



Challenges and opportunities for remote sensing of air quality: Insights from DISCOVER-AQ

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<http://discover-aq.larc.nasa.gov/>



Thanks to Partners



Maryland Department of the Environment (MDE)
San Joaquin Valley Air Pollution Control District (SJV APCD)
California Air Resource Board (CARB)
Bay Area Air Quality Management District (BAAQMD)
Texas Commission on Environmental Quality (TCEQ)
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National Oceanic and Atmospheric Administration
National Park Service

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University of California, Davis; University of California, Irvine
University of Houston; Rice University; University of Texas;
Baylor University; Princeton
University of Colorado-Boulder; Colorado State University

Deriving Information on Surface Conditions from Column and VERTically Resolved Observations Relevant to Air Quality

A NASA Earth Venture campaign intended to improve the interpretation of satellite observations to diagnose near-surface conditions relating to air quality

Objectives:

- 1. Relate column observations to surface conditions for aerosols and key trace gases O_3 , NO_2 , and CH_2O***
- 2. Characterize differences in diurnal variation of surface and column observations for key trace gases and aerosols***
- 3. Examine horizontal scales of variability affecting satellites and model calculations***

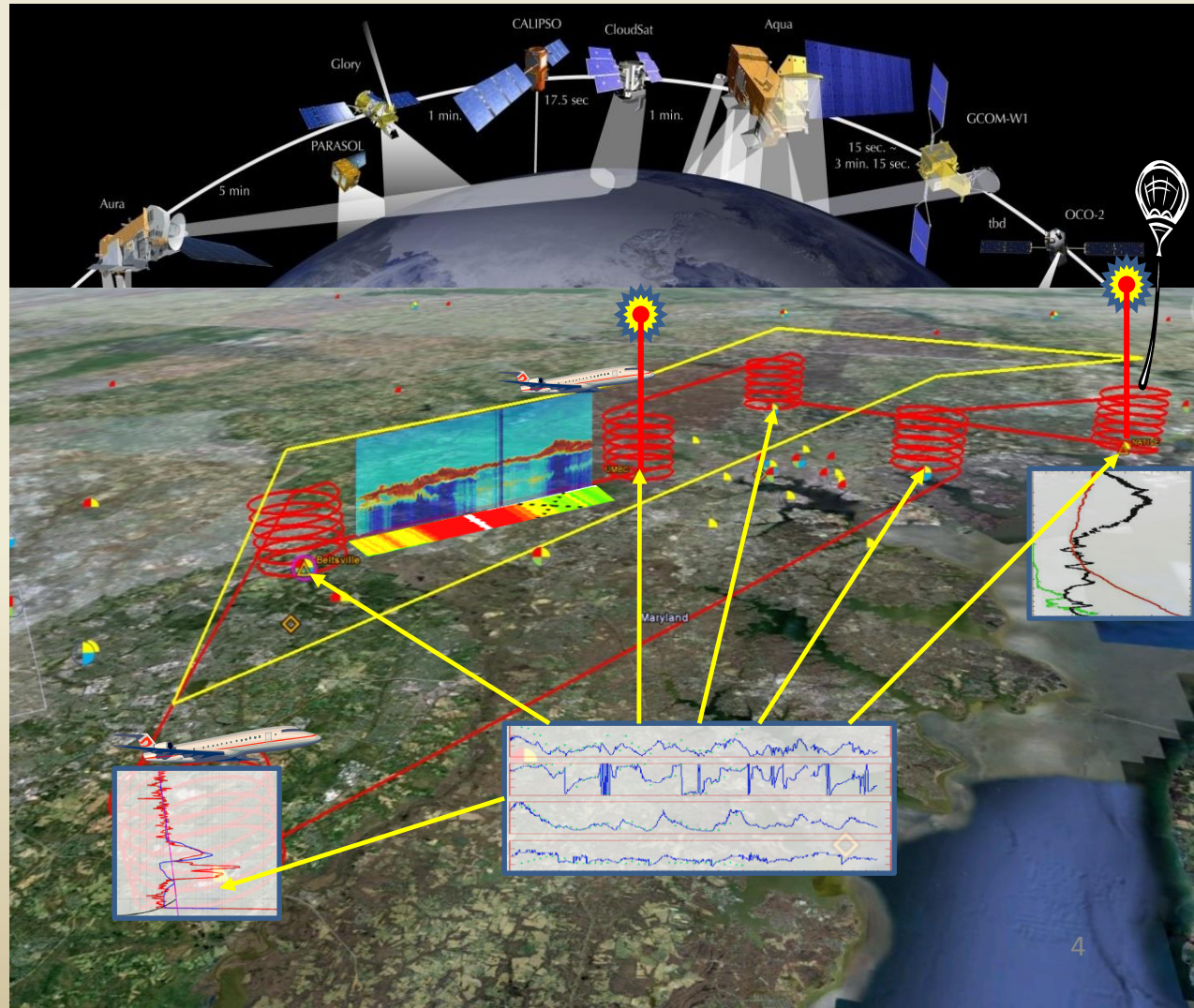
Systematic and concurrent observation of column-integrated, surface, and vertically-resolved distributions of aerosols and trace gases relevant to air quality as they evolve throughout the day.

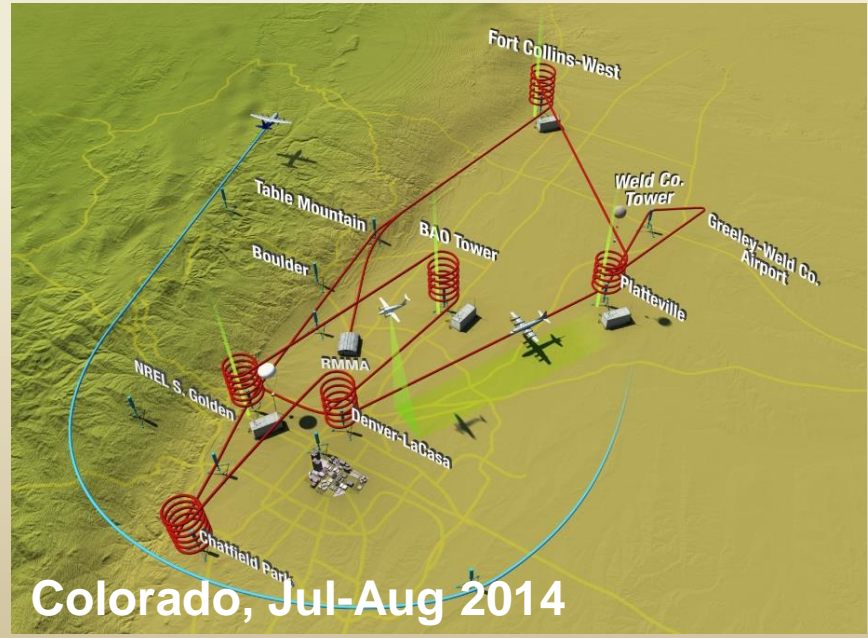
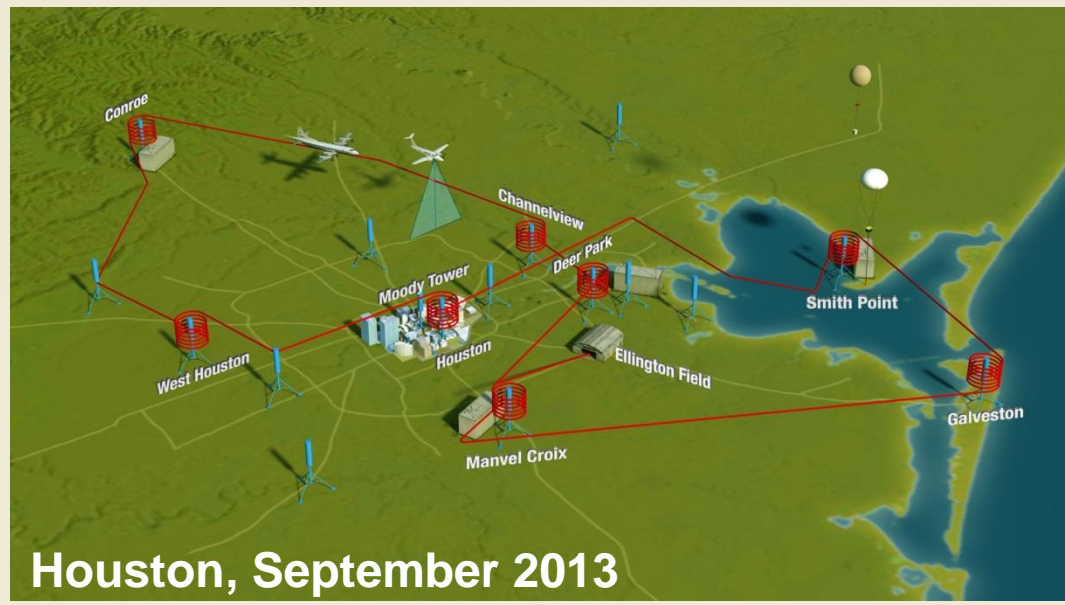
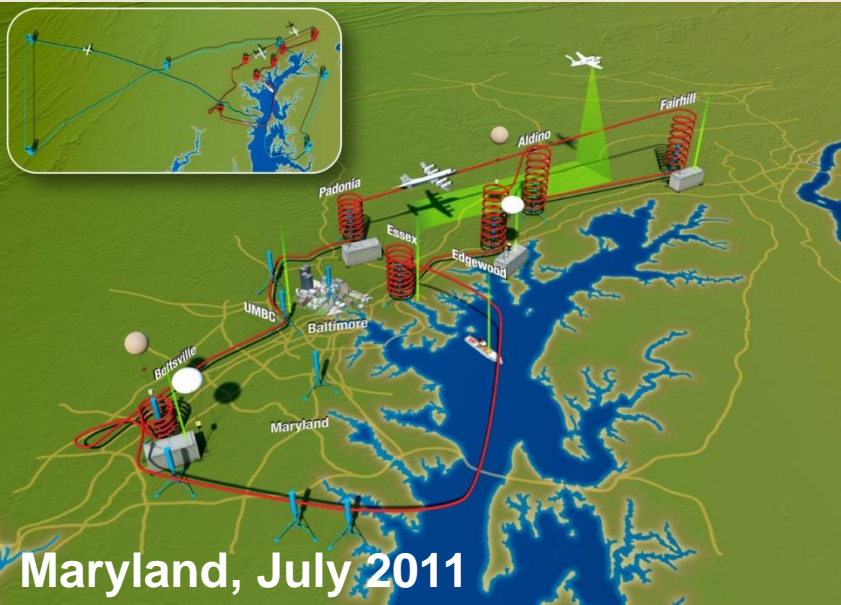
Three major observational components:

