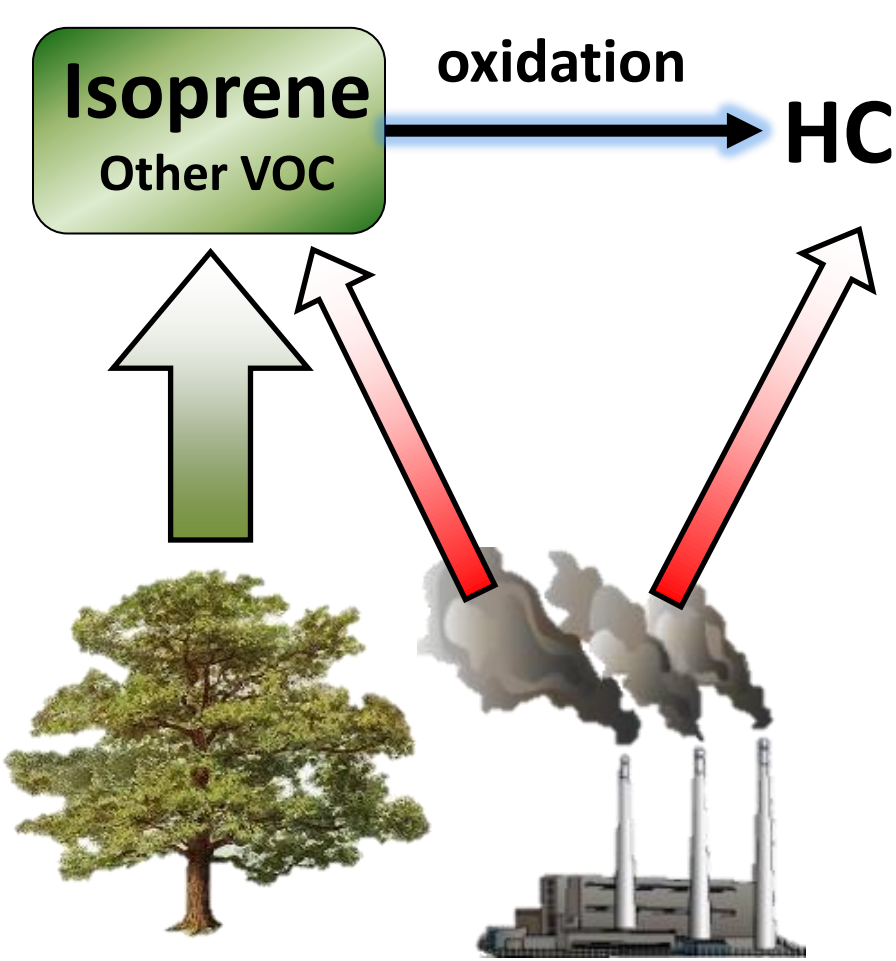
Formaldehyde during WINTER

Glenn Wolfe, NASA GSFC

- Background
- Questions
- Other neat ideas
- Instrument summary

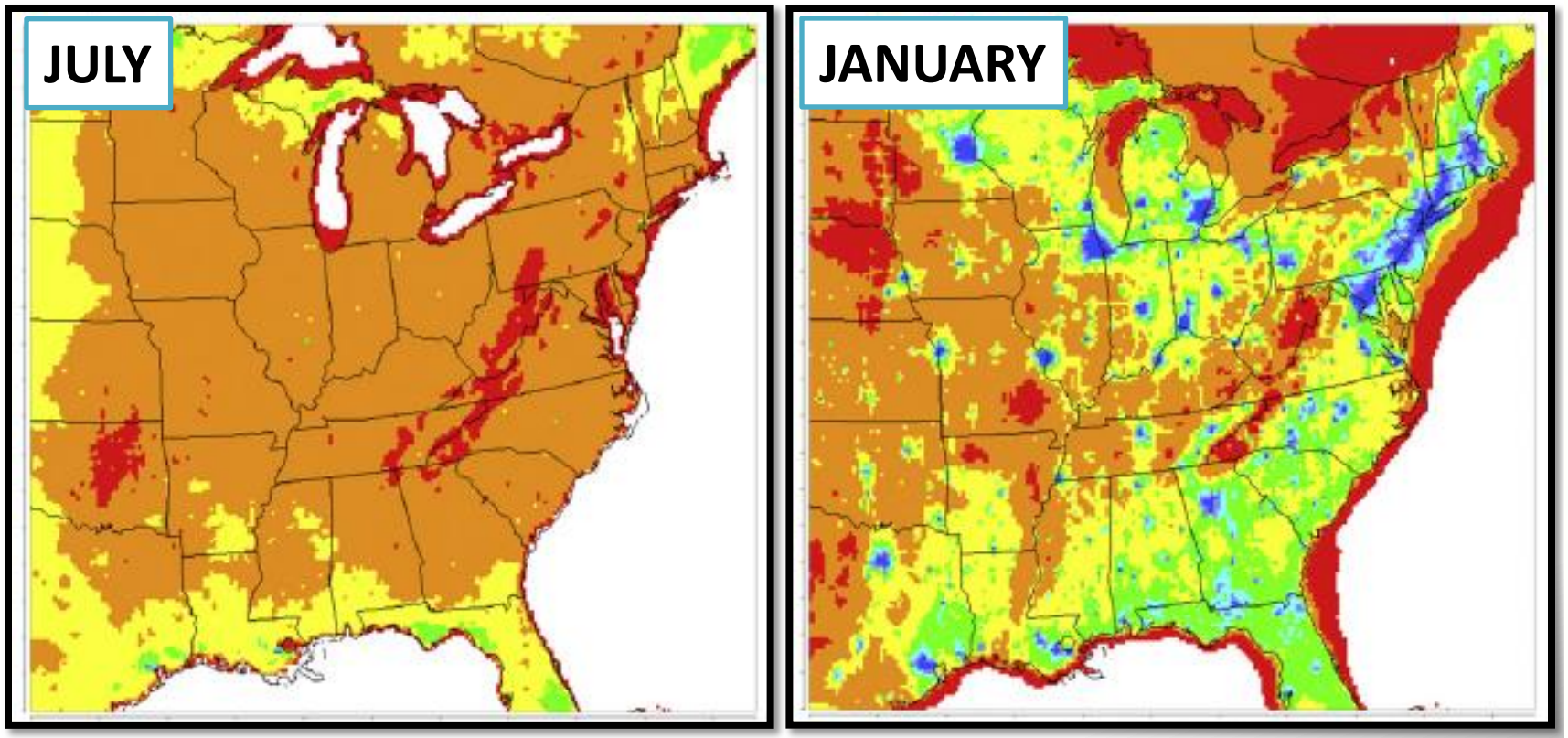
Formaldehyde (HCHO)



- Tracer for VOC oxidation, emission
- Radical source

Can We Quantify Primary HCHO Emissions?

Fraction of CMAQ HCHO due to photochemistry



Luecken et al., Atmos. Environ. (2012)

