

Expansion of marine plastic database and future predictions: from the seas around Japan to the polar regions

*Mao Kuroda¹

1. Center for Oceanic and Atmospheric Research, Research Institute for Applied Mechanics, Kyushu University

Marine plastic pollution has become a major global issue, as reflected in the Sustainable Development Goals (SDGs) adopted at the United Nations Summit in September 2015, which include the target of “conserving and sustainably using the oceans” and explicitly address marine plastic debris. At the G20 Osaka Summit held in June 2019, the “Osaka Blue Ocean Vision” was proposed, aiming to reduce additional pollution from marine plastic debris to zero by 2050. Since then, various initiatives have been undertaken, including field observations, database development, and the creation of future prediction models based on these datasets.

However, this vision did not present specific numerical reduction targets, and the indicators required to achieve zero additional pollution were not clearly defined. In this presentation, I introduce the efforts made in Japan to build a comprehensive database of marine plastic debris, the results of computer simulations that track the fate of plastic waste transported from land to the ocean based on this database, and future projections derived from a newly developed probabilistic distribution model.

I will also present the latest status of field observations that form the foundation for these future projections. Previous efforts mainly focused on the global surface ocean excluding polar regions, while it is now recognized that most marine plastic debris eventually fragments into microplastics (5 mm or less) and exists below the sea surface. Observational studies are now advancing to quantify the abundance, distribution, and transport pathways of this currently under-observed “missing plastic,” in order to close the gap between estimated and observed oceanic plastic inputs. This presentation will report newly identified processes of microplastic transport from surface accumulation zones into intermediate layers in the North Pacific. In addition, it will highlight recent research on marine plastic debris conducted in Antarctica during the 66th Japanese Antarctic Research Expedition wintering period (December 2024–January 2026), where only a few observational studies have previously been carried out.

Keywords: microplastic, marine debris, Future prediction, Antarctica