QOS2016-365, 2016
Quadrennial Ozone Symposium of the International Ozone Commission

Have we underestimated the role of short-lived chlorine compounds in ozone depletion?

D.E. Oram (1,2), J Laube (2), B Sturges (2), L Gooch (2), E Leedham-Elvidge (2,8), G Forster (1,2), M Ashfold (3), N Harris (4), I Mead (4), A Abu Samah (5), S-M Phang (5), O-Y Chang-Feng (6), N-H Lin (6), J-L Wang (7), A Baker (8), and C Brenninkmeijer (8)

(1) National Centre for Atmospheric Science, University of East Anglia, School of Environmental Sciences, Norwich, United Kingdom (d.e.oram@uea.ac.uk), (2) Centre for Ocean and Atmospheric Sciences, School of Environmental Sciences, University of East Anglia, UK, (3) School of Biosciences, University of Nottingham Malaysia Campus, Malaysia, (4) Department of Chemistry, University of Cambridge, UK, (5) Institute of Ocean and Earth Sciences, University of Malaya, Malaysia, (6) Department of Atmospheric Sciences, National Central University, Taiwan, (7) Department of Chemistry, National Central University, Taiwan, (8) Max Planck Institute for Chemistry, Air Chemistry Division, Mainz, Germany

In recent years much attention has been focussed on the potential of bromine-containing VSLS (very short lived substances) to contribute to stratospheric ozone depletion. This is primarily due to the large observed discrepancy between the measured inorganic bromine in the stratosphere and the amount of bromine available from known, longer lived sources gases (halons and CH3Br). In contrast, the role of very short-lived chlorine compounds (VSLS-Cl) has been considered trivial because they contribute only a few percent to the total organic chlorine in the troposphere, the majority of which is supplied by long-lived compounds such as the CFCs, HCFCs, methyl chloroform and carbon tetrachloride. However recent evidence shows that one VSLS-Cl, dichloromethane (CH2Cl2) has increased by 60% over the past decade (WMO, 2014) and has already begun to offset the long-term decline in stratospheric chlorine loading caused by the reduction in emissions of substances controlled by the Montreal Protocol. We will present new VSLS-Cl measurements from recent ground-based and aircraft campaigns in SE Asia where we have observed dramatic enhancements in a number of VSLS-Cl, including CH2Cl2 and CH2ClCH2Cl. Furthermore we will demonstrate how pollution from China and the surrounding region can rapidly, and regularly, be transported across the South China Sea into the tropics and subsequently uplifted to altitudes of 11-12 km, the region close to the lower TTL. This process occurs frequently during the winter monsoon season and could represent a fast and efficient mechanism for transporting short-lived compounds, and other pollutants, to the lower stratosphere.