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Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurement of motion corrected wind velocity using an aerostat lofted sonic anemometer" *by* W. R. Stevens et al.

Anonymous Referee #2

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The manuscript describes a method to measure wind speed and direction in altitudes up to 500 m using a tethered balloon as platform for a sonic anemometer. As the platform is not stable in the atmosphere the motion of the sensor (and platform) has to be taken into account for correction of the wind measurements. This is done using a small inertial navigation system (INS) capable to measure the 3D attitude in space with high accuracy.

The technique has some advantages compared to other flying platforms, concerning the duration of the measurements, however, it also has some severe disadvantages.

For a manuscript to be published in a journal of measurement technology, the text is very sparse with information about the individual components, their precision and accuracy. For example in the description of the INS the placement of the GPS antenna

and its impact on the performance of the instrument is not specified and the accuracy of the measurements of the attitude and the proper motion is missing.

Completely missing is a paragraph about possible errors due to the close vicinity of the aerostat to the instrument. For aircraft measurements an impact of the mobile platform on the flow field around the aircraft of a minimum of 5 diameters can be assumed, requiring upwash and sidewash corrections for measurements made at the nose of the aircraft. Here the instrument is installed very close (about 5 ft) to the 14 ft diameter Aerostat. Additionally the real sail, stabilizing the aerostat direction, reaches as far down as the sensor location.

The manuscript does not contain information about the required time resolution and accuracy of the intended measurements. This can be substantial for the accuracy. It only states that a 20 degree uncertainty is too bad, but does not explain, what is considered as good. An average offset between tether angle which could serve as a long term reference and the fast wind measurement of 11 degree is still considered as good, although deviations up to the unacceptable 20 degrees occur occasionally. Not clear is also, why there is always a positive deviation of the tether angle compared to the wind measurements. Such an offset could be produced from the real sail (see above) and would then be most probably dependent on wind speed.

How can this be compared to the UAV system of Van Den Kronenberg et al (2008), cited as a poor example, which was shown to have an average standard deviation of $\sim$ 9.5 degree (one example with 21 degrees) and is always within a few degrees within the measurements of a SODAR and a nearby meteorological tower (not only flying directly into the wind). This system is measuring the wind with up to 40 Hz for turbulence studies.

For publication in AMT the manuscript has to be by far more detailed in the description of the instruments, their properties and possible uncertainties. It also needs a section about possible interferences introduced by the tether itself, a more thorough error anal-

ysis and a description of the range of possible meteorological conditions under which the setup can be used and the accuracy expected within this range.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 703, 2013.