Atmos. Chem. Phys. Discuss., 14, C989–C992, 2014
www.atmos-chem-phys-discuss.net/14/C989/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global investigation of the Mg atom and ion layers using SCIAMACHY/Envisat observations between 70 km and 150 km altitude and WACCM-Mg model results" *by* M. Langowski et al.

Anonymous Referee #1

Received and published: 1 April 2014

General Comments

1) This paper describes global observations of the Mg and Mg ion from the SCIAMACHY satellite instrument. The observations are discussed in terms of previous measurements and concluded to be in generally good agreement. The SCIAMACHY measurements are compared to 3D model results of the Mg and Mg ion number density. These comparisons indicate better agreement for Mg ions than for Mg, although differences exist. In particular the model indicate a seasonal cycle in Mg that is not

present in the observations, and the model does not indicate latitudinal dependence in the Mg ion peak height which the observations show.

2) The results of this paper are relevant to a variety of areas including studies of meteor influx and deposition of meteoric material in the atmosphere, and studies of aerosols and chemistry where interaction with meteoric remnants (smoke) is relevant.

3) The paper is, however, somewhat lacking in scientific interpretation but rather reads as a recitation of results. For example, the discrepancies between model and observation concerning the seasonality in Mg could be discussed in terms of the potential measurement and model shortcomings, ultimately leading to suggestions for future work.

Specific Comments

1) Many of the Mg+ observations are presented separately for retrievals using two different wavelengths. The results are different, however, there is no discussion of why they vary for the two wavelengths, or if the authors suspect that one wavelength gives a better result. This may be discussed elsewhere, but the present study should give a synopsis of any issues. It would be preferable to show only results from the most reliable of the two wavelengths, and then state that the other wavelength indicates similar variability in time and space yet with some bias.

2) pg. 1980, second paragraph: The discussion of electron distributions comes with no motivation. Please begin with a sentence or two discussing why this is relevant to the study.

3) Section 5: The comparison of SCIAMACHY to previous observations is useful and appreciated. It would be instructive, however, to convey these results in the form of a figure or table if possible.

4) Section 6, Figures 16: It would be useful to add panels that show the VCD vs. time for both model and observation on the same plot, for selected two latitudes. This is

ACPD
14, C989–C992, 2014

suggested because the model - observation comparisons are a major part of the work, and could benefit from some additional illustration.

5) Section 6, Figures 17 & 18: The comparisons of SCIAMACHY and WACCM are instructive as shown, but it might be more illuminating with an additional panel that shows VCD vs. latitude for both model and observation as lines on the same plot.

Technical Corrections

pg. 1974, line 26: "125 km." remove period

pg. 1975, line 2: "density" should be "number density"

pg. 1975, line 14: "can act" should be stated "are thought to act as"

pg. 1976, line 2: "wavelengths" should be "wavelength"

pg. 1977, lines 19-20: please clarify this sentence.

pg. 1978, line 5: try this "These features are not dependent on the orbit phase, but. . ."

pg. 1980, line 24: you introduce undefined nomenclature, "E x B-Drift", please define these terms.

pg. 1980, line 27: within 3 deg. latitude of what?

All figures with latitude as the abscissa: The left and right abscissa labels are "-60" and "60", respectively. These should be "-90" and "90"

pg. 1983, line23: "($\pm$200m)" should be "$\pm$200m"

General: You could introduce the terms Southern Hemisphere (SH) and Northern Hemisphere (NH) early in the paper as they are used extensively.

pg. 1985, line 18: You should briefly define the "Ring effect".

pg. 1988, line 8: by "3.3 km step size" I believe you mean 3.3 km vertical resolution. Please clarify.

ACPD
14, C989–C992, 2014

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 1971, 2014.

ACPD
14, C989–C992, 2014