Assessment of uncertainty in CH4 concentrations retrieved from thermal infrared spectra of GOSAT/TANSO-FTS sensor

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CH_4 is one of major greenhouse gases as well as CO_2 in the atmosphere. For global observation of CO_2 and CH_4 with high accuracy/precision, the Greenhouse gases Observing Satellite (GOSAT) has been developed by National Institute for Environmental Studies (NIES), Ministry of the Environment, and Japan Aerospace Exploration Agency (JAXA) and planed to be lunched in 2008. This study assesses uncertainty in CH_4 profiles retrieved from thermal infrared spectra (band 4)of the GOSAT/TANSO-FTS sensor. We focused on the spectral region centered at 7.7 micron (1200-1400 cm^{-1}). The spectral region contains absorption bands of H_2O and N_2O as well as that of CH_4. The effects of uncertainties in H_2O and N_2O concentrations on retrieved CH_4 concentrations were examined in this study. The spectral resolution in band 4 is about 0.2 cm^{-1} and the signal to noise ratio (S/N) is designed to be around 300 at a brightness temperature of 280 K; these values were used to compute pseudo-spectra of TANSO-FTS. Based on the maximum *a posteriori* (MAP) method for CH_4 retrieval, 10% biases in H_2O and N_2O concentrations produced biases of 3% and 2.5% in retrieved CH_4 concentrations, respectively, and +/-0.5% random scatters led to 0.4% and 0.3% CH_4 random errors, respectively. However, selecting channels appropriate for CH_4 retrieval on the basis of information content of CH_4 computed following the Shannon' s information theory [*Shannon and Weaver*, 1949] could reduce both bias and random errors in retrieved CH_4 concentrations to be one fifth of the errors in the case of all the channels used.