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# *Interactive comment on* "CranSLIK v1.0: stochastic prediction of oil spill transport and fate using approximation methods" *by* B. J. Snow et al.

## Anonymous Referee #1

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1. Overall quality of the discussion paper ("general comments")

The paper here describes a simplified, computationally fast oil spill fate model. A brief background is given about the problem in general, along with some description of existing theory and models. The method used is not described clearly, but a simplification of the full oil spill fate model is generated using polynomials derived from regression relationships between the input and a subset of output from a full deterministic set of runs. What is the advantage of doing this? For example: Medslik II is designed to run on small desktop PCs, but probably could be run even hundreds of times per day, depending on the problem and model set up and CPUs available. Thousands of calculations can be done using CranSLIK (Monte Carlo) but how is this expected to be used in practice? It should be also clearly explained how the performance of the model in

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this mode could be tested, since it seems it was not possible with the test case here. A richer set of test cases should be used to convince the reader of the validity and usefulness of the method. For example, in real transport phenomena, surface patches are often twisted and drawn out into long filaments before being eventually fully mixed. Can this model handle such an event? The ideas presented here have scientific interest and potential application to real problems, but are not adequately or convincingly explained.

A reorganisation of the paper is needed since the Methods are scattered over sections 2, 3, and 4. Section 2 should be drastically reduced and moved to background. It is not adequate as a review, but too long for a summary, especially since it is not the purpose of the paper to try to explain the physics of oil spill fate models.

2. Individual scientific questions/issues ("specific comments")

In the abstract, the reader will probably have no idea what is meant by "sampled" and "captured" by "the Algeria scenario"

In section 1, terms are used but not defined adequately: "apply sampling" "Hypercube" Otherwise it is an appropriate way to introduce a reader to the topic.

In section 2, a number of physical and chemical processes are discussed, but it seems these are part of MEDSLIK II, not CranSLIK. This discussion does not seem relevant beyond a single paragraph describing MEDSLIK II capabilities and approach. This should be placed strategically in the new Methods section (see general comments) 2.2 Spreading is described but stated to be very poor approximation, but it is used anyway? There are no references after 1971?

In section 3, there are many confusing aspects. The new Methods section should contain a completely re-written version carefully and logically explaining the technique. For example, -Uncertainty: how does it affect the forecast values of wind speed, -How is the hourly value related to the distributions discussed (is a value taken from the

forecast model, then a distribution assumed, or are many forecast runs completed as an ensemble?), and -What is meant by "apply sampling"? line 13 p 7055 -Where do values of wind come from? Which meteorological model? Reference?

In section 4, again there are basic elements that should be put in the context of methodology. For example, Medslik, a deterministic model, is described as the first section under the Probabilistic Assessment. -Is a "solver" a deterministic oil spill fate model? -"Sampling" needs to be explained explicitly. -Current velocities are generally lower in the Med? This is not common knowledge, if it is even true, so a reference is needed. -Part of the methodology should include the equations used for regression...what are the relationships between all these component variables: forcing, response, stochastic, deterministic, otherwise it is too vague to follow.

In section 5, the case study is where we can finally hope to see everything working together and the resulting big picture. It is helpful in this regard, but needs more full description of the experiment: forcing, configuration, results, how was the result evaluated and agreement with Medslik and field data quantified.

Section 5.2 is not helpful. Remove or explain more fully.

Section 5.3 should describe how we can expect to know the distribution of currents, winds, directions in a place and how to fully test this mode against independent data. Figure 7 is not well presented.

Section 5.4 needs to be enriched with some further, detailed discussion of the benefits and limitations of this model: can it produce the results needed, and under what circumstances?

3. Compact listing of purely technical corrections.

p7049 line 27 "This" what? (paper, tool, prediction?)

line 30 "probable regions for the oil spill"?

p7051 line 2 "varying models"

p7052 line 9 "spreading of oil due to film thickness and area????"

p7053 line 13 "can wave water levels?"

p7056 line 17 "While the ...acts." fragment

p7057 line 16-17 "however ...however." ??

p7060 and elsewhere what does "oil captured" mean?

p7064 line 5, what "insufficient data" is referred to?

Likely to be a few more, but in light of the heavy modifications required, it is not useful to list more at this point.

Specific points to consider, with comments: Does the paper address relevant scientific modelling questions within the scope of GMD? Does the paper present a model, advances in modelling science or a modelling protocol that is suitable for addressing relevant scientific questions within the scope of EGU?-yes

Does the paper present novel concepts, ideas, tools, or data?–It is not clear if the simplification of the oil spill fate model is novel except for this particular model, since the methods are not described well. No mention of other similar attempts.

Does the paper represent a sufficiently substantial advance in modelling science?–See above.

Are the methods and assumptions valid and clearly outlined? No, the stochastic part of the method is not described well. Other assumptions generally described well.

Are the results sufficient to support the interpretations and conclusions?–no, conclusions are weak and not fully justified. Need more convincing discussion and figures.

Is the description sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? In the case of model description papers, it should

in theory be possible for an independent scientist to construct a model that, while not necessarily numerically identical, will produce scientifically equivalent results. Model development papers should be similarly reproducible. For MIP and benchmarking papers it should be possible for the protocol to be precisely reproduced for an independent model. Descriptions of numerical advances should be precisely reproducible.–no, methodology too vague

Do the authors give proper credit to related work and clearly indicate their own new/original contribution?-Seems so, but could be improved.

Does the title clearly reflect the contents of the paper? The model name and number should be included in papers that deal with only one model.–Yes

Does the abstract provide a concise and complete summary?–Very good, but uses some terms and phrases unknown to reader

Is the overall presentation well structured and clear?–no, need reorganisation, especially coherent methodology

Is the language fluent and precise? –Not at all

Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? –There are no formulae to speak of

Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?–yes: Figure 2 is very poor quality and not explained. Other figures poorly presented (graphically and in text). Figure 7: what is shown? No labels, no description Animation: inconsistent axes, no labels Methodology should be consolidated into a single coherent description Introduction should include summary text about physics of oil spills and that section 2 removed

Are the number and quality of references appropriate? only 2 about underlying physics: one old summary and one example (degradation) No mention of related work, is the first such attempt?

Is the amount and quality of supplementary material appropriate? For model description papers, authors are strongly encouraged to submit supplementary material containing the model code and a user manual. For development, technical and benchmarking papers, the submission of code to perform calculations described in the text is strongly encouraged.–yes, link to code, test case provided, BUT no user manual provided

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Interactive comment on Geosci. Model Dev. Discuss., 6, 7047, 2013.

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