STAKEHOLDER REPORT

MARCH 2017

WEATHER-MIC – HOW MICROPLASTIC WEATHERING CHANGES ITS TRANSPORT, FATE AND TOXICITY IN THE MARINE ENVIRONMENT

Our ocean is continuously being fed with large quantities of plastic, which in turn enters the diet of fish, shellfish, birds, and we who eat from the sea. Much of the plastic in our collective diets is so-called microplastic, which is often too small or hidden to see with the naked eye. The WEATHER-MIC research project is investigating the processes controlling the fate and distribution of microplastic, as it is weathered by sunlight, bacteria, wave motion, seasonal changes, and other processes. Collectively, these weathering processes slowly degrade microplastic to smaller sizes and chemical fragments, and lead to changes in their distribution all over the entire ocean depth.

WEATHER-MIC will help answer 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?

FATE and DISTRIBUTION: The weathering and transport of microplastic in the ocean

WEATHER-MIC is divided into 7 key areas, or work packages (WP). WP1 investigates the changes to microplastic sizes and shapes during weathering, as well as what chemicals are being released during this process. Distinct chemical profiles have already been identified from the weathering of certain types of microplastic. In WP2 changes to the distribution of microplastic below the ocean surface are being investigated, as weathering has an impact on the density, size distribution, surface structure, and biological coating of microplastic. Preliminary results show that exposure to sunlight can increase the sinking rate of plastic, and that small floating plastic fibers can easily be brought down and distributed below the surface with small amounts of turbulence.

WEATHER-MIC is also conducting large-scale modeling and monitoring activities. In WP4, existing marine particulate transport models are being adapted to predict how weathered microplastic is affected by currents and waves and where it accumulates. The models will be developed for Oslo Harbor in Norway and the Himmerfjärden Bay near Stockholm, Sweden. At the same time, field sampling efforts in these areas will help inform and validate the model, as part of WP5.

RISKS: The consequences of microplastic

As previous to WEATHER-MIC there is little known about what happens to microplastic as it weathers, it cannot be said if weathering reduces or increases the harm that microplastic can cause. As part of WP3, it is being investigated how microplastic during aging enters the marine food web. Therefore the effects on pelagic species when they eat plastic or clay particles, with and without biofilm, are being compared. Thus far, effects can be seen for all kinds of particles. Work to

differentiate these effects is currently ongoing. In WP6 the toxicity of microplastic at different stages of aging, as well as the chemicals they release, are being investigated through toxicity tests. Preliminary results indicate no effects for two common types of plastic, PE and PET; though research is ongoing for weathered versions in different sizes of these and other plastic.

Finally, to bring all the work together, a risk assessment strategy will be developed, that accounts for how the risk related to microplastic changes as the material weathers in the marine environment; currently it is not clear if the risk increases or decreases.

SOLUTIONS: The impact of WEATHER-MIC

The harm microplastic causes is triggering societal action to eliminate marine litter and other sources of marine microplastic. But even if we managed to completely eliminate marine litter and other sources of microplastic, we will still have to face the consequences of that material that is already in the oceans. Much of this plastic will persist for at least the decades to come. The outcome of WEATHER-MIC will lead to better risk management and environmental adaptation strategies for this microplastic we have fed to the ocean.

Sampling of microplastic using a Manta net trawl

EDUCATION AND OUTREACH

Education material is currently being developed and will be accessible at the project website. This includes class room experiments and videos about what happens to microplastic in the ocean.

The WEATHER-MIC consortium

WEATHER-MIC is one of four approved projects following the 2014 JPI-Oceans Pilot Call on ecological effects of microplastic. It consists of five partners from four European countries : Helmholtz Centre for Environmental Research – UFZ (lead), Stockholm University, NGI - Norwegian Geotechnical Institute, Fraunhofer Gesellschaft (IKTS Dresden) and University of Leuven (KU Leuven).

More info: annika.jahnke@ufz.de and Hans.Peter.Arp@ngi.no

For more info see: http://jpi-oceans.eu/weather-mic/about

Plastic litter is degraded to microplastic and smaller fragments due to environmental stressors such as UV light and wave action.