



Reprocessed KNMI NO₂-sonde data for D-AQ site at Golden, CO

Deborah Stein Zweers¹ (stein@knmi.nl), Mirjam den Hoed¹,
 Ankie Piters¹, Ken Pickering^{2,3}, and Gina Mazzuca³
¹KNMI, ²NASA-Goddard, ³UMD

Introduction:

The KNMI NO₂-sonde data measured at the Golden, CO site and operated on the Millersville University tethered balloon, have been reprocessed and are available on the DISCOVER-AQ data archive. The data processing software has been transferred from IDL to Python and all corrections have been assessed as a result.

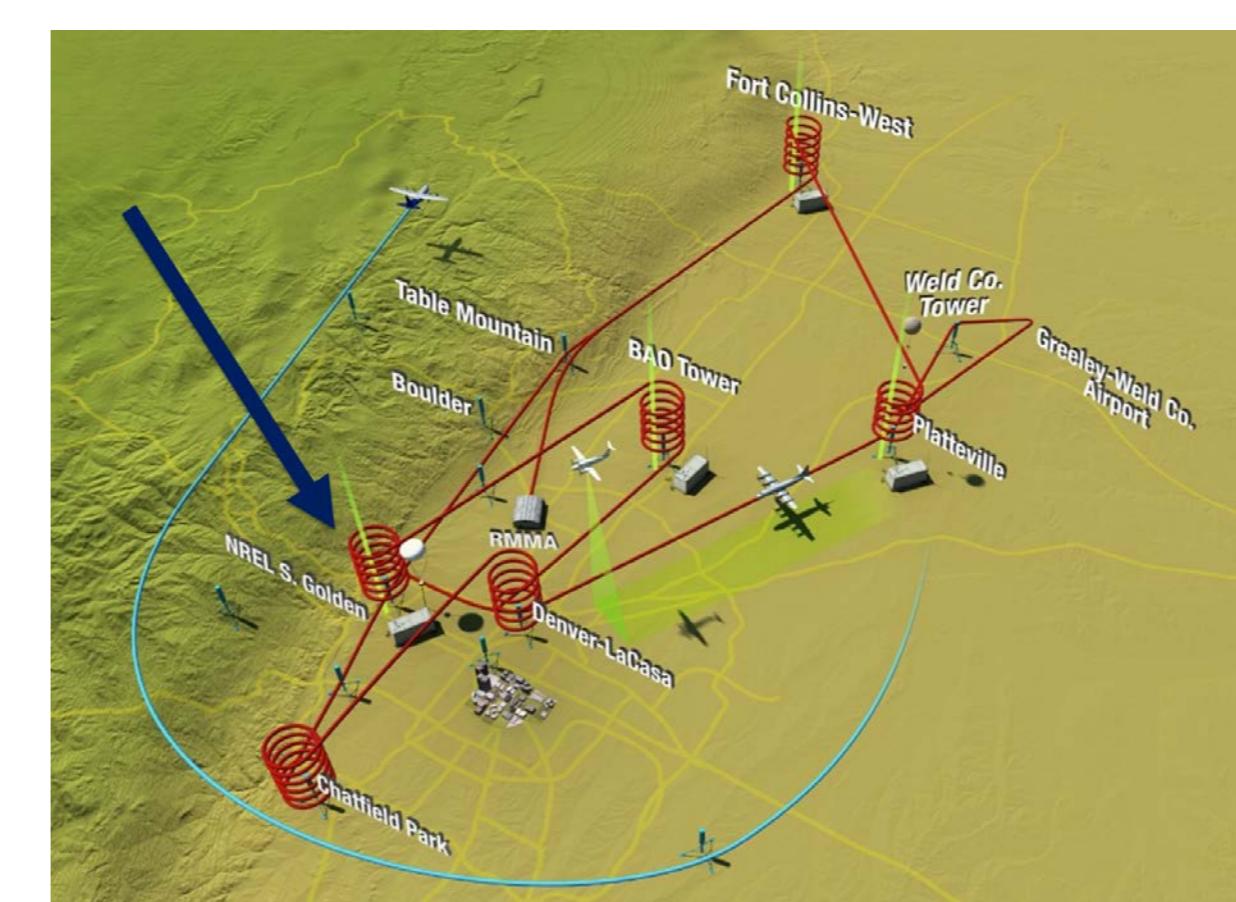
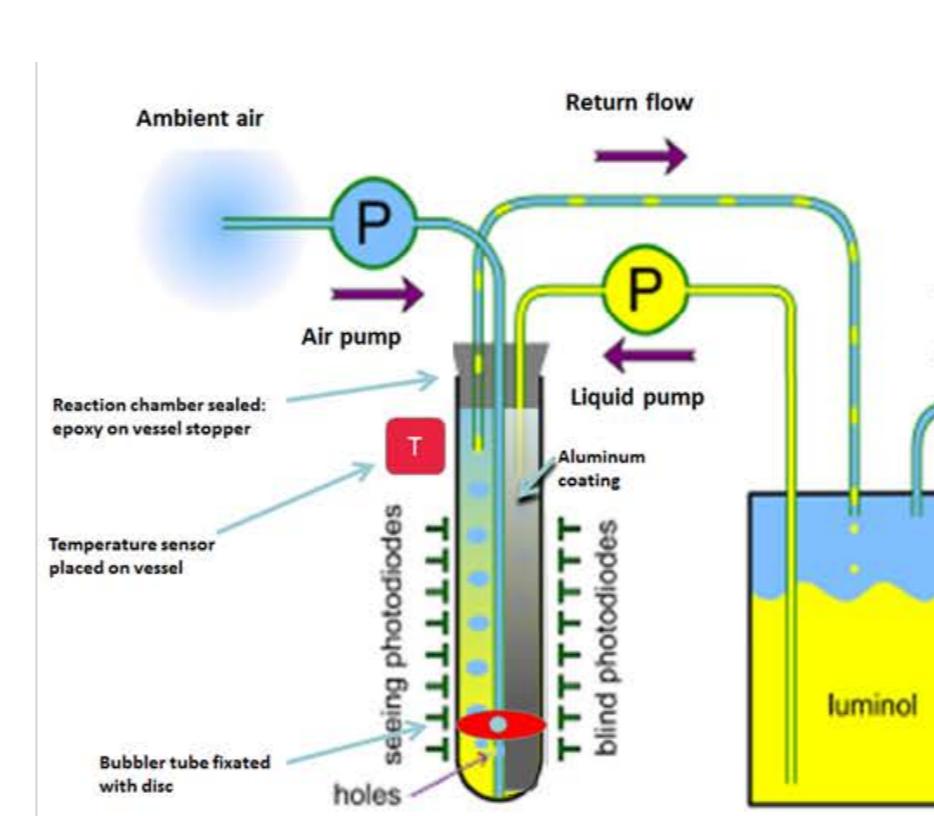
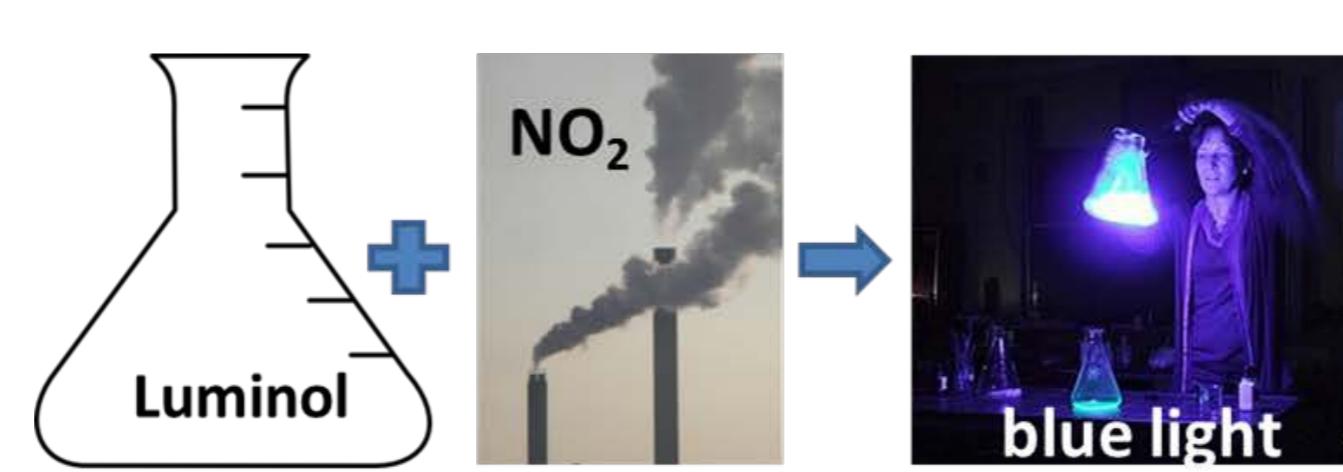
Processing:

