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Measurements of reactive nitrogen above the canopy of a South East Asian tropical rainforest

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The potential for NOx species to influence local chemistry is significant in remote tropical areas due to the high concentrations of both OH and volatile organic compounds and the low background NOx concentrations. It has been suggested that emissions from soil could be a major biogenic source of nitrogen oxides but fluxes from tropical areas are poorly quantified. To understand the potential influence of soil emissions we must understand the sources and sinks of NOx in the boundary layer above a forest canopy. Measurements of NO, NO2 and total reactive nitrogen (NOy) were made in an opening above a rainforest canopy at the Bukit Atur Global Atmosphere Watch station in Sabah, Borneo as part of the Oxidant and particle photochemical processes above a South-East Asian tropical rainforest (OP3) project. Measurements of total reactive nitrogen using a gold catalytic converter followed by chemiluminesence detection of the resulting NO are compared to individual measurements of different NOy species (NO, NO2, PAN, Alkyl nitrates, HNO3) in an attempt to understand the nitrogen chemistry occurring and to assess any outstanding contributions to the nitrogen budget.

The ground measurements above the rainforest canopy are compared to measurements taken from an aircraft platform within the boundary layer and free troposphere above the rainforest. The aircraft measurements from within the boundary layer agree well with the ground-based measurements suggesting that these are representative of the boundary layer above a rainforest canopy. A box model containing a simple chemical mechanism was used to explore the ability of a simplified global model chemical mechanism to capture the chemistry occurring at this rainforest site with a view towards improving the ability of global models to predict important trace gas levels over tropical rainforest.