



Where's all the plastic in our oceans? Simulating ocean transport to identify sources, fate and risks of marine litter

Erik van Sebille

Utrecht University, Institute for Marine and Atmospheric research Utrecht, Utrecht, Netherlands (e.vansebille@uu.nl)

Plastic is one of the best materials ever invented, but it doesn't belong in the ocean. Large pieces can entangle turtles, birds, sharks, and other marine animals. Tiny bits of plastic, the result of the degrading actions of waves and Sun, can linger around for decades; once they get into the food chain, they too can adversely affect marine life.

Many of us — scientists and concerned citizens alike — think that humankind should immediately do something about all this plastic in our ocean. But assessment of the effectiveness of plans and mitigation strategies will first require understanding how the plastic moves through the ocean.

Most of our understanding about plastic debris movement in the ocean comes from observations of drifting buoys or numerical simulations of passive virtual particles in ocean general circulation models. However, neither of those represent the fragmentation, sinking, beaching and other processes that affect the movement of real plastic items in the ocean.

In order to fully simulate the sources, fate and risks of marine litter, it will be essential to simulate virtual particles that 'behave' like plastic. Such simulations are now being built, but the simulations will be most useful with sufficient observational data to constrain parameterisations for fragmentation, sinking and beaching.

Here, I will show our latest global simulations of dispersion and accumulation of plastic through our oceans and how we constrain them to data. Focussing on regional examples in the North Pacific gyre, the Arctic and the Southern Ocean, I will show how the resulting maps of plastic distribution can be used to identify hotspots of risk to marine life.