Question E: Are there sources of ozone and aerosol precursors that are not represented in the reported emissions inventories?

Observations of Formaldehyde at Moody Tower

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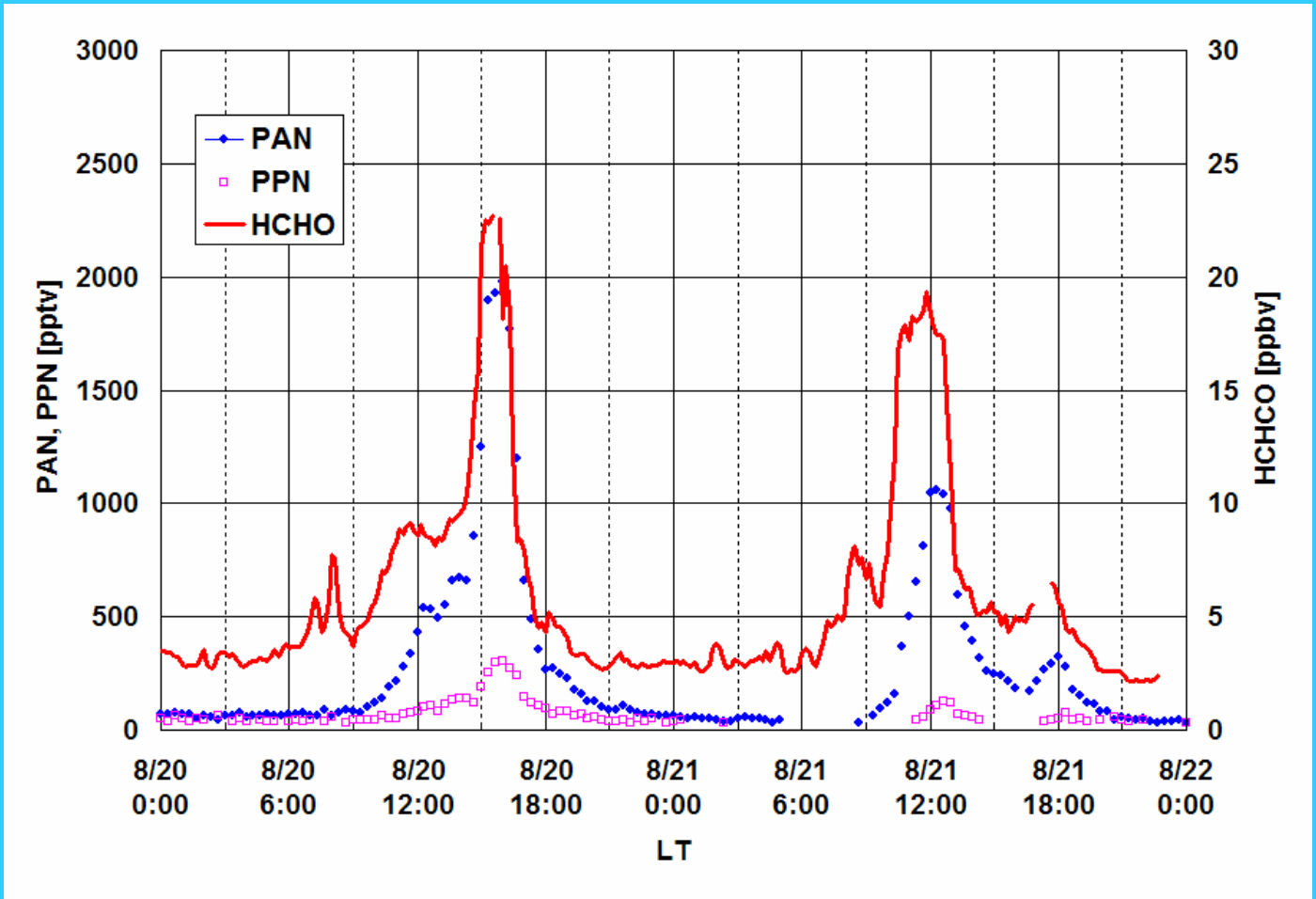
Overview - Methods

- Formaldehyde measurements
- Time series: daytime vs nighttime
- The event on September 29
- Tentative conclusions

