FerryBox Data for Ecosystem Modelling

9th FerryBox Workshop - Genoa 24 to 26 April 2019

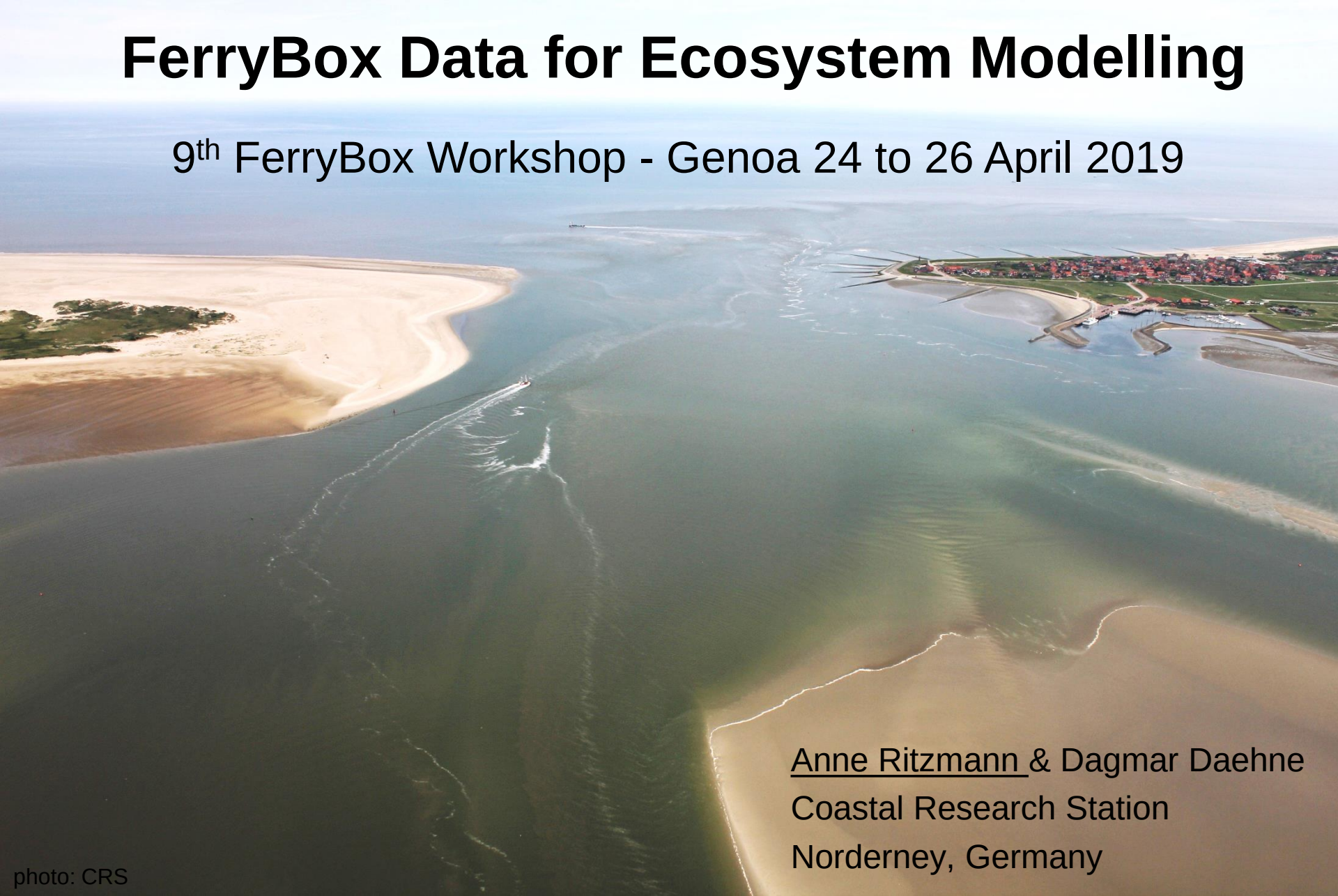

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photo: CRS

Outline

- Burchana FerryBox
- Harmonisation of the phytoplankton assessment in the German-Dutch Wadden Sea
- Microplastics transport and accumulation from point and diffuse sources in the Weser estuary and Wadden Sea (PLAWES)
- Future perspective

INTERREG Deutschland Nederland

Europäische Union
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FONA
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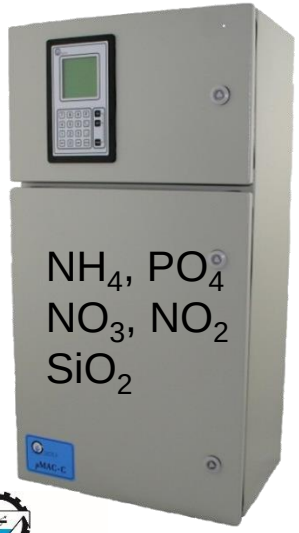
BMBF

