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Comment on amt-2021-76

Anonymous Referee #2

Referee comment on "Development of an in situ Acoustic Anemometer to Measure Wind in the Stratosphere for SENSOR" by Song Liang et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-76-RC2>, 2021

The scope of this manuscript is to present the development and the performance of a sonic anemometer able to produce wind measurements in the stratosphere. While I think sensors technology is now mature to design experiments based on ultrasonic probes purposely developed for high altitude atmospheric observations, I have major concerns on the quality and the originality of the research proposed here.

Although the authors cite two recent articles presenting experiments that fully achieved the goal of performing science quality measurements in the stratosphere with acoustic anemometers, they do not reference them properly and instead they make such statements as "This is the first time that in-situ wind measurements were obtained during level flight at this altitude" (meaning above 20km), as reported in the abstract at lines 22-23.

This is misleading, as I will explain in the following, and the authors insist throughout the text on the fact that their measurements are (the first) being performed above 20km and during a balloon level flight, in order to differentiate their work from previous experiments based on this technology already performed in the stratosphere.

As a matter of fact, Banfield et al. 2016 and Maruca et al. 2017 (both cited in the manuscript) performed experiments in which sonic anemometers have been developed (and/or modified) and tested with positive outcomes on high altitude stratospheric balloons. In the case of Banfield et al. 2016 the probe operated up to ~ 33 km while the sonic anemometer of the TILDAE experiment by Maruca et al. 2017 operated up to around 19 km. These experiments (dated back in 2015 and 2016, respectively) have been successful attempts of employing sonic anemometers for stratospheric measurements and they both returned science quality data, as testified by the statistical analyses presented in the aforementioned manuscripts, including the computation of kinetic energy spectra (see Maruca et al. 2017).

Indeed, what is relevant for these type of the experiments is not the peak altitude at which a sonic anemometer returned some sort of signal, but the fact that ultrasonic probes have been able to produce reliable measurements in the stratosphere - meaning above the tropopause - and that these measurements could be used to perform rigorous scientific investigations. These goals have not been achieved by the experiment presented here, since the signals reported in the plots included in the manuscript clearly show that the probe needs further development and testing, and no analysis of the data collected

has been performed.

On the sidebar, I would like to point out that the tropopause does not have the same altitude everywhere over the globe and it is lower at the poles, where the ultrasonic probe by Maruca et al. 2017 was operated. Thus the maximum operational altitude of 19 km reported in Maruca et al. 2017 is probably deeper in the stratosphere than the altitude of 20 km over the Da chaidan district (as reported in the present manuscript).

Even the evidence that the probe presented here has been tested during a level flight is rather weak, since Fig.7 shows a time series of only 300 seconds during which the altitude of the balloon was more or less constant. This time interval is really too short. However, following the narrative of the manuscript, this point should differentiate significantly the present work from Banfield et al. 2016 and Maruca et al. 2017, where ultrasonic anemometers operated only during the ascent phase of the the respective balloon flights.

For these reasons I cannot suggest the publication of this manuscript on AMT. Though, I strongly encourage the authors to pursue with the development of their acoustic anemometer and to re-propose this work corroborated by the analysis of the data collected, once its design will allow to perform science valuable measurements in the stratosphere.