Source Characterization of WINTER Formaldehyde

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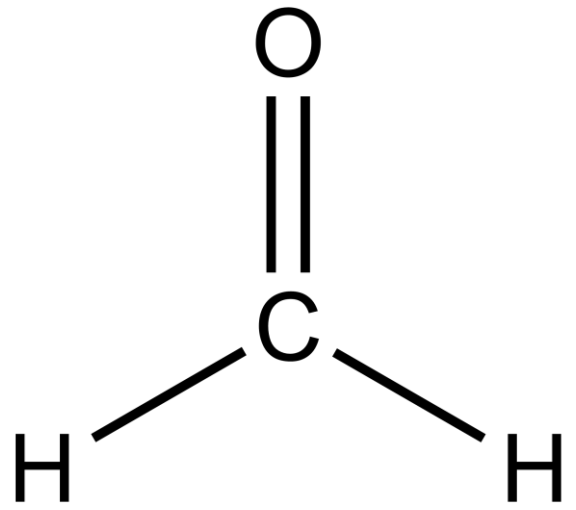
WINTER Science Team Meeting

09/17/2015

Snow at LaRC (c. 1969)

Formaldehyde (HCHO)

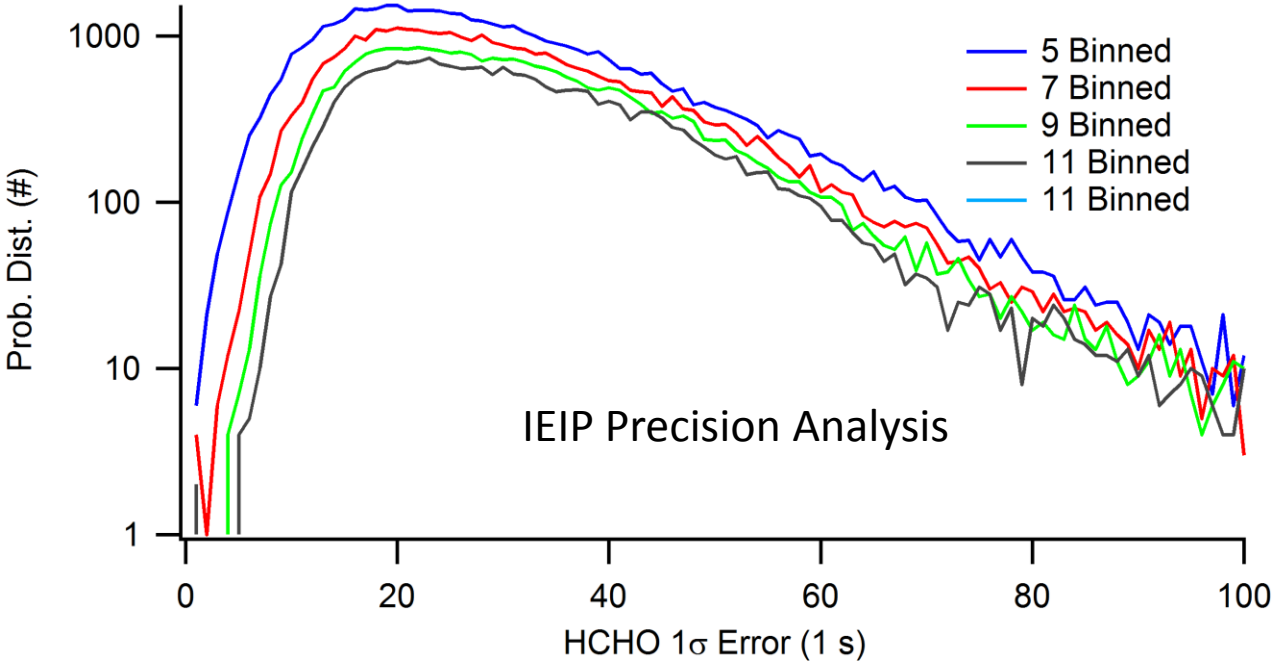
- Formed in oxidation of nearly all VOCs
- Short lifetime (hours)
- Can be used as a local tracer of total VOC oxidation



- Major source is photochemical, but primary emissions can be important in boundary layer

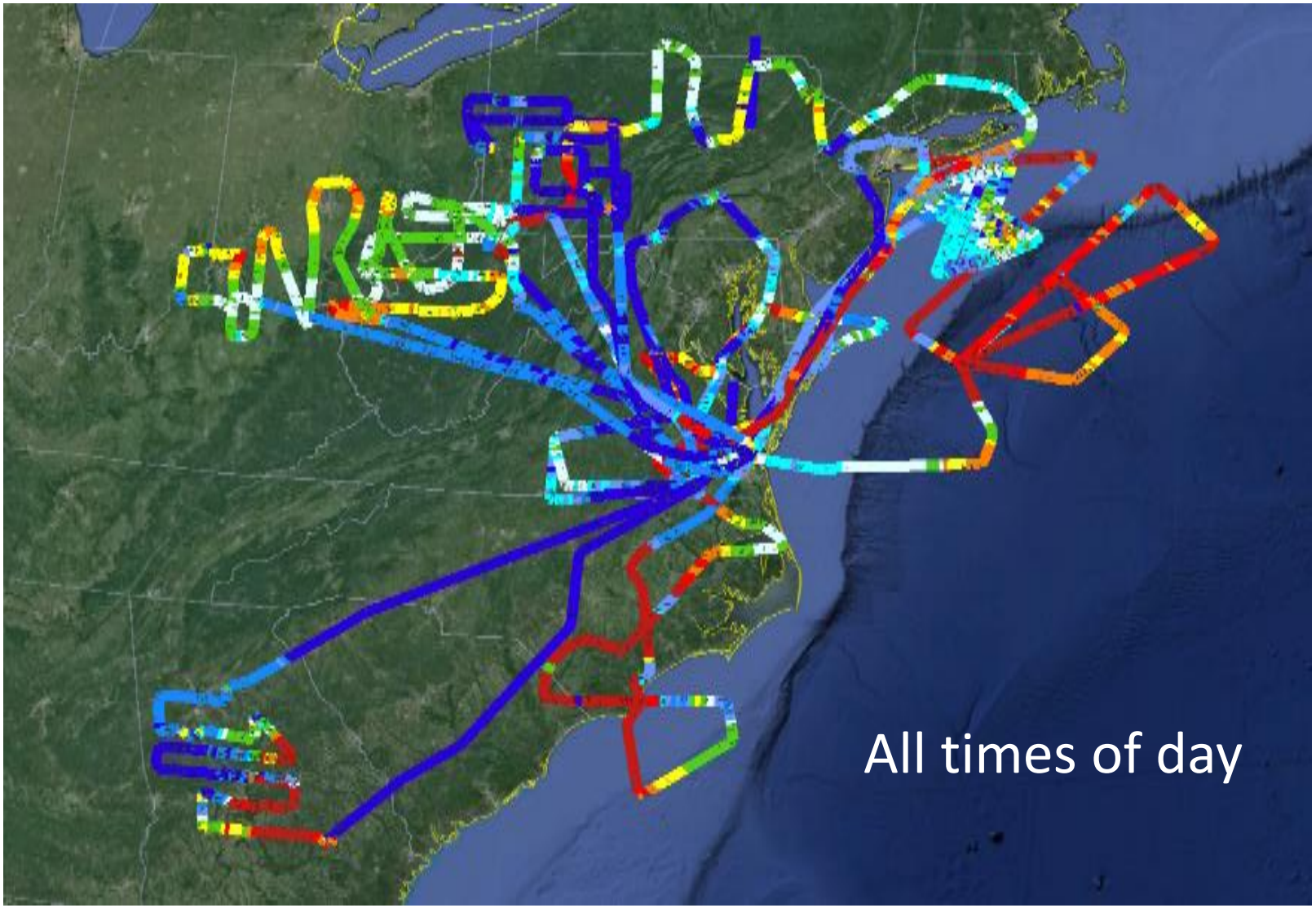
In Situ Airborne Formaldehyde (ISAF)

