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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.

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The Authors thank the Referee #1 for the request of useful clarifications that will be added in the text, improving the model evaluation, description and understandability.

In the following we list our answers:

Specific Comments:

(1) There are several reasons to select a number of grid points as acceptable error:

a) It is common wisdom that in finite difference models 8 grid points are required (Haidvogel, 1999) to resolve a structure, thus taking three-four grid points as a limit is quite

conservative;

b) The acceptable maximum separation between observed and modelled trajectory depends also on the particular application. An error between 7 – 19 km (3 times the model resolution of the ocean model used in this work) would allow to use the model forecasts in situations of rapid response, such as oil spills and search and rescue operations. We should have in mind that the oil spill model results should be used to deploy booms, to place skimmer, to protect a particular piece of coast, to intervene with airplane or vessels.

We now list the above reasons for our choice at page 2012.

Furthermore, the MEDSLIK-II model performances are now compared with the state-of-art assessment of Lagrangian predictive skill. An extensive literature is now cited on model performances at page 2009.

- Price et al. (2006): separation distance between modelled and drifters trajectories is 78 km after 3 days. After 20 days is 229 km.

- Barron et al. (2007): separations distances between modelled and drifters trajectories after 1 day ranged between 10 to 25 km. After 7 days from 50 km to 150 km.

- Caballero et al. (2008) after 3 days observed and modelled drifters separated by about 23 km. After 7 days the separation increased to 46 km.

- Sotillo et al. (2008) during 13 days of simulation the mean RMSE comparing the modelled and observed trajectories is 5 km.

- Liu et al. (2011) separations distances between modelled and drifters trajectories after 1 day are between 13 to 34 km. After 5 days from 58 km to 177 km.

- Huntley et al. (2011) modelled trajectories from observations separated by 15 km after the 1 day.

- Cucco et al. (2012) mean separation distance is 4 km after 2 days.

(2) The ocean model used is the Mediterranean Forecasting System providing hourly current fields with an horizontal resolution of 6.5 km (the resolution will be added in Table 4). The transport is insensitive to the oil concentration, number particles and tracer mesh resolution because MEDSLIK-II is based on some fundamental assumptions. As stated in Part 1, the particles do not influence water hydrodynamics and processes and move through infinitesimal displacements without inertia (like water parcels) and without interacting amongst themselves. Thus concentration will not affected. On the contrary the transport will have effect on oil concentration because the oil concentration is calculated counting up the particles in each grid cell of the tracer mesh. Thus, using different ocean model resolutions will lead to different particle positions and as consequence to different oil concentration patterns. In the particular case study area of Section 4.2 no higher horizontal resolution model is available, but we are already considering this analysis in future works where higher resolution currents are available.

New references included in the manuscript:

Barron, C.N., Smedstad, L.F., Dastugue, J.M., Smedstad, O.M., 2007. Evaluation of ocean models using observed and simulated drifter trajectories: impact of sea surface height on synthetic profiles for data assimilation. J. Geophys. Res. 112 (C7), C07019.

Huntley H. S., B.L. Lipphardt Jr., A.D. Kirwan Jr., 2011. Lagrangian predictability assessed in the East China Sea, Ocean Modelling, (36), Pages 163-178.

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.

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