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Bromoform in the tropical boundary layer of the Maritime Continent during OP3

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Abstract. We report measurements of bromoform made by gas chromatography during the OP3 campaign in 2008. Measurements were made simultaneously for a few days at the World Meteorological Organization (WMO) Global Atmospheric Watch (GAW) site in the Danum Valley, a rainforest location in Sabah, Borneo, and at a nearby coastal site at Kunak. Background values at Kunak were higher than those measured in the rainforest (2–5 ppt compared with 1 ppt) and excursions away from the background were very much higher, reaching 10 s of ppt. Measurements of C_2Cl_4, an industrial tracer, showed no significant difference in background at the two sites. Modelling using two different models can reproduce a number of the observed features. The data are consistent with a strong, local coastal source of bromoform in eastern Sabah and can be used to infer the strength of the source of bromoform in South East Asia. However, they provide only a very weak constraint on global emissions. The global model results highlight the difficulty for short-lived species of extrapolating limited duration, local measurements to a global source.

1 Introduction and background

Two major field campaigns of the multi-national OP3 (Oxidant and particle photochemical processes above a south-east Asian tropical rainforest) project took place during 2008 in Sabah, Malaysia, on the island of Borneo. The OP3 project aims were wide-ranging, focussed on the better understanding of the interactions between natural forests, atmospheric composition and the Earth's climate system. A wide range of measurements explored biogenic emissions and their contribution to the oxidizing capacity of the troposphere. For example, measurements of isoprene fluxes from the forest and from palm oil plantations were an important component of OP3 and first results describing the potential implications of land use change for atmospheric isoprene concentrations and for oxidising capacity have been presented by Hewitt et al. (2009). The detailed objectives of OP3, and some preliminary results, are described by Hewitt et al. (2010).

An important sub-focus of OP3 was the investigation of the role of halogen species. Several groups made measurements of halocarbons (see Table 1 in Hewitt et al., 2010) and there was also a supporting modelling effort. There are a number of pressing reasons to study halocarbons in the tropics. Firstly, recent measurements at the Cape Verde Observatory have indicated that halogen species play an important role in controlling tropical oxidizing capacity (Read et al., 2008). The source of the halogen radicals is not well understood so further measurements of potential source gases are required; measurements of both radical and source gases were an OP3 objective. Secondly, there is some evidence that the rainforest might be a direct source of some halocarbons. A number of studies have looked at possible biogenic sources of halocarbons (principally CH_3Cl, but including other chloro- and bromocarbons), with the sources including plants, leaf litter, wood-rotting fungi and insects (Harper, 1985; Hoekstra et al., 1998; Yokouchi et al., 2002; Gebhardt

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