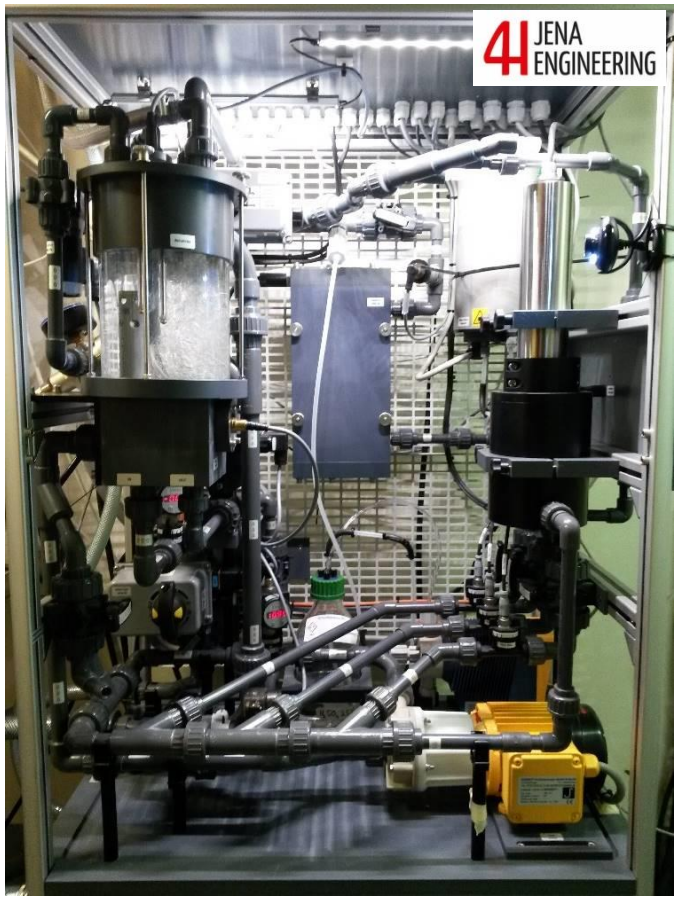
PLAWES

Burchana FerryBox

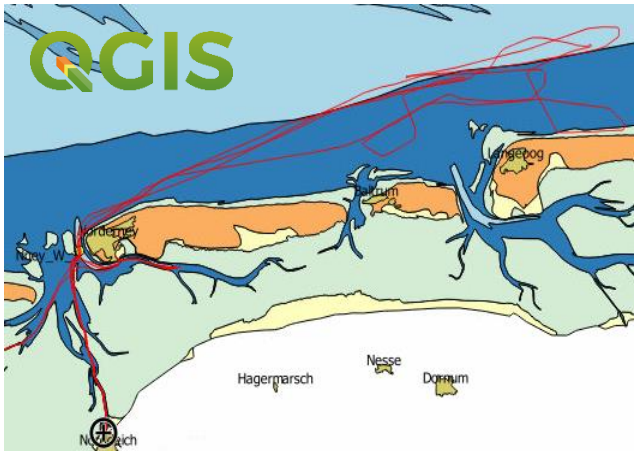


SYSTEA

TELEDYNE TECHNOLOGIES



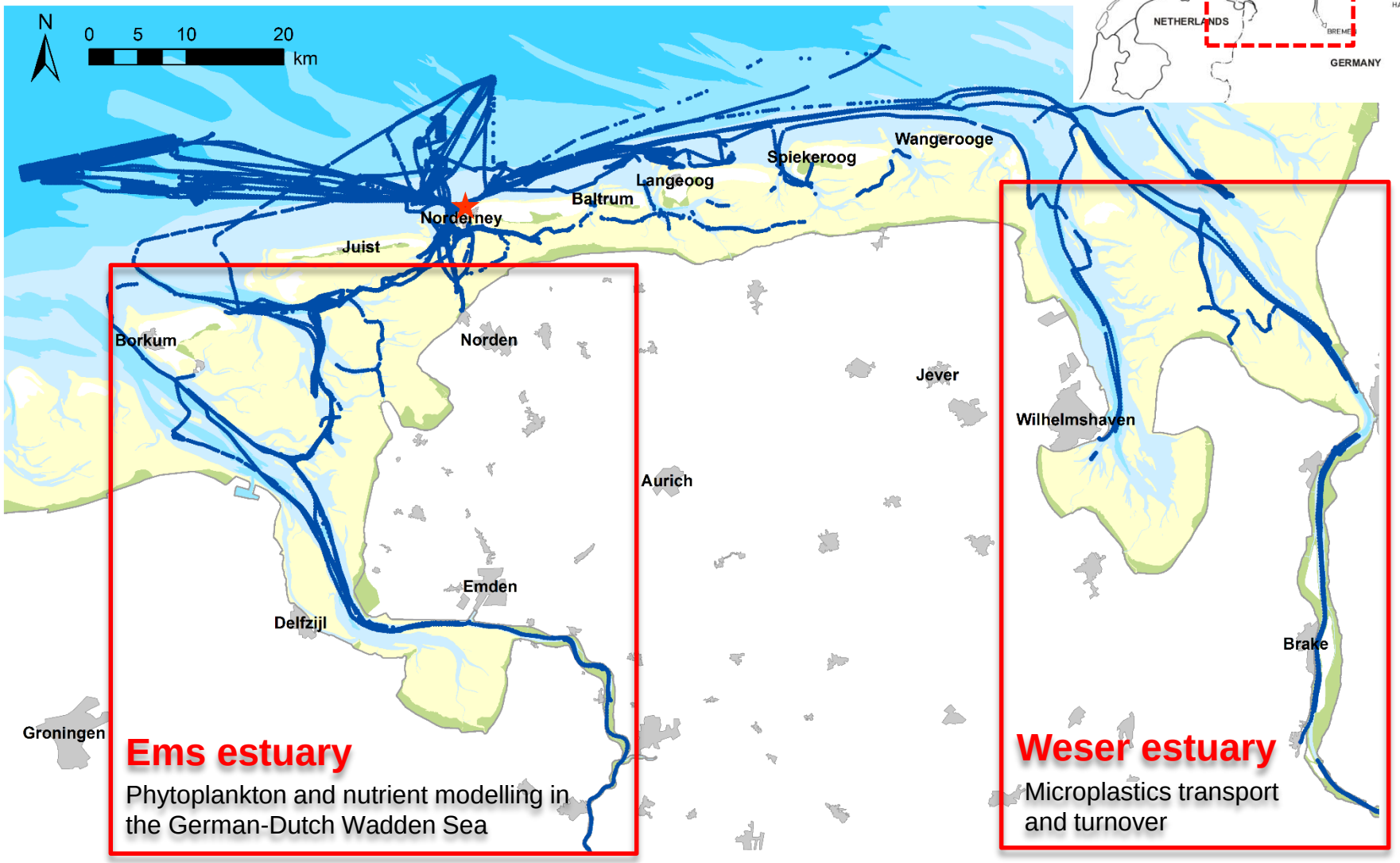
T, S, pH, DO, Turb., Chl-*a*

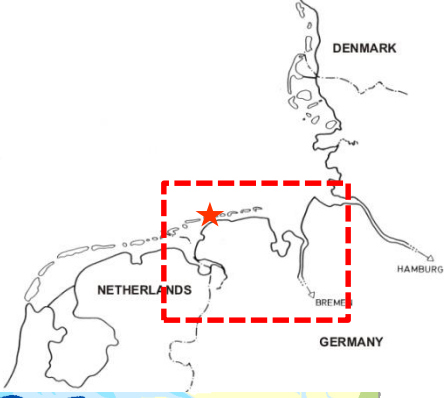


GPS

photos: CRS, Teledyne, SYSTEA

FerryBox data coverage 2017 and 2018





Numerical modelling approach

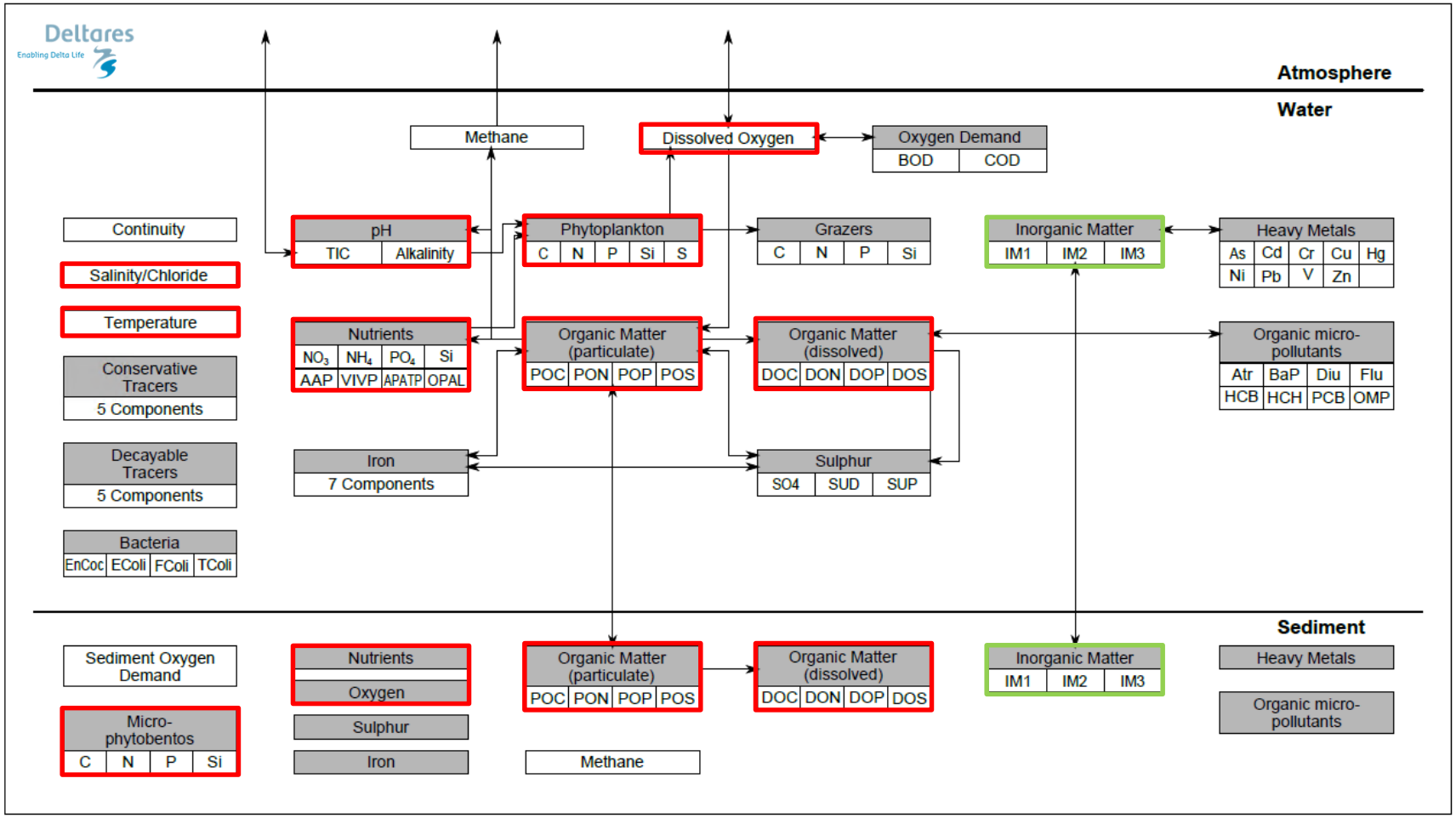


fig. WAQ substances (Deltares, 2015)

Bilateral Interreg project

- Harmonisation of the phytoplankton assessment in the German-Dutch Wadden Sea

INTERREG Deutschland Nederland

Europäische Union
Europese Unie

NLWKN Forschungsstelle Küste

