

Estimation of CH₄ emission from Siberian natural wetland by land surface dynamics characterization with remote sensing

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Abstract: Snow cover amount and duration have a large role in both the natural and anthropogenic systems. Any changes in the climatology of the amount, duration, and timing of the snowpack may have long-lasting environmental and economic consequences. Being one of the most important ecosystems, wetlands are presumed to be a source of methane emission. Methane emission always influenced by many reasons or environment conditions and it has complicate variation. Nowadays estimation methods by using passive remote sensing to approaching actual reality are come out one after the other even it is not easy to consider each of impact factors.

The objective of this study is to estimate methane emission through analyzing LSWC (Land Surface Water Coverage) and considering NDVI, land surface temperature and precipitation as well.

In this paper, firstly, using globcover land-cover map of Eastern Europe for the essential data, which is a product of MERIS from ENVISAT, masking out the wetland distribution. Secondly, create several points interested in and calculating timing and duration of snow and water coverage. Thirdly, process the data as an area scale in time series from 2003 to 2011. Using average, the most value and other threshold value to find out the natural phenomenon of snow and water coverage in each year. Finally, Snow and land surface water coverage behavior such as timing, duration and offset and onset date will be investigated from high confidence, valuable and density appearance of representative regions.

Following the result of methane emission of one specific point in Siberia in ACRS in 2012, in this study will estimate not only the water and snow coverage conditions as duration and timing dynamics in regional scale and the changes of natural wetland, but also the methane flux.

To estimate the methane emission, there are several parameters will considered in this study. It will be by extending the model from points to continental scale by LSWC, LST, NDVI and precipitation. The preliminary result of snow and water coverage implies the trends of wetland changes. LST and precipitation could out to further proof of that trend. Since global warming, the more water coverage create more anaerobic environment and cause more methane flux. More NDVI represent more methane emission in growing season also. After all analyzation and estimation, methane emission seasonal dynamics are compared with GOSAT and SCHIAMCY measurement.

By gradually changing trend of wetland, the expecting result is methane emission should increase. We will try to provide scientific reason based on nowadays' study to explain why big changes happened in Siberian natural wetland and the importance of environmental controls.

Keywords: Snow, LSWC, LST, NDVI