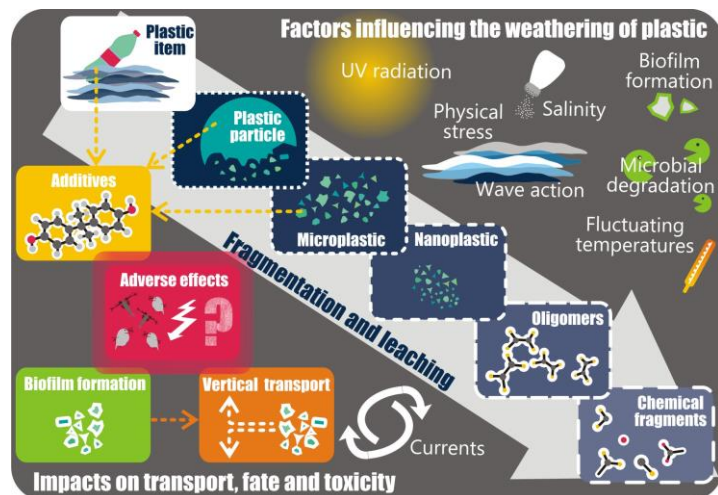


WEATHER-MIC - how microplastic weathering changes its fate, transport and toxicity in the marine environment

Stakeholder Report #2, February 2018



Why do we care about plastic in the oceans?

Our ocean receives large quantities of plastic from rivers and sewage treatment plants amongst others. This plastic is often fragmented into so-called microplastic, often too small to see with the naked eye. The WEATHER-MIC research project is investigating the processes controlling the transport, fate and toxicity of microplastic, as it is weathered by, e.g., sunlight, bacteria, wave motion, changing temperatures, and other processes. Collectively, these weathering processes slowly degrade microplastic to smaller sizes and chemical fragments, and lead to changes in their distribution over the entire ocean depth. As is it unknown how plastic degradation affects its effects on the various organisms present in the environment, our project strives to characterize the impact of weathering on biota.

WEATHER-MIC will contribute to answering critical questions: What happens to microplastic over time? How do these changes affect its environmental risk? Which options do we have to manage these risks?

Recent scientific progress of WEATHER-MIC

During the second year of the WEATHER-MIC project, the partners of the consortium were very busy to accomplish large parts of the work program. The scientific outcomes include:

- Development of a “weathering wheel” that allows producing large amounts of aged plastic material as well as leachates that correspond to half a year of weathering in the field within few days for further studies.
- Establishing a fingerprinting approach for identifying degradation products of the main commercial polymers using liquid chromatography coupled to high-resolution mass spectrometry. This approach will be further developed for fingerprinting of field-aged plastic.
- A battery of methods for characterizing weathering-induced changes in density, shape and surface charge, amongst others.
- A protocol for fractionating plastic material to yield specific size ranges for ecotoxicological studies.
- Column experiments to investigate in which respect weathering changes the sinking velocity of plastic material in the water column.
- Determination of the toxicity of microplastic particles to marine organisms as opposed to non-anthropogenic particles that ubiquitously exist in considerably higher concentrations than microplastic.
- Development of models to describe the distribution and fate of particles with changing properties in our two study areas, Oslo Harbor and Himmerfjärden Bay in the Stockholm Archipelago.
- Field sampling campaigns to collect real-world plastic material.
- Development of a digestion protocol to remove organic material from real world sediment samples and trawls of the water column.
- Adaptation of standard ecotoxicological test systems for testing of microplastic particles. Application of the protocol to weathered and

pristine particles showed increased toxicity of the weathered material.

- Experiments to investigate the impact of weathering on biofilms attached to the surface of the plastic particles.
- Effect assessment of the leachates liberated from weathering plastic material of common polymers, showing that pure polymers do not elicit strong effects.

Dissemination



An invited presentation has been given by Matthew MacLeod at a side-event at the United Nations' Oceans Conference, "Multilateral Science-Policy Processes – Generating the Evidence to Underpin SDG Implementation" organized by JPI Oceans. (Permanent Mission of Germany to the United Nations, New York, USA. 07.06.2017).

Moreover, the consortium contributed 9 presentations and 12 posters at conferences and workshops and published 5 peer-reviewed scientific papers.

Outreach

WEATHER-MIC partners interacted extensively with selected stakeholders, students and the public, including:

- Contribution of exhibits and ideas with guidance on how to implement them to the Ocean Plastics Lab ship container-based exhibition for touring across different locations world-wide.
- Participation in Researcher Nights events in Sweden and Germany
- Interviews on the radio and television
- Participation in press conferences
- Hosting of students of the course "Microplastic & Medusea" at the Berlin University of the Arts / Technical University Berlin
- Posts in social media (Twitter, Facebook, YouTube)

- Discussions in reference groups on microplastic as emerging environmental contaminants, their sources and effects with regulators and environmental managers



Participation in the Race for Water Odyssey for field sampling in Cuba, in collaboration with CEAC (Centro de Estudios Ambientales de Cienfuegos)

For more information, please have a look at our websites:

<http://jpi-oceans.eu/weather-mic/about>

<https://www.researchgate.net/project/WEATHER-MIC>



WEATHER-MIC partners include: Helmholtz Centre for Environmental Research – UFZ (lead), Stockholm University, NGI – Norwegian Geotechnical Institute, Fraunhofer Gesellschaft (IKTS Dresden) and University of Leuven (KU Leuven).

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