Formaldehyde Measurements

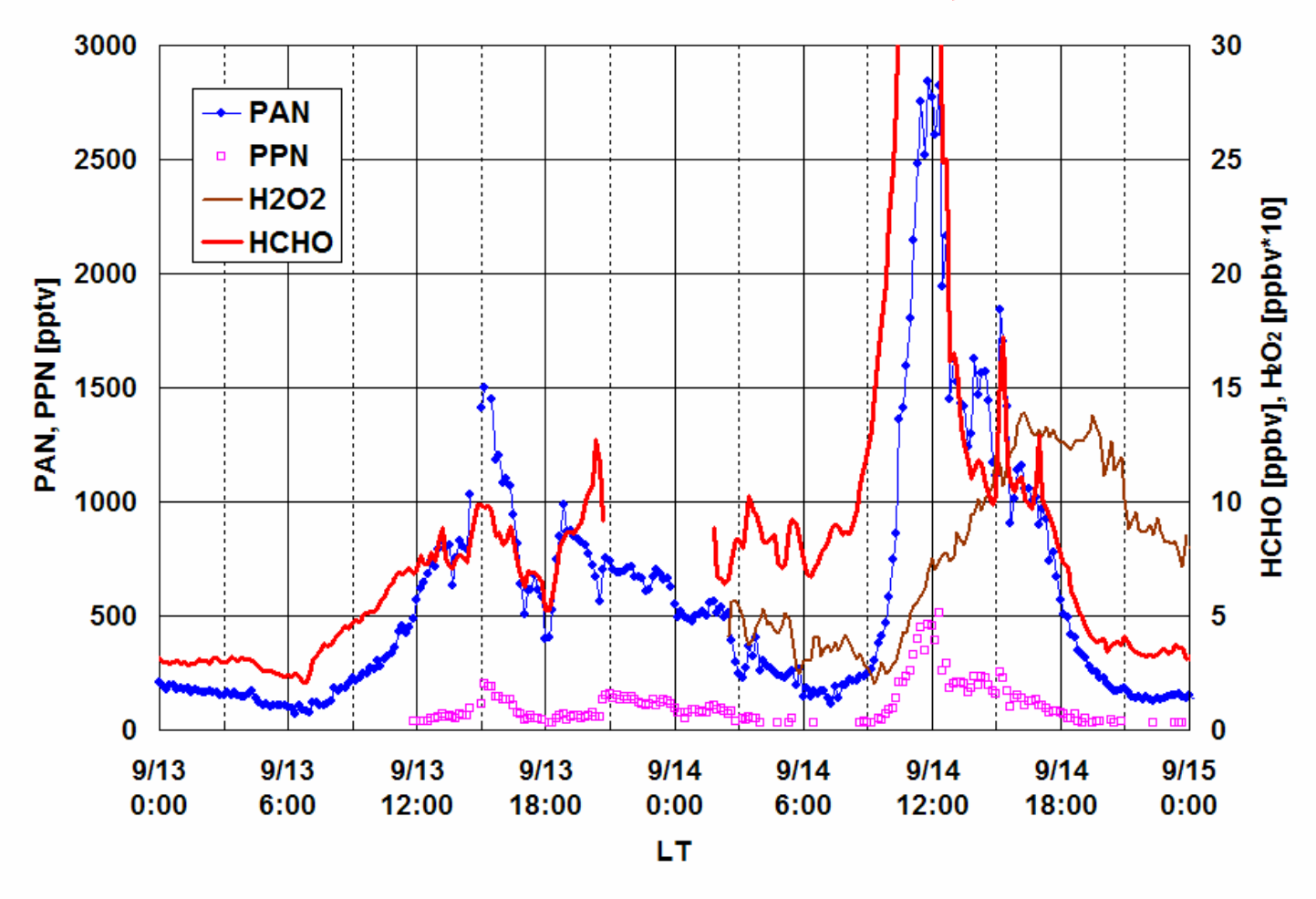
- Instrument
  - AeroLaser AL4021
    - •Hantzsch reaction; Fluorescence
    (liquid phase reaction of formaldehyde with 2,4 pentadione and an amin like NH_3. Production of α-α'-dimethyl-β- β'-diacetyl-pyridine that is excited at 400 nm. Fluorescence is detected at 510 nm.)
  - Calibration gases:
    - internal permeation source
    - NCAR Formaldehyde standard (4 ppm)
- Location: Moody Tower (60 m a.g.l.)

