

Lightning NO_x measurements during and after DC3

GLM Science Meeting, Huntsville, AL
September 19, 2012

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Motivation

- Lightning NO_x has been measured by:
 - Aircraft
 - Satellite
 - Laboratory
 - Chambers capturing rocket-triggered lightning
 - Models
- What has yet to be done is a simple measurement near thunderstorms

Experiment design

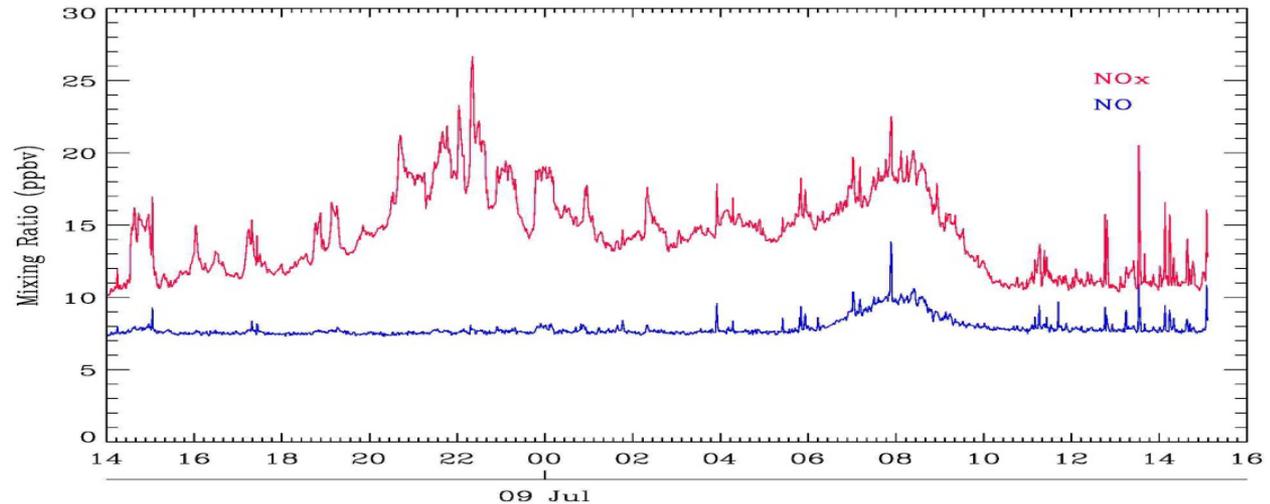
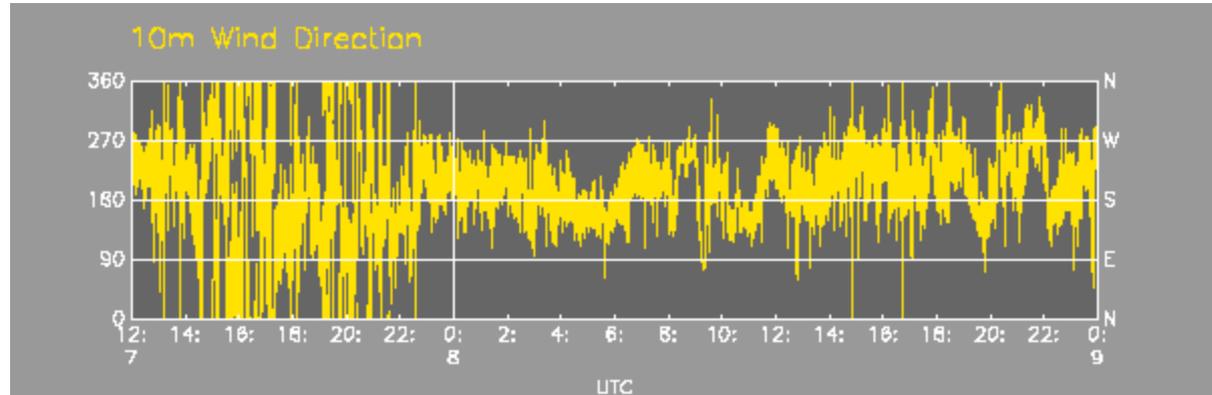
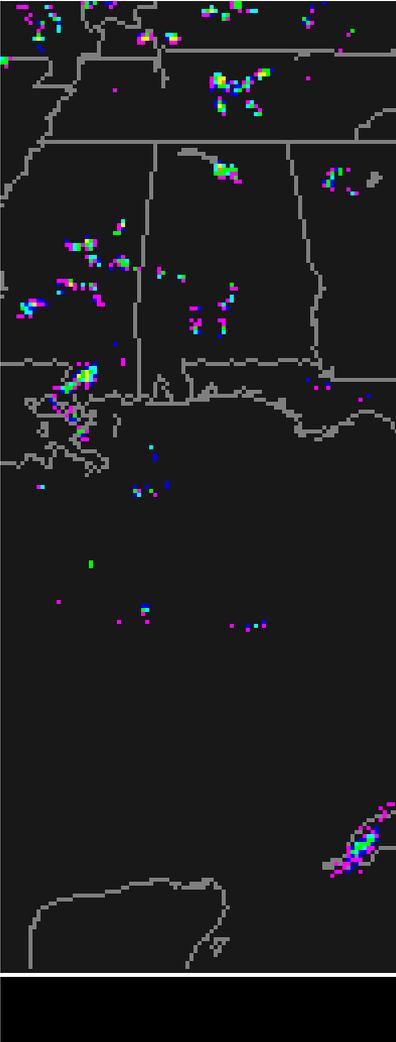


