Geophysical Research Abstracts
Vol. 15, EGU2013-5297, 2013
EGU General Assembly 2013

Measurements of Volatile Organic Compounds (VOCs) on Board of the Zeppelin NT during the PEGASOS Campaign in 2012

Julia Jäger (1), Andreas Hofzumahaus (1), Harry Beck (1), Franz Rohrer (1), Sebastian Broch (1), Hendrik Fuchs (1), Sebastian Gomm (1), Frank Holland (1), Keding Lu (1), Astrid Kiendler-Scharr (1), Thomas Mentel (1), Bernhard Rose (2), Robert Wegener (1), and Andreas Wahner (1)

(1) Institut für Energie- und Klimaforschung, IEK-8: Troposphäre, Forschungszentrum Jülich GmbH, Jülich, Germany, (2) GERSTEL GmbH & Co. KG, Mülheim an der Ruhr, Germany

Volatile Organic Compounds (VOCs) are mostly emitted at the ground and are degraded by the reactions with OH, NO_3 or O_3 as they rise upwards in the atmosphere. VOCs play an important role as sources and sinks for radicals in the troposphere. Up to date, most of the VOC measurements were performed from ground based platforms; the profile measurements across the whole planetary boundary layer (PBL) are still quite limited which restrained the exploring of the VOCs chemistry of the entire PBL. This although these measurements are particularly interesting, as most of the chemistry of the VOC degradation in the troposphere takes place in the PBL. Moreover, fast VOCs measurements utilizing Gas Chromatography coupled with Mass Spectrometry (GC-MS) are a challenge due to the great chemical variability of VOC species. Therefore accurate in-situ measurements of VOCs together with other species as CO, NO_x, O_3 and the OH reactivity, encompassing different levels of altitude and fast time resolution, would essentially improve the understanding of the VOC distribution in the lower troposphere.

Here we present the setup and the modifications of the fast GC-MS system and the results of the PEGASOS Zeppelin campaigns in summer 2012. First, we present our developments and modifications of an in-flight GC-MS system to detect volatile non methane hydrocarbons (NMHC) with a time resolution of 3 minutes and a detection limit in the order of 2 pptv. The modified setup enabled us to analyze 70 different VOC species, ranging from alkanes (C4 to C11), aromatics and terpenes to oxygenated hydrocarbons (OVOC) such as alcohols and aldehydes.

Second, in contrast to previous airplane studies also utilizing a GC-MS system, the Zeppelin NT as a measuring platform during the PEGASOS campaign enabled us to measure vertical profiles up to 1500m at low travelling speeds which means a high spatial resolution. We will present results for selected VOC that offer new insights on height profiles encompassing different emission regimes (anthropogenic and biogenic) in both the Netherlands and in Italy, and on the fate of VOCs in the nocturnal boundary layer.

Third, we also present how the VOC concentrations relate to other substances such as CO, NO_x, O_3 and the OH reactivity. Especially the comparison of VOC Data with the measured OH reactivity will reveal more insight into the 'missing reactivity'.

Acknowledgement: PEGASOS project funded by the European Commission under the Framework Program 7 (FP7-ENV-2010-265148)