
# Microplastic Pollution in the Arctic

## PAME workshop, June 2018

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Swedish Agency for Marine and Water Management

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# Current projects on marine microplastic pollution

JPI OCEANS

BASEMAN
MICROPLASTICS ANALYSES IN EUROPEAN WATERS

Developing methods for harmonized monitoring of microplastics in European seas.

PLASTOX

Effects of microplastics and associated pollutants on marine organisms.

BONUS MICRPOLL

Understanding the role of waste water treatment plants as sources of microplastics to the Baltic Sea (biofilms, pathogens, contaminants, more efficient cleaning, fragmentation).

norden
Nordiska ministerrådet

HARMIC- harmonized monitoring of microplastics in Nordic marine environments.

The Research Council of Norway

PlastArc- two year project investigating occurrence and effects in Greenland and Svalbard coastal ecosystems. Focus on sources

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# PlastArc (2017-2018)

**Determine concentrations and effects of microplastic pollution** in sediments and benthic food chains, in relation to **local sources** and background **levels**, in Norwegian and Greenlandic **Arctic coastal marine ecosystems**.

- **YEAR 1**: quantify and determine the composition of microplastic particles along short benthic food chains at pristine and polluted sites in Sisimiut, West Greenland, and Longyearbyen and Ny Ålesund in Svalbard.
- **YEAR 2**: Study the uptake, accumulation and effects of microplastic particles in selected Arctic sediment dwelling organisms.

