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EFFECTS OF NITROGEN ON METHANE PRODUCTION AND OXIDATION AND DISSOLVED ORGANIC CARBON IN A FRESHWATER MARSH

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Abstract

Freshwater marshes are the single largest source of atmospheric methane (CH₄). Climate change and anthropogenic nitrogen (N) deposition can alter the production and oxidation of CH₄ respectively and thereby also CH₄ exchange. But there was little known about how N regulate key carbon (C) processes, like CH₄ production and oxidation under freshwater marshland conditions. In this study, field-fertilization and incubation experiments were conducted to investigate the effects of four N-fertilization treatments (0, 6, 12, 24 g N m⁻²) using ammonium nitrate (NH₄NO₃) on CH₄ production and oxidation and the potential mechanisms involved, in the Sanjiang Plain, Northeast China. Both the CH₄ production and oxidation of N24 (24 g N m⁻²) treatment was significantly higher than control and other N treatments. The ammonium nitrogen (NH₄⁺-N), nitrate nitrogen (NO₃⁻-N), dissolved organic carbon (DOC) and dissolved inorganic carbon (DIC) concentrations were higher at the N24 treatment compared with the control. The incubation experiment indicated that N-addition stimulated CH₄ production more than CH₄ oxidation resulting in net CH₄ emission from N-fertilization treatments.

Key words: CH₄ production and oxidation, DOC and DIC, freshwater marsh, nitrogen-fertilization

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