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Ocean Science Discussions

Interactive comment on "A computational method for determining XBT depths" *by* J. Stark et al.

J. Stark et al.

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We are grateful for the comments by Dr. S. Kizu and we believe that addressing these suggestions will add to the quality of the paper.

1. Dr. Kizu is correct in noting that this analysis did ignore the impact of rotation, as was stated. It is expected that rotation will affect the drag coefficient however it is not clear how large that impact will be. As mentioned in the paper, incorporating rotation is an important next step. The drag force is from both frictional action between the fluid and the probe as well as pressure effects. It is likely that frictional drag would increase on a rotating object however it is not clear whether pressure drag would increase or decrease. On objects which create fluid separation, pressure drag typically is the larger of the drag forces. We have added a few sentences to clarify this issue. In the future, it will be interesting to see how the drag coefficient changes with rotation and how those

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changes affect the depth predictions. It is interesting that the reviewer also made a comment about the impact of drag coefficients on rotation. We have addressed those comments as well.

2. An expanded section on the drag coefficient was added along with another equation which shows how the drag coefficient was calculated.

3. The model does have fins. The reason the fins aren't shown in Figure 1 is because a slice was taken through the probe bode to focus the elements on the body itself. To clarify this, we have added text assuring readers that the model did in fact include the fins, even though they are not shown in Figure 1. This comment is also related to a comment pointed out by the reviewer which we have addressed in the revised version.

4. The fluid flow equation in question now has the unsteady term added.

5. We fully agree that the impact of probe weight (and other variables such as launch height, wire linear density, etc.) on fall rates is of great interest. One of the advantages of this new method is that it can be used to perform sensitivity studies to evaluate the impact of variations in these quantities. We hope to soon perform a detailed study which looks at the impact of all of these parameters on depth, however that was not the purpose of the present publication.

6. Dr. S. Kizu correctly noted this issue which was also brought up in a prior comment. This has been fixed.

7. This subscript has been corrected.

8. The suggestion on rewriting the Reynolds numbers has been used in the revised version of the paper.

9. The addition of "LMS" has been made.

10. The density used to determine the drag coefficients was 1025. The density that was used in the fall calculations was 1028. This density was based off of the local conditions

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of the XBT drop. It is not necessary to have these two densities be the same. The dependence of the drag coefficient on Reynolds number (from the CFD calculations) is independent of the fluid density. In fact, this is why dimensionless numbers are used in drag calculations. Nevertheless, we thank Dr. Kizu for the comment.

11. The reference DiNezio and Goni, 2010 has been added.

12. The reference to “Boyd” has been changed to “Boyd and Linzell”

13. Both Kizu references are now added, as suggested and the references in the text are modified as suggested.

14. The change to the Hanawa citation has been made, as suggested.

15. Kizu 2010 has been replaced by Kizu 2011.

Interactive comment on Ocean Sci. Discuss., 8, 1777, 2011.