

Interactive comment on “Muon radiography for exploration of Mars geology” by S. Kedar et al.

Anonymous Referee #4

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general comments

The topic is of great interest, the idea is clever and should be pursued, and this paper will stimulate valuable discussion.

However, while the concept is described well, the paper does not seriously address several significant problems with the proposed experiment. This paper is an excellent starting point, and no doubt these issues will be worked out with continuing peer-community discussion, and growing pressure to address explicit, practical plans in more detail as possible mars mission planning proceeds.

The paper should certainly be published and authors may want to address specific comments below before finalizing.

specific comments

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The earth-based experiment doing muon tomography in a volcano, used as a model (several references by Tanaka et al, in particular GEOPHYSICAL RESEARCH LETTERS, VOL. 36, L01304), employed 48 scintillator bars and photomultiplier tubes. The latter paper certainly demonstrate the kind of results that can be obtained, but it does not mention exposure time or statistics, and no statistical errors are shown on plots, so these facts cannot be deduced.

However the statement that a practical muon detector could have power consumption as low as 2~3 watts is quite impossible, unless the authors are referring to just one of the scintillator-PMT bars used in the volcano experiment. Even the FPGA processor chip required as part of the data acquisition system would consume this much or more power. The detector sketched in the mars rover figure could be about the same size as the volcano experiment (about 1.5m square) but would have mass ~ 160 kg which would be impractical as part of a planetary payload.

Any Mars detector would have to be MUCH smaller and would thus require (given the reduced muon flux due to the thin martian atmosphere, and the various hadronic backgrounds mentioned in the paper), much longer data collection time. So i would suggest the authors consider a scheme whereby the rover would drop off small autonomous detectors, with their own solar panels, which could be left in place long-term to collect adequate statistics. These could perhaps communicate data with the rover via cellphone-type radio links.

technical corrections (none)

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