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# The role of Stokes drift in the dispersal of North Atlantic surface marine debris

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Understanding the physical mechanisms behind the transport and accumulation of floating objects in the ocean is crucial in order to efficiently tackle the issue of marine pollution. The main sinks of marine plastic are the coast and the bottom sediment. This study focuses on the former, investigating the timescales of dispersal from the ocean surface and onto coastal accumulation areas through a process called "beaching" in the presence of Stokes drift. Previous literature have found that the Stokes drift can reach the same magnitude as the Eulerian current speed and that it has a long-term effect on the trajectories of floating objects. Two virtual particle simulations are carried out and then compared, one with and one without Stokes drift, named SD and REF respectively. Eulerian velocity and Stokes drift data from global reanalysis datasets are used for particle advection. Particles in the SD model are found to beach at a yearly rate that is almost double the rate observed in the Eulerian model. The main coastal attractors are consistent with the direction of large-scale atmospheric circulation (Westerlies and Trade Winds). Long-term predictions carried out with the aid of adjacency matrices found that the concentration of particles in the subtropical accumulation zone after 100 years is 10 times lower in the presence of Stokes drift. The results confirm the need to accurately represent the Stokes drift in particle models attempting to predict the behaviour of marine debris, in order to avoid overestimation of its residence time in the ocean and guide policies towards prevention and removal more effectively.