Measurement of Volatile Organic Compounds (VOCs) in Marine Air at Cape Grim Using Proton Transfer Reaction Mass Spectromety (PTR-MS)

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PTR-MS is a promising new approach for measuring VOCs in global background air. The World Meteorological Organization/Global Atmospheric Watch has specified that PTR-MS can be used for measuring isoprene, terpenes, acetonitrile, methanol, ethanol, acetone and dimethyl sulphide (DMS) in the background atmosphere. We briefly present a critical examination of the underlying assumptions that PTR-MS can unequivocally identify and quantify these compounds in global background air.

We present high time resolution VOC observations made using PTR-MS at the Cape Grim Baseline Station, Tasmania (41°S) in January-February 2006, November-December 2007 and April 2008. VOCs measured include DMS, isoprene, isoprene oxidation products (methyl vinyl ketone and methacrolein), methanol and acetone. VOC concentrations at Cape Grim are compared to measurements of clean oceanic air elsewhere in the world. PTR-MS benzene measurements during a local biomass burning event are compared to parallel benzene measurements made using Advanced Global Atmospheric Gases Experiment Medusa, Gas Chromatography-Mass Spectometry.

Diurnal cycles of VOCs in clean oceanic air at Cape Grim are explored and show a clear diurnal cycle of DMS with a daytime minima and night time maxima that agrees well with the observations from Cape Grim reported by Ayers et al, (Figure 1). A diurnal cycle of isoprene with a daytime maxima is also observed in November-December (Figure 2).

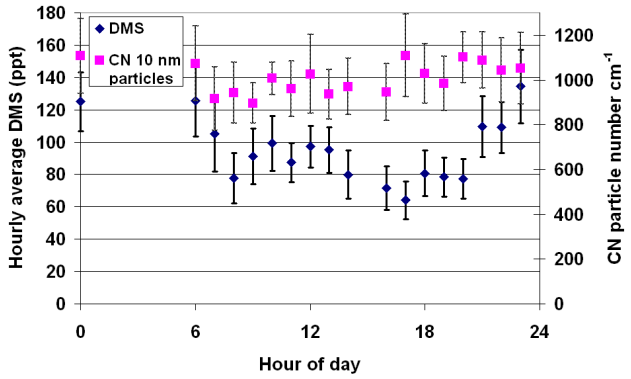

Figure 1. Concentration of DMS and CN 10 nm particle number presented as an average for each hour of the day from 12 days with clean marine air in December 2007.

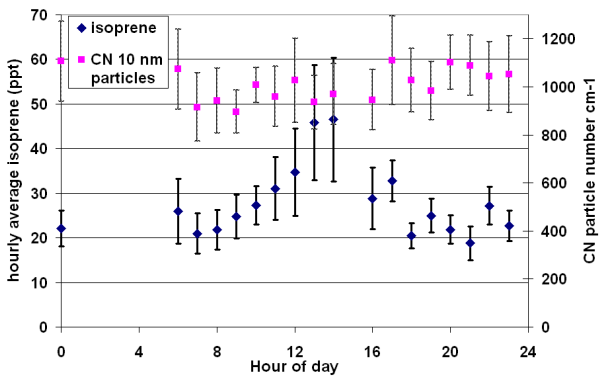

Figure 2. Concentration of isoprene and CN 10 nm particle number presented as an average for each hour of the day from 12 days with clean marine air in December 2007.