NASA UC-12 (Remote sensing)
Continuous mapping of aerosols with HSRL and trace gas columns with ACAM

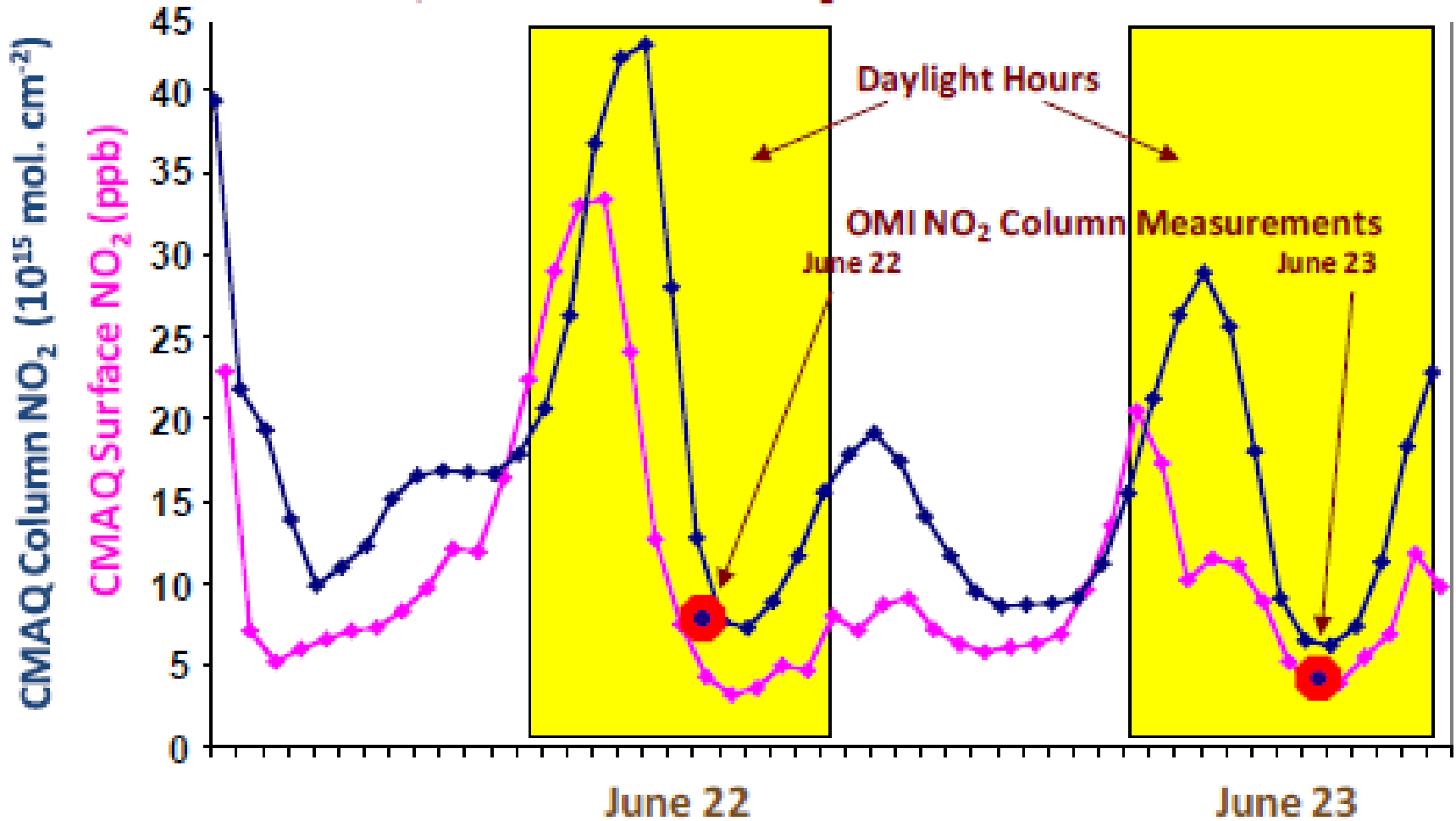
NASA P-3B (in situ meas.)
In situ profiling of aerosols and trace gases over surface measurement sites

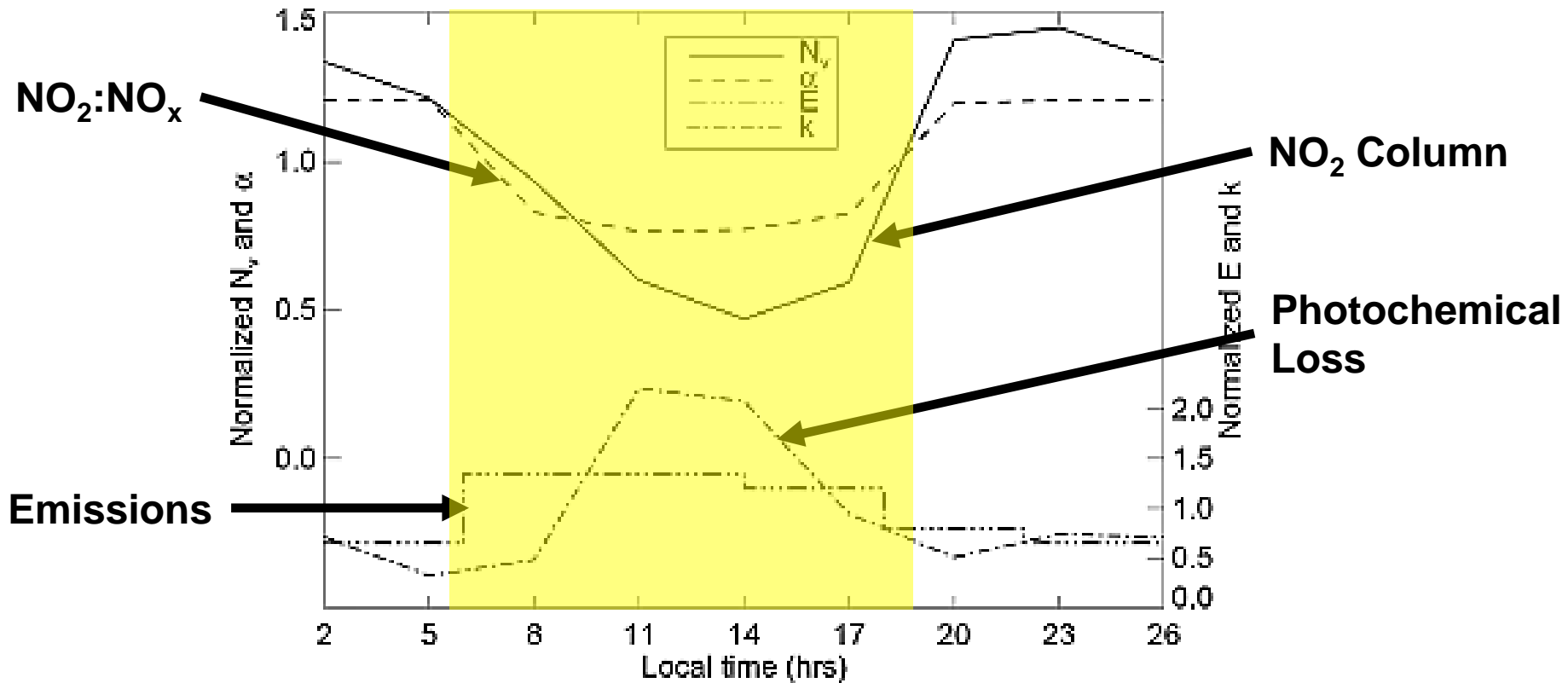
Ground sites
In situ trace gases and aerosols
Remote sensing of trace gas and aerosol columns
Ozonesondes
Aerosol lidar observations





