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研究论文

内蒙古典型草原植物功能型对土壤甲烷吸收的影响

刘 伟[1,2*], 王继明[3], 王智平[1]

[1]中国科学院植物研究所植被与环境变化国家重点实验室, 北京 100093;
[2]中国科学院研究生院, 北京 100049;
[3]安徽师范大学生命科学学院, 安徽省重要生物资源保护与利用研究重点实验室, 安徽芜湖 241000

LIU Wei[1,2*], WANG Ji-Ming[3], WANG Zhi-Ping[1]

[1]State Key Laboratory of Vegetation and Environmental Change, Institute of Botany, Chinese Academy of Sciences, Beijing 100093, China;
[2]Graduate Universityof Chinese Academy of Sciences, Beijing 100049, China;
[3]Anhui Provincial Key Laboratory of the Conservation and Exploitation of Biological Resources,College of Life Sciences, Anhui Normal University, Wuhu, Anhui 241000, China

- 摘要
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摘要 甲烷(CH_4)是仅次于CO_2的重要温室气体。内蒙古草原是欧亚温带草原的重要类型, 具有典型的生态地域代表性。该文以内蒙古温带典型草原为研究对象, 通过人工剔除植物种的方法来确定群落中的植物功能型, 并应用静态箱技术, 观测土壤CH_4的吸收, 以理解植物功能型对土壤CH_4吸收的影响。结果表明: 1)土壤CH_4的吸收受温度和水分变化的影响, 具有明显的季节差异, 且与温度显著相关。2)在2008年和2009年所测的大部分月份中, 植物功能型的土壤CH_4吸收量之间没有显著差异;然而在植物生长旺季(8月), 不同植物功能型的土壤CH_4吸收量之间存在显著差异, 多年生丛生禾草的土壤CH_4吸收量最小。3)处理中一、二年生植物、多年生杂类草的存在能够增加土壤CH_4的吸收量, 而处理中多年生根茎类禾草、多年生丛生禾草的存在对土壤CH_4吸收的影响不大。这可能是因为, 植物功能型影响土壤的微生物代谢和环境因子, 进而影响土壤CH_4吸收量。该试验说明, 在痕量气体层面上, 植物功能型组成在生态系统功能中具有重要作用, 特别是群落中的亚优势种和伴生种(一、二年生植物、多年生杂类草), 通过调控土壤微生物和环境因子, 对地-气的CH_4交换产生重要影响。

关键词： 甲烷氧化 草原生态系统 温室气体 植物群落 锡林河流域

Abstract: *Aims* Methane (CH_4) is an important atmospheric trace gas, contributing to global warming and atmospheric chemistry. Aerated soils are a biological sink for atmospheric CH_4. In this study, a set of measurements were made both to quantify CH_4 uptake by soils in the typical grasslands of Inner Mongolia and examine the effects of plant functional type/group on the uptake. *Methods* Static chamber sampling and gas chromatography measurement were used to examine the effects of 4 PFTs (Plant Functional Types), i.e. PR (Perennial Rhizome), PB (Perennial Bunchgrass), PF (Perennial Forbs), and AB (Annuals/Biennials) in the platform of BEF (Biodiversity and Ecosystem Functioning), on CH_4 uptake by aerated soils. *Important findings* (1) The CH_4 uptake by soils showed seasonal change, which was related to soil water content and temperature. (2) Over most of observed periods in 2008 and 2009, there were no significant differences in the soil CH_4 uptake rates among the various treatments of PFTs. During rapid plant growth in August, however, there existed the significant differences in the soil CH_4 uptake rates. The soil CH_4 uptake rates were lower in PB treatment. (3) AB or PF increased the uptake of CH_4 by soils, while PR or PB had little influence on the uptake of CH_4 by soil. A number of soil physico-chemical factors such as temperature, water content, and gas diffusion are considered to affect CH_4 uptake. The differences in the CH_4 uptake rates by soils may be explained using these environmental factors affected by PFTs. In the aspects of trace gas, this study indicates that PFT has prominent effects on ecosystem, and that the sub-dominant species and companion species (AB/PF), by regulating soil microbe and environmental factors, have important and irreplaceable roles on the take-up of CH_4 by soils.

Keywords: CH_4 oxidation, grassland ecosystem, greenhouse gas, plant community, Xilin River Basin

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通讯作者 刘伟　　Email: lw076@163.com

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