A Global 3D map of marine plastic litter

assimilating models and observational data

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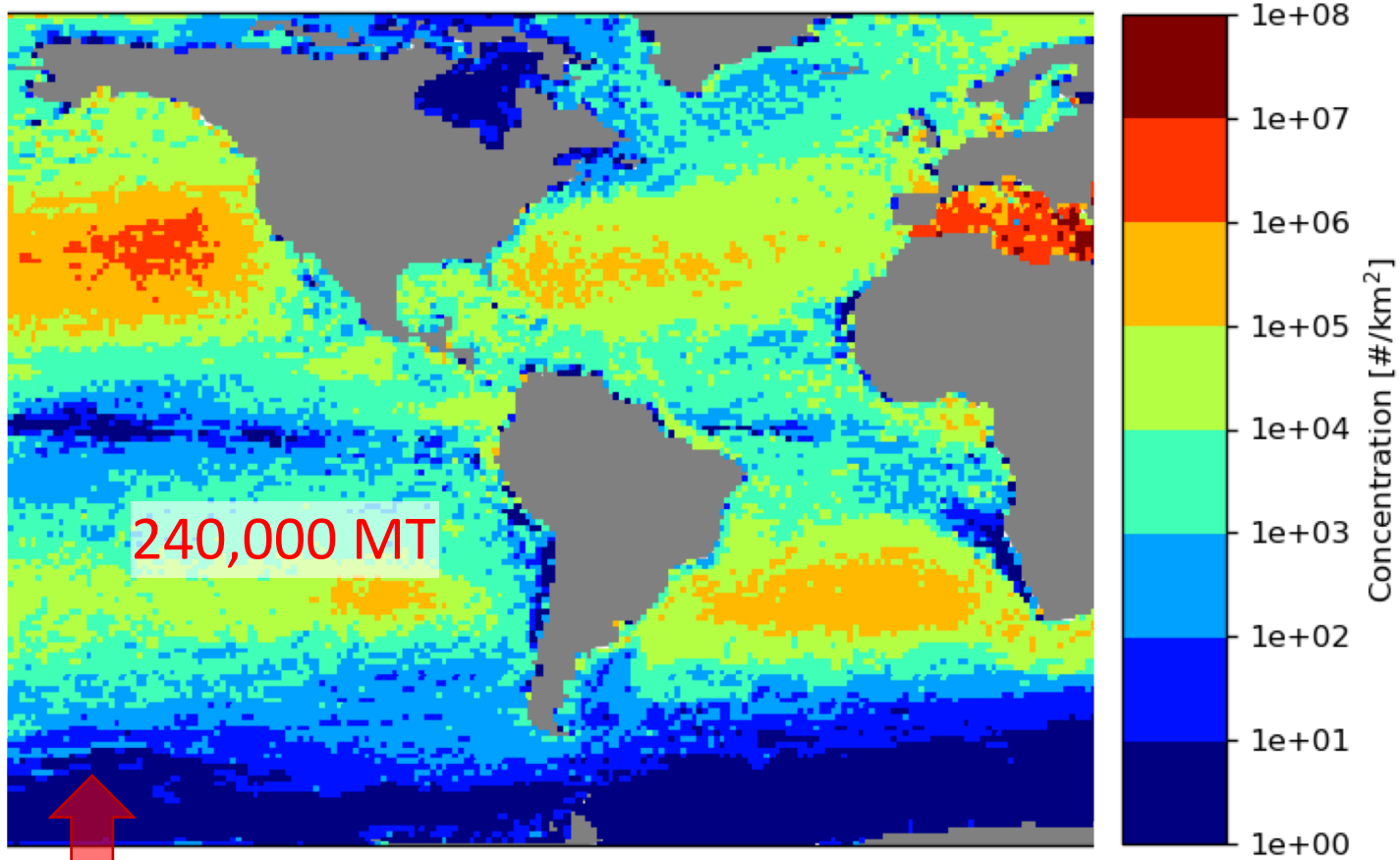

van Sebille et al. (2015)

>4.8 MMT/year

Jambeck et al. (2015)

