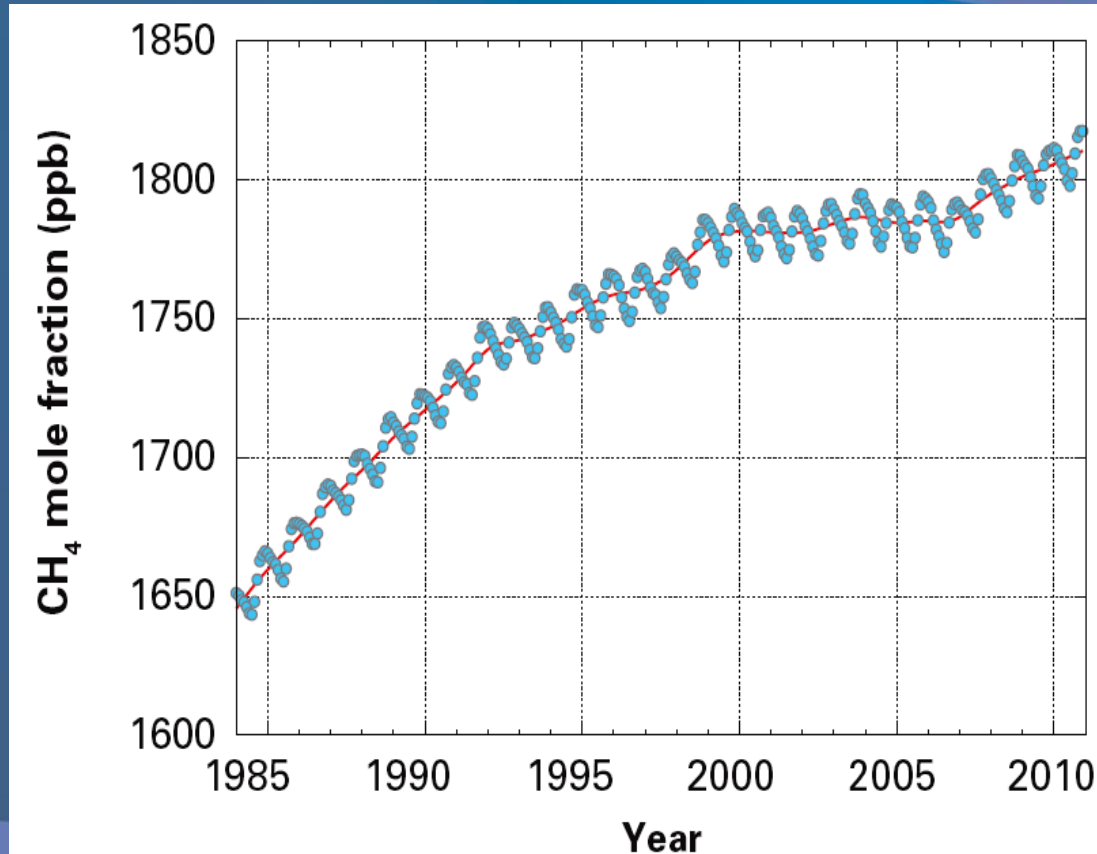


## Wetlands and methane emission in the XXI century: RCM-based projection for Northern Eurasia

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## Globally averaged methane emission



The most likely cause of the increase is greater than average wetland CH<sub>4</sub> emission at high northern latitudes

