I CONVEGNO ISTITUTO DI SCIENZE POLARI

NEW AND EXISTING ORGANIC CONTAMINANTS IN THE ARCTIC MARINE ECOSYSTEM IN A CLIMATE CHANGE SCENARIO: THE KONGSFJORDEN-KROSSFJORDEN SYSTEM (SVALBARD, NORWAY) AS STUDY MODEL

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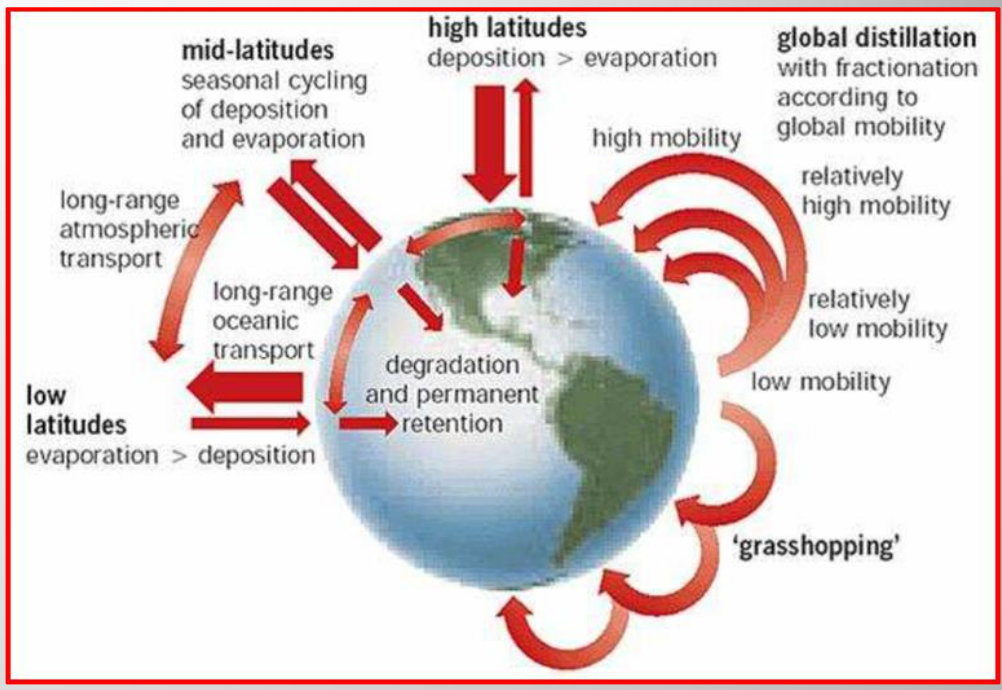
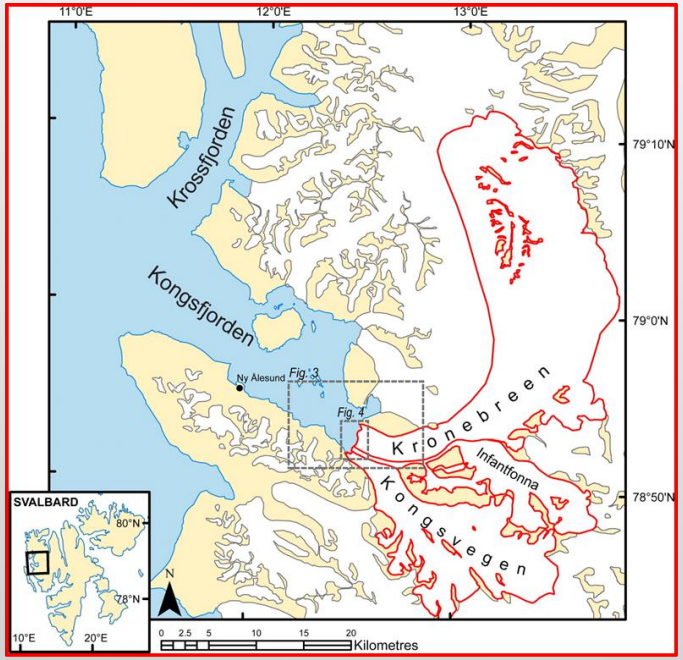
Roma, 22 – 24 settembre 2021

Introduction Kongsfjorden-Krossfjorden system (KKS)

- Polar regions are the final sink for many contaminants acting as a cold trap.
- Contaminants primarily occurs in Arctic due to atmospheric and oceanic circulation and organisms.



