Supplement to Observations of Glyoxal and Formaldehyde as Metrics for the Anthropogenic Impact on Rural Photochemistry

J. P. DiGangi¹*, S. B. Henry¹, A. Kammrath¹**, E. S. Boyle¹, L. Kaser², R. Schnitzhofer², M. Graus³,⁴, A. Turnipseed⁵, J-H. Park⁶, R. J. Weber⁶, R. S. Hornbrook⁵, C. A. Cantrell⁵, R. L. Maudlin III⁵,⁷,***, S. Kim⁵, Y. Nakashima⁸, G. M. Wolfe¹, Y. Kajii⁸, E.C. Apel⁵, A. H. Goldstein⁶,⁹, A. Guenther⁵, T. Karl⁵, A. Hansel², and F. N. Keutsch¹

¹Department of Chemistry, University of Wisconsin-Madison, Madison, WI, USA
²Institute of Ion Physics and Applied Physics, University of Innsbruck, Innsbruck, Austria
³Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, CO, USA
⁴Chemical Sciences Division, National Oceanic and Atmospheric Administration, Boulder, CO, USA
⁵Atmospheric Chemistry Division, National Center for Atmospheric Research, Boulder, CO, USA
⁶Department of Environmental Science, Policy, and Management, University of California, Berkeley, CA, USA
⁷Department of Physics, University of Helsinki, Finland
⁸Division of Applied Chemistry, Faculty of Urban Environmental Sciences, Tokyo Metropolitan University, Japan
⁹Department of Civil and Environmental Engineering, University of California, Berkeley, CA, USA
*Now at: Department of Civil & Environmental Engineering, Princeton University, Princeton, NJ, USA
**Now at: Kimberly Clark Corporation, Neenah, WI, USA
***Now at: Department of Atmospheric and Oceanic Sciences, University of Colorado, Boulder, CO, USA

Correspondence to: F. N. Keutsch
(keutsch@chem.wisc.edu)
Fig. S1. One hour bin averaged Gly, HCHO, and $R_{GF}$ during BEARPEX 2009.
Fig. S2. One hour bin averaged Gly, HCHO, and $R_{GF}$ during BEACHON-ROCS 2010.
Fig. S3. Thirty minute binned median diurnal profiles of MBO+Isoprene, monoterpenes, and OH reactivity during BEACHON-ROCS and BEARPEX 2009.
Fig. S4. Diurnal median profiles of $R_{GF}$, HCHO, Gly, and wind direction for the two different wind regimes during BEACHON-ROCS 2010.
Fig. S5. Comparison of Gly and HCHO (17.8 m inlet only) with other species and meteorological parameters for the MFI on 17 July during BEARPEX 2009. Gly, HCHO, and $R_{GF}$ are shown as 30 min binned averages (±15 min each half hour), whereas other species are shown at full resolution.
Fig. S6. Four hour forward HYSPLIT trajectories for 16 July, 2009 originating at the MFI site (red symbol) at 50 m above ground level. Lines denote initial times of 14:00 (red), 15:00 (blue), 16:00 (green), 17:00 (grey), and 18:00 (purple). Filled circles denote plume position after each hour of travel time. The BEARPEX site is denoted by the green diamond, and the solid black line denotes the rough end line of the upwind isoprene emission region based on Dreyfus et al. (2002).
**Fig. S7.** Four hour forward HYSPLIT trajectories for 17 July, 2009 originating at the MFI site (red symbol) at 50 m above ground level. Lines denote initial times of 10:00 (red), 11:00 (blue), 13:00 (green), 14:00 (grey), and 16:00 (purple). Filled circles denote plume position after each hour of travel time. The BEARPEX site is denoted by the green diamond, and the solid black line denotes the rough end line of the upwind isoprene emission region based on Dreyfus et al. (2002).
Fig. S8. Gly, HCHO, $R_{GF}$, other tracer species, and meteorological data during day BN1. Gly, HCHO, and $R_{GF}$ are shown as 30 min binned averages (±15 min each half hour), whereas other species are shown at full resolution. Data for MBO+Isoprene, C$_4$H$_7$O$^+$, benzene, and acetonitrile were measured via PTR-TOF-MS.
Fig. S9. Gly, HCHO, $R_{GF}$, other tracer species, and meteorological data during day BN2. Gly, HCHO, and $R_{GF}$ are shown as 30 min binned averages ($\pm 15$ min each half hour), whereas other species are shown at full resolution. Data for MBO+Isoprene, $C_4H_7O^+$, benzene, and acetonitrile were measured via PTR-TOF-MS.
Fig. S10. Gly, HCHO, $R_{GF}$, other tracer species, and meteorological data during day BN3. Gly, HCHO, and $R_{GF}$ are shown as binned averages, whereas other species are shown at full resolution. Data for M-BO+Isoprene, $C_4H_7O^+$, benzene, and acetonitrile were measured via PTR-TOF-MS. Data shown for toluene was measured via TOGA, and $R_{TB}$ is based on TOGA measurements of benzene and toluene.
Fig. S11. Comparison of C₆H₇O⁺ with Gly, HCHO, and RGF during days (a) BN1 and (b) BN2. Note the lack of change in C₆H₇O⁺ during the fast rises/falls in Gly and HCHO.
Fig. S12. High time resolution data for HCHO (30 s), Gly (60 s), and $R_{GF}$ (60 s) shown for the significant features of (a) MFI, (b) BN1, (c) BN2, and (d) BN3 events. Error bars denote the 1σ precision.

References