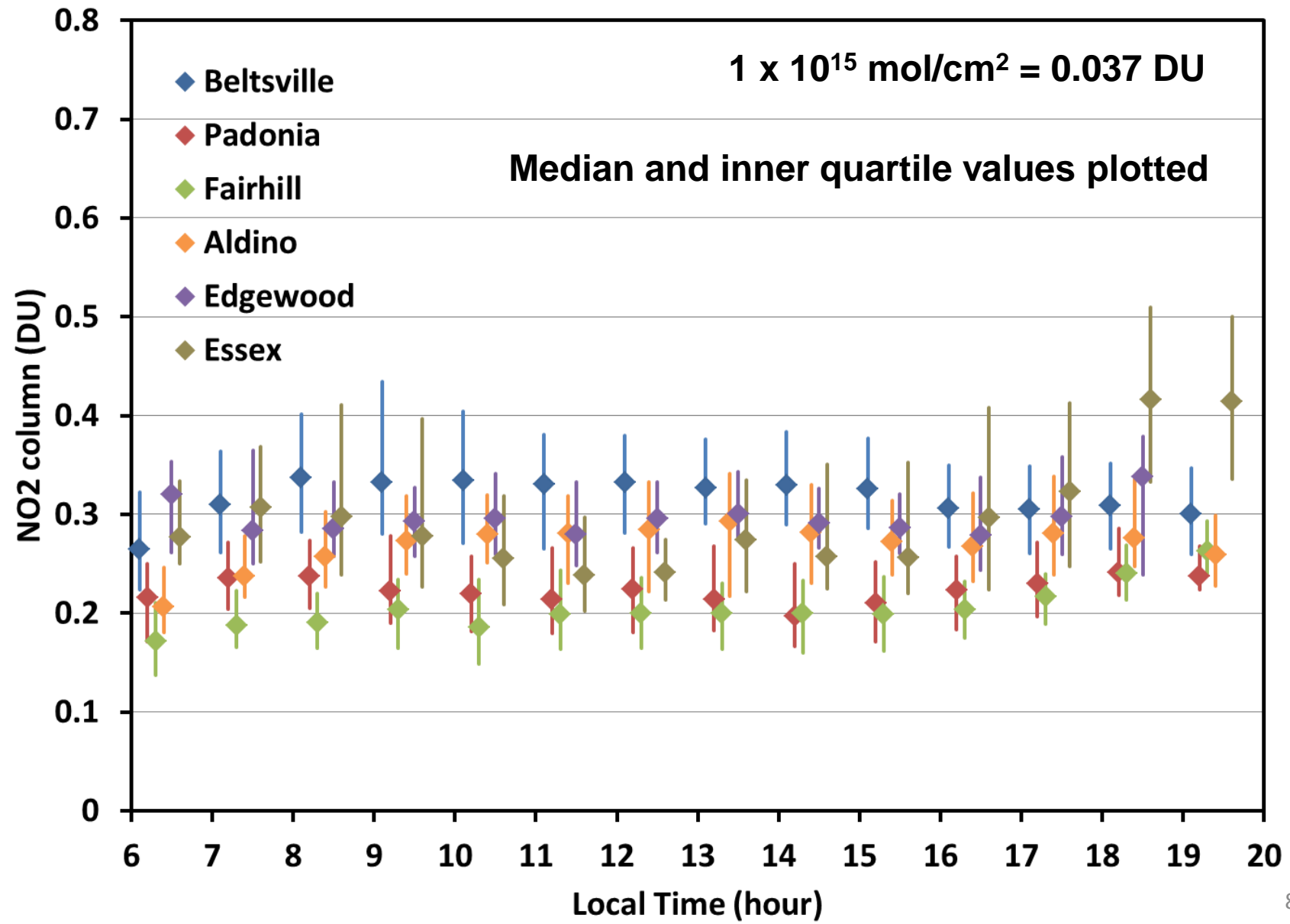
CMAQ Surface and Column NO_2 Plotted as a Function of Hour

