Keynote

Thu. Nov 12, 2026 9:00 AM - 10:30 AM JST | Thu. Nov 12, 2026 12:00 AM - 1:30 AM UTC | Room B (Kujaku) (2F)

Keynotes B2

Chair: Yasumasa Miyazawa, Bente Lilja Bye

9:20 AM - 9:40 AM JST | 12:20 AM - 12:40 AM UTC

[s8HxLUFw-02] Environmental Impacts of Microplastics Beyond Biological Effects

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As marine microplastics (MPs) are transported vertically via biological processes, the total amount of particulate organic carbon (POC) attached to MPs was estimated in the North Pacific Ocean, and its impact on the biological carbon flux was evaluated using the Martin curve (Martin et al., 1987). Observational data on marine MP concentrations ranging from 10 μm to 5 mm (Kuroda et al., 2025) were used to validate a three-dimensional model reproducing MP transport from the sea surface to 1000 m depth. The model incorporated riverine and fisheries-derived MP emissions, as well as ocean currents, windage, and Stokes drift to simulate transport. In addition, it concurrently included an algae ecosystem model for MP biofouling (Kooi et al., 2017) and a zooplankton ingestion process (Kvale et al., 2020, 2021). Ocean currents, wind, Stokes drift, water temperature/salinity were derived from reanalysis or satellite data, while ecosystem data such as phytoplankton concentrations were obtained from ESTOC reanalysis data (Osafune et al., 2015). Calculations assumed a plastic-free ocean prior to 1960 and hindcasted/forecasted in subsequent changes. Since MPs are less dense than seawater, POC aggregates containing MPs exhibit reduced densities and slower settling velocities, thereby inhibiting downward carbon flux. Furthermore, MPs from which biofouling has been removed through decomposition may return to upper ocean again, thereby inhibiting downward carbon flux over long timescales. The present-day downward carbon flux was estimated to decrease by several percent at depths of 500 m and 1000 m. Considering the projected decline in the coming decades, marine plastic pollution may need to be recognized not only as a threat to marine ecosystems but also as a potential player in the climate system.

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