

## ***Interactive comment on “Performance of thermal conductivity probes for planetary applications” by E. S. Hütter and N. I. Kömle***

**Dr Eng. Marczewski (Referee)**

wmar@cbk.waw.pl

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**General Comments** The paper pertains the title topic “The performance...” in two aspects. It comprises defining a model and a way of determining thermal properties of media basing on measured values, with a wide range of possible media under test. The other one is to evaluate usefulness of the design of candidate probes, and assess quality of results. Five probes with three different geometries of probes and media samples were considered to compare difference in results. Final comparison of results was presented, thus aims have been achieved and the paper should be understood for qualified to publication without major objections.

However, there are few minor recommendations for considering by authors how to

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improve communicativeness of the paper to a reader.

1) Potential readers who are oriented in modeling may rise wishes like the following:

re - equations (18) and (20) “It is unclear how the authors of the paper obtained equation (20) from equation (18). The integral in (18) is a combination of Bessel functions, which makes the integral difficult to be solved analytically (in my opinion not possible). The algorithm used to do the long time approximation should be briefly described or the reference should be provided if the results wasn’t obtained by the authors. Another thing is the validation of the approximation. To do that, the integral in (18) need to be numerically solved. Did the authors do the validation? If yes, what kind of algorithm they used to integrate the function? Is it something dedicated to the Bessel function? From my experience I know, that the integrals with Bessel functions and not easy one. And did the authors check how function  $G$  (in (18)) is sensitive for the contact resistance? - Agata Przepiórka, Karol Seweryn, SRC PAS”

There is a hope that authors can satisfy this expectation at least by referring the method which they employed for evaluating this integral (18), and saying few comments.

2) re - equations (28) and (32) Author follow Jones, 1988 with the successive regression method and employ recognizing that components in the temperature response which are deserved by axial and radial ways of developing the heat diffusion. Behind that line is an expectation of fitting to a particular part of the temperature response, corresponding to short or long time of lumped measurements. It is not clear whether the expectation is addressed to fitting only a part of the response, or to the entire shape. In our understanding only a selected part of the response is possible for fitting. So if authors agree it could be expressed verbally for sake of clarity in reading. But in that case the equation (28) comprises four variables which are subjects of fitting, described by (29) to (32). Then the fitting is a multi parameter task to be performed, and some particular strategy of fitting is involved to obtain – the response computed in (28) matched to the response measured. It is a pity that there are no such illustrations which depict

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in what part of the measured transient characteristics the match is achieved. Under multi parameter fitting the question of strategy for fitting is quite much important subject of advanced methods, creating and minimizing cost functions etc.. Author surely have enough experimental data to illustrate how chosen particular effects of fitting are related to the measured responses. It would serve much better for explaining where is a practical problem with uniqueness of a measured result with a wide range of media properties, than presenting many cases of transient responses twice, once in real time and then in log time. We suggest presenting responses only in log time in Fig. 9-11, 13-15, 18-19. Instead of many nearly similar curves in real time, it would suffice to emphasize differences in shapes for different media, and explaining why in cases of low diffusivity the lumped transient response still shows an early phase of developing diffusion, and in other cases well developed diffusion. That would be corresponding and link the need of strategy under fitting to the need of determining necessary time of measurements. In Fig. 9-11, 13-15, 18-19, it would be recommended to express directly that presented "Temperature response of" is measured, or modeled.

#### Specific Comments

We propose few obvious typing error corrections in the text: 1) p. 26, row 5 replace "top view millimeters" by "top few millimeters" 2) p. 30, row 1 replace "heat source ansatz" by "heat source approach" 3) p. 35, row 9 replace "has an mean diameter" by "has the mean diameter" 4) p. 39, row 3 replace "lies in between" by "lays in between"

Wojciech Marczewski

Please also note the supplement to this comment:

<http://www.geosci-instrum-method-data-syst-discuss.net/2/C3/2012/gid-2-C3-2012-supplement.pdf>

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