- Climate changes can alter the contaminant fate, transport and distribution in Arctic ecosystems.
- Increasing temperatures, decreasing in sea ice coverage, glaciers melting and permafrost thawing cause the release of contaminants previously trapped, becoming a secondary source of pollutants.



Krossfjorden is less affected by the presence of human settlements compared to Kongsfjorden located closed Ny-Ålesund.

KKS includes two fjords strongly affected by the inflow of warm Atlantic Waters. The inner fjord area is mainly affected by run-off processes from tidal glaciers, which create gradients in freshwater and sediment input in the fjord.

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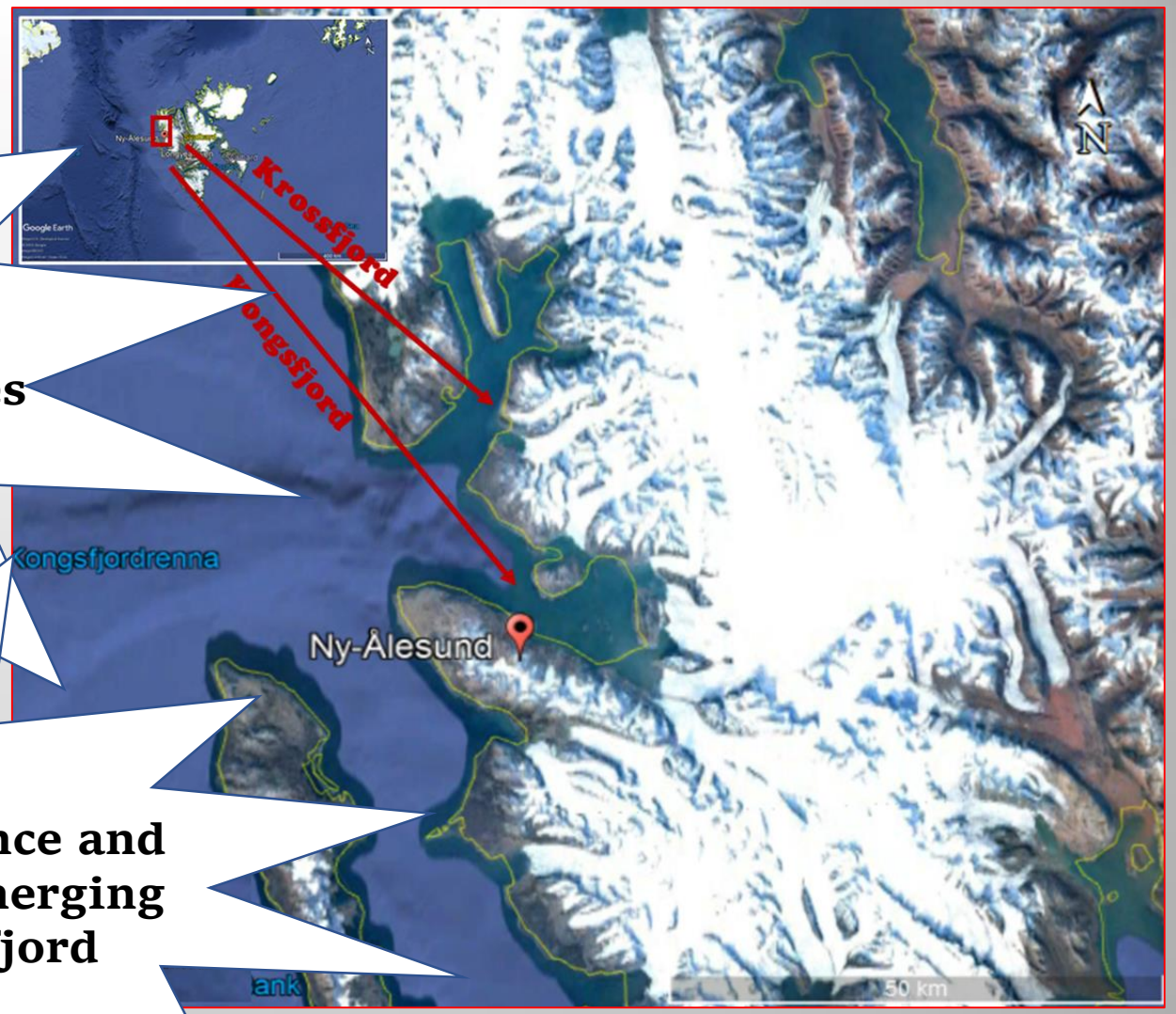
Aims and Study area