## Experimental setup

The GCM+RCM+ground heat transfer model

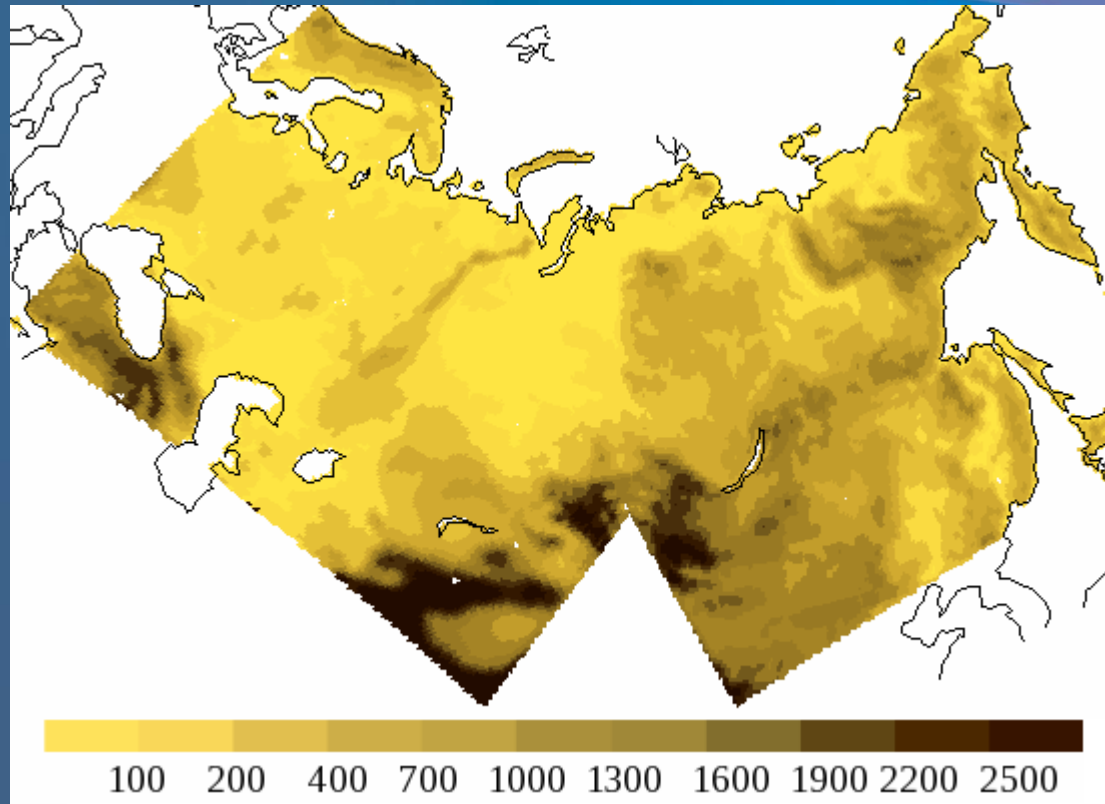
Modeling system is driven by SST/Ice projections derived from 3 CMIP3 models:

ECHAM5/OPYC3 (3 members)  
MIROC3.2medres (1 member)  
HadCM3 (1 member)

Five simulations span 20yr slices for 1981-2000 and 2041-2060 under IPCC A2  
GHG/aerosols emission scenario



