

Changes in wetland methane emissions in the IAP RAS global model under RCP anthropogenic scenarios

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The sensitivity of methane emissions in the Northern Hemisphere to the North Atlantic Oscillation (NAO) variability was estimated for the second half of the 20th century. To simulate methane fluxes from natural wetlands, we used a methane emissions scheme (Denisov et al. 2010, 2013). Model estimations of methane fluxes and their variations were made using the time series of monthly data CRU TS3.1 for the near-surface temperature, precipitation and cloud cover in 1960-2009. Other characteristics were taken from the full version of the A.M. Obukhov Institute of Atmospheric Physics RAS global climate model (IAP RAS GCM). For analysis we selected 5 years with the highest NAO index (1 for each decade in 1960-2009 period) and correspondingly 5 years with the lowest NAO index for winter (DJF). The comparison of methane fluxes was performed for the upcoming warm period.

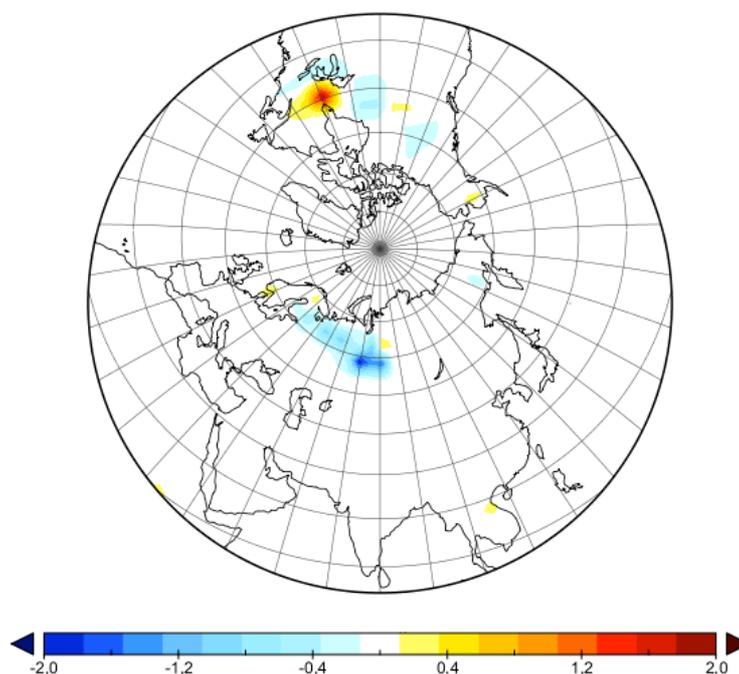


Figure 1. The difference in methane emission [$\text{gCH}_4/\text{m}^2/\text{year}$] between years with the highest and the lowest NAO indices.

The estimated methane emissions from the western Siberian wetlands are approximately $2 \text{ gCH}_4/\text{m}^2/\text{year}$ higher in the positive phase of NAO than in its negative phase (Fig.1). The difference is about 20% of the average methane emission for the second half of the 20th century. A strong interannual variability of methane emissions was noted for this region so such a difference can be partly explained without taking into account its connection with NAO. But it should be noted that methane emissions strongly depend on the near-surface atmospheric temperature and rainfall during the cold season.

The linkage of these characteristics with abnormal values of the NAO index to some extent determines the anomalous character of methane emissions in the following years.

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References

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