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Fluxes and concentrations of volatile organic compounds from a south-east Asian tropical rainforest

B. Langford (1), P. K. Misztal (2), E. Nemitz (2), B. Davison (1), C. Helfter (2), T. A. M. Pugh (1), A. R. Mackenzie (1), and C. N. Hewitt (1)

(1) Lancaster Environment Centre, Lancaster University, Lancaster, United Kingdom (b.langford1@lancaster.ac.uk), (2) Centre for Ecology & Hydrology, Bush Estate, Penicuik, EH26 0QB, United Kingdom

As part of the OP3 field study of rainforest atmospheric chemistry, above-canopy fluxes of isoprene, monoterpenes and oxygenated volatile organic compounds were made by direct eddy covariance from a south-east Asian tropical rainforest. Approximately 500 hours of flux data were collected over 48 days in April-May and June-July 2008. Isoprene was the dominant hydrocarbon emitted from the forest, accounting for 80% of the measured emission of reactive carbon fluxes. Total monoterpene emissions accounted for 18% of the reactive carbon flux. Monoterpenes were not emitted at night and during the day their flux rate was dependent on both light and temperature. The oxygenated compounds, including methanol, acetone and acetaldehyde, contributed less than 2% of the total measured reactive carbon flux. The sum of the VOC fluxes measured represents a 0.4% loss of daytime assimilated carbon by the canopy. The isoprene emission rate, normalised to 30 °C and 1000 μmol m-2 s-1 PAR, was 2.01 mg m-2 h-1, which is 3.2 times lower than the default value for tropical forests in the widely-used MEGAN model of biogenic VOC emissions. This highlights the need for more direct canopy-scale flux measurements of VOCs from the world's tropical forests.