Experiment design

- So simple a baby could do it? (Well, almost...)

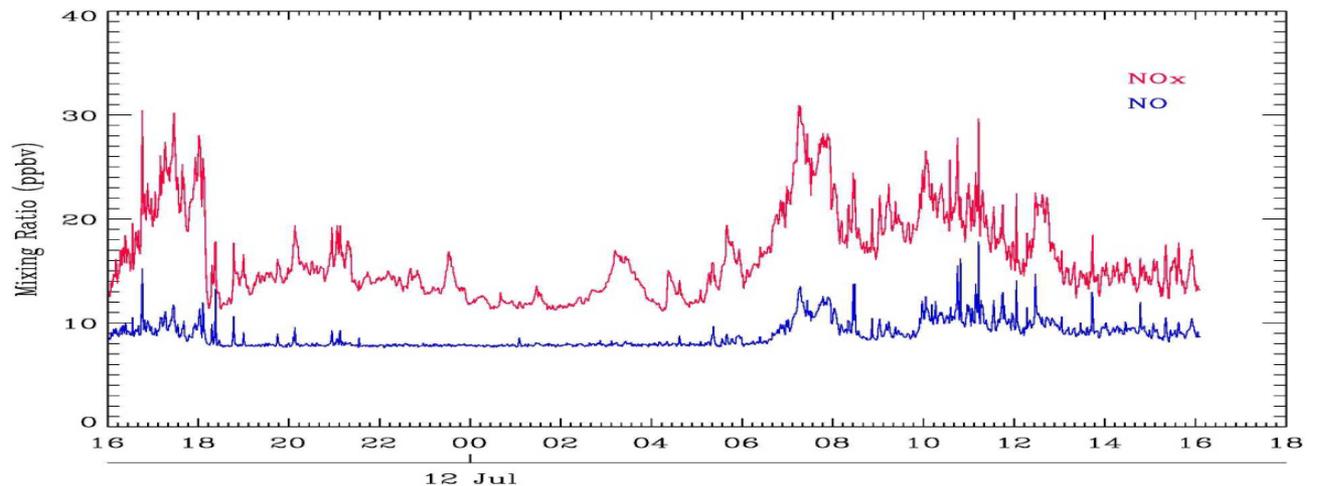
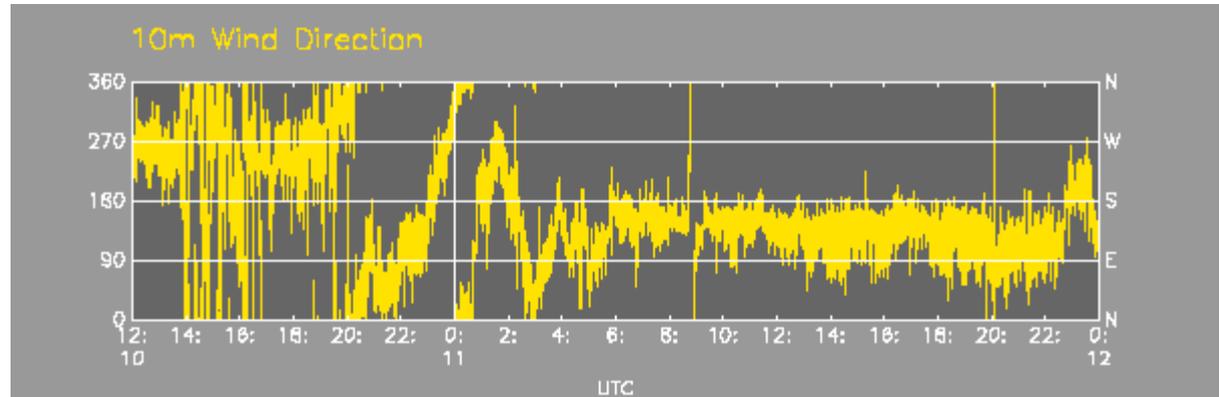
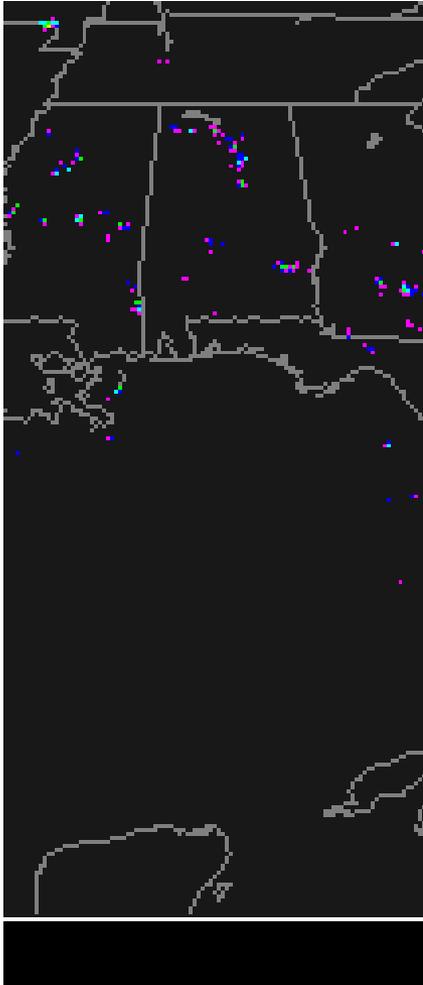


Detailed measurements



NLDN Lightning image is for 5:00-5:15 p.m. local time,
with SW winds at the surface advecting in NO_x (all NO₂)

Detailed measurements



Lightning image is for 5:00-5:15 p.m. local time; SSE winds at the time of the increase in NO_x (mostly NO₂)

Conclusions

- Lightning NO_x has a signal that is unique from anthropogenic NO_x
 - Lower amplitude (sometimes), longer duration, NO₂ instead of NO
 - Larger than background NO_x, so we know there is an additional source above and beyond concurrent anthropogenic NO_x
 - No wildfires present in the area during the measurement period, so there are no other natural NO_x sources

Conclusions

- Consequence 1: Larger than normal peaks in NO_x concentration may result from an anthropogenic event superimposed on a lightning event (compare July 6 and July 7 morning NO_x)

Conclusions

- Consequence 2 (TBD): Similar effects are predicted for lightning ozone

Acknowledgements

- Thank you to Solomon Bairai and TVA for loaning us a calibrated NO_x detector
- NLDN lightning images are from the Global Hydrology Research Center
- Wind direction maps are from Kevin Knupp's berm instruments