

Overview of the "Study of Houston Atmospheric Radical Precursors" (SHARP) Project

Barry Lefer & Bernhard Rappenglück

(University of Houston)

Bill Brune

(Penn State University)

Jack Dibb

(Univ. of New Hampshire)

Xiao-Ying Yu

(PNNL)

Jochen Stutz

(UCLA)

George Mount & Tom Jobson

(Washington State Univ)

Martin Buhr & Max Shauck

(Baylor University)

Johan Melqvist

(Chalmers University)

Renyi Zhang & Don Collins

(Texas A&M)

Greg Huey

(GaTech)

Gary Morris

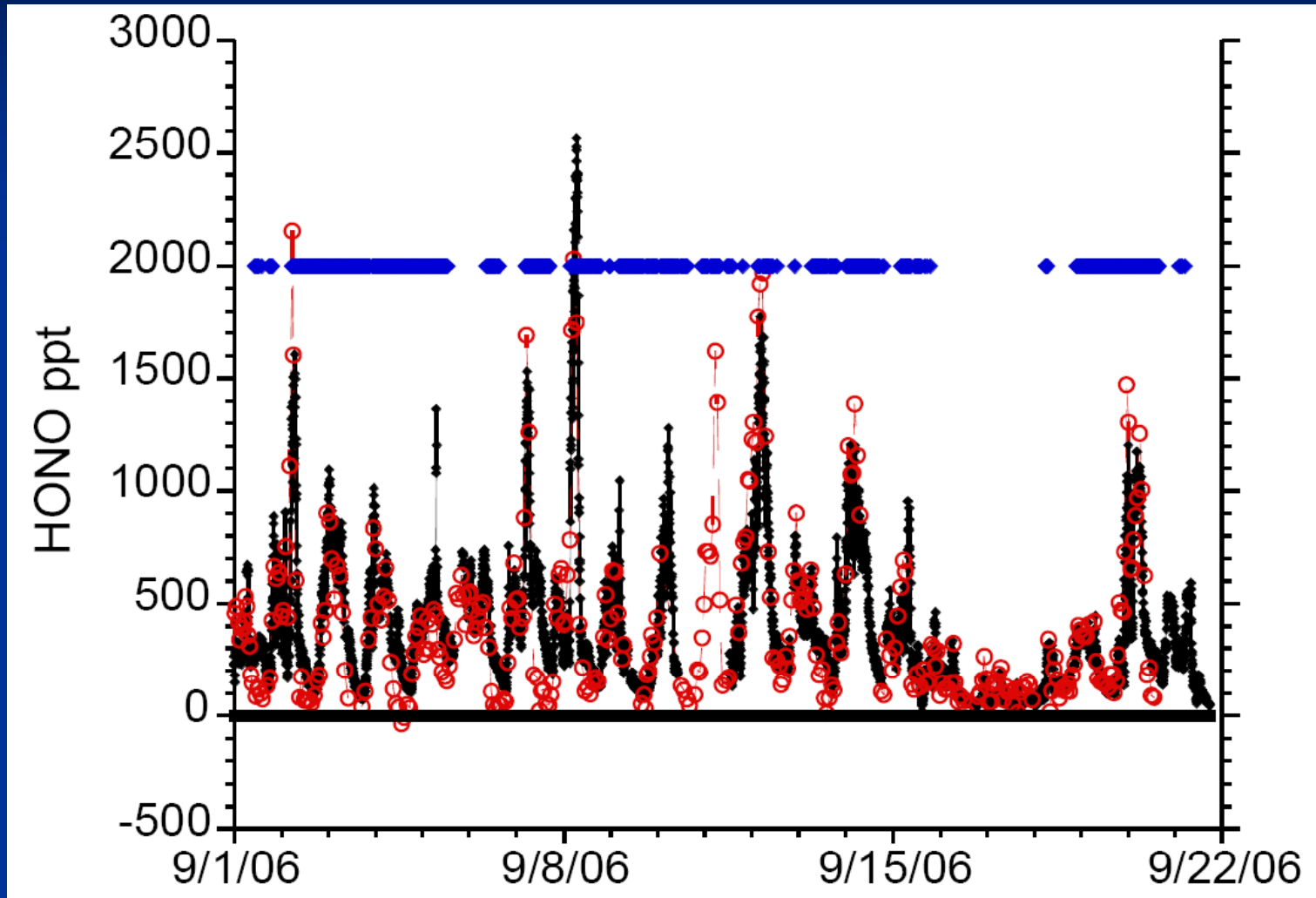
(Valparaiso University)

SHARP Overview Outline

- I. Selected findings from previous work
- II. SHARP Goals
- III. Current SHARP Projects
- IV. Details of Moody Tower SHARP Intensive

