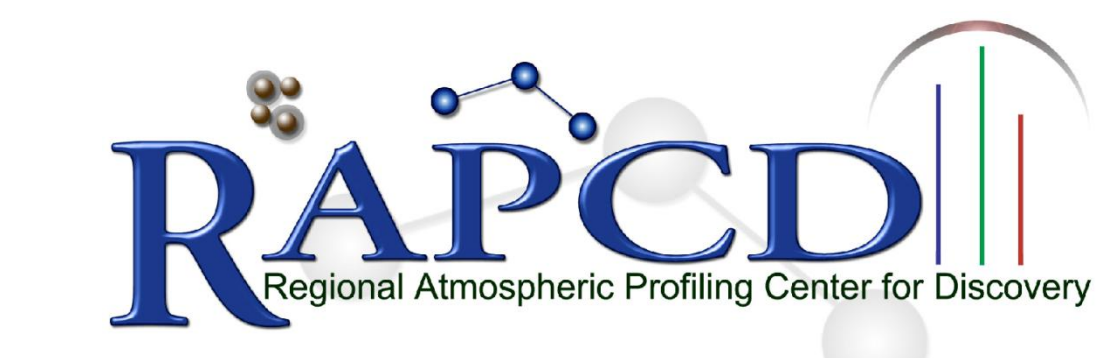
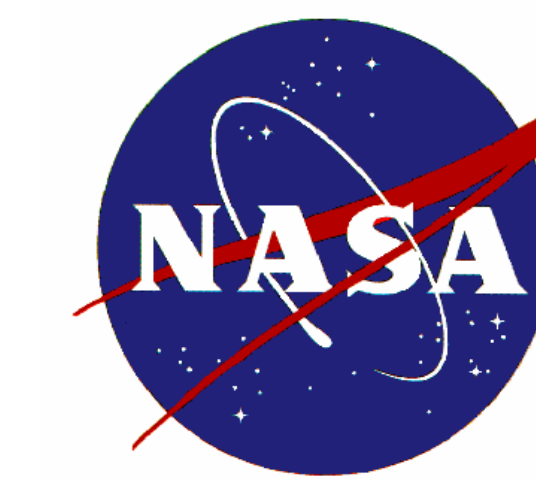




# Surface NOx Measurements in Northern Alabama During and After DC3

Harold Peterson, Universities Space Research Association (harold.peterson@nasa.gov)  