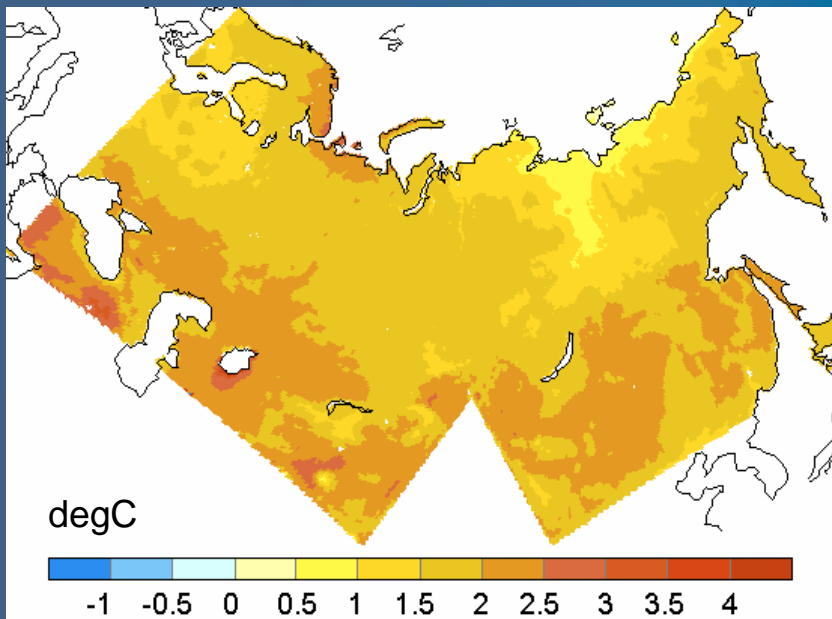
## RCM domains at 25 km resolution



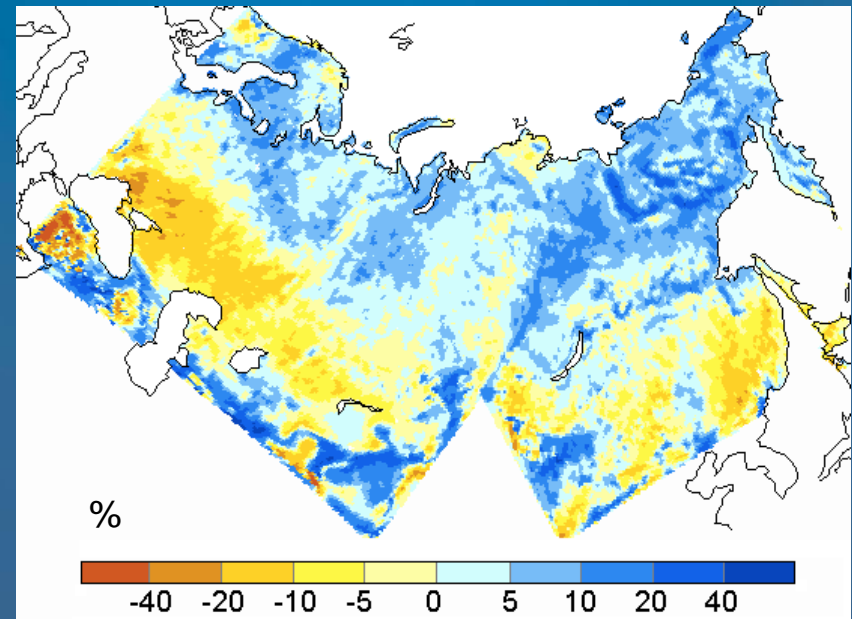


## Ensemble mean changes over Northern Eurasia

Changes in the surface air temperature (JJA)

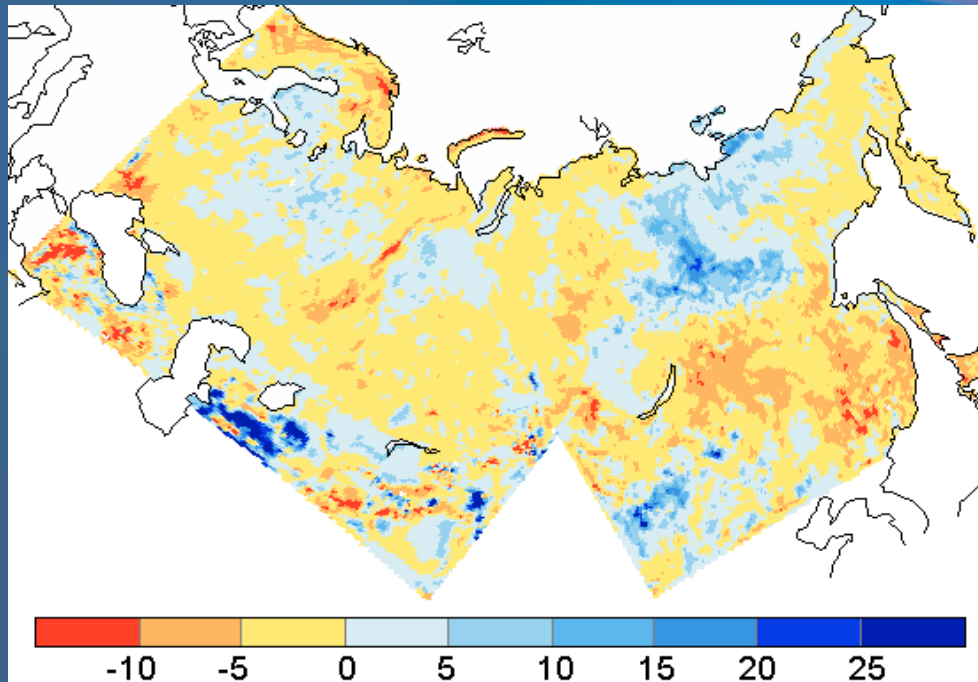


Changes in the total precipitation (JJA)



