

Northern boreal methane emission estimates from CTDAS-CH₄ data assimilation system

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Boreal and arctic terrestrial land is covered by a large areas of peatlands, where about one fifth of global terrestrial carbon is stored. The region is very sensitive to the changes in temperature and water balance; the annual average temperate increase is nearly twice the global mean change, plus it is expected to release soil carbon into the atmosphere due to the warming. The largest sources of methane (CH₄) emissions from the boreal and arctic regions are natural biospheric sources, such as peatlands, wetlands and permafrost. However, their magnitude and spatial distribution still vary greatly in the process model estimates, mainly due to the heterogeneity of CH₄ fluxes, and the uncertainty in wetland extent. In this study, we estimate CH₄ fluxes in northern Fennoscandia, north west Russia and west Canada for 2004-2015 using the CTDAS-CH₄ data assimilation system. Continuous and discrete atmospheric CH₄ observations from in situ stations are assimilated, and CH₄ fluxes are optimized at 1°x1° horizontal resolution in those regions. In addition, atmospheric CH₄ observations from the global in situ stations are assimilated to constrain the global budget. The estimated fluxes will be compared with the process model estimates and flux observations, such as those based on the eddy covariance method, to better identify the spatial distribution and magnitude of CH₄ emissions in boreal and arctic regions.

Keywords: methane, atmospheric inverse model, northern boreal region, peatland