- Laser-induced fluorescence detection

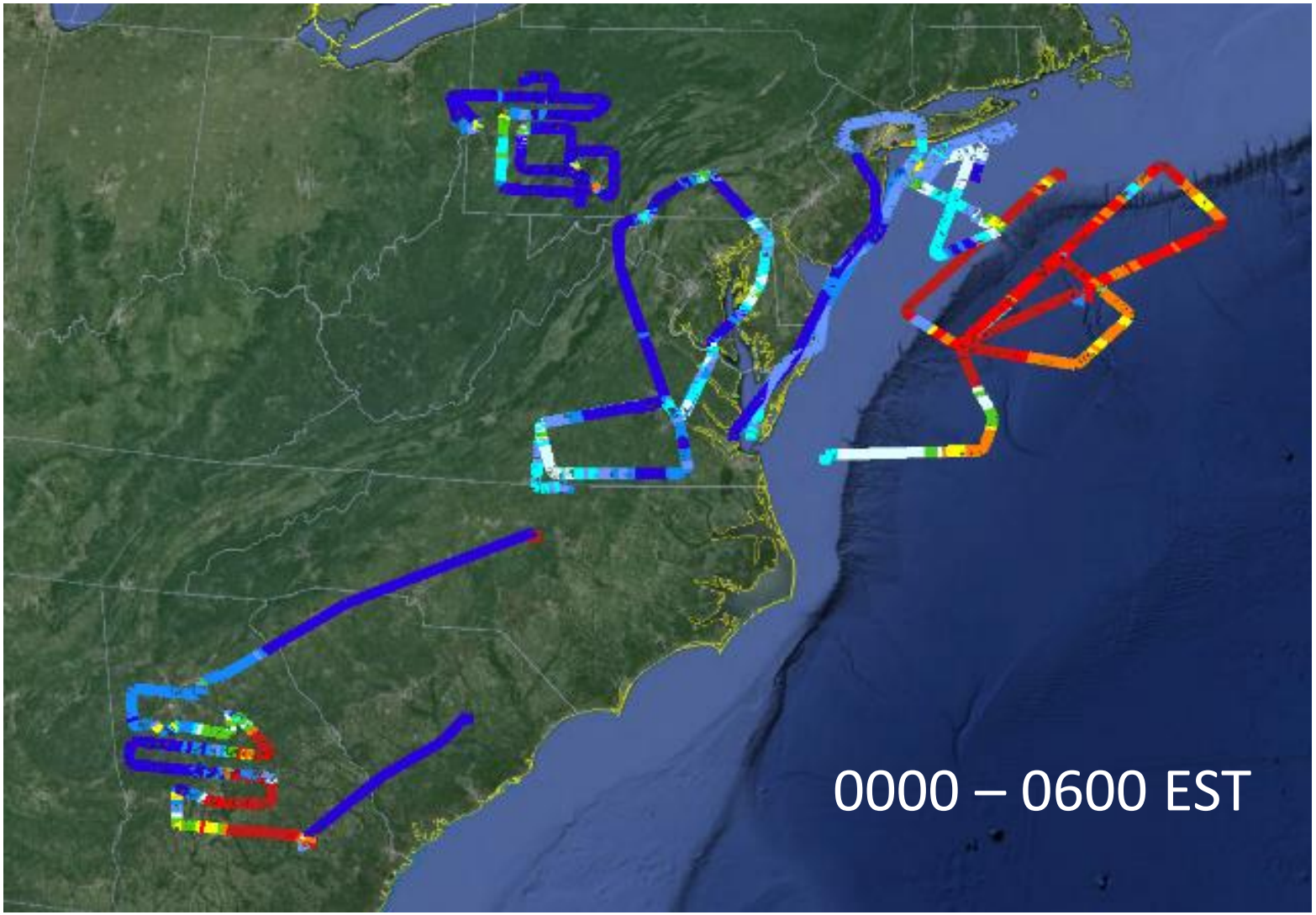


- WINTER instrument stats
  - Accuracy: ± 10%+10 pptv
  - Precision: ~20 ppt (1σ)
  - >90% data coverage

