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Measurements of HO_x radicals and the total OH reactivity (k_{OH}) in the planetary boundary layer over southern Finland aboard the Zeppelin NT airship during the PEGASOS field campaign.

Sebastian Broch (1), Sebastian Gomm (1), Hendrik Fuchs (1), Andreas Hofzumahaus (1), Frank Holland (1), Mathias Bachner (1), Birger Bohn (1), Rolf Häseler (1), Julia Jäger (1), Jennifer Kaiser (2), Frank Keutsch (2), Xin Li (1), Insa Lohse (1), Franz Rohrer (1), Mitchell Thayer (2), Ralf Tillmann (1), Robert Wegener (1), Thomas F. Mentel (1), Astrid Kiendler-Scharr (1), and Andreas Wahner (1)

(1) Forschungszentrum Jülich GmbH, IEK-8, Jülich, Germany (s.broch@fz-juelich.de), (2) University of Wisconsin, Madison, WI, USA

The concentration of hydroxyl (OH) and hydroperoxy (HO_2) radicals (also named HO_x) and the total OH reactivity were measured over southern Finland and during transfer flights over Germany, Denmark and Sweden aboard the Zeppelin NT airship within the framework of the Pan-European Gas-AeroSOls-climate interaction Study (PEGASOS) field campaign in 2013. The measurements were performed with a remotely controlled Laser Induced Fluorescence (LIF) instrument which was installed on top of the airship. Together with a comprehensive set of trace gas (O_3, CO, NO, NO_2, HCHO, HONO, VOCs), photolysis frequencies and aerosol measurements as well as the measurement of meteorological parameters, these data provide the possibility to test the current understanding of the chemical processes in the planetary boundary layer (PBL) over different landscapes and in different chemical regimes.

The unique flight performance of the Zeppelin NT allowed us to measure transects at a constant altitude as well as vertical profiles within the range of 80 m to 1000 m above ground. The transect flights show changes in the HO_x distribution and k_{OH} while crossing different chemical regimes on the way from Friedrichshafen, Germany to Jämijärvi, Finland over Germany, Denmark and Sweden. Vertical profile flights over the boreal forest close to Jämijärvi and Hyytiälä (both Finland) gave the opportunity to investigate the layering of the PBL and with that the vertical distribution of HO_x and k_{OH} with a high spatial and temporal resolution. Gradients in the HO_x concentration and k_{OH} were measured between the different layers during the early morning hours. The maximum radical concentrations found during the campaign were 1.0 x 10^7 cm^{-3} for OH and 1.0 x 10^9 cm^{-3} for HO_2. The total OH reactivity measured in Finland was much lower than what was reported before in the literature from ground based measurements and ranged from 1 s^{-1} to 6 s^{-1}.

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