



Interactive comment on “MEDSLIK-II, a Lagrangian marine oil spill model for short-term forecasting – Part 1: Theory” by M. De Dominicis et al.

Anonymous Referee #2

Received and published: 4 May 2013

This manuscript describes a Lagrangian oil spill model by listing an extensive set of mathematical equations and explaining their meanings and potential application conditions and problems. The paper is tedious to read because so many equations are used. However, by providing a relatively complete description of the formalism of the oil spill model, it may act as a good reference to the oil spill community, especially, when it comes with an open source numerical oil spill model. Thus, I would like to recommend it be accepted for publication after some necessary revisions.

Specific comments:

It has been three years after the Deepwater Horizon (DWH) oil spill, the largest offshore

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oil spill in the world. Valuable lessons have been learned from the rapid response to the DWH incident, including modeling of the oil spill, which have been published as a book by American Geophysical Union (Liu et al., 2011a). For example, 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). Also, the frequent re-initializations with available satellite image inferred or in situ oil locations and the ensemble of six different trajectory models (based on different ocean circulation model outputs) are found to be important in the rapid response to the DWH incident (Liu et al., 2011b, 2011c; MacFadyen et al., 2011). It's surprising that neither the book nor any of the book chapters are mentioned in this manuscript.

One should be cautious to use the empirical parameterization of the surface Ekman currents from wind data using Eq. (47), especially in coastal oceans where oil spills often happen. 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).

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”.

P1952, L8, since the “MEDSLIK” is an “established” model, a reference of related publication is expected here.

P1961, L3, several hours? The DWH oil gushing lasted for almost three months (e.g., Liu et al. 2011a).

P1969, L10-11, state of art ocean circulation models output surface current field that is satisfactory, and the wind drifting term is not needed. This was exactly the case for

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the DWH oil spill trajectory model applications (Liu et al. 2011b, 2011c). P1969, L21, regarding to the importance of the Stokes drift, Pugliese Carratelli et al. (2011) should be cited here.

Technical errors:

P1958, L1, "In order now to solve for the complete ..." should be revised as "To solve the complete ...".

P1958, L18, the word "also" should be removed.

P1959, L2, "and the sea bottom" should be "and on the sea bottom".

P1959, L3, "In order to do so," can be removed.

P1959, L4, "in a oil tracer ..." should be "in an oil tracer ...".

P1959, L4, "are defined" should be "are defined as".

P1960, L2, "has been" should be "is".

P1960, L12, the word "done" should be removed.

P1960, L18, "have estimated" should be "estimated".

P1963, L8, The sentence should be written as "Using Eq. (10), the time rate of change of oil volume is written as"

P1969, L27-28, "run side by side" should be "run in parallel".

P1971, L7, word "as" should be added to the end of the sentence.

P1975, L2, "may wash back" should be changed to "may be washed back".

P1975, L5, "it washes off" should be revised as "it is washed off".

P1977, L2-3, single-sentence paragraphs should be avoided in the text.

P1977, L9, word "attention" should be removed.

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P1989, L25-26, some of the upper case letters should appear in lower case.

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., doi:10.1029/GM195.

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MacFadyen, A., G. Y. Watabayashi, C. H. Barker, and C. J. Beegle-Krause, 2011: Tactical modeling of surface oil transport during the Deepwater Horizon spill response, in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, *Geophys. Monogr. Ser.*, 195, 167-178, doi:10.1029/2011GM001128.

Pugliese Carratelli, E., F. Dentale, and F. Reale, 2011: On the effects of wave-induced drift and dispersion in the Deepwater Horizon oil spill, in Monitoring and Modeling the Deepwater Horizon Oil Spill: A Record-Breaking Enterprise, *Geophys. Monogr. Ser.*,

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