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Boundary Layer Concentrations of Halocarbons at Coastal and Forest Sites in Borneo

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Halogen compounds are increasingly recognised as being important in atmospheric chemistry processes in the stratosphere and the troposphere. The sources of the halogens include natural and anthropogenic emissions of organics species, with particularly important ocean sources, as well as wind-driven release of inorganic salts from the open ocean and coastal regions and from polar snows lying on sea ice. The maritime continent potentially plays a major role. High temperatures favour high biological productivity, leading a high emission potential.

We present the results of the first nine months worth of regular measurements of a range of halocarbons (including the short-lived CH3I, CHCl3, CHCl2Br/CH2Br2, CHBr2Cl, CHBr3) made at inland and coastal sites in Borneo. A Gas Chromatograph with Electron Capture Detector (GC-ECD) has been developed which is capable of operating quasi-autonomously with a low level of local support. Two instruments were operated during the OP3 campaign (April-July 2008) at the Bukit Atur Research Station, Danum Valley (5.0°N, 117.8°E) with one making routine background measurements and the other being used in an exploratory mode. The exploratory instrument has been subsequently operated at a coastal site in Borneo (Tawau, 4.2°N, 118.0°E).

High concentrations of halocarbons have been observed at the coastal locations. Background values of 2-6 pptv of bromoform (CHBr3) were routinely observed with significant higher values (peaking at 50-150 pptv) occurring when on-shore winds are observed. In contrast the observed background concentrations at the inland site (about 85 km away) are around 1 pptv with few of the transient peaks observed at the coast. These peaks are attributed to local marine production of CH3Br (and similarly behaving species such as CH2Br2 and CHBr2Cl). Preliminary analysis of the measurements made in June 2008 indicates a regional emission of CHBr3 similar to that derived by Yokouchi et al. (J. Geophys Res., 2005). The possible link of these emissions to the local macroalgae population will be discussed.

The measurements are interpreted using an atmospheric chemistry model which includes a detailed tropospheric bromine chemistry scheme and representations of organic and inorganic emissions. Limitations of the emission schemes will be discussed and the importance of halogen compounds on ozone on regional and global scales is assessed.