

Seasonal change of methane observed over Alaska with ground-based FTIR spectrometer.

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Background and purposes

Methane (CH_4) is a one of important molecules for greenhouse effect from its strong radiative forcing in the troposphere [e.g., Brasseur *et al.*, 1999]. The National Institute of Information and Communications Technology (NICT) have been observing solar absorption spectra over Poker Flat (65.1N, 147.4W, 0.61 km), Alaska since 1999 by using a high-resolution ground-based FTS to investigate the atmospheric environment from the troposphere to the thermosphere. The purpose of the study is to investigate seasonal and annual cycles of methane over Alaska. This presentation shows retrievals of methane data and its seasonal cycle. Precise error estimation of Poker Flat methane is also one of our purposes because our Poker Flat FTS joins validation study with GOSAT methane data.

FTS and retrievals

The FTS instrument, a Bruker 120 HR, was installed at Poker Flat in July 1999. Its observation frequency range and frequency resolution are $750.0\text{-}4200.0\text{ cm}^{-1}$ and 0.0019 cm^{-1} , respectively. The instrument is equipped with Mercury Cadmium Telluride (MCT) and Indium Antimonide (InSb) detectors, which cover the 7.0-14.0 micron and 2.0-5.5 micron spectral regions, respectively. A micro-window at $\sim 2600\text{ cm}^{-1}$ is used for the methane retrievals. The retrieval procedure used the SFIT2 software algorithm, which incorporates Rodgers' formulation of the Optimal Estimation Method (OEM) with an iterative Newton scheme [Rodgers, 2000].

Seasonal cycle of methane

Poker Flat methane data is consistent with Atmospheric Chemistry Experiments (ACE) methane data within $\sim 10\%$ in partial column [M.DeMaziere *et al.*, 2008]. Methane seasonal cycle over Poker Flat showed the methane indicates its maximum value in winter and gradually decreases toward summer. This feature is reasonable qualitatively because methane amount correlates with OH radical in the troposphere. This presentation shows seasonal cycle including recent observations till 2008 as well as detailed model parameters. We are going to estimate errors of Poker Flat methane from error analysis and compare with GOSAT data in near future.

Brasseur *et al.*, (1999), Atmospheric chemistry and global change, *Oxford University Press*.

M.DeMaziere *et al.*, (2008), Validation of ACE-FTS v2.2 methane profiles from the upper troposphere to the lower mesosphere, *Atmos. Chem. Phys.*, 8(9), 2421-2435.

Rodgers, C. O. (2000), Inverse methods for atmospheric sounding: Theory and practice, *World Scientific*.