Selected TRAMP Findings

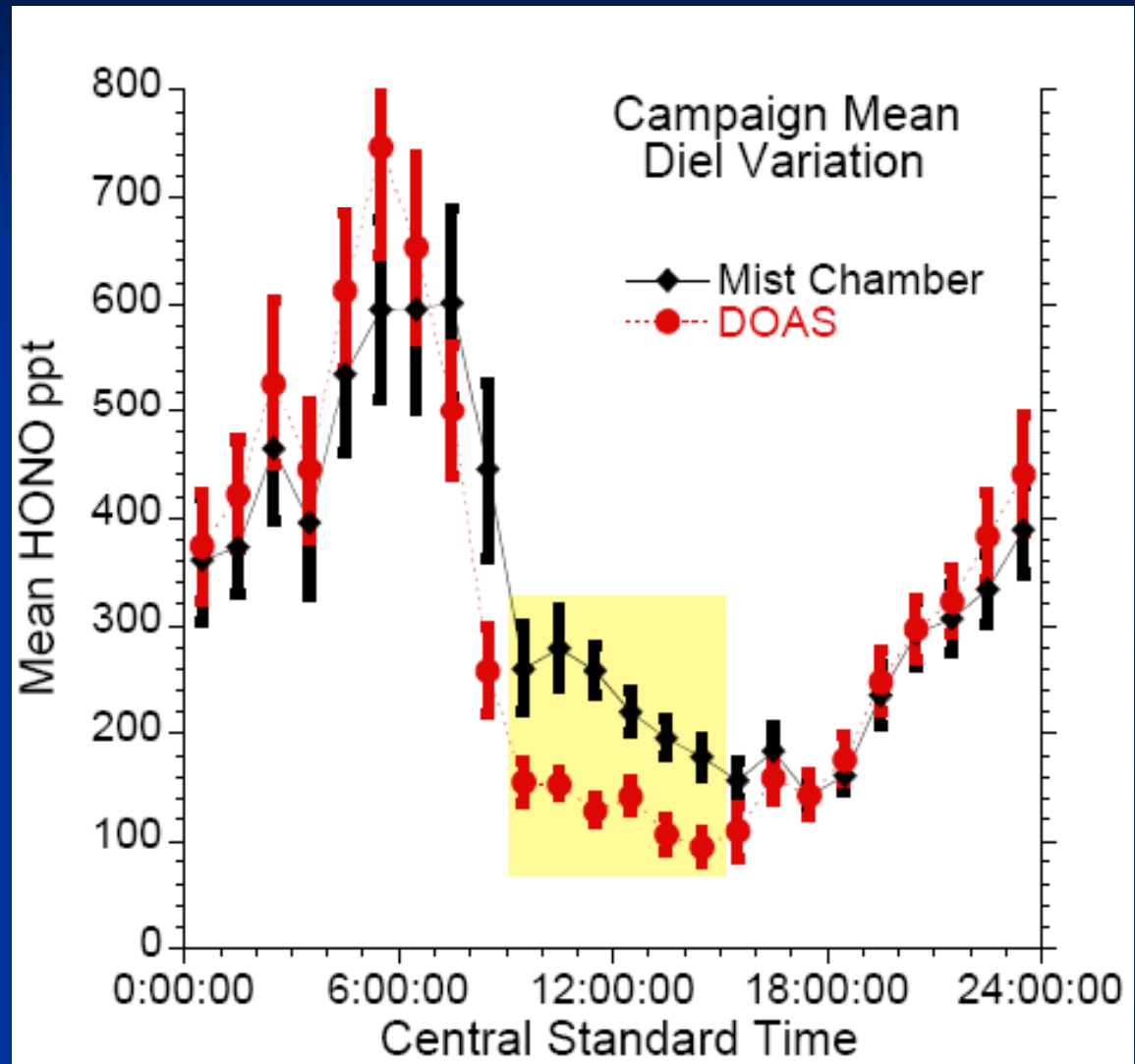
HONO



Stutz et al. (TRAMP AE Special Issue)