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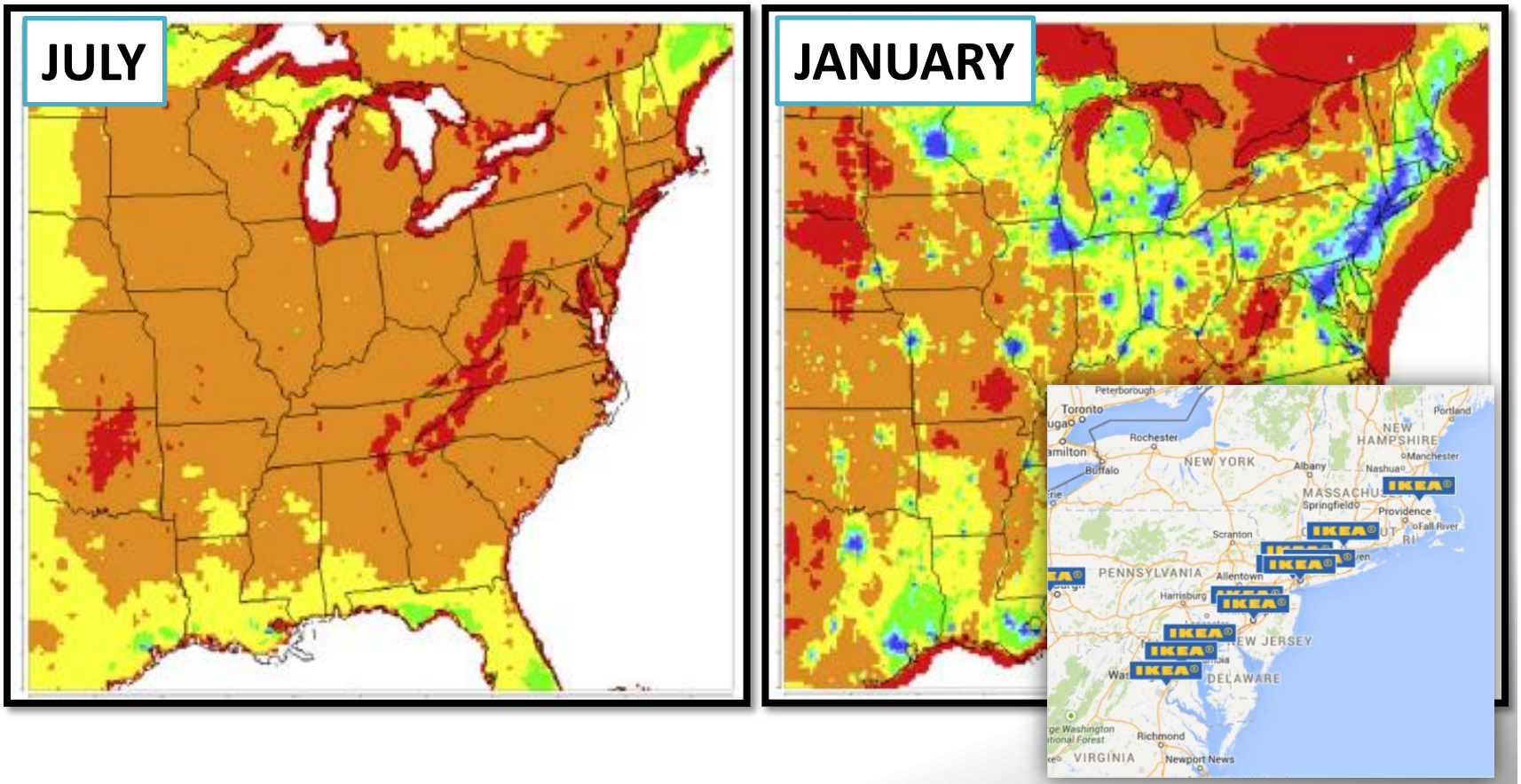
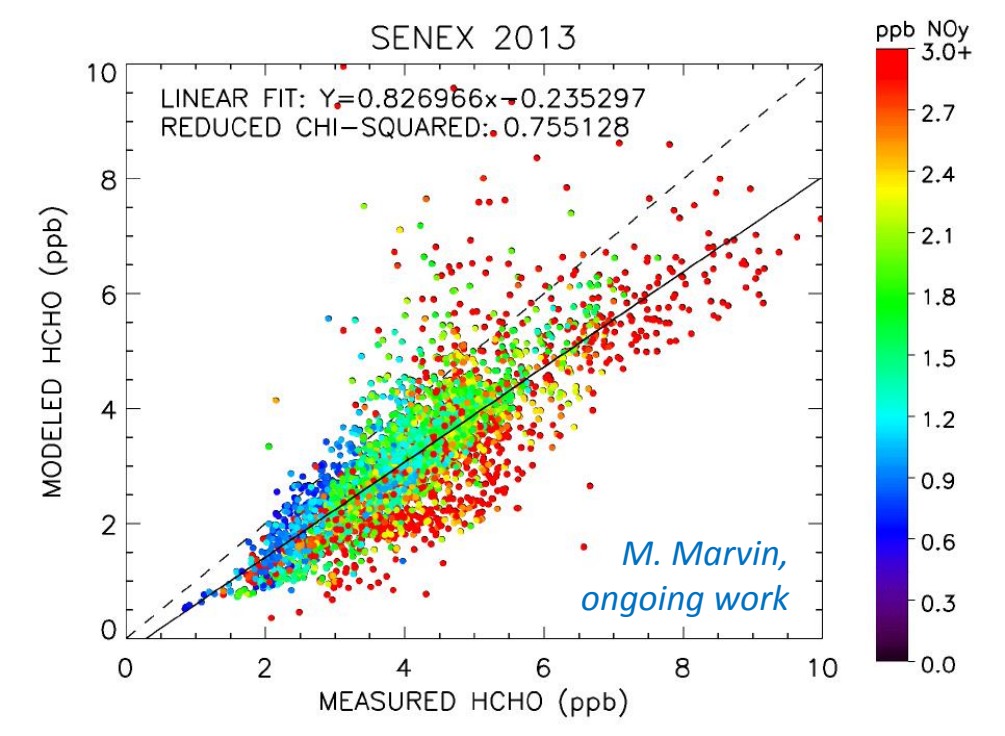


Luecken et al., Atmos. Environ. (2012)

How does Chemistry Change when Trees Sleep?

