Natural Hazards
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Discussions

Interactive comment on "Drift simulation of MH370 debris using supersensemble techniques" *by* E. Jansen et al.

Anonymous Referee #2

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General Comments

This paper presents the results of a super-ensemble particle tracking simulation of the debris originating from the probable crash site of the MH370. The paper is clear and easy to read. It is acceptable after a minor revision. I suggest enriching it as follows:

1) In the abstract, you should add a better statement of the scientific problem you are addressing and why your approach is general (or can be generalized) and applicable to any area and to different cases/objects at sea.

2) In the Introduction, it is missing a paragraph to situate this work in the context of (i) trajectory modelling studies, with particular attention to previous works about tracking objects/debris at sea, (ii) ensemble and super-ensemble techniques (both a general overview and a specific focus to trajectory modelling applications). As you may find

in the state-of-the-art literature, the ocean model horizontal resolution, the temporal frequency of currents and the inclusion of the wave effect in the transport of objects at sea might be important. I suggest adding some comments on these issues in the methodology and results sections and comparing your approach with previous studies.

3) A paragraph about the ocean general circulation in the area and how it is connected with the probability density patterns is missing. I suggest adding this in the results section to enrich your findings.

4) Please consider including in your revised version the specific comments listed below.

Specific comments

Page 1 Line 7: "to improve" might not be the proper verb to use; you cannot run the super-ensemble without at least one observation, right? So, you are not improving your simulation, it is absolutely necessary to have at least the position of the discovery of the debris on Réunion.

Page 1 Line 9: "initial probability density": I would add of "marine debris distribution". Please specify "initial" at which date/time corresponds.

Page 1 Line 9: "current" are the underwater research still on-going?

Page 1 Line 9-10: "later times" add specific time frame (date).

Page 2 Eq (1): Have you used any existing trajectory model or did you build your own?

Page 2 Line 20: I suggest adding more on "the wind drag coefficient": 1) what are the physical processes this term is accounting for (you should cite here the literature on leeway factors)? 2) please explain here or at page 2 Line 27 why these coefficient are not accurately known.

Page 2 Eq (2): Is Δt in Eq (2) different from dt in Eq (1)?

Page 2 Line 24: Could you add more about the choice of the diffusivity? It may be

depending on the ocean model resolution you are using (reference to De Dominicis et al. 2012 for the original work about diffusivity).

Page 3 Eq (4). Does i go from 1 to Nk?

Page 3 Line 6: "certain distance" is vague; please specify values and/or reasons to choose a certain value.

Page 3 Line 12: Could you explain the choice of 100 km and 3 months?

Page 3 Eq. (6): Is this a standard choice?

Page 3 Line 15: Is t=90 days somehow related with the 3 months of Line 12? What happens to your model results if you choose different values?

Page 3 Line 19-21: Wind drag coefficients are not initial conditions. I suggest enlarging and moving this sentence to Section 2.1. Does the wind drag depend only on the size of the object or also on the in/out water parts of the objects? Is the limit of 2.5% adequate? Please add more on the uncertainty of the size and properties of the objects in this specific case.

Page 3 Line 21: Were the 5000 particles released in a single point or on an area?

Page 3 Line 25: Are you using forecast or analysis? Please specify. Have the surface currents you are using been validated (in other studies, please cite)?

Page 4 Line 2: Why were you using daily currents at the very beginning of the simulation?

Page 4 Line 10: "drifters" were not mentioned before, better to change to particles.

Page 4 Line 12-13: Is there a way to calculate the super-ensemble without the weights? Otherwise it's not clear the sense of this sentence.

Page 4 Line 17: In the figures you are not showing September 2014 but August 2014, please cite your figures and make consistent the text with the figures.

Page 4 Line 18: In the figures you are not showing October 2014 but November 2014, please cite your figures and make consistent the text with the figures. In general, I like the figures, but I do not understand the criteria to show one month instead of another, they are not at regular intervals, nor linked with the comments in the text.

Page 4 Line 19: Add the reference to Figure 3. Can you comment on the probability patterns that are shown in Figure 3? Top left panel shows very low probability around Réunion Island and the probability density has a particular shape, narrowing around the Réunion Island. Could you comment on this? Bottom panels show hot spots of higher probability around the Réunion Island. I guess this is because the piece of the wing was found in August 2015 (why don't you show the probability density of August 2015?). Do these hot spots really identify higher probability density areas or is it just an artefact due to the fact that you have just one observation? Some comments to link these patterns with the methodology you used would strengthen your manuscript.

Page 5 Line 4-5: "satellite data analysis" not clear. Did you mean the final satellite communication? If so, this information was used to "determine the underwater search area" and it is not independent from it (so you can say that is in agreement with just on of those information).

Page 5 Line 5-6: Does "search area" refer to the wider or the underwater search area?

Page 5 Line 13: Why in a conventional ensemble adding additional information would be very difficult? This is one of the strength of your paper, please add more on this (I would suggest to add this also in the abstract).

Page 5 Line 14-15: This statement is another strength of your paper. I suggest commenting more on this. In my opinion, you could insert the appendix as another section of the paper and I propose changing the title in order to highlight that the main strength of that section is to show the capability of easily including more information, rather than "Mozambique debris". In general, you should focus on the scientific value of the methodology that you are presenting rather than on the "chronicle" of the accident.

Page 6 Line 25: Why in this case did you choose 50 km? Was 100 km in the previous case? The choice of this parameter should not be arbitrary and should be clarified.

Technical corrections

Title: "supersensemble" to "superensemble"

page 2 line 8: "presents" to "present

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Discussion paper