Sensitivity studies to determine the effect of rotational Raman scattering on ozone profile retrieval from backscattered UV measurements

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Ozone profile retrieval from backscattered UV measurements has gradually developed since SBUV retrievals. Currently we try to improve the ozone profile algorithm used for the Ozone Monitoring Instrument (OMI) on board of Aura. In particular, our aim is to improve the retrieval of tropospheric ozone.

At the quadrennial ozone symposium in 2004 it was shown that advanced treatment of rotational Raman scattering is required if the differential optical absorption spectroscopy is used to determine the total ozone column. Therefore we are investigating whether we need rotational Raman scattering in the forward model used for the ozone profile retrieval and whether including rotational Raman scattering improves the information content on tropospheric ozone. We expect to gain more information on tropospheric ozone because rotational Raman scattering increases with multiple scattering and is therefore more sensitive to the lower parts of the atmosphere than the elastic scattering.

For this purpose we use wavelengths from 270 up to 330 nm to sample both the troposphere and the stratosphere. We have created an accurate forward model that accounts for polarization effects (through look-up tables) and rotational Raman scattering. The current OMI ozone algorithm uses an approximation for rotational Raman scattering. With our forward model we can assess the accuracy of this approximation. We will present results of this assessment. In addition we hope to present the initial results of a sensitivity study that includes the full diagnostic information provided by the optimal estimation method.