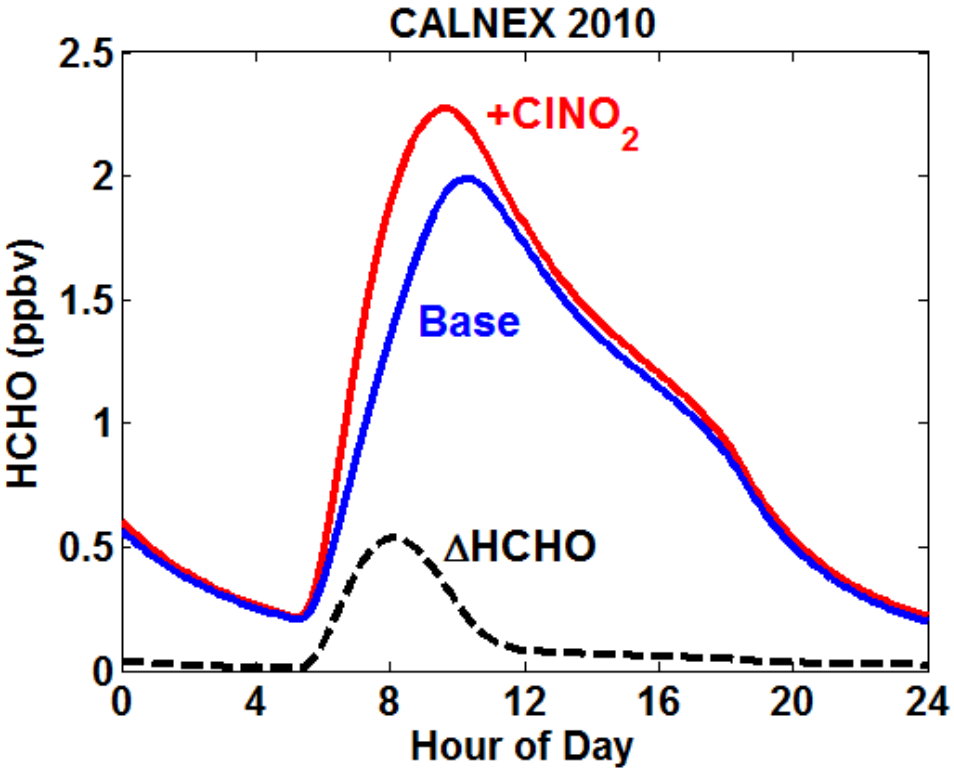


During SENEX 2013, isoprene chemistry *alone* accounts for ~83% of observed HCHO.

Wintertime HCHO precursors expected to be primarily anthropogenic alkenes

What can HCHO tell us about Nocturnal Processes?

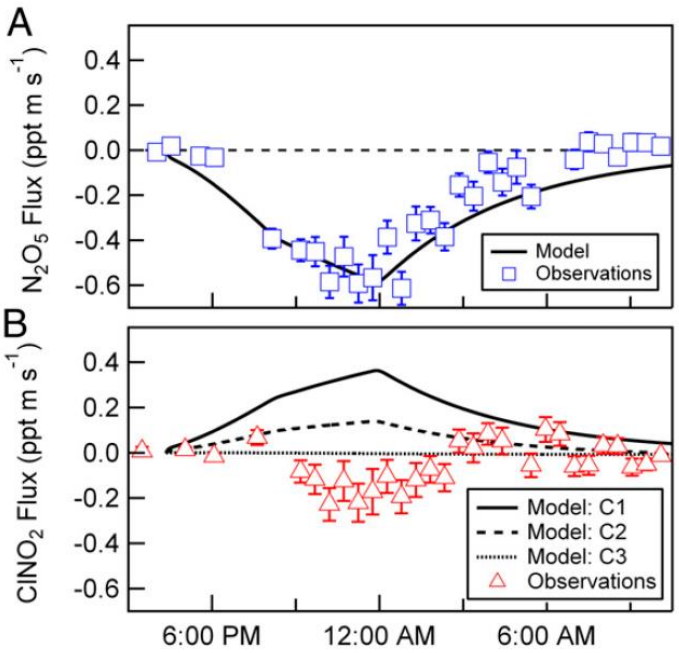
- Halogen-enhanced VOC oxidation should increase HCHO production



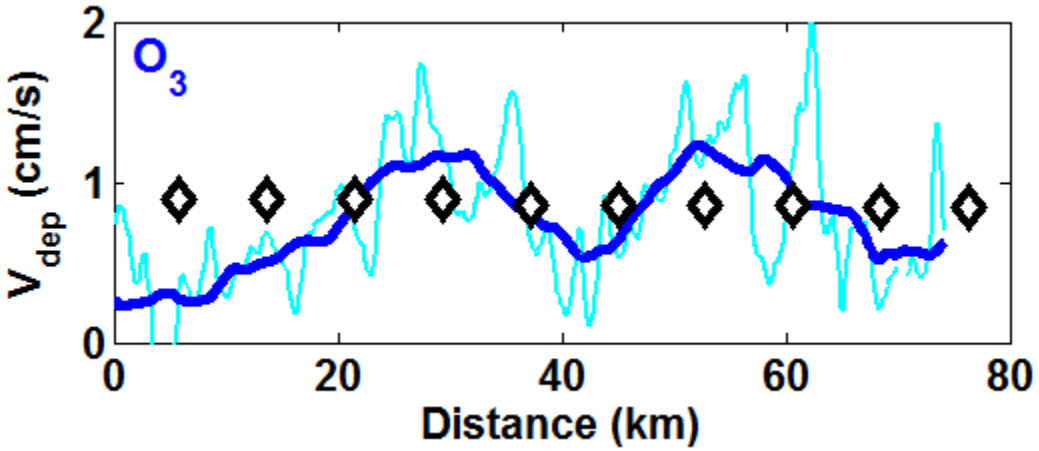
- HCHO *might* be a tracer for NO_3 oxidation of VOC

