

2.027 Temperature and burning history affect emissions of greenhouse gasses and aerosol particles from tropical peatland fire .

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Abstract:

Peatland burning is a major source of greenhouse gasses as well as atmospheric trace species such as aerosol particles. Burning of tropical peatland in equatorial Asia has intensified over the last decades, emitting huge plumes of haze that can blanket large parts of Southeast Asia. Both laboratory and field studies have previously been conducted to investigate emission from peat burning, yet a significant variability in data still exists. We conducted a series of experiments to characterize the gas and particulate matter emitted during burning of a peat samples from Sumatra in Indonesia. Heating temperature of peat was found to regulate the ratio of CH₄ to CO₂ in emissions ($\Delta\text{CH}_4/\Delta\text{CO}_2$) as well as the chemical composition of particulate matter. The $\Delta\text{CH}_4/\Delta\text{CO}_2$ ratio was larger for higher temperatures, meaning that CH₄ emission is more pronounced at these conditions. Mass spectrometric analysis of organic components indicated that aerosol particles emitted at higher temperatures had more unsaturated bonds and ring structures than that emitted from cooler fires. In addition, CH₄ emitted by burning charcoal derived from previously burned peat was lower by at least an order of magnitude than that from fresh peat. These results highlight the importance of both fire history and combustion temperature for the composition of tropical peat-fire emissions. They suggest that remote sensing technologies that map fire histories and temperatures could provide improved estimates of emissions.