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Comment on angeo-2022-12

Anonymous Referee #3

Referee comment on "Arecibo measurements of D-region electron densities during sunset and sunrise: implications for atmospheric composition" by Carsten Baumann et al., Ann. Geophys. Discuss., https://doi.org/10.5194/angeo-2022-12-RC3, 2022

The authors analysed an asymmetry of the electron density during sunset than during sunrise. They presend study of electron density measurements from the Arecibo incoherent scatter radar and corresponding velues obtained by modelling. I think that the manuscript is well written and should be published after the following corrections:

The authors should give the full name for WACCM-D and GCM in the abstract. In the text, full names should be given in the first place where the abbreviation appears.

Fig. 1: Is 10 ^ 4 cm ^ - 3} the maximum obtained value of electron density? I ask, because I have the impression that this value is given on large parts of the displayed graphs. I have impression that higher values were obtained but that they are seen as 10 ^ 4 cm ^ {- 3} due to the limitations of the domains in the display.

Lines 122-123: D-region heights is located between 50-60 km and 90 km. For this reason, the part "... the D-region with an altitude range from 20 to 150 km. " should be rewritten.

To my knowledge, the SIC model is primarily used for polar region analyzes. The authors should explain the possibility of applying this model (its original version and the version including meteoric smoke particles) to the area observed in this study. Is it necessary to make some corrections (eg those related to the chemical composition, the influence of the magnetic field, etc.) in these versions of the model to make their application relevant to other areas, or changes depending on observed areas and observation periods can be made in the input files?

Does the model use Eq. (1) for calculations of the effective values of the parameters related to the respective processes, or does it consider the reactions of a single type of

particles (and consequently coefficients corresponding to these processes considered in particular)? The authors should explain this in the text. In case the first variant is applied, the names of the corresponding coefficients should be written and it should be explained how the corresponding effective coefficients are changed in accordance with the observed conditions. In case the second variant, Eq. (1) should be rewritten with sums and corresponding indexes and all these quantities should be explained in the text.

line 204: γ and γp are the effective coefficients related to the collisional electron detachment and electron detachment by solar photons, not the collisional electron detachment and electron detachment by solar photons.