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沙坡头人工植被固沙区生物结皮-土壤系统温室气体通量特征

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Greenhouse gases fluxes of biological soil crusts and soil ecosystem in the artificial sand-fixing vegetation region in Shapotou area.

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摘要
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摘要

荒漠生物结皮-土壤系统温室气体(CO_2、CH_4和N_2O)通量数据的缺乏,给区域尺度上温室气体通量的估算带来很大的不确定性.2011—2012年在腾格里沙漠东南缘沙坡头地区不同时期建植的人工植被固沙区,采用静态箱-气相色谱法研究了不同类型和不同演替阶段生物结皮覆盖的土壤CO_2、CH_4和N_2O的通量特征.结果表明: 结皮类型、恢复时间及二者与采样时间的互作显著影响CO_2通量;恢复时间、结皮类型与采样时间的互作显著影响CH_4通量;采样日期显著影响CO_2、CH_4和N_2O通量.苔藓结皮年均CO_2通量(105.1 mg·m^{-2}·h^{-1})显著高于藻类结皮(37.7 mg·m^{-2}·h^{-1}).荒漠生物结皮-土壤系统年均CH_4和N_2O吸收通量分别为19.9和3.4 μg·m^{-2}·h^{-1}.藻类结皮的年均CH_4和N_2O吸收通量略高于苔藓结皮,但差异并不显著.随着荒漠生物结皮的发育和演替的深入,生物结皮-土壤系统呼吸逐渐增加,CH_4和N_2O吸收能力逐渐下降.与藻类结皮相比,苔藓结皮呼吸对温、湿度的变化更为敏感,且随着生物结皮的发育和演替的深入逐渐增强.温度和湿度不是决定荒漠生物结皮-土壤CH_4和N_2O通量的关键因子.

关键词: 生物土壤结皮 温室气体 人工固沙 生态恢复 演替 沙坡头

Abstract:

Uncertainties still existed for evaluating greenhouse gases fluxes (GHGs), including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) at the regional scale for desert ecosystem because available GHGs data about biological soil crusts (BSCs) was very scarce. In 2011 and 2012, soil ecosystem covered by various types of BSCs and BSCs at different succession stages in an artificial sand fixing vegetation region established in various periods at southeast of the Shapotou area in Tengger Desert was selected to measure fluxes of CO_2, CH_4 and N_2O using static chamber and gas chromatography. The results showed that curst type, recovery time and their interactions with sampling date significantly affected CO_2 flux. Recovery time and interaction of crust type and sampling date significantly affected CH_4 flux. Sampling date significantly affected the fluxes of CO_2, CH_4 and N_2O. The mean annual flux of CO_2 for moss crust (105.1 mg·m^{-2}·h^{-1}) was significantly higher than that of algae crust (37.7 mg·m^{-2}·h^{-1}) at the same succession stage. Annual mean CH_4 and N_2O consumption was 19.9 and 3.4 μg·m^{-2}·h^{-1}, respectively. Mean annual consumption of CH_4 and N_2O for algae crust was slightly higher than that of moss crust, however, significant difference was not found. Ecosystem respiration (Re) of desert soil covered by BSCs increased with the recovery process of desert ecosystem, in contrast, consumption of CH_4 and N_2O decreased. Re of moss crust was more sensitive to temperature and moisture variation than algae crust and Re sensitivity of temperature and moisture gradually increased with the development and succession of BSCs. Both soil temperature and moisture were not the main factor to determine CH_4 and N_2O fluxes of BSCs soil in desert ecosystem.

Key words: biological soil crust greenhouse gases artificial sand-fixing ecological recovery succession Shapotou area.

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[1] 王昱1,2,冯起2**,陈丽娟2,鱼腾飞2. 基于参与性调查的生态输水和治理工程的可持续性[J]. 应用生态学报, 2014, 25(1): 211-218.

[2] 闫晓君1,王丽丽1,江瑜1,邓艾兴2,田云录3,张卫建1,2 . 长江三角洲主要超级稻CH_4排放特征及其与植株生长特性的关系[J]. 应用生态学报, 2013, 24(9): 2518-2524.

[3] 周健1,肖荣波1**,孙翔2. 住区形态变迁与居民通勤能源消费的关系[J]. 应用生态学报, 2013, 24(7): 1977-1984.
[4] 潘颜霞,王新平**,张亚峰,虎瑞 . 沙坡头地区吸湿凝结水对生物土壤结皮的生态作用[J]. 应用生态学报, 2013, 24(3): 653-658.
[5] 方英1,2,赵琼1,台培东1 **,吴海燕3,秦秦1,2,邓鑫1,2 . 芒颖大麦草对菱镁矿粉尘污染的生态适应性[J]. 应用生态学报, 2012, 23(12): 3474-3478.
[6] 张鹏**,李新荣,张志山,潘艳霞,刘艳梅,苏洁琼. 腾格里沙漠东南缘生物土壤结皮的固氮潜力[J]. 应用生态学报, 2012, 23(08): 2157-2164.
[7] 魏素珍**. 甲烷氧化菌及其在环境治理中的应用[J]. 应用生态学报, 2012, 23(08): 2309-2318.
[8] 杨倩1,田昆1,2**,肖德荣2,李隐1,董瑜1,杨扬3. 滇西北高原闭合半闭合退化湿地的生态恢复效果[J]. 应用生态学报, 2012, 23(06): 1520-1526.
[9] 蔡传钰1,2,李波1,3,吕豪豪2,3,吴伟祥1,2**. 垃圾填埋场氧化亚氮排放控制研究进展[J]. 应用生态学报, 2012, 23(05): 1415-1422.
[10] 杨凯,赵允格,马昕昕. 黄土丘陵区生物土壤结皮层水稳性[J]. 应用生态学报, 2012, 23(01): 173-177.
[11] 刘正佳,于兴修,李蕾,黄玫 . 基于SRP概念模型的沂蒙山区生态环境脆弱性评价[J]. 应用生态学报, 2011, 22(08): 2084-2090.
[12] 牟长城,张博文,韩丽冬,于丽丽,顾韩 . 火干扰对小兴安岭白桦沼泽温室气体排放的短期影响[J]. 应用生态学报, 2011, 22(04): 857-865.
[13] 孙中宇,任海. 生态记忆及其在生态学中的潜在应用[J]. 应用生态学报, 2011, 22(03): 549-555.
[14] 李海防;张杏锋. 剔除灌草和添加翅荚决明对厚荚相思林土壤温室气体排放的影响[J]. 应用生态学报, 2010, 21(3): 563-568.
[15] 牟长城;吴云霞;李婉姝;徐蕊. 采伐对小兴安岭落叶松-泥炭藓沼泽温室气体排放的影响[J]. 应用生态学报, 2010, 21(2): 287-293.