Arastoo Pour Biazar, University of Alabama- Huntsville (biazar@nsstc.uah.edu)  
Michael Newchurch, University of Alabama- Huntsville (mike.newchurch@nsstc.uah.edu)  
Wesley Cantrell, University of Alabama- Huntsville (wes.cantrell@nsstc.uah.edu)



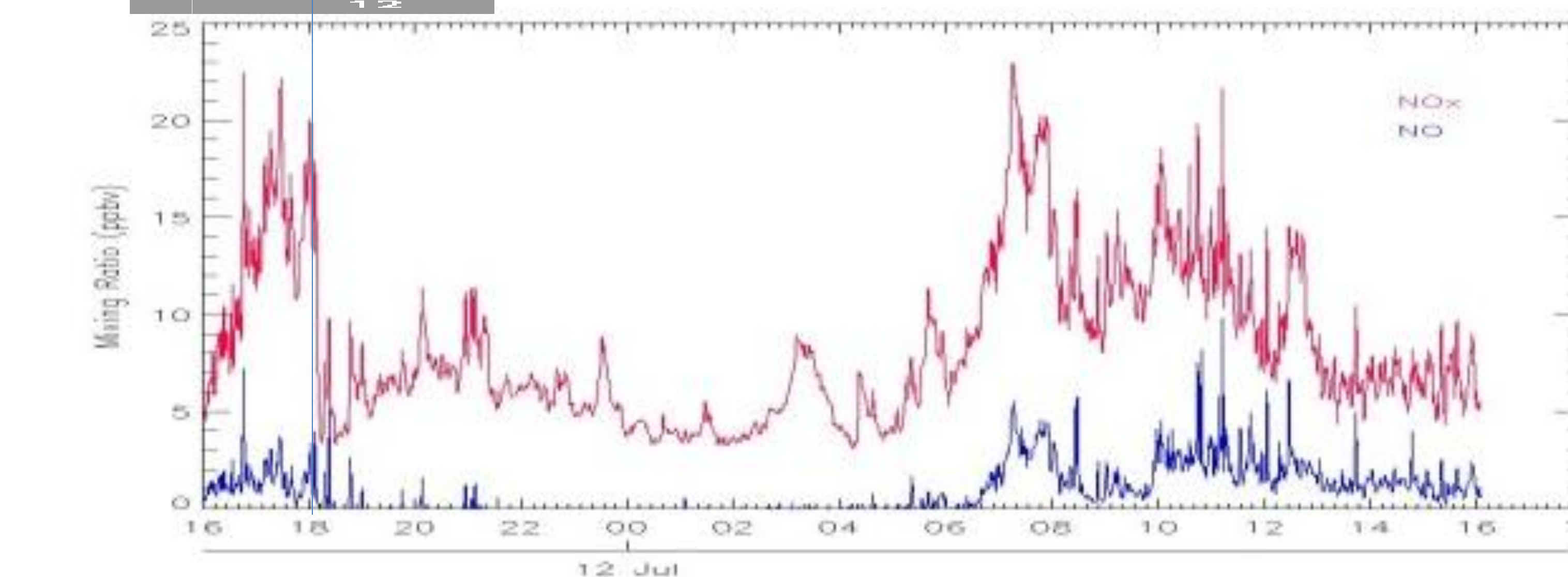
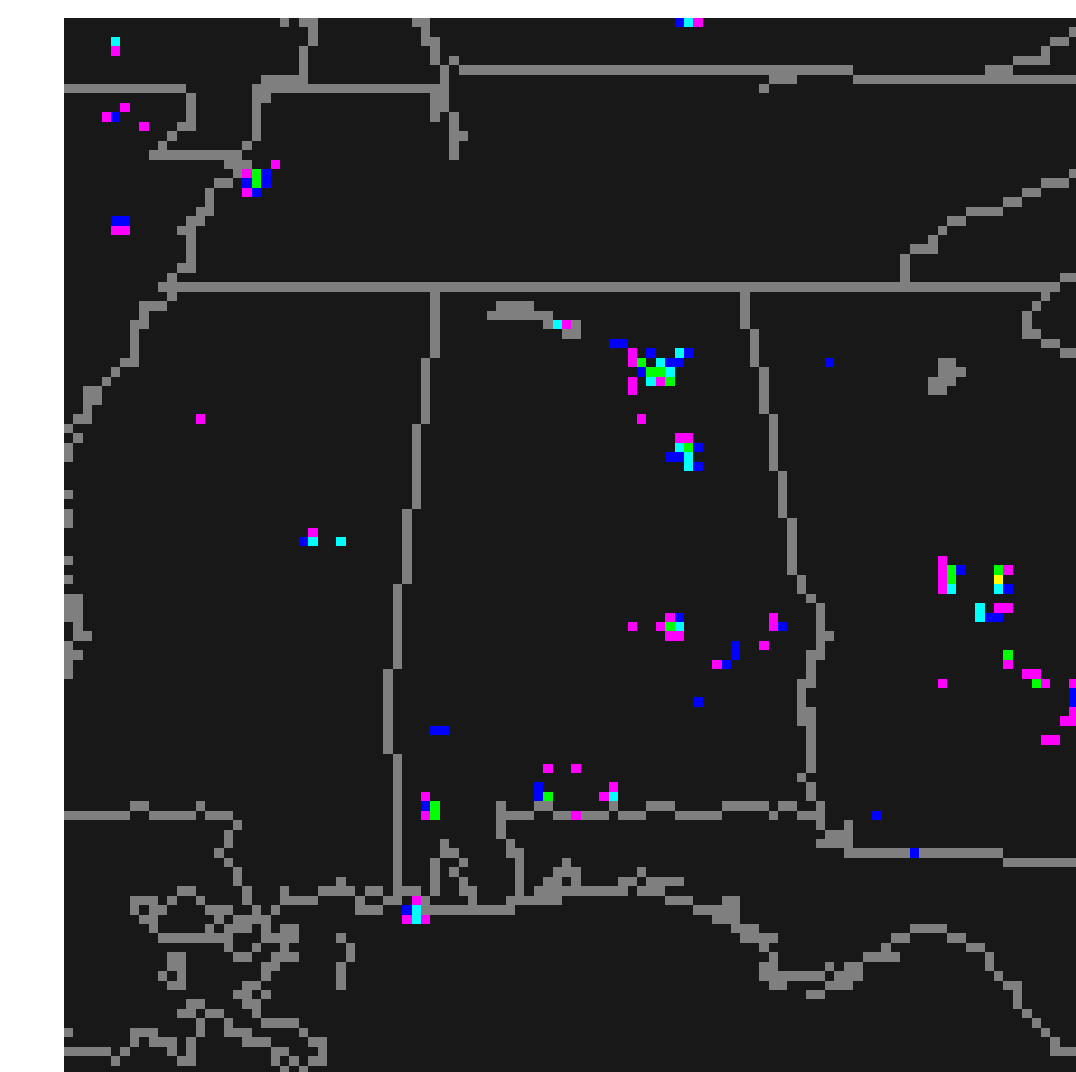
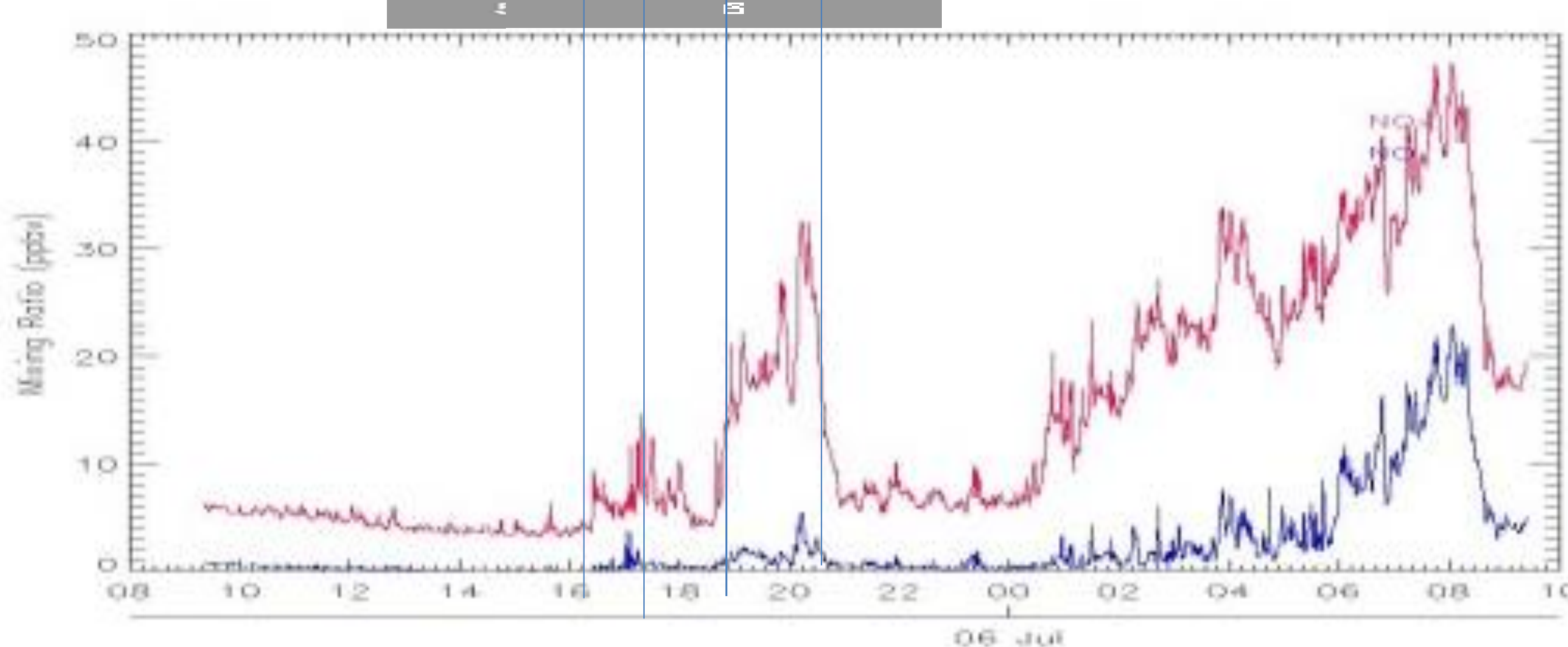
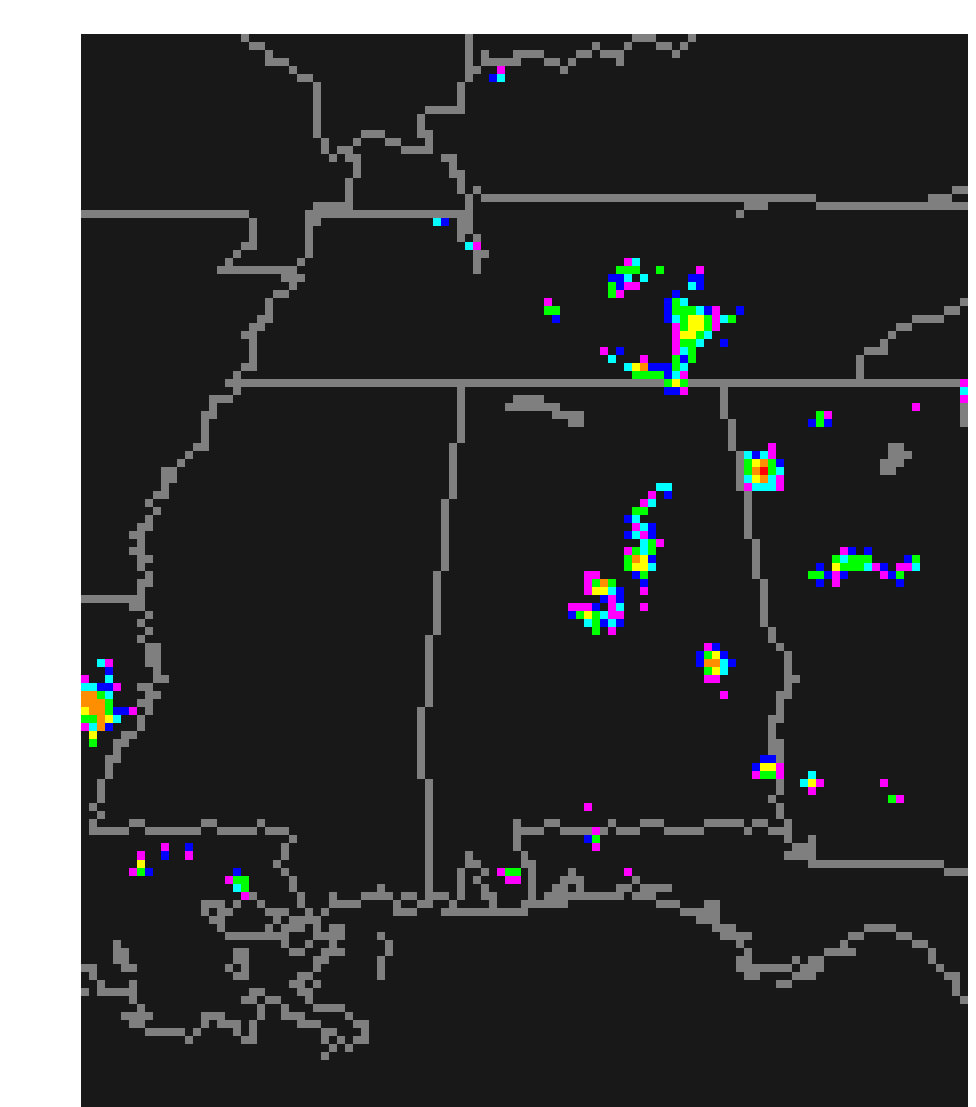
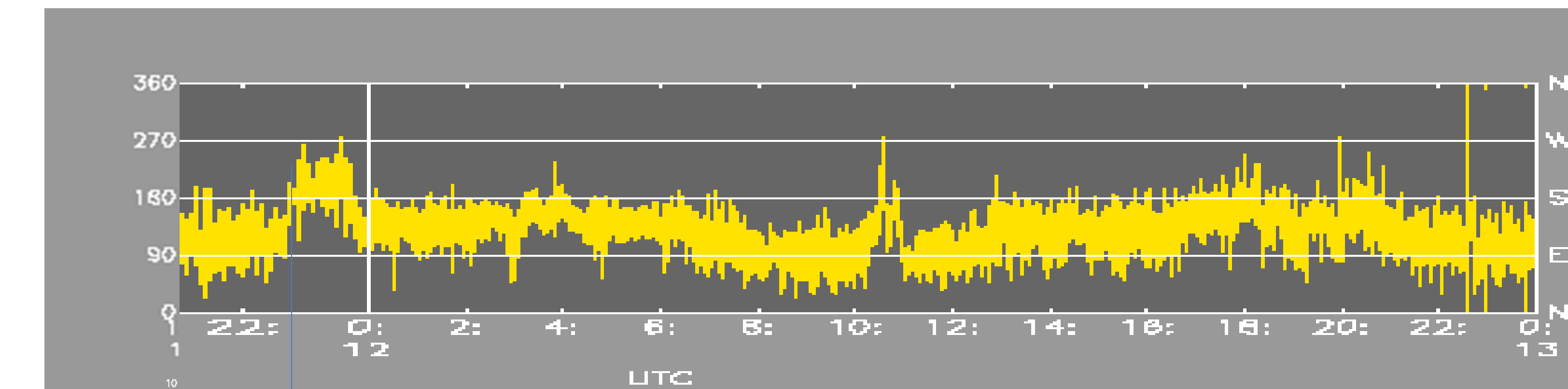