European Research Council
Established by the European Commission

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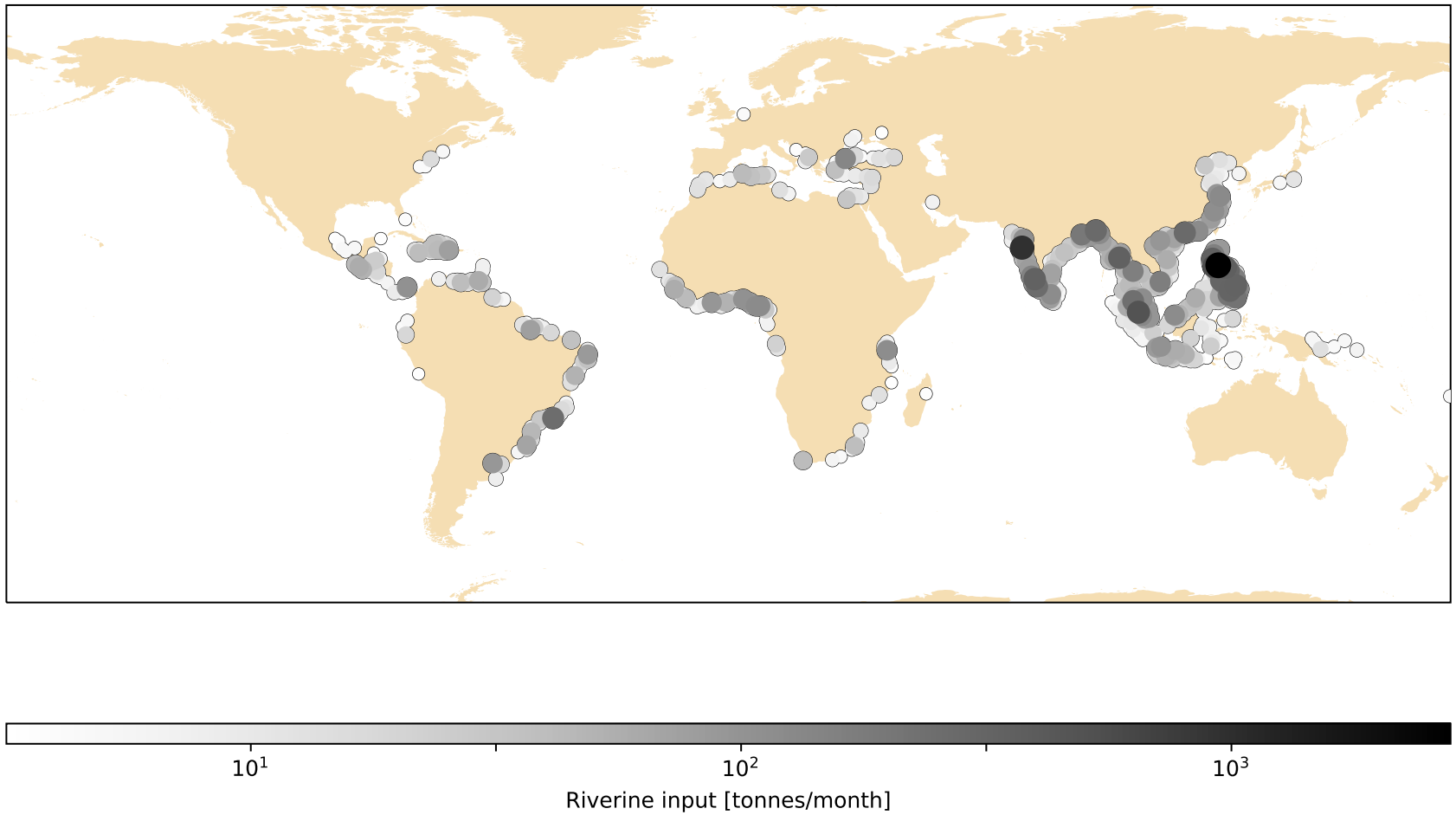
SURF

What are the possible sources?

Rivers
Meijer et al. (2021)
Coastlines
Jambeck et al. (2015)
Fishing activity
Kroodsma et al. (2018)



