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Riverine transport of microplastics

from the Dutch border to the North sea

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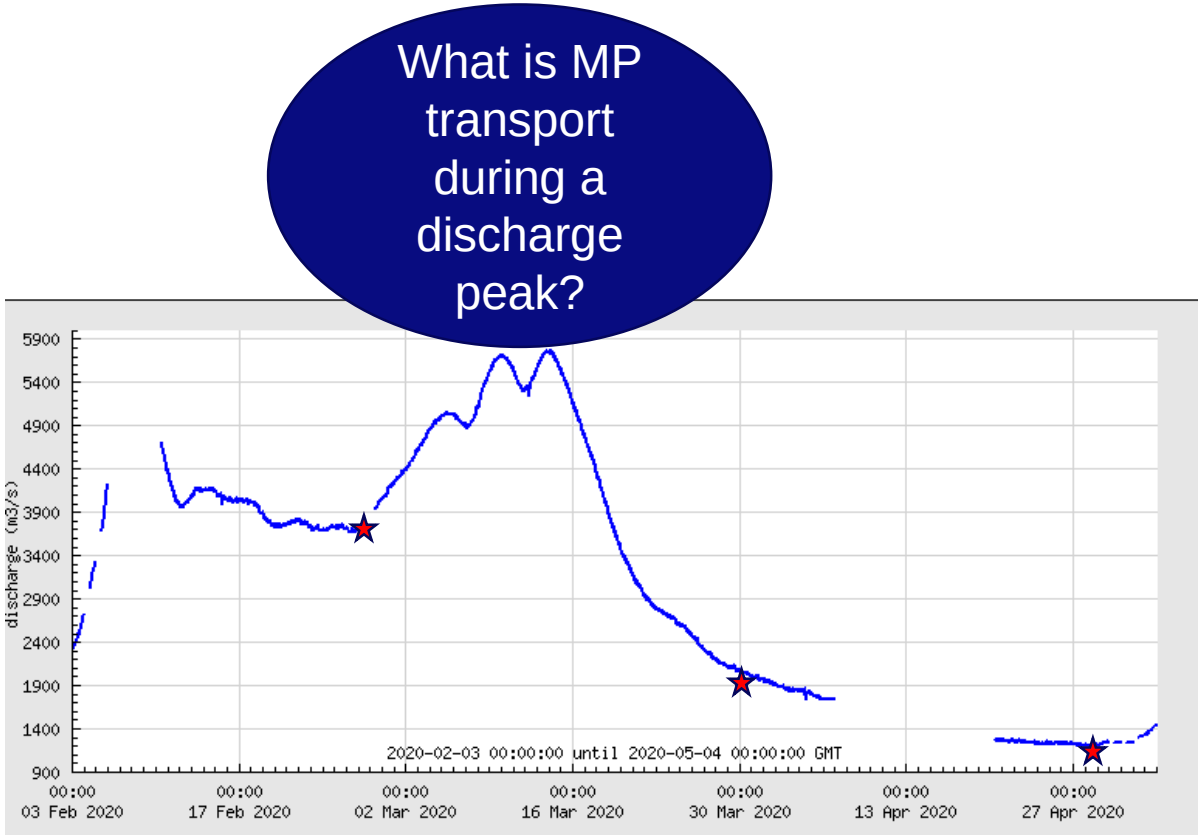
Introduction

- Microplastic concentrations in the water column usually monitored:
  - Only a few times a year (e.g. →)
  - Only at one/few locations (x,y,z)
- With a model, the spatial and temporal variation of the microplastics concentration can be predicted:
  - Large scale (year, catchment) → 1D modelling
  - Small scale (~month, river stretch) → 3D flow + vertical distribution MP

Objective:

"Determine the annual transport of microplastics in the Rhine and Meuse river branches from the Dutch border to the North Sea from 1D modelling"