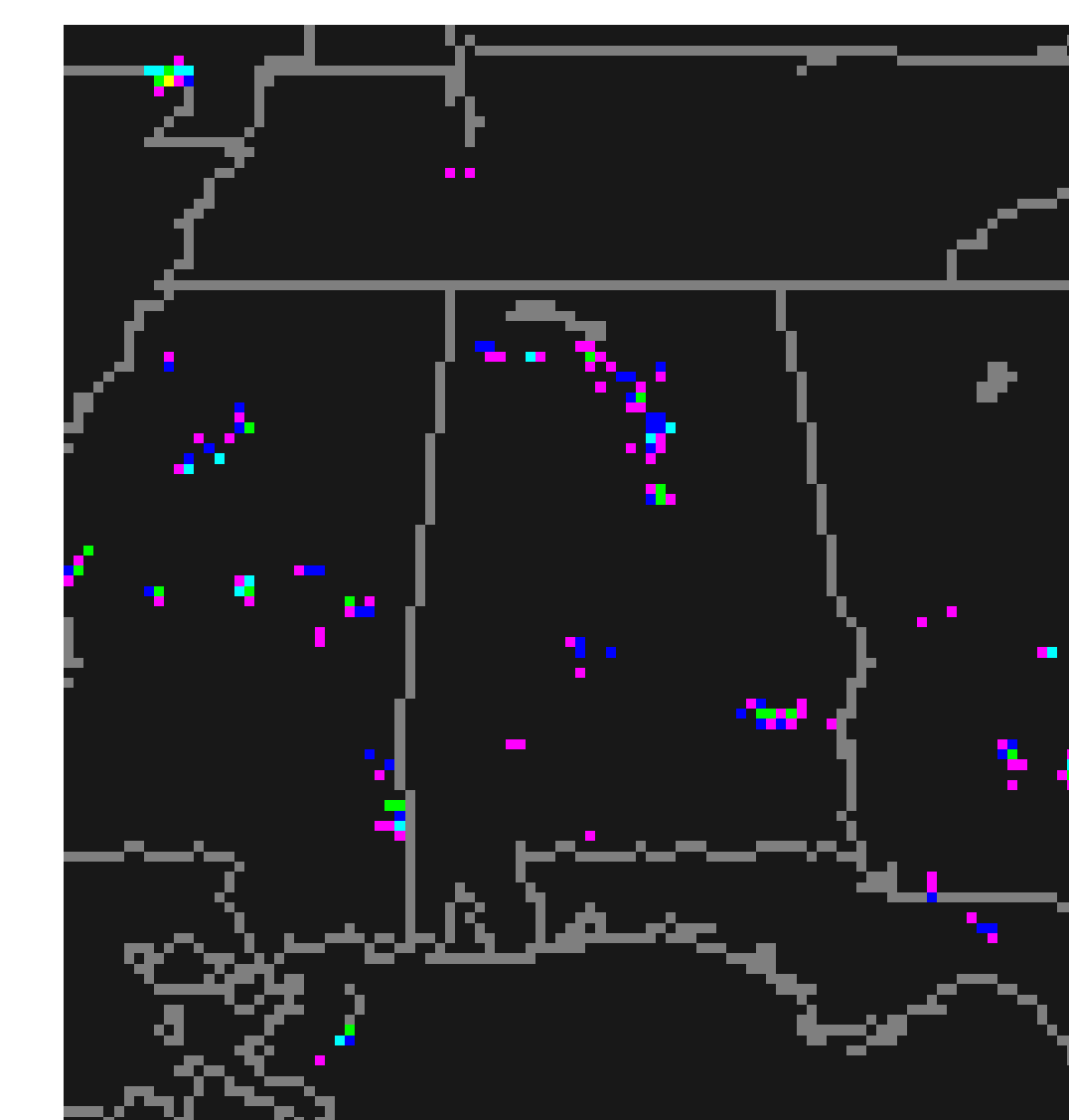
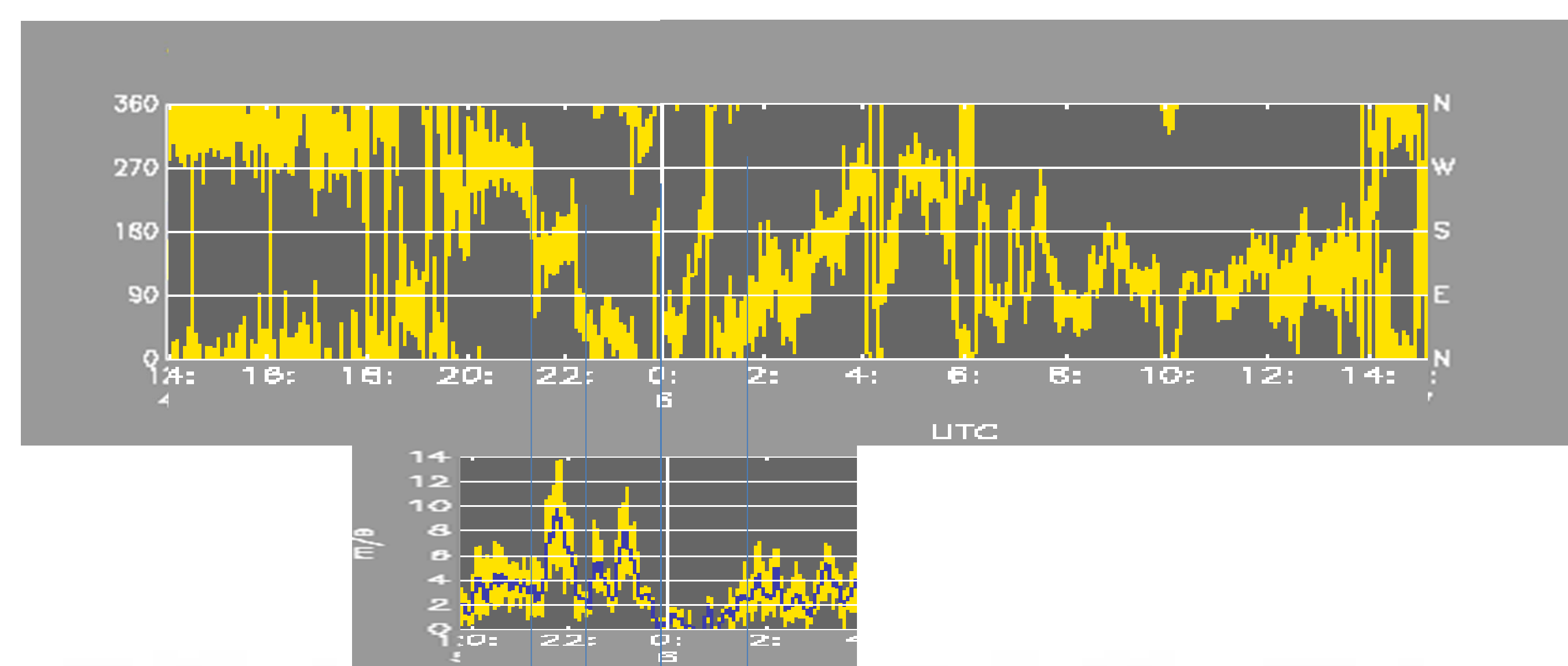
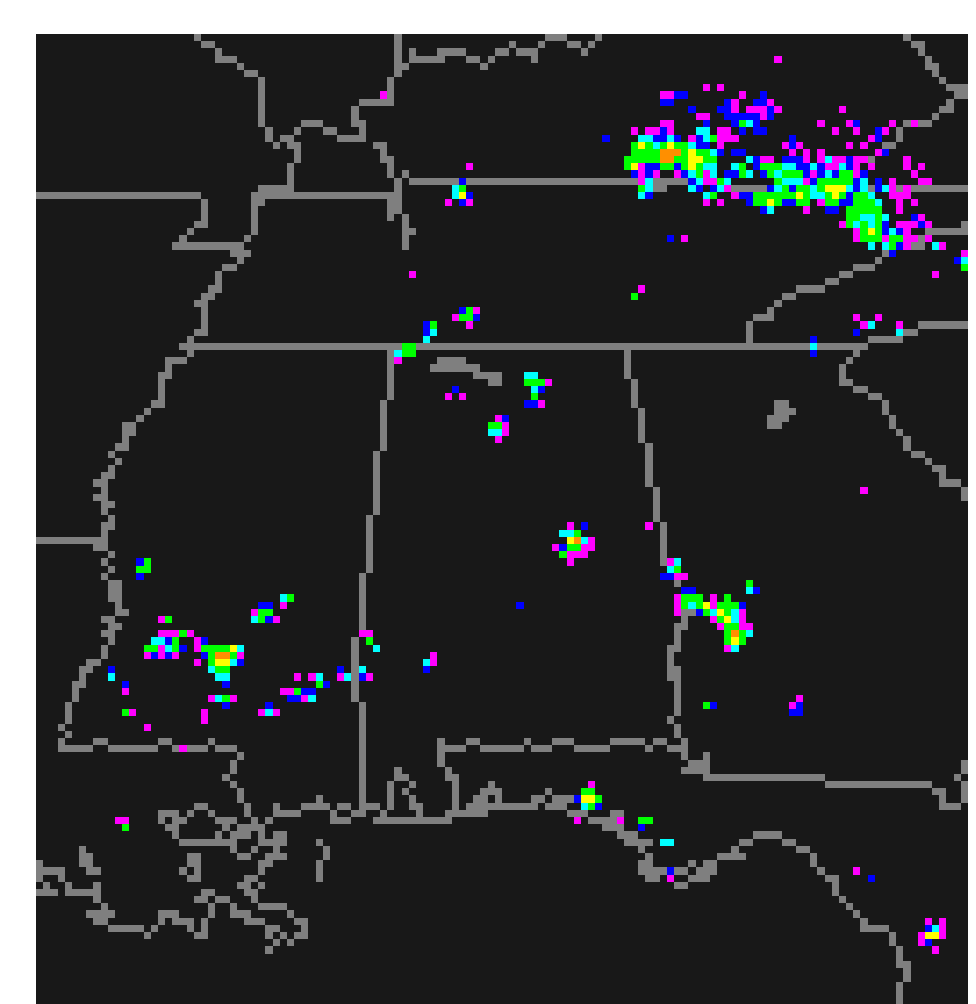
Lightning NOx has been measured by:

- Aircraft
- Satellite
- Laboratory
- Chambers capturing rocket-triggered lightning
- Models

What has yet to be done is a simple ground measurement near thunderstorms



A chemiluminescence nitrogen oxides detector was placed in a trailer (left) on the UAH campus and run continuously to obtain measurements of NO and total NOx (NO2 derived by simple subtraction). Local wind data were derived from measurements on the nearby instrument berm, and lightning data were obtained from the National Lightning Detection Network (NLDN).

