

Reply to comments by Anonymous Referee #1:

We sincerely appreciate your kind careful reading and various comments on our article. We also thank you for disclosing much information about the manufacturing process of the instrument. We hope our replies in the following are satisfactory.

Replies to specific comments:

>The dependency on temperature that is discussed in 2.4 on page 8 is sound, but could be
>normalized as a function of temperature difference, or as a function more directly of viscosity.
>As a common formula is used for the whole depth range and the temperature profiles do not
>vary linearly with depth (in particular for H; L on the other hand has almost constant T), it is
>not so clear what is the relevant temperature which should normalize the observed difference
>near the surface (maybe the average T in the top third of the profiles). It could be also more
>relevant to provide a standard fall rate formula for an average T (viscosity) profile and then a
>deviation from fall rate as a function of temperature difference that could be then applied as a
>function of z.

Yes, it is a very interesting point. We actually tried to quantify the temperature dependency of the fall-rates but finally gave it up for several reasons. The temperature-dependency is found to be too small for the T-7 (much smaller than that of T-5 we tried in Kizu et al., 2005) to be estimated at the presence of natural variability and the possible dependency on the probe weight. The estimated cast-to-cast difference is believed to be caused at least partially by variation in water temperature, but it also could be a result of probe-to-probe weight difference and cast-to-cast difference in launching condition (i.e. waves, ship motion, etc.). We believe that we could keep good control on comparing the two manufacturers' probes, but we could not obtain a sufficient data set for separating the temperature-dependency from such other factors. We will return to this problem when we obtain larger sample by additional sea tests in the future.

>In the example of profile plotted on figure 5, there is also a suggestion of a positive T bias for
>the SIP T7 probe. Although this is not commented in the paper, and the magnitude is within
>the reported probe accuracy, it would be interesting to indicate in the paper if this error is
>random or has a significant average (for this small sample), whether this error varies with
>depth, and whether it corresponds in what is reported in recent papers (Reseghetti et al., 2007;
>Gouretski and Reseghetti, 2010; Reverdin et al., 2009) for example. It is also interesting to
>know whether the error is dependent on manufacturer (probe type). It has also be mentioned

>that launcher or system could be involved.

We basically confine ourselves to the fall-rate issue in this article, as its title shows, though we well understand that the possible pure bias in temperature could cause serious errors in thermal profiling of the sea. We will return to the issue of possible pure temperature bias by combining data from our past sea tests to enlarge sample size, but we just described in this revision that the sample profiles presented in the figure show positive T bias for the LMS T-7 and negative T bias for the TSK T-7. We cannot tell anything about the possible dependencies on launching/acquisition system because we tested only one unit.

The magnitude of estimated temperature bias for the specific pair is presented in the revised manuscript at the request of the other referee. However, the estimated T biases are not common to other pairs, and sometimes even change signs. So we do not discuss temperature bias any further. We think our small sample does not allow identification of such a small bias in temperature under varying condition.

>Here, is it present with the TSK launcher and systems used?

Yes. That is clearly noted in the revised manuscript.

>Altogether, this is a very interesting, but somewhat worrying paper, which opens important
>questions that need to be checked for the past (probably, easier for Sippican probes). When
>were these structural changes made...

Yes, it may be worrying too much. Reviewing the past records is not intended in this paper for obvious reason: we just tested recent probes. We do not think it is easy because our community has only very limited number of controlled sea tests in some periods in our history. We have almost no chance to test the classical probes now, but we hope that detail investigation of recent probes will give us some insights about the possible change of fall-rates in the past.