Authors' response to the comments reviewer 3 in the interactive discussion on the manuscript: "Influence of probe geometry on measurement results of non-ideal thermal conductivity sensors" by P. Tiefenbacher et al.

The paper mentions the need for more thermal property measurements as a consequence of a small amount of previous in situ measurements made by spacecraft. It does not automatically follow that there is a need for thermal property measurements because there have not been many in the past. The reason why there have not been so many measurements in the past needs to be examined more fully. Is it difficult to obtain precise measurements with previous techniques? What are the advantages and disadvantages of the techniques used previously?

This paper focusses on cylindrical sensors. It is not the aim to describe all kind of sensors which are used in space applications. Furthermore, this paper is dedicated to the calibration of such cylindrical-type sensors. The advantages and disadvantages of this class of sensors, in comparison with other sensor-types, were discussed in the literature (partly given in the references).
In space applications thick sensors are preferred which are robust and more accurate when applied to granular samples of high porosity. These are advantages of thick cylindrical sensors, which is emphasised in the paper (last but one paragraph of Sect. 1 has been extended suitably).

Also does your instrument allow multiple sampling at different sites? What kind of forces can it tolerate during deployment? If this is not known will there be some tests in the future to determine what kind of materials it can be deployed in without breaking? Could it be deployed in an icy regolith?

Since the maturity level of our planned instrument is at TRL 3 (analytical and experimental critical function and/or characteristic proof-of-concept) no automatic insertion tests have been made so far, but will be part of further development. This type of sensor is planned to be used in dry regolith but not icy regolith, as it can be assumed that for the deployment in icy regolith the sensor has to be much more robust, according to the findings of (Spohn et al., 2015). A corresponding explanation has been added to Sect. 3.

It is noted the authors miss out some more recent work on the measurement of thermal properties of planetary bodies by landed spacecraft. It would be a good idea to mention these as they would aid the authors when examining the advantages and disadvantages of the different techniques that are available for making thermal property measurements of the surface and shallow subsurface.
1) Martinez et al., 2014, Surface energy budget and thermal inertia at Gale Crater: Calculations from ground-based measurements, 2014, Journal of Geophysical Research: Planets, 119, 10.1002/2014JE004618
2) Spohn et al., 2015, Thermal and mechanical properties of the near-surface layers of comet 67P/Churyumov-Gerasimenko, Science, 349, 10.1126/science.aab0464
3) Paton et al., 2016, Thermal and microstructural properties of fine-grained material at the Viking Lander 1 site, Icarus, 271, 10.1016/j.icarus.2016.02.012

This paper describes the calibration of geometrically non-ideal cylindrical thermal sensors and focusses on the question if the probe geometry (in this case the probe-length) influences thermal conductivity measurement results. Therefore, no comparisons with other techniques have been made, what is the reason why (Martinez et al., 2014) was not mentioned. Although such a comparison is very interesting and a good idea for a following paper it is outside the scope of this paper.
(Paton et al., 2016) has only been published after the submission of this paper, so there was no possibility to mention it.
In Sect. 3 the planned application field of the robust sensors has been described and explained by the findings of (Spohn et al., 2015).

There is also no mention of remote sensing techniques and how the authors' instrument would fit in with measurements made by orbiting spacecraft. It is important that the authors' mention the possible application for lunar exploration which they have done. It would however be more useful, for promoting the instrument's relevance, if information regarding the context of the scientific measurements could be described briefly.

Remote sensing techniques are beyond the scope of the present paper, which only deals with the investigation of the influence of the geometry of cylindrical probes on thermal property measurements.

In summary the introduction could be expanded by adding a paragraph or two's worth of extra text outlining the motivation for the work more fully. To start with I suggest splitting the second paragraph of the introduction and then expanding the two blocks of text.

The general motivation for determining the thermal properties of the surface of solar system bodies is explained in the first paragraph of Sect. 1. The motivation for using cylindrical sensors with the geometric dimensions of the LNP03 and LNP04 is explained at the end of Sect. 1 (see also answer to comment 1 of reviewer 3).

There appears to be no assessment of the results in a wider context. This could be achieved by comparing the precision to other techniques and the expected precision in the lunar regolith. This would be best placed at the end of the results section, if the text is not too expansive, otherwise it might be worth creating a discussion section after the results.

Since this article only deals with properties of cylindrical probes a comparison with various other thermal measurement techniques is not given. In fact, comparison of different measurement techniques is very interesting but outside the scope of this paper. However, such a review paper would be a good idea for a follow-up of the present paper. The precision analysis given in the paper is in principle applicable to any material. However, we can expect less accuracy for materials of very small conductivity (about 0.01 W/m/K or less), because a greater bias is produced due to higher axial heat flow. A corresponding explanation has been inserted in Sect. 4.

The results section (section 4) contains a description of the method and the properties of the samples. It is recommended this material be relocated to the previous section (section 3) so all the material related to the experimental set-up is in the same place.

The overview of the sample properties was shifted to section 3, while the description of the method has been left in Sect. 4, as this seems to be more practical for us.

Also some motivation regarding the choice of the materials, in terms of testing the instrument and its relevance to planetary regoliths if any, needs to accompany the description of the materials.

A corresponding explanation has been added.

Section 5 and 6 need to be placed at the end of section 3 too as that is part of the experimental set-up. It is suggested table 11 and 12 be reduced in size by deleting the long columns of numbers used to calculate the means.

Since the focus of the paper is the investigation of the sensors, we prefer to dedicate an own chapter to the description of the calibration procedure. The long columns of numbers in table 11 and 12 have been deleted and the two tables have been merged to one table.

The meaning and relevance of the sensor labels used in the paper, i.e. TP02, LNP03 and LNP04, take some time to be understood. It is suggested that a sentence or two is added in the introduction to expand the meaning of the acronyms. Additionally it might be a good idea to refer to LNP03 and LNP04 as 'our customised sensor LNP03' instead of just writing 'the LNP03 sensor' a few times in the text to remind the reader the relevance of the labels.

An explanation of the acronyms as well as the suggested phrase has been added to Sect. 3.

Are the TP02, LNP03 and LNP04 sensors really sensors or instruments? This needs to be made clearer.

The TP02, LNP03 and the LNP04 are sensors. This was mentioned in Sect. 1.

Table 1 is not required and can be deleted

Table 1 gives an overview of all parameters and variables used for the theoretical approach. We think that some readers may find this useful.

Authors' changes in the manuscript: "Influence of probe geometry on measurement results of non-ideal thermal conductivity sensors" by P. Tiefenbacher et al.

The title of Sect. 3 was changed to "Experimental setup" and is now including "Measurement probes" and "Sample materials" as subsections. Therefore, Table 3 was shifted from Sect. 4 to Sect. 3.

Table 11 and Table 12 were merged to one table.