Background
Understanding the hazards posed by microplastics in the sea requires understanding the changes they undergo as a result of environmental weathering processes, like UV exposure, biofilm growth and physical stress. These processes influence their brittleness, density, size, shape and surface charge. The resulting changes can in turn affect their environmental fate as the microplastics undergo fragmentation, aggregation and ultimately sedimentation or mineralization. As these processes occur, there are a series of tradeoffs of hazard to the marine environment and changes that influence the microplastics’ mobility.

Toolbox
WEATHER-MIC will develop novel tools for tackling the complex implications of weathering of microplastics including
- “fingerprinting” methods to track microplastic weathering
- advanced particle imaging to investigate size distribution and morphological changes with weathering
- improved understanding regarding the biofilm growing on microplastics and its trophic transfer
- numerical particle transport models to account for changes in sedimentation and dispersion with microplastic fragmentation-aggregation
- (eco)toxicity profiles for weathered microplastics and their leachates

Current activities and first results
The initial efforts within WEATHER-MIC have focused on
(i) Weathering studies
- development of a protocol for artificial aging (Figure 2) using UV light (SU)
- LC-Orbitrap MS screening of plastic leachates (SU)
- column weathering experiments (NGI & IKTS)
- surface imaging of field-aged plastic particles (Figures 3 and 4, IKTS)
(ii) Studies including biota
- biofilm grown on plastic material (Figure 5, UFZ) and its characterisation (SU & UFZ)
- Daphnia feeding experiments with PCB-contaminated microplastics (Figure 6, SU)
(iii) Modelling
- assembling a hydrodynamic model that covers Oslo Harbor and the Stockholm Archipelago of the Baltic Sea (Figure 7)
(iv) Field work
- field weathering of plastic materials has been started (NGI in collaboration with PLASTOX)
- initial field sampling in Oslo Harbor and the Baltic Sea (Figure 8, NGI & SU)

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