

# A numerical simulation of microplastic transport using a particle tracking model includes coastal residence processes in the Sea of Japan

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Recently, marine litter is widely recognized as a global environmental problem. In addition to large marine debris, small plastic fragments are significant concern because they can be found anywhere in the ocean, coastal regions, and beaches. The total particle count of plastic fragments within the East Asian Seas around Japan was 16 times greater than in the North Pacific and 27 times greater than in the world oceans. Thus, a combination of a particle tracking model and surface ocean currents provided by ocean reanalysis products have been used widely in reproducing the oceanic transport of marine debris in these areas. However, modeled particles were prevented from being washed ashore onto the modeled land or they were returned to the ocean cell in which they were located at the previous computation time step. Thus, previous particle tracking models have ignored processes of washing ashore, remaining the beach, and re-drifting to the ocean. These processes are important to understand the mechanism of producing the plastic fragments because marine debris gradually degrade into small plastic fragments on a beach because of exposure to ultraviolet radiation, heat of the sand, and mechanical erosion. In the present study, a particle tracking model includes processes of washing ashore, remaining the beach, and re-drifting to the ocean was established to reproduce the oceanic transport process of plastic fragments in the Sea of Japan. We will present this experiment results and discuss generality of our result using simplified analysis model.

Keywords: particle tracking model, coastal residence process, beached litter