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Structure and Evolution of Formaldehyde Vertical Profiles in the Po Valley

Jennifer Kaiser (1), Glenn M . Wolfe (0,1), Frank N. Keutsch (1), Laurens N. Ganzeveld (2), Sebastian Broch (3), Birger Bohn (3), Hendrik Fuchs (3), Sebastian Gomm (3), Rolf H¨seler (3), Andreas Hofzumahaus (3), Frank Holland (3), Julia J¨ger (3), Keding Lu (0,3), Xin Li (3), Insa Lohse (3), Franz Rohrer (3), Robert Wegener (3), Thomas F. Mentel (3), Astrid Kiendler-Scharr (3), and Andreas Wahner (3)

(1) Chemistry, University of Wisconsin-Madison, Madison, WI, USA (jen.b.kaiser@gmail.com), (0) now at College of Environmental Sciences & Engineering, Peking University, Beijing, China, (2) Earth System Science and Climate Change, Wageningen University and Research Center, Wageningen, Netherlands, (3) Institut für Energie- und Klimaforschung Troposph¨re IEK-8, Forschungszentrum Jülich GmbH, Jülich, Germany

As both a source of HO_2 radicals and an intermediate in the oxidation of most volatile organic compounds (VOCs), formaldehyde (HCHO) is a useful tracer for the oxidative processing of hydrocarbons that leads to the formation of secondary pollutants. During the Pan-European Gas-AeroSOls Climate Interaction Study (PEGASOS), Zeppelin-based observations allowed for high spatial and temporal mapping of HCHO throughout the planetary boundary. Here, we focus on one flight in the Po Valley in Northern Italy, where clear delineations between the nocturnal boundary layer, residual layer, and growing mixed layer are observable. Early morning profiles demonstrate an inversion in HCHO concentrations, which gradually reverses as the mixed layer develops throughout the day. In the later morning, as little as 1.4 ppb HCHO is observed in the residual layer, while 3.8 ppb HCHO is observed in the mixed layer. Preliminary analysis shows oxidized VOCs are the dominant source of HCHO throughout the planetary boundary layer. Using a 1-D box model, we further examine the role of dynamics and chemistry in the structure and evolution of HCHO vertical profiles.

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