Dataset Title: UW Formic Acid Mixing Ratio and Flux Measurements

Dataset Authors:

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General Dataset Description:

This dataset contains quality-controlled HCOOH fluxes 30-minute averaging periods at the 30-m inlet height at the WLEF very tall tower. HCOOH mixing ratio measurements were made using a chemical ionization time of flight mass spectrometer (CI-ToFMS). All flux values are in ppbv cm/s. Time is in fractional day of year CDT. For all measurements assume a 20% uncertainty, as that is the upper limit in flux uncertainty calculations.

Instrument Description:

A full description of the instrument can be found in Bertram, T.H., et al., A field-deployable, chemical ionization time-of-flight mass spectrometer, Atmos. Meas. Tech., 4, 1471–1479, 2011, www.atmos-meas-tech.net/4/1471/2011/doi:10.5194/amt-4-1471-2011

A full description of the detection method (Ox-CIMS) can be found in Novak, G. A., Vermeuel, M. P., and Bertram, T. H.: Simultaneous Detection of Ozone and Nitrogen Dioxide by Oxygen Anion Chemical Ionization Mass Spectrometry: A Fast Time Response Sensor Suitable for Eddy Covariance Measurements, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2019-445, in review, 2019.

Data Collection:

Fluxes were calculated via Reynold's averaging of 30-m blocks of ToF signal (X) and vertical winds (w) of a collocated sonic anemometer. Prior to Reynold's averaging of a flux period, X was despiked and detrended by subtraction of the linear fit of the signal time series. Winds were rotated based on the planar fit method (PFM), which is an assessment of the anemometer tilt with respect to long-term local streamlines. A plane was fit using 15-minute averaged sonic anemometer u, v, and w data from 2019 April – July.

Quality Control:

Flux periods were removed if any of the following conditions were true:

1. The calculated friction velocity was less than 0.1 m/s

2. The mean flux value of five flux sub-periods differed from the value of the entire 30-minute flux period by more than 30% (i.e. stationarity test)

3. The calculated Obukhov length was greater than 20 m (this on average was between 2200-0500 CDT so those points were removed).

4. The calculated cospectra had >3 instances where the differences between two consecutive frequencies had their cumulative flux differ by >18%

5. An individual flux period had a cross-covariance time lag of beyond 5 seconds of the calculated campaign average time lag in cross-covariance. Lag times were calculated using the method in Langford, B., et al., Eddy-Covariance Data with Low Signal-to-Noise Ratio: Time-Lag Determination, Uncertainties and Limit of Detection, Atmos. Meas. Tech. 2015, 8 (10), 4197-4213. https://doi.org/10.5194/amt-8-4197-2015

Uncertainties:

Flux uncertainty was calculated following the methods in Langford, B., et al., 2015.

Time Period: 2019/07/02 20:07:52.3 - 2019/07/15 23:36:31.68

Location: The tower is located at 45.946 N and 90.272 W.

Data Frequency: 30 min

Data Spatial Type:

Time series data from a single tower at 30-m.

Dataset Restrictions:

No restrictions. Refer to the CHEESEHEAD Data Policy.

File format:

All files are in .xlsx format.

Data format:

The .xlsx file should have 3 columns:

DOY - Fractional day of year (CDT)

MR_30m_ppbv = HCOOH mixing ratio at the 30-m inlet height (ppbv)

flux_30m_ppbv_cm_s = O3 flux at the 30-m inlet height (ppbv cm/s)

Digital Object Identifier (DOI): https://doi.org/10.26023/637Q-E3SY-KZ03

GCMD Keywords:

EARTH SCIENCE

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CARBON AND HYDROCARBON COMPOUNDS

FORMIC ACID