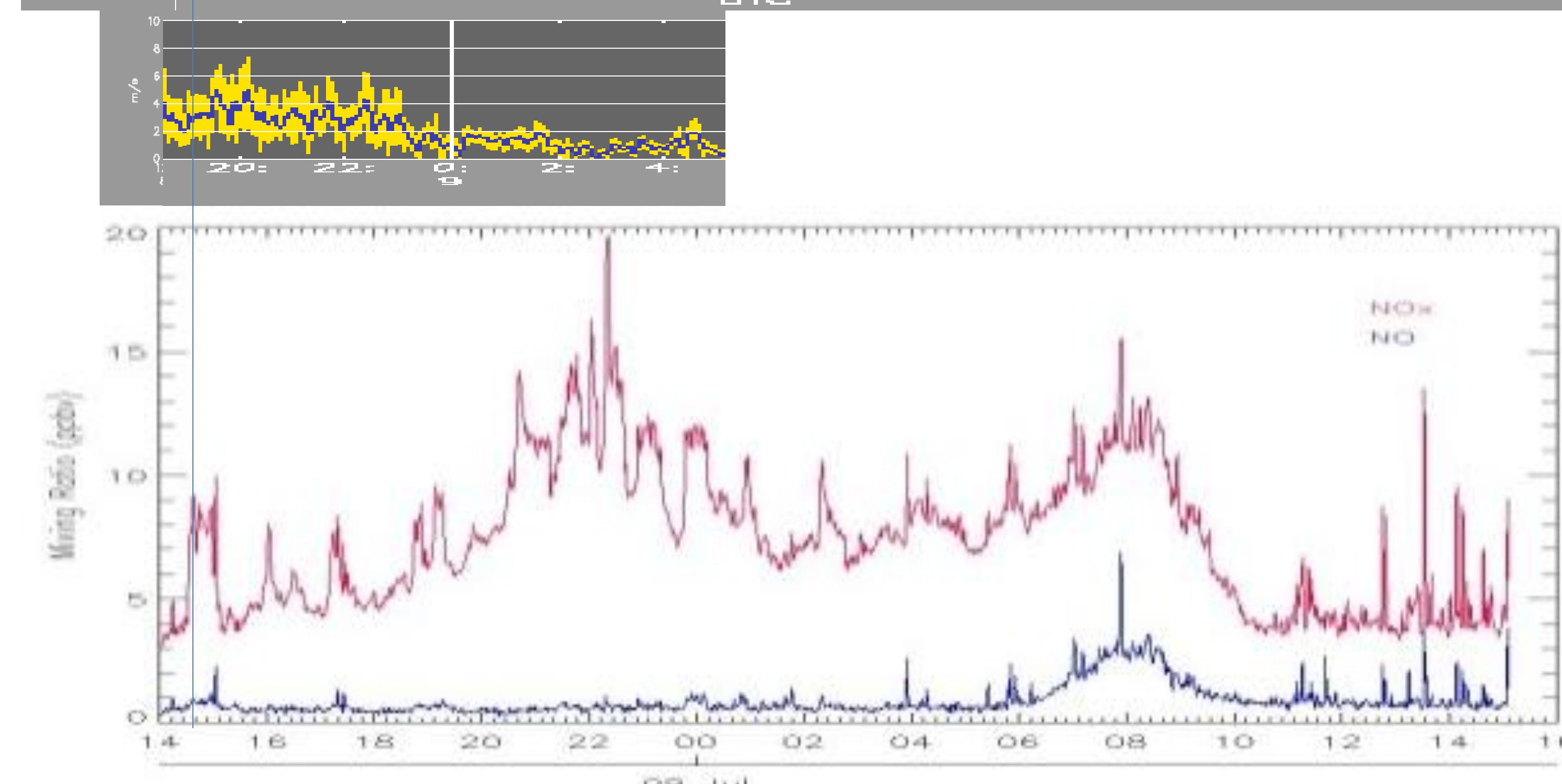
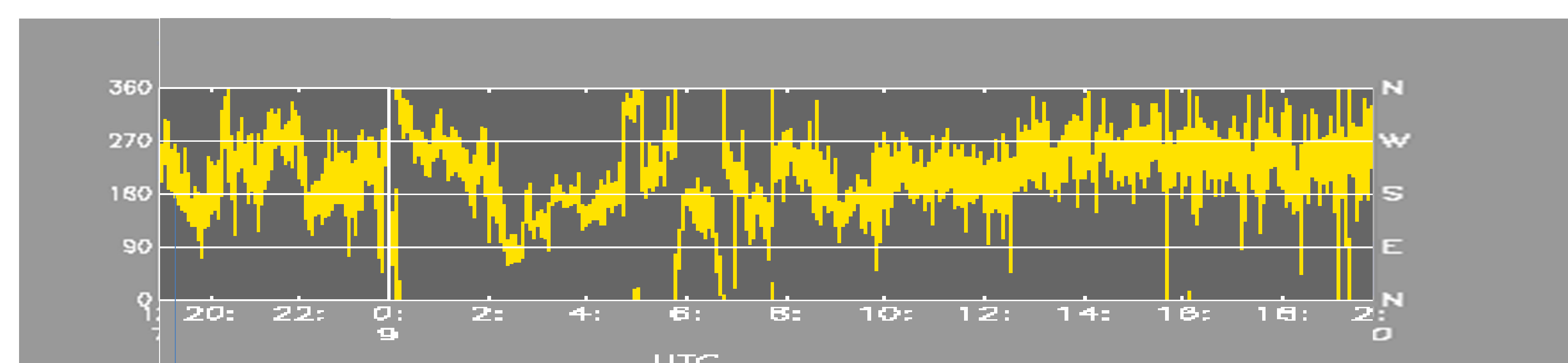
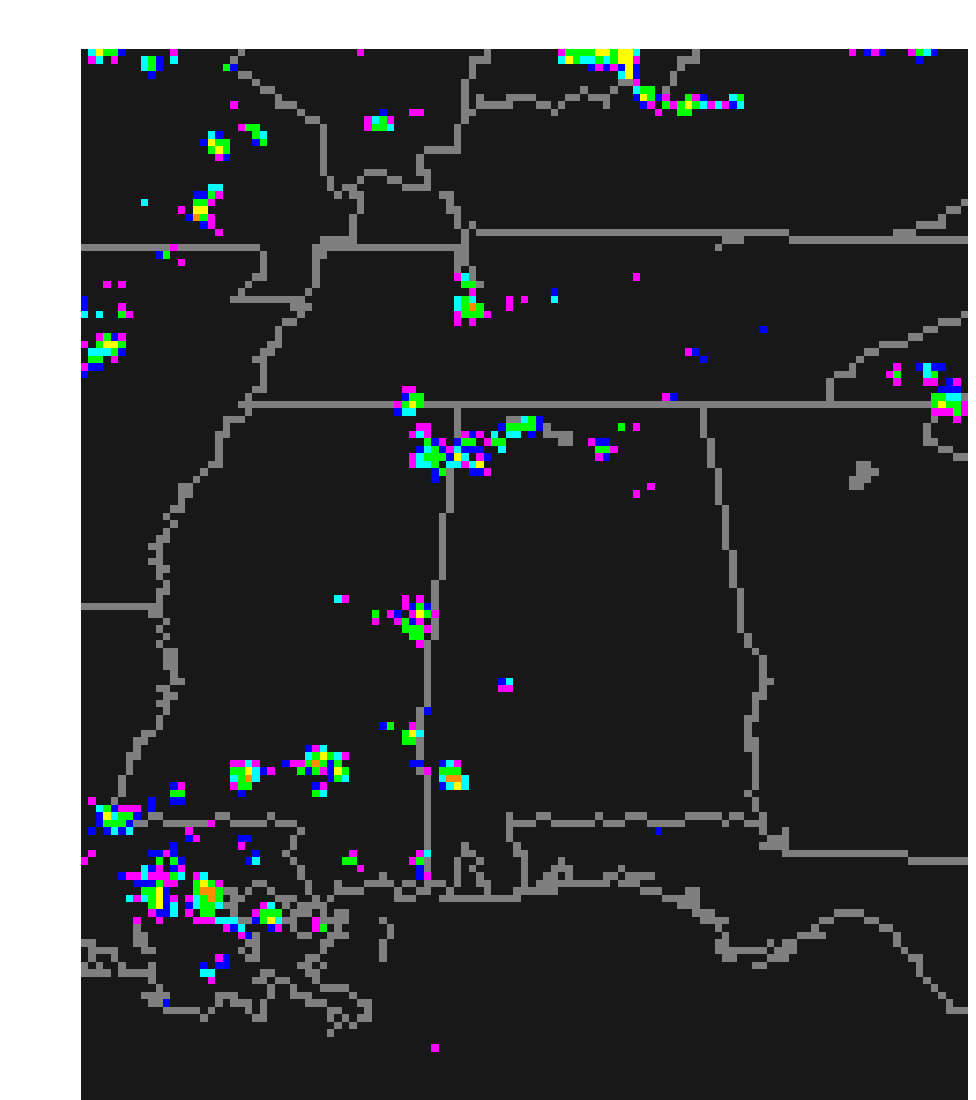


NLDN Lightning images on left are for 4:15-4:30 p.m. (top) and 7:00-7:15 p.m. (bottom) local time, with variable winds at site advecting NOx (mostly NO2) from both the southern (4:15) and northern (7:00) storms; easterly winds later remove NO2. Also note the commuter signal the next day.

NLDN Lightning image is for 5:00-5:15 p.m. (top) and 6:00-6:15 p.m. (bottom) local time; SSE winds at the time of the increase in NOx (mostly NO2); some contribution from commuter NOx as well (mostly NO). Wind gust from the SW at 6:00 p.m. (storms are to the SE at this point) removes NO2.

Lightning NOx has a signal that is unique from anthropogenic NOx

- Lower amplitude (typically 5-10 ppb), longer duration, NO2 instead of NO (anthropogenic is a mix of the two)
- Larger than background NOx, so we know there is an additional source above and beyond concurrent anthropogenic NOx
- No wildfires present in the area during the measurement period, so there are no other natural NOx sources
- Larger than normal peaks in NOx concentration may result from an anthropogenic event superimposed on a lightning event (compare July 6 and July 7 morning NOx)



NLDN Lightning image is for 2:30-2:45 p.m. local time, with weak S winds at the surface; no commuter NOx at that time since it was a Sunday afternoon. There is no increase in NOx immediately after the storms, though a small rise in NO2 throughout the early evening leveling back down by midnight.

Special thanks to the Tennessee Valley Authority for loaning us a nitrogen oxides detector.  
<http://nsstc.uah.edu/atmchem> <http://www.usra.edu>