Selected TRAMP Findings

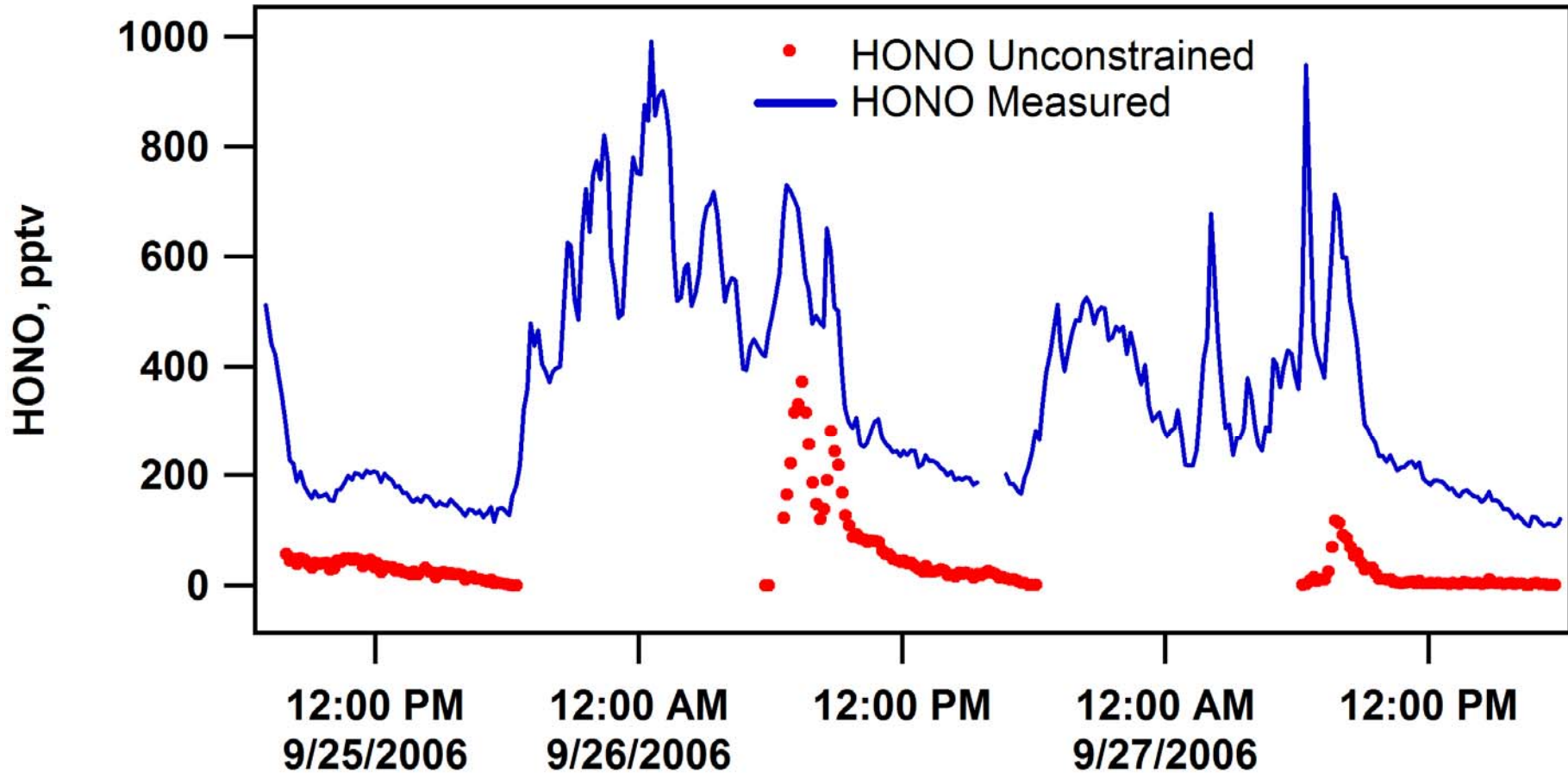
HONO



Stutz et al. (TRAMP AE Special Issue)

Selected TRAMP Findings

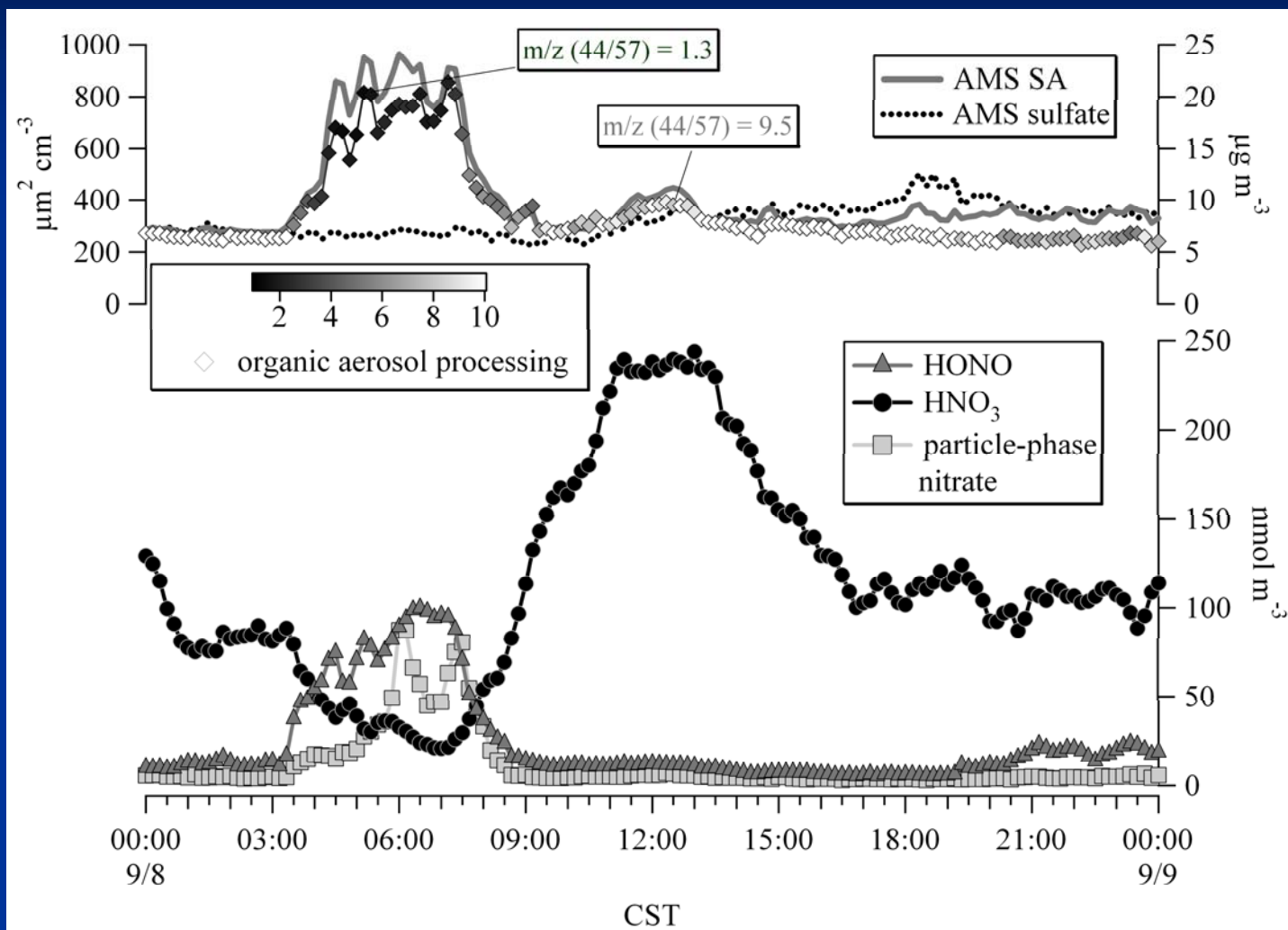
HONO



Flynn et al. (TRAMP AE Special Issue)