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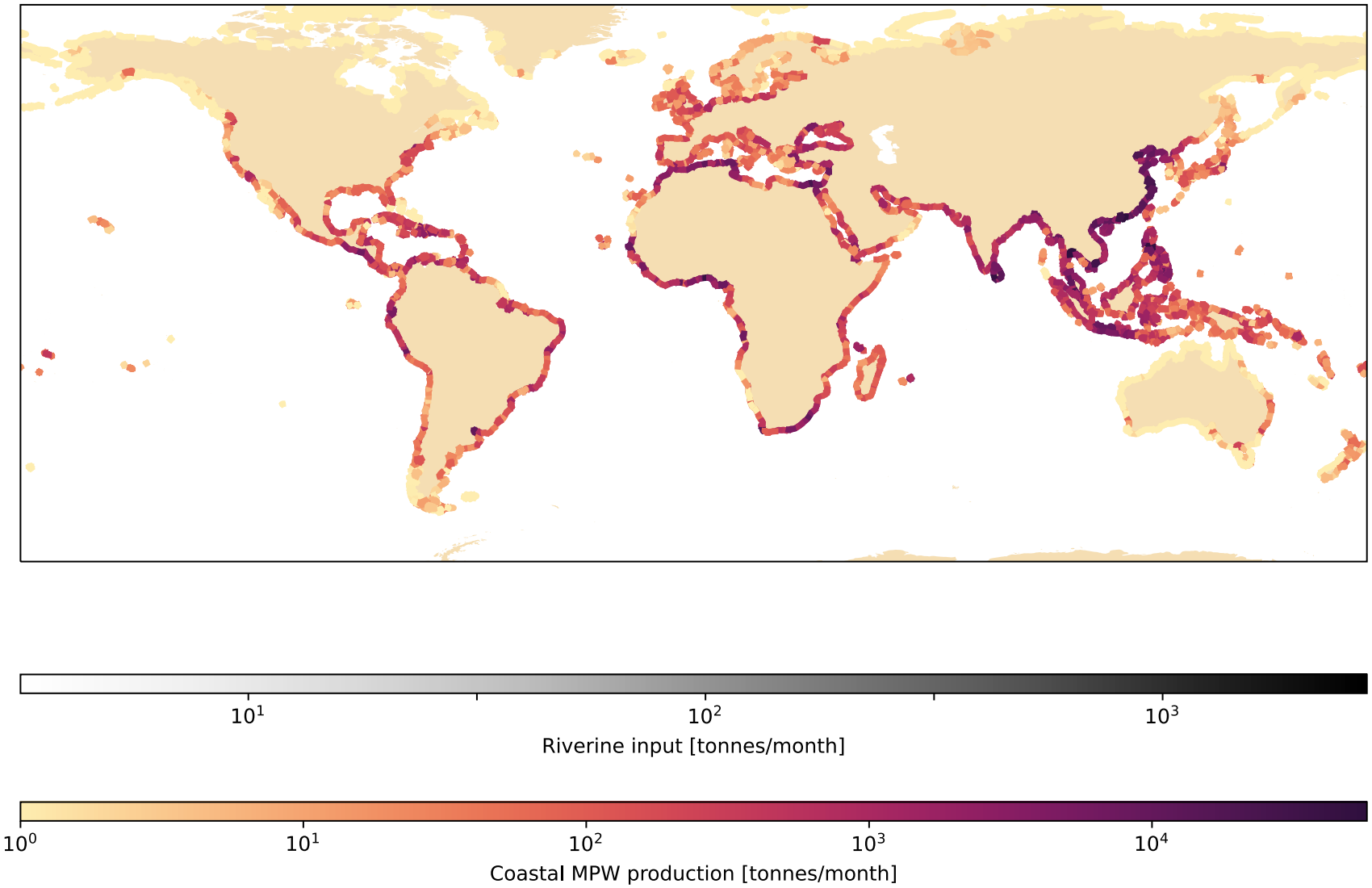

