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Operational surface drift uncertainty analysis using a multi-model ensemble training methodology

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Surface drift estimation requires combining different kind prediction models (atmospheric, ocean and waves), in a different way depending on the drifting objects in order to account for direct windage, surface currents and surface wave push and drift. Errors in the prediction fields will propagate non-linearly to the drift trajectory estimates, through model coupling and/or forcing schemes being used. This fact makes surface drift prediction a non-linear problem very sensitive to uncertainty cascading.

The NATO Tactical Ocean Modeling System (NTOMS) was designed to measure and improve the accuracy and reliability of local forecasting by using operationally available environmental models and local data. It uses statistical analysis and multi kind model ensemble techniques and introduces high resolution sampling and stochastic-feature modelling as a solution to improve the reliability and resolution of local end-products. This methodology is suited for end-to-end approaches in the presence of multiple parameter inputs, with different statistical nature, like surface drift estimation.

This work will show examples of the NTOMS applied to 24 hours cycle trajectory and area-of-containment estimation of CODE ARGOS surface drifters, during the MREA04 sea trial off the coast of Portugal. During this trial three ocean, two wave and three atmospheric high resolution (i.e. grids finer than 10km) models were running operationally providing 48 hours predictions every 12 or 24 hours. Local data included real-time ocean profilers (SEPTR), ADCP stations, CTD casts, meteorological stations and wave buoys. Discussion will include accuracy and reliability improvements by using the local real-time available environmental data for single kind model training and bias correction and compared it to untrained operational support.