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Wetland methane dynamics in East Asia monsoon region (2000-2012)

Xiaoyan Zhang (1), Xiyan Xu (2), Gensuo Jia (3), Benjamin Poulter (4), and Zhen Zhang (5)

(1) School of Atmospheric Science, Nanjing University of Information Science and Technology, Nanjing 210044, China (xxiaoyzhang@163.com), (2) Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China (xiyan.xu@tea.ac.cn), (3) Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China, (4) NASA Goddard Space Flight Center, MD 20771, USA, (5) Dynamic Macroecology, Swiss Federal Research Institute WSL, Birmensdorf 8903, Switzerland

Wetland methane (CH4) emissions contribute to about one third of total natural and anthropogenic emissions. The interannual variation of the wetland CH4 emission is largely correlated with the wetland extent and climate drivers. We use results from 11 process models that contributed to Global Methane Budget (2000-2012) project to investigate the interannual variation and trend of wetlands methane emissions and their drivers in Asian Monsoon region and its sub-regions. The sub-regions are classified and reshaped based on Koppen-Geiger climate zone as: Equatorial fully humid (Af), Equatorial monsoonal (Am), Warm temperate fully humid (Cf), Warm temperate winter dry (Cw), Snow winter dry (Dw) and Polar tundra (ET). CH4 emission in the Af, Am, Cf and Cw regions account for about 94% of total wetland methane emissions in Asia Monsoon Region. In general, methane emissions enhanced for the Af and Cf regions over the period 2000 - 2012, whereas the other four regions reveal the decrease trend. It is noted that extremely low CH4 emissions over the Af, Cw and Cf regions were found in year 2008, 2009 and 2011, respectively. The significant negative anomalies are related to strong ENSO events preceding the anomaly year. ENSO events are accompanied with shifted rainfall condition with a general declining precipitation, soil moisture and inundation area, and eventually CH4 emissions in Asia Monsoon Region. However, due to the varied intensity of ENSO and the combined effects with Asia Monsoon systems and Western Pacific subtropical high, the pattern of rainfall shift varies, and thus the spatial pattern of CH4 emission anomalies.

Keywords: methane; wetlands; Asia Monsoon Region; interannual variation; ENSO events