Selected TRAMP Findings

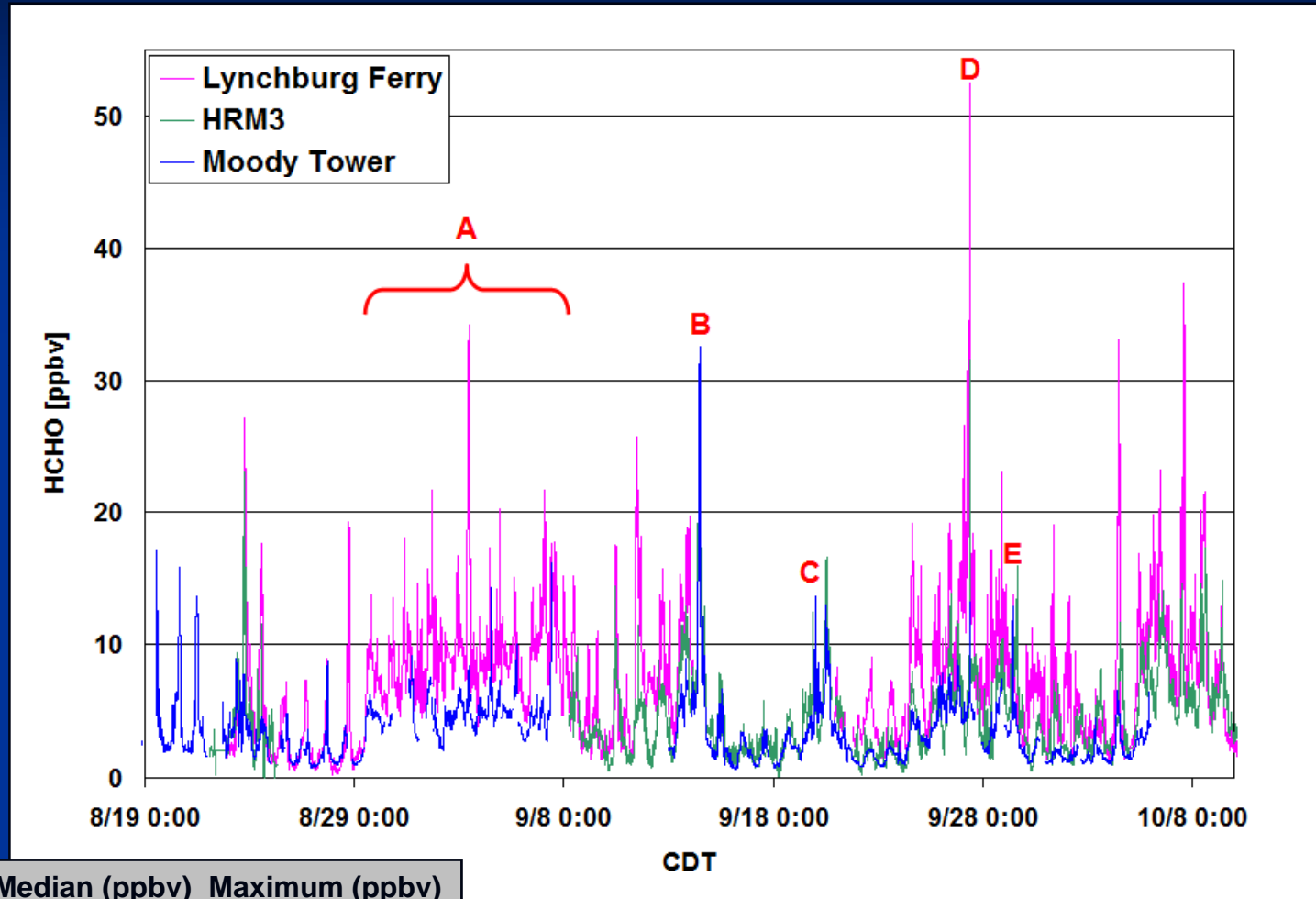
HONO



Ziemba et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

HCHO

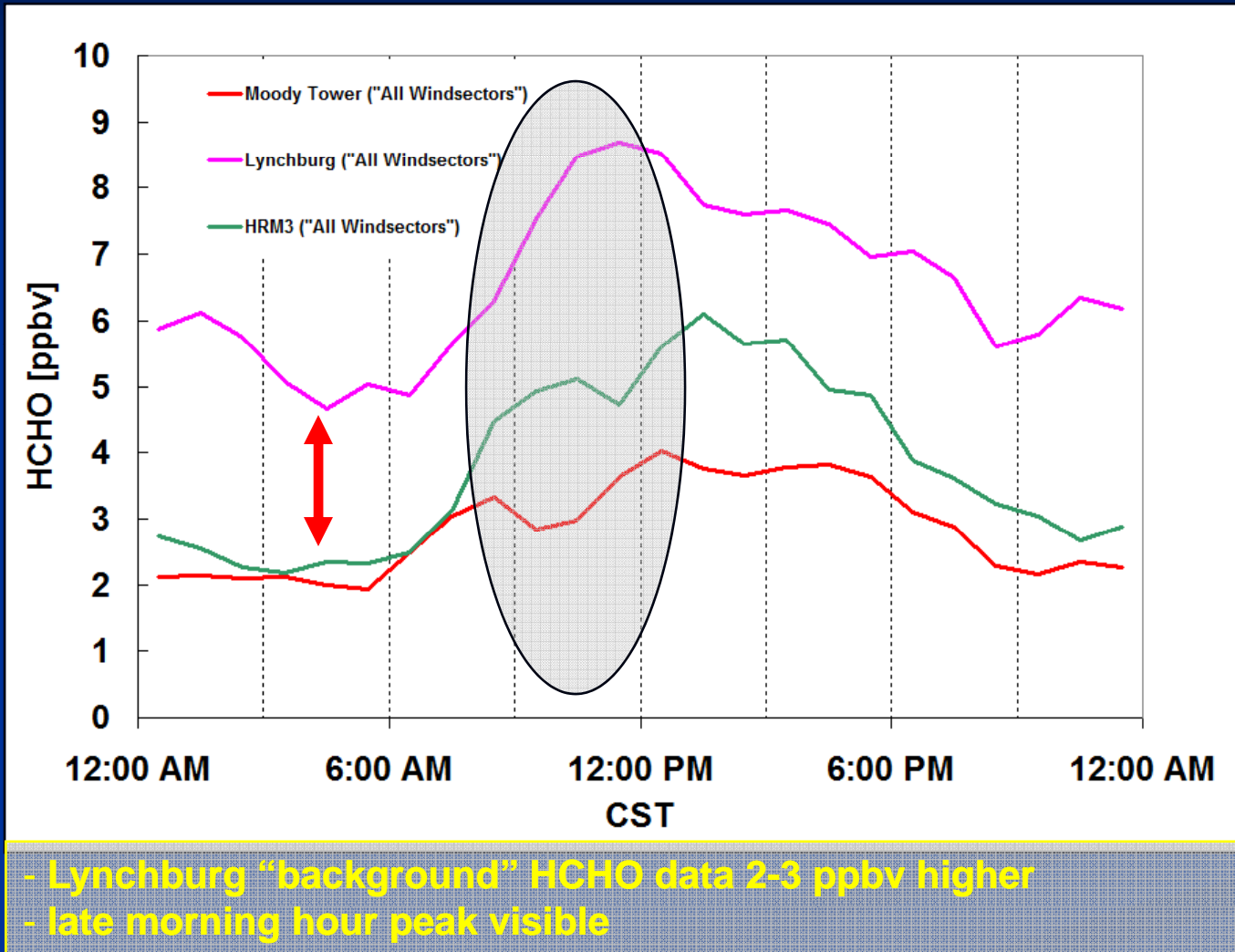


	Median (ppbv)	Maximum (ppbv)
Lynchburg	6.62	52.44
HRM3	3.54	31.53
Moody Tower	2.88	32.54

