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Correction of atmospheric scattering effects in observations of carbon dioxide and methane from space: model study of GOSAT data processing

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This presentation concerns development of the retrieval algorithms for the processing of the Greenhouse gases Observing SATellite (GOSAT) data. GOSAT is scheduled to be launched in 2008 to monitor column amounts of CO₂ and CH₄ gases. A nadir-looking Fourier-Transform Spectrometer (FTS) of Short Wavelength Infrared (SWIR, 1.6 microns and 2 microns) and 0.76 microns oxygen A-band regions will be mounted on GOSAT.

We present an original methodology that accounts for thin cloud in carbon dioxide and methane retrievals from space-based reflected sunlight observations in near-infrared regions utilized by GOSAT. This approach involves a reasonable, simple parameterization of the effective transmittance using a set of parameters that describe the path-length modification caused by cloud. The complete retrieval scheme included the following: estimation of cloud parameters from the 0.76-microns O₂ A-band and from the H₂O-saturated area of the 2.0-microns band; the necessary correction to use these parameters at the target CO₂ (1.58 microns) and CH₄ (1.67 microns) bands using estimated ground surface albedo; and, finally, retrievals of the averaged-column CO₂ and CH₄ amount at the target bands. The proposed methodology offers the advantages of differential optical absorption spectroscopy (DOAS) and provides acceptably accurate carbon dioxide and methane retrievals from cloudy atmosphere.