Time Series: Daytime



Time Series: Daytime

Formaldehyde max.: 47 ppbv

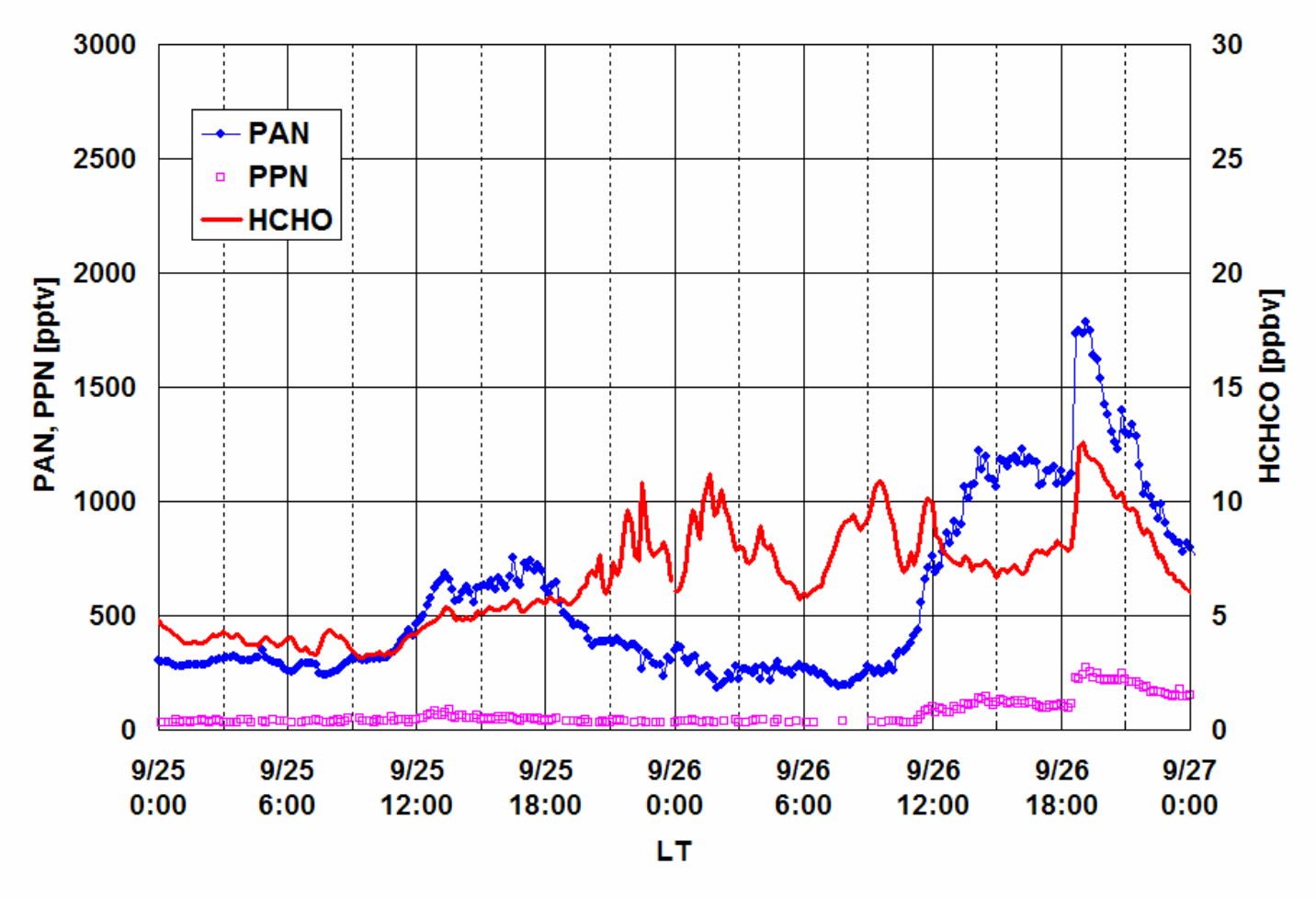


Time Series: Daytime

