

Formaldehyde and formic acid measurements at Westport, CT

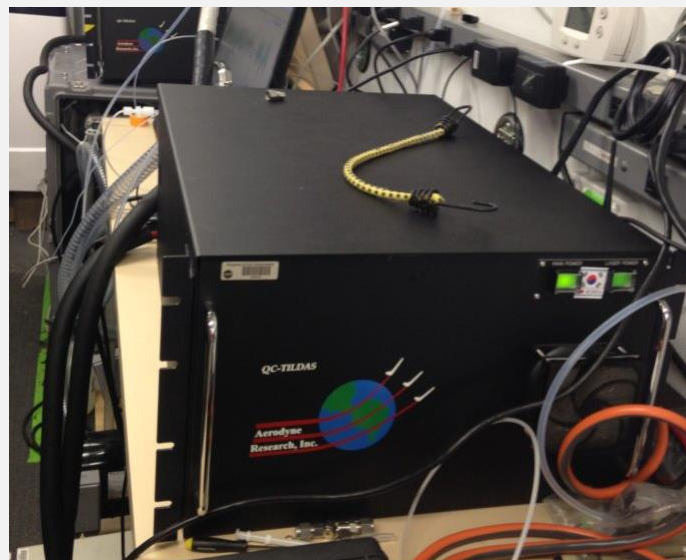
Andrew R. Whitehill, David Williams, Lukas Valin, James Szykman, Russell Long

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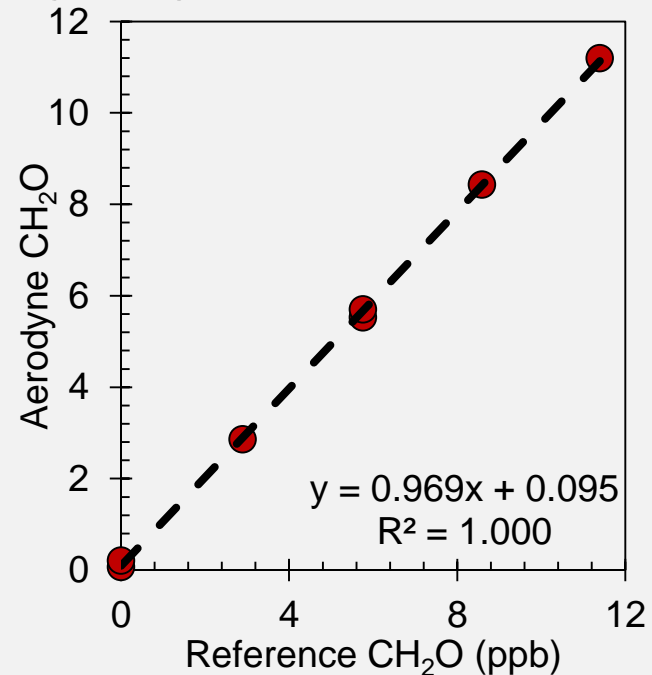
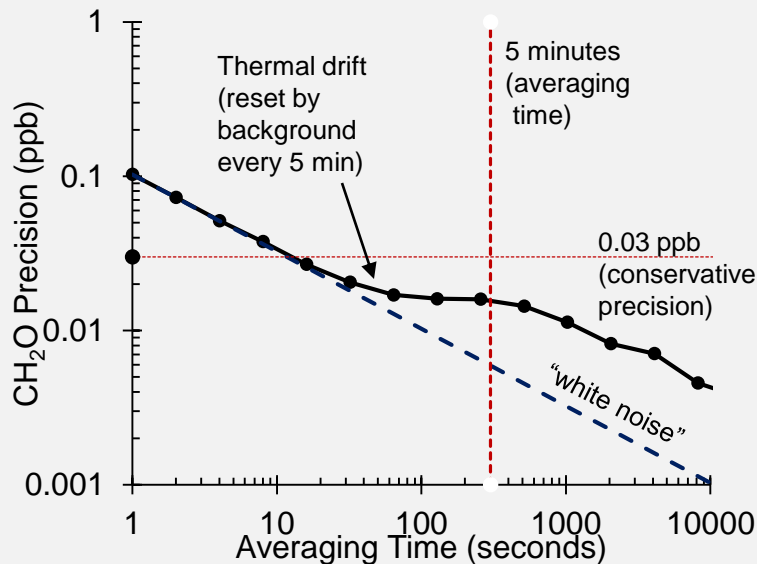
Measurement Summary

- Measurement Dates
 - June 20, 2018 –
September 4, 2018
- Measured Species
 - Formaldehyde (CH₂O)
 - Formic Acid (HCOOH)
 - Water vapor (H₂O)
- Method
 - Mid-infrared (1765 cm⁻¹) Laser Differential
Optical Absorption Spectroscopy
- Instrument
 - Aerodyne Research, Inc. Mini-TILDAS
Formaldehyde Monitor