Riedel et al., ACP (2014)

Fluxes



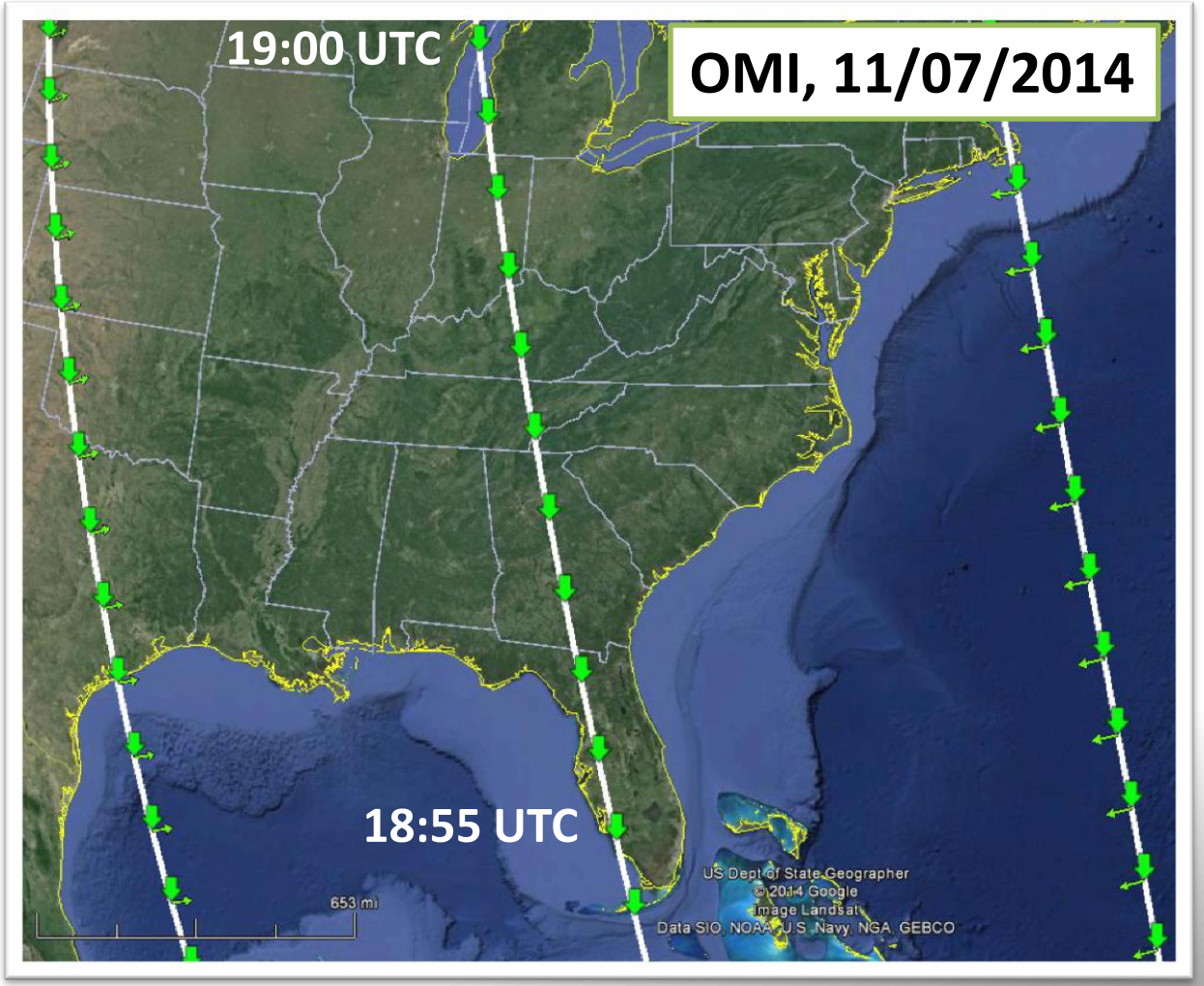
- Surface-atmosphere exchange is an important, but often poorly quantified, source/sink for trace gases
- Wavelet transforms offer a spatially-resolved advantage over traditional eddy covariance