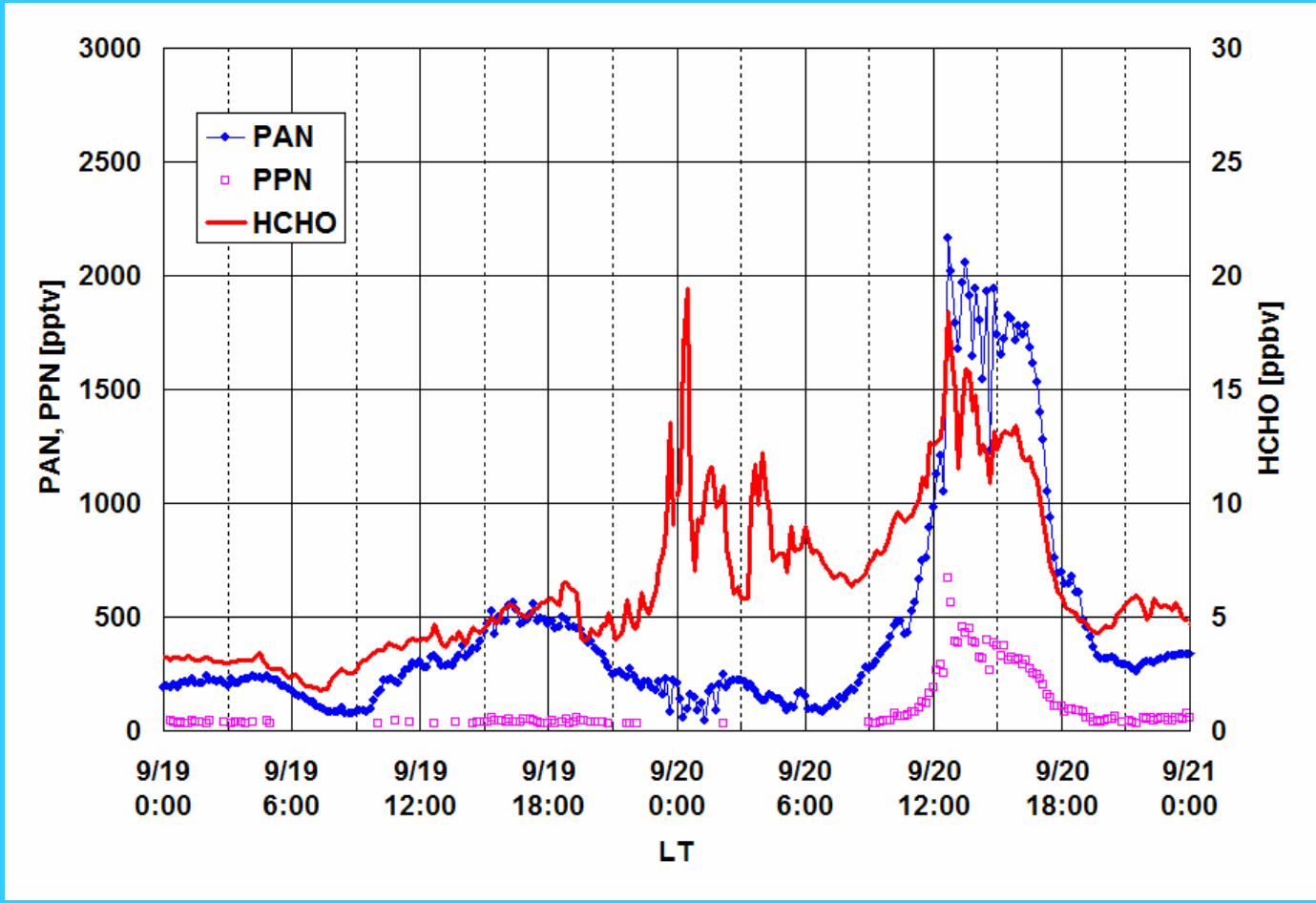
- 1. Observation

High daytime Formaldehyde values nicely correlate with PAN and PPN. Formaldehyde most likely secondarily formed.