Rappengluck et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

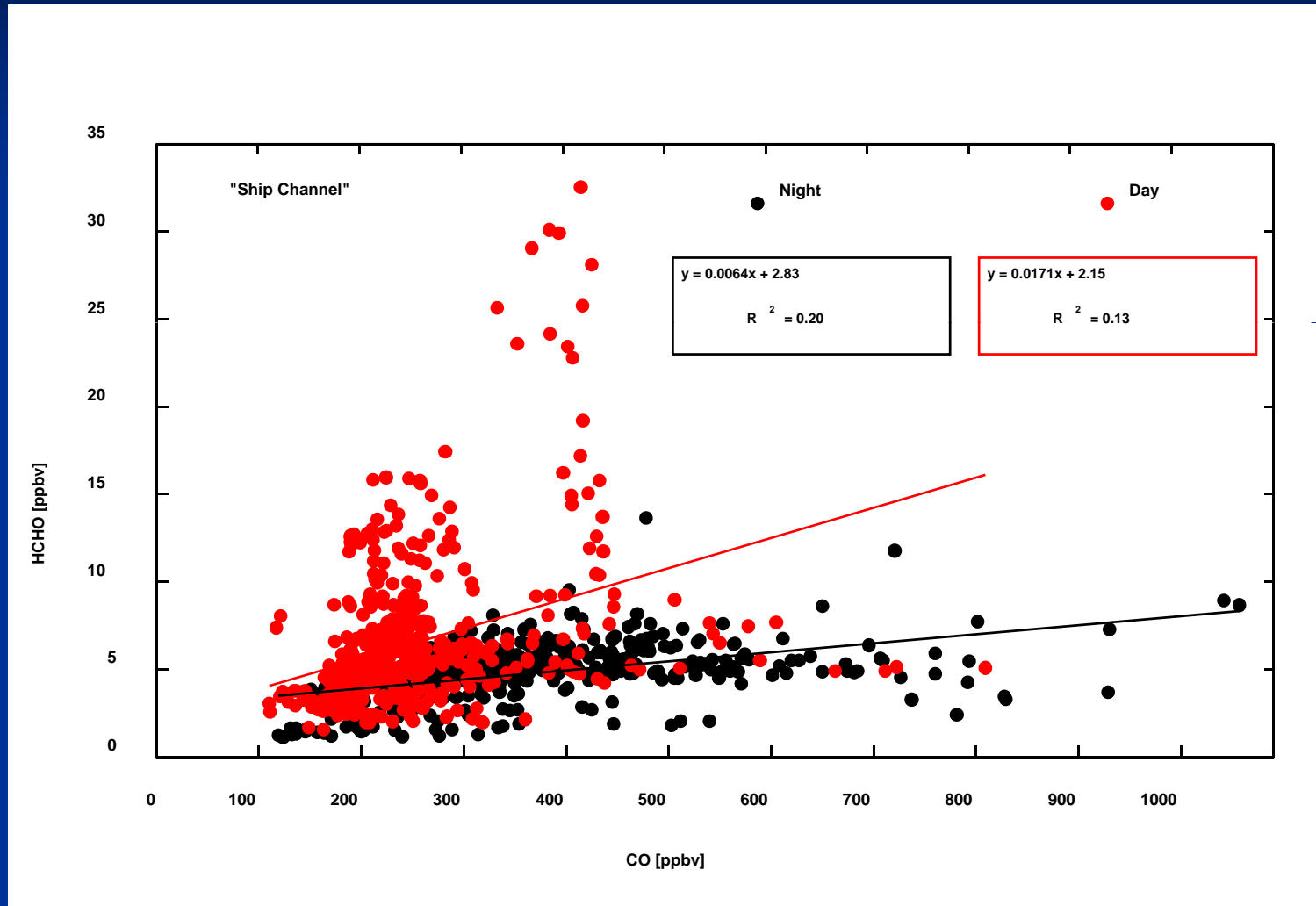
HCHO



Rappengluck et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

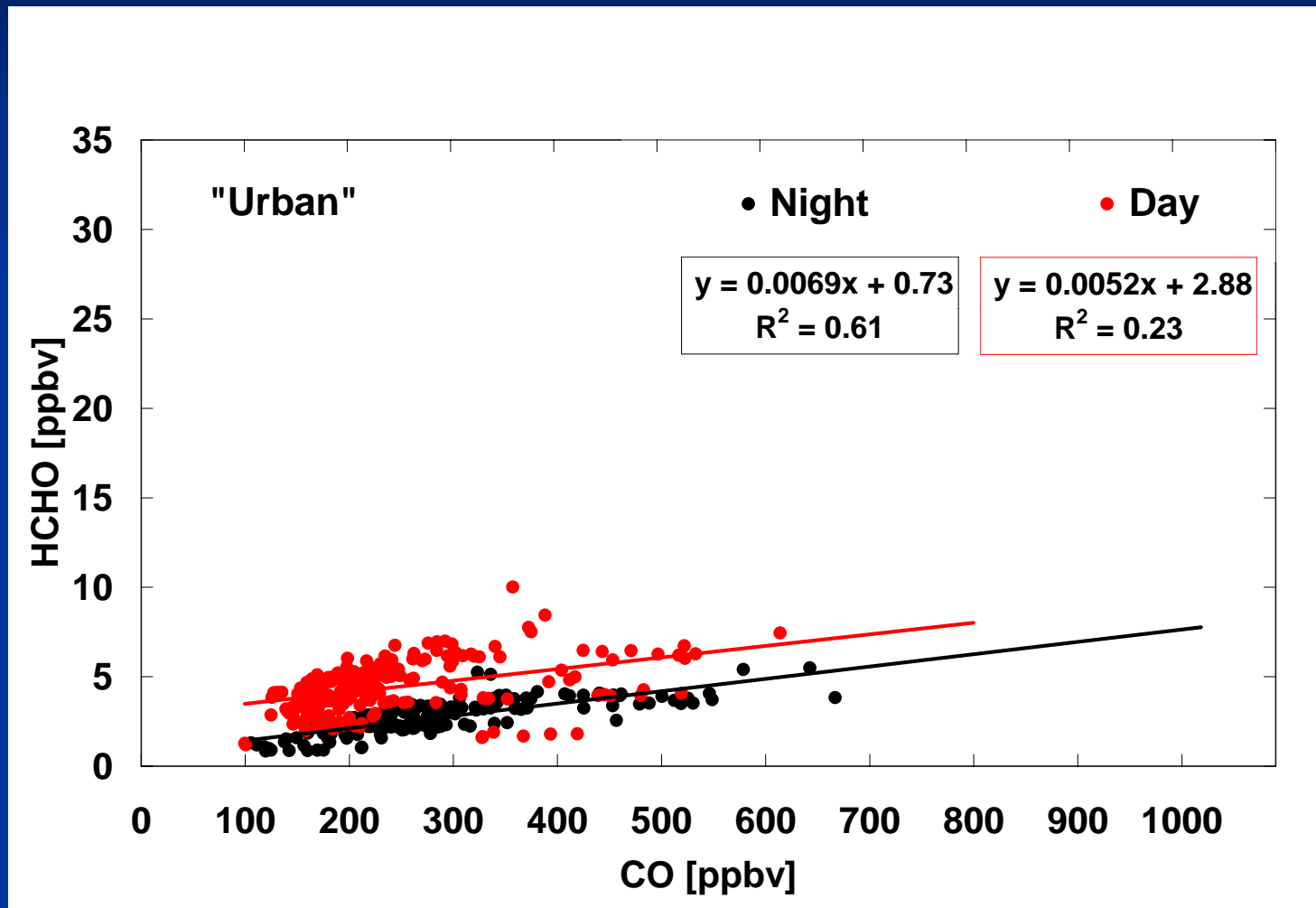