DKRZ DEUTSCHES KLIMARECHENZENTRUM

HIFMB Helmholtz Institute for Functional Marine Biodiversity at the University OLDENBURG

Rijkswaterstaat

Deltares Enabling Delta Life

- Promote a common understanding of the extent of eutrophication by means of a joint modelling approach

- Realistic representation of ecosystem dynamics by large scale → fine scale model

Hyperturbid Ems estuary

Instrument	Task
FerryBox, CTD	Water quality
ADCP, density sensor	Fluid mud dynamics
Multibeam echosounder, subbottom profiler	Morphodynamics and habitat mapping

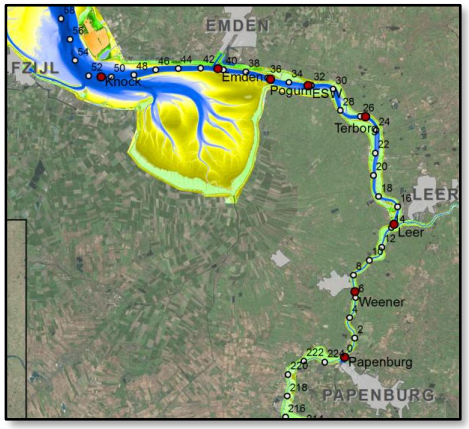
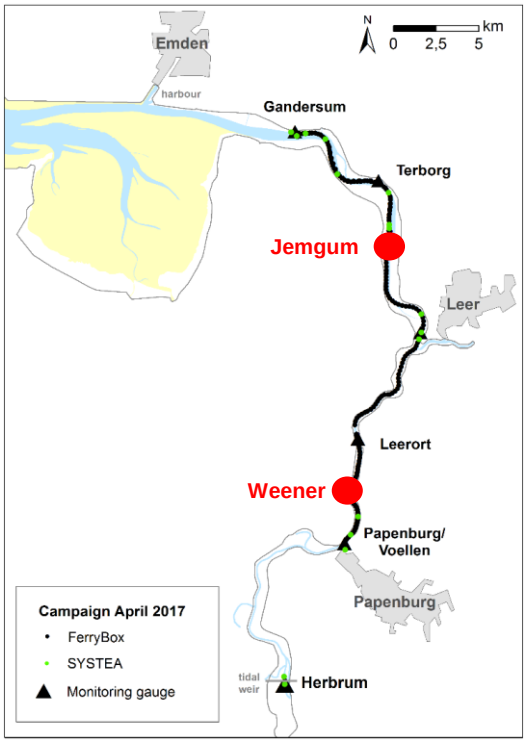
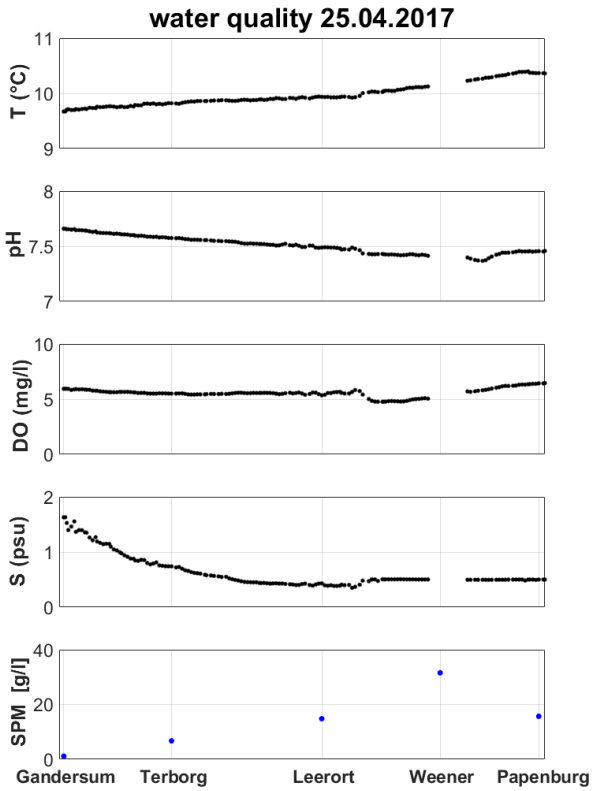


