# Numerical experiment on vertical motion of microplastics with both physical and biological processes

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Microplastics smaller than 5 mm are observed over the world’ s ocean. They are likely to damage marine organisms both particle toxicity of plastics, and interaction with chemical pollutants. However, the damages have not been predicted clearly in the ocean, because neither net abundance nor horizontal/vertical distribution of microplastics in the ocean have sufficiently reported to date. Although previous studies found that most microplastics are existent mostly in the surface layer < 1 m from the sea surface, 90~99% of microplastics are lost from the surface layer especially in the size range smaller than 1mm (Isobe et al., 2015), and light-weighted microplastics such as PP and PE were found at the bottom of the ocean (Cauwenberghe et al., 2013). Therefore, it is necessary to examine vertical transport of microplastics.
We tried to reproduce vertical transport of microplastics into the deep layers with both physical and biological processes. First, we constructed a numerical model with physical processes such as upward motion owing to buoyancy and turbulence owing to winds and waves. This model could explain the vertical distribution of microplastics in the size range between 300 $\mu$m and 5mm, and shows that most of microplastics within this size range remain from the sea surface at 5 m depth. The model, however, could not explain the abundance of microplastics with sizes smaller than 100 $\mu$m. The lost of these tiny microplastics is likely to occur due to settling aggregates of phytoplankton, and thus, we try to establish a numerical model including these biological processes.

Keywords: oceanic microplastics, vertical transport, aggregation

 