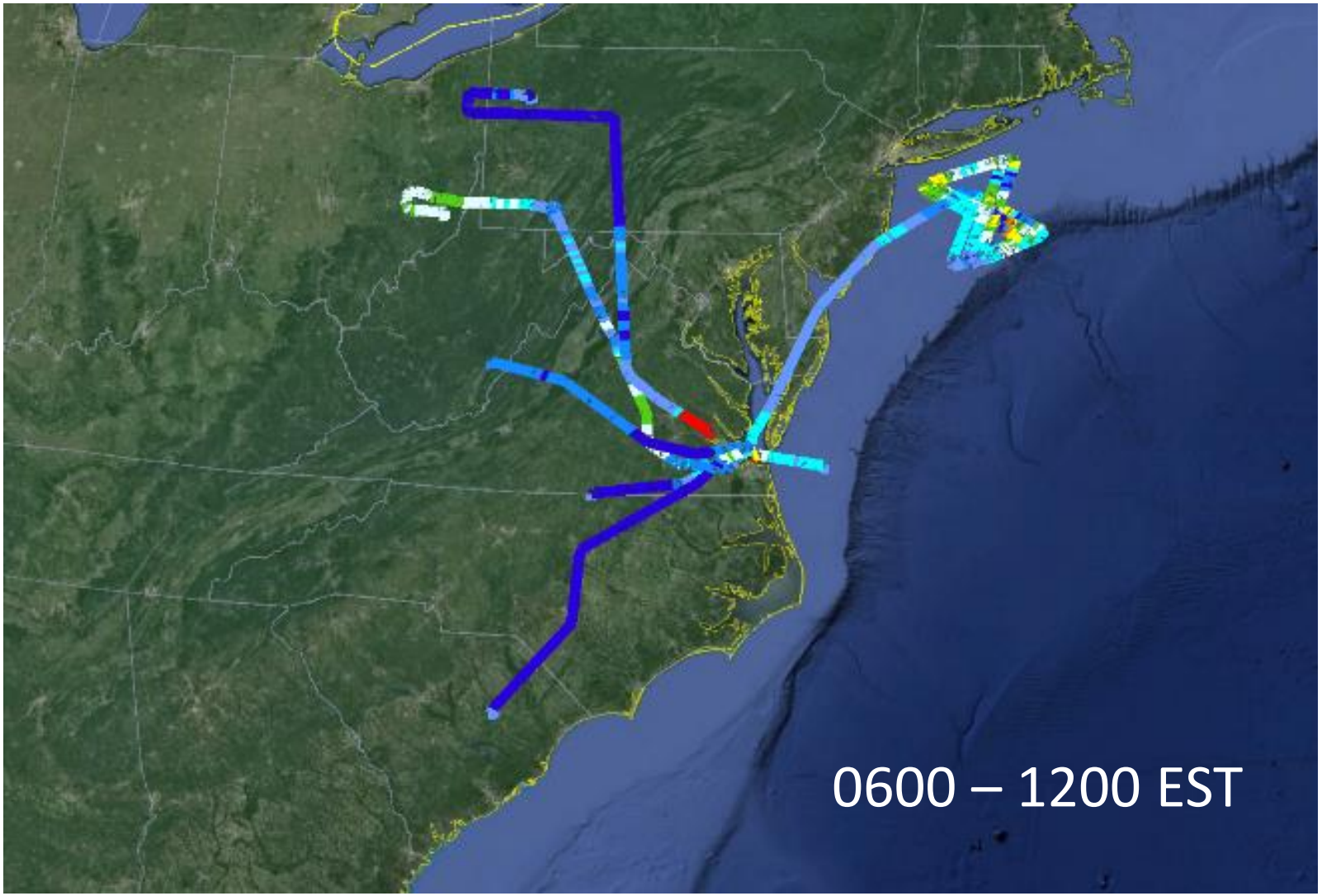
WINTER HCHO Overview



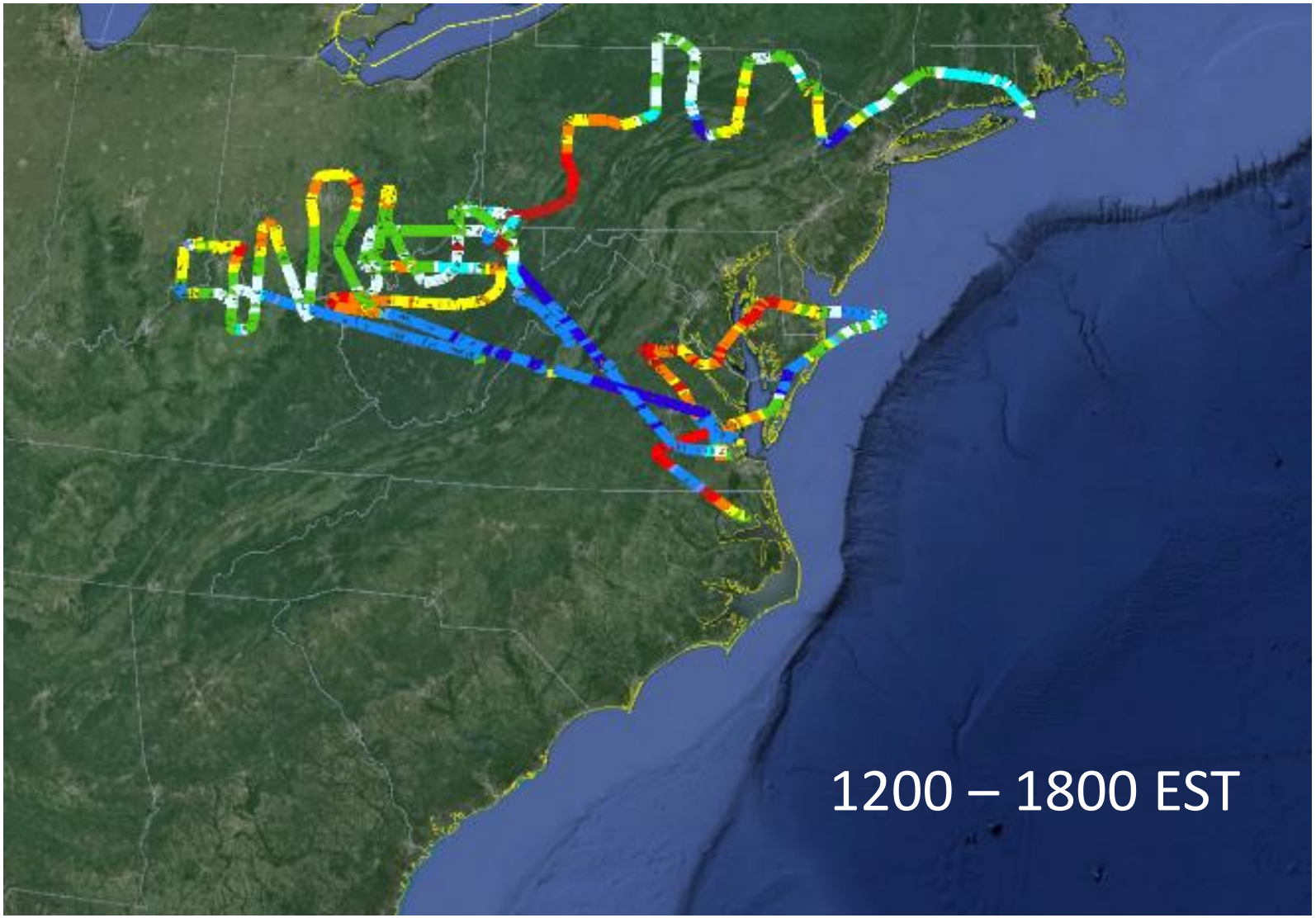
WINTER HCHO Overview



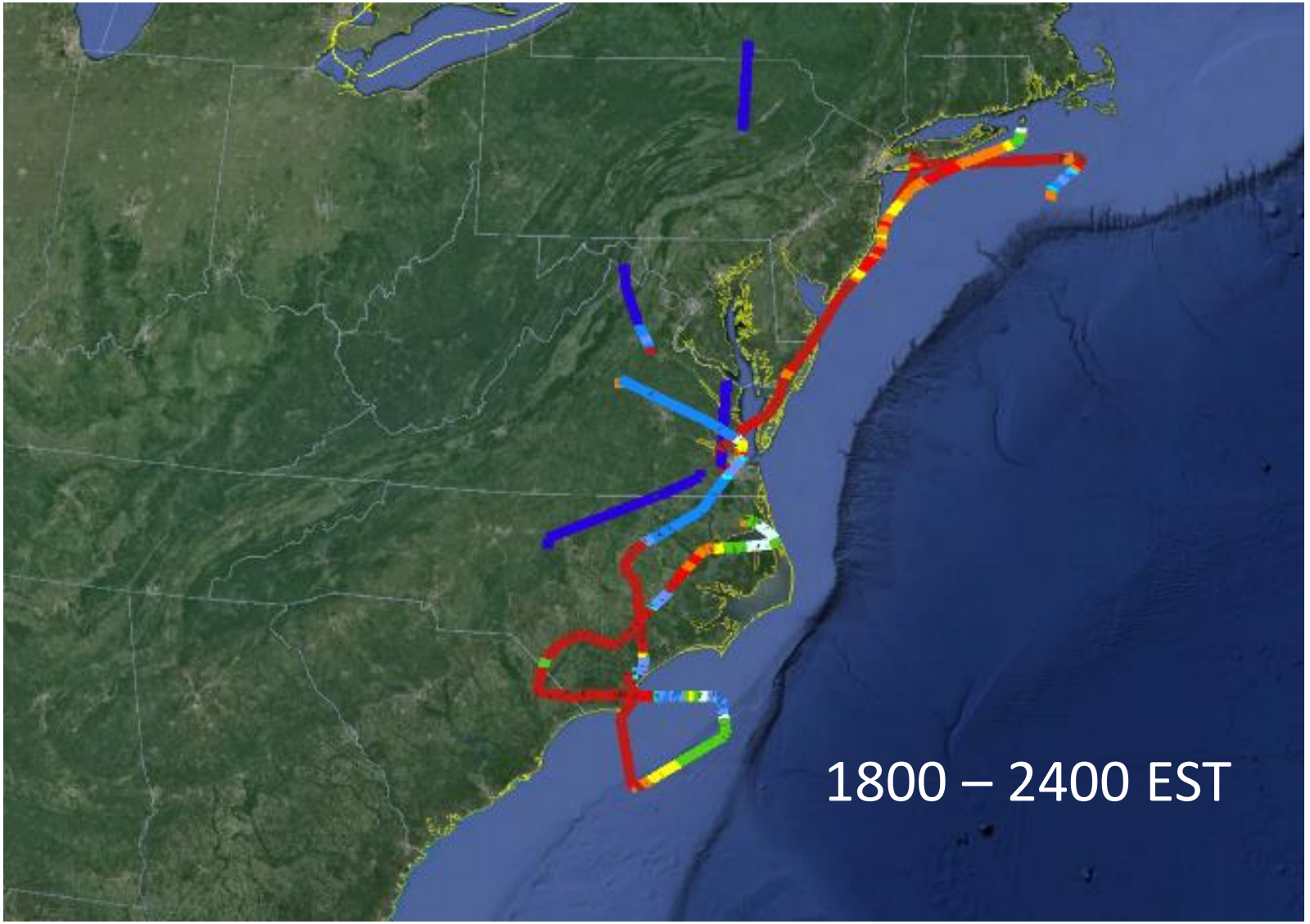
WINTER HCHO Overview



