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Tropospheric methane and carbon dioxide over West Siberia: observation data analysis, surface flux inventories and transport modeling (*Invited*)

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Observations of the atmospheric methane and carbon dioxide are conducted at 4 airborne sites and 9 towers in Siberia. We present analysis of several years of data with tracer transport model and inverse modeling. Observed CO_2 seasonal cycle in West Siberia is relatively strong in comparison to background locations, which agrees well with transport model simulations. Inverse modeling of the regional fluxes with observed monthly mean carbon dioxide climatology allows us to improve ecosystem flux seasonality. Large synoptic scale variability is observed with close correlation between sites separated by 300-500 km. In summer the synoptic CO_2 variability is reproduced by transport model, but in winter observations show more variability than simulations. A coupled, high resolution Lagrangian transport model was applied to simulate high resolution time series of methane and carbon dioxide at tower sites, significantly improving the simulations of variance at weekly to sub-daily time scale. Vertical CH_4 profile observations are useful for constraining strength of both summer and winter emissions. Methane airborne profiles observed over West Siberia are compared with a model of atmospheric transport and chemistry. Model simulations conducted with EDGAR/GISS methane surface flux inventories are matching within model uncertainty with the observations in Surgut, but are less successful in the south of West Siberia. We prepared regional wetland methane flux inventory map based on detailed wetland map and survey of all available surface flux observations with static and automatic chambers that gives upward correction of the fluxes in the southern taiga, while similar correction is suggested by comparing airborne observation data to the model simulations.

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