

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

E. Jansen et al.

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Dear reviewer,

Thank you for reviewing our paper and for your kind words. Please find our response to your questions and comments inline below.

This manuscript is a very important contribution to Natural-Hazards-And-Earth-System-Sciences and is entirely suitable for publication. The paper adds new knowledge to the overall body of scientific understanding regarding particle tracking in the environment. The authors, especially the second and third ones, are very well recognized and highly regarded researchers in the subject area of this manuscript. The authors build on their previous work with lagrangian modeling and employ well established meteorological (ecmwf) and oceanographic (European Copernicus Marine Envi-

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ronment Monitoring Service) data sets in their analysis. The use of drift simulations will take on especial importance as air and sea travel continues to rise and world events become more dangerous putting more of our population at risk. The research results presented are highly original. The approach taken in the conduct of this research will set a standard for future drift modeling.

I believe the paper is free of errors in logic; their case is very well presented and made.

Some comments: 1. I think that the appendix should be moved into the main body of the manuscript. It is possible that the Mozambique debris may not be related to MH370. But the method of including it in the analysis is important for the readers. In fact there are other announcements of possible debris. It would be so good to include them all.

<http://www.ibtimes.com/flight-mh370-update-chinese-vessel-resume-search-recover-lost-towfish-amid-suspected-2350977> <http://www.livescience.com/54158-debris-found-from-mh370-malaysia-plane.html> <http://www.inquisitr.com/2941135/malaysia-airlines-flight-mh370-new-debris/> <http://www.inquisitr.com/2968872/malaysia-airlines-flight-mh370-inside-plane-debris/> <http://www.inquisitr.com/2957754/malaysia-airlines-flight-mh370-planes-interior-debris/>

We agree that the appendix should be included in the main body of the paper. Especially since the debris found in Mozambique has now been confirmed to be part of the horizontal stabiliser of the missing aircraft.

Furthermore, if the editor agrees, we would like to extend the simulation until May 2016 and include an additional 3 debris discoveries that have been confirmed in the meantime:

- Flap fairing, Guinjata Bay, Mozambique (December 2015)
- Piece of engine cowling, Mossel Bay, South Africa (December 2015)
- Interior panel, Rodrigues Island, Mauritius (March 2016)

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This would include all of the currently confirmed discoveries and we believe it adds to the impact of this manuscript at the time of publication.

2. It would be interesting if the authors could discuss a backtracking approach. Release particles from Reunion Island and see where they came from. Play the currents back in time.

We have examined the possibility of using a backtracking approach, but we found that the results are not accurate enough to provide meaningful information. The reason is that in a forward simulation a particle moves from x_0 to x_1 using the forcing fields at x_0 , while in a backward simulation the same particle returns from x_1 to x_0 using the opposite of the fields at x_1 . The assumption that x_0 and x_1 are close enough such that the field values are the same is only approximately true, introducing a small error in the backtracking step. As the output of one integration step is the input for the next, these errors accumulate and become noticeable for simulations longer than a couple of weeks.

3. Why is the approach called a “superensemble” as opposed to an ensemble? What makes it super?

Superensemble refers to the fact that the superensemble is an ensemble of ensembles.

4. It seems to me that there has been much published about the debris field. Has all the literature been reviewed for this manuscript?

Various groups have performed simulations of the debris field, but unfortunately none of these studies have been published. Without a full description of the method and data that were used it is difficult to make an in-depth comparison. Based on the available information the forward simulations agree with our current result. The application of the superensemble technique has not been done in any of the unpublished studies.

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<http://www.marine.csiro.au/griffin/MH370/>
http://iprc.soest.hawaii.edu/news/MH370_debris/IPRC_MH370_News.php
<http://www.geomar.de/n3972-e>
<http://www.geomar.de/n4432-e>

5. I like the figures. I think Figure 1 should contain labels for Mozambique and Madagascar. Others?

Thank you. Figure 1 will be updated to include all the locations where debris has been discovered.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-88, 2016.

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