Environmental response of KKS to climate change and the hydrological, biogeochemical and ecological processes occurring in this Arctic region



Investigation on the occurrence and distribution of legacy and emerging organic pollutants in the fjord ecosystem

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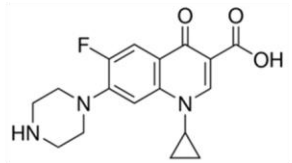
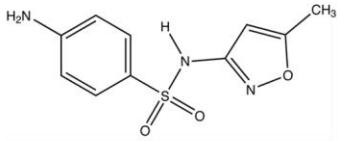
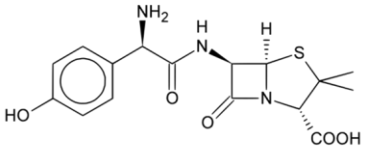
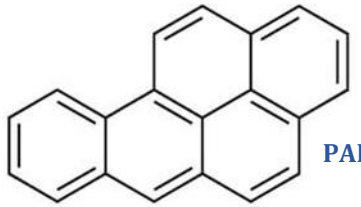
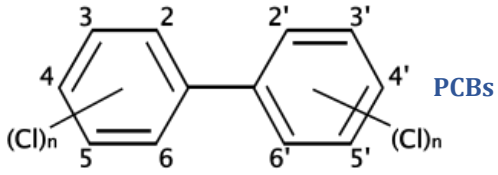
Experimental

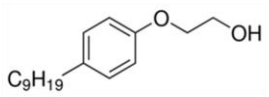

Ciprofloxacin
(CIP)

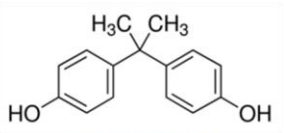

Sulfamethoxazole
(SMX)

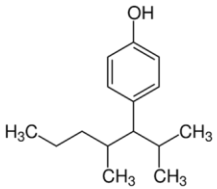

Amoxycillin
(AMX)

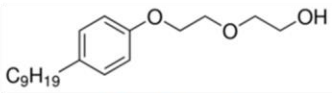

PAHs


PCBs


Nonylphenol
monoethoxylate
(NP1EO)


Bisphenol-A
(BPA)


Nonylphenol (NP)


Nonylphenol
diethoxylate
(NP2EO)


