



Global carbon dioxide and methane column observation by GOSAT (Greenhouse gases observing satellite)

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The observation of carbon dioxide and methane from space is expected to contribute to the better understanding of carbon cycle in global scale. The main task of GOSAT is to retrieve the column abundance from the reflected solar light spectra observed by a Fourier transform spectrometer (FTS). The wavelengths chosen are 2.0 micrometer for CO₂ (4,800-5,200 cm⁻¹), 1.6 micrometer for CO₂ and CH₄ (5,800-6,400 cm⁻¹), 0.67 micrometer for O₂ (12,900-13,200 cm⁻¹), and the thermal infrared band of 700-1,800 cm⁻¹. The weighting function of 2.0 micrometer is larger in lower troposphere and that of 1.6 micrometer is homogeneous up to 8 km in height, resulting in a good combination to retrieve the concentration profile information. The observed spectra are disturbed by the path-radiance caused by cloud and aerosol, and by the path length difference caused by the surface altitude/slope, and by the surface reflection spectra. Oxygen A band is used to make the correction of effective optical path-length to the surface altitude, cloud and aerosol. The optical thickness of cirrus cloud is evaluated from the reflection at the oxygen band and 2.0 micrometer saturated water vapor band.

The spectrometer we chose is an FTS with ZeSe beam-splitter combined with two corner-cube mirrors in a double pendulum structure. A similar FTS is used successfully in AIRS instrument. The field of view is 10.3 km in diameter or less, and there is a pointing mirror to compensate the motion of the satellite with the short term stability of 50 m, and to scan across the track (five points or less within +/-35 degrees), result-

ing in a 90-800 km mesh observation. A polar orbit with inclination of 98.05 degrees, local time of observation 1 pm and altitude of 666 km is selected. The recurrence rate is three days for 44 orbits (spacing 8.2 degrees longitude).