

Article title	Effects of increased temperatures and rice straw incorporation on methane and nitrous oxide emissions in a greenhouse experiment with rice
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Abstract	<p>We investigated the effect of increased temperatures of water and soil, together with the incorporation of rice straw, on emissions of methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), and the daily variation in CH<sub>4</sub> emissions. Three temperature treatments (floodwater temperature), ambient, ambient +2°C and ambient +4°C, and two amounts of rice straw (0 and 6 t ha<sup>-1</sup>) were arranged in a randomized complete block design with four replications. The emissions of CH<sub>4</sub> and N<sub>2</sub>O and the soil's redox potential (Eh) were measured weekly for two crop cycles. Daily variation in CH<sub>4</sub> emission rates was measured with and without rice straw incorporation in planted and unplanted soil (with no warming treatments) during four growth stages of the crop. Methane emissions increased by as much as 91% with increasing amounts of water and soil temperature (+2 and +4°C), up to 34–35°C. Increases in temperature (+2 and +4°C above ambient) above 34–35°C decreased emissions by 30–36%. A decrease in soil Eh to &lt; -100 mV and in CH<sub>4</sub> emissions was observed earlier in the pots containing rice straw than in those without straw. Methane emissions varied daily; they were larger from 11:00 to 14:00 hours, particularly in unplanted soil. They showed positive correlations with the temperatures of both soil and air. In contrast, N<sub>2</sub>O emissions were negligible throughout the growing season. The emissions of CH<sub>4</sub> evidently depend on the background temperature range; in our experiment, CH<sub>4</sub> emissions increased up to 34°C and then they decreased above that.</p>
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