HCHO



Rappengluck et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

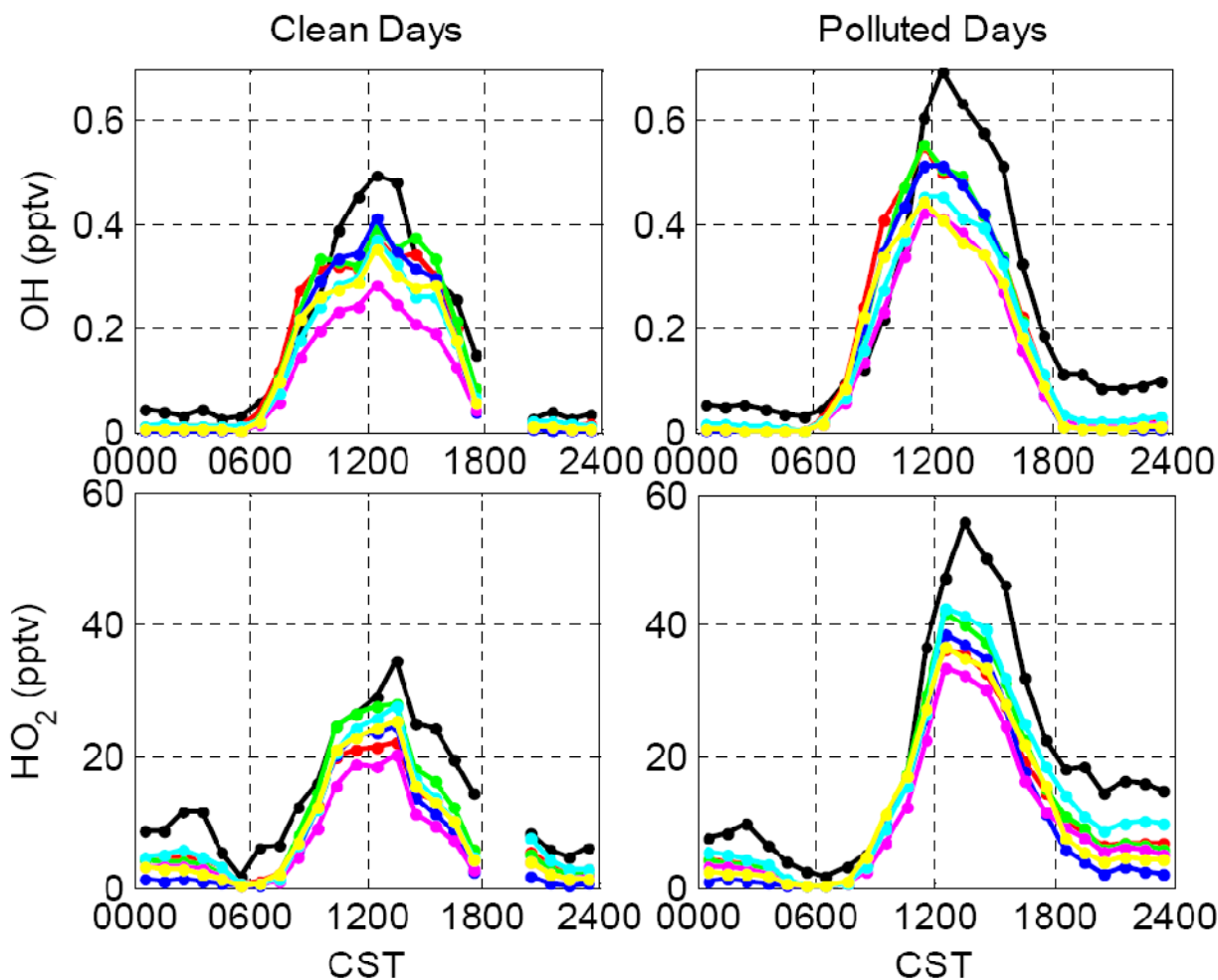
HCHO



Rappengleuck et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

OH/HO₂