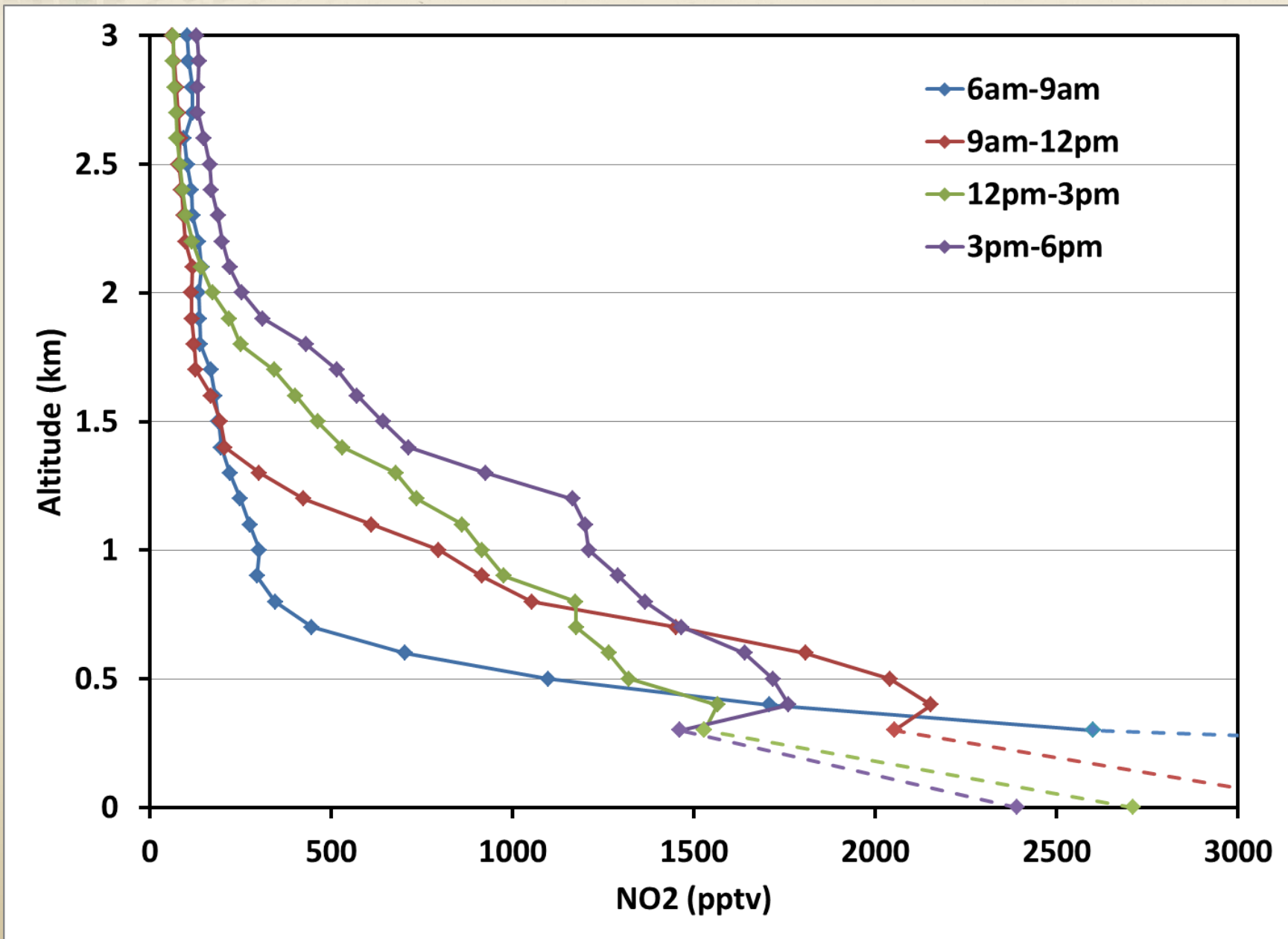


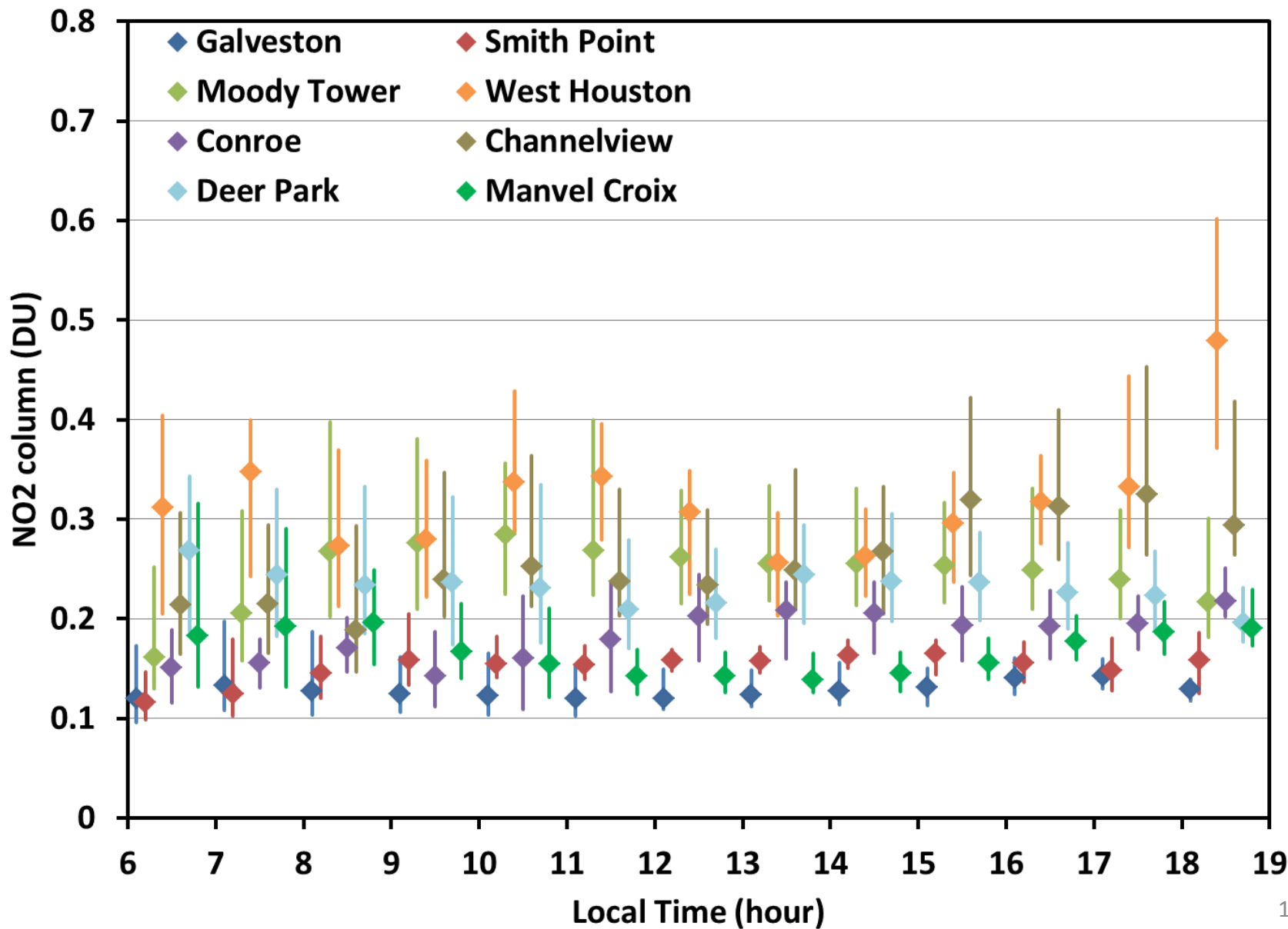


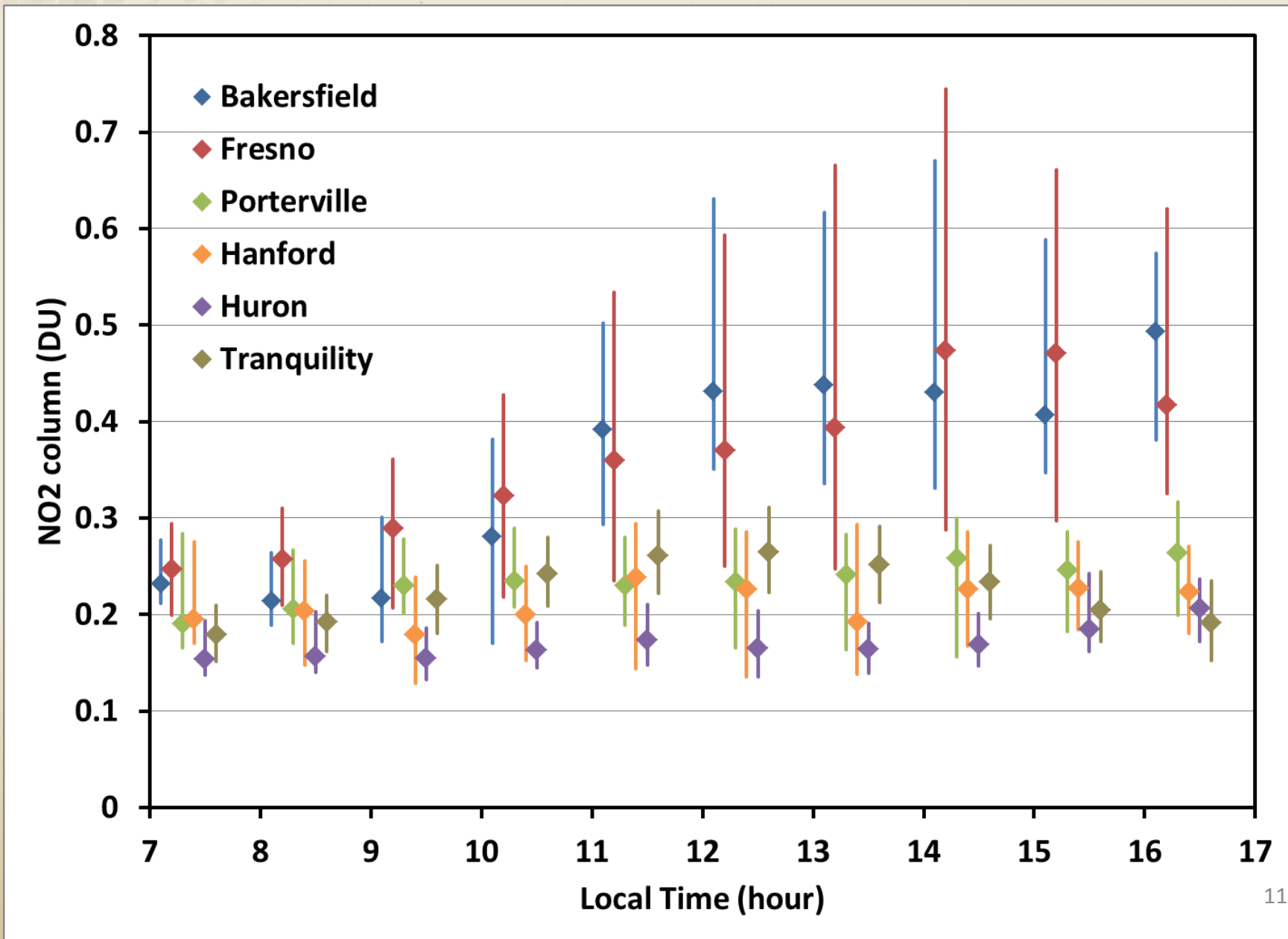
$1 \times 10^{15} \text{ mol/cm}^2 = 0.037 \text{ DU}$

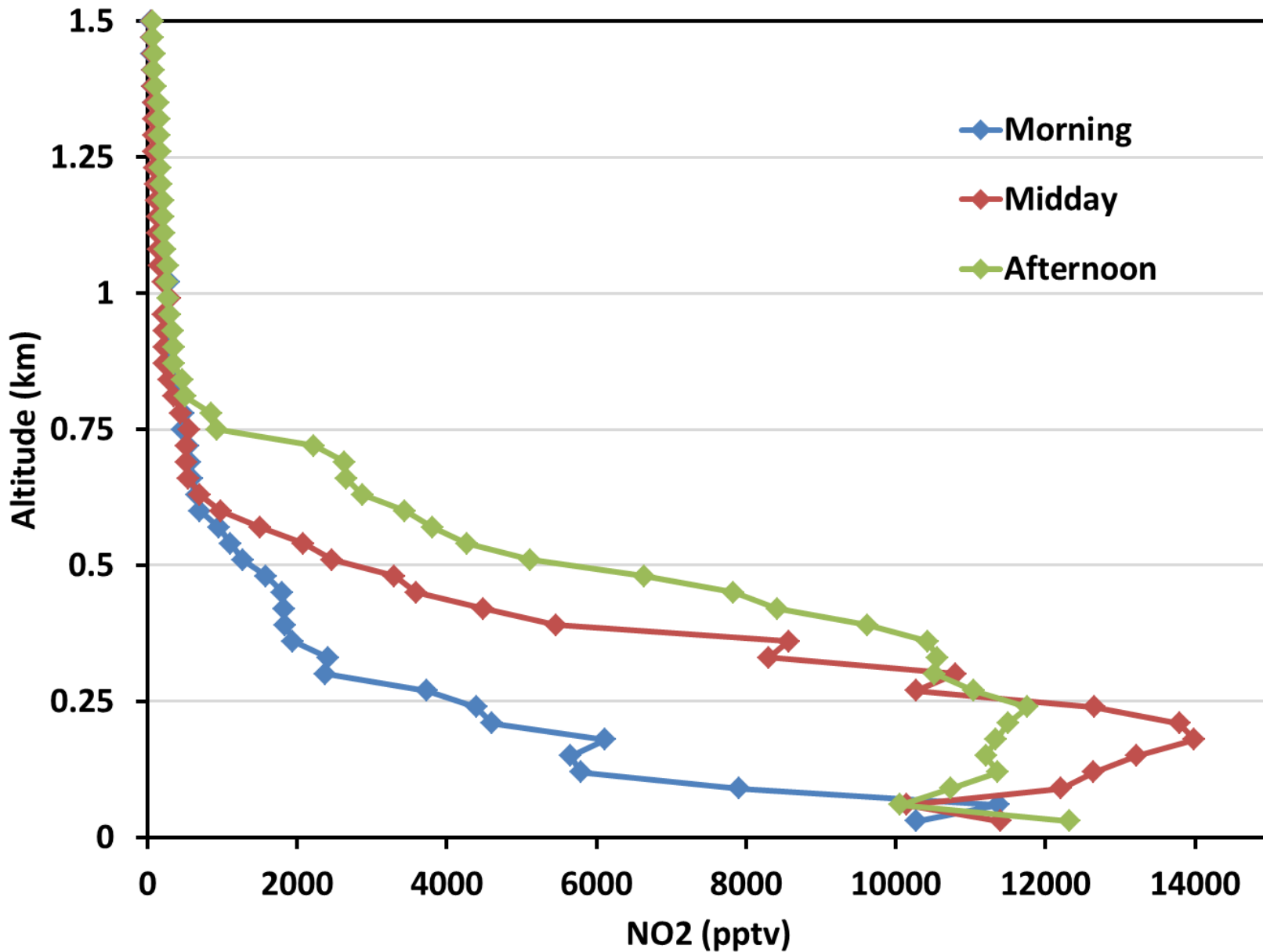
Median and inner quartile values plotted

