Review of:

"Fast-response high-resolution temperature sonde aimed at contamination-free profile observations"

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The paper describes a new fast-response temperature sonde that is applicable to radiosonde measurements. According to the manuscript, a goal of the new technique is to improve measurements in the upper troposphere - lower stratosphere (UTLS), a region that is thought to play a catalytic role in climate change. It is apparent that the authors have put large amounts of energy into the development and testing of the new temperature sonde sensor. It also appears, that a highly accurate, fast-response temperature sonde could provide very useful measurements in the UTLS. In general, the paper is well written and the work deserves to be published. However, in its present form the manuscript makes several claims that are not (yet) well substantiated. These claims need to be removed, and further research is suggested before the temperature sonde described in the manuscript can be considered applicable for general deployment.

This reviewer has had the opportunity to read reviews of two other referees and one short comment. I find that I agree with the nearly all of these comments. There are several anomalies in the measurements that are not explained in the manuscript, especially the large spikes that do not correspond with the pendulum swing in Fig. 4. The authors need to provide adequate explanations to the comments and questions raised by the other referees and the by the short comment. I strongly suggest that the authors eliminate claims that the new sonde should be used universally. The manuscript needs to present this work as an approach that shows potential to improve temperature measurements in the UTLS, and that additional testing and evaluation is needed to confirm the preliminary findings presented in the paper.

I am not convinced of the 0.4 K accuracy claim. There is simply insufficient evidence to support this figure. First, there is no description of the signal conditioner, and there is no documentation showing tests of its performance specifications. Electronic conditioning of the signal from a tungsten wire over an environmental temperature range of +50 to –90 C is not trivial. For example, research aircraft, military aircraft and commercial airliners have relied on the Rosemount 0510BH (or GH) signal conditioners for the past 50 years, and these units currently cost about $20,000 USD. They have proven performance over extreme environmental conditions. The manuscript should describe the signal conditioner used and how it was tested. Was its performance tested in an environmental chamber down to –90 C? For a future test one could deploy the new fast-response instrument along with a Minco wire-wound (25 micron diameter) platinum element and a Rosemount signal conditioner in the dual-sensor configuration shown in Fig. 7. The combination of the Minco platinum element and Rosemount signal conditioner has been used in reverse-flow housings on research aircraft for several years

and its performance is well documented. However, I realize that this suggestion is not within the scope of the current paper.

I do suggest that the manuscript show a complete propagation of measurement uncertainties, starting with a bath calibration of the sensor, an environmental calibration of the signal conditioner, evaluation of the data recording system, and then propagation of these errors into evaluation of the dynamic performance discussed in the text. The bias and random error components need to be computed separately, propagated through the entire measurement chain of events, and combined in quadrature (see Abernethy, R.B. and R.P. Benedict, 1984: Measurement uncertainty: a standard methodology. *ISA Transactons*, **24**, 75-79). The bias error is the major concern in this case, because the temperature measurement has not been compared during the balloon ascent with a well-documented "standard" (not the radiosonde standard, which is known to have significant errors). Thus, currently there is no way to actually quantify the bias error in temperature measurement of the new temperature sonde, and this is the critical component of temperature measurement that needs to be quantified if the new sonde is to be used in the UTLS.