NORSK POLARINSTITUTT

AARHUS UNIVERSITY

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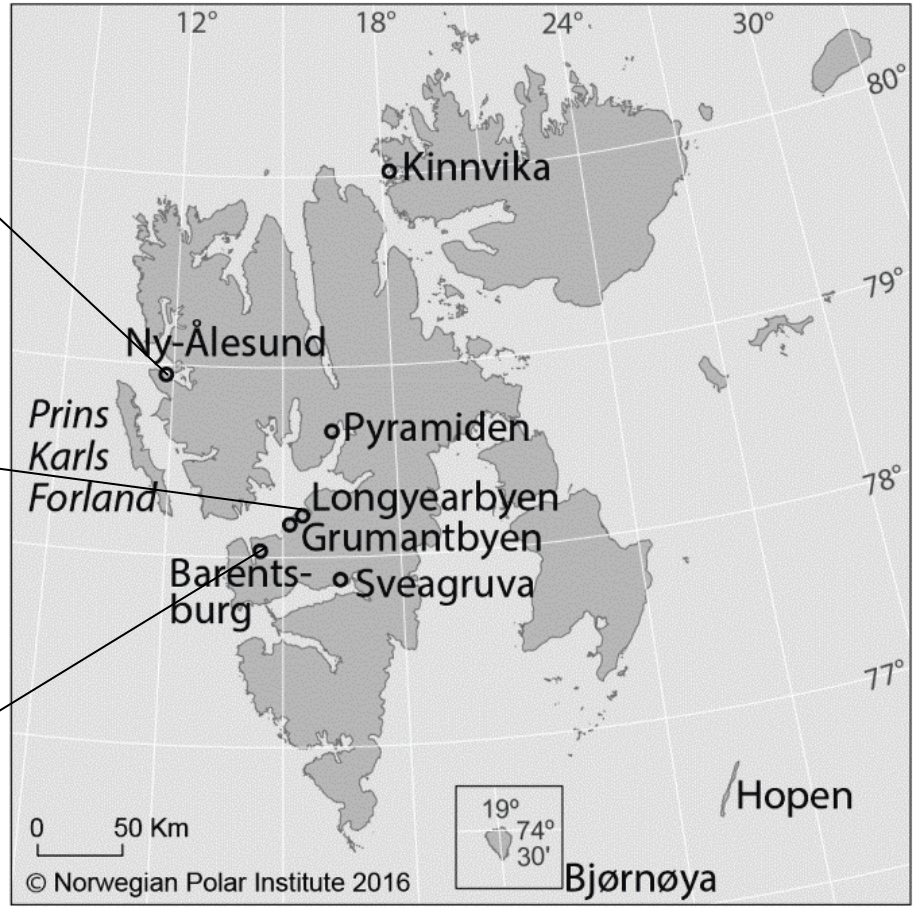