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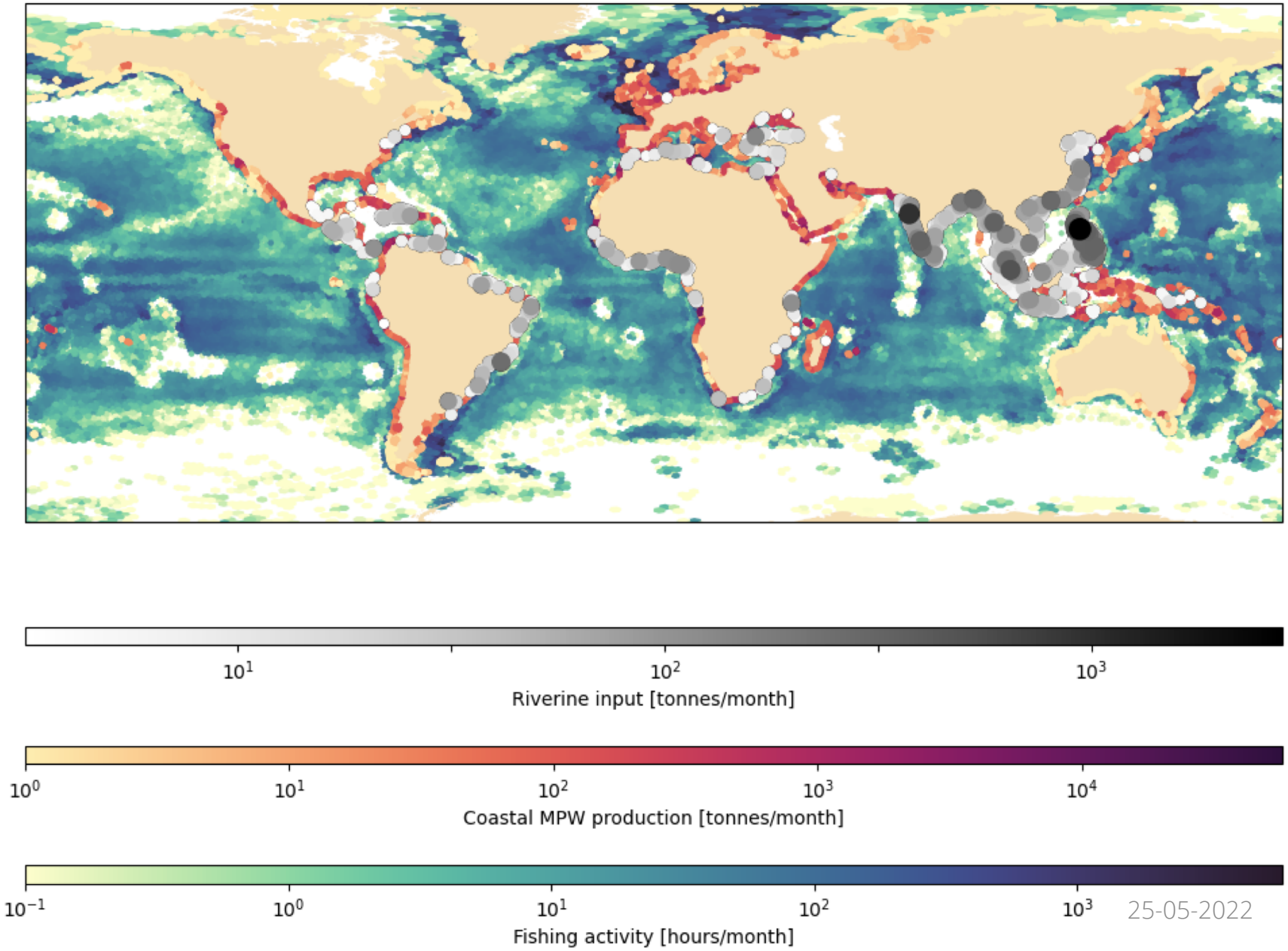
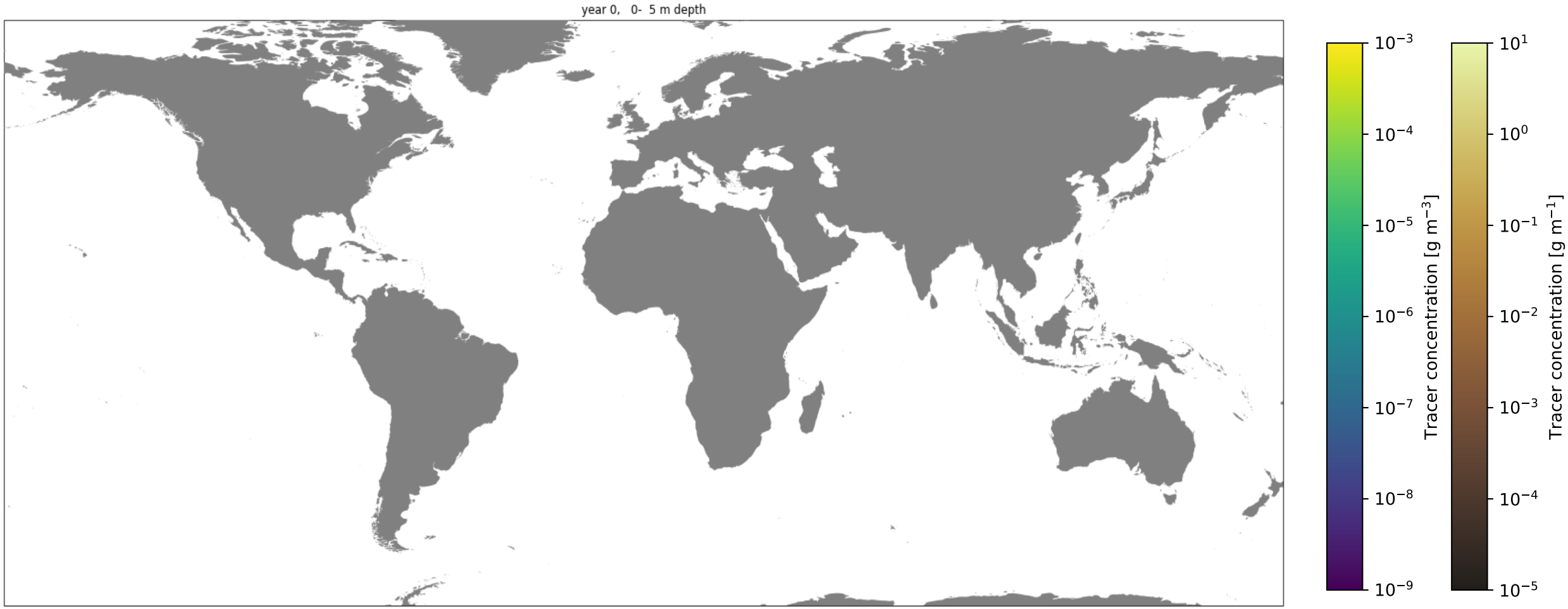
Relative importance?