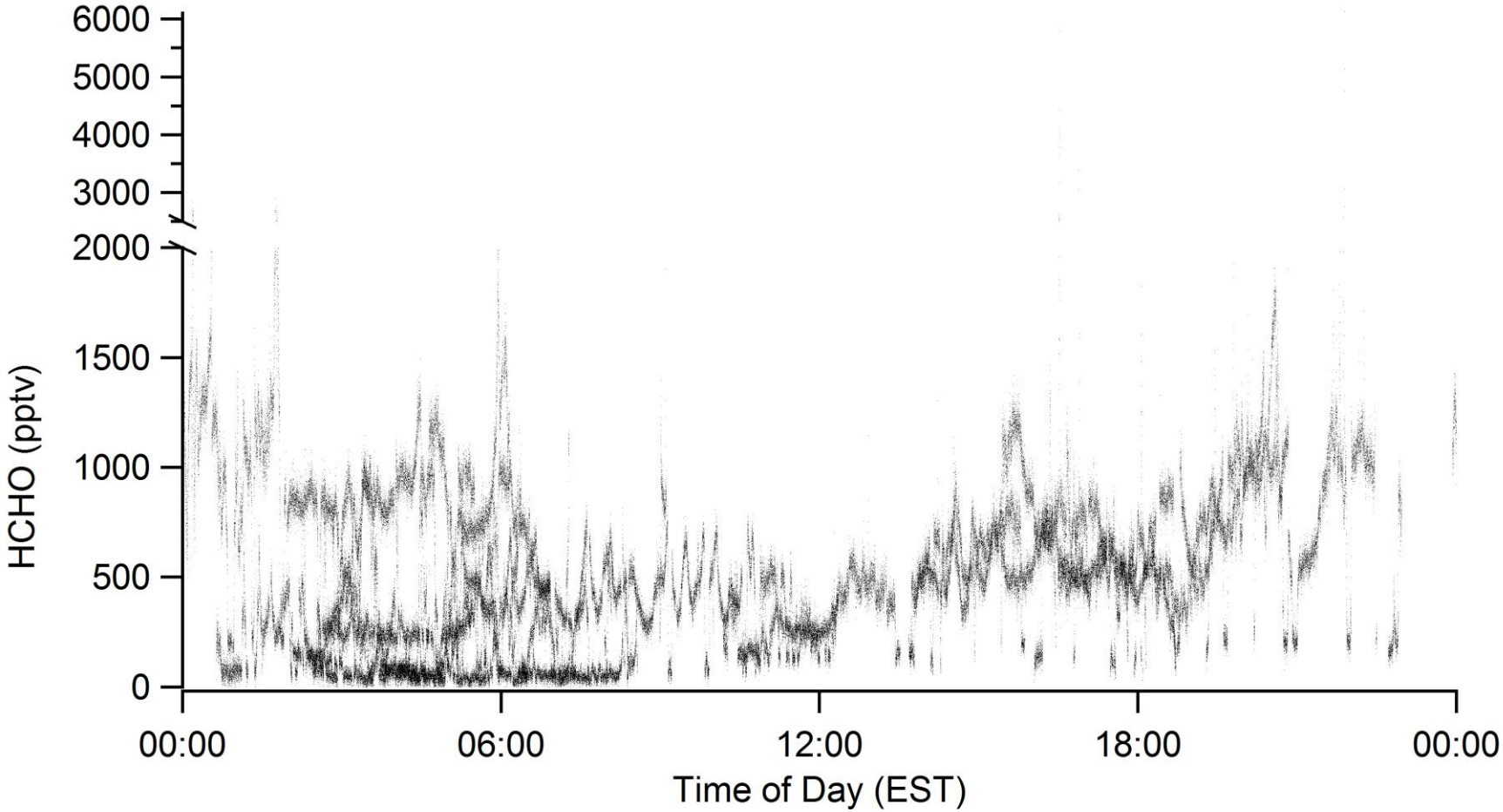
WINTER HCHO Overview



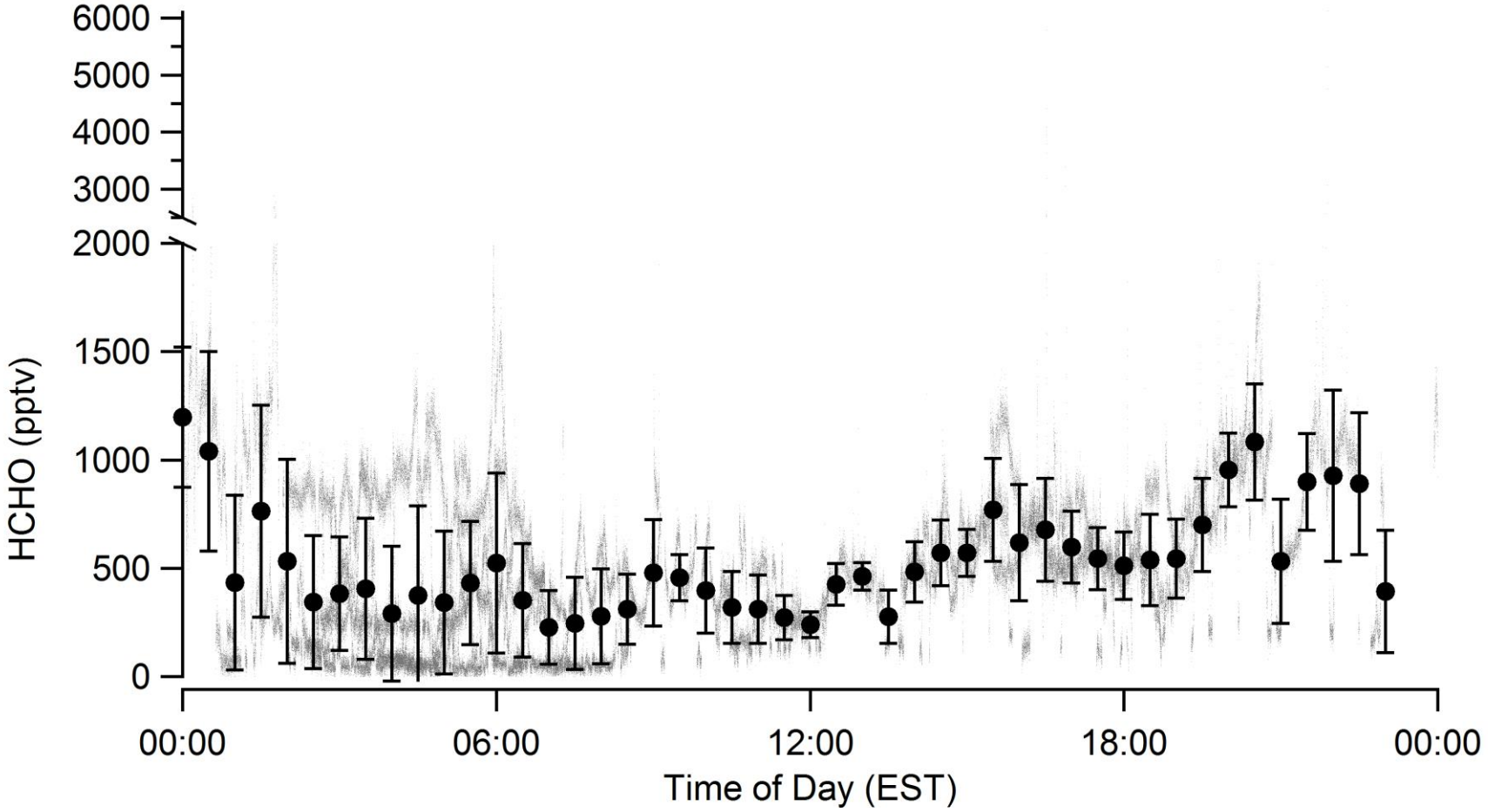
WINTER HCHO Overview



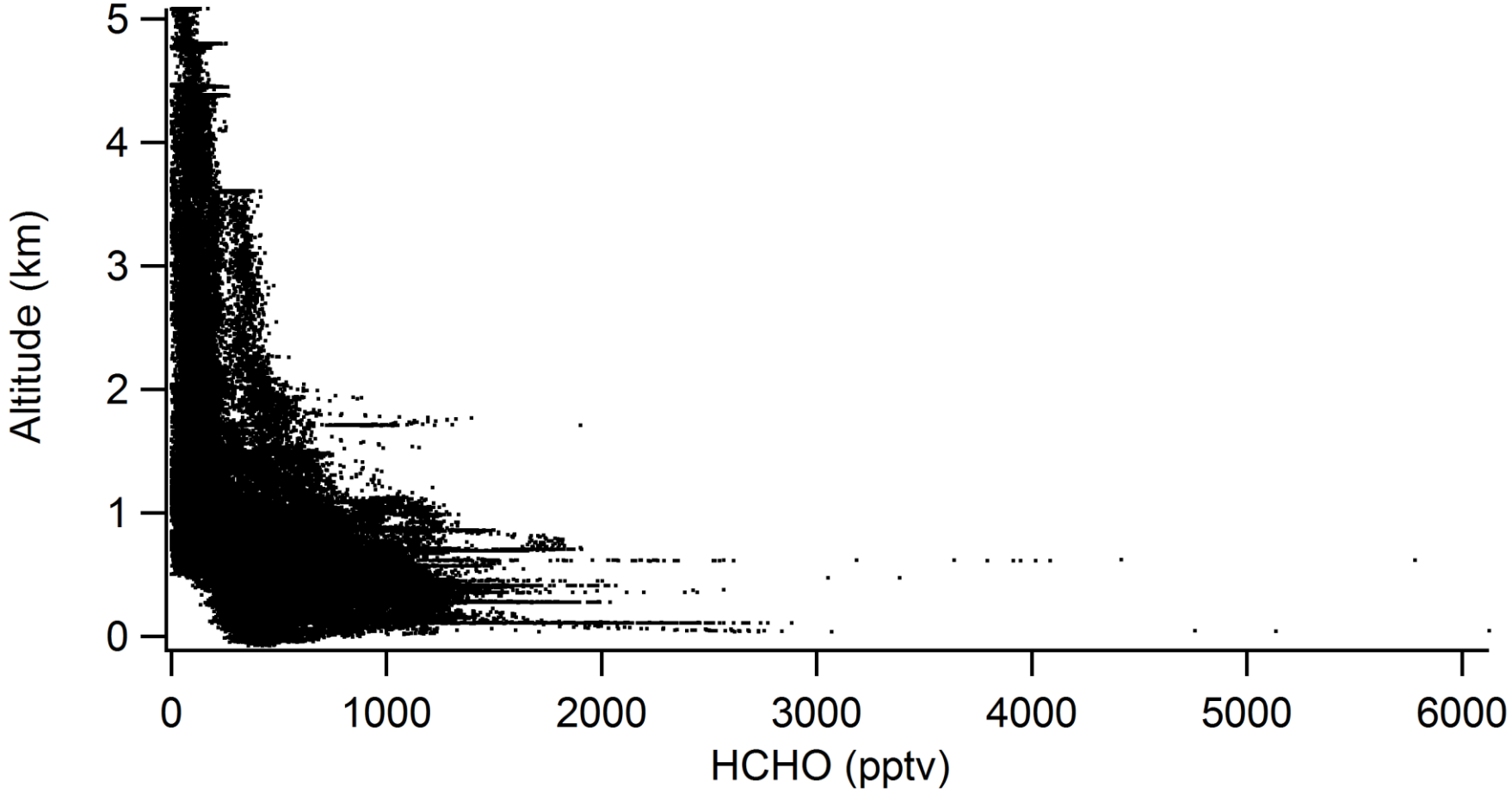
HCHO Diurnal Variability < 2 km



