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Impact of using different ozone cross sections on ozone profile retrievals from Global Ozone Monitoring Experiment (GOME) ultraviolet measurements

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Abstract. We investigate the effect of using three different cross section data sets on ozone profile retrievals from Global Ozone Monitoring Experiment (GOME) ultraviolet measurements (289–307 nm, 326–337 nm). These include Bass-Paur, Brion, and GOME flight model cross sections (references below). Using different cross sections can significantly affect the retrievals, by up to 12 Dobson Units (DU, 1 DU = 2.69×10^{16} molecules cm^{-2}) in total column ozone, up to 10 DU in tropospheric column ozone, and up to 100% in retrieved ozone values for individual atmospheric layers. Compared to using the Bass-Paur and GOME flight model cross sections, using the Brion cross sections not only reduces fitting residuals by 15–60% in the Huggins bands, but also improves retrievals, especially in the troposphere, as seen from validation against ozonesonde measurements. Therefore, we recommend using the Brion cross section for ozone profile retrievals from ultraviolet measurements. The total column ozone retrieved using the GOME flight model cross sections is systematically lower, by 7–10 DU, than that retrieved using the Brion and Bass-Paur cross sections and is also systematically lower than Total Ozone Mapping Spectrometer (TOMS) observations. This study demonstrates the need for improved ozone cross section measurements in the ultraviolet to improve profile retrievals of this key atmospheric constituent.

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