

## ***Interactive comment on “Turbulence measurements with a tethered balloon” by G. Canut et al.***

**Anonymous Referee #2**

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I found the subject of this paper extremely interesting and timely. Very recently I was discussing observed turbulence profiles in the atmospheric boundary layer with a colleague. As neither of us were aware of how these measurements were originally performed, we speculated on how they might have acquired them with the technology available at the time and discussed how one might be able to make improved measurements with the technology that is currently available. One of the concepts that we discussed was very similar to the system discussed in this manuscript. I am happy to see that such a concept has been developed. The possibilities of this measurement system are very exciting. This system makes it possible to deploy sonic anemometers in relatively fixed locations quickly and inexpensively. I had the same principal concerns as the first referee, even before I had read that review. While I agree with the main points, I believe that the system discussed is a significant improvement in

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the ability to directly measure atmospheric turbulence and is well worth publishing. Therefore I recommend that the manuscript should be considered for publication if the authors are willing to perform major revisions. Regarding the technical content of the manuscript: The claims of the originality of mounting a turbulence probe on a tethered balloon in the abstract are obviously too general. The capabilities of the new system needs to be discussed in relation to previous balloon-based turbulence measurement platform discussed in Lapworth and Mason (1988). Their system used three propeller anemometers, therefor the 3D sonic anemometer should easily outperform the Lapworth and Mason's system in more than the total weight, such as frequency response and minimum detectable velocity, etc. The validation of the balloon-mounted system needs a more direct comparison with a tower-mounted sonic anemometer. It should not be necessary to have the turbulence probe mounted to tethered balloon in order to validate the system. It can easily be accomplished by mounting your system to a tower or tripod while still allowing it to pivot and move in the wind. It should be located within a few meters of a fixed 3D sonic anemometer at the same height above the surface. It wouldn't be necessary to mount the two instruments very high above the surface, perhaps just 2 or 3 meters. The two instruments need only measure essentially the same flow, making it obvious whether or not the motion correction is working correctly. While such a comparison would not be exercising the ability of the inertial GPS motion sensor for large scale motions, it is likely that it is more difficult correct for the small-scale motions than it is the large motions due to the movement of the balloon. Editorial concerns: This manuscript needs a thorough copy edit by a native English speaker. There are numerous grammatical and spelling errors throughout the manuscript as well as several instances where words were used incorrectly. For example, the word 'weighted' was used instead of 'weighed' on page 2, left column, line 16 and elsewhere in the manuscript. Page 4, right column, Line 8: You refer to potential temperature as  $t$  when  $\theta$  is used elsewhere.

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