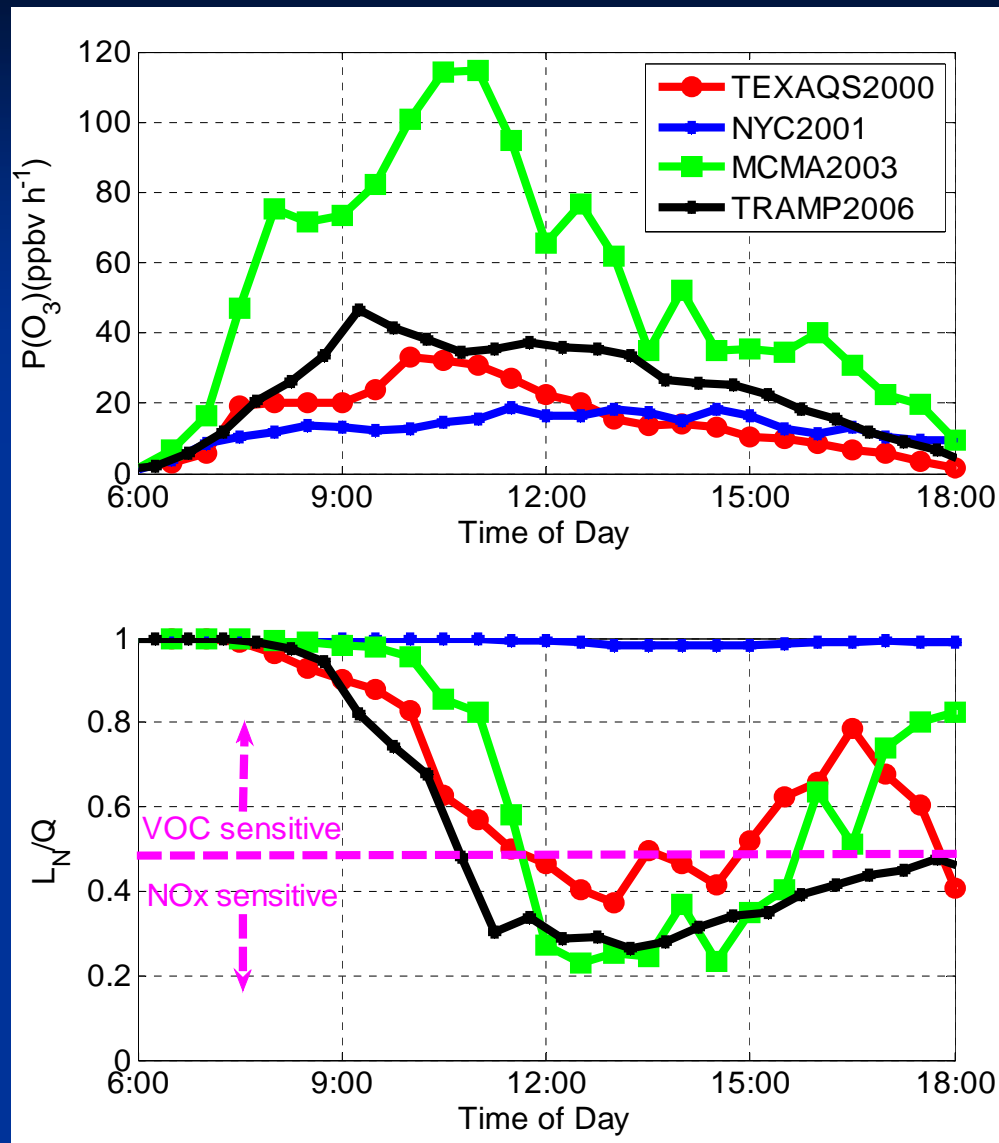


RACM (red), CB05 (green), LaRC (blue), SAPRC-99 (magenta), SAPRC-07 (cyan) and MCMv3.1 (yellow) under clean (left panels) and polluted (right panels) conditions.

Chen et al. (TRAMP AE Special Issue)