The following corrections have been carried out for:

- Data logging interface;
- Dark current;
- Temperature, pressure.

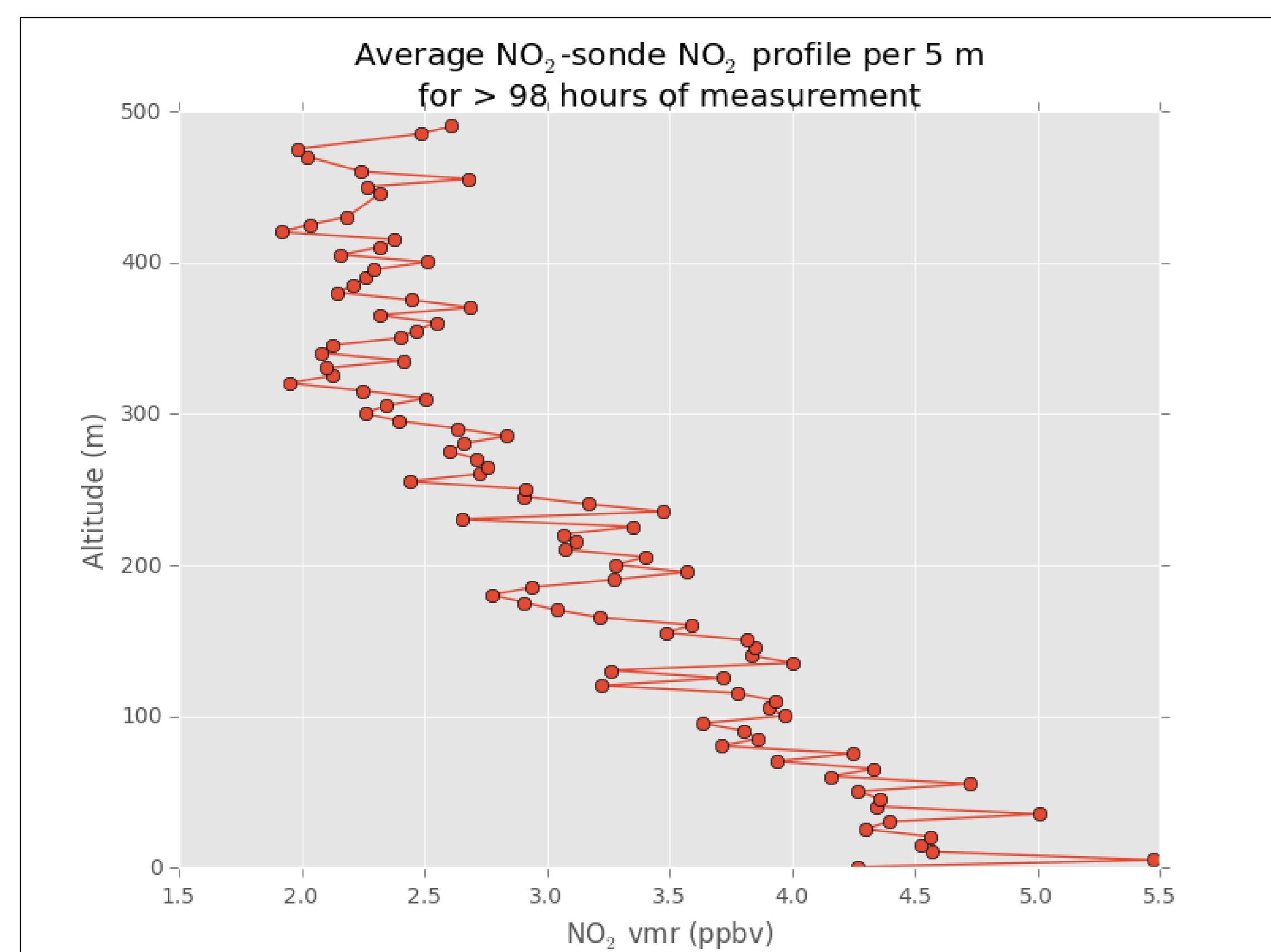
Next, the data are scaled to:

- Individual sonde sensitivity;
- Side-by-side meas. with EPA CAPS/CRDS data.

