Simulating the transport of floating marine litter across scales

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Marine litter is a major environmental problem. Quantifying the ecological and economic impacts of marine litter and assessing the efficacy of proposed solutions to the problem requires accurate knowledge of the distribution and transport of floating litter at the ocean surface. This can be done in the so-called Lagrangian framework, where trajectories of virtual particles are computed as they are transported through the ocean.Floating litter is transported not only by ocean currents – including geostrophic, Ekman and submesoscale components – but also by waves and, if it has sufficient freeboard, also by winds. In coastal areas, tidal currents may also be important. Accurately modelling the pathways of floating litter as a result of these phenomena requires high-resolution datasets, both in space and time.In this presentation, I will showcase some examples of Lagrangian simulations with these different fields. I will also discuss to what extent these simulations can be forced by Earth Observations and/or Ocean General Circulation Models only, and how EO-simulations compare to OGCM-simulations. Lagrangian particle tracking methods such as described here can be combined with optical, SAR and/or hyperspectral remote sensing techniques that identify and quantify the amount of floating debris. I will discuss how such a combination of flow and imaging will lead to improved estimates of the two-dimensional distribution of floating marine litter.