fig. Wattenrat, FSK

Campaign 04/2017 – longitudinal profile





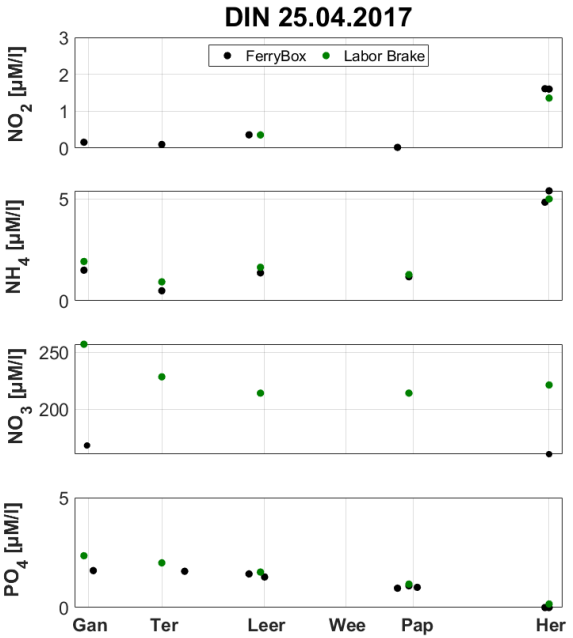
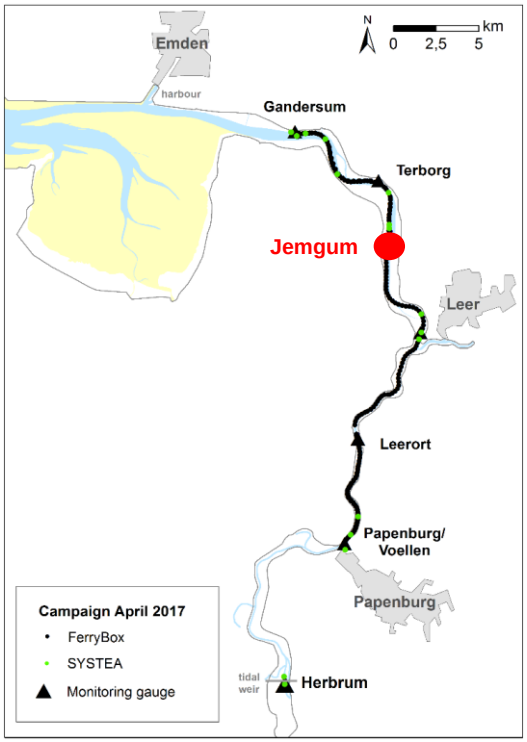


fig. Ritzmann (2018)

Campaign 04/2017 – stationary measurements



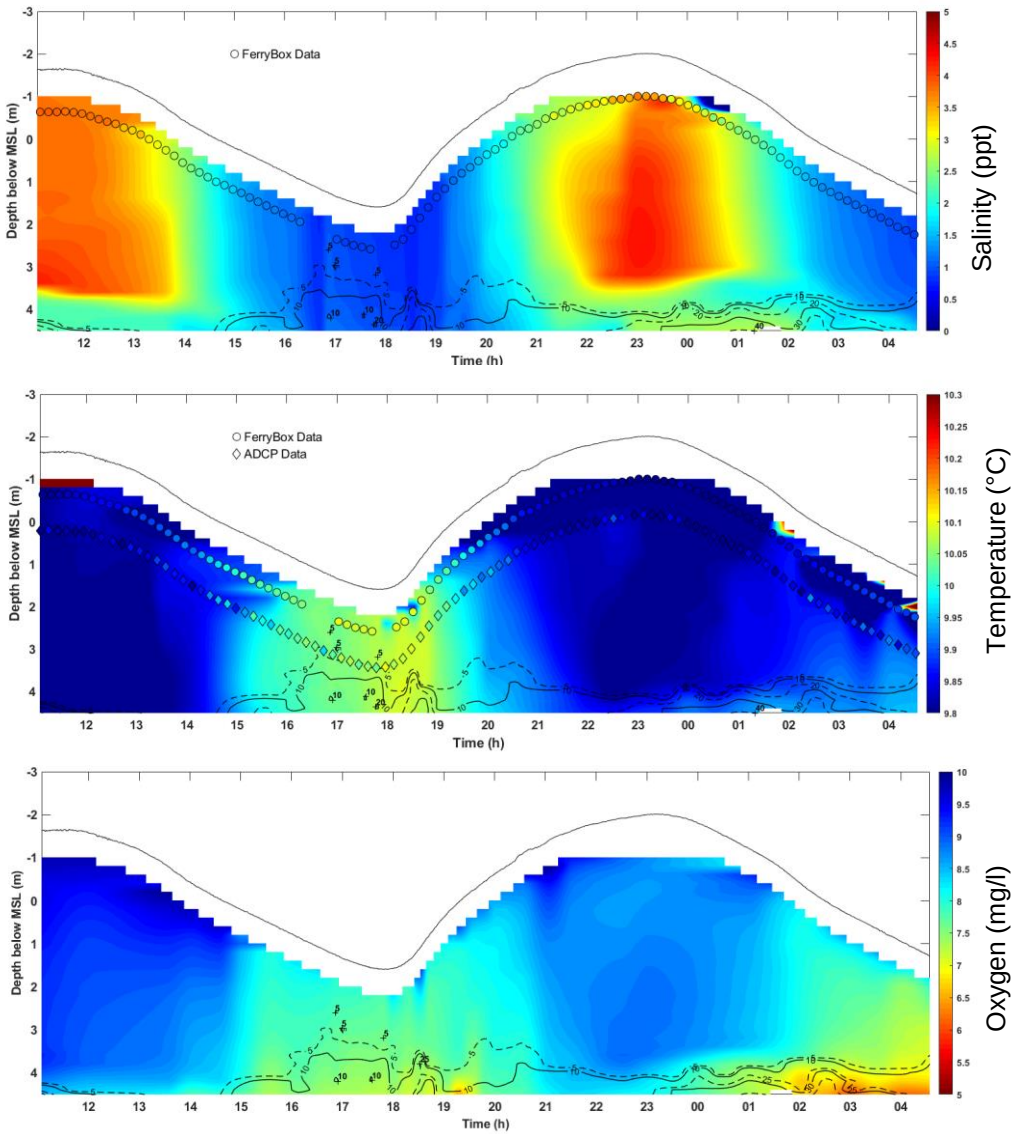
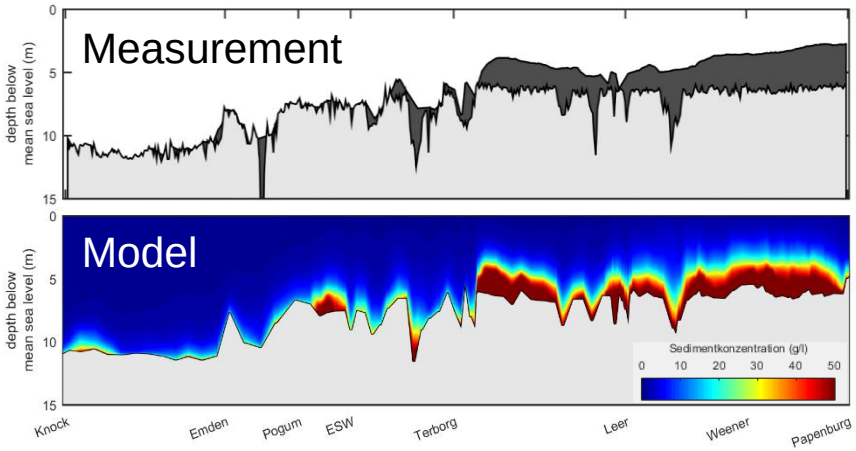