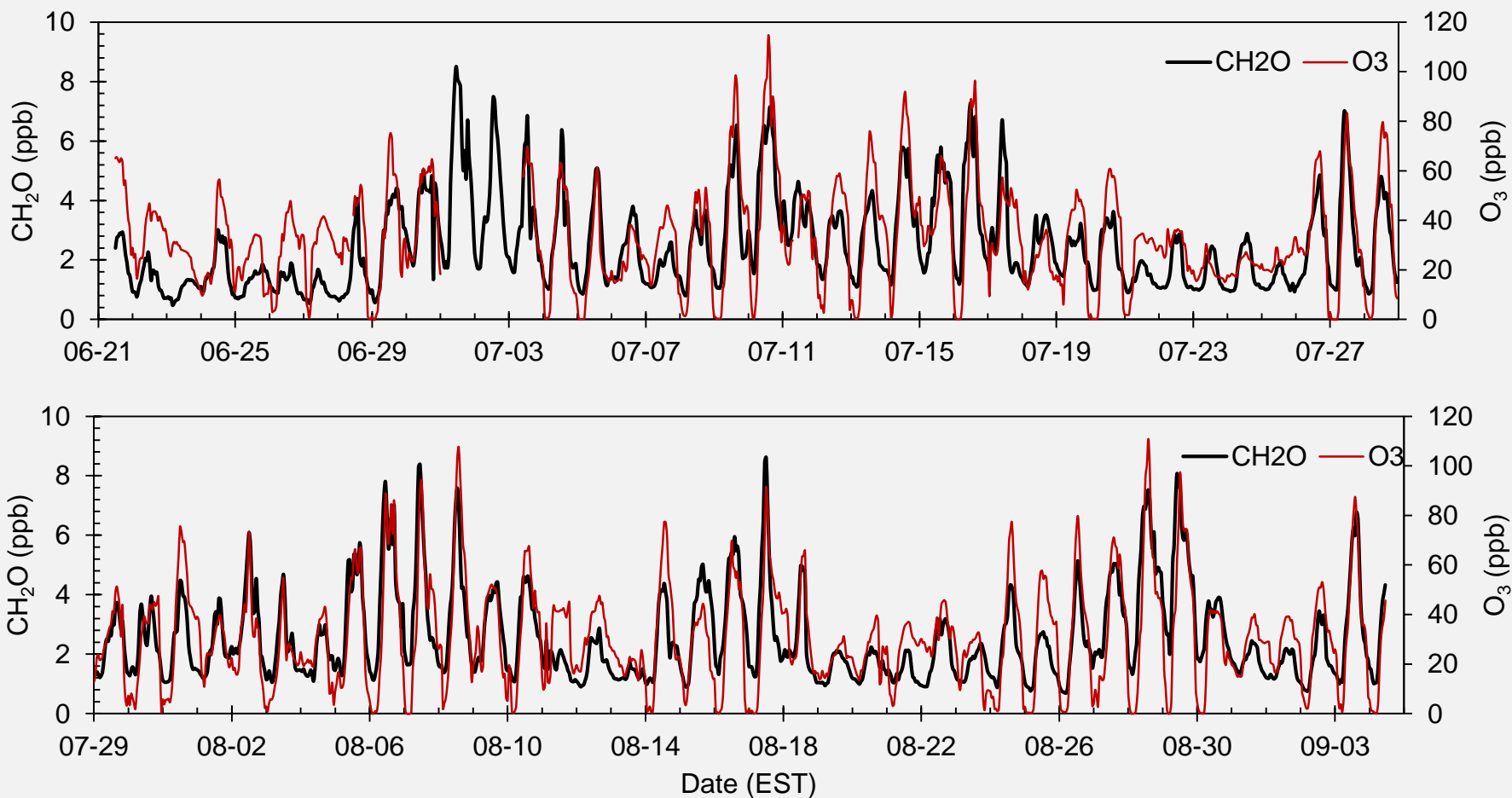


Instrument Summary and QA

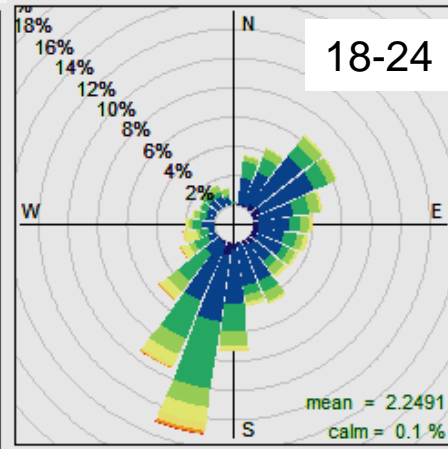
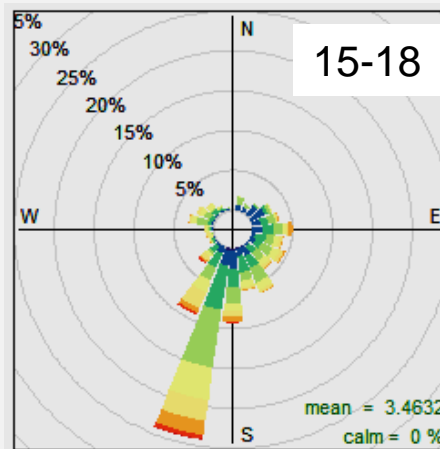
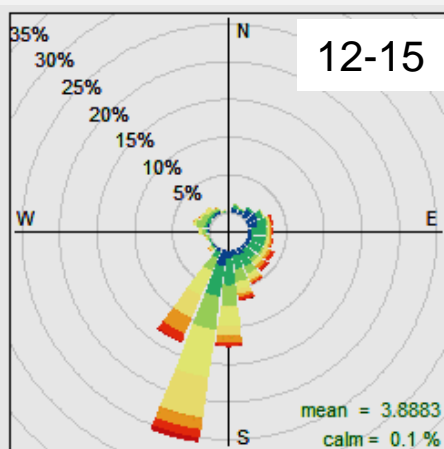
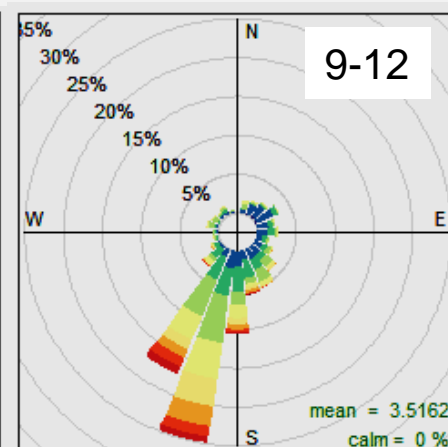
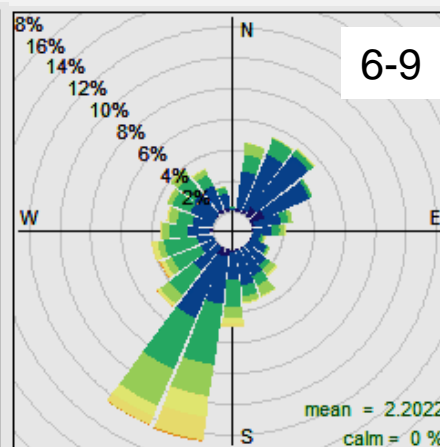
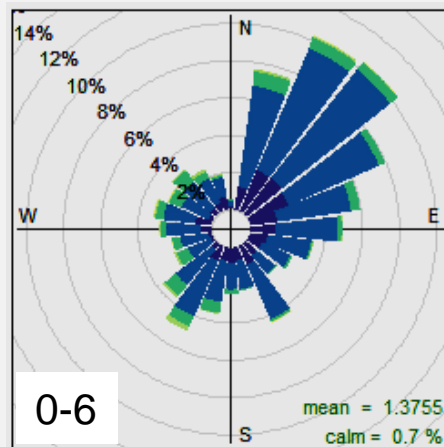
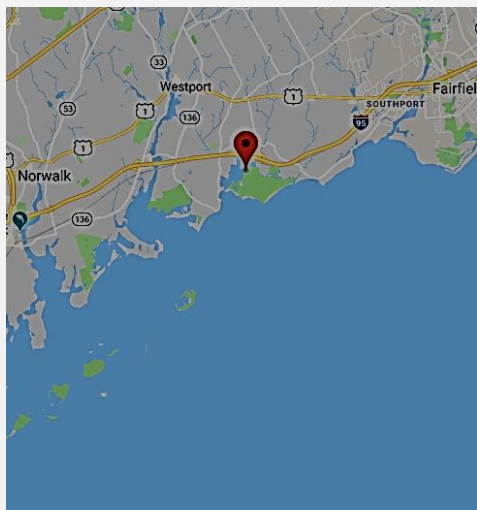
- Zero air “background” spectra taken every 5 minutes
 - Ensures precision and accuracy by cancelling out drift
- All tubing / fittings heated to 30° C, made of PFA or PTFE or passivated glass
- 13 LPM flow through heated inertial inlet



