Geophysical Research Abstracts
Vol. 18, EGU2016-4167-1, 2016
EGU General Assembly 2016

Investigation of photon path length distributions in cloudy atmospheres using GOSAT satellite measurements

Beke Kremmling, Marloes Penning de Vries, and Thomas Wagner
Max-Planck-Institut für Chemie, Mainz, Germany (beke.kremmling@mpic.de)

Photon path length distributions in the atmosphere are significantly affected by multiple scattering events through the presence of clouds. Our study investigates photon path length distributions for different cloud situations by combining high resolution space based measurements of the oxygen A-band with radiative transfer simulations. The measured spectra originate from the GOSAT TANSO-FTS instrument whose high spectral resolution allows to almost entirely resolve individual absorption lines, which is a prerequisite to our study. The spectra are compared to radiance simulations from the Monte Carlo Model McArtim which also provides detailed information on the individual simulated scattering events.

The investigated statistics include photon path length distributions below a selected altitude as well as within a single atmospheric layer and the photon penetration depth. Individual photon trajectories can be visualized. Examples of these photon path length distributions are presented for a model atmosphere containing a cloud with varying optical depth.

A simple retrieval algorithm exploiting different wavelength regions within the oxygen A-band is applied to selected GOSAT measurements to investigate cloud properties (optical depth and cloud height). The results are compared to collocated CALIOP measurements to verify the retrieved results. A case study is presented where simulations are compared to the measured spectrum and a photon path length distribution is inferred.