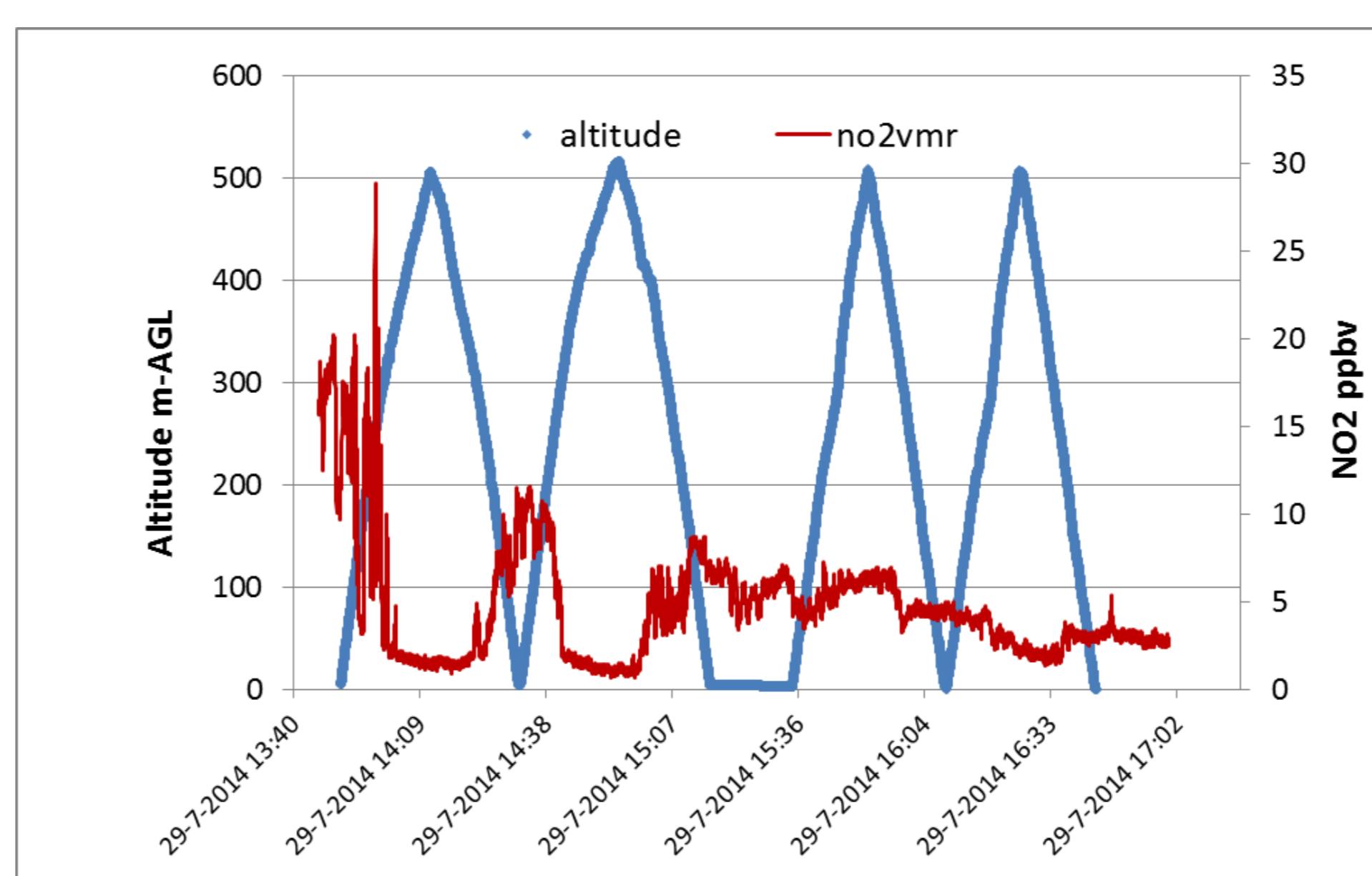


Left: Chemiluminescence cartoon and NO₂-sonde schematic illustrating flows and key design features. **Middle:** D-AQ site map showing Golden; **Far right:** Five sondes placed on the EPA trailer roof close to the CAPS/CRDS inlet (red circle) for a side-by-side measurement at the Golden site.

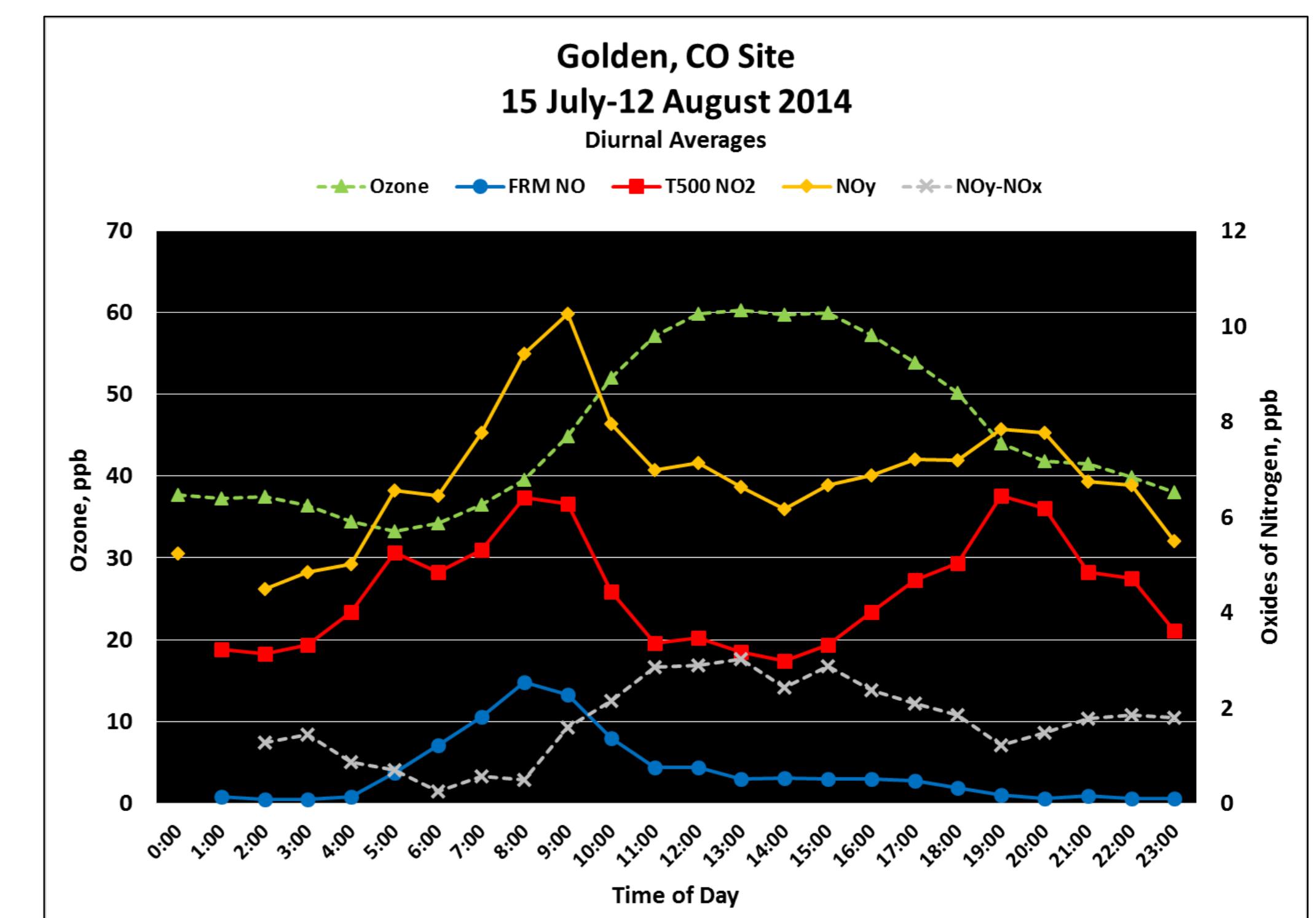
NO₂-sonde results and comparative datasets:



