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Geoscientific
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Discussions

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 #1

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1 General Comments:

In their manuscript "MEDSLIK-II, a Lagrangian marine oil spill model for short-term forecasting - Part 1: Theory," the authors De Dominicis *et al.* describe the formulation of an oil spill model that uses Lagrangian tracers coupled with Eulerian circulation. The manuscript describes all aspects of model formulation, its underlying assumptions, and typical ranges for its parameters. The manuscript is generally well-written and technically correct.

This reviewer has oscillated on the question of whether this manuscript should be sep-

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Interactive Discussion

Discussion Paper

arated from Part II. The authors address this question when they claim that "the analytical and discrete formalism to represent all processes of transport, diffusion and transformation for a Lagrangian surface oil model are not adequately described in the literature." It is the opinion of this reviewer that this claim is not sufficient justification for publishing the present formalism as a stand-alone contribution. Instead, this formalism could be made available in other sources. It could be posted online as a technical note to accompany the user manual, and/or it could be shortened and combined with Part II to strengthen the overall contribution.

However, this reviewer is inclined to **recommend publication of a revised manuscript** as a stand-alone contribution, mostly due to the thoroughness and completeness of the presentation. In their revision, the authors are encouraged to better emphasize its novelty, especially relative to the contributions of Mackay *et al.* (1980), Al-Rabeh *et al.* (2000), and the other works referenced repeatedly in the text.

2 Specific Comments

In addition, the manuscript would benefit from a revision to address the following:

- In the paragraph surrounding Equation 22, the authors note their approximation that "the oil slick state variables depend only on the slick's central geographical position." It is noted that the wind and sea surface temperatures do not vary significantly over the geographic scales that are typical for oil slicks. But what is the cost of interpolating to the position of each particle? Is it prohibitive?
- In Section 7.1 (and elsewhere), the authors discuss the interpolation of environmental variables to the mesh used to compute the oil tracer weathering or advection. Can the authors comment in general terms about when these meshes may be identical, and when they may be different? For example, in what types of

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applications would the oil particles be transported on a different mesh than the ocean currents? What is the benefit of using different meshes?

- In the paragraph above Equation 62, the authors describe the beaching of particles: "If the particle crosses the coastline, it is moved to the intersecting position." Most ocean models employ boundary conditions with no normal flow, so that the normal velocities approach zero at the boundary. (Tangential velocities are allowed to be non-zero.) If this is true, then it should be impossible for particles to reach (much less cross) the boundary. If they do, then isn't this an indication that the time step is too large, i.e., that the ocean current velocities should be updated more frequently as the particle approaches the coastline?

3 Technical Corrections

- While the writing is generally good, the manuscript would benefit in several places with the inclusion of commas to separate each initial clauses from the rest of its sentence. This is true whenever a sentence begins with a preposition. A few early examples are:
  - Page 1952, line 18: "In this paper, we discuss ...."
  - Page 1953, lines 5-6: "While the oil moves, its concentration changes ...."
- There were also a few typographical errors and misspellings:
  - Page 1961, lines 8-9: ".... case of an *instantaneous* release, the surface oil release ...."
  - Page 1965, line 8: "... are the *volumes* of oil ...."
  - Page 1974, line 3: "After *this* movement, the surface particle ...."

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Interactive comment on Geosci. Model Dev. Discuss., 6, 1949, 2013.

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