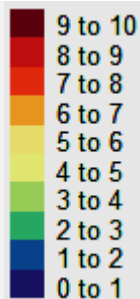
Formaldehyde at Westport, CT



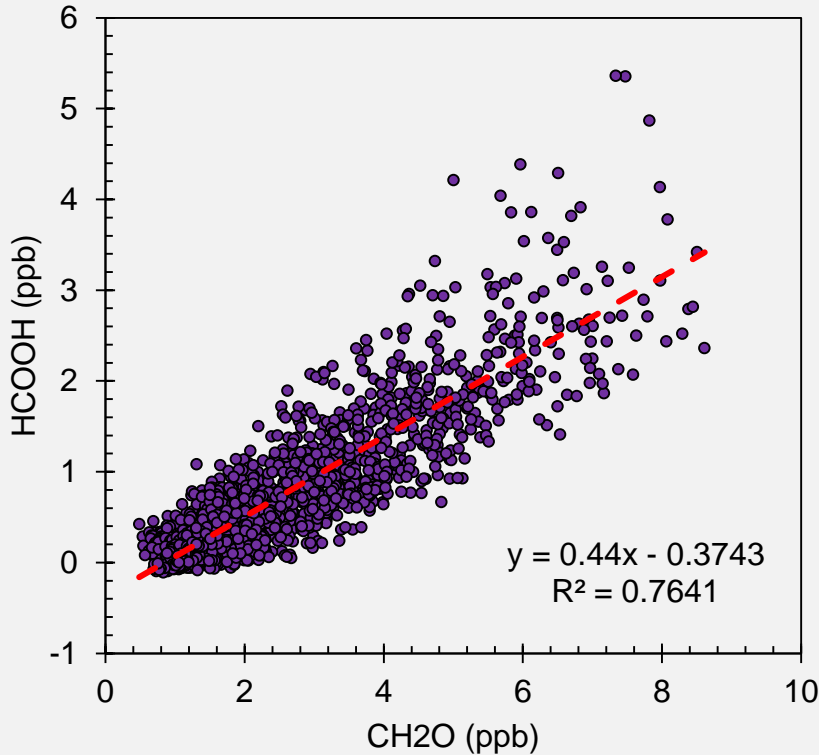
Daily Evolution of CH₂O at Westport



CH₂O (ppb)



Formic Acid



Formic acid is generally well correlated with formaldehyde, although relationship depends upon ... ? (sunlight, water, source)

- Salt Lake City, UT, Winter:
 - $\text{HCOOH} = 0.33 \text{ CH}_2\text{O} + 0.20$
- Durham, NC, Summer:
 - $\text{HCOOH} = 0.55 \text{ CH}_2\text{O} - 0.51$
- Seoul, South Korea, Summer:
 - $\text{HCOOH} = 0.58 \text{ CH}_2\text{O} + 0.04$

Formaldehyde as a constraint on VOC Emissions and Chemistry

- CH_2O is a key intermediate species in the photochemical oxidation of VOCs
- CH_2O formation likely dominated by oxidation of biogenic species (isoprene, etc.), although anthropogenic contributions can also be significant
- **Measured CH_2O can provide an important constraint for models:**
 - How accurate are your VOC emissions?
 - How representative is your chemistry?
- Improving VOC emissions and chemistry can improve model performance for O_3 production

Data Availability

LISTOS Data Archive – “Westport”

LISTOS_2018

Current Archive Status
As of Fri Apr 5 21:47:02 2019 EST

Login succeeded -- http download is ON.

NASA Aircraft	UMD Aircraft	Stony Brook Aircraft	Ground Mobile	Merges
Rutgers *	>> Westport *	Flax Pond *	Bayonne *	CCNY *
Bronx Pfizer *	Queens College *	New Haven *	Outer Island *	Hammonasset *
Ground-Other	Model	Trajectory	Satellite	All Others

* Ground Site

PI is EPA.ORD

PI Directory	Last Updated	Parameters	Research Description (LISTOS_2018)
BERKOFF TIM/	Nov 05, 2018		NASA LaRC Lidar Ozone Profiles
EPA.ORD/	Mar 21, 2019	+ Show VarList	

Data file is: listos-EPAORD-CH2O-insitu_GROUND-WESTPORT_20180621_R0.ict

<input type="checkbox"/> EPA.ORD/			
Download	Filename	Recv'd/Updated	Size (KB)
<input type="checkbox"/>	listos-EPAORD-CH2O-insitu_GROUND-WESTPORT_20180621_R0.ict	20190321	1319.8

Data is 5-minute averages of CH₂O, HCOOH, and H₂O in ICARTT format.
Alternative formats and averaging times available by request (whitehill.andrew@epa.gov)

Additional Comments

- 2 weeks of ambient data available from Flax Pond (Long Island)
- Comparison of two instruments (Aerodyne and Picarro formaldehyde monitor)
- Not on archive yet

