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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.

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The Authors thank Referee 2 for the helpful comments that will contribute to improve the model evaluation method and to place the work in the state-of-the-art context of oil spill model development.

In the following we list our answers:

Specific comments:

(1) In the revised version of the manuscript the skill score based on the cumulative Lagrangian separation distances normalized by the associated cumulative trajectory

lengths, as described in Liu and Weisberg (2011), has been shortly introduced in the text and new figures included.

Text to be added at page 2010:

"In addition to the RMSE calculation (Eq. 13), the new skill score proposed by Liu and Weisberg (2011) has been used to further evaluate the performance of the modeled trajectories. A non-dimensional index is defined as:

$$ss = 1 - \frac{\sum_{i=1}^{N} d_i}{\sum_{i=1}^{N} l_{oi}} \tag{1}$$

where d_i is the separation distance between the simulated drifter position and the observed position at selected time step i after the inizialization, l_{oi} is the length of the observed trajectory at the corresponding time step and N is the total number of time steps. Such weighted average tend to reduce the skill score errors that may rise using only the purely Lagrangian separation distance. The higher the ss value, the better the performance, with $ss = 1$ implying a perfect fit between observation and simulation. If $ss < 0$ the model simulations have no skill, assuming that the cumulative separation distance should not be larger than the associated cumulative length of the drifter trajectory. "

Fig. 3b, Fig. 6b, Fig. 6d and Fig. 8b have been included in the manuscript. We noticed that the simulated trajectories re-initialized every day (Fig. 6d) show lower skill scores than without re-initialization (Fig. 6b). However, the separation distance between the observed and simulated trajectories is significantly lower by using the re-initialization. Thus, what we can conclude is that different starting points give a very different predictability, which leads to a low skill score averaged among all the re-initialized trajectories.

In the last figure attached (not to be added in the text), we show that the skill score works well in the case (1). However, this skill score should be treated with caution: if we consider the case of a fast (2) and a slow (3) trajectory, but with the same separation distance error, the skill score will be different and this is not an obvious conclusion.

The supplementary figure shows also that by using the re-inizialization procedure (case 4), the separation distance may be lower in case (4) than in case (2), although the skill score is higher in case (2) (as in our simulations).

(2) The case taken as an example by the Referee (Fig.2 of the manuscript) is not a coastal case but we agree, that if it would be coastal there are more than one reason not to use the Ekman drift correction. In our particular case, even the open ocean result is worse with the Ekman correction and this is why we have overcome the problem using high resolution operational and nested models. Thus, the authors added a phrase at page 2012 stating that: " Ekman corrections should be carefully tested for coastal currents where the major forcings are local bathymetries and coastlines."

(3) In the Mediterranean Sea it is very difficult to have subsequent satellite images over the same area in subsequent days, and even more difficult to have satellite images from the same research group or same sensor (SAR or optical images). This is why we are obliged to use different sources of satellite images, despite the inherent technological limitations. We have added the above phrase at page 2014.

(4) The title has been modified into "MEDSLIK-II, a Lagrangian marine surface oil spill model for short-term forecasting."

(5) "chemical changes" has been removed from page 2001 line 4.

(6) Liu et al. 2011a, 2011b have been cited at page 2001.

(7) The sentence has been rephrased into: "Between those studies, the pioneering study of Reed et al. (1994) combined the drifters, remote sensing observations and chemical samplings."

(8) Liu et al., 2011b, 2011c have been cited at page 2017.

(9) Liu et al., 2011b, 2011c have been cited at page 2018.

(10) Liu et al., 2011b, 2011c have been cited at page 2018.

(11) The MEDSLIK-II model can be freely downloaded from the http://gnoo.bo.ingv.it/MEDSLIKII, minor changes in the model routines would allow the usage of the model in the Gulf of Mexico region. One of the aim of being an open source model is to attract users and scientists to test the model in very different conditions and region to check its performance, thus the model implementation and testing in other regions outside the Mediterranean Sea might be a very interesting future work.

New references included in the manuscript:

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.

Liu, Y., and R.H. Weisberg, 2011: Evaluation of trajectory modeling in different dynamic regions using normalized cumulative Lagrangian separation, J. Geophys. Res., 116, C09013, doi:10.1029/2010JC006837.

Liu, Y., R. H. Weisberg, C. Hu, and L. Zheng, 2011b, Tracking the Deepwater Horizon oil spill: A modeling perspective, Eos Trans. AGU, 92(6), 45-46, doi:10.1029/2011EO060001.

Liu, Y., R.H. Weisberg, C. Hu, and L. Zheng, 2011c: Trajectory forecast as a rapid response to the Deepwater Horizon oil spill, in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, Geophysical Monograph Series, 195, 153-165, doi:10.1029/2011GM001121.

Interactive comment on Geosci. Model Dev. Discuss., 6, 1999, 2013.