Time Series: Nighttime



Time Series: Nighttime



Time Series: Nighttime

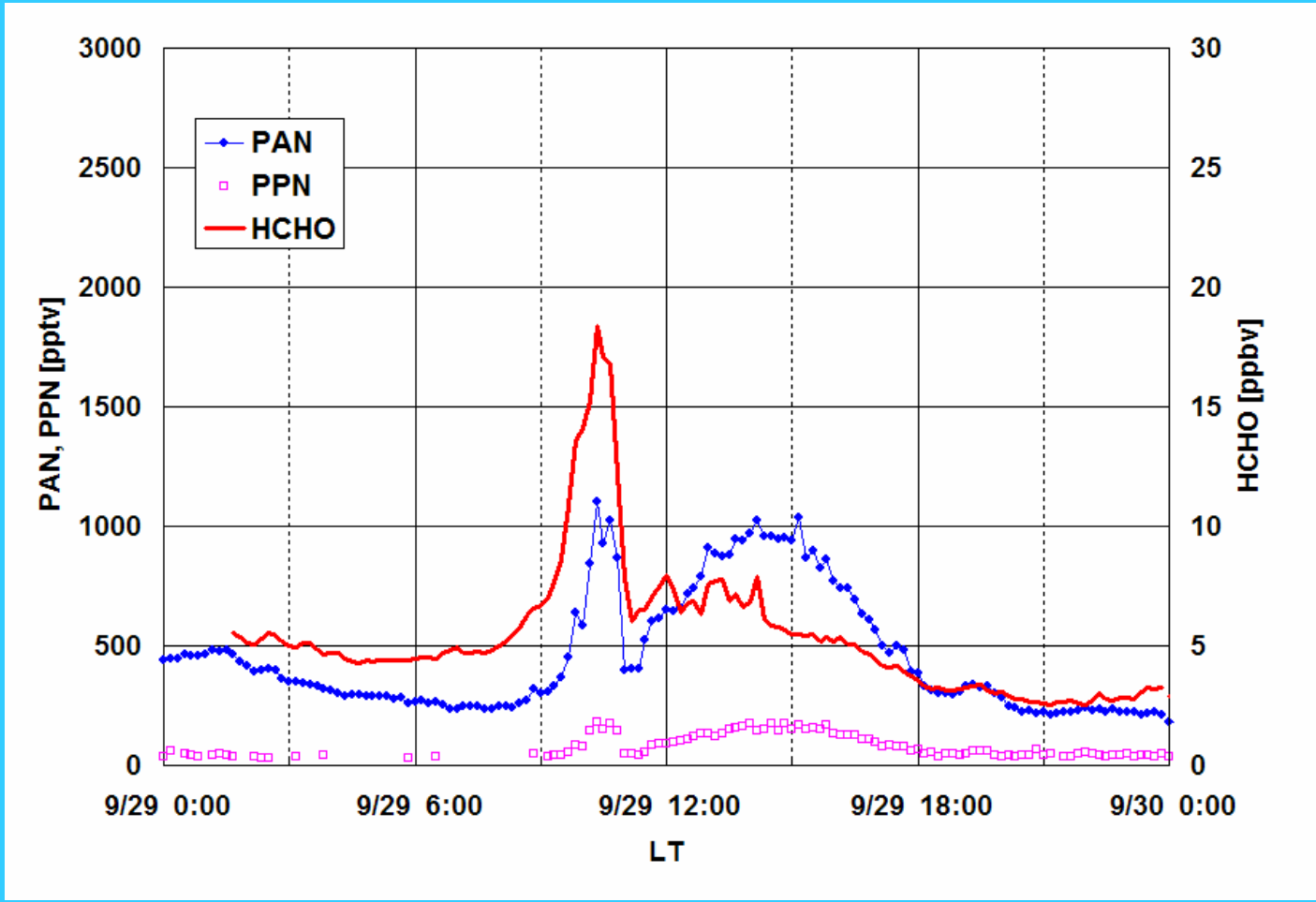
- 1. Observation

  High daytime Formaldehyde values nicely correlate with PAN and PPN. Formaldehyde most likely secondarily formed.

