

## ***Interactive comment on “A penetrator for making thermal measurements in a gas-filled planetary regolith” by M. D. Paton et al.***

**M. D. Paton et al.**

markipaton@hotmail.co.uk

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Dear reviewer #1,

Thank you for your helpful and insightful comments that have improved the paper. We would like to note here a planned change to the title of the paper to “Investigating thermal properties of gas-filled planetary regoliths using a thermal probe”.

We acknowledge that your analysis regarding the temperature fluctuations in figure 11 is probably a correct one. While fluctuations in temperature inside the penetrator may play a role the fluctuations observed in the temperature difference are close to the measurement uncertainty ( $\sim 0.1$  K for the temperature difference). So any assumptions, regarding heat transfer interpretations, will not be convincing. However these fluctua-

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tions still need explaining because their sudden, and common time of occurrence for both samples, suggests some phenomena related to the increasing temperature.

Thanks very much for pointing out the paper by Hütter and Kömle, “Performance of thermal conductivity probes for planetary applications”. The paper explains the effects on measurements, relating to axial heat flow and contact resistance, rather elegantly. It also makes clear the correct way to apply such probes.

According to Hütter and Kömle contact resistance is important at ambient, low vacuum, conditions. A change in contact resistance changes the characteristics and length of the transient period and causes a constant temperature offset at later measurement times. It may be that the changes in the contact resistance plays a significant role with our results and needs to be taken into consideration.

We would like to update our paper quoting the measurement uncertainty of the instrument from Paton (2005). We will also update the analysis of the results with a discussion of contact resistance and provide alternative explanations (i.e. measurement setup issues) for the fluctuations seen in the temperature differences. We also acknowledge your technical comments and will apply these to the paper.

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