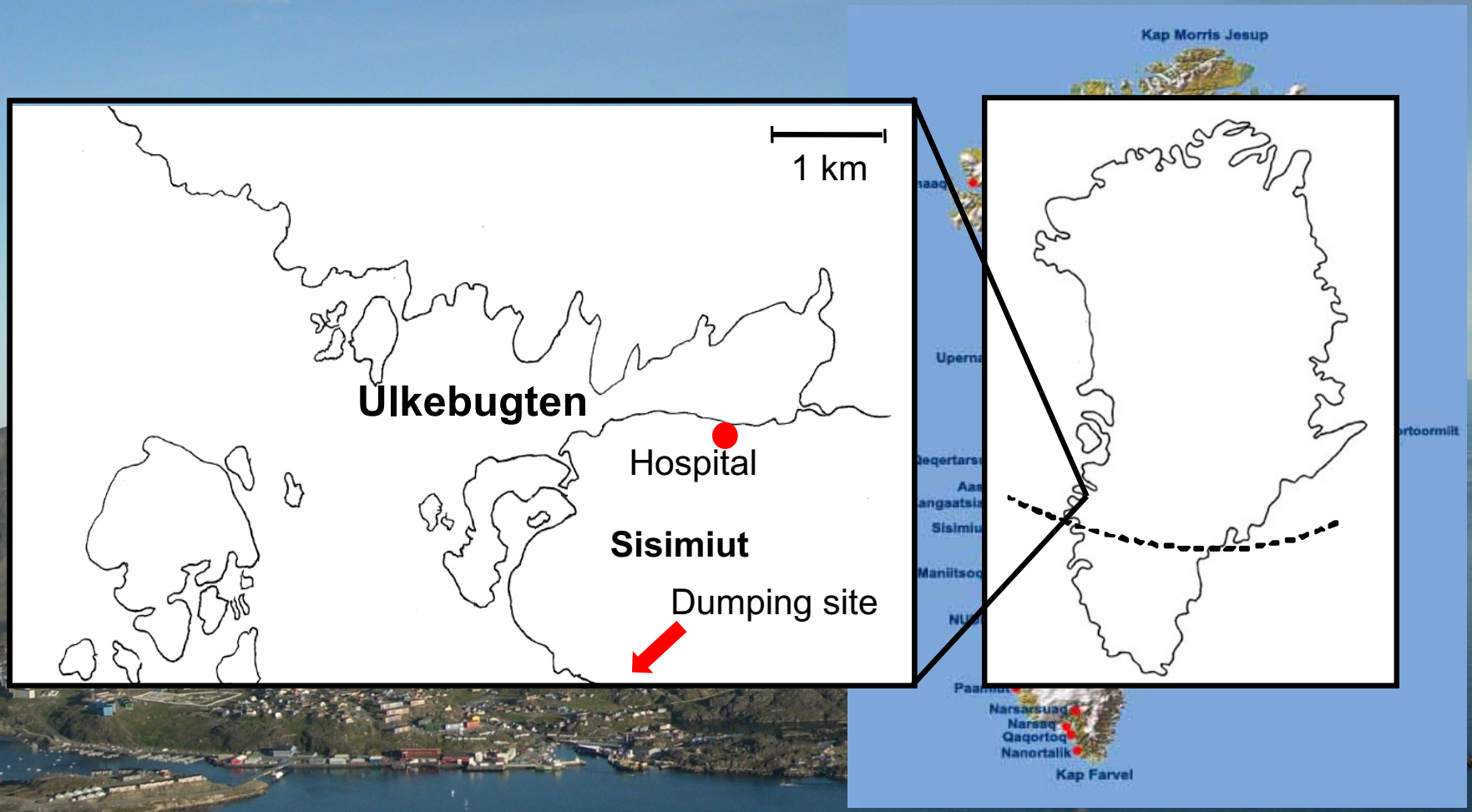
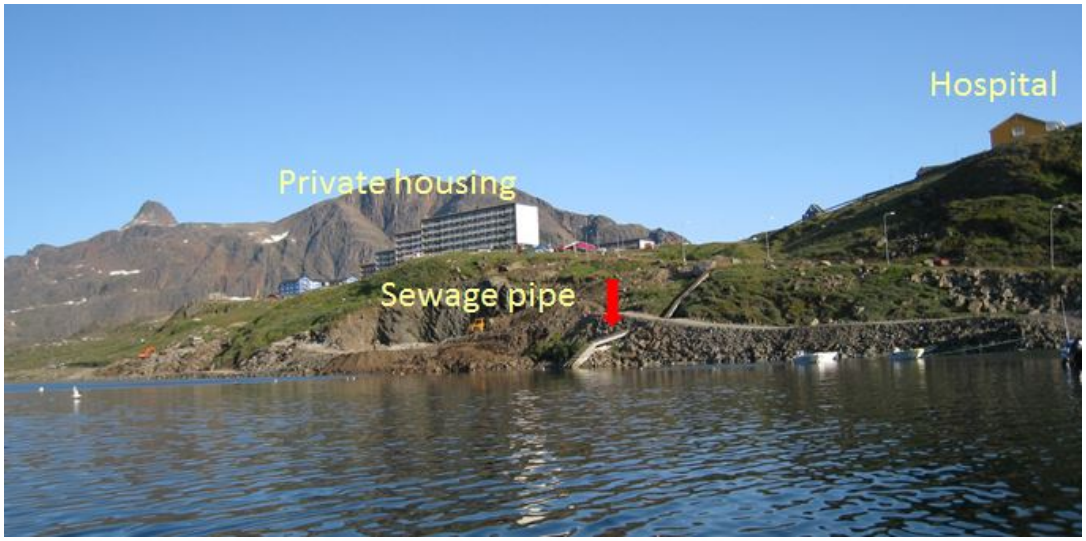
# Sampling sites- Svalbard (Settlements, anthropogenic impact)

