



Investigation of chlorine radical chemistry in the Eyjafjallajökull volcanic plume using depletions in non-methane hydrocarbons

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In April and May 2010 the CARIBIC observatory (www.caribic-atmospheric.com), operating onboard a Lufthansa passenger aircraft, measured atmospheric composition within plumes from the Icelandic volcano Eyjafjallajökull. In addition to real-time measurements of trace gases and aerosols, whole air samples were collected for post-flight analysis of trace gases, which included measurements of non-methane hydrocarbons (NMHCs). Within the volcanic plume NMHC concentrations were systematically below background levels and their depletions were consistent with chlorine radical (Cl) chemistry kinetics. Chlorine can strongly influence local tropospheric chemistry, and volcanic emissions have only recently been identified as potential halogen radical sources. From the relative depletions in NMHCs we derived Cl concentrations of $1.1\text{--}5.1 \times 10^4 \text{ Cl cm}^{-3}$. Further investigation of the variability-lifetime relationships for NMHCs within the plume was used to examine the OH/Cl ratio. To our knowledge this is the first report of NMHC depletions and estimation of Cl radical concentrations in a volcanic plume.