

Physical processes behind interactions of microplastic particles with ice

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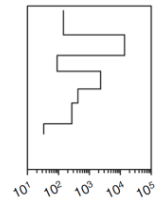


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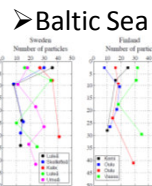
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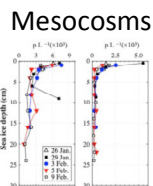
Field data: distribution of MPs in ice cores



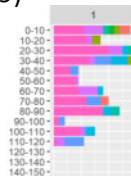
➤ Arctic Ocean (Peeken et al., 2018)



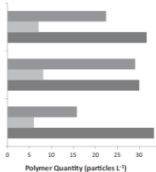
(Geilfus et al., 2019)



➤ Central Arctic Basin (Kanhai et al., 2020)



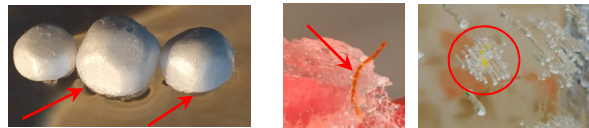
➤ Antarctic (Kelly et al., 2020)



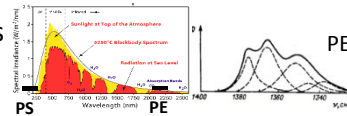
Complicated pattern. Surface enrichment? Correlation with ice salinity?

Properties: ice vs MPs

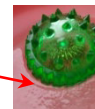
➤ Plastic hydrophobicity ==> MPs at the surface, in bubbles & channels



➤ Optical properties (spectra, colours)



➤ Lower plastic heat conduction/capacity ==> faster ice melting at MPs surface

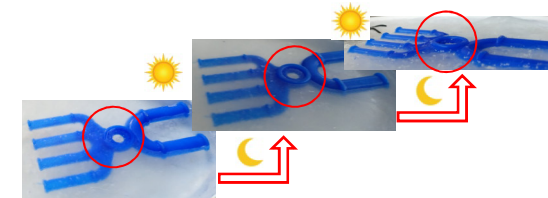


➤ Plastic brittleness temperature: up to -5°C (PP, PVC)

Laboratory tests

Processes

➤ Freeze/thaw cycles push surface MPs further up



➤ Formation of fresh (brackish) vs marine ice:

- water stratification: stable vs convection
- ice: solid vs layered, permeable (>5 psu)
- with bubbles vs with brine channels
- MS at the surface vs MPs throughout the depth

Conclusions

- Plastics hydrophobicity leads to pushing MPs out of ice – to its surface, into air bubbles or brine channels
- Due to smaller heat conduction / heat capacity, surface MPs melt out of ice
- Absence/presence of convection while ice freezes makes distributions of MPs in fresh (brackish) and marine ice principally different

Paper under preparation to ERL

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