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研究报告

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冬水田稻稻麦轮作对小麦生长季温室气体排放的影响

Effects of altering winter flooded paddy field to rice-wheat rotation on greenhouse gases emission during wheat growing season

关键词：冬水田|稻麦轮作|减排|综合增温潜势|温室气体|影响因子|直接排放系数

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摘要：用静态暗箱-气相色谱法测定了川中丘陵地区典型冬水田(RF)及冬水田稻稻麦轮作处理(RW)在小麦生长季的温室气体排放通量,并同步测定了土壤温度、水分和可溶态碳氮含量.结果表明,RW在小麦生长季的CH_4、生态系统呼吸CO_2和N_2O平均排放通量分别为0.05、117.01 mg·m^{-2}·h^{-1}(以C计)和77.19 μg·m^{-2}·h^{-1}(以N计),而RF相应通量分别为1.43、7.85 mg·m^{-2}·h^{-1}和-0.61 μg·m^{-2}·h^{-1}.RW施氮肥后出现N_2O的排放峰,其N_2O直接排放系数为1.28%.土壤可溶态有机碳含量与CO_2通量之间呈显著正相关关系(r = 0.342,p < 0.01),与CH_4、N_2O的相关关系不显著;硝态氮、可溶态总氮含量与N_2O通量的关系为显著正相关,但与CH_4通量呈显著负相关.RF的综合增温潜势(以CO_2-eq计,下同)为3.03 Mg·hm^{-2},大于RW(-1.66 Mg·hm^{-2}),暗示冬水田稻稻麦轮作会降低生态系统的综合增温效应.

Abstract：Field experiment were conducted in the hilly area of Central Sichuan to investigate the effects of altering rice-flooded-fallow (RF) to rice-wheat rotation(RW) on the emissions of CH_4,CO_2 and N_2O.Gas fluxes were analyzed by static opaque chamber and gas chromatography techniques.Soil samples were collected to determine dissolved organic carbon and nitrogen concentrations.Soil temperature and moisture were measured at the same time of gas sampling.Results showed that average CH_4,CO_2 (ecosystem respiration) and N_2O fluxes for RW treatment were 0.05,117.01mg·m^{-2}·h^{-1} and 77.19 μg·m^{-2}·h^{-1}, respectively,and were 1.43,7.85 mg·m^{-2}·h^{-1} and -0.61 μg·m^{-2}·h^{-1},respectively,for RF treat-ment.N_2O flux peak was observed after nitrogen fertilizer application from RW,and the N_2O direct emission factor for RW was 1.28%.Soil dissolved organic carbon content was significantly correlated with CO_2 flux (r = 0.342,p<0.01). Nitrate and dissolved total nitrogen was positively correlated with N_2O flux while negatively with CH_4 flux.Global warming potentials of three greenhouse gases were 3.03Mg·hm^{-2} for RF,which was higher than that for RW(-1.66Mg·hm^{-2}). Result of this study proved that converting RF to RW decreased global warming impact of the ecosystem.

Key words：winter flooded paddy field|rice-wheat rotation|global warming potential|greenhouse gases|impact factors|direct emission factor

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