

Evaluation of changes in methane emissions by wetlands of the European and Asian parts of Russia in the 21th century based on regional climate model simulations.

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Module of methane emissions based on [1] was developed for the climate model of intermediate complexity of the A.M. Obukhov Institute of Atmospheric Physics RAS (IAP RAS CM). Previous simulations with this module were performed with use of data of relatively coarse spatial resolution [3,4]. In present work, a simulation with module of methane emissions is performed using the MGO regional climate model simulations data for the 21th century [5] with high spatial resolution. A simulation is forced by temperature and fractional saturation of soil layers and performed only for regions with porosity higher than 0.4 which is the evidence of presence of peat in the soil.

Simulations was performed for the European and Asian parts of Russia (Fig. 1). Simulated methane emissions for the present day period (1991-2000) amount about 8 MtCH₄/yr for the European part of Russia and 10 MtCH₄/yr for the Asian part (Fig. 2). Geographical distribution of the simulated methane emissions is realistic as a whole if compared with map [2]. A notable exceptions is the region near Baltic Sea where simulated emissions are low and the southern part of eastern Europe where emissions absent in observations.

Simulated emissions increase up to 11 for the European part of Russia and 13 MtCH₄/yr for the Asian part to the middle of the 21th century, and up to 14 and 17 MtCH₄/yr to its end, respectively (Fig. 3). These tendencies are related to the increase of thaw period in soil and integral methane production dependence on temperature.

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References

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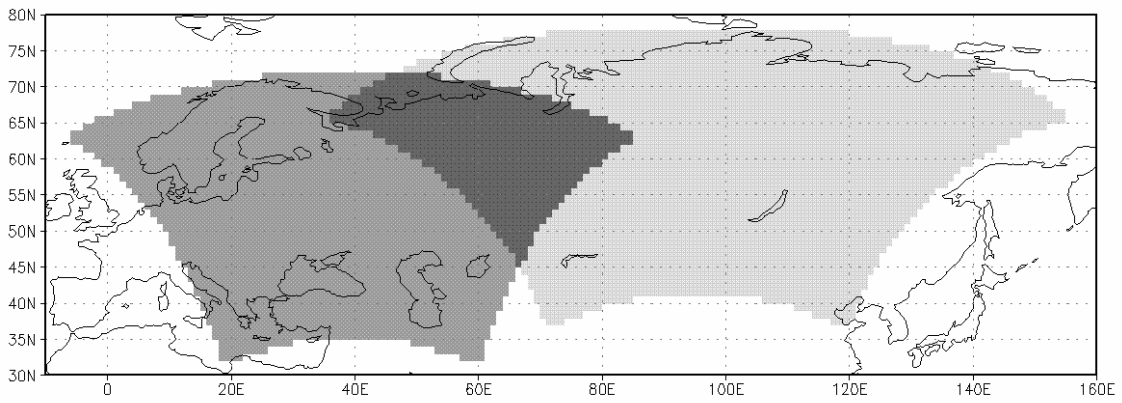


Figure 1: European and Asian parts of Russia in regional climate model.

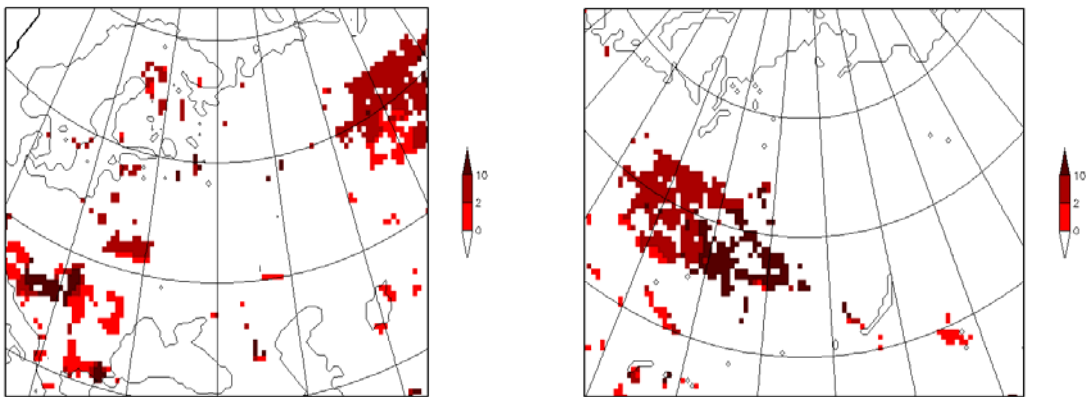


Figure 2: Modelled methane emissions ($\text{g}\cdot\text{m}^{-2}\cdot\text{yr}^{-1}$) in the end of the 20th century.

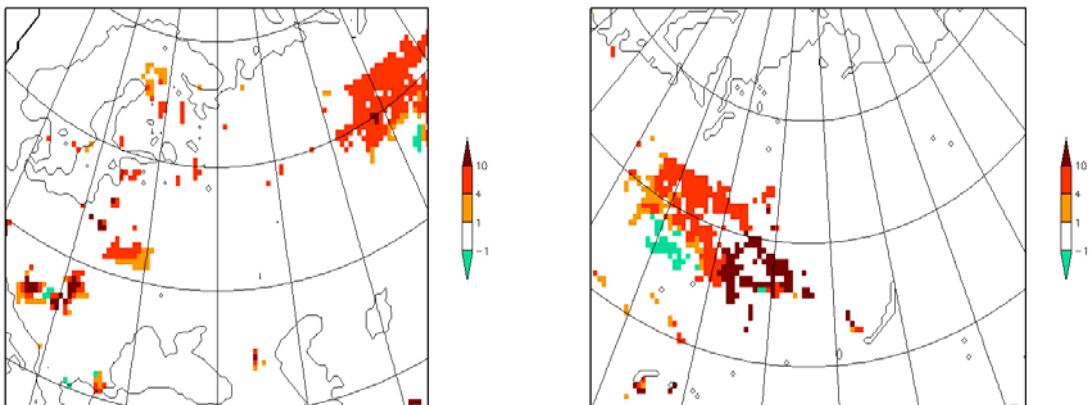


Figure 3: Changes in simulated methane flux ($\text{g}\cdot\text{m}^{-2}\cdot\text{yr}^{-1}$) from the end of 20th century to the end of 21th.