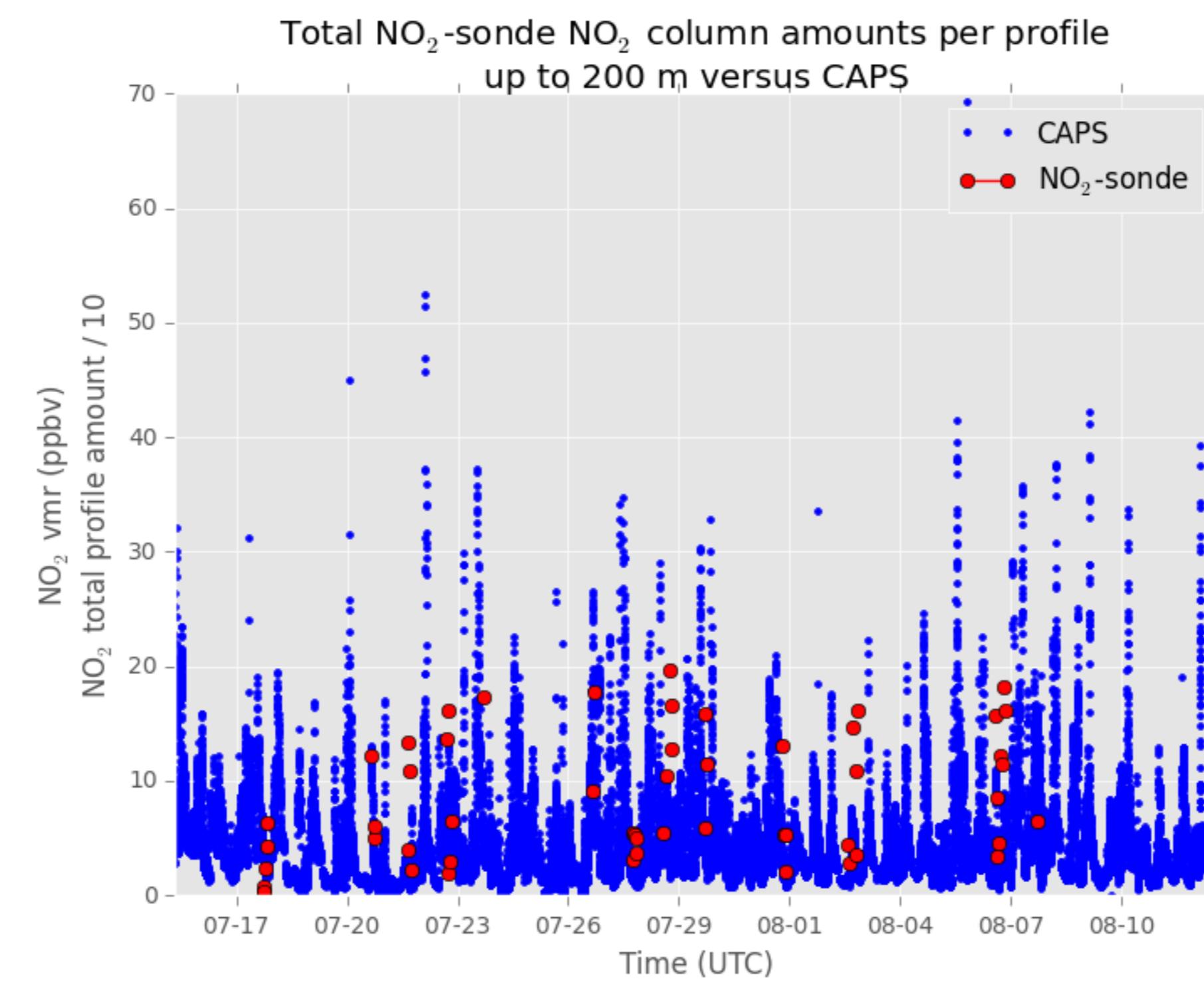
Average profile containing all data from the tethered balloon profiles binned per 5 meters. This plot indicates a near-linear decay in NO₂ from the surface to 300 meters agl. It should be noted that there are far fewer data points above 350 meters.



