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Boundary Layer Concentrations of Halocarbons at Coastal and Forest Sites during the OP3 campaign, 2008

John Pyle (1) and the halocarbon Team

(1) University of Cambridge, Chemistry, Cambridge, United Kingdom (john.pyle@atm.ch.cam.ac.uk), (2) NCAS-Climate, Cambridge, (3) Global Satria, S/B, Malaysia, (4) Malaysian Meteorological Department, Ketua Stesen GAW Lembah Danum, Malaysia

As part of the OP3 project, halocarbon measurements were made in 2008 at two sites in Sabah, Borneo, by gas chromatography using the μ-Dirac instrument. In this second field deployment of μ-Dirac the measurements confirmed the potential of the instrument for longterm observations at a range of sites for studies of halocarbon trends and emissions. Observations with two identical instruments at Bukit Atur, Danum Valley, produced identical measurements of two different halocarbons, bromomform and C2Cl4. When one instrument was then deployed at a nearby coastal site, higher concentrations of both species were measured. The bromoform background at the coast was higher than inland and the variability was also greater, with occasional peaks of many 10s pptv. The background of C2Cl4 was the same at both sites but, again, the coastal measurements showed occasional very high values. In each case, the explanation appears to lie with coastal sources. In the case of bromoform, these are likely to be related to macroalgae; for C2Cl4 industrial emissions from the populated coastal strip are the probable explanation.

Two different numerical models were used to aid data interpretation. The Lagrangian air parcel dispersion model, NAME, confirms that the air parcels during this period had crossed potentially rich oceanic and, especially, coastal regions prior to measurement in Sabah. Both models show that, despite a lifetime of about two weeks, substantial gradients between the coast and inland can be expected for bromoform. For the very short period of measurements undertaken, the coastal background was always higher than that measured inland. The modelling suggests that this need not always be the case, a results confirmed by a longer measurement series. The chemical transport model, p-TOMCAT is able to reproduce the magnitude of the bromoform measurements but only if the emission strengths used by Warwick et al. (JGR, 2006) are reduced. Here we used global bromoform emissions of 190 Gg(Br)/year, considerably lower than those reported earlier based on our short period of measurements at the Cape Verde observatory in 2007 (O'Brien et al., ACP, 2009). The difference serves to emphasise the difficulty with using local measurements of short-lived halocarbons to attempt to infer global emissions.