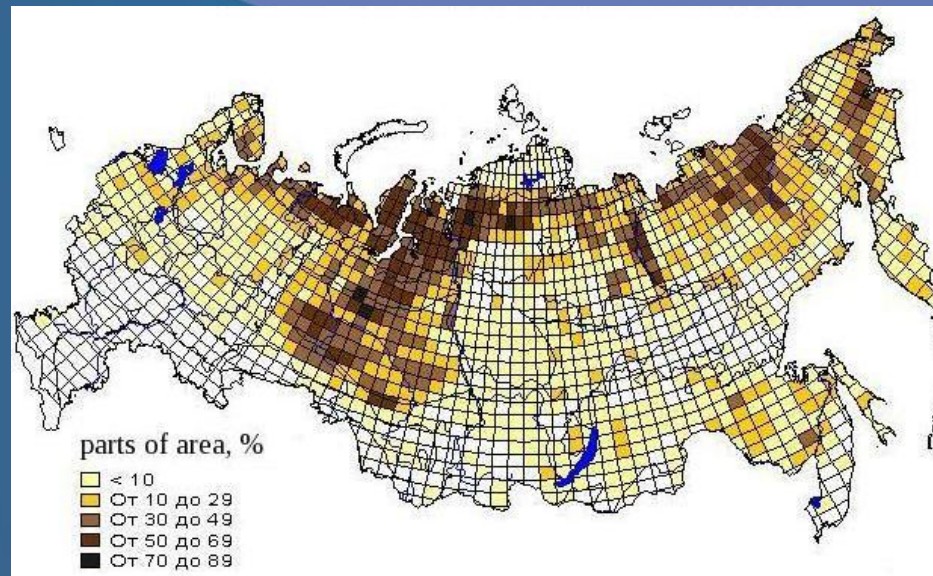


## Ensemble mean changes in soil moisture (JJA), %

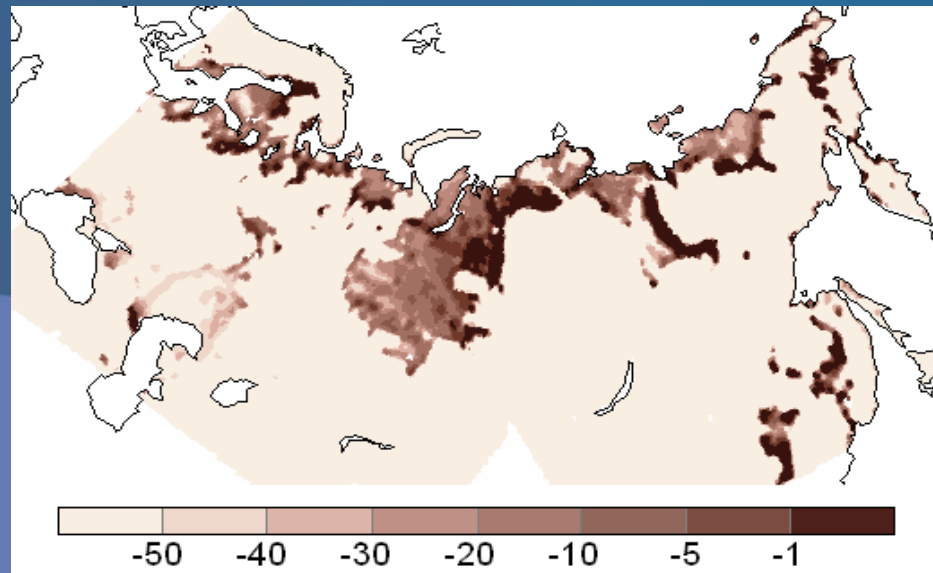


Soil moisture and water table position controls methane production and oxidation processes

