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

Anonymous Referee #2

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This paper analyses the impact of magnetic local time (MLT) resolved ionization rates in the mesosphere lower thermosphere region on the chemical state in this altitude region. It addresses a problem related to recent and on-going climate simulation which study the role of the external forcing by solar-terrestial connections, specifically uncertainties of the applied ionization rates which do not account for local time dependency of the flux of mid-energy electrons (MEE).

The organization of the paper is straightforward: three model experiments without MEE contribution, a zonal mean and a MLT resolved one are compared to each other. As a specified dynamics experiment is performed, the paper concentrates on the chemical

impact under the assumption that any climate response is driven by resulting changes in the radiatively active trace gases, i.e. mainly ozone, to be studied in free-running experiments. From their analysis the authors conclude that resolving ionization rates to magnetic local time has only a minor impact on monthly averaged ozone changes caused by particle precipitation.

The paper is generally well written, the conclusions are clear, the figures allow the readers to follow the authors analysis. The paper is timely as it supports the rational of the model experiments in CMIP6.

Besides minor comments (see below) I find the paper ready to be published.

Minor comments:

- Please check the use of articles in your text carefully. Often articles are missing.

- in the title specify the altitude domain, perhaps "Impact of magnetic local time resolved ionization rates on ozone in the polar middle atmosphere"

- p2,l30: give reference to ionization models which include LT dependency (eg. the AIMOS model) and which have been used in many studies so far

- specific comments are given in the commented pdf

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2020-14/angeo-2020-14-RC2-supplement.pdf

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