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Interactive comment on "Long Range Plasma Momentum Coupling by High Voltage Static Electric field and Deep Space Exploration" *by* Kokwei Chew et al.

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The authors are grateful to the careful reading and valuable comments from the referee.

We have revised the manuscript according to the comments. Here is our reply:

1, about the power consumption and structure size. Yes the power consumption is a unrealistic, we changed the size of the spacecraft, and lowered the power. Actually we can also increase the effective radius to, say, 1 km, thus lower the power to about one tenth of the orginal. We have some problem with the numerical stabilities of the simulation. Janhunen's orginal E-Sail interact with neutral plasma, in which the influ-

ence is limited by Debye length. We create a large dynamic positively charge cloud, which can interact with a much larger range of ambient plasma. If E-Sail can deplete the neibouring electrons, it should be as efficient too.

2, the effective radius of a conductor. With the same amount of electric charge, the larger ths conductor is, the lower its potential will be. The energy required to shot the electrons away (to keep the potential of the spacecraft) should be a little higher than the potential. Lower potential is prefered for energy efficiency.

3, Line 115: Which of the two cases is shown in Figure 4? Which direction is the X-axis in Figure 4? Please add labels and units in the figure. Please find in the modified manuscript attached.

4, Line 129: Please explain why 'the momentum coupling between the spacecraft and the ambient plasma is stronger than plasma shielding'. This is due to the difference of quasi-neutral plasma, and non-neutral structure as explaned in comment no.1 above.

Line 134: the thrust in 2D simulation is 2âĹij3 times larger than that of 1D simulation. So, it doesn't seem like 'a good approximation'. Yes, you are right, we changed the manuscript.

Line 140: k ranges from -2+0.3=-1.7 to -2+0.5=-1.5. right? The number is -1.3 to -1.5.

Line 150: what does the '[11]' mean? We have changed to the right reference style.

Line 161: What is the thrust-energy efficiency of this scheme proposed by the authors? This is a preliminary proposal, and we don't have experimental support. We believe the efficency should be better than we presented, for we also tried to solve the electromagnetic field numerically, but we cannot get a stable result, though seems to be much better. We tried two years, and fail to reach a presentable simulation. Both students (first two authors) graduated, and the work is not supported, so we have to settle with the conservative but referencible method and result. The general principle applies: the larger the effective radius, the higher the energy efficiency.

The manuscript has been revised and highlighted.

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2019-41/angeo-2019-41-AC1-supplement.pdf

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