



Simultaneous retrieval of atmospheric gases and cloud properties using the Ring effect

Christophe Lerot (1), Rob Spurr (2), Jeroen van Gent (1), and Michel Van Roozendael (1)

(1) Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium (michelv@oma.be, +32-(0)2-3748423), (2) RT-Solutions, Inc., Cambridge, MA, USA

The Ring effect describes the filling-in of solar and telluric absorption lines in spectra of the scattered sunlight, which is due to inelastic rotational Raman scattering (RRS) occurring on molecular oxygen and nitrogen in air. In spectra measured from space nadir sensors such as GOME and SCIAMACHY, the Ring effect is usually treated as an interfering process when retrieving trace gas columns, without any further use. Modern radiative transport models, such as the LIDORT code developed at RT-Solutions, now allow to accurately simulate the nadir backscattered radiance field including both elastic and inelastic RRS processes. We present a simple method that exploits Ring effect coefficients commonly retrieved in DOAS-type and direct-fitting trace gas retrievals to infer effective cloud fractions and cloud top heights, which are therefore determined in the same spectral interval as the trace gases. The method is applied to total ozone retrievals in the Huggins bands and to tropospheric NO₂ in the visible range. Results are compared with reference retrievals obtained using commonly available cloud products derived in the O₂-A band.