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Geoscientific Model Development Discussions

Interactive comment on "MEDSLIK-II, a Lagrangian marine oil spill model for short-term forecasting – Part 2: Numerical simulations and validations" *by* M. De Dominicis et al.

Anonymous Referee #2

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General comments:

The Lagrangian oil spill model, MEDSLIK-II, is applied to the Mediterranean Sea. The sensitivity of the model in Lagrangian trajectory simulation is validated against surface drifter data and satellite images. Despite the model evaluation problems and ignorance of the previous work, some useful results have been obtained, such as the importance of the ocean currents relative to winds drift and wave effects, the predictability of the oil spill model, etc. Even though the data for model validation are very limited in this study, the potential usefulness of the oil spill model has been demonstrated. Thus, I would like to recommend it be accepted for publication after some major revisions.

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Specific comments:

(1) The Lagrangian separation distances or their rmse values, Eq. (13), are not good indicators of Lagrangian trajectory modeling in oceans. For a region with eddy activities (shown as the quasi-circled trajectories in Fig. 7), the separation distances may not indicate the model performance. Actually, Liu and Weisberg (2011) proposed a new skill score based on the normalized cumulative Lagrangian separation, which is useful for this case. I would suggest the authors to switch to this new skill assessment in this study.

(2) P2012, L11-21, the addition of the wind drift does not give a good result. This is expected for coastal ocean regions. Ocean currents near the coasts are generally polarized to be in the direction of local coastline or local bathymetry (e.g., Liu and Weisberg, 2005). Note that the horizontal decorrelation scales of the winds are much larger than those of the coastal currents. Across-shore winds may not be able to induce across-shore Ekman currents near the coast due to the blocking of the coastline. An example of observed complex coastal current patterns in response to wind forcing can be seen in Liu et al. (2007).

(3) P2014, L20-27, two types of satellite images were used. There may be a lack of consistency in identifying oil slicks between the two satellite products. A typical example is the Deepwater Horizon oil spill; the surface oil slicks derived from the same source of satellite images but by different research groups showed significant differences. The resolutions of the SAR images and MODIS optical imagery are also different. So, it is better to use the satellite product from the same research group to study the temporal variation of the surface oil slick.

(4) The proposed oil spill model is actually a surface oil spill model. The title of the paper should specify this feature by adding a word “surface” right before “oil spill”.

(5) P2001, L4, the model is capable of predicting physical and chemical changes of the surface oil spill . . ... The “chemical changes” are not included in the model at all.

(6) P2001, L12, such satellite images have been proved to be important in re-initializing the oil spill trajectory models in rapid response to the Deepwater Horizon incident (e.g., Liu et al. 2011a and the chapters therein). For the first time the combination of satellite images of surface oil slick with Lagrangian trajectory models has been implemented in operational oil spill trajectory hindcast/forecast (Liu et al., 2011b).

(7) P2001, L22-27, the sentences need to be rewritten. What do you mean "combining field observations and drifter observations"?

(8) P2017, L3-7, the main conclusions on the importance of the ocean currents and the predictability time window of 1 to 2.5 days are consistent with the experience of the rapid response to the Deepwater Horizon oil spill (Liu et al., 2011b, 2011c). It would be good to mention this in this paragraph.

(9) P2018, L17-19, the predictability time of 2 to 3 days and "frequent re-initialization" are exactly what have been found/suggested in Liu et al. (2011b, 2011c). Proper credits should be given to those publications.

(10) P2018, L21-22, "ensemble" of different model output is another important feature of the operational oil spill trajectory modeling effort in the Deepwater Horizon oil spill response (Liu et al., 2011b, 2011c). Again, proper credits should be given to those publications.

(11) Limited data are used for model validation in this study. It would be good to test your model in a data rich region, e.g., the Gulf of Mexico for the Deepwater Horizon case, in the future. This is not required in this study, though.

References:

Liu, Y., A. MacFadyen, Z.-G. Ji, and R.H. Weisberg (Editors), 2011a: Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, Geophysical Monograph Series, 195, 271 PP., AGU/geopress, Washington D.C.

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