Global transport of marine plastic

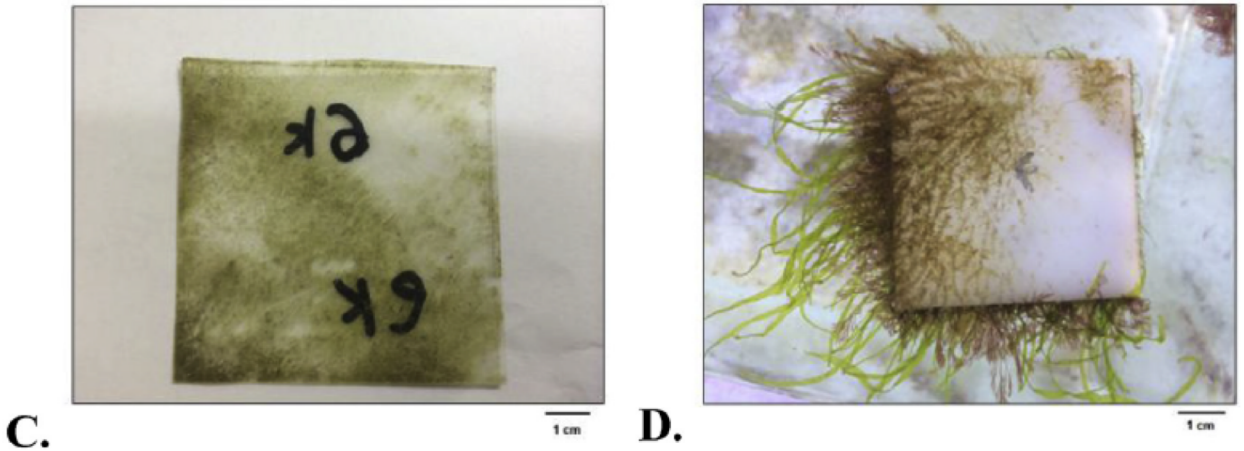


- Continuous input from rivers *(Meijer et al. 2021)*
- Forcing: Mercator Ocean PSY4V3 1/12° (3-dimensional)
- Different months and particle sizes

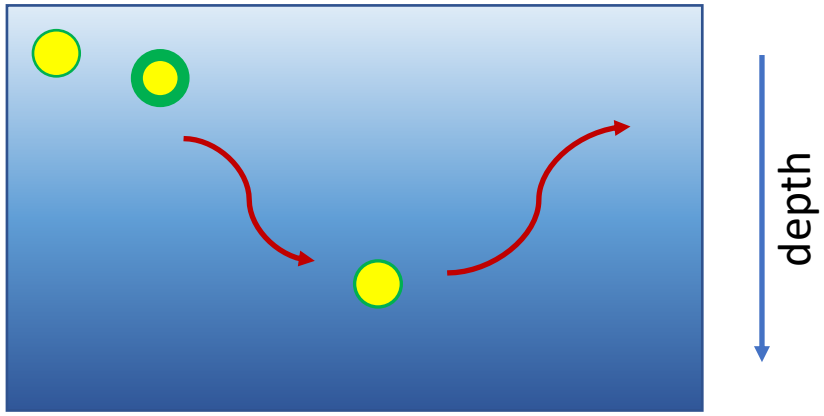
What are the possible ‘sinks’?

- Processes removing plastics from the surface water
- Biofouling
  - Permanent, oscillatory

Fischer et al. (2022)



(Fazey and Ryan, 2016)



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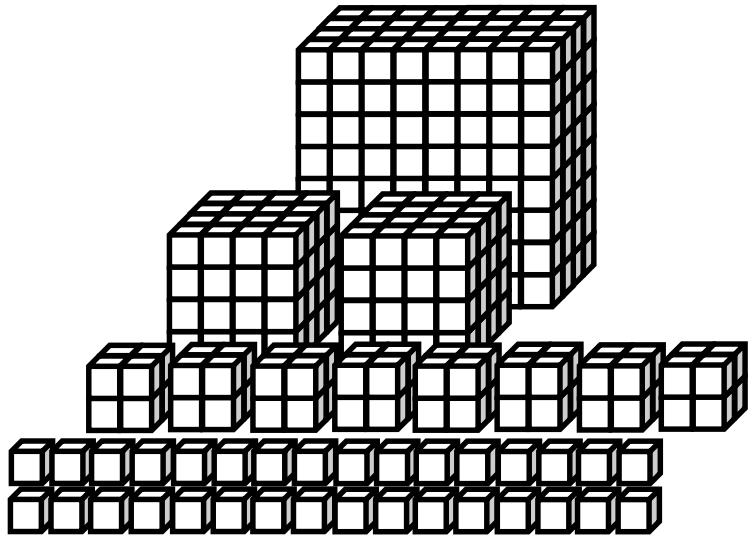
    Fischer et al. (2022)
- Fragmentation

  Kaandorp et al. (2021)

Particles from a 20 min. net tow ($\approx 900m^2$), North Atlantic Gyre



Kaandorp, Dijksta, van Sebille (2020), Modelling size distributions of marine plastics under the influence of continuous cascading fragmentation *Environ. Res. Lett.* DOI: 10.1088/1748-9326/abe9ea

