1986 - 2013

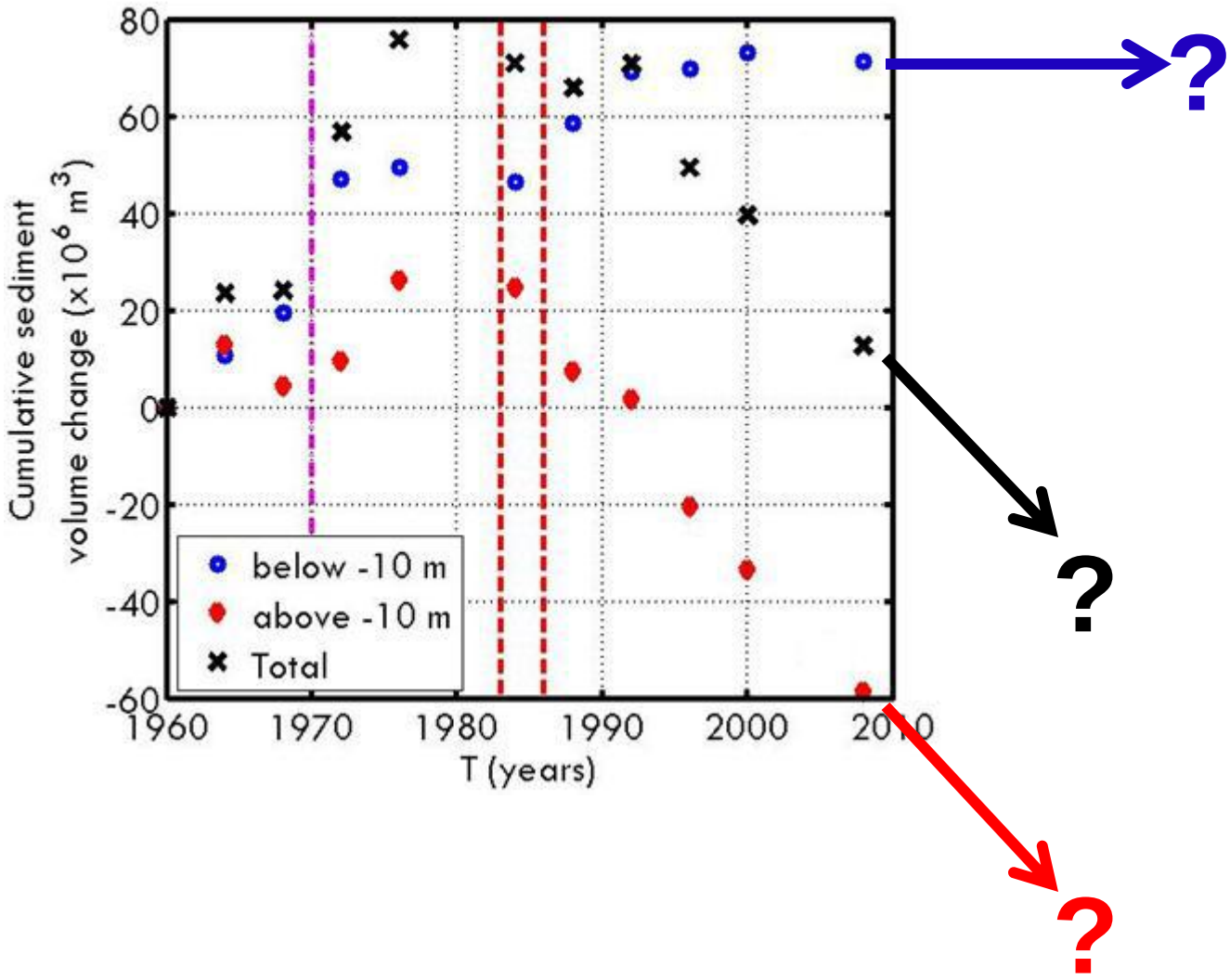
The effects of the storm surge barrier

- Balance between the tide coming out of the inlet, the tide moving along the coast, and the wind waves is disturbed.



The effects of the storm surge barrier

However, it is unclear how these trends will evolve over time



2013 - ?

Conclusions

- The Eastern Scheldt has been under the influence of human intervention for centuries.
- The basin was not in equilibrium when it was altered again by the Delta Plan.
- The decrease in tidal flow by the storm surge barrier is responsible for most morphological developments we see today.
- The trends on the ebb-tidal delta still need a long time to level out.


Thank you for your attention!