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Atmospheric Measurement Techniques Discussions

Interactive comment on "What do satellite backscatter ultraviolet and visible spectrometers see over snow and ice? A study of clouds and ozone using the A-train" *by* A. P. Vasilkov et al.

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The authors thank Dr. M. Weber for his review and for providing constructive comments on the paper.

P. 239. We added references to papers by Krijger et al. (2005) and Lotz et al. (2009). The papers are briefly described in the paper as follows:

Krijger et al. (2005) developed an algorithm to differentiate between clouds and snow/ice covered surfaces that makes use of the SCIAMACHY polarization measurement device (PMD) observations in the spectral range between 450 nm and 1.6 microns. The algorithm is based on spectral threshold tests and mostly utilizes the differ-

ence in reflectance between clouds and snow covered surface around 1.6 microns. A similar algorithm was used by Lotz et al. (2009).

P. 240. We added GOME to a list of satellite UV/Vis backscatter spectrometers with a reference to Burrows et al. (1999).

P. 241. We added a paragraph that discusses the use of cloud information in DOAS algorithms applied to GOME and SCIAMACHY:

Various Differential Optical Absorption Spectroscopy (DOAS) ozone algorithms applied to GOME and SCIAMACHY (Coldewey-Egbers et al., 2005; Van Roozendael et al., 2006) make use of cloud information from the oxygen A-band (Koelemeijer et al., 2001; Kokhanovsky et al., 2006). For example, over snow and ice the oxygen A-band cloud algorithm of Koelemeijer et al. (2001) assumes full cloud coverage and retrieve the effective scene height which comes out as a height of a Lambertian reflecting layer that provides the observed amount of oxygen absorption. This effective scene height is then used for estimating the ghost vertical column of ozone to be added to the total column ozone (Coldewey-Egbers et al., 2005). It should be noted that OMI does not provide measurements in the oxygen A-band.

P. 248. We added a phrase in the text:

A latitude-dependent estimate of the tropopause pressure is provided in the MODIS data set.

P. 251. Yes, it is feasible to retrieve scene pressures from both TOMS and SBUV (see Joiner and Bhartia, JGR, 100, 23019-23026, 1995). However, the discrete wavelengths of TOMS and SBUV (continuous spectral scan of SBUV is made just once a month) are not optimal for applying the Raman cloud pressure algorithm and can lead to large errors in the retrieved cloud pressures - comparable to or in places larger than the errors resulting from the use of a climatology. That is why we plan to use the OMI cloud pressure climatology for the reprocessing TOMS data. This UV-derived climatology has

been proven to produce better ozone retrievals and smaller radiance residuals than the thermal infrared-derived cloud pressure climatology that have been used for TOMS.

We have added:

"While it is possible to derive information about cloud pressure from the limited number of available TOMS and SBUV discrete wavelengths (Joiner et al., 2005), the subsequent errors are comparable to or greater than those resulting from the use of a cloud climatology produced from OMI. In future reprocessing of historical TOMS and SBUV data, the current infrared-based cloud climatology will be replaced with one produced from OMI data. This will reduce systematic errors in the estimated total ozone over all surface types."

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