NO₂ (ppbv) and tethered balloon altitude (m, agl) in the morning on 29 July 2014, during the Denver cyclone event.



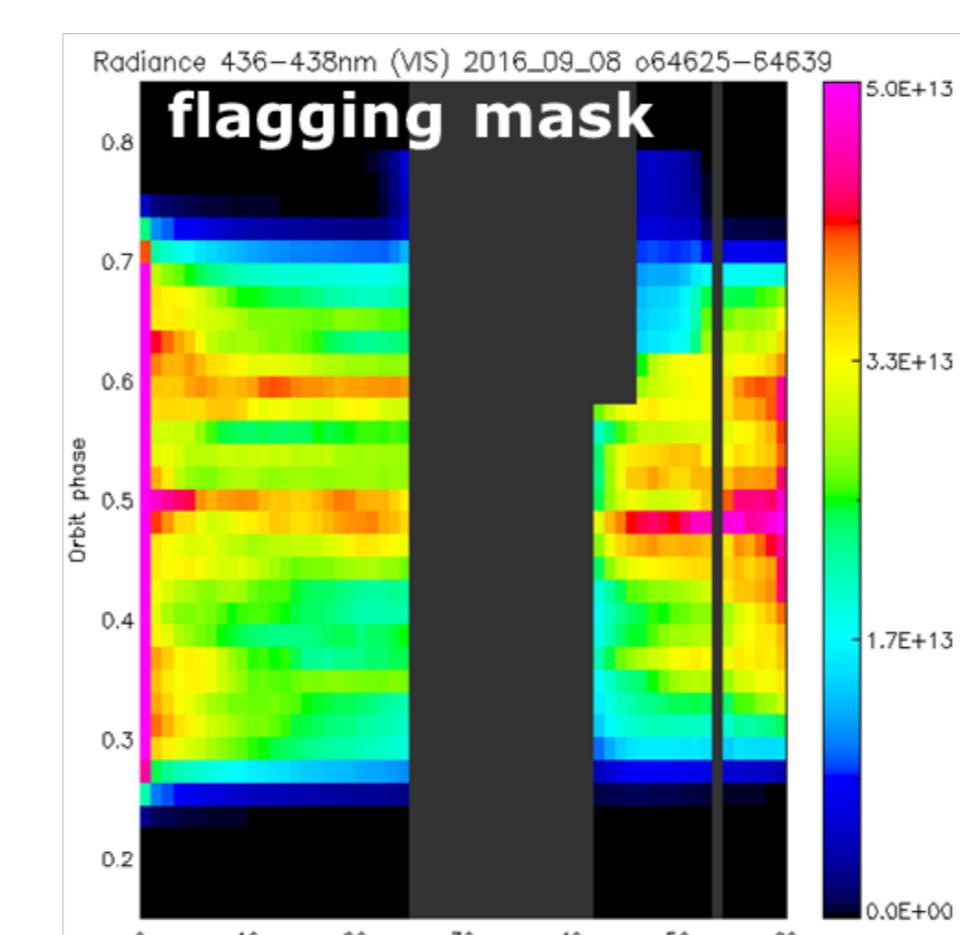
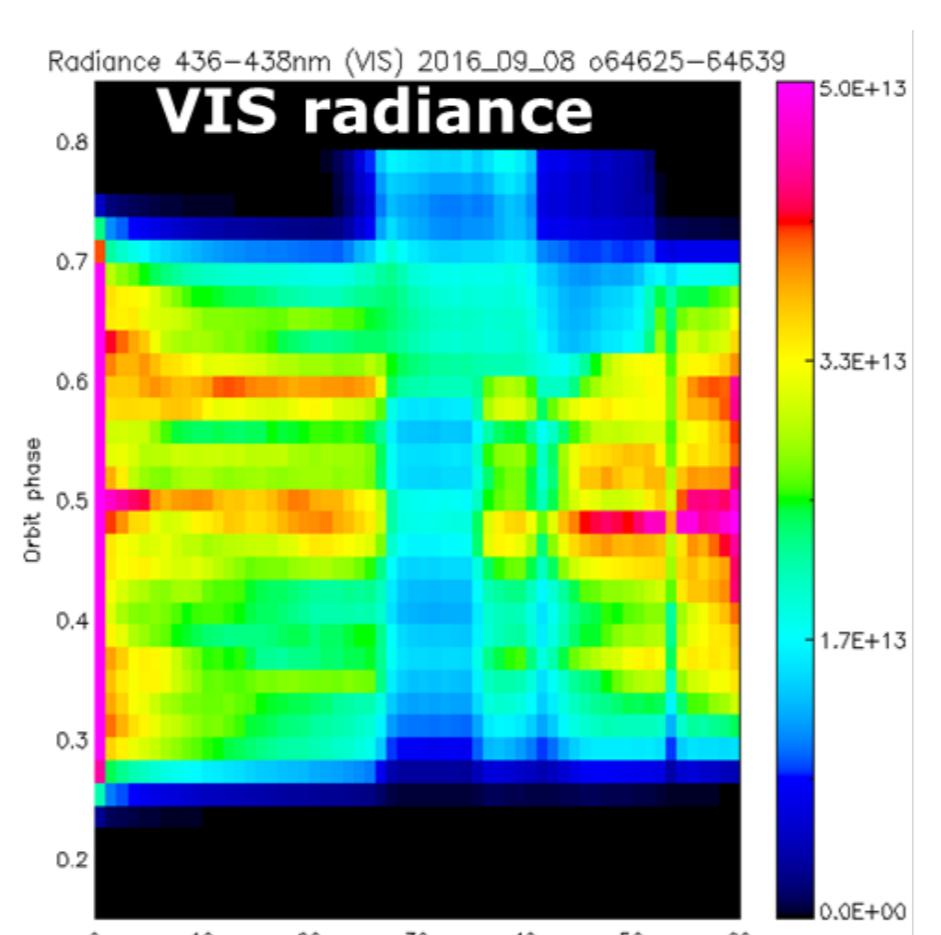
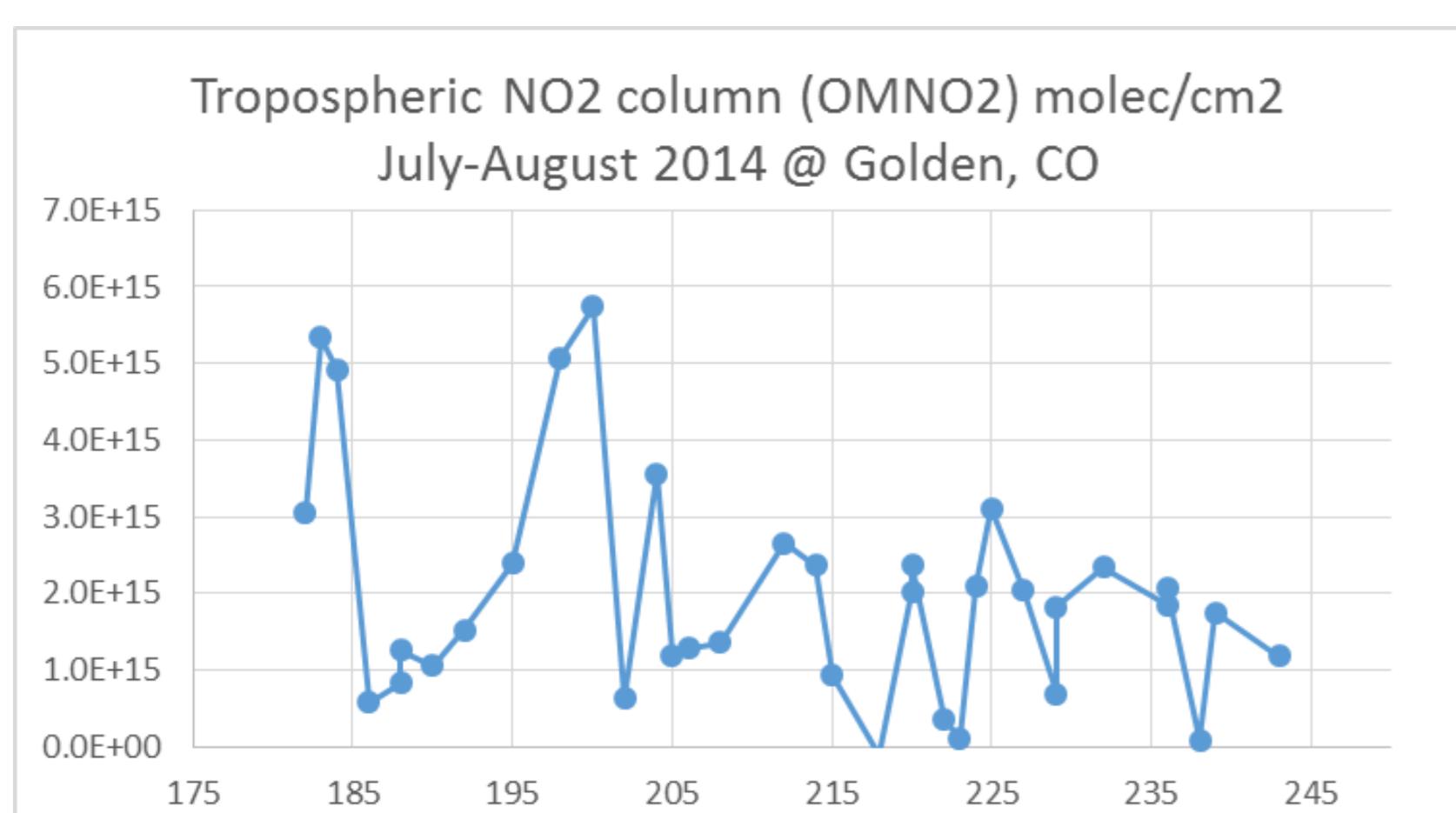
Average diurnals from EPA trace gas monitors at the Golden site (Russell Long). The NO₂-sonde has been calibrated w.r.t the combined T500-CAPS (shown above in red) and CRDS dataset. Most of the NO₂-sonde profiles were measured between 08:00-16:00 LT.



