Reduced Nitrogen Measurements at CSN/IMPROVE

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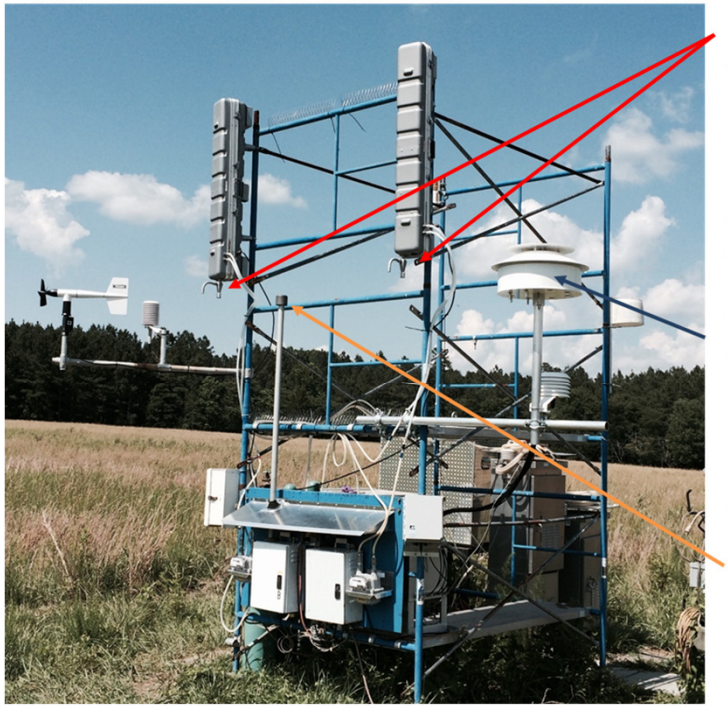
Southeastern U.S. CSN/IMPROVE NHx Pilot Study

- Follow on to IMPROVE NHx pilot study in the West/Midwest (Chen et al., 2014)
- Operated IMPROVE and CSN PM samplers with acid-coated filters May – October 2017

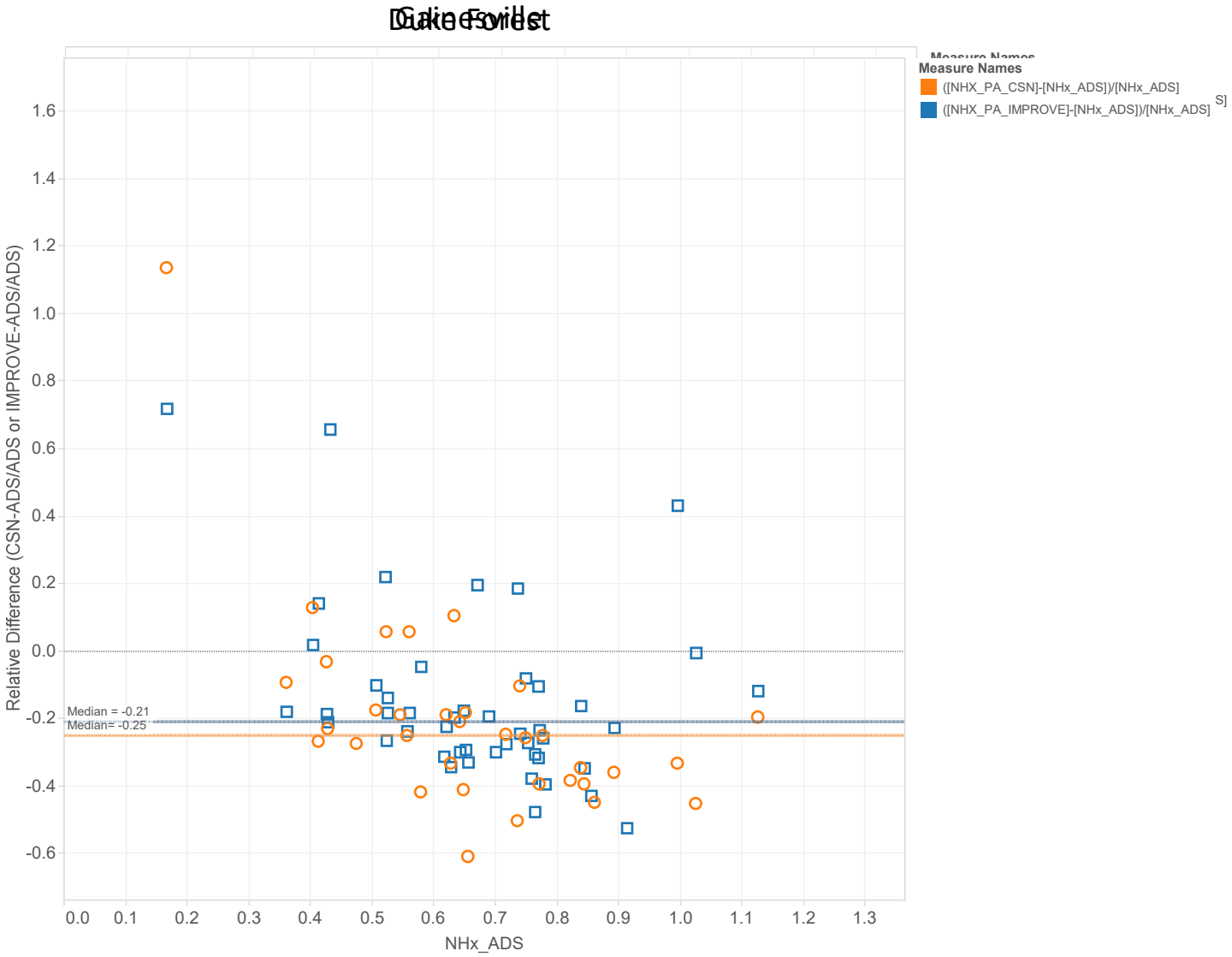


Duke Forest NHx study site

URG denuder/filter pack
- Separates NH_3 and NH_4^+
  - Acid coated denuder (NH_3)
  - Nylon filter (NH_4^+)
  - Backup denuder (volatile NH_3)
- Duplicates
- $PM_{2.5}$ inlet @ 10 Lpm

