EGU24-11590, updated on 05 May 2024
https://doi.org/10.5194/egusphere-egu24-11590
EGU General Assembly 2024

Microplastic trajectories and fates in the Canary Current System using TrackMPD

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The pollution caused by marine microplastic debris is a significant environmental problem that affects the world's oceans. Therefore, understanding their movement, distribution and fates in the ocean is crucial for addressing this issue. We explore the sensitivity of microplastic trajectories and fates to physical processes in the Canary Current System by employing the TrackMPD modeling framework, an existing open-access toolbox developed in MATLAB. TrackMPD resolves the limitations of previous toolboxes considering particle dynamical properties and a diverse set of physical processes. The sensitivity tests were performed through the release of virtual particles upstream the Canary Islands, using the horizontal velocity field extracted from the operational Atlantic – Iberian Biscay Irish (IBI) Ocean Analysis and Forecasting dataset. We base the sensibility test on varying the advection resolving method (RK4, RK2 and Euler Method) and the horizontal dispersion coefficient. Comparisons between scenarios are conducted by descriptive visualization of the trajectories and by computing a dimensionless Skill Score based on normalized cumulative Lagrangian separation that allows to estimate differences between trajectories. Results underscore the impact that varying physical processes parameters have on microplastic transport within the Canary Current System. These preliminary findings indicate that the transport and fates of microplastics are strongly influenced by the noteworthy mesoscale activity in the region, especially the eddies, and a coastal jet located east of the islands. After 90 days of simulation, most of the particles remain in the open ocean and those that reach the coast will mainly do so on the east coast of the islands. In all cases, average Skill Score values are above 0.8. The main differences are related to the horizontal dispersion, resulting in lower Skill Scores with higher dispersion coefficients. This effect shows no significant differences between advection scheme resolution. Moreover, the Skill Score indicates variability differences between advection schemes, where the Euler method exhibits more variability than the RK2, and the RK2 more than the RK4. This analysis provides insights into the importance of basic physical processes on the distribution and fate of microplastic debris, thereby increasing the knowledge on the topic. Ongoing analyses test the performance of the above different schemes against real case scenarios of surface drifters

navigating through the Canary Current system