CAPS/CRDS NO₂ (ppbv) in blue and cumulative NO₂ per sonde profile divided by factor of 10. More subcolumn to surface correlative analysis to be performed in the future (to be submitted for OMI STM 12-14 Sep 2017)

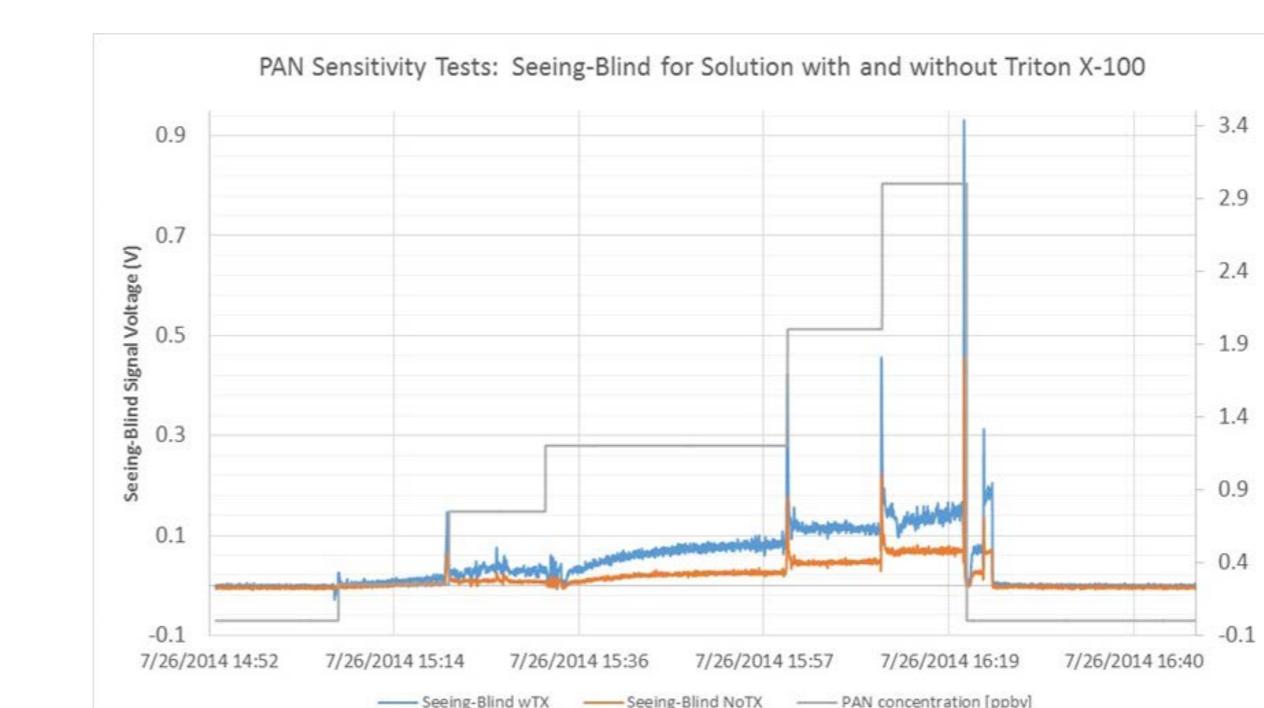
Comparison with OMI:

OMI overpass data for Golden are plotted and shown below (left) from the OMNO2 (v003) tropospheric column product screened for row anomaly (see plot below right), cloud radiative fractions > 30%, and other raised flags related to the quality processing.



PAN sensitivity:

Using a PAN-GC located at BAO tower (thanks to E. Fischer), PAN in steps from 300 pptv to 3 ppbv was run through two NO₂-sondes. We found the following response: 1 ppb PAN = 1.6 ppb NO₂_{obs}



Outlook: With the Golden dataset complete, reprocessing will be carried out for the KNMI NO₂-sonde datasets measured at Smith Point, TX (Sep 2013) and Huron, CA (Jan-Feb 2013). Also, look for an update of the NO₂-sonde methods paper (Sluis et al, 2010) to be submitted to AMT, including D-AQ NO₂-sonde results.