

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

**Anonymous Referee #1**

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The general topic of this manuscript is the thermal modelling of a penetrating device applied to Martian regolith. Although, at the current time we have sadly enough a lack of actual missions to the surface of Mars the scientific question is of broader interest. Thermal modelling of subsurface probes is currently investigated within several groups at least in Europe and thus each contribution helps to advance this field. The chosen approach to the subject is valid and the method of modelling is based on a proven basis. I have however, one minor comment concerning some of the data interpretations:

P127/Sect6/L13ff I am not sure if I agree to that conclusion; the temperature profile looks like the usual equilibrium curve between heat flow and heat production for this kind of probes. Is there a substantial deviation from an exponential heating curve which might substantiate the author's assumption? The temperature measurements in figure

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11 seem to be within the resolution limit of the measurement system. I'm not sure the conclusion drawn is fully valid. What is the error bar on the measurements or can the authors bring more arguments for their interpretation? The fluctuations might be due to convection inside the hollow body and along the outer surface of the body. However, I doubt that fluctuations of about 0.2-0.3 K as shown for the heater would propagate from the inner walls through the penetrator body, the glue and the highly insulating Kapton back to the heater without dissipating along the penetrator shaft in axial direction. I would rather assume the fluctuations are due to effects outside the penetrator, and/or fluctuations in the measurement setup. A 10 bit bridge ADC system and a Heater with a resistor tolerance of 10% (MINCO 5228 Datasheet) is not that accurate to go into great details of interpretation when the total difference between two measurements (different sample preparations and setup) is about 0.6-0.8% in absolute values and <0.09% for the fluctuations (in fig 11b). Compare with figure 14 and 15 of Hütter & Kömle 2012 doi:10.5194/gid- 2-23-2012 a paper which is also in the discussion phase of the GI Journal parallel to this paper!

This point aside, I think the manuscript is ready for publication.

More but mere technical corrections are listed in the attachment below.

Please also note the supplement to this comment:

<http://www.geosci-instrum-method-data-syst-discuss.net/1/C54/2012/gid-1-C54-2012-supplement.pdf>

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Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 1, 109, 2011.

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