Dear Editor:

We re-submit a revised version of our article entitled "Whistler waves produced by monochromatic currents in the low nighttime ionosphere" [No.: angeo-2020-51] for publication in *ANGEO-COMMUNICATIONS*. We highlighted the progress achieved in the article compared to the results already published, performed additional calculations and added new material (see Fig. 5 and its description). Our results show the possibility of controlling the energy fluxes of electromagnetic ELF/VLV radiation entering the Earth-ionosphere waveguide and the magnetosphere. We also submit an itemized ‘Author's response’ to the comments offered by Reviewer after the second revision. The issues raised by reviewer have been fully addressed in the revised version (highlighted and clean versions of the manuscript are presented) and in the response, and we thus hope that the paper will now be considered acceptable for publication.

With highest respect,

Peter A. Bespalov
IAP, Nizhny Novgorod, Russia

3 May 2021

(1) Comments from referee

This study is about VLF propagation calculated within the full wave model. Authors adopts already well known technique (namely "two-point boundary-value MATLAB solver" by Kierzenka and Shampine (2001)) to quite model problem of VLF generation by plane currents. Although the topic is generally interesting, I did not find anything particular new in this study… basically Authors report that the two-point boundary-value Maltab solver works well, but this is not scientific result. To shape a scientifically sounding study, Authors would need either provide some comparison with spacecraft/ground-based measurements, or demonstrate new theoretical results (and describe in details what new has been done). The present form of this study does not contain such comparisons or new theories. Thus, I cannot recommend it for publication.

(2) Author's response

We would like to thank the Reviewer for the time he/she spent reading, and commenting our manuscript. We have prepared a point-by-point answer to his/her comments below. The responses are marked in bold.

Reviewer's Comments:

This study is about VLF propagation calculated within the full wave model. Authors adopts already well known technique (namely "two-point boundary-value MATLAB solver" by Kierzenka and Shampine (2001)) to quite model problem of VLF generation by plane currents.

Response:

The article by Kierzenka and Shampine (2001) implements a purely mathematical algorithm for solving a boundary value problem. There was no geophysics there at all. In this work, we used this algorithm for the first time to solve an important geophysical problem closely related to active experiments on short-wave ionospheric heating facility. Other researchers have considered close problems by methods that are less perfect from a mathematical point of view, without guaranteeing the convergence and accuracy of the calculation results.

Reviewer's Comments:

Although the topic is generally interesting, I did not find anything particular new in this study… basically Authors report that the two-point boundary-value Maltab solver works well, but this is not scientific result. To shape a scientifically sounding study, Authors would need either provide some comparison with spacecraft/ground-based measurements, or demonstrate new theoretical

results (and describe in details what new has been done). The present form of this study does not contain such comparisons or new theories. Thus, I cannot recommend it for publication.

Response:

The adaptation and use of an advanced mathematical apparatus made it possible to compactly formulate an important geophysical problem, taking into account the real inhomogeneity of the parameters of the ionosphere and to advance the calculations to a new level. Our results show the possibility of controlling the energy fluxes of electromagnetic radiation entering the Earth-ionosphere waveguide and the magnetosphere. The revised version of the manuscript provides an example of the distribution of external ionospheric currents, which do not direct the energy into the magnetosphere (see green lines in Fig. 5). We have expanded the bibliography to compare results with ground-based measurements.

On the contrary, it is possible increase the level of energy directed into the magnetosphere (see blue lines in Fig. 5). This can be useful for modification processes in the plasma magnetic trap. Of course, the electromagnetic ELF/VLF radiation of ionospheric currents themselves are not sufficient for a noticeable modification of the Earth's electron radiation belts. However, under quiet conditions in the nighttime magnetosphere, these emissions can ensure the radiation belts transition through the threshold of the cyclotron instability. This process can be accompanied by a significant precipitation of energetic electrons into the ionosphere and other geophysical manifestations.

(3) Author's changes in manuscript

The modified parts are marked in yellow and the removed parts are marked in red in the new marked version of the manuscript.