Response to reviewer #1

The answers to the interactive comments by reviewer #1 have been shared with the co-authors of the manuscript.

Reviewer #1

The ms is of very interest in terms of examining new approaches for the improvement of the oil spill predictions due to surface forcing uncertainties.

The use of the ECMWF ensemble wind forecast can provide valuable information to the response agencies regarding the impacted area, both at sea and at shoreline, as well as of the variation of the weathering processes.

Author

We thank the reviewer for the constructive and positive comments. In the revised manuscript, we will address all reviewer's comments.

Reviewer #1

Minor comments:

Clarify the temporal resolution of the used ECMWF deterministic and ensemble wind forecasting data, as from the Figure 4 it seems that are 3 hourly? Similarly, provide the temporal resolution of the used CMEMS Med MFC sea currents.

Author

Thank you for the careful reading, the deterministic and ensemble wind forcing were retrieved by ECMWF archives at 3-hour frequency. The Med MFC data were provided by CMEMS at daily frequency. For both datasets, we used the MEDSLIK-II pre-processing tools to generate hourly metocean forcing fields as required by the oil spill model.

This information will be included in Section 2.2 of the revised manuscript: *"converting the oil spill model inputs from the CMEMS daily ocean forcing and the ECMWF 3-hour atmospheric forcing to hourly fields."*

Reviewer #1

Clarify if the DA is applied also to the southern part of the convex hull area, as from Figure 5 the DA it seems that it was applied only in the northern part.

Author

We apologize to the reviewer for the confusion depicting the convex hull areas.

In Figure 5, we show the deterministic convex hull (blue) and the convex hull of an individual member (orange) selected from the ensemble. We focus on the hatched area in the northern part, where the deterministic convex hull exceeds the convex hull of the individual member. This area is named in the ms with the letter "A". In order to keep the schematic as simple as possible, we do not depict the area "DA" denoting the difference between the deterministic convex hull (blue) and the convex hull of all members of the ensemble (not shown).

Figure 5 will be revised to better indicate the hatched area "A". Also, we will explain better in the revised text the hatched area "A".

Reviewer #1

The figure 8 to be renamed as figure 8a and add an additional map as figure 8b showing the extend of the deterministic and ensemble spill extend on the sea surface and on shoreline only. The transport of the dispersed oil, i.e. the transport of the subsurface oil in oil spill modeling is calculated using sea currents, not winds.

Author

We agree with the reviewer that the transport of the subsurface oil is calculated using the sea currents.

Following the reviewer's suggestion, we will rename Figs. 8a, b as Figs. 8c, d, and we will add two additional maps as new Figs. 8a, b, showing the deterministic and ensemble spill extent on the sea surface and on the shoreline, during winter and spring respectively. Also, we will revise the text to include the aforementioned changes.

Reviewer #1

It will be an added value of the ms the provision of the plots of the main weathering parameters derived from the deterministic oil spill simulation and those derived from the ensemble oil spill simulations (mean averaged).

Author

We thank the reviewer for the insightful comment. In our application, the differences between the deterministic and ensemble simulations were mainly attributable to phase errors in the wind direction controlling advection and oil spill trajectories. The oil spill state due to weathering processes showed relatively small differences between the deterministic and ensemble simulations.

Following the reviewer's suggestion, we will revise the text and provide information for the ensemble mean and spread (i.e., 1std) for weathering parameters (e.g., water/oil volume ratio, emulsion viscosity, emulsion density, evaporative volume).

Reviewer #1

For operational oil spill predictions is of interest to the response agencies to provide the run time required for the deterministic oil spill prediction and of the run time required for the ensemble oil spill predictions for 48 hours, 72hours, 120hours and 240hours.

Author

Thank you, we agree that for operational predictions the computational run time is of particular interest to the response agencies.

The text will be revised accordingly: *"The run time of our simulations was mainly determined by the number of oil parcels and the size of the ensemble. For a 168-hour (7-day) oil spill prediction (in our domain of interest depicted in Fig. 1), the deterministic simulation required approximately a 20-minute run time, including the model's I/O tasks. The computational cost of the ensemble prediction, in case all members are run in serial mode (i.e., one after the other in sequence), is analogous to the number of the ensemble members. The latter is valid also for the data storage. For a small ensemble simulation in a HPC facility with available CPU cores, the ensemble can run in parallel mode (i.e., the members can run independently) and the computational cost will be the same as the deterministic simulation."*