Geophysical Research Abstracts
Vol. 19, EGU2017-12980, 2017
EGU General Assembly 2017

Inversion model estimates of methane emissions from northern wetlands during soil freezing period

Tuula Aalto (1), Aki Tsuruta (1), Vilma Kangasaho (1), Kimmo Rautiainen (1), Leif Backman (1), Ingrid van der Laan-Luijkx (2), Maarten Krol (2,3,4), Renato Spahni (5), Sebastian Lienert (5), Edward Dlugokencky (6), Tuomas Laurila (1), Juha Hatakka (1), Doug Worthy (7), Motoki Sasakawa (8), Olli Peltola (9), Aleksanteri Mauranen (9), Martin Heimann (10), Lena Kozlova (11), Andrew Crotwell (6), and Wouter Peters (2)

(1) Finnish Meteorological Institute, Helsinki, Finland (tuula.aalto@fmi.fi), (2) Wageningen University, Meteorology and Air Quality, the Netherlands, (3) SRON Netherlands Institute for Space Research, the Netherlands, (4) Institute for Marine and Atmospheric Research, Atmospheric Physcis and Chemistry, the Netherlands, (5) University of Bern, Climate and Environmental Physics, Swizerland, (6) NOAA Earth System Research Laboratory, Global Monitoring Division, U.S.A., (7) Environment Canada, Atmospheric Greenhouse Gases, Canada, (8) National Institute for Environmental Studies, Center for Global Environmental Research, Japan, (9) University of Helsinki, Department of Physics, Finland, (10) Max Planck Institute for Biogeochemistry, Department of Biogeochemical Systems, Germany, (11) University of Exeter, College of Life and Environmental Sciences, U.K.

The northern wetland methane emissions continue throughout the autumn season, and the transition period when subsurface soil temperatures are near freezing may significantly contribute to the annual biospheric methane budget. Methane fluxes at northern latitudes were estimated with Carbon Tracker Europe – CH4 (CTE-CH4) atmospheric inversion model, optimizing separately for anthropogenic and biospheric fluxes. The results were combined with top-soil freeze data from satellite (SMOS) to quantify the late autumn season biospheric emissions and find out whether they continue throughout the period when the soil freezes. The enhanced in situ observation network at northern latitudes enables spatially better resolved flux estimates. Fluxes were solved in weekly time resolution, enabling the follow-up of soil freeze development. Generally, the methane emissions continued throughout the transition period until complete top-soil freeze, and there was a positive correlation between the magnitude of the emissions and the length of the transition period.