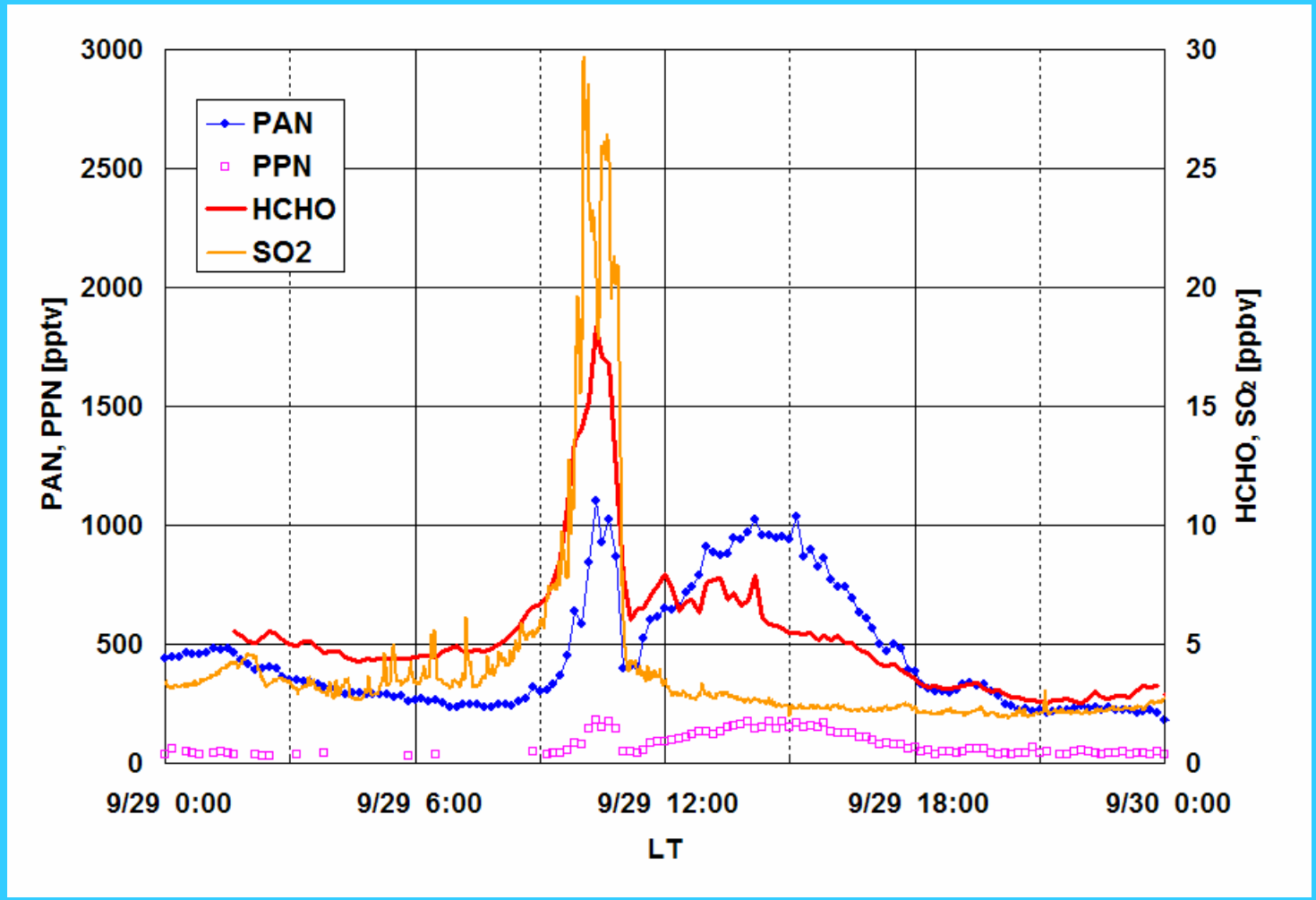
- 2. Observation

  During nighttime Formaldehyde values up to 20 ppbv have been observed. Formaldehyde shows strong fluctuations.