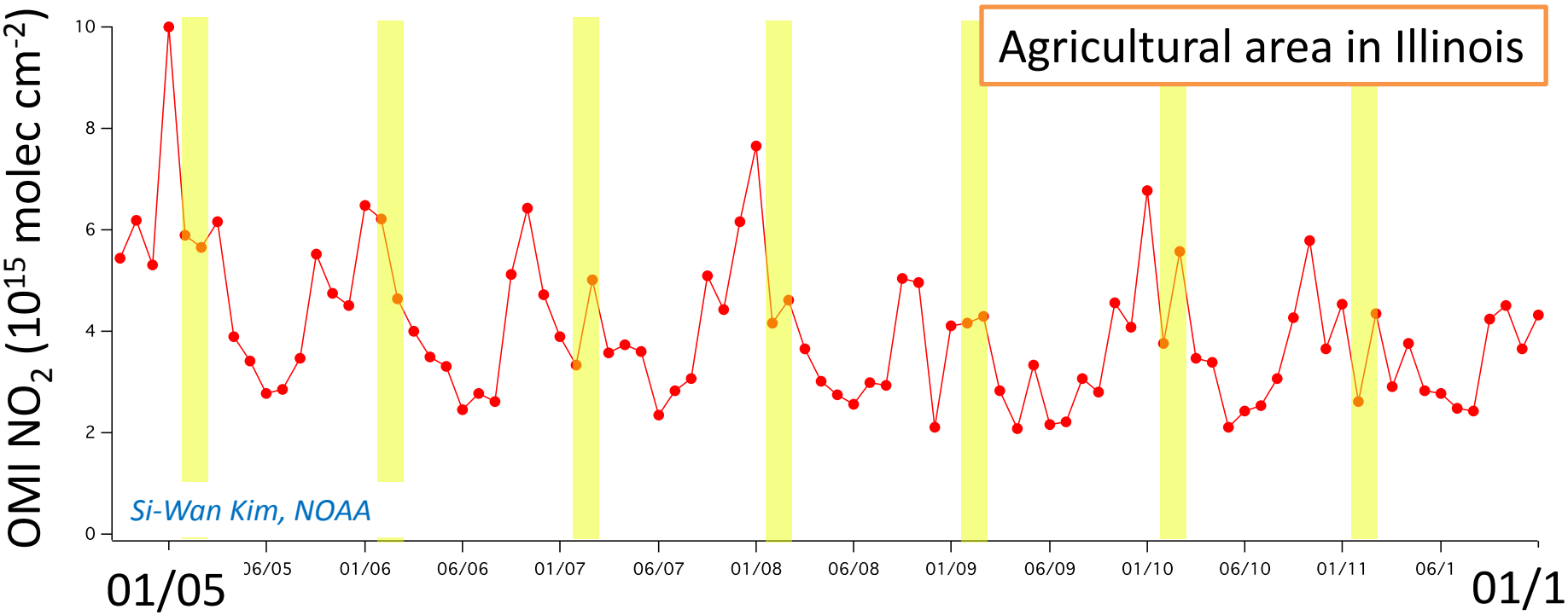
Kim, Farmer and Bertram, PNAS (2014)

Satellite Validation Opportunities

- OMI
  - HCHO
  - NO_2
  - SO_2
- TES
  - NH_3
  - CH_3OH
  - HCOOH



Agricultural Emissions?



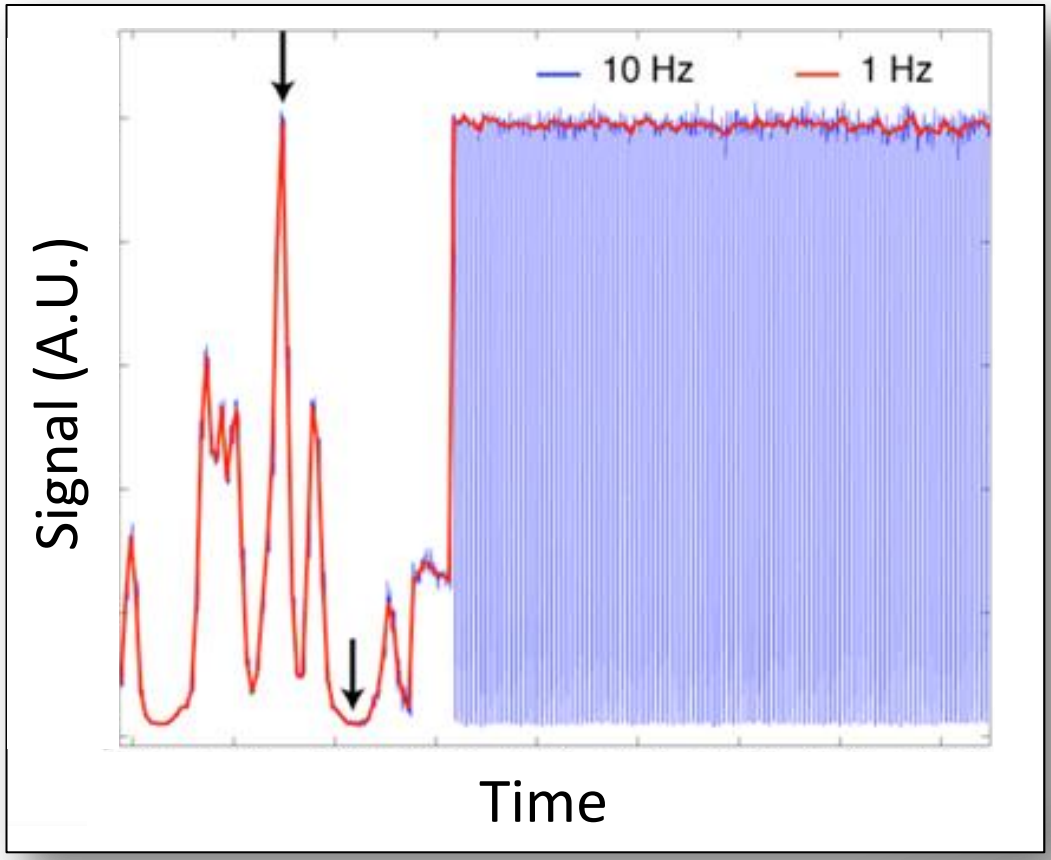
Is the wintertime maximum in OMI NO_2 due to emissions (e.g. from winter wheat) or a retrieval artifact?

