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Long-term variations of atmospheric methane concentration over Siberia derived from aircraft and tower measurements

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Methane measurements over Siberia are crucial for estimating global CH_4 emissions since Siberia is estimated to contain over 100 million ha of wetlands. We have been acquiring long-term records of atmospheric CH_4 concentration in Siberia at 3 sites (Surgut, Novosibirsk, Yakutsk) using aircraft since 1993 and at a tower network since 2004 (JR-STATION: Japan-Russia Siberian Tall Tower Inland Observation Network, Sasakawa *et al.,* 2010, 2012). Observed CH_4 concentrations at the tower sites in West Siberia showed much higher than those observed at coastal background sites operated by NOAA in northern high latitudinal zone. They also exhibited clear seasonal cycle with double maxima in winter and summer. However increasing trend observed in background sites did not appear in tower data due to high variability in concentration during summer and winter. On the other hand, aircraft data did not have clear seasonal cycle but showed obvious increasing trend. Global stagnation in rise of CH_4 concentration around 2000-2006 was observed in aircraft data over taiga sites (Novosibirsk, Yakutsk) but not clear over wetland site (Surgut). In Surgut, vertical difference of CH_4 concentration in recent years between 1 km and 5.5 km altitude data decreased less than 2/3 of that in early 1990's. This weakening vertical gradient appeared in other altitude data (0.5-4 km) as well. Simulation results with a chemistry-transport model (ACTM; Patra *et al.,* 2009) suggested that transport influence on this trend could be small. A regional emission tagged tracer simulation with the ACTM (Umezawa *et al.,* 2014) indicated that the CH_4 emissions from West Siberia and Europe could produce most extent of the vertical gradient. This finding thus suggested that the sum of dominant emissions decreased in these 20 years.

References
Patra *et al., J. Meteorol. Soc. Jpn.,* **87**(4), 635-663, 2009.
Sasakawa *et al., Tellus,* **62**B, 403-416, 2010.
Sasakawa *et al., Tellus,* **64**B, 17514, doi:10.3402/tellusb.v64i0.17514, 2012.
Umezawa *et al, Tellus,* **66**B, 23837, 2014.

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