

## ***Interactive comment on “Brief communication: Electron pair donors and Earth’s energy generation” by Frederick Mayer***

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Received and published: 13 April 2018

The manuscript "Electron pair donors and Earth's energy generation" submitted by F. Mayer for publication in Nonlin. Processes Geophys. Discuss. develops further the idea published in a previous paper (Mayer and Reitz, 2014) of energy generation by the tresino nuclear reaction chain. The current work focuses on the source of the electron pairs and their amount to justify the long term ratio of He isotopes. I found the proposal interesting but the paper requires major revision before publication.

The output of a series of model calculations is plot in Figure 2 and, to my understanding, is the main scientific information the paper is providing. It would be important to show the behavior of the long term He isotopes ratio for proton content larger than

C1

$6 \times 10^{20} \text{ cm}^{-3}$ . It would also help to have different colors for the different proton content for the two plots in the Figure.

The proposal of Cooper pairs as source of electron pairs for the tresino nuclear reaction is interesting. To my knowledge, there are no experimental evidences of their existence inside the Earth but that would be indeed a wonderful discovery! There is one point the author should consider in the manuscript. In order to have Cooper pairs, electrons need an attractive interaction that overcomes their natural Coulomb repulsion. In standard superconductors, this interaction is due to phonons, i.e. the vibrations of the crystal lattice; in novel and exotic superconductors, it is thought to derive from magnetic fluctuations. A lot of research is ongoing to clarify this point on these new superconductors but so far, superconductivity manifests at low temperatures. What would be the mechanism that could lead to high temperature Cooper pair formation inside the Earth? Despite the author states that it is difficult to distinguish between the possible sources of electron pairs, the proposal would be more strong developing this point.

There are also few issues (style/format) that should be revised.

The introduction is not clear unless the reader knows the previous paper (Mayer and Reitz, 2014): it would be better to summarize its main findings in the current manuscript before moving on to present the new proposition.

Introduction, page 1 line 21: "Cooper pairs have been recently been proposed .." -> "Cooper pairs have recently been proposed .."

The sentence "Of course, assessing the materials most operative in the Earth will have to be determined." is not clear. Does it mean that superconductivity will be only present in certain rocks? Does the nuclear reaction occurs deep inside the Earth or at its surface?

Introduction page 2 line 6: "the broken circles ...is meant " -> "the broken circles ... are meant ";

C2

Introduction page 2 line 9: a reference should be added to the citation of MT scans;

Figure 1: adding the labels to the "molecules" in the Figure could help the reader;

Page 3 line 2 : "a series model calculations" -> "a series of model calculations";

Page 3 line 7 "And the ratio of  $^3\text{He}$  and  $^4\text{He}$  isotopes of these two isotopes.." : remove "of these two isotopes";

page 3 line 16: "verses" -> "versus".

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Interactive comment on Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2018-13>, 2018.