Laser-Induced Fluorescence (LIF)

The laser is continuously tuned between a large formaldehyde rotational transition and a non-resonant wavelength.

$\Delta\lambda$ = 0.005 nm

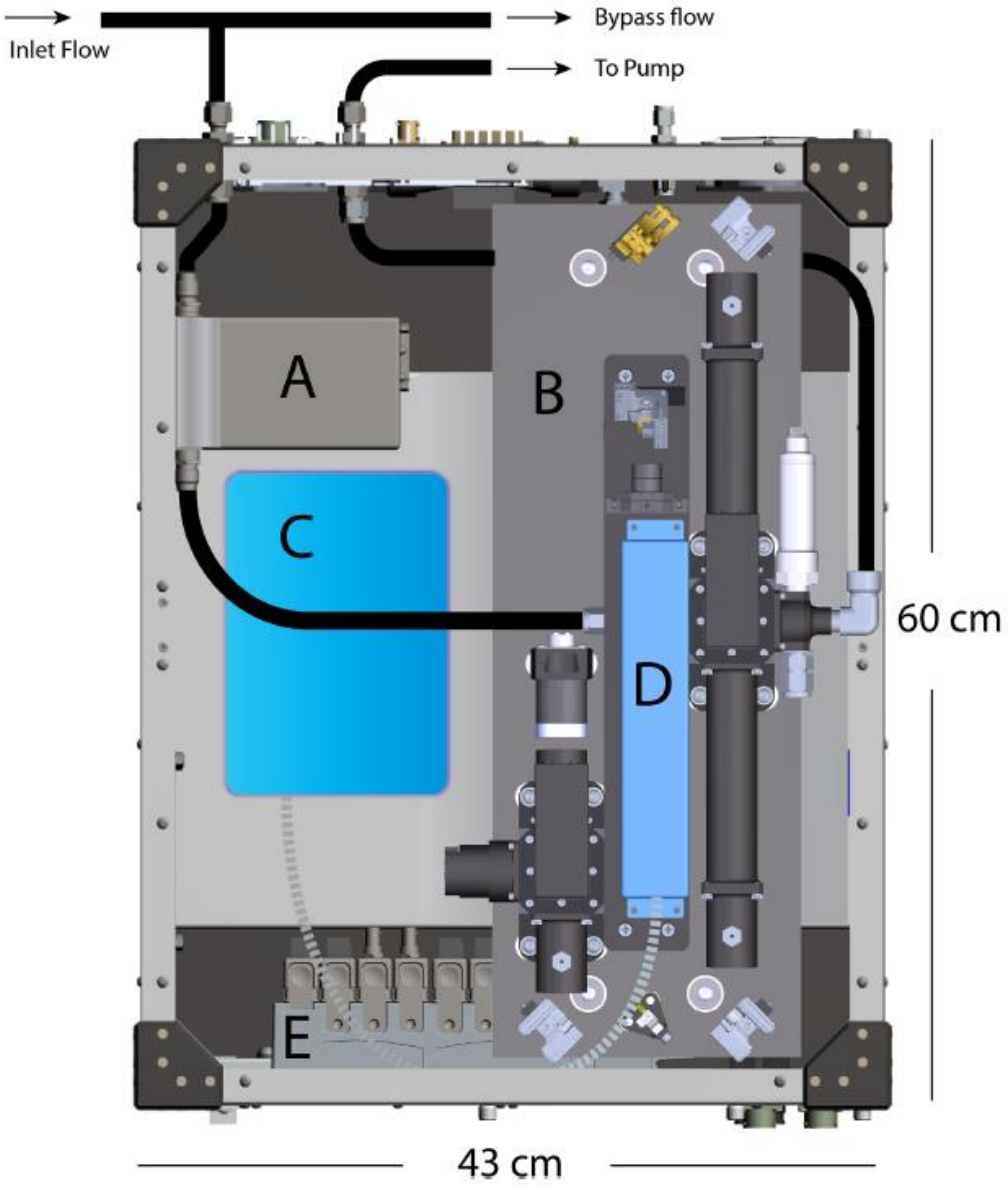
The concentration of formaldehyde is proportional to the difference between the online and the offline signals.



