Three-dimensional transport of microplastics in the South China Sea using a Lagrangian particle tracking model

*Kosei Matsushita[1], Yusuke Uchiyama[1], Naru Takaura[1]

1. Kobe Univ.

Oceanic plastic waste has been gaining attention over the past decade. Because of exposure to ultraviolet radiation and mechanical erosion, plastics are gradually degraded into small plastic fragments (microplastics). Marine organisms accidentally ingest microplastics that may absorb pollutant, resulting in deleterious effects as harm to marine ecosystem. Recent studies have reported the presence of microplastics in the worldwide ocean including polar waters. A global model of plastic inputs from rivers into oceans showed that the top 20 polluting rivers, mostly located in Asia, account for 67% of the global total. In particulalr, 12 of the top 20 rivers are located around the South China Sea (SCS). In the present study, a 3D tracking of neutrally buoyant Lagrangian particles that mimic microplastics is conducted using the 3D current velocity field pre-computed by the HYCOM-ROMS downscaling model for the SCS. A total of more than 5×10^4 particles are released continuously for one year period of 2012 from the mouths of the ten rivers around the SCS. It is found that the microplastics derived from the rivers discharged into the SCS remain in the SCS at about 80% even after one year since each release. In contrast, the microplastics derived from the outside of the SCS are barely transported back into the SCS. Furthermore, the transport and dispersal of microplastics are found to have prominent seasonality due to seasonally varying SCS circulations strongly affected by the monsoons. However, such seasonal transport does not bring most of particles out of the SCS but retains them mostly within the SCS regardless of the seasons.

Keywords: Microplastics, South China Sea, Three-dimensional, Monsoons

