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Biogeosciences Discussions

Interactive comment on "Martian sub-surface ionising radiation: biosignatures and geology" *by* L. R. Dartnell et al.

L. R. Dartnell et al.

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Authors' Response to Anonymous Referee 1:

The paper is well written albeit somewhat lengthy. Many times in the introduction to the different sections the authors include ver y basic information, which can be perhaps deleted in an advanced scientific publication. I only have few minor points outlined below.

The Introduction very deliberately includes fundamental information. This paper has been written for an interdisciplinary audience, demonstrating the relevance of radiation modelling to biologists and geologists, to whom the conventions of each other's field, and in particular radiation physics, may not be familiar. This crucial background

information is kept relevant and concise.

- Title, abstract. Ionizing or ionising? The authors should make up their minds about US or UK spelling.

Thank you, the spelling is now uniformly the UK variant.

- Page 2, column 1, 1st paragraph, line 4. Reference is missing

Now added.

- Page 2, column 2, 2nd paragraph: delete "one million"

This quantitative statement is required. Figure 1 plots the particle densities on the surface and so knowledge of the total number of simulated particles is important. Normalisation of the maps to the total annual fluence would be meaningless as we are treating monoenergetic particles.

- Page 3, section 1.3, line 16. The dose is uniform only if a large target is considered, e.g. a mammalian cell. On the micrometer or nanometer scale, the dose is non-uniform for sparsely ionizing radiation, too.

This sentence has been modified accordingly.

- Page 4, section 2, Method. As far as I know, GEANT4 has strong limitations in modeling ions heavier than protons. Do the authors know of any check on HZE simulations using GEANT4?

Please see a detailed answer to this question above, in response to the comment by Anonymous Referee 2 on p.467 P2.

BGD
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- Results. I think neutrons data should be presented separated by protons or recoil protons separated by galactic hydrogen ions. At increasing depth, the dose will be dominated by neutrons.

The reviewer makes a good point that it would be interesting to see the proton dose data separated into primary protons and neutron-induced recoil protons. Unfortunately, the model was not originally designed to output data in this manner and as such providing such a feature would necessitate re-running all the simulations reported in the paper. It is a meaningful extension to the research, however, and this functionality can be added to the model in the future for subsequent work.

Interactive comment on Biogeosciences Discuss., 4, 455, 2007.