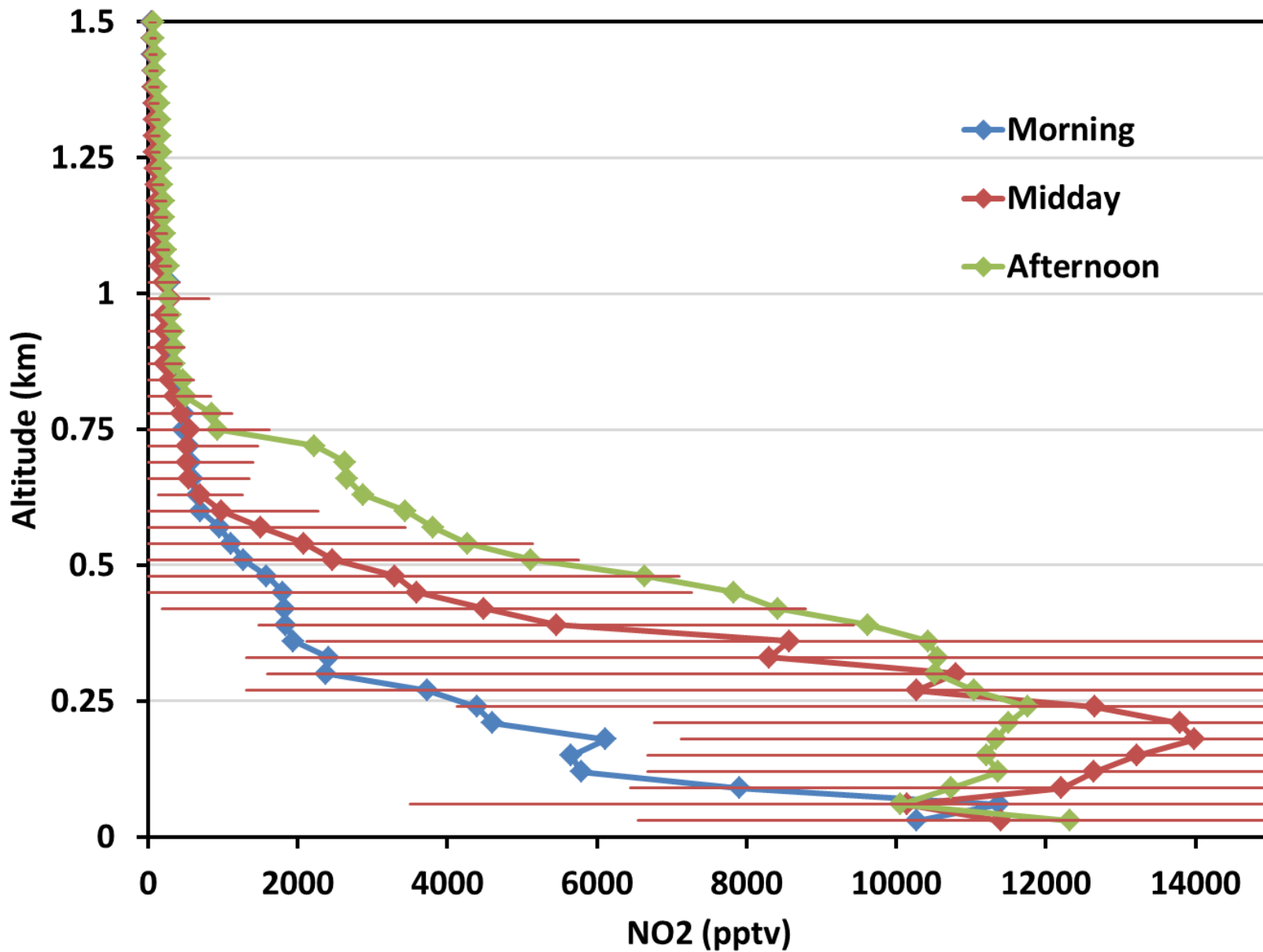


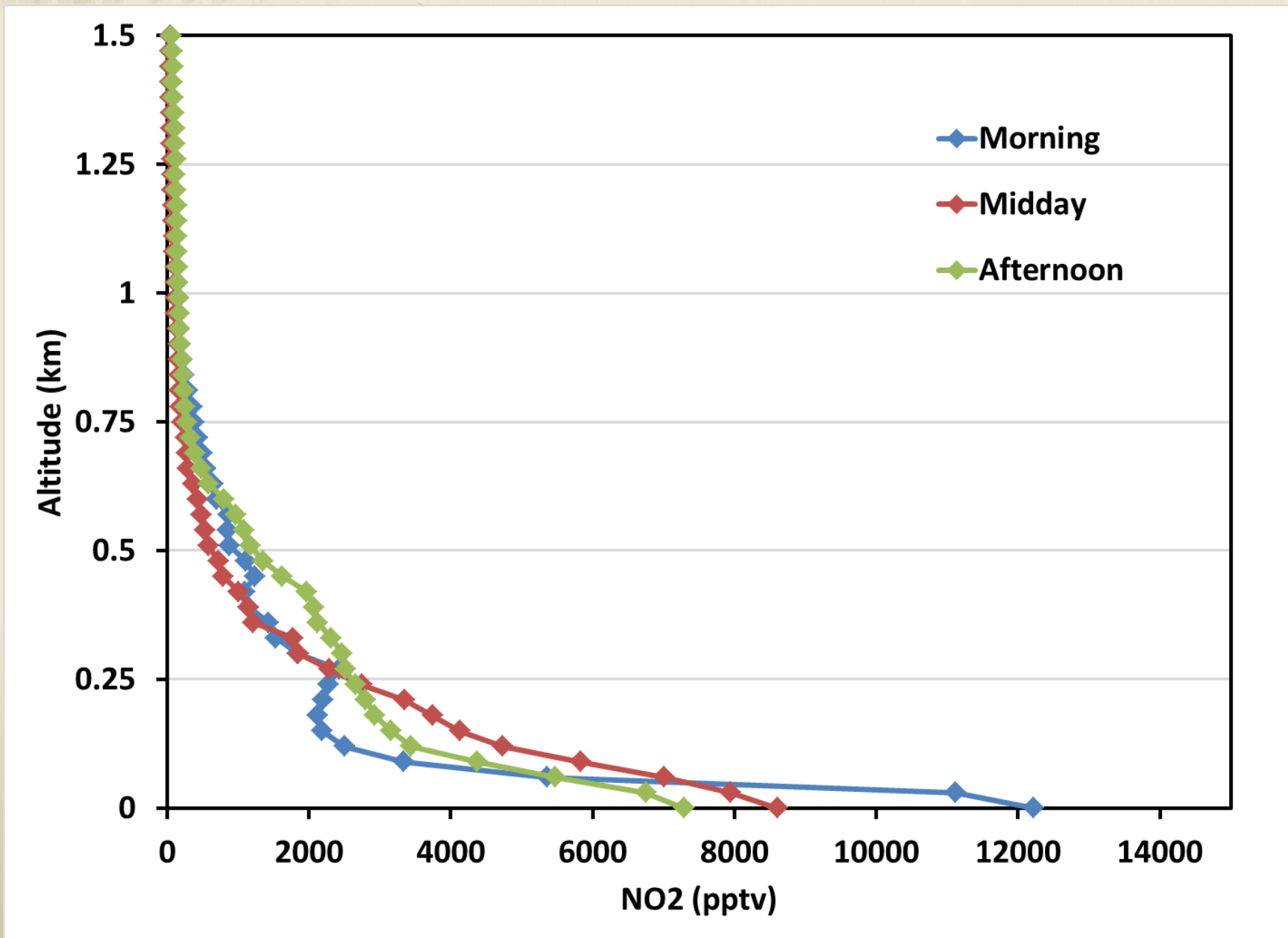


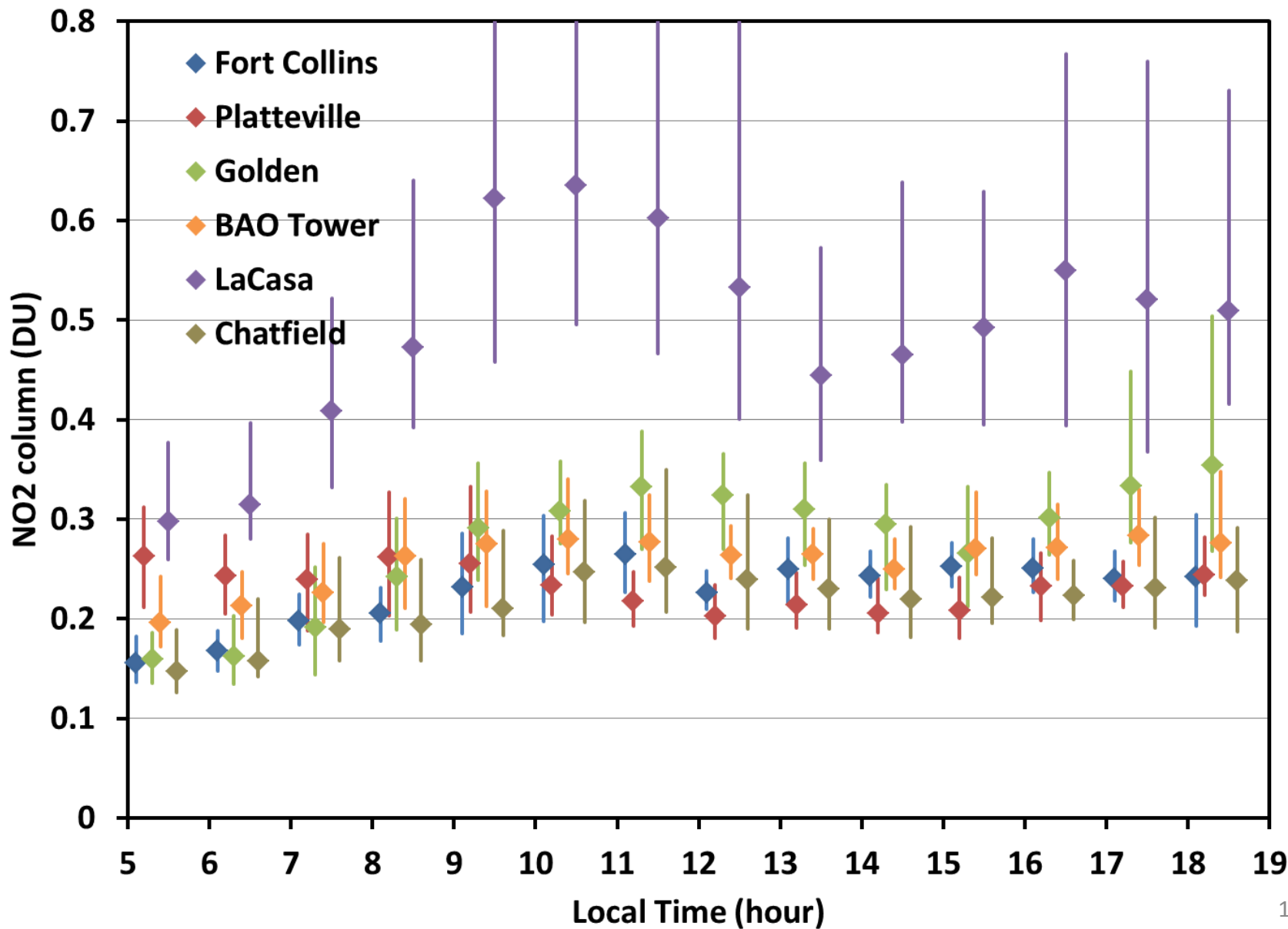


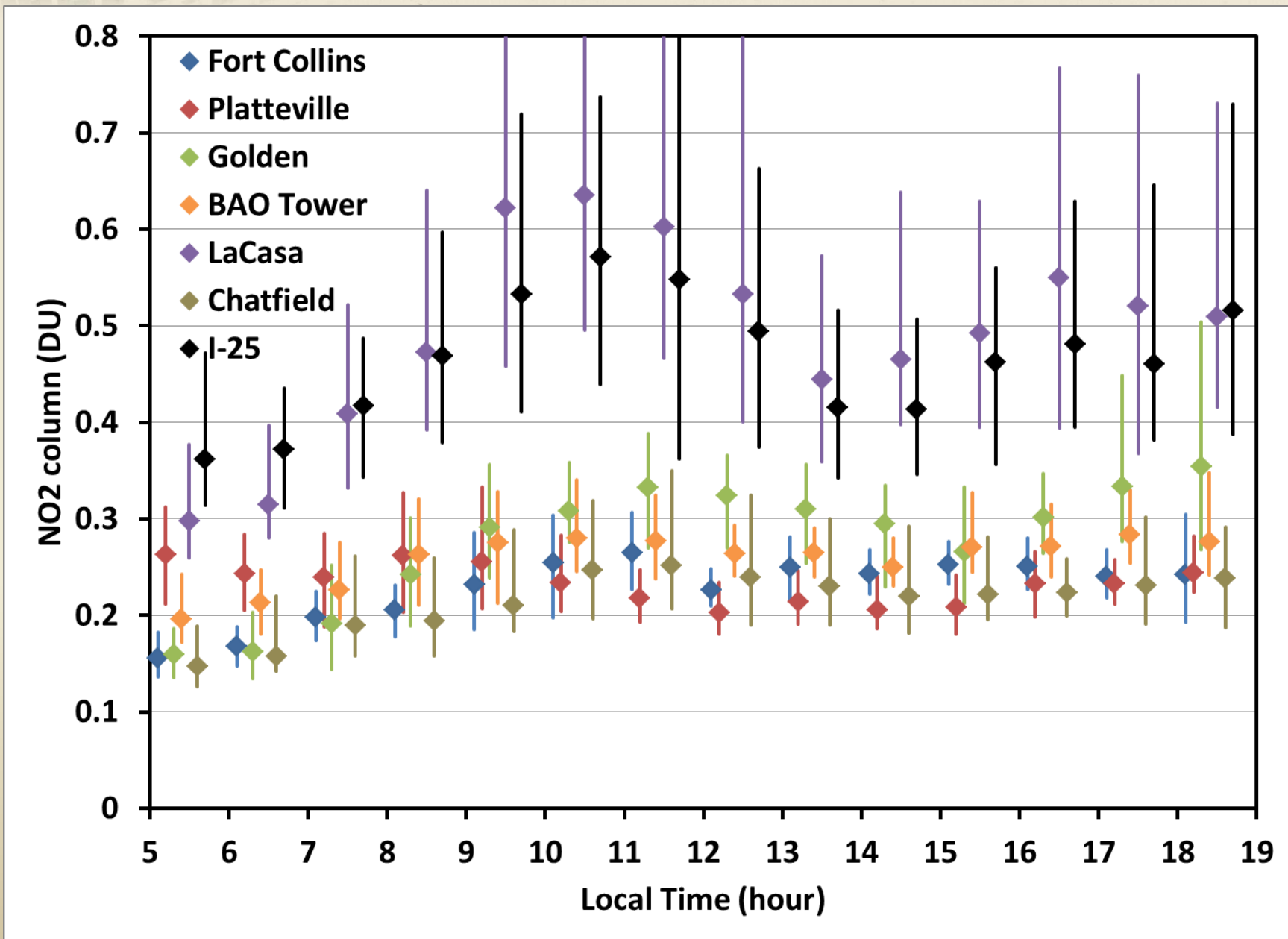


