

Interactive comment on “An excitation mechanism for discrete chorus elements in the magnetosphere” by Peter Bessalov and Olga Savina

Anonymous Referee #1

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The manuscript claims to have proposed an VLF electromagnetic pulse excitation mechanism in the magnetosphere; however, the manuscript lacks data supporting its idea, and misses many key references for its claims and assumptions. I could only find an exhibition of a wave instability growth rate calculation. There is neither simulation based on this calculated growth rate nor any observation to be compared with, therefore it is hard to guess any physical validity of this calculation, yet the authors still claim that it could explain many phenomena in their conclusions. The calculation relies on many key simplifications and assumptions that lack enough reference to support, for example in the paragraph around Eq. (10). The calculation procedure appears to me as a composition of selected equations and results from textbooks, without enough

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explanation of their backgrounds or even physical meaning of symbols. Moreover, I don't see a clear logical link between these equations, for example, the Vlasov equation discussed in Eq. (1)~(4) are never used in the later part of the manuscript, and it is hard to understand why they are there. In its current form, it is difficult to fairly evaluate the originality and scientific contribution/significance of the manuscript. Therefore I suggest the authors to resubmit after serious and substantial improvement. Additional comments are shown below.

Figure 1, which is the only figure in the manuscript, is not clear. Why particles (marked stars) move as shown in Figure 1? What are the two parallel lines?

Why a nearly step-like form of A in equation (2) is important in the beam pulsed amplifier mechanism proposed? This form seems lack of observational support.

The instability requires electrons, or even ideal beam with $v_z = U_g$, which is not realistic either. Another mainstream idea for chorus generation, which is associated with inhomogeneity and cyclotron instability, is not discussed.

As equation 16 shows, the favorable wave normal from the proposed mechanism is quite oblique, which is not consistent with often observed quasiparallel propagation in the literature.

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