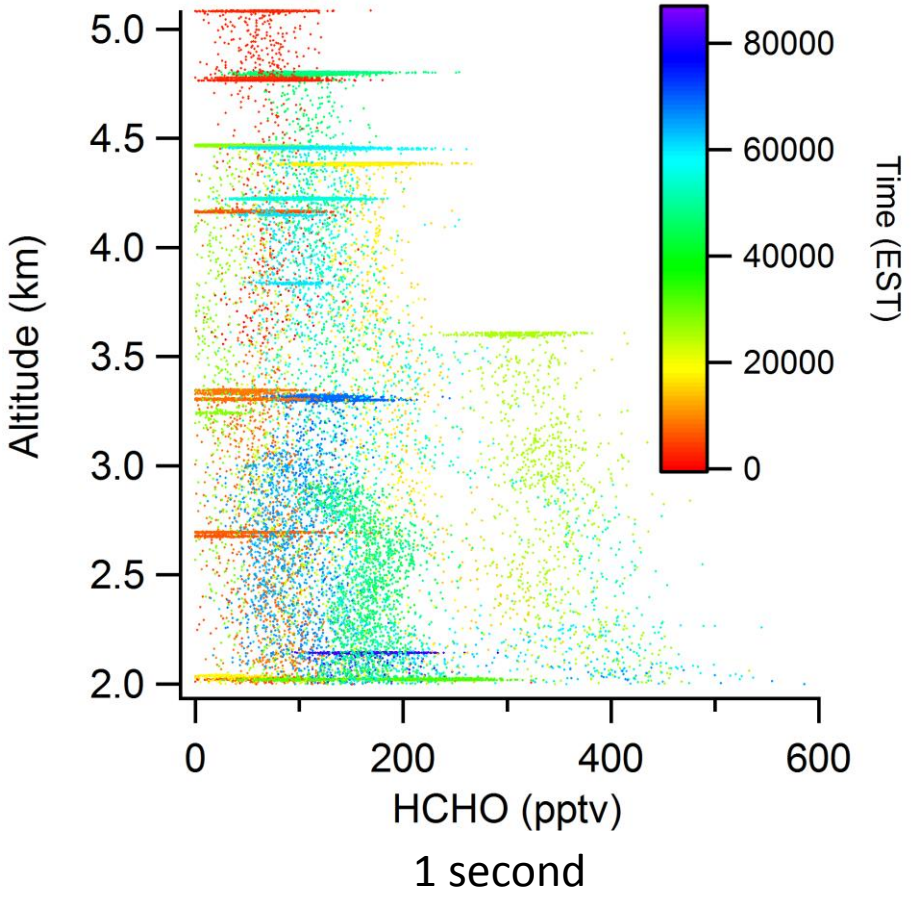
HCHO Diurnal Variability < 2 km



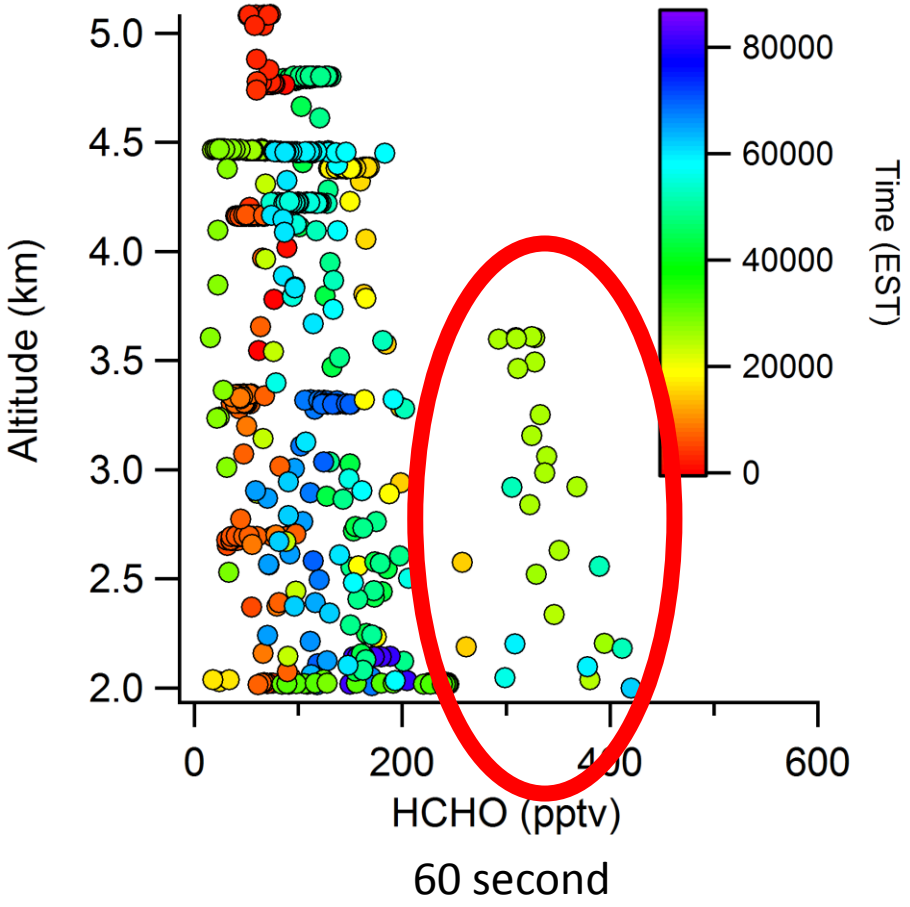
HCHO Vertical Variability



HCHO Vertical Variability

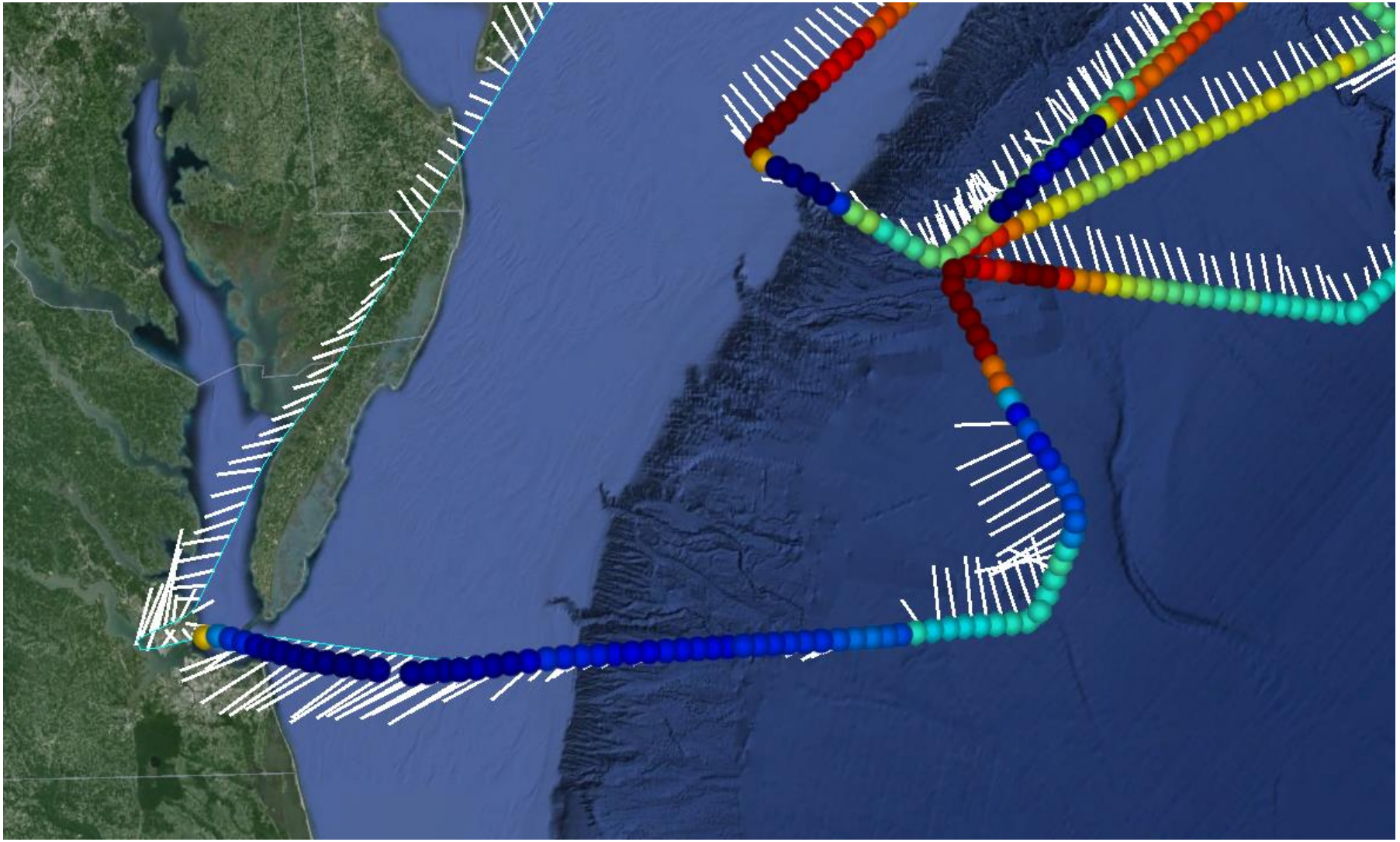


