

#6 Topic: How to use complex systems techniques to map hotspots of marine litter?

Senior Scientist: Dr. Erik van Sebille

Abstract:

Erik van Sebille is a physical oceanographer and climate scientist investigating the transport of tracers such as heat, salt and marine plastic in the ocean. He currently leads the "Tracking Of Plastic In Our Seas" (TOPIOS) project, which aims to describe the pathways and fate of marine plastic litter.

Plastic particles in the ocean are subject to a range of physical effects, such as transport by ocean currents, breaking up through mechanical weathering and biofouling, which is the degradation and subsequent sinking through marine microbes. Only little is known about the processes and time scales of these effects. This is reflected by the "missing plastics problem": less than 1% of the total plastic estimated to be in the ocean has actually been found at the surface, and it is an open question where the remaining 99% are.

In order to close the marine plastics budget, new methods using techniques from complexity science could be used. The papers for the preparation focus on capturing the transport of surface plastics in a stochastic way – through the construction of transition matrices. These essentially reduce the transport to a large but simple spatially extended network. So far, this transition matrix work has only considered passive, floating plastic. An idea is to extend this network model and incorporate other effects in addition to the ocean currents.