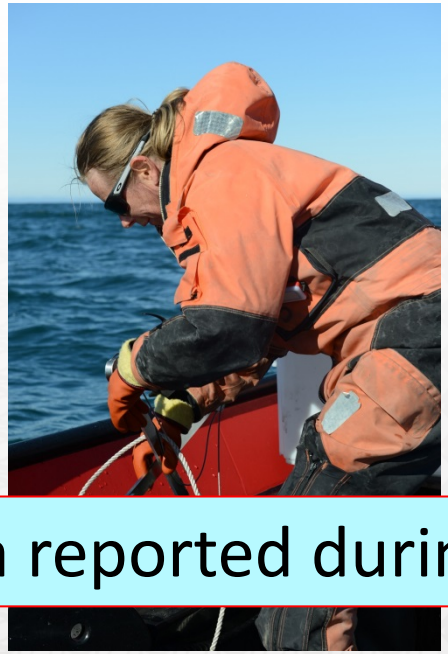
# Sampling sites- Greenland (Sisimiut)



# Sampling sites- Greenland (Sisimiut)




- Water samples 10 um (Niskin bottle)
- Water samples 100 & 20 um  (field pumped)
- Waste water
- Sediments
- Beachsand
- Benthic invertebrates
- Fish guts (Greenland)
- *Plastic associated contaminants (Svalbard-NP)*
- *Organic matter tracers (plastic fate-SAMS)*



Data reported during the end of this year

# Svalbard investigation 2

Marginal ice zone

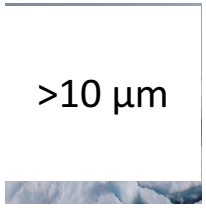

Lisa Winberg von Friesen
MSc

Kongsfjorden- transect with Ny-Ålesund as potential source

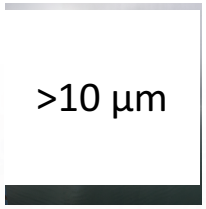
Rijpfjorden- no land-based human activities