Det. Limit: 36 ppt/s

Accuracy: ±10%

In Situ Airborne Formaldehyde (ISAF)



Size: 15” x 17” x 24”
Weight: 25 kg (+16 kg)
Power: 200 W @ 28 VDC
+300W @ 60 Hz

Team HCHO

Tom Hanisco (NASA GSFC)

Josh DiGangi (NASA LARC)

Andrew Swanson

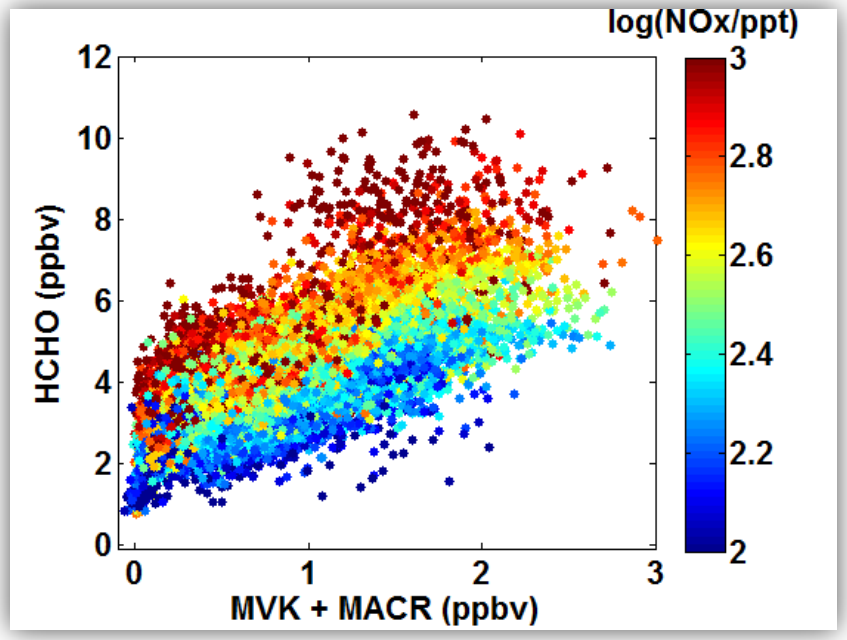
Steve Bailey

SUPPORT:

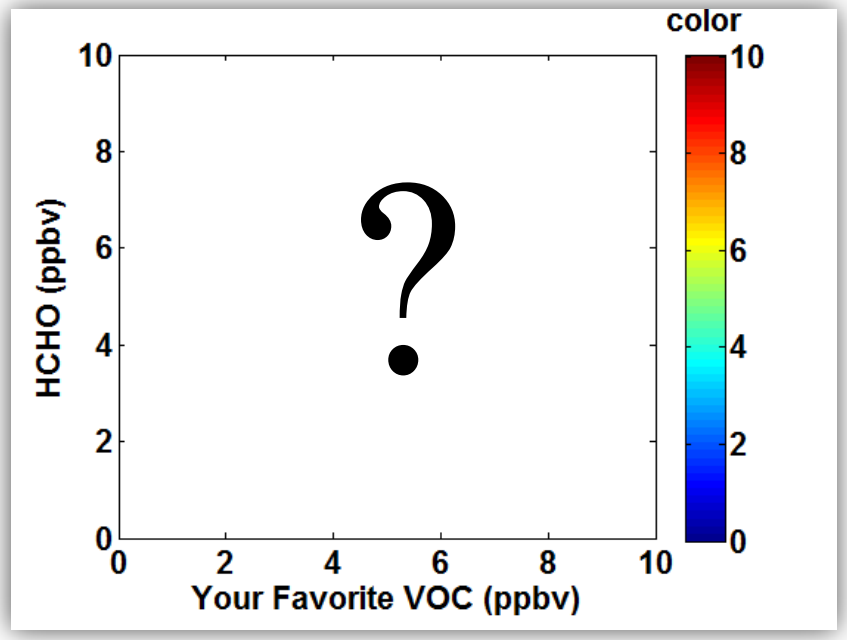

NASA

How does Chemistry Change when Trees Hibernate?

SENEX 2013



WINTER 2015



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