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- Beaching

Beach on Texel, the Netherlands

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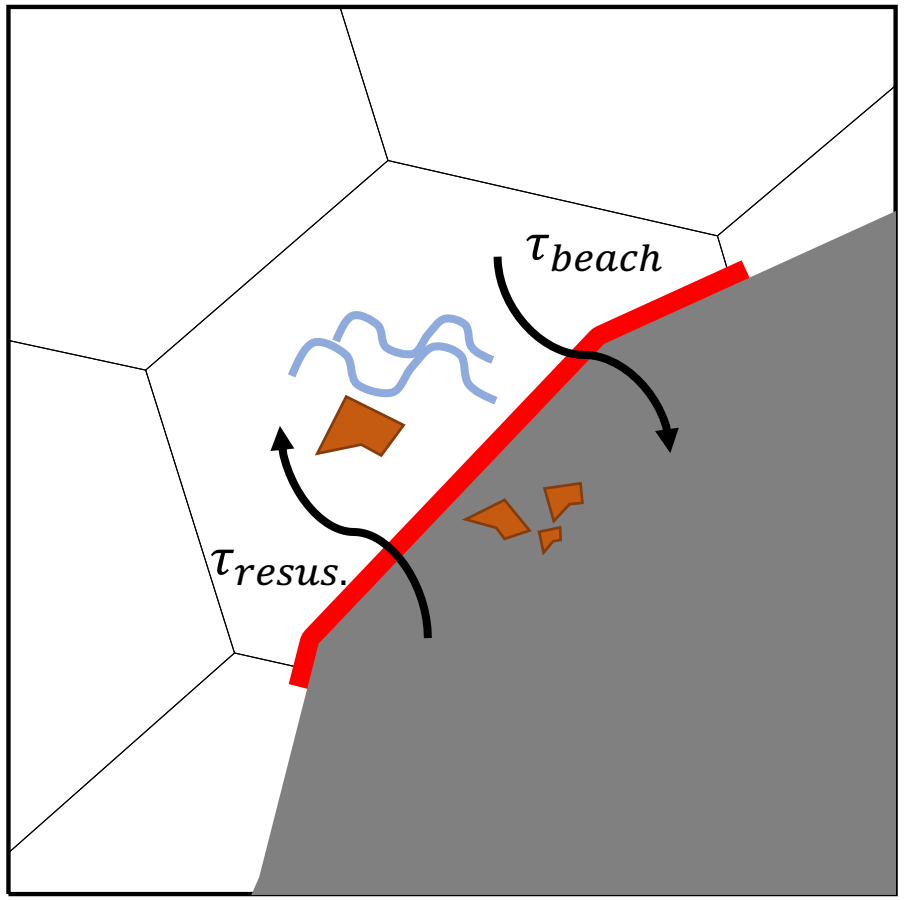