fig. Oberrecht & Ritzmann (unpublished)

Ems-Dollart Model

- Fine scale model for hydro- and morphodynamics incl. fluid mud interaction
  - 21 layers, 6 s timestep
  - 10 - 100s m resolution
- Calibrated and validated against field data



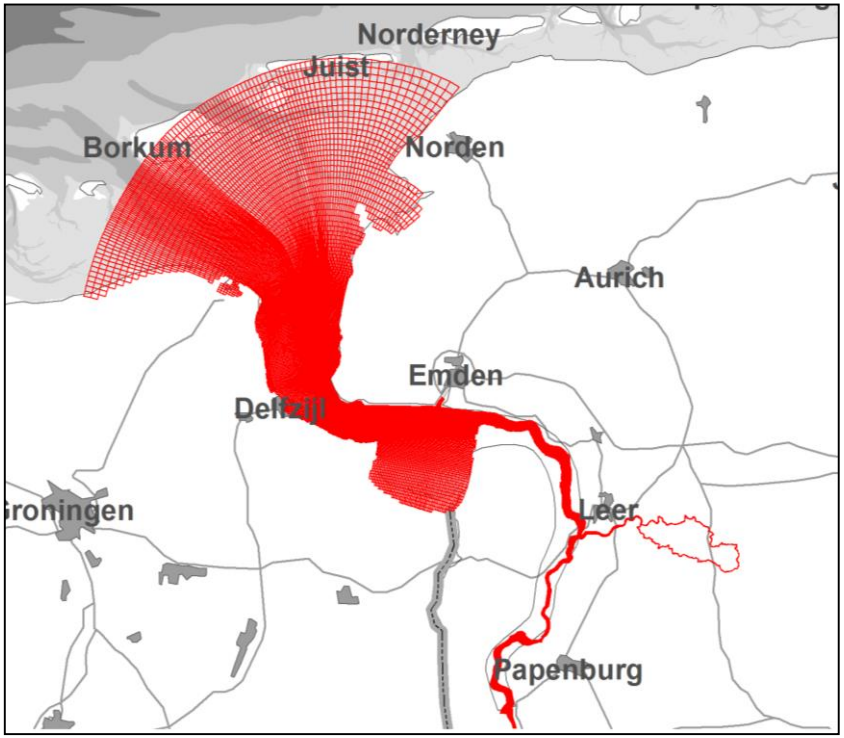
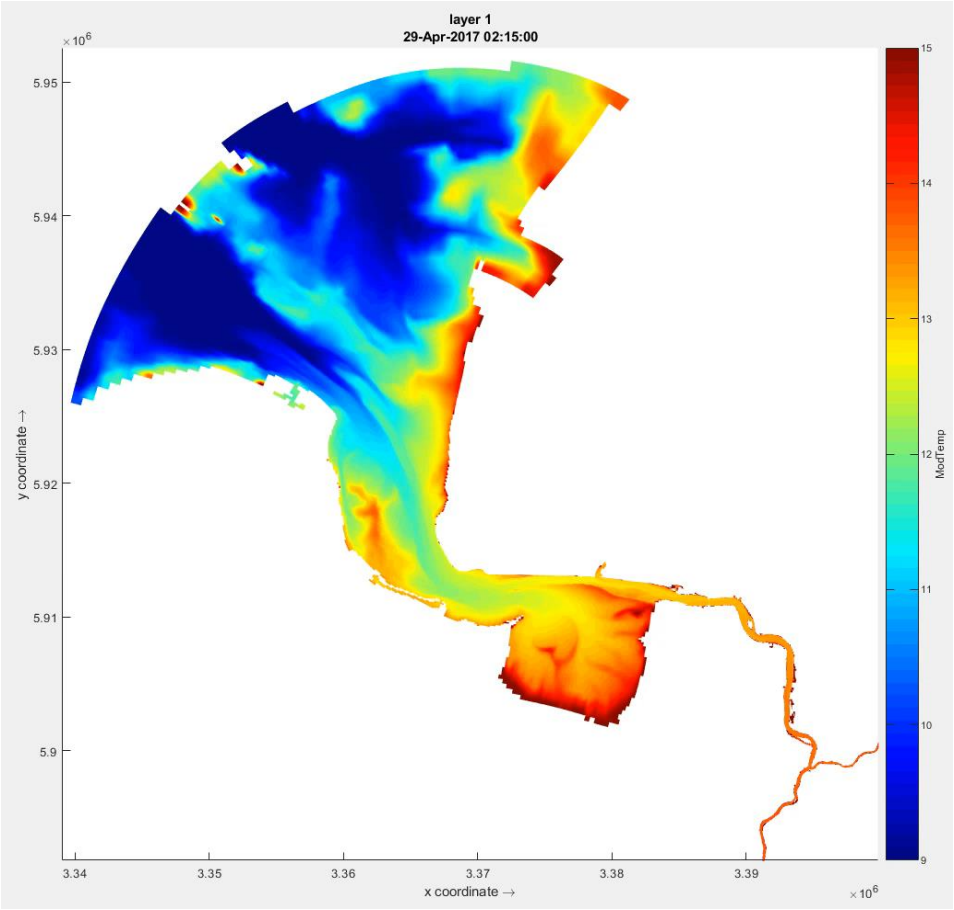