Pressurized liquid
extraction - PLE


Solid phase
extraction - SPE


LC-MS/MS


GC-MS

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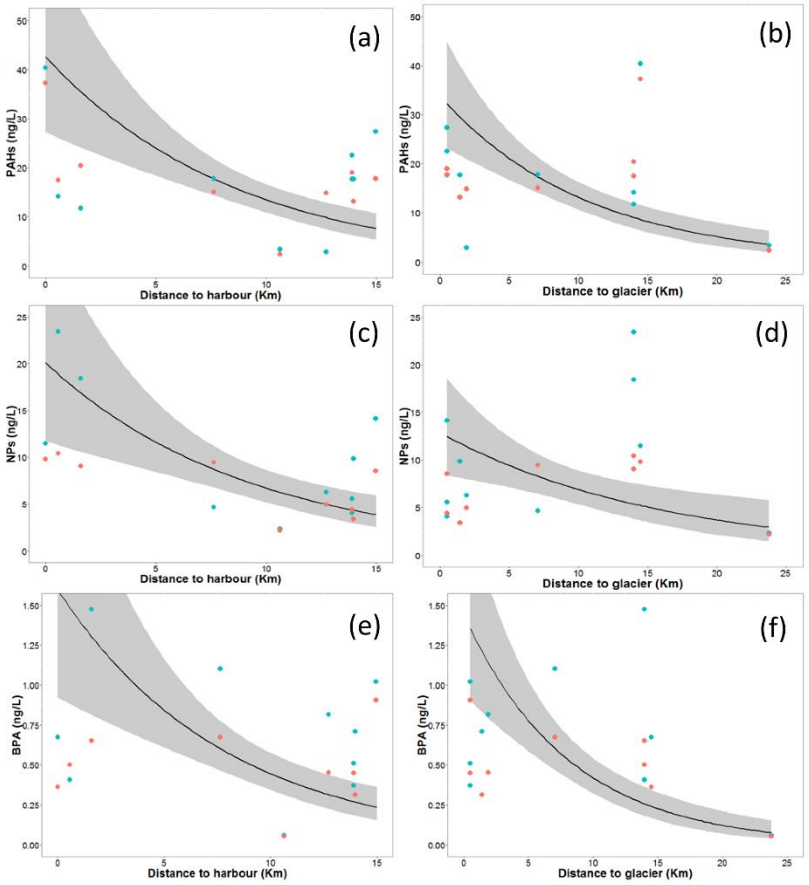
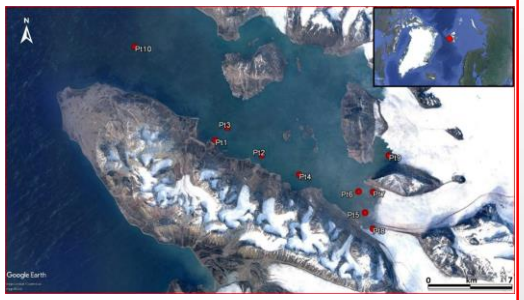
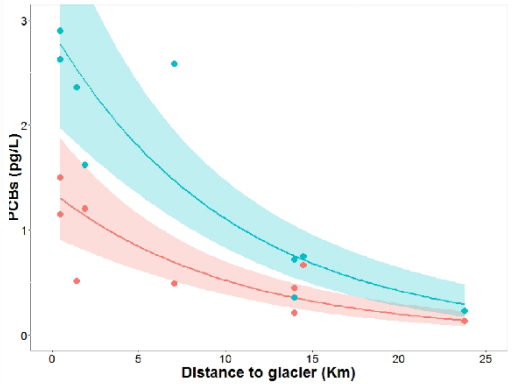
Results

Surface water







The concentrations in seawater of target contaminants have been analyzed by generalized linear models (GLMs) to evaluate the interactive role of different sources.

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Occurrence, distribution and pollution pattern of legacy and emerging organic pollutants in surface water of the Kongsfjorden (Svalbard, Norway): Environmental contamination, seasonal trend and climate change

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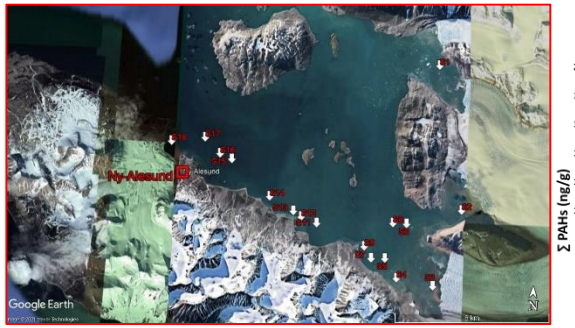
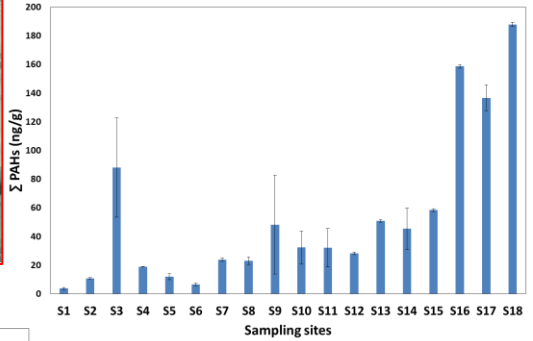
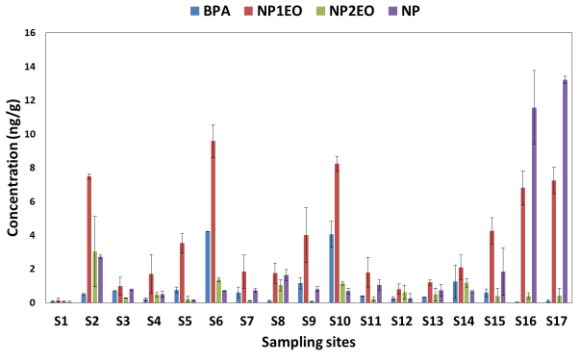
Sediment







- The target contaminants were found at high amount close to the harbour and Bayelva mouth. The values measured at the harbour and Bayelva likely result from the proximity to Ny-Ålesund village discharges.