# Sample collection, processing and analysis

Sea ice

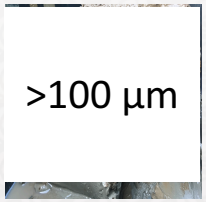


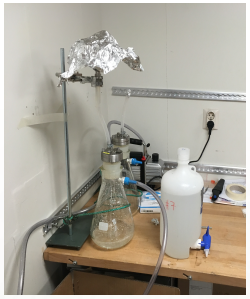

Water column

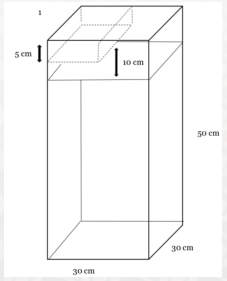



Gastropods
Bivalves


Sediment

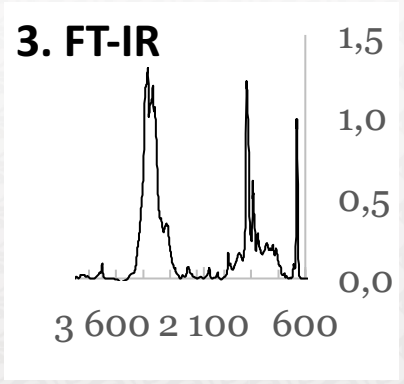


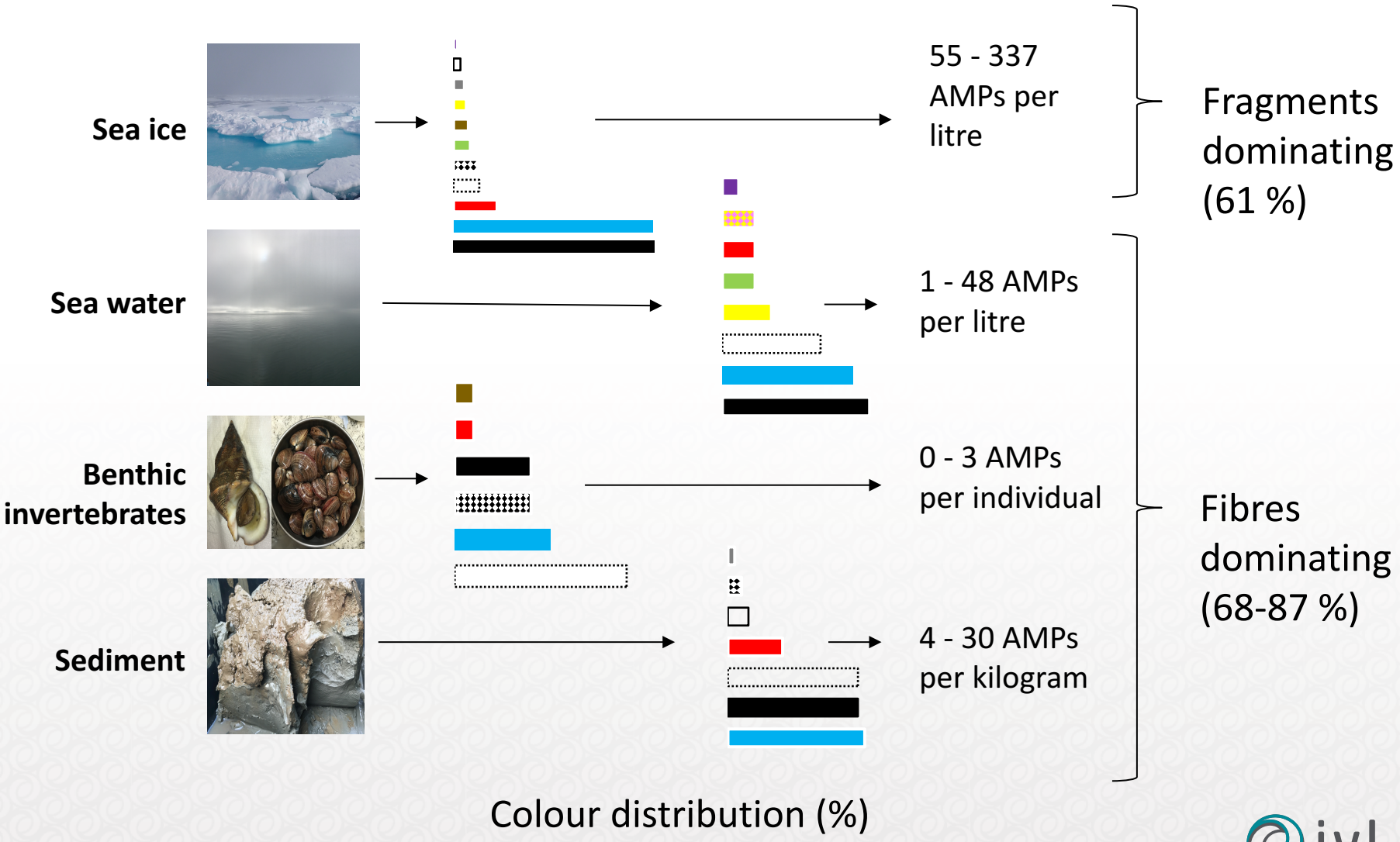



1.

2.

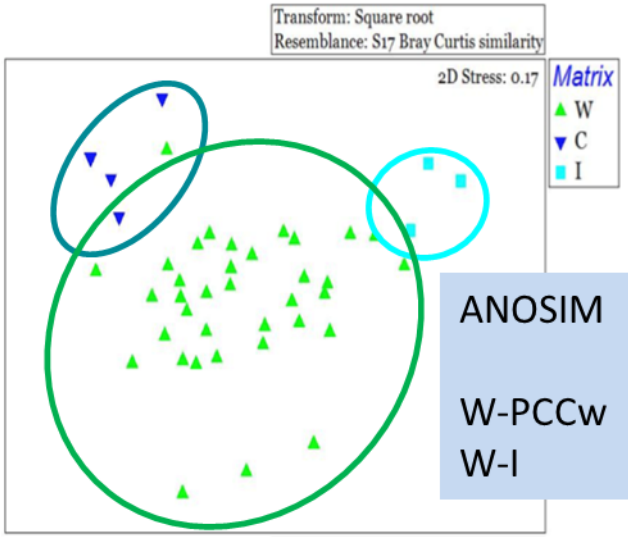


# General overview of the different matrixes



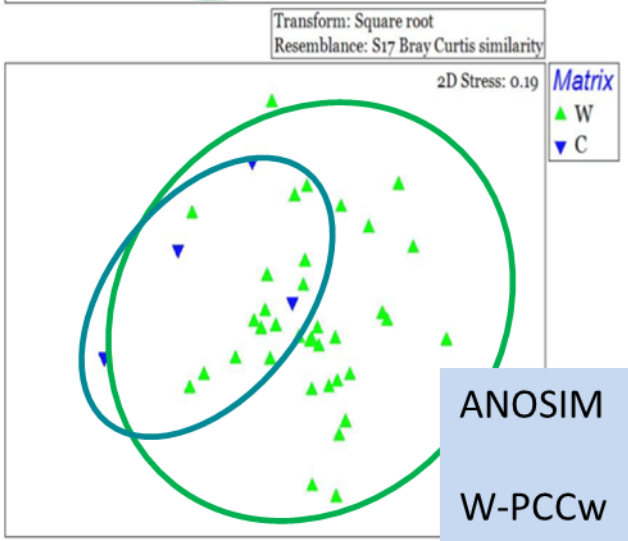
# Water column and sea ice

Colour




| ANOSIM | | |
|---|---|---|
| | local R | p-value |
| W-PCCw | 0.522 | 0.000*** |
| W-I | 0.722 | 0.000*** |

Shape and size




| ANOSIM | | |
|---|---|---|
| | local R | p-value |
| W-PCCw | 0.404 | 0.005** |

- Geographical differences (ANOVA, $F_{6;37}$=31.669, p=0.000***)
- Significant differences between water, ice and $PCC_W$ (number, colour, shape & size, polymer assemblage)

