Geophysical Research Abstracts
Vol. 16, EGU2014-12116-1, 2014
EGU General Assembly 2014

Photon path length distributions for cloudy atmospheres from GOSAT satellite measurements

Beke Kremmling, Marloes Penning de Vries, and Thomas Wagner
Max Planck Institute for Chemistry, Mainz, Germany (beke.kremmling@mpic.de)

The presence of clouds in the atmosphere has significant influence on the photon paths of the scattered sunlight. Besides reflections of radiation at the cloud top, additional scattering events inside the cloud may occur and thus lengthening or shortening of the photon path in the atmosphere. Clouds consisting of multiple layers or patches may lead to a "ping pong" behaviour of the photons due to reflections at the individual surfaces.

The objective of our study is the retrieval of photon path length distributions for various atmospheric cloud situations which will lead to a better understanding of the influence of clouds on the atmospheric radiative transport. Following principles from ground based photon path length retrieval (Funk et al., 2003), our research uses the combination of space based measurements of the oxygen A-band and radiative transfer simulations.

The experimental spectra originate from the Japanese Greenhouse gases Observing SATellite (GOSAT), more precisely the Fourier Transform Spectrometer TANSO-FTS. Its high spectral resolution allows to almost completely resolve the individual absorption lines which is a prerequisite to our study. The Monte Carlo radiative transfer model McArtim (Deutschmann et al., 2011) is used to model the measured spectra. This model allows user-defined input for the altitude dependent cross sections and furthermore the incorporation of three dimensional cloud shapes and properties. From the simulation output and the sun-satellite geometry, photon path length distributions can be obtained.

Distributions of photon path lengths are presented for a selection of GOSAT observations of entirely cloud covered atmospheres with similar measurement geometries.