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Forecasting skill assessment of an oil spill simulation system in the NE Aegean and atmospheric forcing perturbation experiments

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In the present study, the predictive skill of an oil spill simulation system implemented in the Northern Aegean Sea was evaluated using field observations from surface drifters, provided in the framework of the TOSCA project. The system produces satisfactory results as in most cases the forecasting error is quite small, allowing the operational use of the forecast. In order to examine the sensitivity of the forecast to atmospheric forcing, additional simulations with perturbed atmospheric conditions were performed, using a time-shifting technique. In most experiments the differences between the simulations are relatively small, most likely due to slow oceanic response to variations in the wind fields. From the individual simulations an ensemble forecast was created, the results of which were also compared with the observations. The results suggest that by applying this method a safer forecast can be provided, especially regarding cases for which the wind-driven circulation is predominant. However, in cases where the circulation is characterized by intense velocity gradients (in the NE Aegean this is associated with the thermohaline front created by the Black Sea Water inflow), larger differences are present. They are related to imprecise representation of the location of the front. In these cases, the ensemble method produced no significant improvement since the relatively small differences between the trajectories of the ensemble members indicate that the position of the front in not significantly affected by the wind perturbations, based on the spatio-temporal scales examined. It is concluded that in regions with large spatio-temporal variability, an ensemble forecast produced by simulations generated from perturbed initial conditions could possibly lead to more robust results.