Atmos. Meas. Tech. Discuss., 3, C1151–C1153, 2010
www.atmos-meas-tech-discuss.net/3/C1151/2010/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Fast-response high-resolution temperature sonde aimed at contamination-free profile observations" *by* K. Shimizu and F. Hasebe

F. Dalaudier

francis.dalaudier@aerov.jussieu.fr

Received and published: 12 August 2010

This manuscript makes a good description of the problems encountered with balloon-borne high resolution temperature sensors. It also discusses some of the possible work-around. I have a personal experience of this kind of problems and I wish to make comments and suggestions to the authors as well as ask some questions.

My first comment is that the amplitude of the pendulum motion appear huge. Horizontal displacement $\approx$ 40 m (amplitude $\pm$20 m) pendulum length $\approx$ 35 m (assuming rotation around balloon center) imply angular amplitude $\pm$35 degree. Can you give the

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

amplitude (linear and angular) observed for the sounding on 19 June 2010 (Figure 10) with a suspension of 120 m ?

My second comment is that the amplitude of the (spurious) peaks shown on figure 3, 4 and 6 also appear huge. In order to get peaks with amplitude 3-4 K the over-temperature (or under-temperature) of the package box must be even larger, may be 6-8 K. Such value is rather surprising, can you comment ?

Looking at figures 4 and 6, it is possible to say that the physics of the contamination is even more complicated than what is proposed. On figure 4, there is some peaks which does not correspond to "turning point" of the pendulum motion. Conversely, there is one turning point (at 31540 m) without peak. Furthermore, the peaks observed on Figure 6 (both green and red ones) does not correspond to turning point but rather seem to occur right in the middle (at least between A and C where the motion is shown).

Additional suggestions from our personal experience can be seen on the Figure 17 of paper Luce, H., Crochet, M., and Dalaudier, F. (2001). Temperature sheets and aspect sensitive radar echoes. ANNALES GEOPHYSICAE, 19(8):899–920.

http://www.ann-geophys.net/19/899/2001/angeo-19-899-2001.html

In addition to the long suspension and the night-time launch, we also used a "cape" over the balloon in order to reduce drastically its wild motion during the ascent (this is very efficient). With the long suspension, and the consecutive lengthening of the pendulum period, the pendulum-related velocity is much smaller than the relative horizontal wind due to the vertical shear of horizontal wind (induced by gravity waves). It is then possible to add a vane to the gondola and thus to keep permanently the temperature sensors outside (in front or on the side) of the wake of the gondola. Furthermore, the relative wind shear blows back the wake of the balloon. Consequently, the contamination by this wake is very rare.

My last comment is about your suggestion to use data during descent. From real

AMTD

3, C1151–C1153, 2010

balloon experience, I can tell that this idea does not work for the following reasons :

The descent under parachute is much more shaky than the ascent

This shaky motion makes GPS localization difficult

The balloon is far from the reception station and the signal is easily lost

The balloon is at low angle above the horizon and the lower part of the profile is lost

---

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 3293, 2010.