Selected TexAQS II / TRAMP Findings

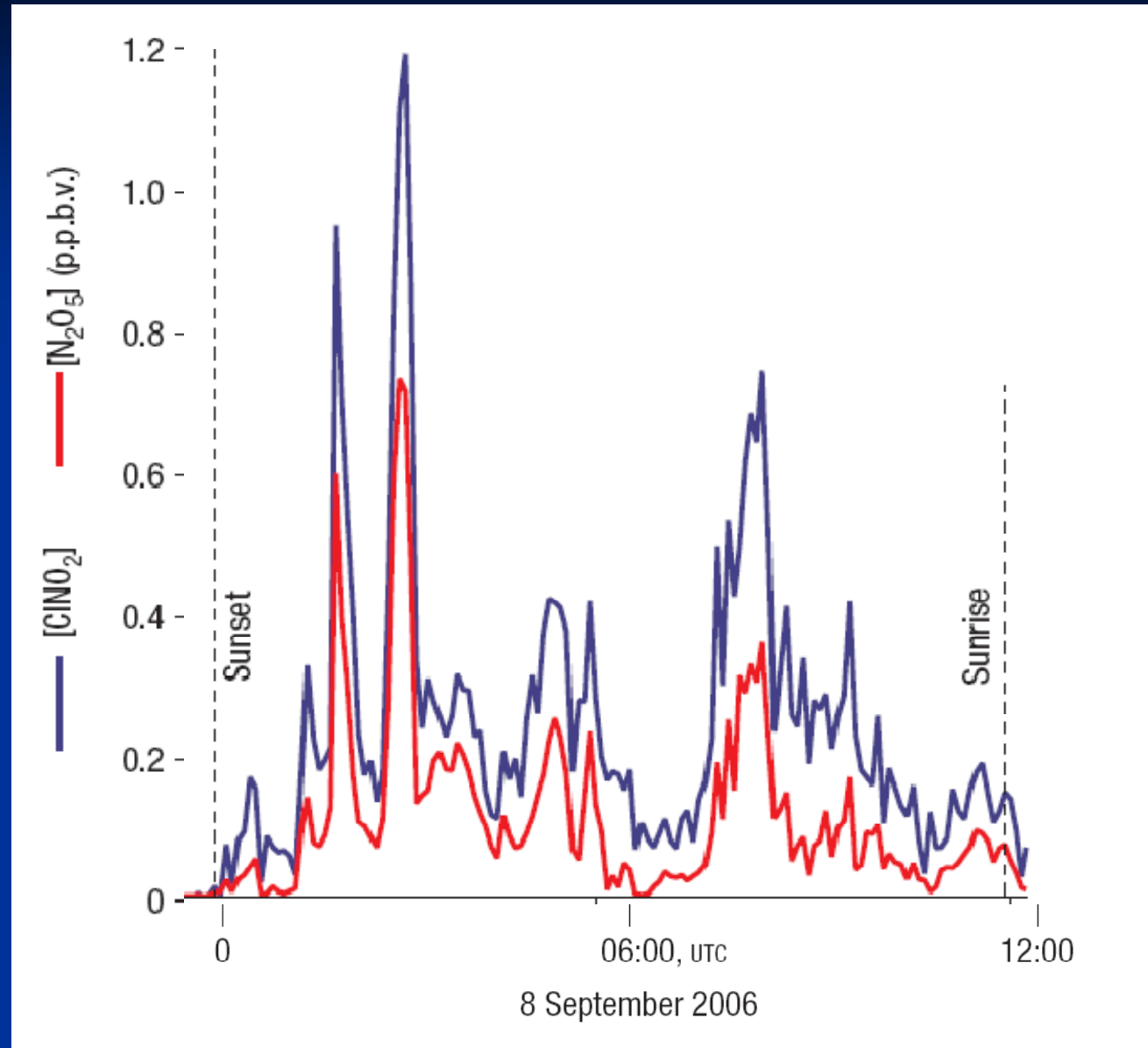
O₃ Production



Mao et al. (TRAMP AE Special Issue)

Selected TexAQS II Findings

CINO₂



Osthoff et al., Nature (2008), doi:10.1038/ngeo177

SHARP Goals

Based on the TexAQS-II and TRAMP findings concerning radical processes in the Houston atmosphere, the following topics require additional research to better understand:

- 1) The contribution of direct emissions of OH radical precursors HCHO and HONO from flares, smoke stacks, and other point sources as well as from mobile sources.
- 2) The identification of various pathways of surface-induced formation of HONO.
- 3) The magnitude of daytime HONO levels as well as possible daytime sources of HONO.
- 4) The ambient levels of ClNO_2 in Houston and potential as a radical source.
- 5) The importance of other "missing" radical sources.

These uncertainties limit our ability to model radicals and ozone formation.

Better understanding of radical production has been explicitly recognized in the TERC-Strategic Research Plan (TERC-SRP).

Current SHARP Projects

Moody Tower SHARP Intensive UH

HONO Intercomparison Study (HINT) UH

Surface-induced Oxidation of Organics in the Troposphere (SOOT) TAMU

Traffic Related Emissions of HONO and HCHO (TRENF) UH

Study of HONO Surface Fluxes (HONO-FLUX) UH

Formaldehyde and Olefins from Large Industrial Releases (FLAIR)

Dual MAX-DOAS WSU & UCLA

Imaging-DOAS UCLA

Solar Occultation Flux (SOF) CU

Aztec SHARP Flights (Supports both FLAIR, Moody Tower, and TRENF) UH

Moody Tower SHARP Intensive Campaign

15 April – 31 May 2009

O₃, CO, NO/NO₂/NO_y, SO₂, T, P, RH, ws, wdir, precip (UH)

Actinic flux (photolysis frequencies), AOD, O₃ column, skycam (UH)

VOCs (AutoGC), PANs, HCHO, HOOH, HONO (UH)

OH, HO₂, OH reactivity (Penn State)

Long Path DOAS at ~ 50 m, 150 m, and 300 m for path integrated O₃, NO₂, SO₂, HONO, HCHO, NO₃ (UCLA)

Speciated OVOCs, NO/NO₂/NO_y (WSU)

TRAC, EC/OC, particle size distribution, actinic flux (PNNL)

CINO₂, N₂O₅, PANs (GaTech)

Ozonesondes (Valpo/UH)

Continuous boundary layer height (UH)

HNO₃, HONO*, HCl (UNH)

SOOT Suite of measurements – t-DMA, HONO, N₂O₅, NO₃, particle size spectra, etc (TAMU)

Moody Tower SHARP Intensive Campaign

What else is missing?

AMS / PILS

total peroxy nitrate (RO_2NO_2) and total alkyl nitrate (RONO_2)

other Halogen species

Hg (GEM, RGM, FPM)

????