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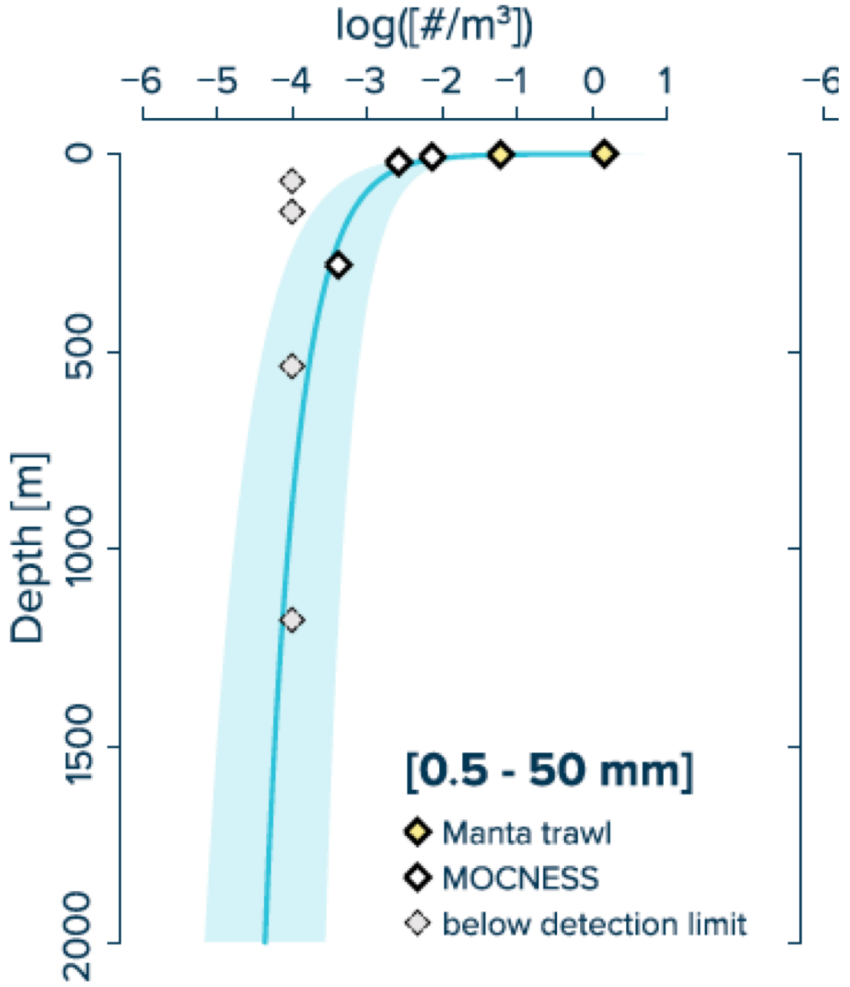
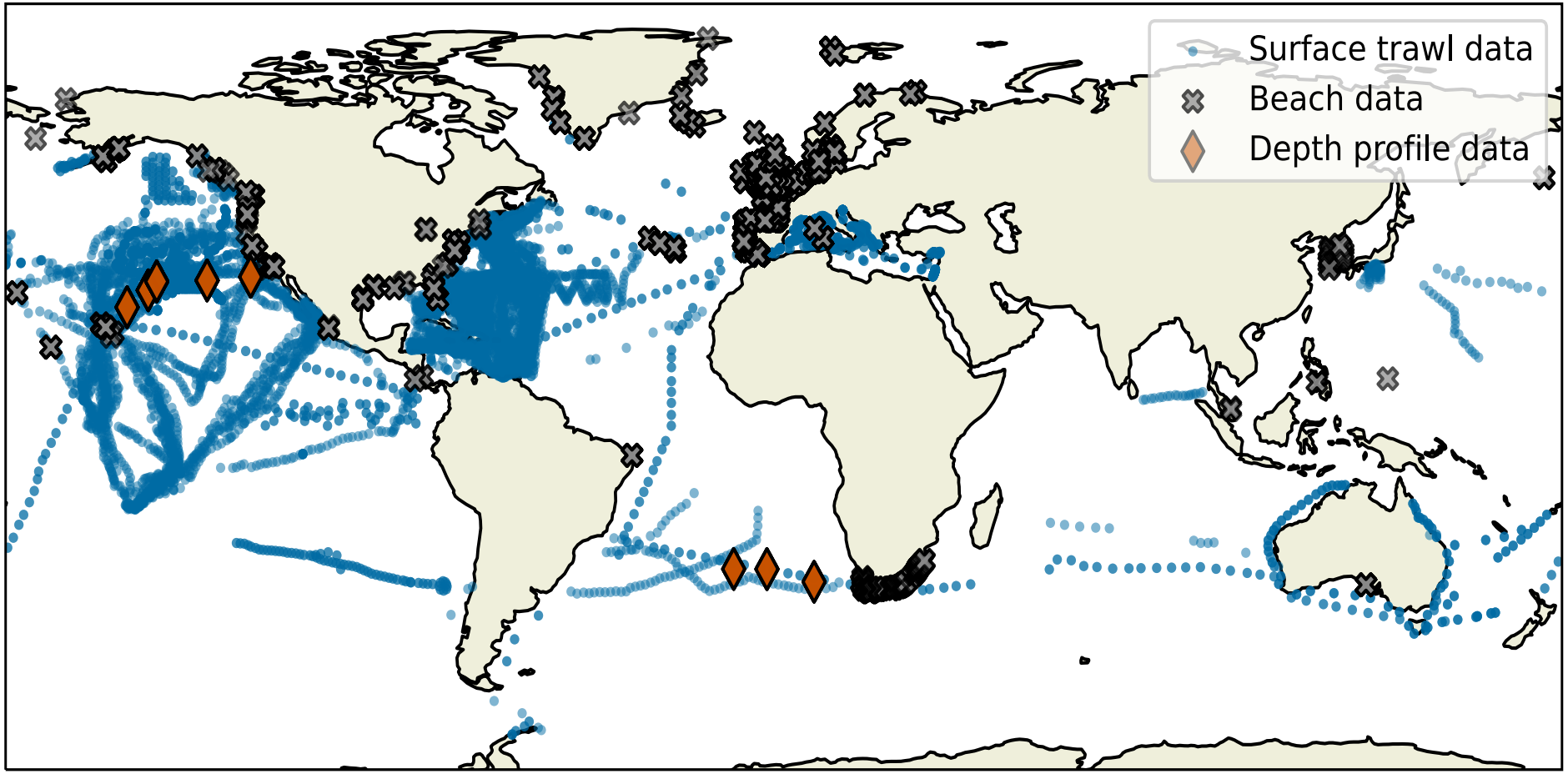
- Vertical (turbulent) mixing



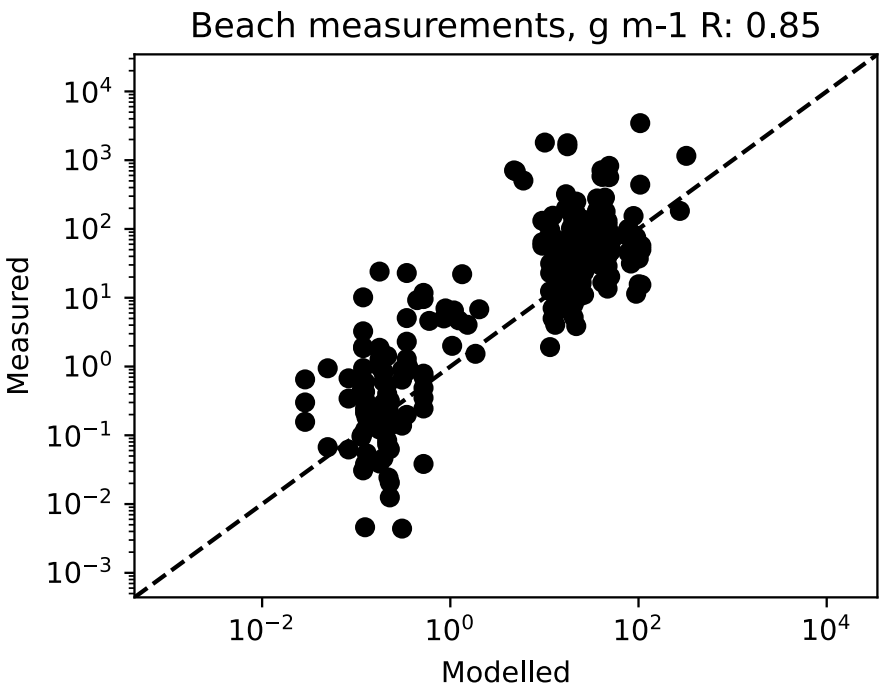
Egger et al. (2020)