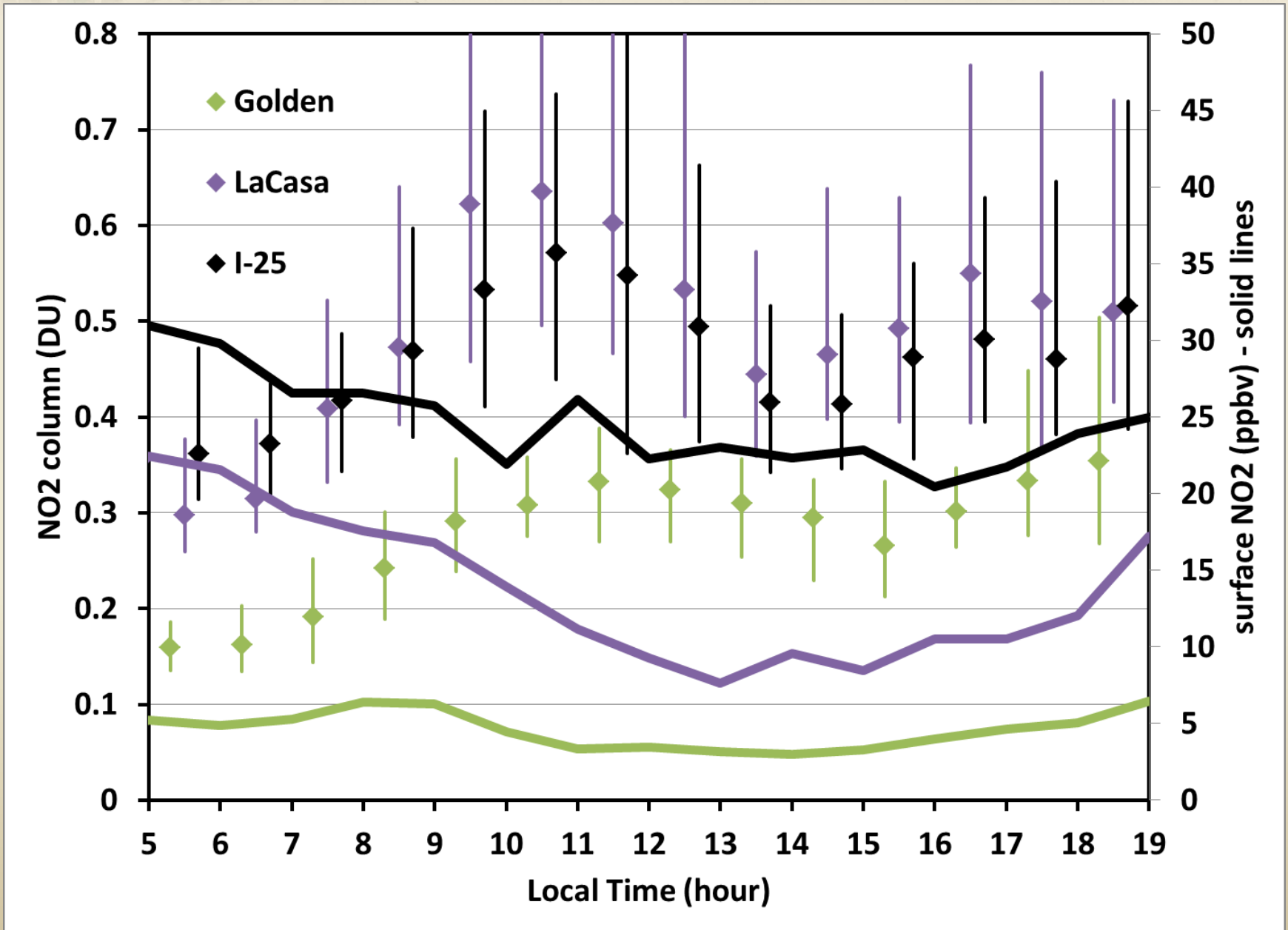


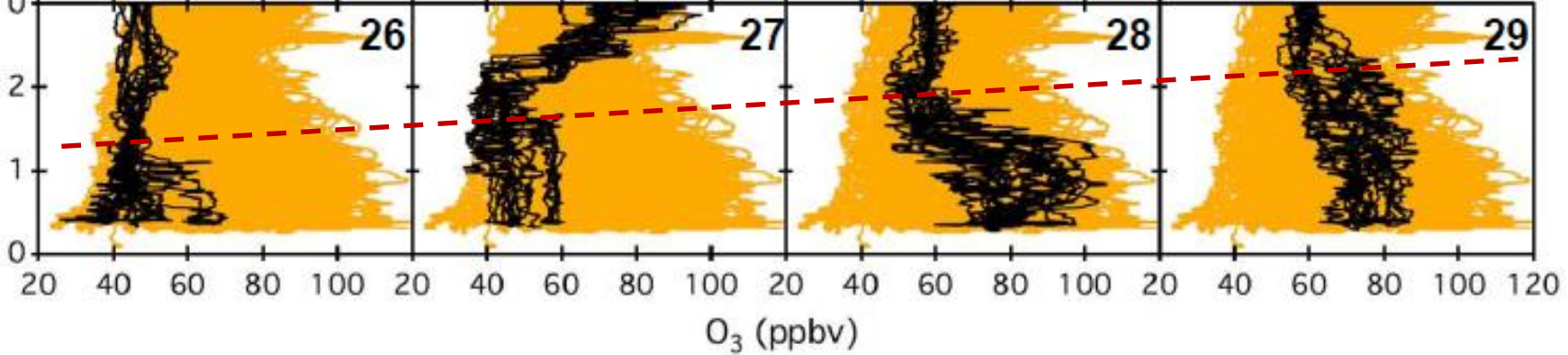
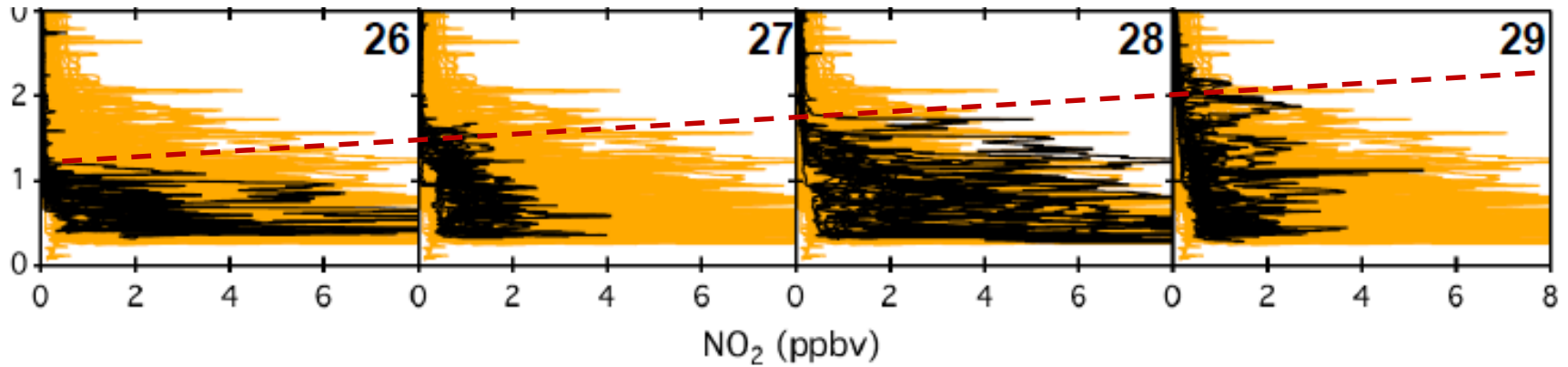
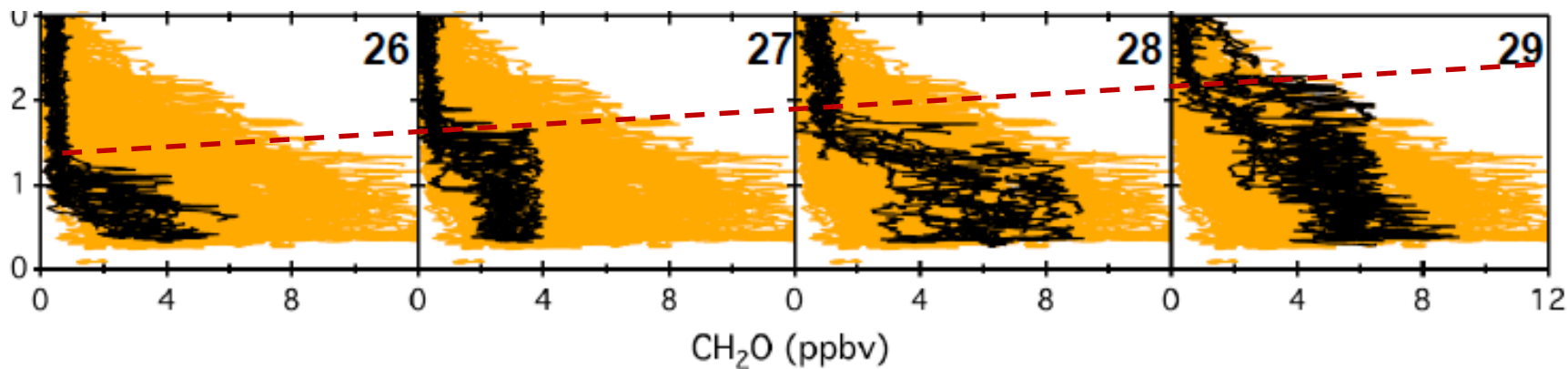