- The results show that the combination of several abiotic factors, such as the distance from local emission sources, depth of the sediment, the concentration of these chemicals in the water column and sedimentation rates affect the occurrence of target contaminants in sediment collected along the transect.
- Analytical determination of pharmaceuticals and personal care products are in progress.

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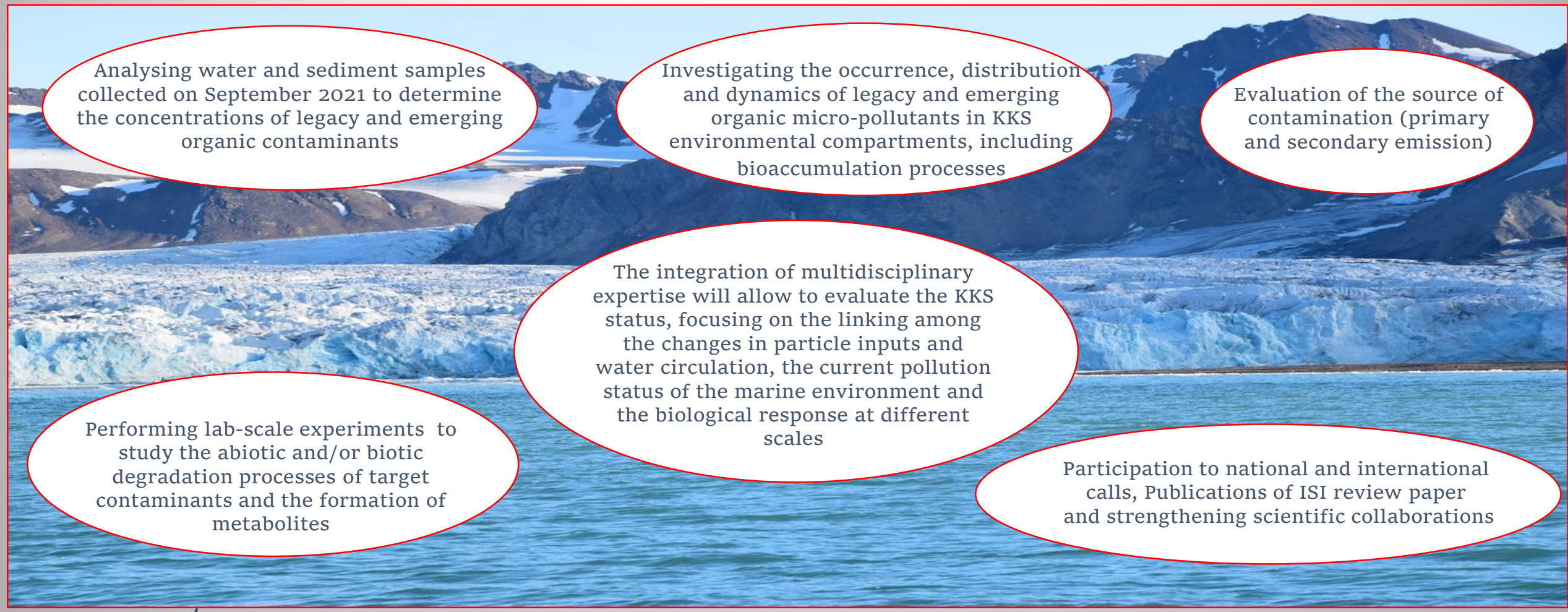
Future perspectives



Analysing water and sediment samples collected on September 2021 to determine the concentrations of legacy and emerging organic contaminants

Investigating the occurrence, distribution and dynamics of legacy and emerging organic micro-pollutants in KKS environmental compartments, including bioaccumulation processes

Evaluation of the source of contamination (primary and secondary emission)

The integration of multidisciplinary expertise will allow to evaluate the KKS status, focusing on the linking among the changes in particle inputs and water circulation, the current pollution status of the marine environment and the biological response at different scales

Performing lab-scale experiments to study the abiotic and/or biotic degradation processes of target contaminants and the formation of metabolites

Participation to national and international calls, Publications of ISI review paper and strengthening scientific collaborations

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Thank for your attention…

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