

# ***Interactive comment on “Magnetic local time dependency of radiation belt electron precipitation: impact on polar ozone” by Pekka T. Verronen et al.***

## **Anonymous Referee #1**

Received and published: 18 April 2020

General Comments: The authors use the Whole Atmosphere Community Climate Model (WACCM) with lower ionospheric chemistry extension (WACCM-D) to study the effect of magnetic local time (MLT) dependency of mid-energy electron (MEE) forcing on the polar ozone response. The paper shows analysis of simulations applying MLT-dependent and MLT-independent forcings, and contrasts ozone responses in monthly mean data. The ozone responses to MLT-dependent and MLT-independent forcings are very similar and the assessment of ozone and NO<sub>x</sub> responses apparently does not need complete MLT coverage. This eases the observational requirements for any new atmospheric instrument or existing datasets. It is concluded that electron forcing, which ignores the MLT dependency, will still provide an accurate ozone response

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in long-term climate simulations. The article presents a good comparison of three simulations in WACCM-D: 1) no MEE input; 2) a zonal mean MEE input; and 3) a MLT-dependent MEE input. The paper provides interesting comparisons for the three simulations including NO<sub>x</sub>, HO<sub>x</sub>, and ozone changes from the different forcings. I do think that the paper should be published. The paper is generally well-written, but I do have eight suggested technical corrections/suggestions.

Technical Corrections/Suggestions: 1) p. 2, lines 38-39: Change “to from mesosphere to stratosphere” to “from the mesosphere to the stratosphere”

2) p. 2, line 47: Change “diurnal cycle” to “diurnal cycles”

3) p. 3, line 89: Change “of was” to “was”

4) p. 4, line 114: Change “be more” to “be a more”

5) p. 5, line 142: Change “is at” to “is at a”

6) p. 6, line 174: Change “descend” to “descent”

7) p. 7, line 197: Change “to to” to “to”

8) p. 8, lines 234-235: Change “provides correct” to “provides a correct”

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