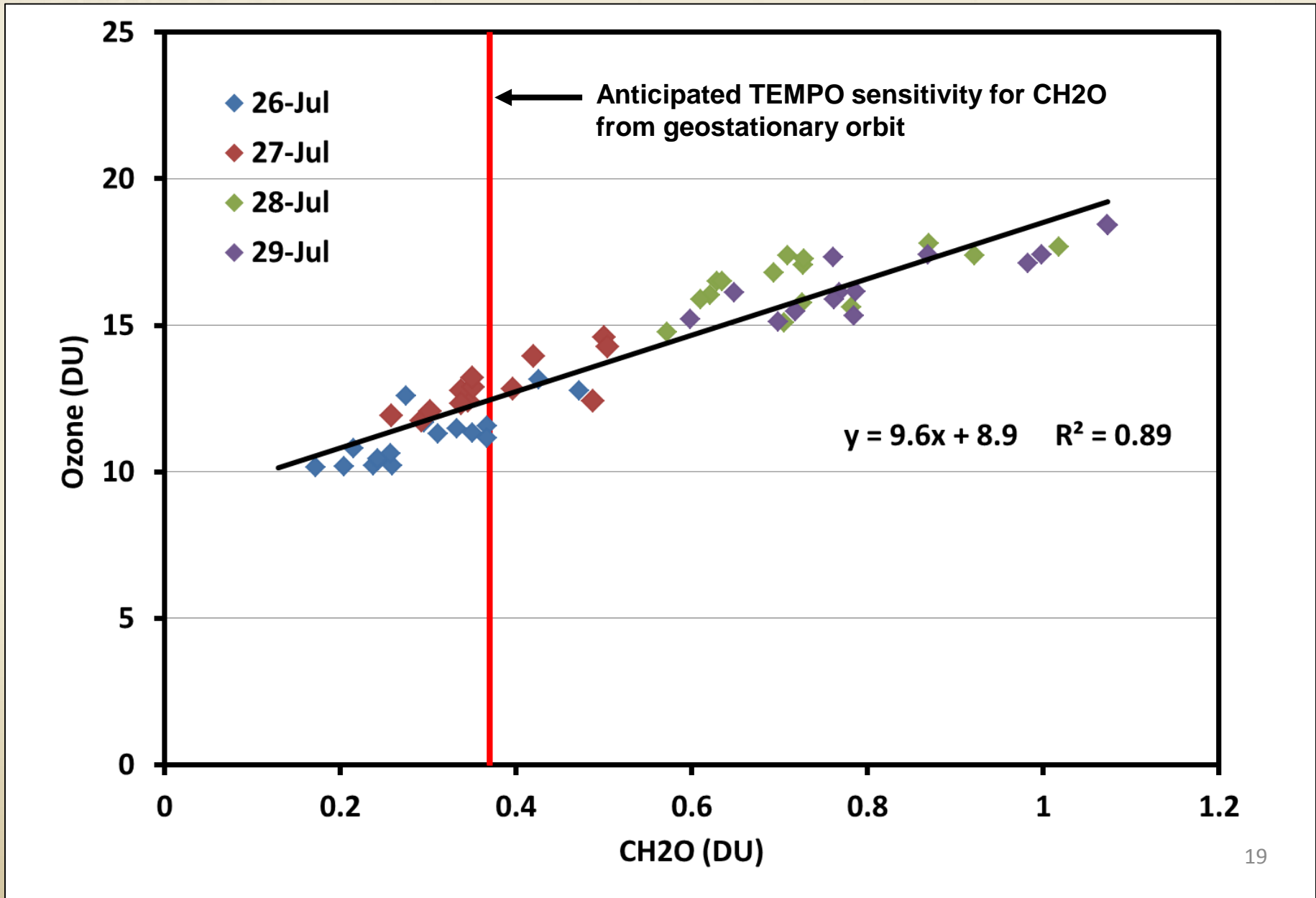


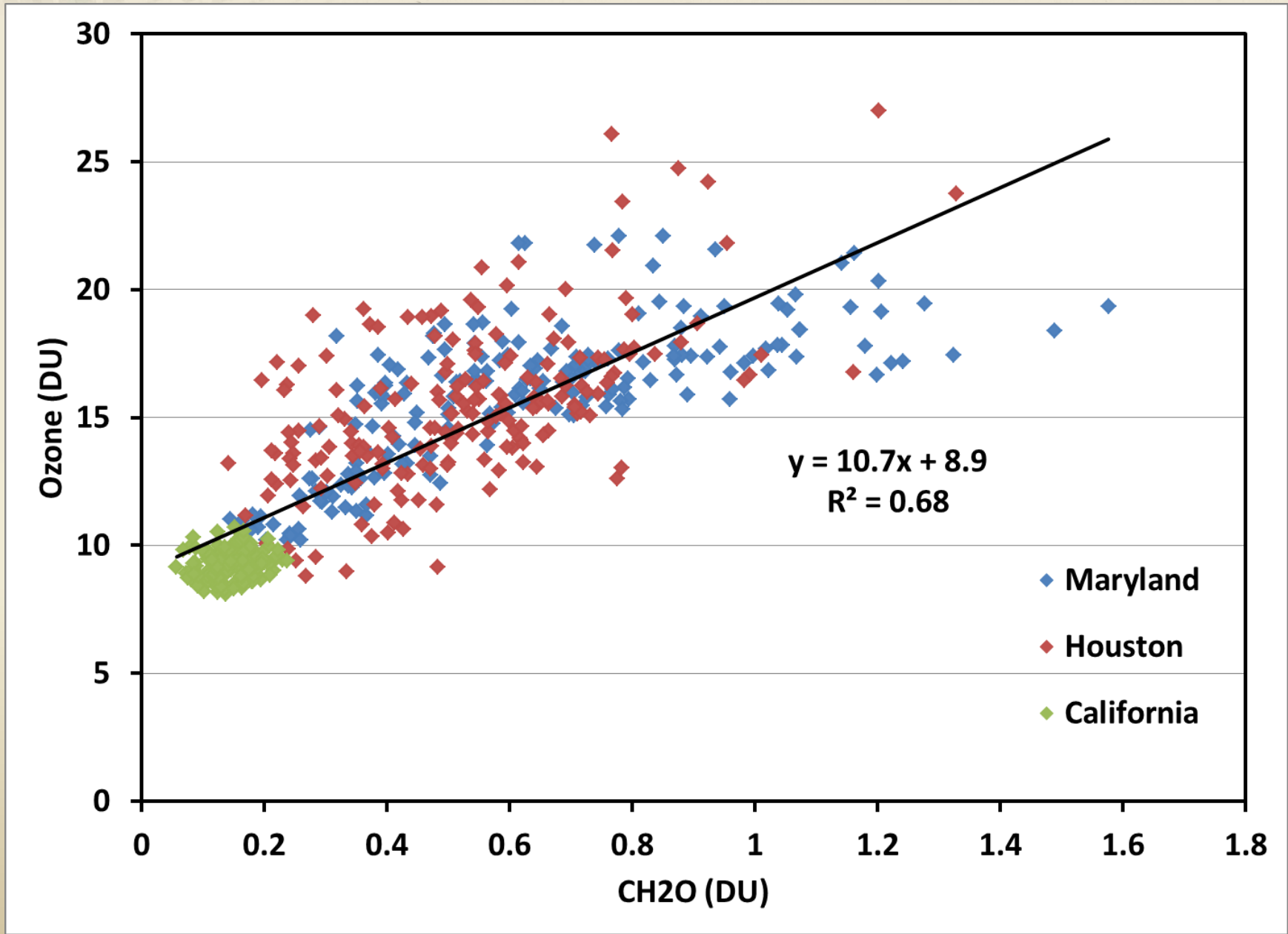


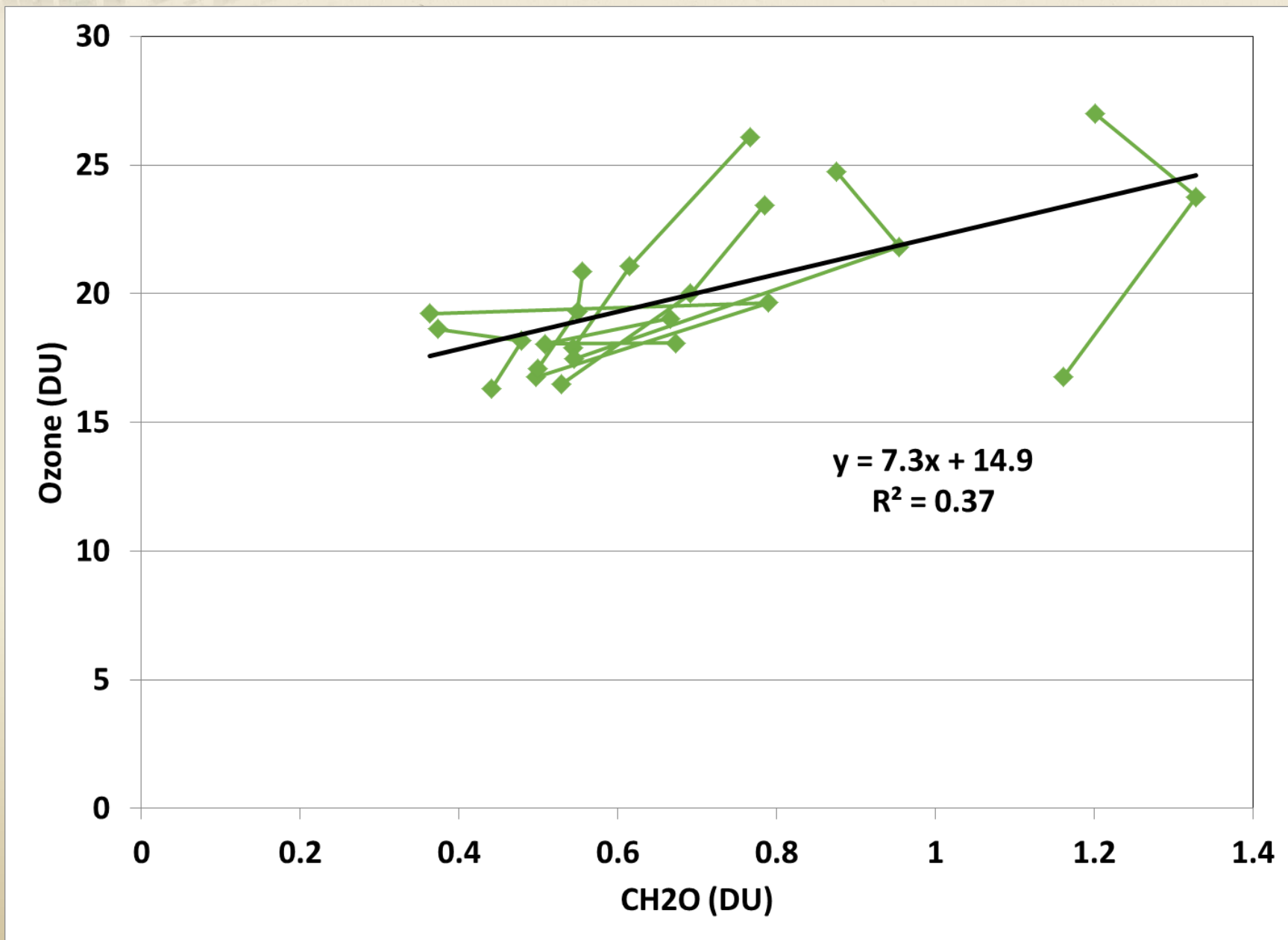


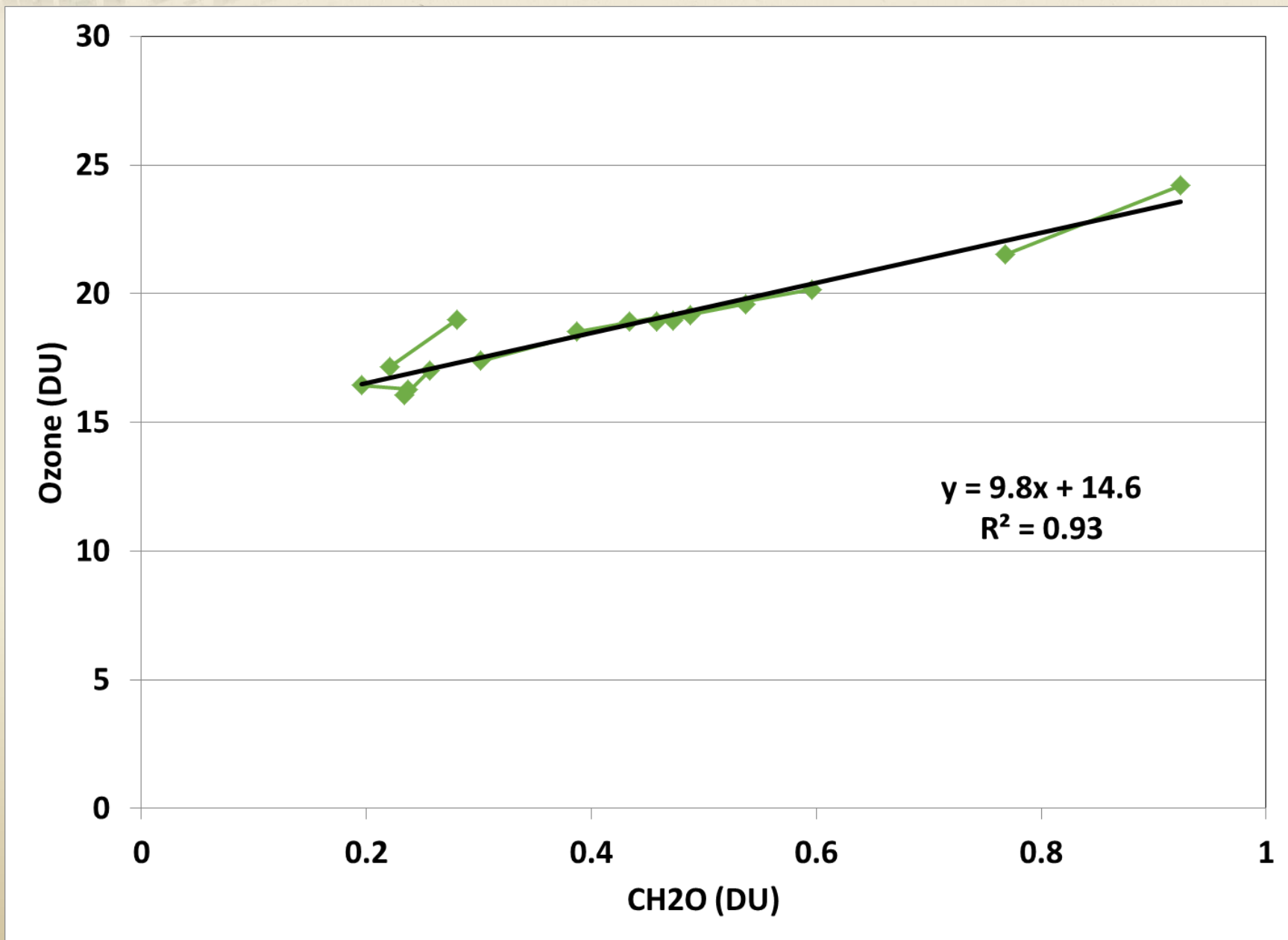












- 1. DISCOVER-AQ has collected a dataset of unprecedented detail on the diurnal trends in air quality as it is discerned from in situ and remote sensing methods.***
- 2. NO₂ columns exhibit both unexpected and diverse diurnal trends that are consistent with vertically resolved profiles.***
- 3. Correlations between column CH₂O and O₃ present an encouraging prospect for using satellite observations of CH₂O as a proxy for boundary layer O₃ production.***