ESTIMATION OF CONTAMINANT TRAJECTORY USING AN INVERSE PROBLEM APPROACH

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Marine pollution is still an ever-growing problem in the planet. Methods to find the source of an emission are scarce in the literature and would be useful to prove liabilities over a contaminant intrusion in the waterbody. Most methods rely on a classical *backtracking* algorithm which aims at identifying the source of a contaminant by inverting the resultant signal of forcing vectors, which will consequently reach a final starting point. Methods based on inverse problem approaches could reach such objective by using metaheuristic models. In this paper a new approach is presented to identify the source of a contaminant trajectory, the GRIPP_Py written in Python language. GRIPP_Py is designed to pursue the probable source of an observed oil spill in any region of the ocean. In order to reach this objective, the classical direct problem solution, which is widely accepted and validated in the scientific literature is used. This paper considers the premise that a single particle emission from a specific spot shall reach the observed spot eventually. By using a searching window reduction strategy, the iterations can be optimised to reduce the computational cost. The method is designed to provide several particles at random positions over a window of possibilities, which will be the input for the contaminant transport model. The hydrodynamic solution and contaminant dispersion is calculated by the computational platform: MOHID Water modelling system. After the first simulations is carried out, the algorithm calculates the distance between the actual target to the calculated targets interrupting the procedure when a tolerance is satisfied. For this model presentation, a random spot in the Eastern Mediterranean Sea was selected producing the direct model. In order to avoid the “inverse crime” concept, a small noise was imposed in the model output so that from this noisy output a source spot would be searched. The algorithm ran as expected, and the results were obtained after few reiterations, reinforcing the GRIPP_Py ability to obtain the source from an emitted contaminant. Strategies based on Artificial Intelligence are promising in this field, motivating the herein authors to a further upgrade.

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