Annales Geophysicae Discussions

Ann. Geophys. Discuss., referee comment RC2
https://doi.org/10.5194/angeo-2021-39-RC2, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on angeo-2021-39

Anonymous Referee #2

Referee comment on "Modelling the influence of meteoric smoke particles on artificial heating in the D-region" by Margaretha Myrvang et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2021-39-RC2, 2021

General comments on "Modelling of the influence of meteoric smoke particles on artificial heating in the D-region" by Myrvang et al.

This paper is an original and welcome addition to the understanding of the effect of HF heating on mesospheric radar echoes.
It descibes, through modelling, the effect of mesospheric smoke particles on the artificially heated electron temperature height profile
for several experimental conditions. This has not been published before to my knowledge, and should be published.
The modelling appears to have been well done and the results and conclusions seem reasonable.
The manuscript is generally well written, but see my notes on technical errors below.

Specific comments

Line 117: The heating time is much less than 100ms, it is less than 1 ms below 90 km (Stubbe et al., 1982).

Line 134 and Fig.1: It would be informative to give the height and some other relevant parameters used in calculating the results shown in Fig. 1, presuming they are relevant to the present modelling.

Figure 2: This is fine, but it is not indicated that the 'Modelling during heating" is performed at each height from below before incrementing to the next height. This is well described in the text. I suggest that at least a sentence is added in the figure caption describing this.

Line 175: The acronymn "SIC" is mentioned here for the first time. It should be explained what it stands for and a reference should be given.

Section 3: Although the details of the MSP model are given in the references Baumann et al. 2013 and Megner et al. 2006, it would be useful for the reader without a detailed knowledge of MSP to have a brief, probably simplified description of the MSP height distribution without having to look up these references. Is it an idealised model or from measurements ? For example are the MSP fairly uniformly distributed over the height ranges mentioned or are they in thin layers ?

Figure 3: The red shaded box the reaction from P to Pp would seem to be photo-detachment so should the wiggly arrow labelled h(nu2) not be pointing away from P instead of towards P ?

Line 194-195: This sentence is a repeat of the sentence in line 193 but with a wrong "five cases" instead of four cases. Delete it.

Section 5, in particular line 220: In discussing the 'open question' of the discrepancy between calculated and modelled electron temperature enhancements, a suggested explanation put forward in a later paper by Senior et al. should be mentioned, namely that the ERP of the heater may be overestimated because of the assumption of a a perfectly conducting ground under the heating antennas is probably not met. This is discussed in section 6.6 and the conclusions of the paper 'Measurements and Modelling of Cosmic Noise Absorption Changes due to Radio Heating of the D-Region Ionosphere',
Senior, A., M.T. Rietveld, F. Honary, W. Singer, M. J. Kosch, J. Geophys. Res., 116, A04310, doi:10.1029/2010JA016189, 2011.

Appendix, line 281: Does atomic oxygen really play an important role at these heights since it is a minor constituent here ? This is discussed in section 6.3 of Senior et al. 2010.
Equation A6: One bracket is not closed.

Reference:
Stubbe, P., H. Kopka, M. T. Rietveld, R. L. Dowden, J. Atmos. Terr. Phys, 44, 12, 1123-1135, 1982,
ELF and VLF wave generation by modulated heating of the current carrying lower ionosphere

Technical errors

In the attached .pdf text I have marked spelling and grammar faults by highlighting in

yellow
without specifying the error except in some cases listed below. Many of the grammar faults are
typical for Scandinavian writers: conjugation of verbs for singular or plural (adding or missing an 's' on the verb). In other cases plural nouns are missing the 's'.

Lines 109 and 280: Should be "lose"

Line 210: "conditions"

Please also note the supplement to this comment:
https://angeo.copernicus.org/preprints/angeo-2021-39/angeo-2021-39-RC2-supplement.pdf