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TANSO-FTS/GOSAT スペクトルデータの複合利用による境界層内 CO2 濃度の推定
Usage of synergetic band spectra observed by TASO-FTS/GOSAT to estimate CO2 concentration in the boundary layer

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CO2 concentration near the surface is an important parameter for estimating the uptake speed into the forests and oceans, and/or emission strength over the urban areas. The greenhouse gas observing satellite (GOSAT) dedicated to observe atmospheric CO2 concentration was launched in 2009 and has been operated for more than four years. The main band of its sensor can measure the columnar concentration of CO2, however, they cannot be directly converted into the concentration near the surface. The objective of this study is to propose a method to estimate the CO2 concentration in the lower atmosphere, particularly in the boundary layer based on the synergetic usage of thermal infrared (TIR) and short wavelength infrared (SWIR) band data. Generally, CO2 emission and uptake occur near the surface, and the air is well mixed in the boundary layer during the daytime keeping the columnar concentration of the gas. However, CO2 mixing ration in the boundary layer is not determined only from the columnar concentration, i.e. the thickness of the boundary layer is necessary. It can be estimated from temperature (or potential temperature) profiles retrieved from TIR band spectra as well as the tropopause height. By combining CO2 columnar concentration retrieved from SWIR band spectra, upper air concentration retrieved from TIR spectra, and the tropopause height and boundary layer thickness, CO2 mixing ration in the boundary layer can be estimated assuming the concentration in the stratosphere based on the yearly trend. We applied this method to a dataset obtained over the Kanto Plain during the GOSAT specific observation periods, and the results were validated using CO2 mixing ration data operationally observed at a ground based observation site of the meteorological research institute (MRI/JMA) in Tsukuba.

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