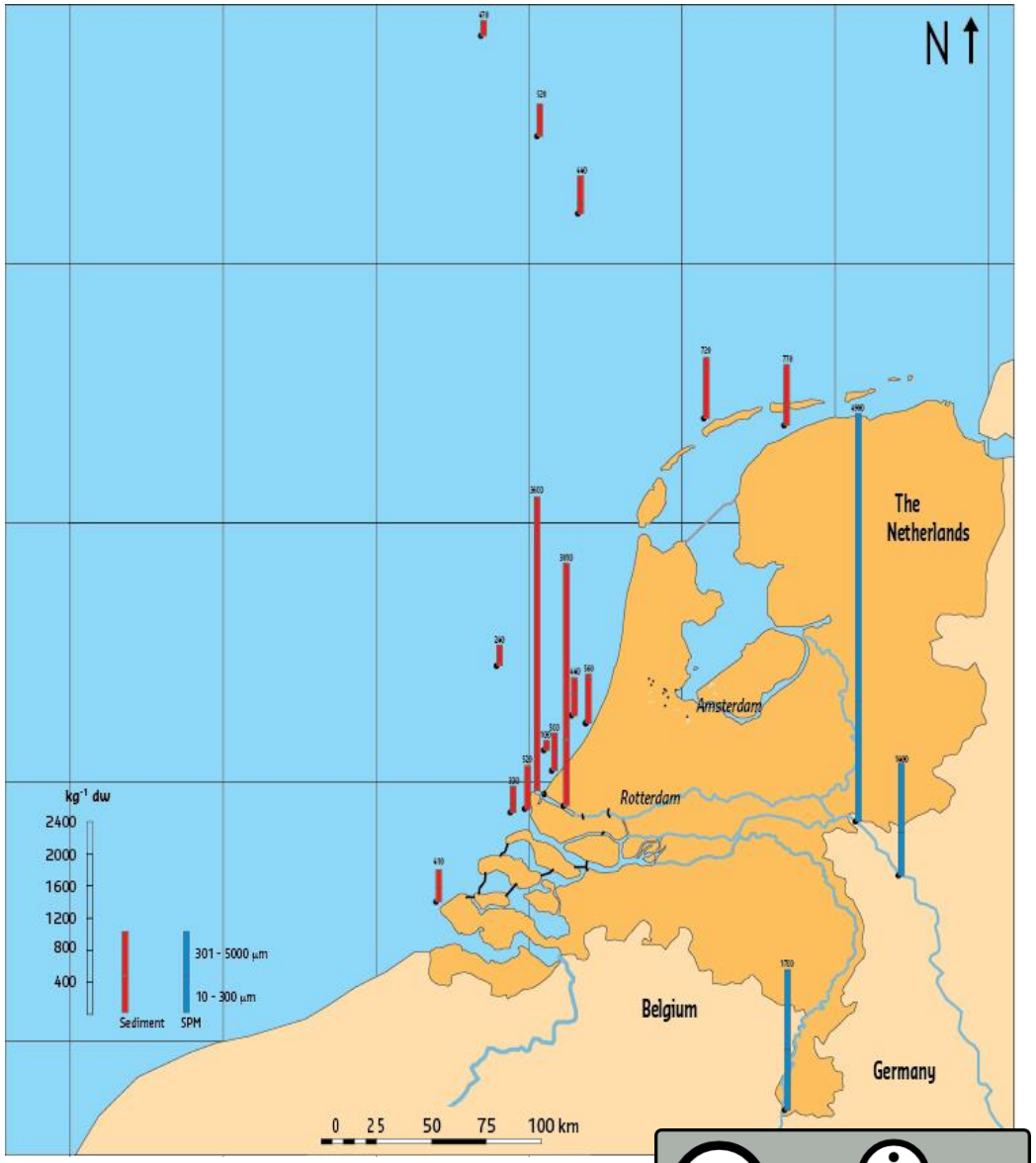


★ = Possible MP observations (planned every 4 weeks: not yet realized in the Netherlands)

Annelotte van der Linden, Arjen Markus and Frans Buschman (2019), Deltares report 11203712-002-ZKS-0004