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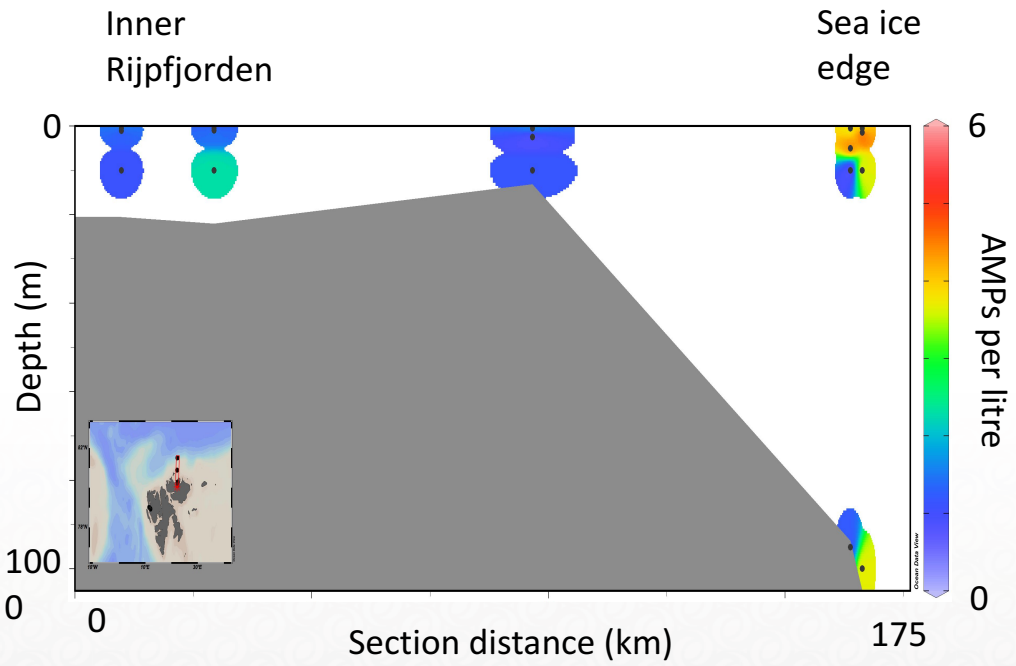
# Water column and sea ice– Rijpfjorden




## Fragments I>MIZ>R

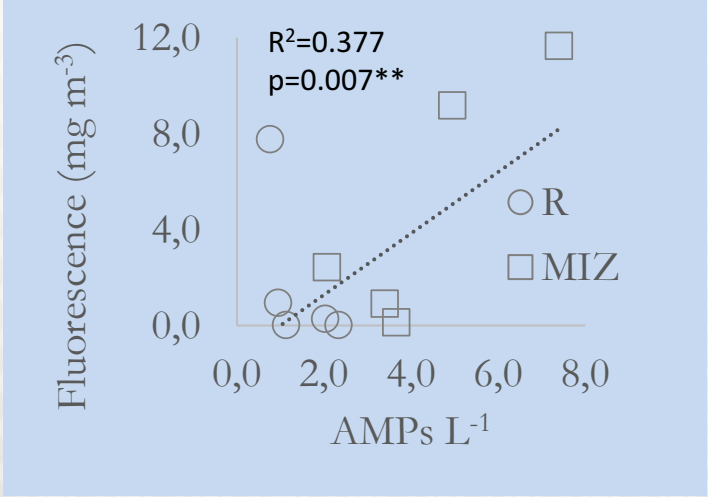
| | ANOSIM & SIMPER local R | p-value |
|---|---|---|
| MIZ-R | 0.165 | 0.020** |

## Blue I>MIZ>R

| | ANOSIM & SIMPER local R | p-value |
|---|---|---|
| I-MIZ | 0.861 | 0.005** |
| MIZ-R | 0.248 | 0.007** |

