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CranSLIK v1.0: stochastic prediction of oil spill transport and fate using approximation methods

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Abstract. This paper investigates the development of a model, called CranSLIK, to predict the transport and transformations of a point mass oil spill via a stochastic approach. Initially the various effects on destination are considered and key parameters are chosen which are expected to dominate the displacement. The variables considered are: wind velocity, surface water velocity, spill size, and spill age. For a point mass oil spill, it is found that the centre of mass can be determined by the wind and current data only, and the spill size and age can then be used to reconstruct the surface of the spill. These variables are sampled and simulations are performed using an open-source Lagrangian approach-based code, MEDSLIK II. Regression modelling is applied to create two sets of polynomials: one for the centre of mass, and one for the spill size. Simulations performed for a real oil spill case show that a minimum of approximately 80% of the oil is captured by CranSLIK. Finally, Monte Carlo simulation is implemented to allow for consideration of the most likely destination for the oil spill, when the distributions for the oceanographic conditions are known.

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