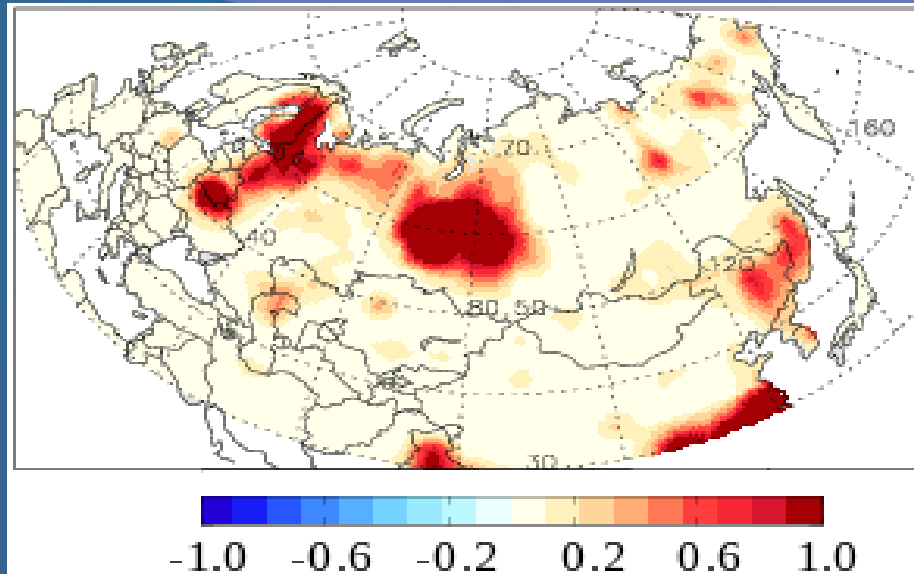
## Synthetic observations of wetland area (ILAN RAS)



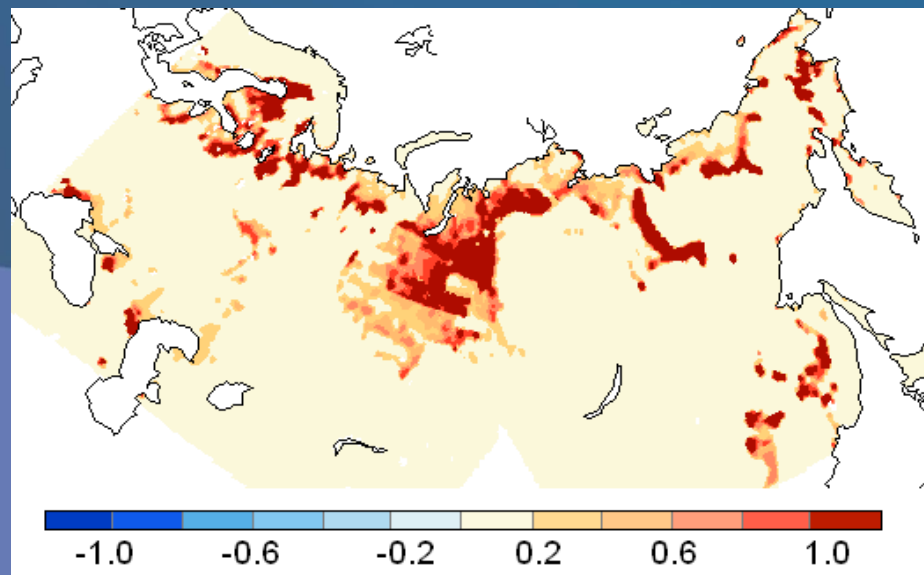
## Model distribution of water table (1981-2000), cm



Methane emission analysis, July (2000-2005),  
g/m<sup>2</sup>/month



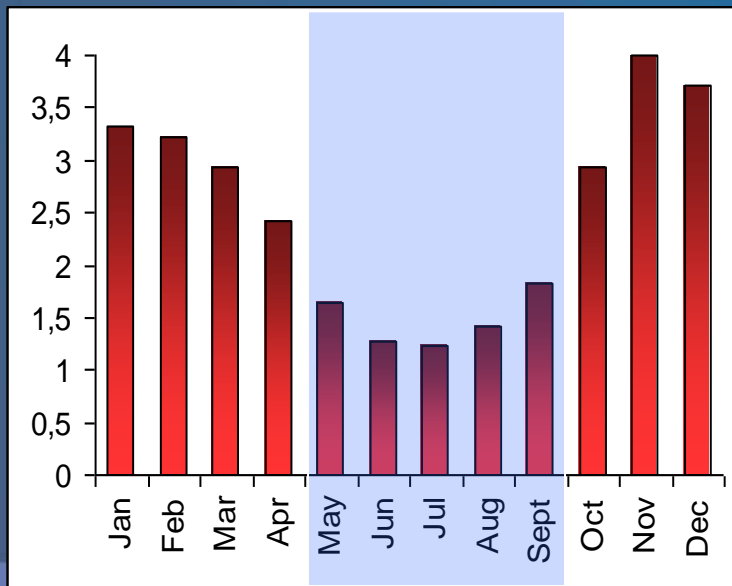
Modeled methane emission, July (1981-2000),  
g/m<sup>2</sup>/month