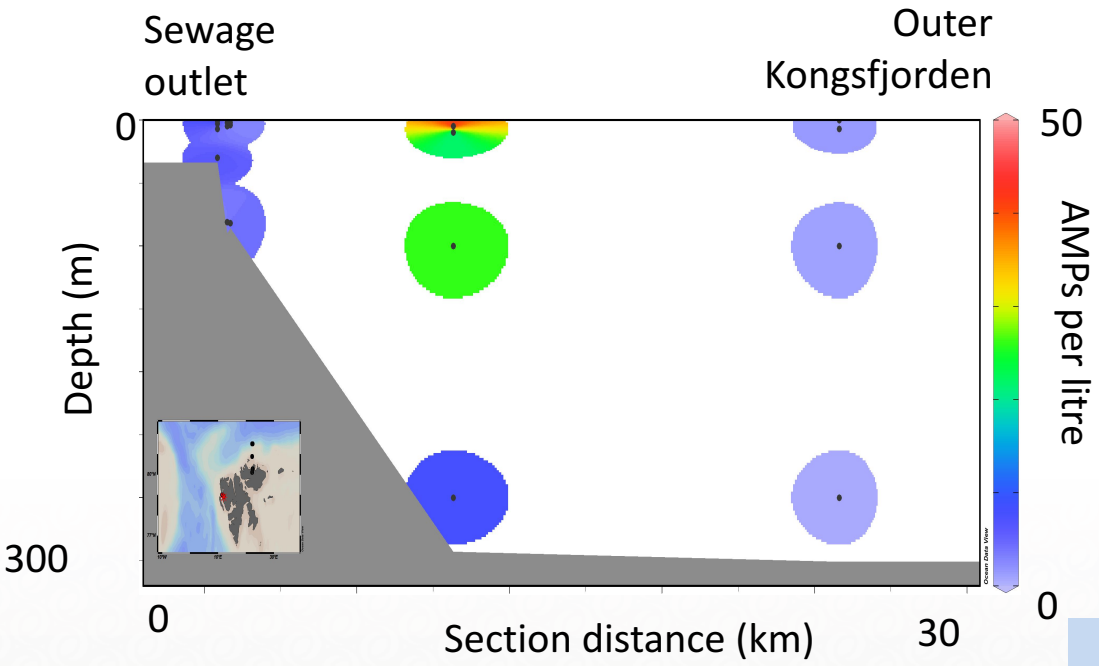
Correlation between and AMPs in the MIZ

→ Sea ice releases AMPs, Ice edge bloom



# Water column - Kongsfjorden



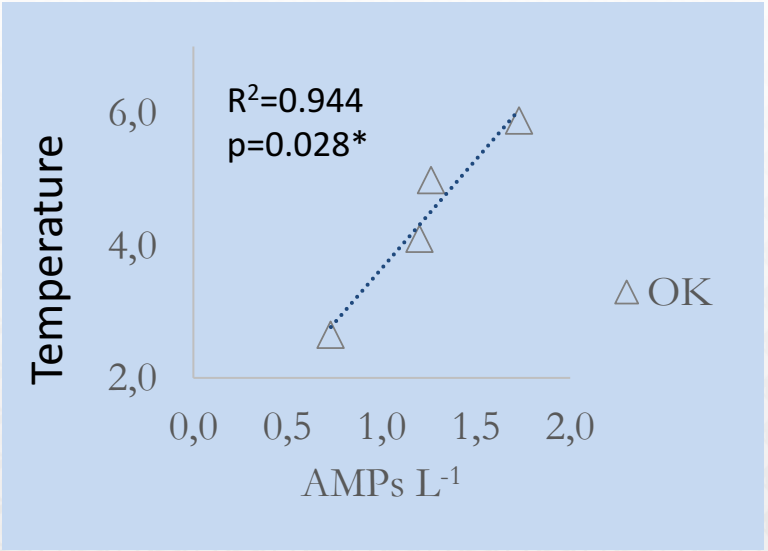



Large fibres SO>OK

| | ANOSIM & SIMPER local R | p-value |
|---|---|---|
| SO-OK | 0.497 | 0.005** |

Polymer richness SO= high

Correlation between Temperature and AMP distribution in outer Kongsfjord



# Major findings

AMPs are present in all investigated parts of the marine ecosystem in Svalbard.

Data analyses of sediment and biota were limited due to the low AMP count.

