

Review of " Comparison of Global Datasets of Sodium Densities in the Mesosphere and Lower Thermosphere from GOMOS, SCIAMACHY and OSIRIS Measurements and WACCM Model Simulations from 2008 to 2012" by Langowski et al.

General Comments

1. This paper describes comparisons of Na layer characteristics from observations and models, and will be useful to anyone who is using these data. While the manuscript offers an accurate and detailed description of the results, it misses many opportunities to discuss the atmospheric (or extraterrestrial) processes that may be underlying the results. Adding such discussion may shed light on the model – measurement differences, and certainly will help in keeping the reader engaged.
2. All of the results are all presented as color cross sections. While these convey a great deal of information in a small space, I would find it useful to see a few simple line plots that focus on areas of interest. For example, all of the seasonal action is in the polar regions, and it would be instructive to see line plots, for example, of the VCD at 65S and 65N, for all of the satellites and models. There is space in the paper and it would more effectively illustrate the agreement and differences, as well as the nature of the Na layer.
3. The paper is generally well written and enjoyable to read, however, there are far too many instances of incorrect grammar. Most of the specific comments below deal with grammatical issues. Please revise the paper with an eye for correct grammar, and go beyond the comments made below.

Specific Comments

line 3: You cannot use these acronyms before you define them.

lines 33-35 (and elsewhere): Stick with either g or μg , but not both.

line 39: Give the typical value in km (in parenthesis).

line 42; Delete “so called”.

lines 43-44: You should cite the 2 papers which used observations to demonstrate that NLC particles indeed contain meteoric smoke: Havnes and Næsheim [2007] and Hervig et al. [2012].

line 45: Murphy et al. [1998] used observations to characterize smoke contained within stratospheric aerosols. This reference is relevant and should be cited as well.

line 52: Carillo–Sanchez et al. [2016] contains the current best estimate for meteoric influx (43 t/d), and you should cite that work here.

line 57: It is the velocity rather than the cost which is the principal challenge in using rockets.

lines 76, 82, and elsewhere: Phrases like ground-based, space-borne, on-board, Gaussian-shaped, etc... are not put in parenthesis.

line 93: You cannot use these acronyms before you define them.

line 95” “good” should be “well”, then “as well as” should be “in addition to”

line 101: Do not capitalize full width half maximum, it is not a proper noun.

line 104: This is an awkward sentence, please re-write.

line 108: ...datasets is provided...

line 118: Delete “where the satellite flies from north to south”, as this is implied by the term descending.

line 124: Do you mean “from 2003 to present” ?

lines 125-127: You can delete these sentences, as the information is fundamental to the technique, and is described elsewhere.

line 132: Do not capitalize “differential optical absorption spectroscopy”. Also, since you never use the acronym DOAS, you do not need to define it.

line 139-140: This is poorly stated. You do not have equations 8, 9, and 11 in your paper. You should rather state that “...below we reproduce the expressions of Fussen et al (Equations 8, 9, and 11 therein)...”

line 139: The representation of GOMOS results as given in Fussen et al. would commonly be referred to as a climatology. Later in the paper you refer to the “GOMOS model data”, which is confusing. I recommend introducing it as a climatology, and then later in the paper refer to it simply as “GOMOS” or as “the GOMOS climatology”.

line 141 and elsewhere: However should have a comma before and after when it is used for emphasis.

lines 162-163: The relevance of this transformation should be explained.

line 165: SCIAMACHY should be in parentheses.

line 178: “multi-annual”

line 179: Step size in which dimension? Perhaps say “...vertical step size...”.

line 180: “step size”

lines 181-183: The sentence in parentheses is not stated very well. Please re-word, and possibly take it out of parentheses.

line 184: The vertical resolution is not determined by the step size, but rather is due to the instrument field of view. Other effects may come into play, like response time, the detector sampling frequency, and the scan rate. The preceding discussion of the step size of 3.3 km, and retrieval spacing of 1 km is rather confusing. One would typically not retrieve on a finer grid than was observed. You should re-word this to clearly summarize the main points: 1) The vertical resolution of the measurements determined by the FOV, 2) the vertical spacing of the measurements due to the detector readout cadence combined with the scan rate, and 3) the spacing of the data used here. Alternately, you can get away with stating only the barest relevant numbers and give a reference for more detail.

line 198: “...to be less than 1 km.”

line 214: What does the pixel resolution of 0.4 nm correspond to in regards to the measurements? Is it spatial, spectral, or?

lines 230-233: You use the acronym WACCM before you define it.

line 245: Delete “termed as”.

line 247: How does the Na input function of Marsh et al compare to that given in Carillo-Sanchez et al. [2016]?

line 251: try “...daily at midnight UT during...”

Somewhere in the paper you should define the acronym for local solar time (LT), as it will be used throughout.

line 256: This paragraph is difficult to read. I think the main points could be stated very simply. Please clarify this section.

Fig. 1: The caption is poorly worded. What do you mean by “The satellite data is collocated...” ? I think this is a plot of model Na VCD results, and that the curves illustrate the satellite LT vs. latitude. Can it be stated this simply?

line 277: Missing tab. Figure 2 shows model results, not measurements. Thus this sentence is misleading.

line 278: delete “negligibly”, also, can you provide a value?

line 279: You discuss the ensemble mean before it is defined. The discussion starting on line 283 should come before you present the results.

Fig. 2 (and other figures): In the description of the results you should place the notation after the description, e.g. (2dn sentence): “Results are for the ensemble mean (M), GOMOS (G), ...”

line 283: Integers less than 10 are spelled out, e.g. “four”,

line 292: Delete “in numbers”

line 294: Within the following paragraph, you need to occasionally refer to a specific figure (in parentheses) where the reader can see what you are describing.

All Figures: You need to label the panels sequentially by letter (e.g., a), b), etc...), on each panel itself, and then describe the figure as such in the caption. This is the standard in journals, and it will facilitate your discussion when you refer to a specific figure / panel.

line 306: “model data” should be “climatology”

line 315 (and elsewhere): “89km up to 95km” should be “89 to 95 km”

line 318: Do not capitalize mesopause.

line 320: What is “...the thermal structure in its altitude”? Please clarify this statement.

line 321: Can you comment on why the layer is higher in summer? Is it simply because of upwelling? It would be a welcome diversion to occasionally comment on the atmospheric processes behind some of the features in the measurements and models.

line 322: This sentence is unclear.

lines 329-333: This sentence is too long.

line 338: You do not need to describe how FWHM is determined, it is a fundamental that we all understand.

line 340 – 341: “model” should be “climatology”. Try this: “...mean width of 12.2 km is used at all times and latitudes.”

line2 341-342: What does this refer to? GOMOS? the model?

line 342: What do you mean by “datasets”? Is this the observations but not the model?

line 357: “regions”

line 358: It is not the “...centroid altitudes of the WACCM model” but rather “...the modeled Na layer centroid altitudes”