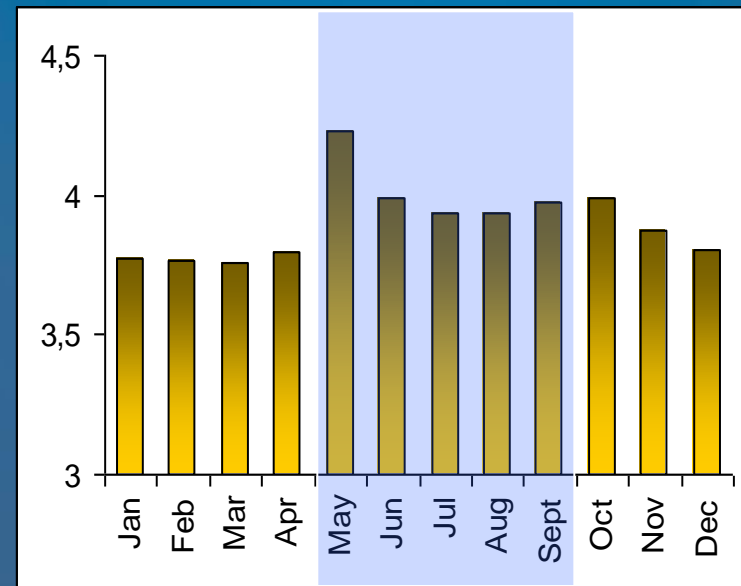


## Ensemble mean changes of upper layer temperature and water table depth in the wetland areas

Upper layer temperature, degC

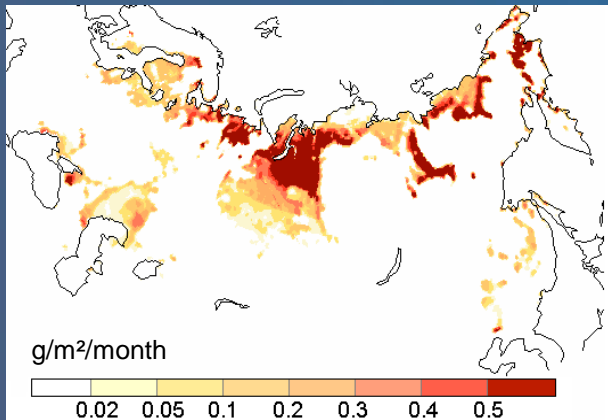


Water table depth, cm

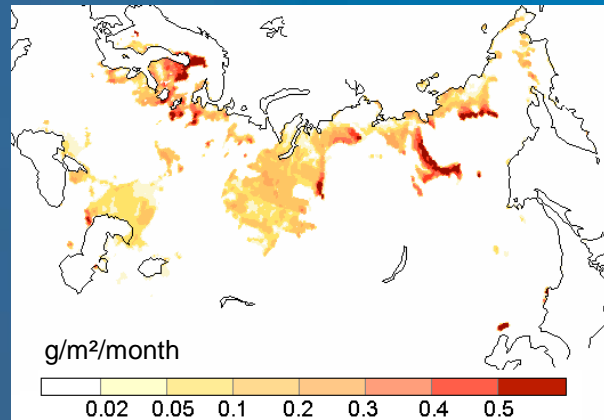


## Ensemble mean changes in methane fluxes and signal-to-noise ratio

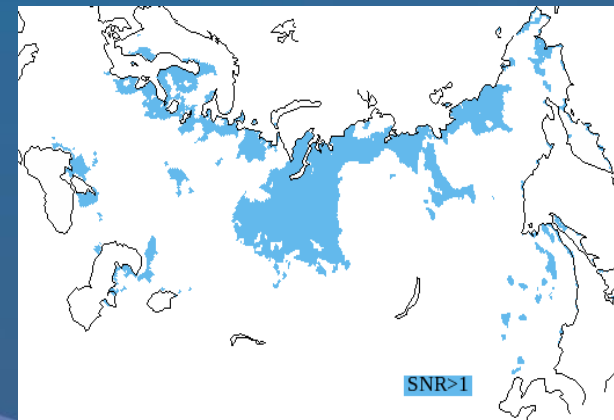
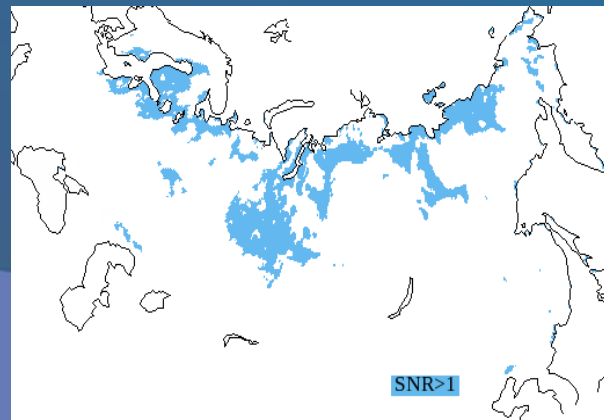
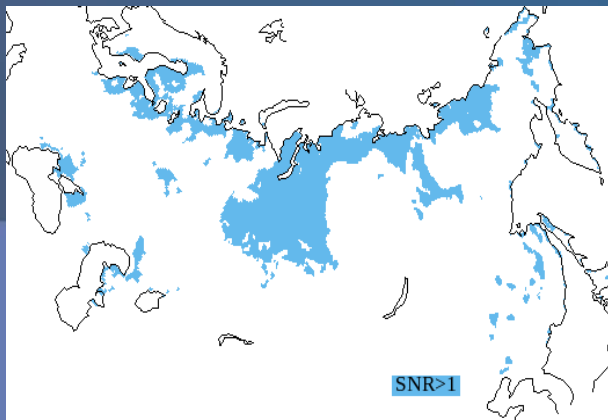
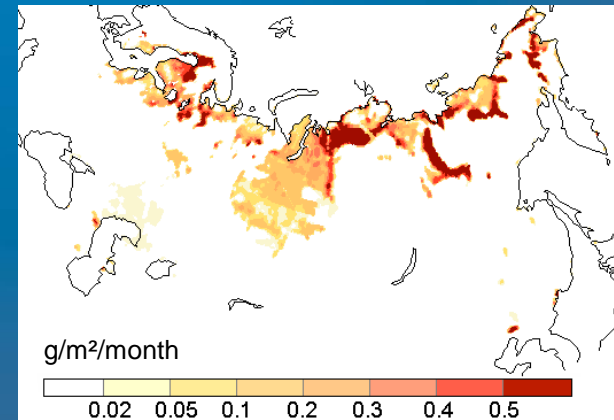
May



June-July-August



September



Current and future methane emission based on RCM projection,  
Mt[CH<sub>4</sub>]/year

	1981-2000	2041-2060
Northern Eurasia	19±0.4	25±0.9

## Summary

The future projections of wetlands and methane fluxes are inferred from high resolution GCM/RCM ensemble simulations for the late 20<sup>th</sup> and mid 21<sup>st</sup> centuries over the Northern Eurasia.

It has been shown that the applied multiscale (global to local) modeling system tends to reproduce the observed wetland distribution and methane emission in the Northern Eurasia.

Most prominent increase in the methane emission by the mid 21<sup>st</sup> century is projected in May and September. Total annual wetland emission will likely increase in 50 years by approximately 30% with respect to the emission in the late 20<sup>th</sup> century.

Further development suggests increasing RCM ensemble size and resolution; implementation of more sophisticated methane production schemes and introduction of different wetland types.

## Acknowledgments

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