Contaminated sea ice release AMPs during spring melting, which coincides with the ice edge bloom.

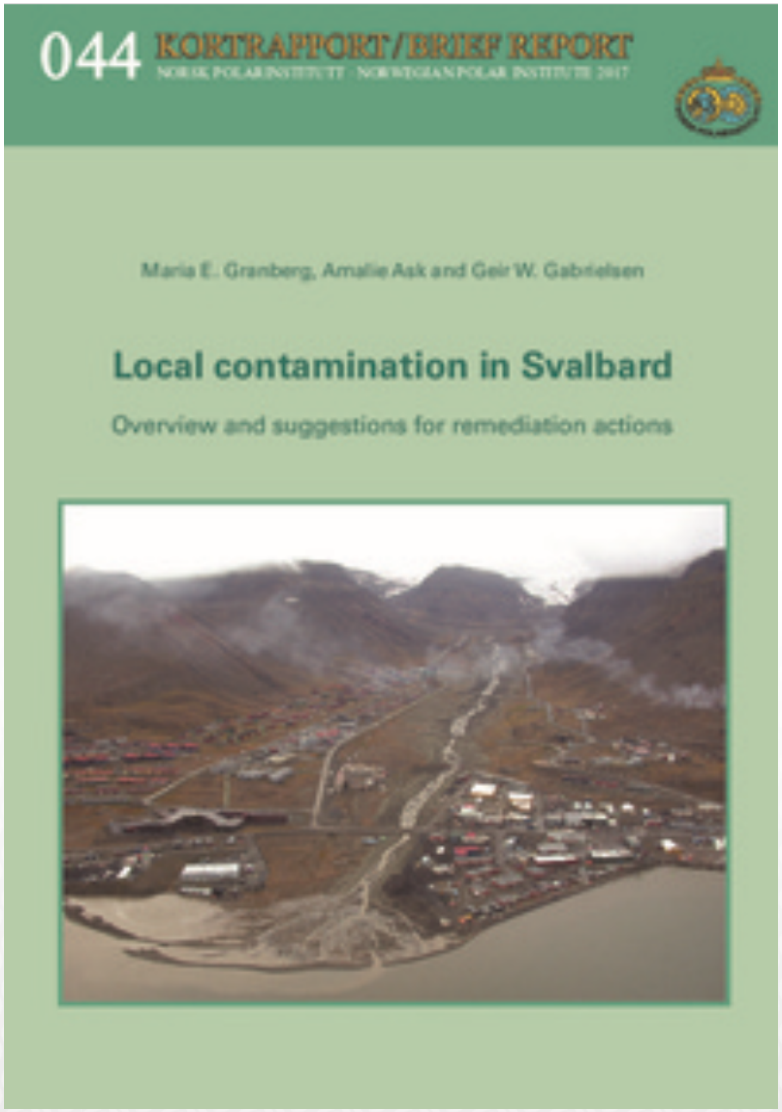
A sewage outlet was indicated to constitute a major release site of AMPs  in Kongsfjorden.

High polymer richness in bivalves close to the sewage outlet and to the sea ice.

# Important aspects of microplastic pollution in the Arctic

- How to design a monitoring program that reflects MP change and how to connect to ecosystem health?
- Processes related to beaches
- Processes related to sea ice
- Linking occurence and effects
- Proper check on local MP sources,

- Install sewage treatment systems in the Arctic- will be beneficial for mitigating several types of pollution.
- Shipping- begin to discuss use of antifouling paints when passing through sensitive Arctic areas (with sea ice).




## Svalbard Environmental Protection Act

*"The purpose of this Act is to preserve a virtually untouched environment in Svalbard with respect to continuous areas of wilderness, landscape, flora, fauna and cultural heritage.*

Under section 7 the Act also proclaims the use of the "precautionary principle" thus prioritizing environmental protection over other interests.

*"When an administrative body lacks adequate information on the effects that an undertaking may have on the natural environment or cultural heritage, its authority under this Act shall be exercised in a manner designed to avoid possible damage to the environment."*

It is important to recognize that the law does not include pollutants originating from household or similar waste present at trace levels.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