fig. Oberrecht & Wurpts, 2019

Water quality model

- Reproduce nutrient concentrations and primary production in Lower and Outer Ems
- Exchange with sediment in order to assess PO_4-remobilisation
- Apply FerryBox and monitoring data in order to calibrate and validate the model
- Add substances & processes



PLAWES

- Micro**PLA**stics contamination in the **WES**er estuary

PLAWES

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THÜNEN

UNIVERSITÄT BAYREUTH

JÜLICH
FORSCHUNGSZENTRUM

AWI

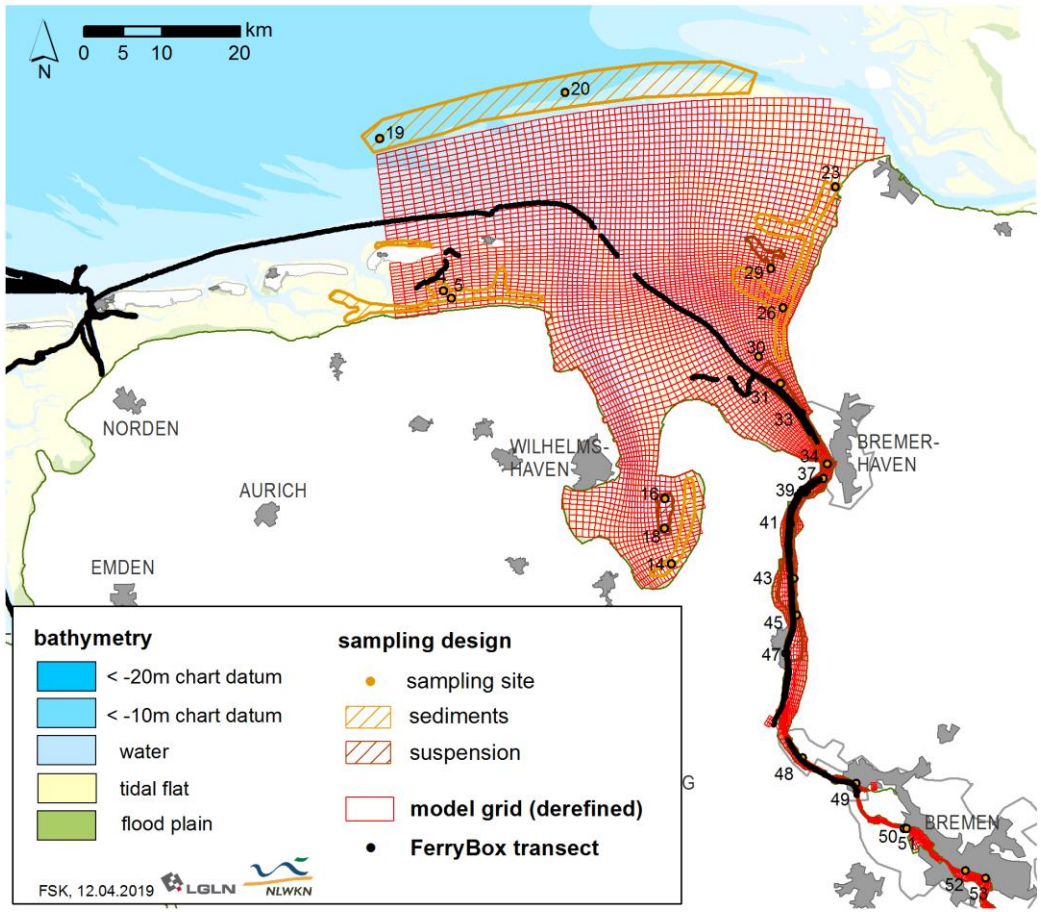
ICBM

GOETHE UNIVERSITÄT
FRANKFURT AM MAIN

- Quantify MP in the environment by laboratory analyses of water, sediment and biota

- Model simulation of MP transport and accumulation from point and diffuse sources in Weser estuary and Wadden Sea

PLAWES



Shiravani et al., 2018 (edited)