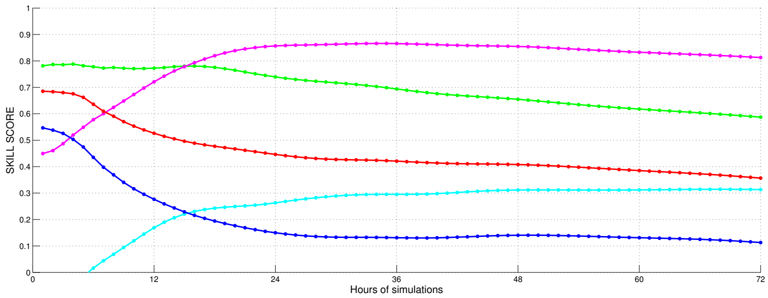

Fig. 1. Figure 3b. Skill score between the observed and simulated trajectories of Fig.2 as a function of the prediction time.

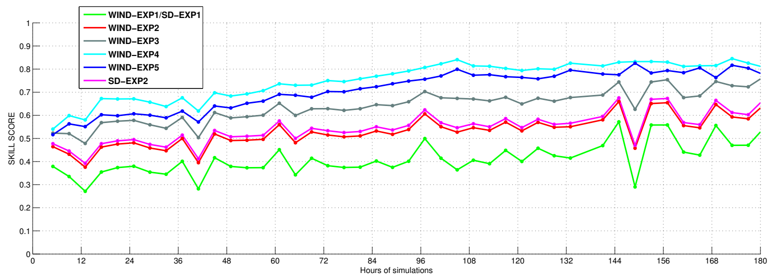

Fig. 2. Figure 6b. Skill score between the observed and simulated trajectories of Fig.4 as a function of the prediction time.

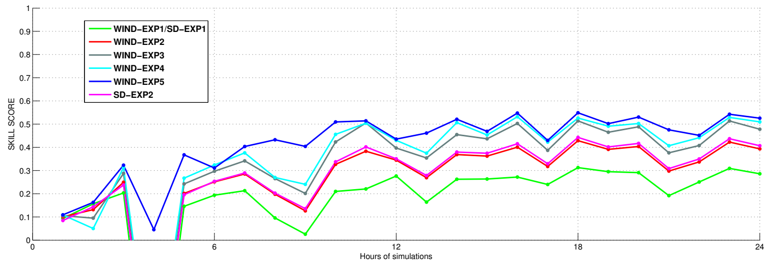

Fig. 3. Figure 6d. Skill score between the observed and simulated trajectories of Fig.5 as a function of the prediction time.

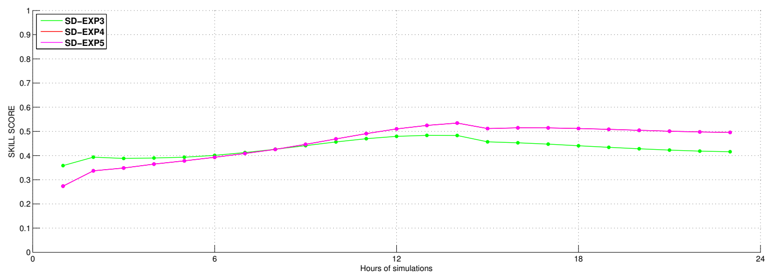

Fig. 4. Figure 8b. Skill score between the observed and simulated trajectories of Fig.7 as a function of the prediction time.

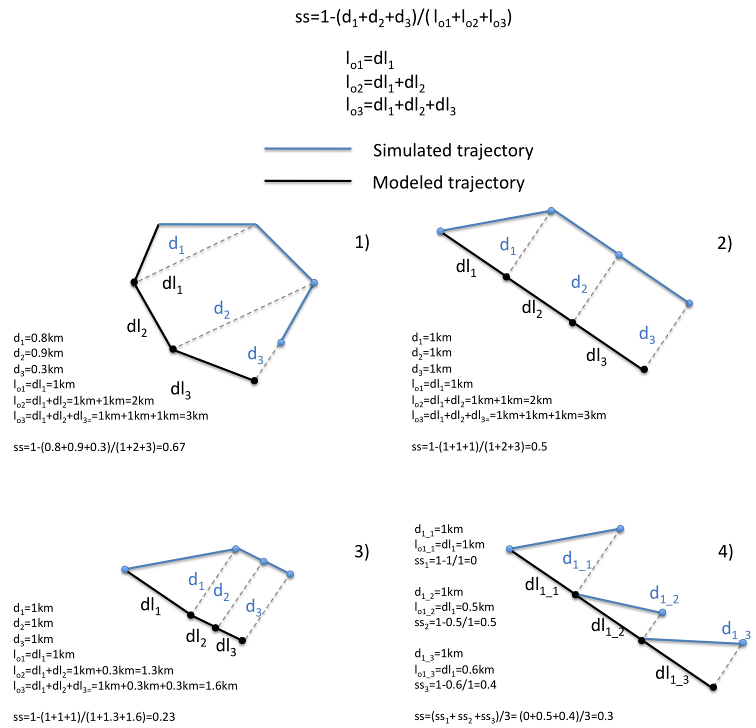

Fig. 5. Supplementary Figure (not to be added in the text). Liu and Weisberg (2011) skill score definition and application examples.