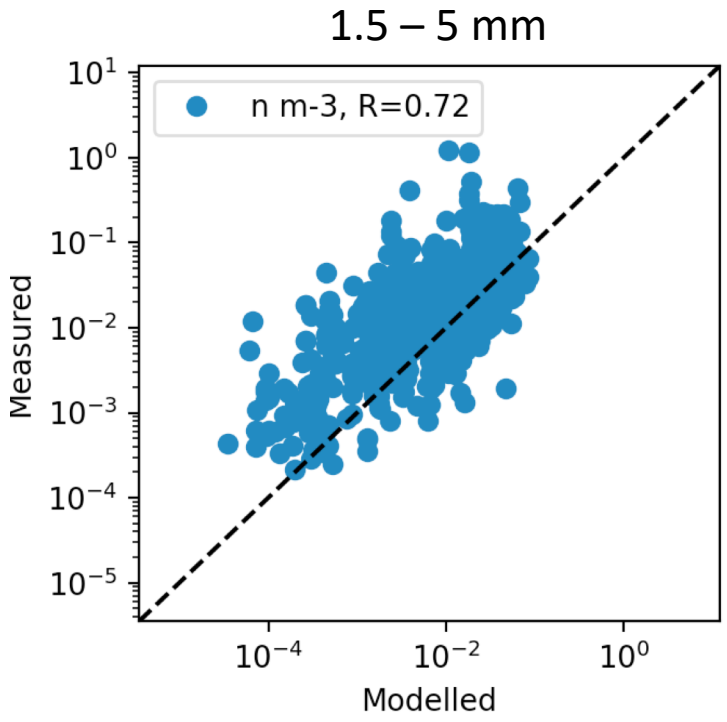
Data assimilation

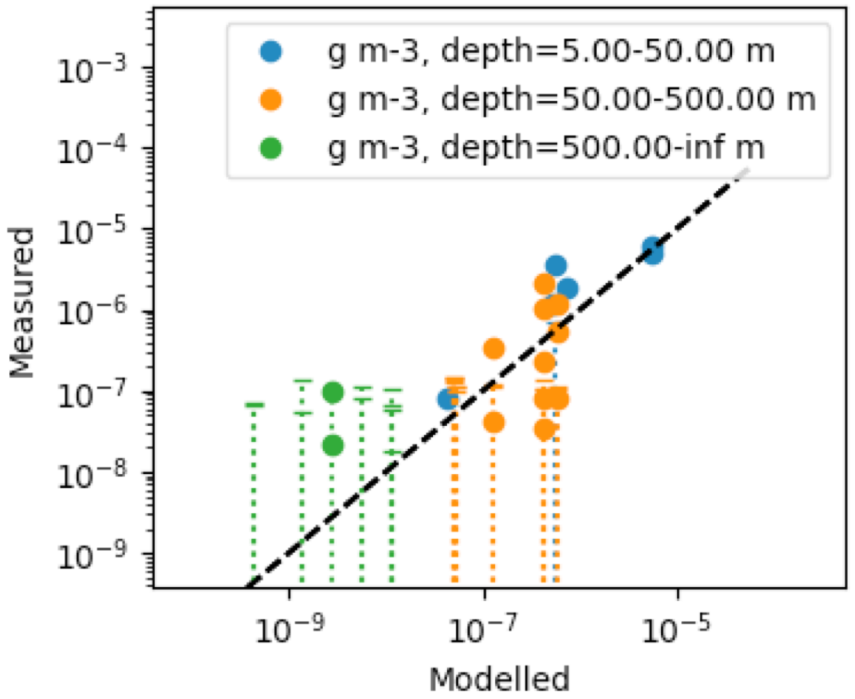
- Unknown parameters:
  - **Source** importances
  - Time scales **sinks**
- Data gathered from literature
- ES-MDA



Different sizes, different units, different regions (preliminary)







Data provided by Egger et al. (2021)

Preliminary results

- Total: 1,900,000 MT
  - Macro: 96% (1,800,000 MT)
  - Micro: 0.7% (12,000 MT)

- Input estimates:
  - Order of magnitude less
  - About 30% from fisheries

- → longer residence times
- → total load still increasing