Lagrangian Approach for Modeling Marine Litter Transport

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Abstract : The permanent supply of marine litter implies their accumulation in the oceans, which causes the presence of more compact wastes layers. Their Spatio-temporal distribution is never homogeneous and depends mainly on the hydrodynamic characteristics of the environment and the size and location of the wastes. As part of optimizing collect of marine plastic wastes, it is important to measure and monitor their evolution over time. For this, many research studies have been dedicated to describing the wastes behavior in order to identify their accumulation in oceans areas. Several models are therefore developed to understand the mechanisms that allow the accumulation and the displacements of marine litter. These models are able to accurately simulate the drift of wastes to study their behavior and stranding. However, these works aim to study the wastes behavior over a long period of time and not at the time of waste collection. This work investigates the transport of floating marine litter (FML) to provide basic information that can help in optimizing wastes collection by proposing a model for predicting their behavior during collection. The proposed study is based on a Lagrangian modeling approach that uses the main factors influencing the dynamics of the waste. The performance of the proposed method was assessed on real data collected from the Copernicus Marine Environment Monitoring Service (CMEMS). Evaluation results in the Java Sea (Indonesia) prove that the proposed model can effectively predict the position and the velocity of marine wastes during collection.

Keywords : floating marine litter, lagrangian transport, particle-tracking model, wastes drift
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