1 second

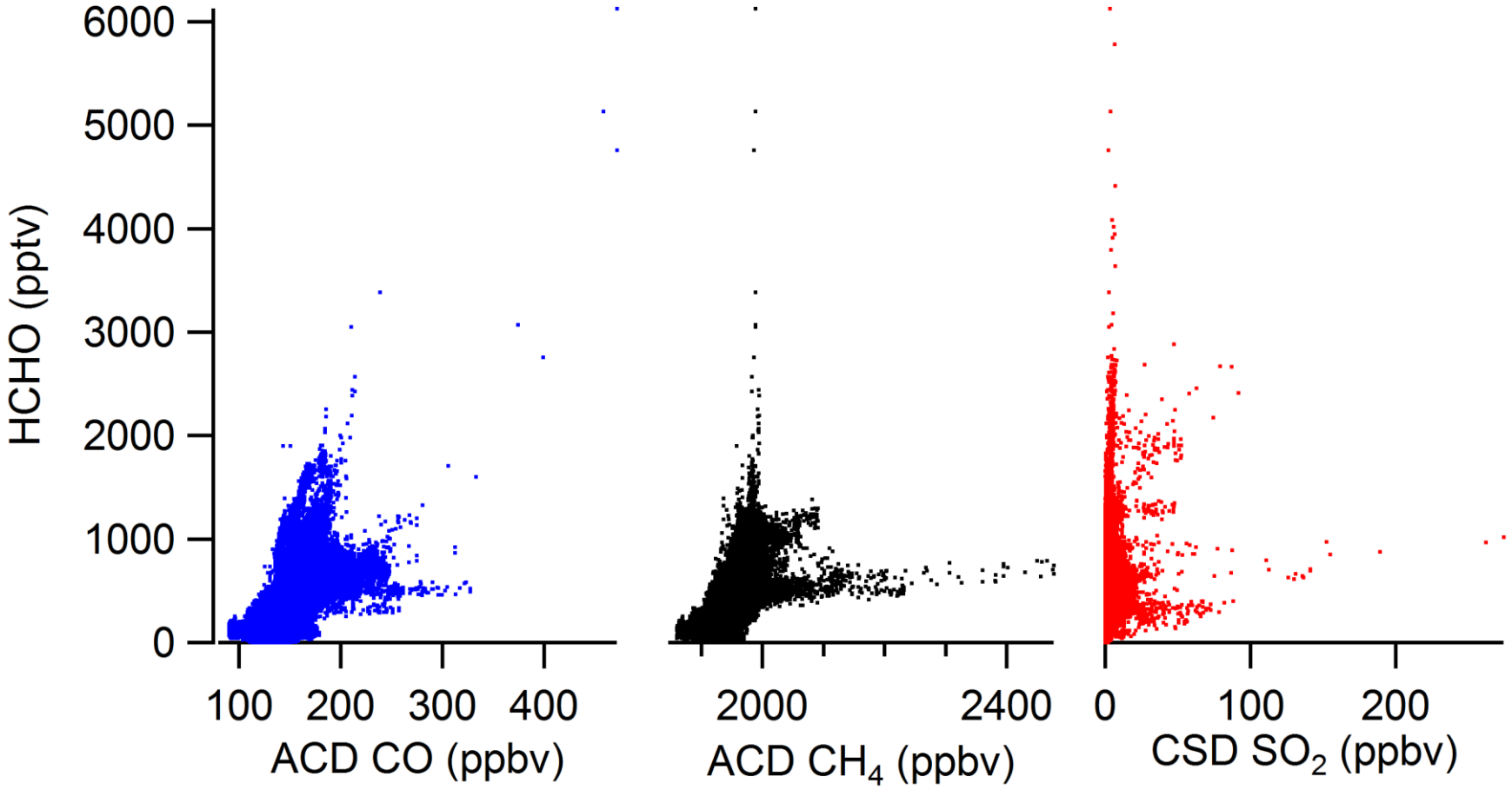


60 second

HCHO Vertical Variability



HCHO Relationships



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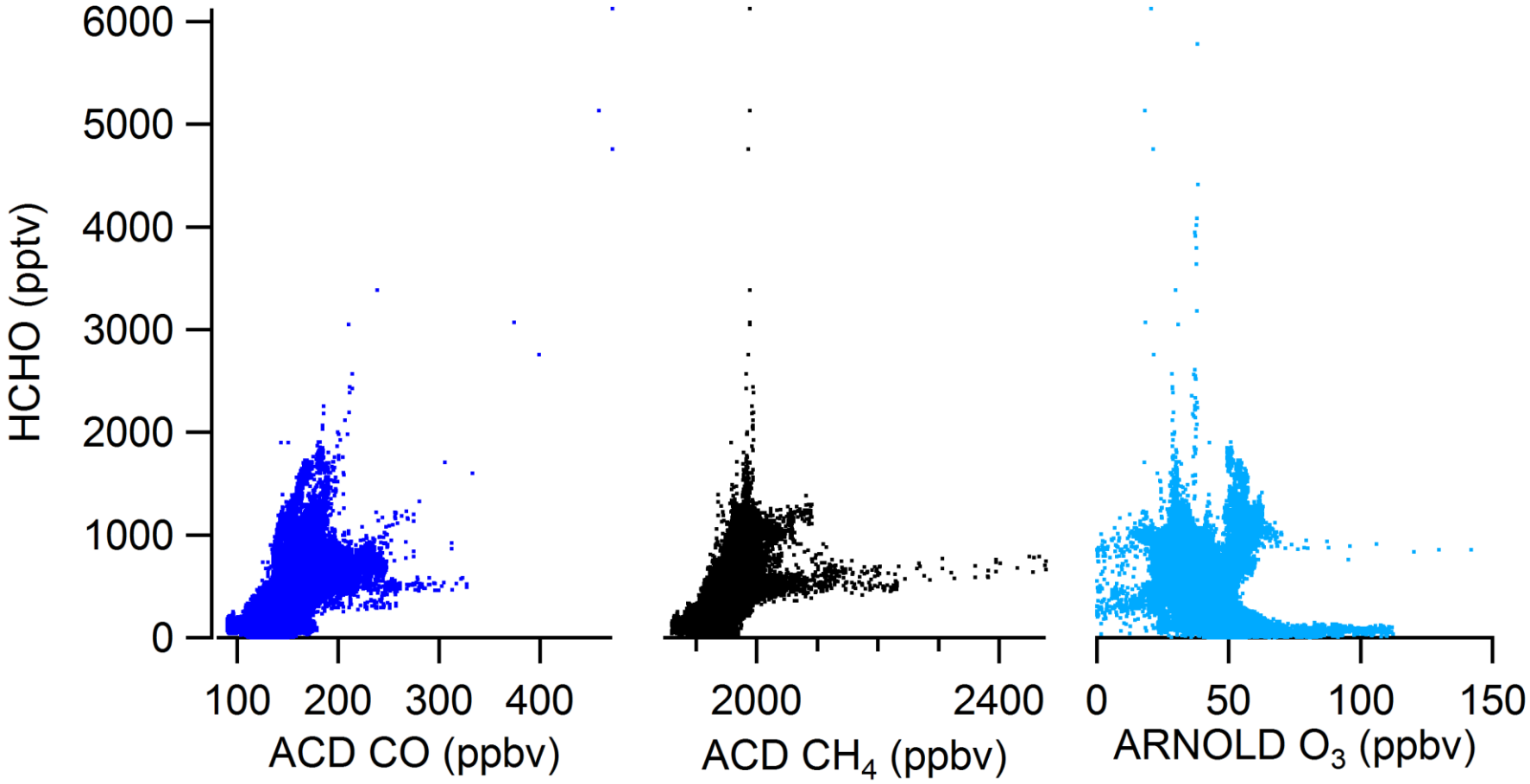

