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Investigation of the detailed chemical composition of organic aerosol in a South East Asian Rainforest

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The formation of secondary organic aerosol (SOA) in tropical regions is a key uncertainty in quantifying the effect of man made emissions on the climate. Large quantities of volatile organic compounds are emitted from natural biogenic sources in the tropics, including isoprene, monoterpenes and sequiterpenes. There are very few studies of the detailed chemical composition of organic aerosols in tropical rainforest regions, but these would provide information on the importance of primary versus secondary organic aerosols, the key VOC precursors, oxidation state and volatility.

Particle samples were collected in a tropical rainforest at Danum Valley in Borneo as part of the OP3 field campaign in 2008. Twenty four hour filter samples were collected at the Global Atmospheric Watch station at a height of around 10 m and shipped back to the laboratory (below -4 °C) for offline analysis. The OA composition was studied using multiple high resolution chromatographic techniques including comprehensive two dimensional gas chromatography coupled to time of flight mass spectrometry (GCXGC-TOFMS) and liquid chromatography coupled to ion trap mass spectrometry (LC-MSn). The composition was directly compared to chamber generated SOA (as part of the Aerosol Coupling in the Earths System , ACES, experiment) to determine SOA tracers. A biogenic SOA tracer MS fragmentation library was constructed and a number of SOA components from limonene, linalool and [U+F061]-pinene were identified in the rainforest OA. Very high resolution mass spectrometry (Fourier Transform Ion Cyclotron Resonance FTICR-MS) allowed the O:C and H:C ratios to be determined and these will be compared to those obtained by aerosol mass spectrometry (AMS). In addition, the OA composition from the rainforest will be compared to other locations.