Ocean Sci. Discuss., 8, C602–C604, 2011
www.ocean-sci-discuss.net/8/C602/2011/

Ocean Science
Discussions

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

S. Kizu

kizu@pol.gp.tohoku.ac.jp

Received and published: 5 September 2011

It is obviously very new and challenging to predict fall-rates of XBTs based on modern computational fluid dynamics. I have five major points that I want authors to examine and some minor comments.

First, the authors neglected rotation of the probe but still their solution is very close (they say almost "discernible") to both the manufacturer's fall-rate equation and the drop in the Mediterranean. It should automatically mean rotation does not give sizable impact on fall-rate. Is this really true? I just cannot believe this. The manufacturers of XBTs claim that giving rotation helps probes stabilize during fall, and I expect larger impact by the fins and rotation (without good experimental evidence, though). The authors should not avoid the discussion about this issue.

Second, more detail description is needed about how the drag coefficient has been

calculated and found to be singular function of Reynolds number.

Third, the probes have three tail fins attached to the after-body, but I found no such structure in Figure 1. Figures 2 and 3 seem to have them. Why do they look inconsistently? Did the authors omit those parts? In addition, even in Figures 2 and 3, the angled part (to give probes rotation) of the tail fins is missed. Do not omit description about the real probes and the modeled probe.

Fourth, the authors seem to solve the problem by forward calculation of the discretized time-dependent momentum equation, but Eq (9) misses the time derivative. Why? It seems to me that they somehow discarded the acceleration term.

Fifth, can the authors give any estimate on if/how possible variation in initial probe weight can change the fall-rate during fall? It is known that the manufacturers' tolerance in probe weight is +/- 5grams for LMS's XBTs and +/- 1gram for TSK's XBTs and that there's actually well-detectable weight variation from time to time. These weight variances are thought to be a potential cause of the historical variation in the fall rates. Therefore, such sensitivity estimates could be very helpful.

Minor comments:

1) The range of horizontal axis of Figure 6 is inappropriate as mentioned earlier by the reviewer. The upper limit should be around 300 seconds to meet with the depth range of T5.

2) The "Xj" in the denominator of the left-hand side of Eq.(9) should be "Xi".

3) The authors should give parameters in the tables with good consideration about significant digits. Perhaps the Reynolds Number in Tables 1 and 2 should be given as 2.141x106 instead of 2141000, and tested velocities should similarly be given in consistent manner, for example.

4) "T-5 XBT" in page 1788 (L26) should be replaced by "LMS T-5 XBT". The fall-rates of two manufacturers' T-5 differ sizably as shown by Kizu et al.(2005b) which I give detail

information in the following.

5) The density of surface water used in the model is described to be 1025 kg/m3 in the text 1028 kg/m3 in Table 3. Which is correct?

6) The reference list and quotation in the text are often inconsistent. I have not fully checked, but, at least I could say [1]The list misses Goni and Di Nezlo (2010), [2]Boyd (1993) in Figure 5 should be Boyd and Linzell (1993), [3]Kizu (2005) in page 1779 should be Kizu et al.(2005a), [4]Hanawa (1995) in page 1780 should be Hanawa et al.(1995), and [5]Kizu et al.(2005) in page 1780 should be Kizu et al.(2005b). We published two papers in 2005: the first one presented new FRE for TSK T5, and second one discussed significant difference in fall-rates and structure between the two manufacturers' T5 and their temperature-dependencies. The paper in the reference list is the first one, and our second paper is Kizu, S., S. Itoh and T. Watanabe (2005): Inter-manufacturer difference and temperature dependency of the fall-rate of T-5 expendable bathythermograph. J. Oceanogr., 61(5), 905-912.

7) Kizu (2010) can be replaced by Kizu et al.(2011): Kizu, S., C. Sukigara, and K. Hanawa (2011): Comparison of the fall rate and structure of recent T-7 XBT manufactured by Sippican and TSK. Ocean Sci., 7, 231-244, doi:10.5194/os-7-231-2011.

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