Exploring marine debris transport patterns downstream of Gran Canaria using TrackMPD and surface drifters deployed after a marine pollution incident

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Abstract

The marine pollution events such as hydrocarbon or microplastic spills require numerical tools to estimate the distribution of these agents. In this context, in April 2015 a fishing vessel sank approximately 16 nautical miles SSE off the southeastern coast of Gran Canaria (Canary Islands, Spain). 6 Oceanographic drifters (iSphere) were deployed one month after the incident, on different days by the Spanish Maritime Rescue staff, enabling the Spanish Institute of Oceanography to study the drift of pollution and its potential impact on the coast. We use the TrackMPD modelling framework, an open access toolbox developed in MATLAB which has been previously validated, and applied to monitor the pellet spill of December 2023, primarily affecting the coasts of Galicia, Spain. We explore the fit between the real and modelled trajectories using the Liu-Weisberg Skill Score. Simulations were conducted by releasing particles at the initial date and position of the drifters, using horizontal current velocity data from the operational Atlantic-Iberian Biscay Irish (IBI) Ocean Reanalysis dataset and 10-meter wind velocity data from the high-resolution HARMONIE model. This provides insights into the physical processes involved in marine debris transport, including macro- and microplastics, in the lee regions of oceanic islands, as well as the associated challenges and identification of modelling shortcomings where future efforts should be addressed. Results suggest that the main, southward, particle transport is properly modelled. However, a few drifters experienced northward movements towards the coastline of Gran Canaria before migrating southward, a behavior that none of the simulations capture, likely due to the complexity of coastal ocean dynamics in a region traditionally rich in submesoscale and mesoscale phenomena.

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Keywords: Trajectory, TrackMPD, Marine Debris, Gran Canaria, Surface Drifters