4.079 Seasonal and inter-annual variations of methane at the upper troposphere.

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Abstract:

To deeply understand climate change, it is important to understand the dynamical processes of transport in free-troposphere and stratosphere-troposphere exchange. We used the profile data (e.g., carbon dioxide (CO_2) and methane (CH_4) profiles) of GOSAT TANSO-FTS Level 2 (the latest version 01.XX [Saitoh et al., AMT, 2016]) and the other trace gases (e.g. ozone) to understand the above issues. These trace gases are long-lived in the troposphere and lower stratosphere, and are retrieved mainly from thermal infrared radiance (TIR) spectra of Band 4 of TANSO-FTS. The present study focuses on the seasonal and inter-annual variations of CH_4 in the upper troposphere and lower stratosphere. To compare, we used the model simulation data, NIES-Transport Model ver.5 [Saeki et al., GMD, 2013] and Nonhydrostatic Icosahedral Atmospheric Model (NICAM)–based Transport Model (TM) [Niwa et al., JMSJ, 2011]. The analysis period is from January 2010 to December 2013.
The spatial and temporal variations of CH_4 are similar with respect to the previous studies, for example, the seasonal march of latitudinal distribution, and the hemispheric contrast. The high concentration was seen over land at the high latitudes in the boreal winter and the central- and east-Asian during the boreal summer. At the south-central pacific, low concentration was seen during the boreal winter and spring. On the other hand, high concentration existed at the equatorial Indian Ocean and the western Pacific during the boreal summer and autumn. It was found that the CH_4 transports from the lower to the upper troposphere over the convective regions continuously. However the isolated maximum at the middle troposphere was seen in the low latitudes. The year-to-year variations removing the trend of CH_4 at the upper troposphere are larger than that of the simulation data, especially at the subtropical region.