CSN
- One module collecting NH_4^+ on nylon filter
- 2nd module collecting total NHx on acid impregnated cellulose filter
- $PM_{2.5}$ inlet at 6.7 Lpm

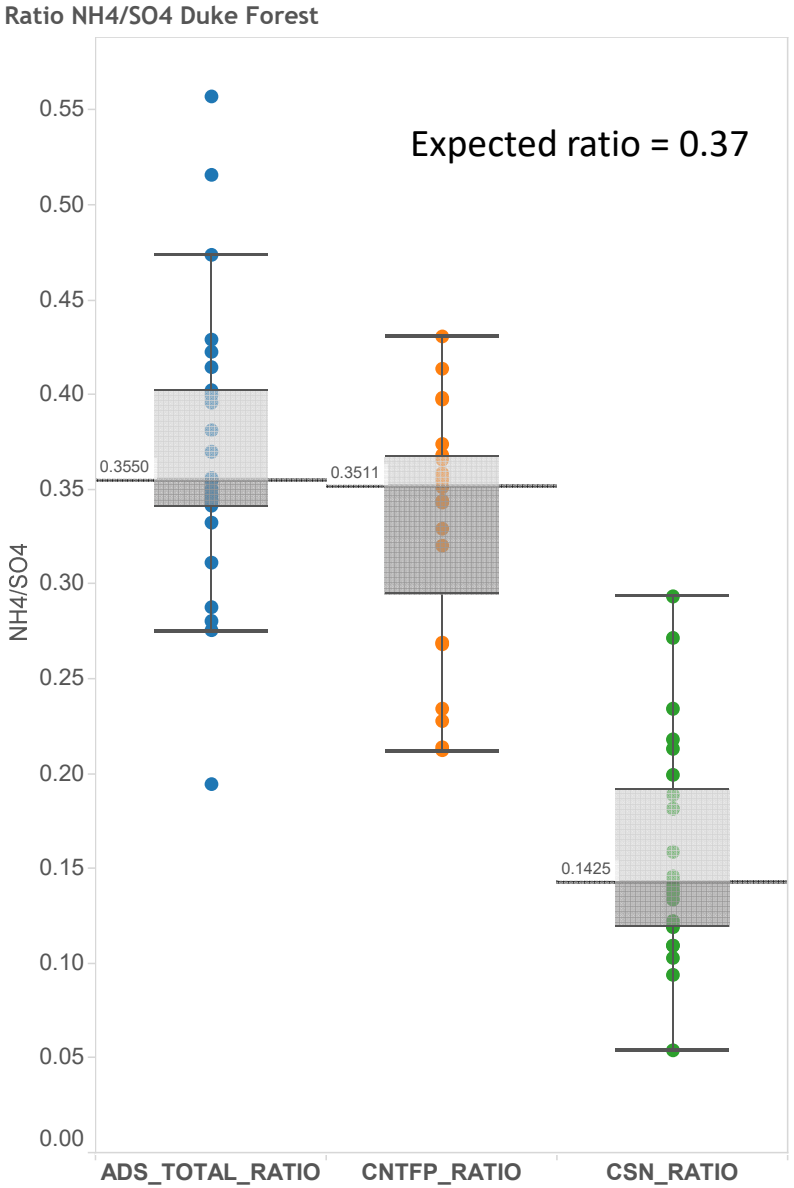
IMPROVE
- Acid impregnated cellulose filter to capture total NHx
- $PM_{2.5}$ inlet @ 22.8 Lpm



- Laboratory and field blanks were low for 3 sampling methods
- Duplicate denuders showed good precision
- Negative bias in CSN NHx concentration
- IMPROVE NHx biased high at Duke Forest and low at Gainesville
- ADS results showed a large fraction of NH_4^+ on the backup acid denuder
- Additional testing in RTP showed ADS capturing NHx completely with backup denuder – loss of NH_4^+ from nylon filter

Results

- Wood analyzed extracts for NO_3^- and SO_4^{2-} from CSN and ADS nylon filters
- CASTNET uses Teflon for NH_4^+, SO_4^{2-}, NO_3^-
- CSN uses nylon filter for NH_4^+, SO_4^{2-}, NO_3^-
  - comparison with CASTNET and ADS showed no loss of SO_4^{2-} from nylon filter
  - CSN loss of NH_4^+ resulted in NH_4/SO_4 ratio of about ½ of what was measured with ADS and CASTNET filterpack



Next Steps

- Determine why CSN acid coated filters were biased low
  - IMPROVE: type 40 cellulose filters with higher particle capture efficiency
  - CSN: type 41 with lower capture efficiency for smaller particles
- Results to date included in summary report
- Interpret Gainesville and Duke Forest meteorology with NHx results
- Resolve NH_4^+ loss from nylon filters