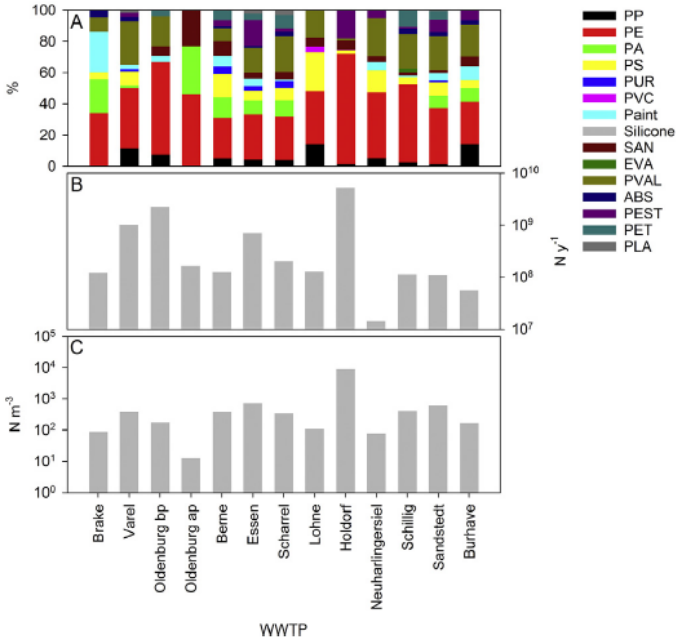
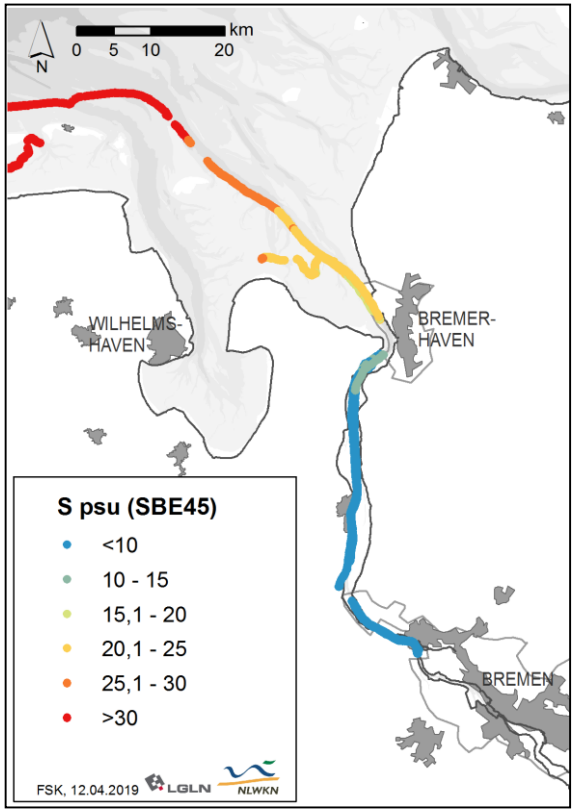
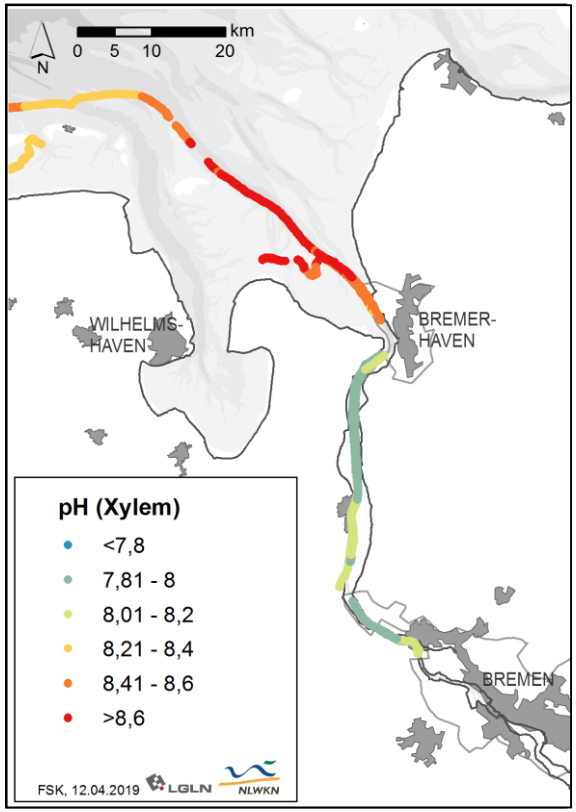


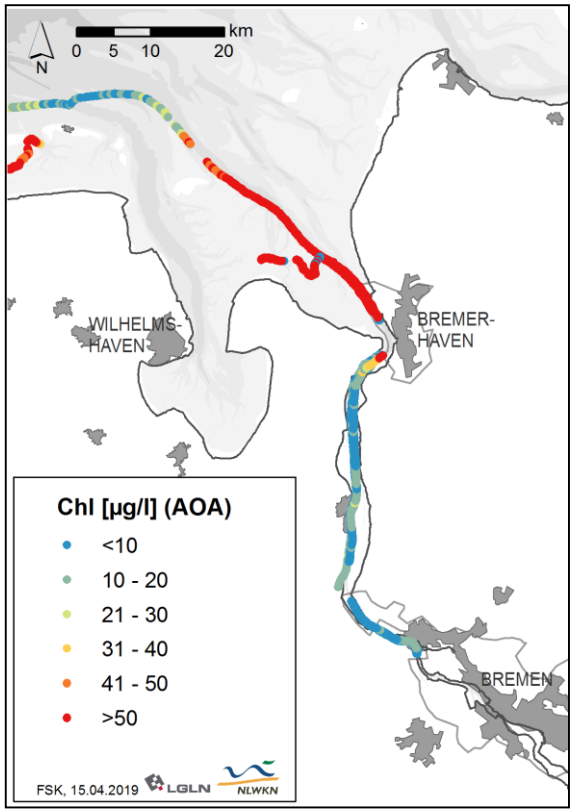
Fig. 2. Microplastics (MP) <500 µm in treated waste water (TWW) of 12 waste water treatment plants (WWTP) in Lower Saxony (Germany). At the WWTP Oldenburg a sample was taken before (bp) and after (ap) post-filtration. A: Percentage composition of synthetic polymers; B: Annual load of MP in the effluent (based on yearly effluent); C: MP numbers per cubic meter.

