

Observations of halogenated trace gases in Taiwan and Malaysia

Lauren J. Gooch (1), Johannes C. Laube (1), William T. Sturges (1), David E. Oram (1,2), Jia-Lin Wang (3), Cheng-Feng Ou-Yang (3), Neng-Huei Lin (3), Iq Mead (4), Matt Ashfold (5), Matt Rigby (6) and Emily White (6)

(1) Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia, Norwich, UK

(2) National Centre for Atmospheric Science, School of Environmental Sciences, University of East Anglia, Norwich, UK

(3) National Central University, Chungli, Taiwan

(4) University of Manchester, Manchester, UK

(5) University of Nottingham, Malaysia Campus, Malaysia

(6) School of Chemistry, University of Bristol, Bristol, UK.

The rapidly developing East Asian region is of global importance in terms of greenhouse gas emissions. We here present results from air sampling activities in Taiwan and Malaysia in the spring months of 2013 and 2014. A large range of halogenated greenhouse gases, including a number of newly detected gases, were investigated via a high sensitivity gas chromatography mass spectrometry (GC-MS) system.

In Taiwan we find periods of relatively clean air as well as episodes that appear to be impacted by urban and/or industrial emissions and examine correlations between individual species. Observed mixing ratios are compared in context with global background data. Enhancements in the abundances of many halocarbons are detected with examples including the Halons 1211 and 1202 as well as the very long-lived perfluorocarbons C_2F_6 and $c-C_4F_8$. We also show and evaluate unusually high mixing ratios of the only chlorofluorocarbon (CFC) with globally growing emissions i.e. CFC-113a (CF_3CCl_3). We use NAME analysis to produce back-trajectories in order to assess possible regional emission sources. In tropical Malaysia we use observations of 31 ozone-depleting substances to calculate the amount of equivalent chlorine (ECl) that could potentially reach the stratosphere. Substantial enhancements in ECl were found during a so-called cold-surge period where air masses from mid-latitudinal East Asia had been transported rapidly to the tropics.