Remote sensing of methane (CH4) emission flux in the Sanjiang plain in northeastern China

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Wetlands are major sources of methane (CH4) emission, one of the most important greenhouse gases. Accurate estimates of CH4 emission flux in wetlands are critical for modeling the spatial-temporal pattern of greenhouse gases and its impacts on climate change. Sanjiang Plain in northeastern China is a low alluvial plain formed by three rivers and is an active source of CH4. However, few studies have been conducted on CH4 emission in this area from a remote sensing perspective. The objective of this study was to estimate CH4 emission flux in wetland using remotely sensed data by Moderate Resolution Imaging Spectroradiometer (MODIS). Daytime and nighttime land surface temperature (LST) and two vegetation indices (NDVI and EVI) extracted from 2000 through 2004 MODIS data were analyzed with biweekly ground measurements collected in a freshwater marsh in Sanjiang Mire Wetland Experimental Station (47o35' N, 133o31' E) from 2001 to 2002. Correlation analysis showed that both nighttime LST and EVI have significant effects on CH4 emission in Sanjiang plain. A linear regression model was established using 2001 measurements to predict the CH4 emission flux using MODIS nighttime LST and EVI. Evaluation using 2002 measurements showed a good agreement between model-predicted CH4 emission flux and in situ measurements. This study indicates that integration of ground measurements of CH4 emission flux and remotely sensed MODIS data provides reliable information for spatial-temporal patterns studies of methane emissions in wetlands.