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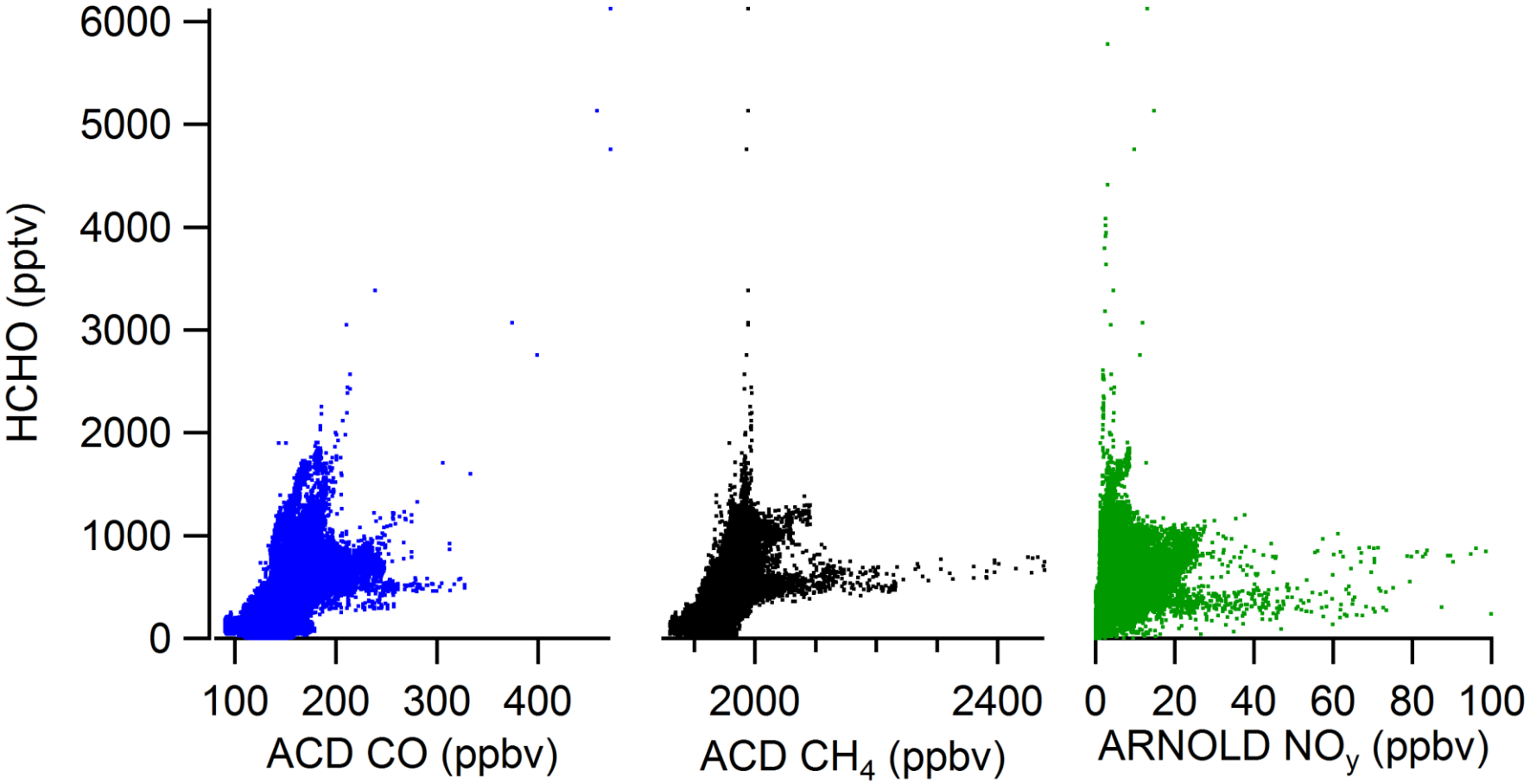
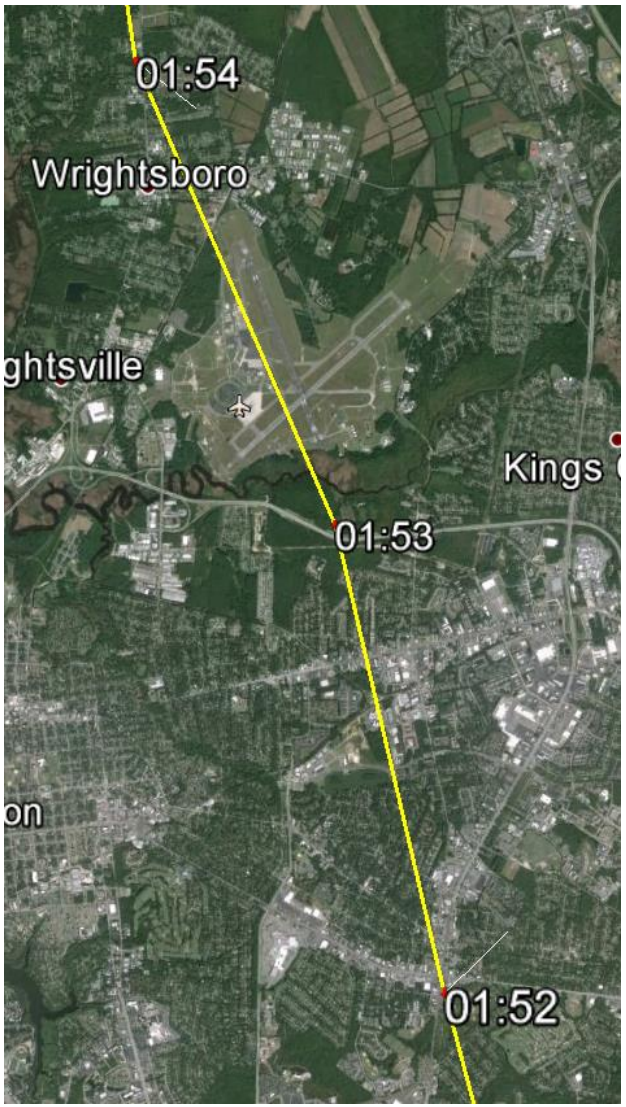
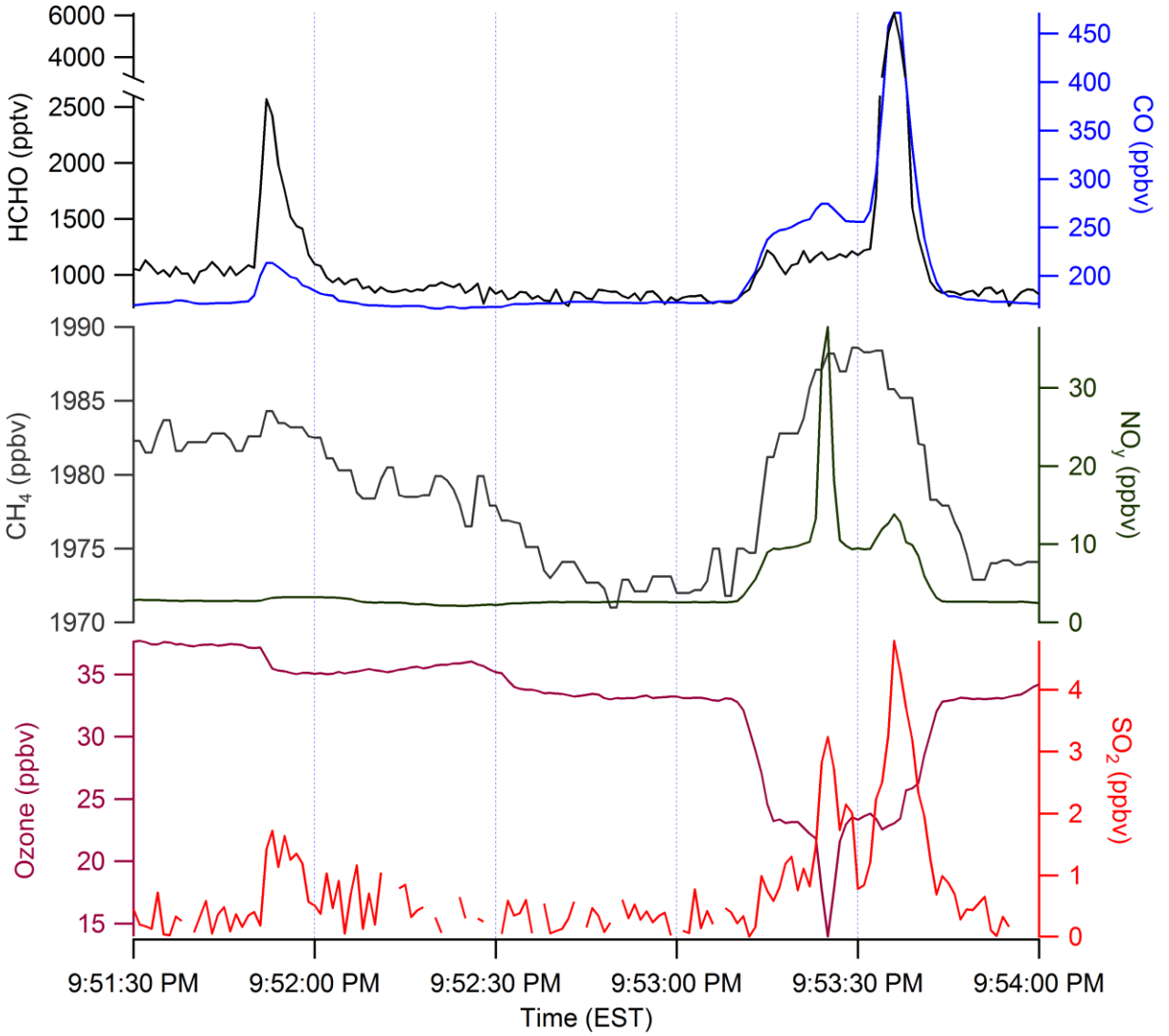
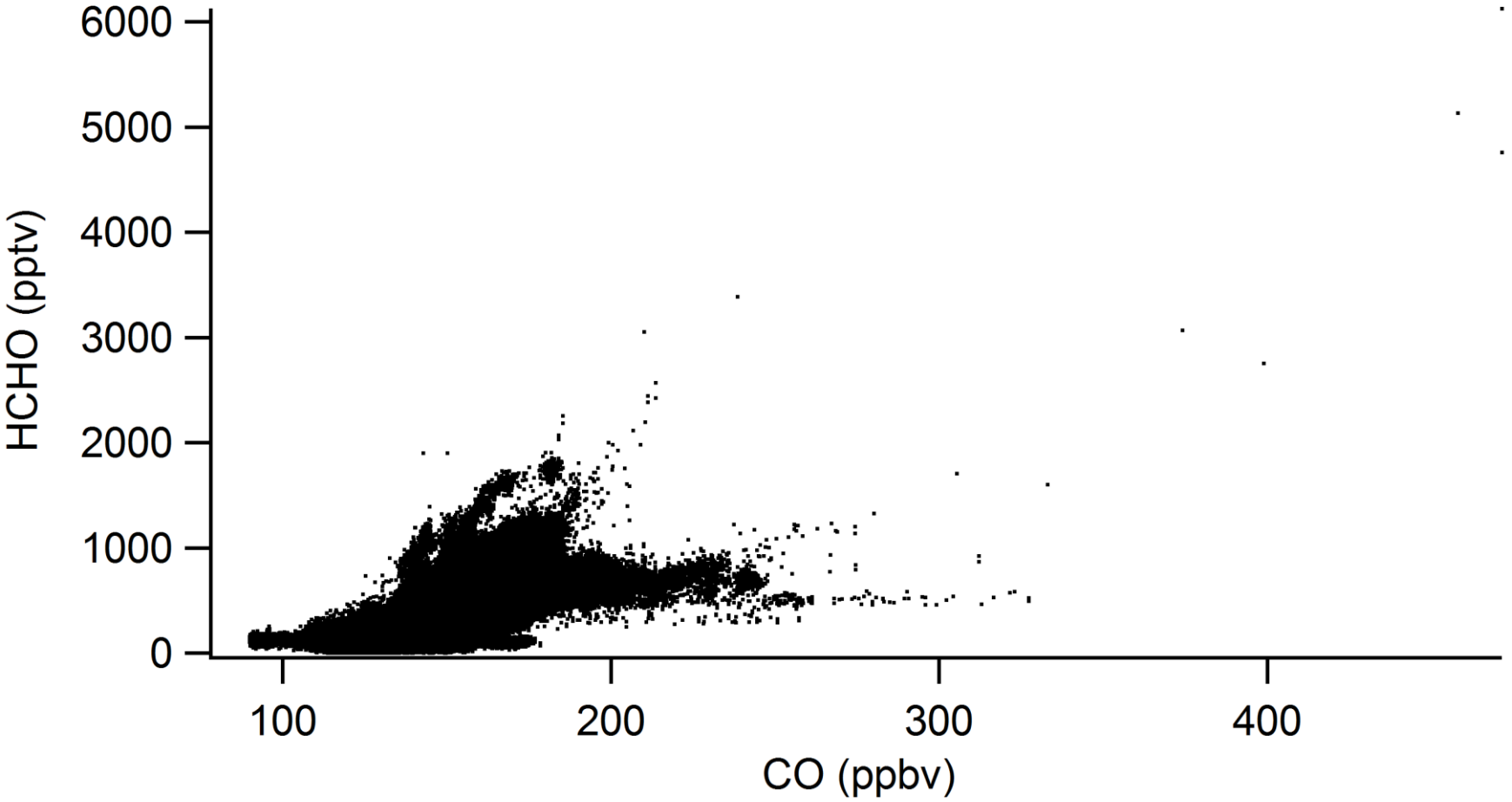