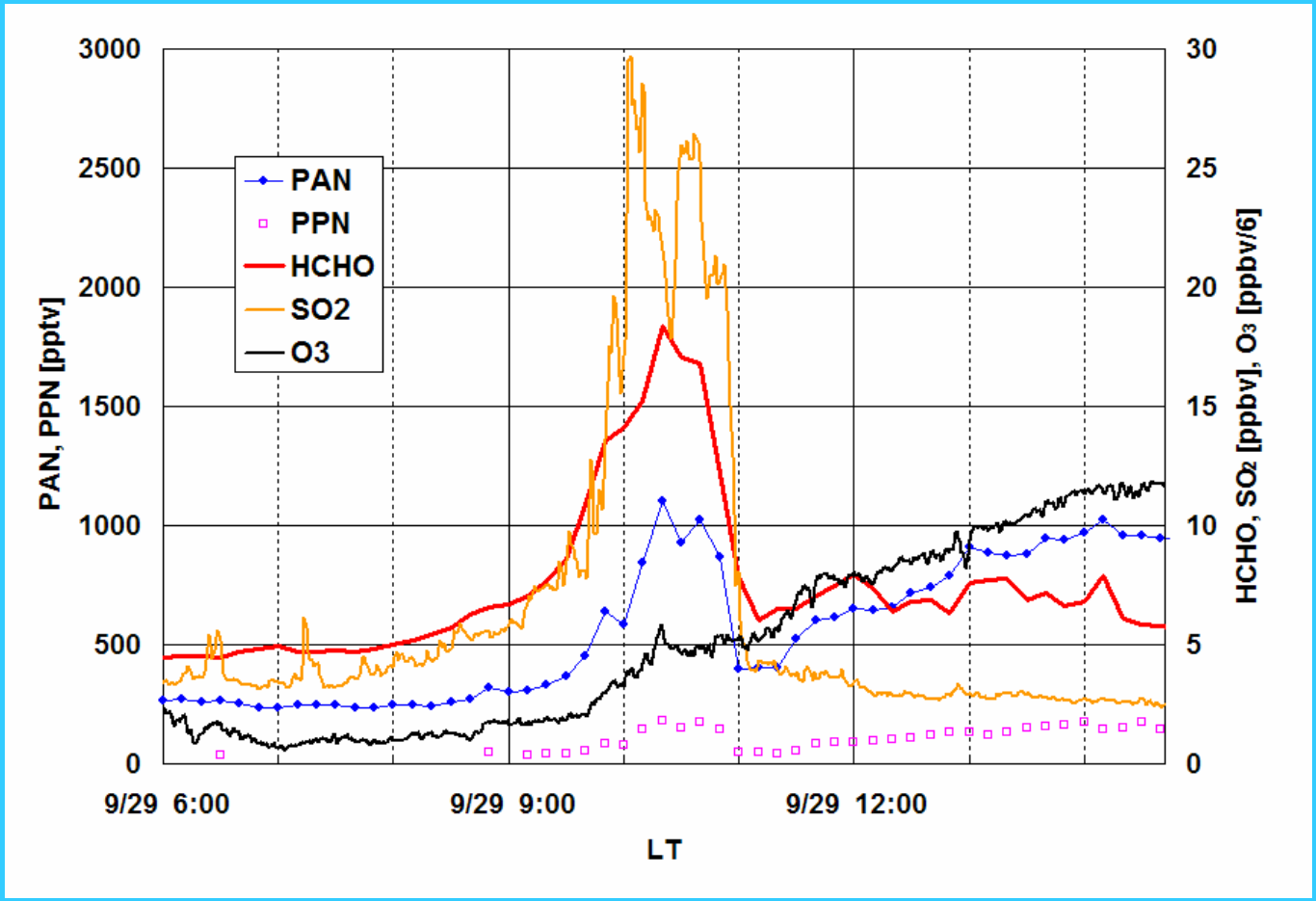
The event on September 29



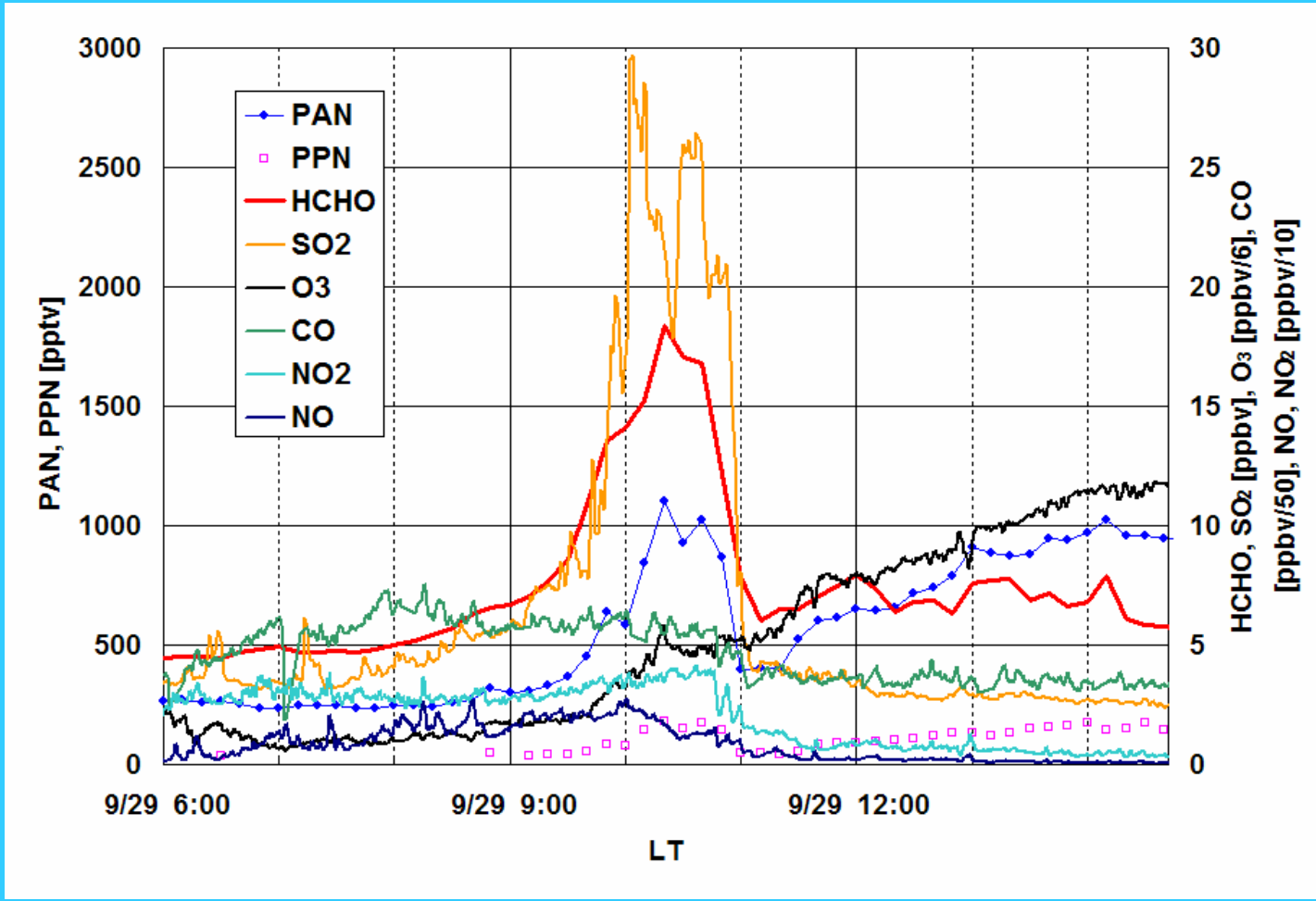
The event on September 29



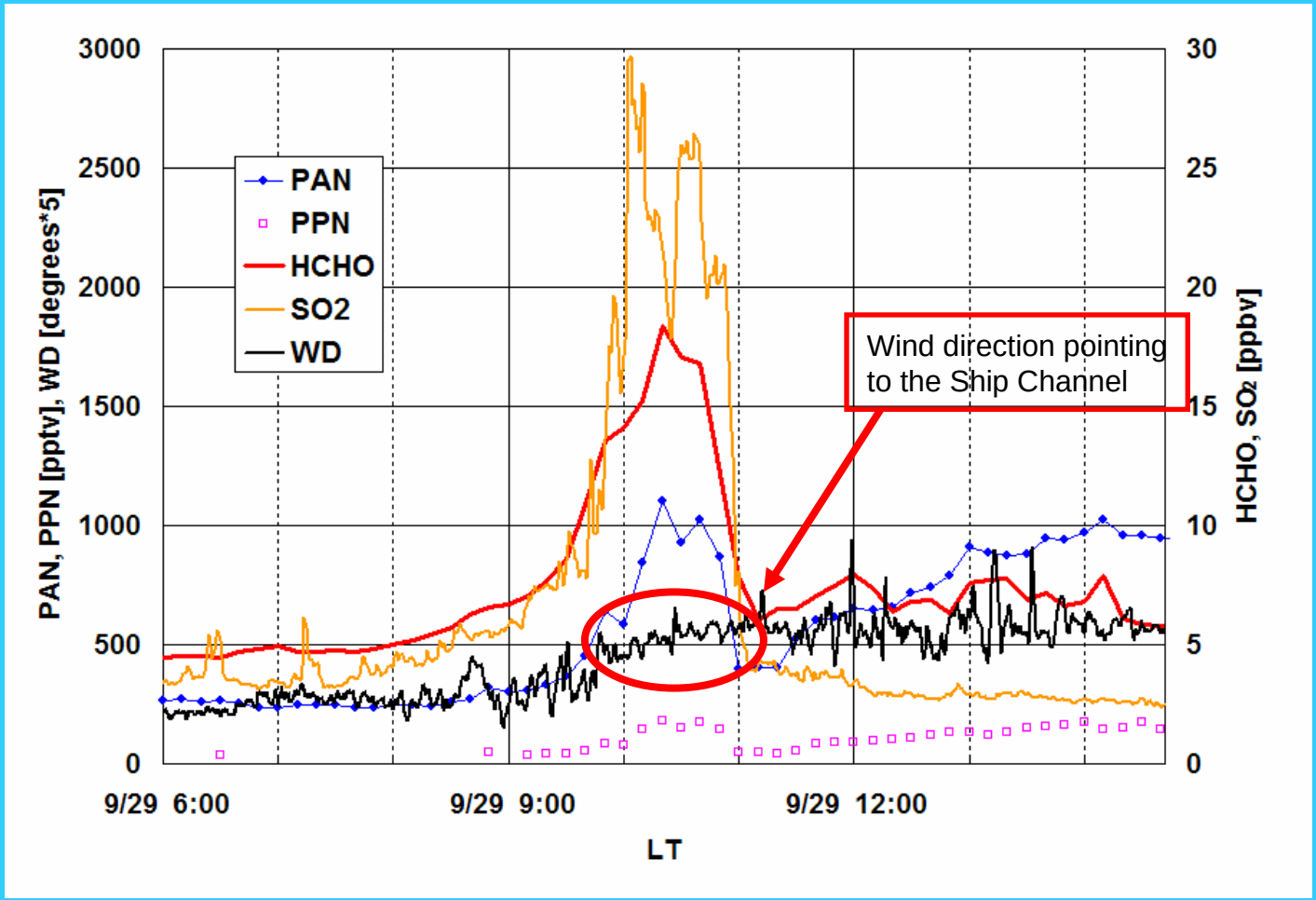
The event on September 29



The event on September 29



The event on September 29



The event on September 29

- 3. Observation

Enhanced Formaldehyde values occur together with significantly enhanced SO_2 and slightly enhanced NO_2 values. Also VOCs are enhanced (not shown, not yet evaluated). PAN and PPN values are strongly enhanced, O_3 almost unchanged.

Tentative Conclusions

- Enhanced nighttime values of Formaldehyde suggest primary sources for Formaldehyde
- Possible sources for primary emissions are traffic exhaust, in particular not well maintained Diesel engines (trains?)
- Other possible source are flares. Dasgupta et al (2005) report the occurrence of elevated NO_2, SO_2 and Formaldehyde close to the Ship Channel