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CONTROL ID: 1471465

TITLE: Carbon flux estimation for Siberia by inverse modeling constrained by aircraft and tower CO_2 measurements

ABSTRACT BODY: Despite Siberian ecosystems being one of the largest carbon reservoirs in the world, the Siberian carbon sink remains poorly understood due to the limited numbers of observations. We present the first results of atmospheric CO_2 inversions utilizing measurements from a Siberian tower network (Japan–Russia Siberian Tall Tower Inland Observation Network; JR-STATION) and four aircraft sites, in addition to surface background flask measurements by the National Oceanic and Atmospheric Administration (NOAA). The inverse model estimates monthly fluxes for 68 regions globally. Our inversion with only the NOAA data yielded a boreal Eurasian CO_2 flux of –0.56 ± 0.79 GtC yr^{-1}, whereas we obtained a weaker uptake of –0.35 ± 0.61 GtC yr^{-1} when the Siberian data were also included. This difference is mainly explained by a weakened summer uptake, especially in East Siberia. We also found the inclusion of the Siberian data had significant impacts on inversion results over northeastern Europe as well as boreal Eurasia. The inversion with the Siberian data reduced the regional uncertainty by 22 % on average in boreal Eurasia, and further uncertainty reductions up to 80 % were found in eastern and western Siberia. Larger interannual variability was clearly seen in the inversion including the Siberia data than the inversion without the Siberia data. In the inversion with NOAA plus Siberia data, East Siberia showed larger interannual variability than that in West and Central Siberia. Finally, we conducted forward simulations using estimated fluxes and confirmed that the fit to independent measurements over Central Siberia, which were not included in the inversions, was visibly improved.

CURRENT SECTION/FOCUS GROUP: Global Environmental Change

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INDEX TERMS: [0365] ATMOSPHERIC COMPOSITION AND STRUCTURE / Troposphere: composition and chemistry, [0428] BIOGEOSCIENCES / Carbon cycling.

AUTHORS/INSTITUTIONS: T. Saeki, S. Maksyutov, M. Sasakawa, T. Machida, CGER, NIES, Tsukuba, JAPAN;
M. Arshinov, V. E. Zuev Institute of Atmospheric Optics of the Siberian Branch, Russian Academy of Sciences, Tomsk, RUSSIAN FEDERATION;
P.P. Tans, T.J. Conway, T. Oda, , NOAA Earth System Research Laboratory, Boulder, CO;
M. Saito, , Laboratoire des Sciences du Climat et de l'Environnement, Gif sur Yvette, FRANCE;
V. Valsala, , Indian Institute of Tropical Meteorology, Pune, INDIA;
T. Oda, Cooperative Institute for Research in the Atmosphere, Colorado State University, Fort Collins, CO;
R.J. Andres, , Oak Ridge National Laboratory, Oak Ridge, TN;

SPONSOR NAME: Tazu Saeki

CONTACT (E-MAIL ONLY): saeki.tazu@nies.go.jp

TITLE OF TEAM:

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