Analysis of Siberian CH4 flux during 1994-2010

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A vast Siberian forest area and the largest West Siberian wetland area in the world play a significant role in the global carbon cycle as a large carbon sink and a major natural source of atmospheric CH4. Moreover the high Siberian Arctic land areas containing thick permafrost layers with carbon rich soils could release high CO2 and CH4 emissions thawing under a warmer climate. In this study, we estimate monthly CH4 fluxes for 43 regions including 4 regions over Siberia during 1994-2010 using a fixed-lag Kalman smoother and investigate the year-to-year variation of Siberian CH4 flux to understand climate-induced changes in Siberian CH4 flux and the significance of Siberia on year-to-year variation of global CH4 budget. Continuous and event measurement data of atmospheric CH4 taken from WDCGG are inverted to optimize CH4 fluxes in this study. Airborne observations of CH4 at three sites over Siberia are used to adjust the magnitude of Siberian CH4 flux with inverse modeling: at Surgut over wetlands and at Novosibirsk and Yakutsk over forests. We use interannually varying CH4 emissions and interannually repeating OH, Cl and O1D radicals provided by TransCom-CH4 project (Patra et al., 2011) in forward simulation by NIES transport model (Belikov et al., 2011).

Keywords: Siberian CH4, inverse modeling