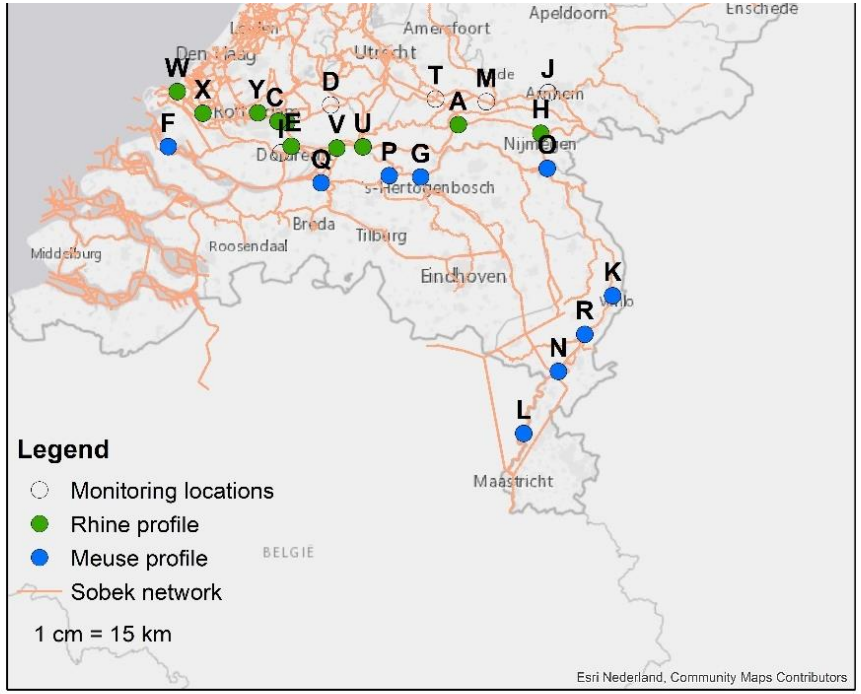
Method for 1D simulation

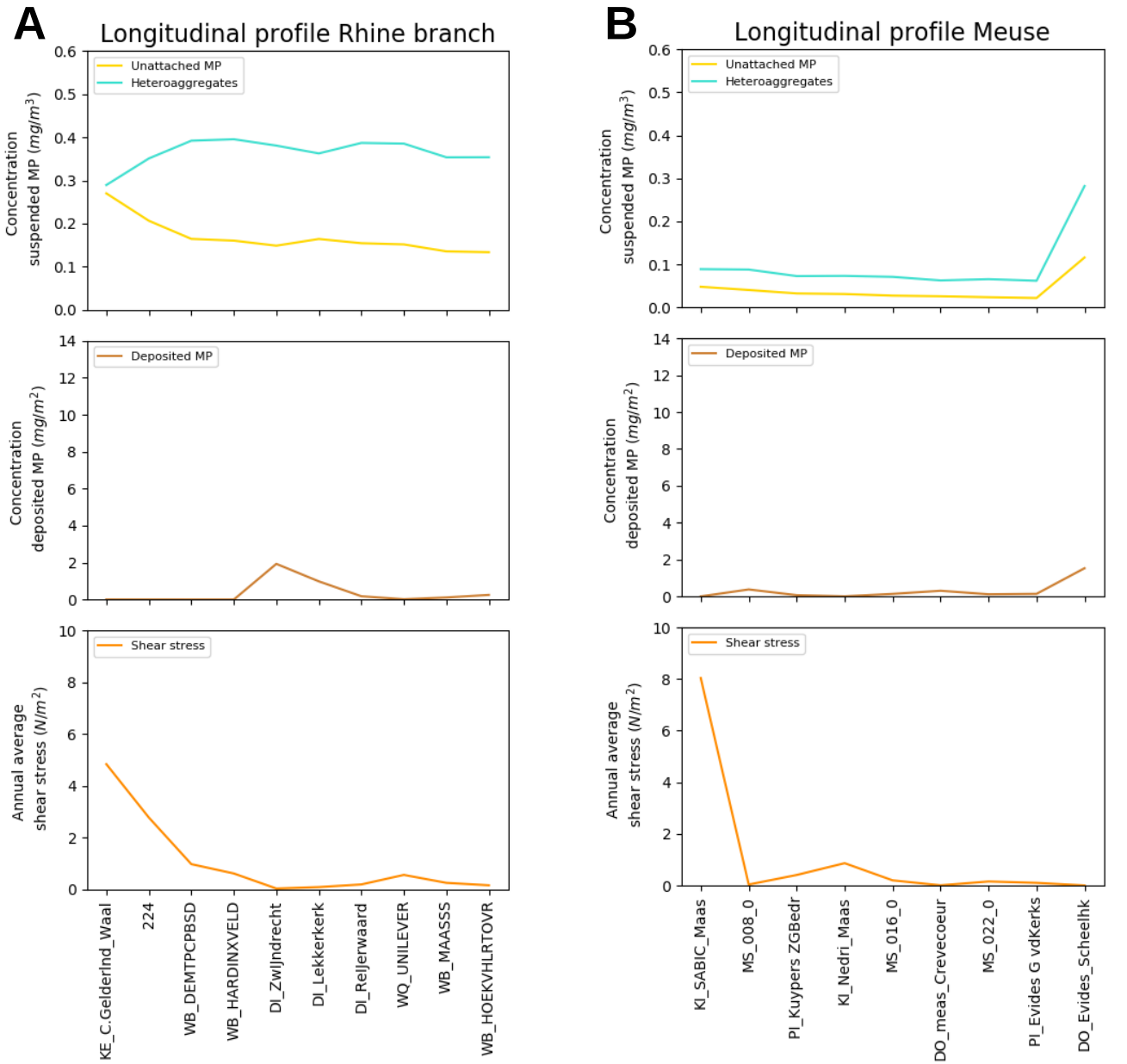
- Estimate the concentration of microplastics from 17 observations in 2014
  - Lobith: 0.56 mg/m3
  - Eijsden: 0.14 mg /m3
  - [no sources within the Netherlands: we underpredict]
- Use results of 2014 national flow model (LSM)
- Modelling processes for 24 types of microplastics:
  - Advection
  - Aggregation (homo and hetero)
  - Deposition
- Estimate pathways of microplastics from border to sea



Results and conclusion

- Around 66-90 % transported to sea
- Deposition occurs in Haringvliet (often low flow velocity due to sluices)





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Detailed modelling: an example

- Allseas develops a sustainable and cost-effective system to remove plastics from rivers and waterways
- They investigate the dynamics by sampling debris
- Deltares investigated for Allseas where the system can be placed most effectively using:
  - 3D hydrodynamic model
  - particle tracking or D-Waq

- Funding: grant under the LIFE programme
- More information:
  - https://allseas.com/allseas-river-plastics-removal-project/

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Allseas

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