Mintenig et al., 2017

FerryBox data may 2018

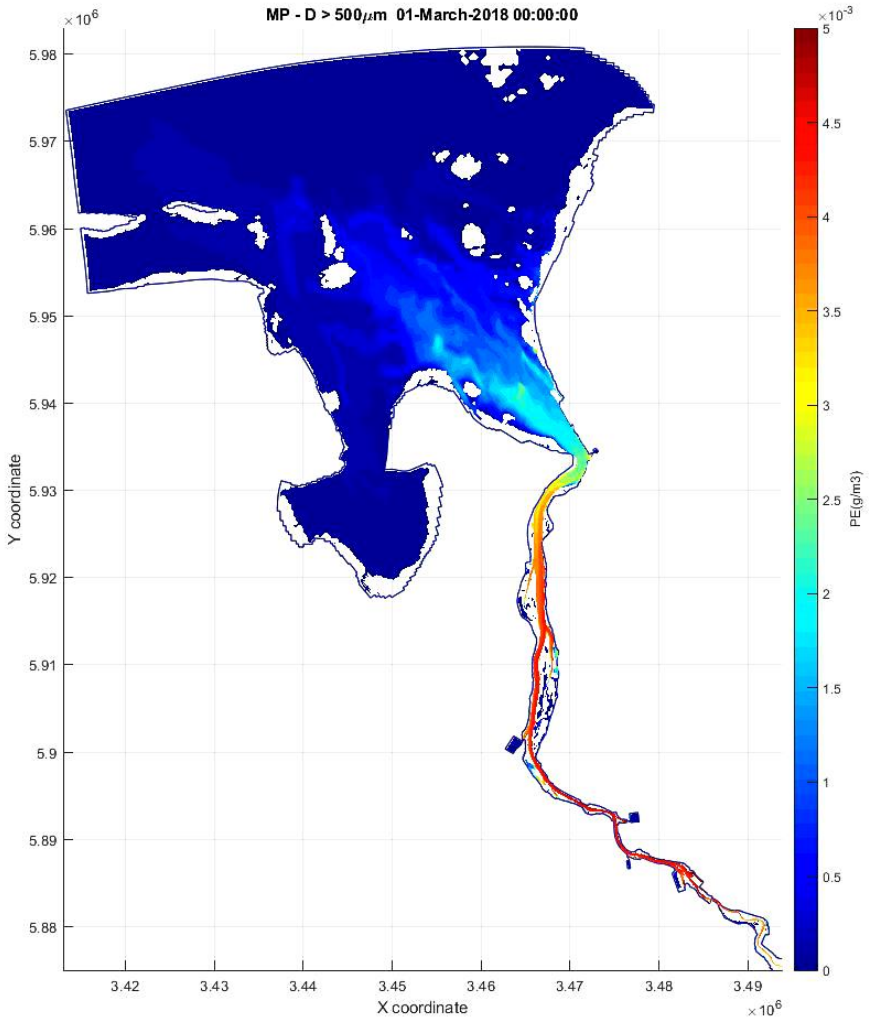






Polyethylen (D>500 µm)

- 3 MP fractions for common particles PE, PP, PS are represented
- Large fraction >500 µm
- Validation by laboratory data



Summary and future perspective

- Weser:
  - MP transport and behaviour
  - Validate model with FerryBox and laboratory data
- Ems:
  - Model for hydro-/ morphodynamics, representation of fluid mud
  - Improve water quality model in order to reproduce nutrient- and chlorophyll patterns

Literature

Mintenig, S.M., Int-Veen, I., Löder, M.G.J., Primke, S. & G. Gerdts (2017): Identification of microplastic in effluents of waste water treatment plants using focal plane array-based micro-Fourier-transform infrared imaging. doi.org/10.1016/j.watres.2016.11.015

Oberrecht, D. & A. Wurpts (2019): Wirkung der flexiblen Tidesteuerung auf die Reduzierung des Schwebstofftransportes und Bildung von Flüssigschlick in der Unterems. Gutachten 01/2019 (unveröff.)

Ritzmann, A. (2018): Hochaufgelöste Messung von Gewässergüteparametern und gelösten anorganischen Nährstoffen im Emsästuar und im niedersächsischen Küstengewässer. Forschungsbericht 02/2018 (unveröff.)

Shiravani, G., Oberrecht, D, Kristandt, J, Ritzmann, A. & A. Wurpts (2018): Numerical modelling of microplastic transport in Weser estuary and Wadden Sea. MICRO2018 Proceedings

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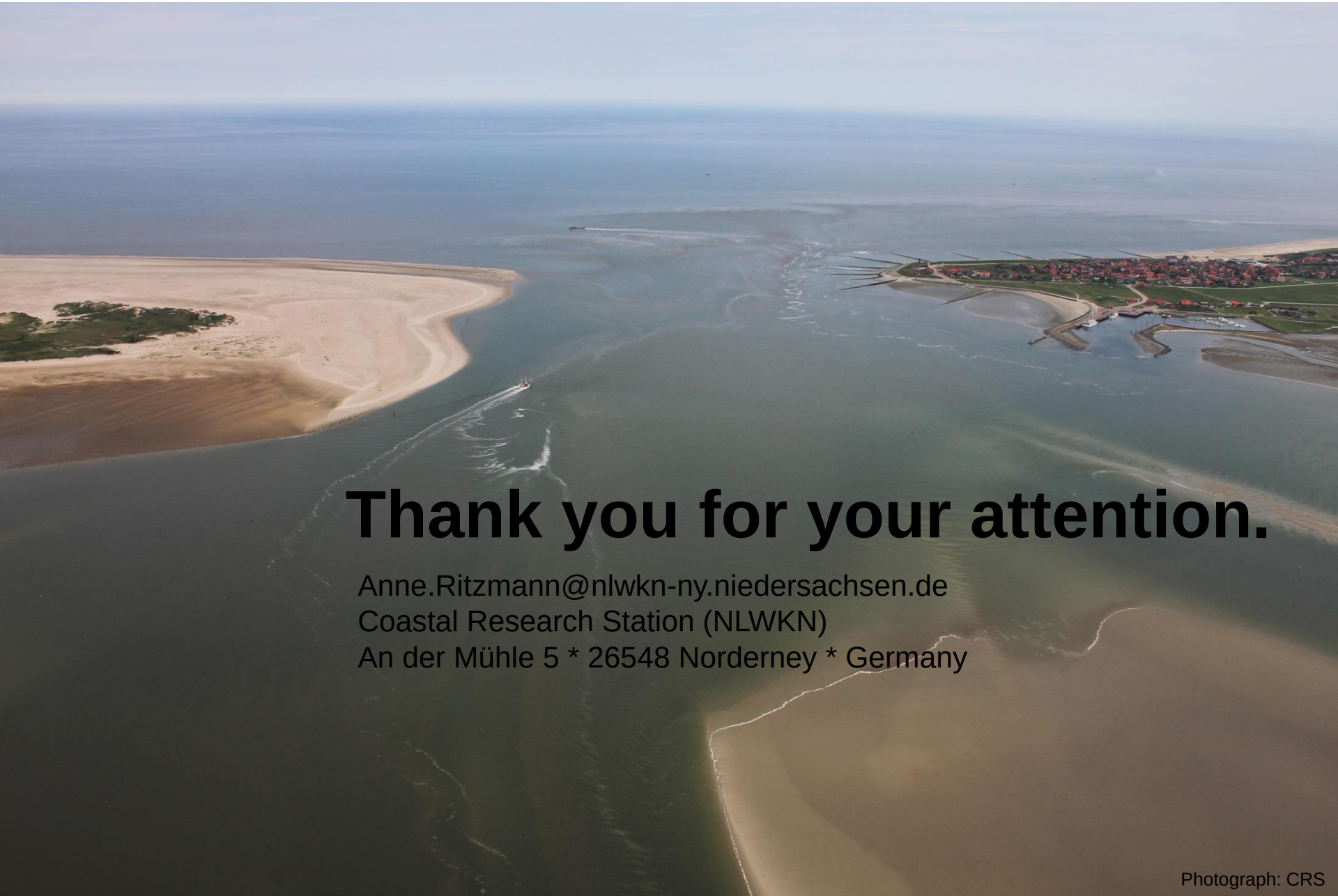

Thank you for your attention.

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Photograph: CRS