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Comment on esd-2021-26

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Community comment on "ESD Ideas: Planetary Antifragility: A new dimension in the definition of the Safe Operating Space for Humanity" by Oliver López-Corona et al., Earth Syst. Dynam. Discuss., <https://doi.org/10.5194/esd-2021-26-CC1>, 2021

Clearly it would nice if scientists could develop an indicator of how the separate planetary boundaries interact so that the impact of phenomenon such as climate change could be measured in a more aggregate way, particularly the impact on the fragility of the planet. The huge problem is that no one knows how the interactions work in detail in each region of the world, and no one knows how to define a useful indicator of the total impact. Unfortunately, this includes the authors of this paper. As far as I can tell, they have no clear physical theory at all of how to move conceptually from "fragility" to "antifragility" to thermodynamics to entropy to solar flux to albedo, etc. The key theoretical scientific section of this paper seems to range only from lines 55-65 in section 2.1. But the authors need to flesh out the connections between all these basic concepts, which is what the paper should be about, before one gets to the need to actually measure various parameters for the earth system. This would take a long paper to accomplish.

For example, the authors state under the sub-section "Entropy production as Payoff function" ---

"As noticed in previous work by Michaelian (2005) and Michaelian (2015), Ecosystems arise and evolve, as any other physical system, under the laws of thermodynamics; in particular under the imperative of dissipating the solar photon flux into heat. In his work, Michaelian as Ulanowicz and Hannon (1987) before, proposes that healthy ecosystems have greater entropy production than unhealthy or stressed ones and entropy production should then be a reliable indicator of its health." Well, yes, ecosystems arise and evolve according to the laws of thermodynamics, as does every physical system. But the rest of the sentence represents a huge leap conceptually, and there is no "imperative" the solar photon flux into heat. (poor English) And the reflected solar radiation has no simple relationship to the entropy of the ecosystem from which it is being reflected. In fact, there is no simple or even complex way of measuring the entropy of a complex system like the earth's ecosystem. Where did the authors get the idea that this could be done even theoretically, and that the reflected radiation was a good indicator of the entropy of the system. And what does any of this got to do with the various planetary boundaries? If the authors know the answers to these extremely difficult questions they certainly do not sufficiently describe the theoretical bases for their paper in those 10 lines, 55-65. Frankly, I think no scientist has a clue as to how all the concepts relate to each other. It is certainly clear physically that reflected radiation from a system/complex surface does

not relate in some simple way to the entropy of the system. The entropy of a complex system is not even well defined, and is not measurable. And there is no simple relationship of entropy to climate change. We need to see the authors' arguments in response to these questions and issues spelled out in detail, if they have any, for this to be a publishable paper. This paper needs to reflect science not speculation. The issues raised are extremely difficult to address, and may never be.

Finally, why I sympathize with foreign language speakers in terms of how difficult it is to write good English, the quality of the English in this paper is so poor that even if good scientific arguments were presented, the poor English alone would be sufficient grounds for rejection.