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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A global climatology of the mesospheric sodium layer from GOMOS data during the 2002–2008 period" *by* D. Fussen et al.

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After my earlier discussion about Fraunhofer structures and spectral analysis, I now add some minor comments about the paper.

Section 2, paragraph 1: It is stated that the slant path optical thickness is not larger than 0.005. This is confusing in the light of the other discussions of the extinction by the Na D transitions. As it is correctly pointed out later in the paper, atmospheric conditions at the Na D line centers can very well be optically thick in the limb direction. (Example: The line center cross section of the D2a transition is ∼1e11 cm2 at 200 K. A typical peak Na limb column density is 2e11 cm-2. This results in an optical thickness of 2.) I assume that the "optically thin" thickness of 0.005 mentioned here is the mean optical thickness when averaged over the GOMOS wavelength interval used in the occultation

analysis. This distinction should be pointed out clearly.

Section 2, paragraph 2: What is meant by "upper and lower bands"?

Section 2, after eq. 3: In the definition of U small "t" should be capitol "T".

Section 2, after eq. 4: It would be instructive to provide some typical values of the line center slant optical thickness (see above).

Section 2, paragraph preceeding eq. 5: The D1a/D1b ratio of 1.667 is called the "theoretical value". This is confusing since also the ratios 1.658 and 1.424 are "teoretical". It might be better to call 1.667 for the "optically thin limit".

Section 3.1: Some resonance lidar references could be given about the depletion of metal atom concentrations in the presence of PMC. The fact that there is not always a 100% depletion of sodium in the presence of PMC is not an argument against the scavenging of sodium by ice (as suggested in the last sentence of the paragraph).

Section 3.2: It is stated that the temperature profile used in the retrieval is fixed at a climatological value. Does this mean that the same temperature profile has been used for all retrievals? In that case, why was not a seasonally/latitudinal climatology like MSIS or CIRA used? It should be discussed how much the use of a fixed temperature can influence the retrieval result. Connected to this, figure 6 shows the effect of temperature variations on the transmittance (left panel). It would be more instructive to show how the same temperature variations influences the retrieved sodium density profile (lower right panel) for a given extinction profile.

Section 5, paragraph 3: It is correct that is has been suggested that PMC may be responsible for the strong sodium decrease in the polar summer mesosphere. However, a more complete reference to Fan et al. (2007) would be that the strong sodium decrease in the polar summer mesosphere has been suggested to been a combination of the effect of PMC and cold temperatures. More specifically, ice particles are suggested to deplete sodium in the lower part of the sodium layer, while temperature-dependent

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chemistry is suggested to control the depletion near the peak and in the upper part of the layer.

Technically: Font sizes in several figures should be increased. The entries in the reference list should be formatted in a consistent way.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 6097, 2010.