Geophysical Research Abstracts
Vol. 21, EGU2019-11593, 2019
EGU General Assembly 2019

Estimation of natural methane fluxes and wetland area dynamics in a climate model of intermediate complexity

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Methane is one of the most significant greenhouse gases by its impact on the Earth's climate system. Its concentration in the atmosphere increased from 400 ppb during the last glacial maximum to 700 ppb by the mid-18th century. To date, it has increased more than 2.5 times, exceeds 1800 ppb and continues to grow at a rate of about 5 ppb / year. The growth of methane concentration in atmosphere results from the balance between emissions and sinks. The largest and the most volatile on an inter-annual scale source of methane is wetlands. Emissions from wetlands are highly sensitive to climate change and variability. Emissions from wetlands of northern circumpolar region could potentially increase due to the rapid climate warming of the Arctic in the 21st century. Multi-model estimates show low confidence in the modeled area of wetlands and methane emissions, both in space and in time. The model of methane emission from wetlands proposed in A.M. Obukhov Institute of Atmospheric Physics RAS (IAP RAS) was supplemented with a scheme for calculating the area of wetlands within the model cell based on TOPMODEL approach and integrated in IAP RAS climate model. Made an assessment of global and regional changes in wetlands area and methane emission under climate change in the 21st century in interactive experiments with the IAP RAS global climate model with anthropogenic and natural forcing on the system in accordance with the RCP scenarios. This study is supported by Russian Science Foundation (17-77-10152).