RF04 Over Wilmington,NC





WINTER HCHO vs CO



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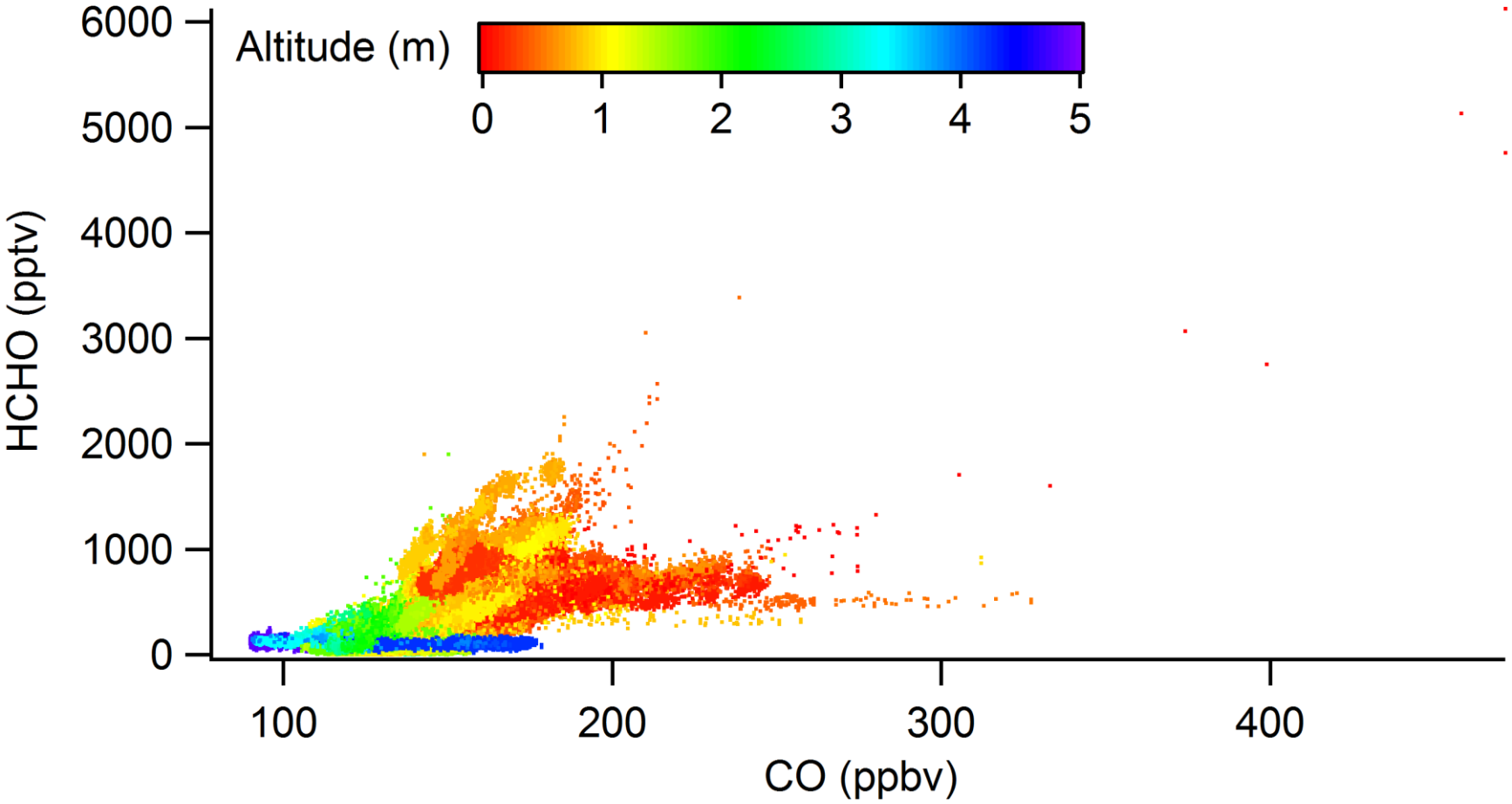
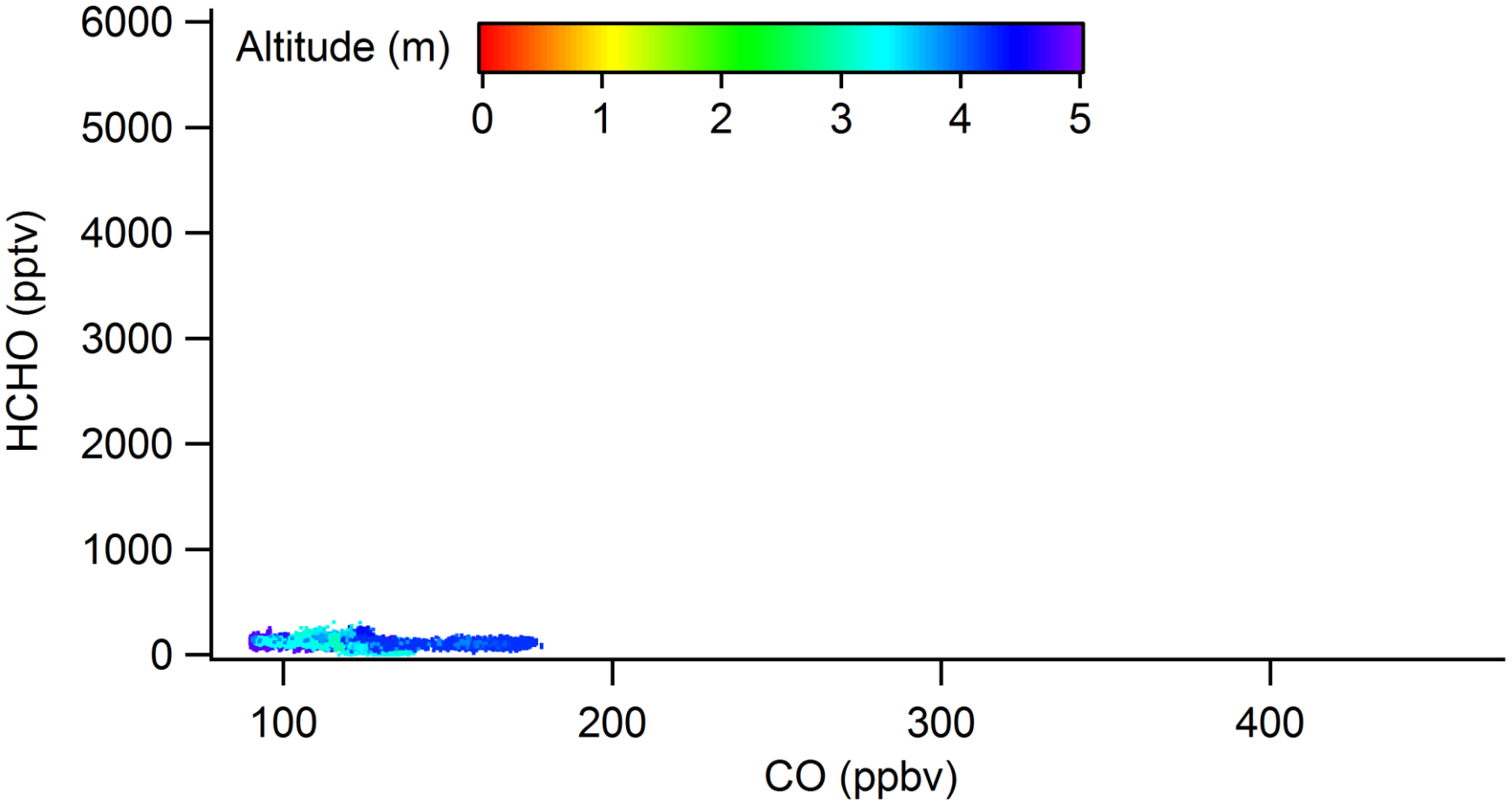
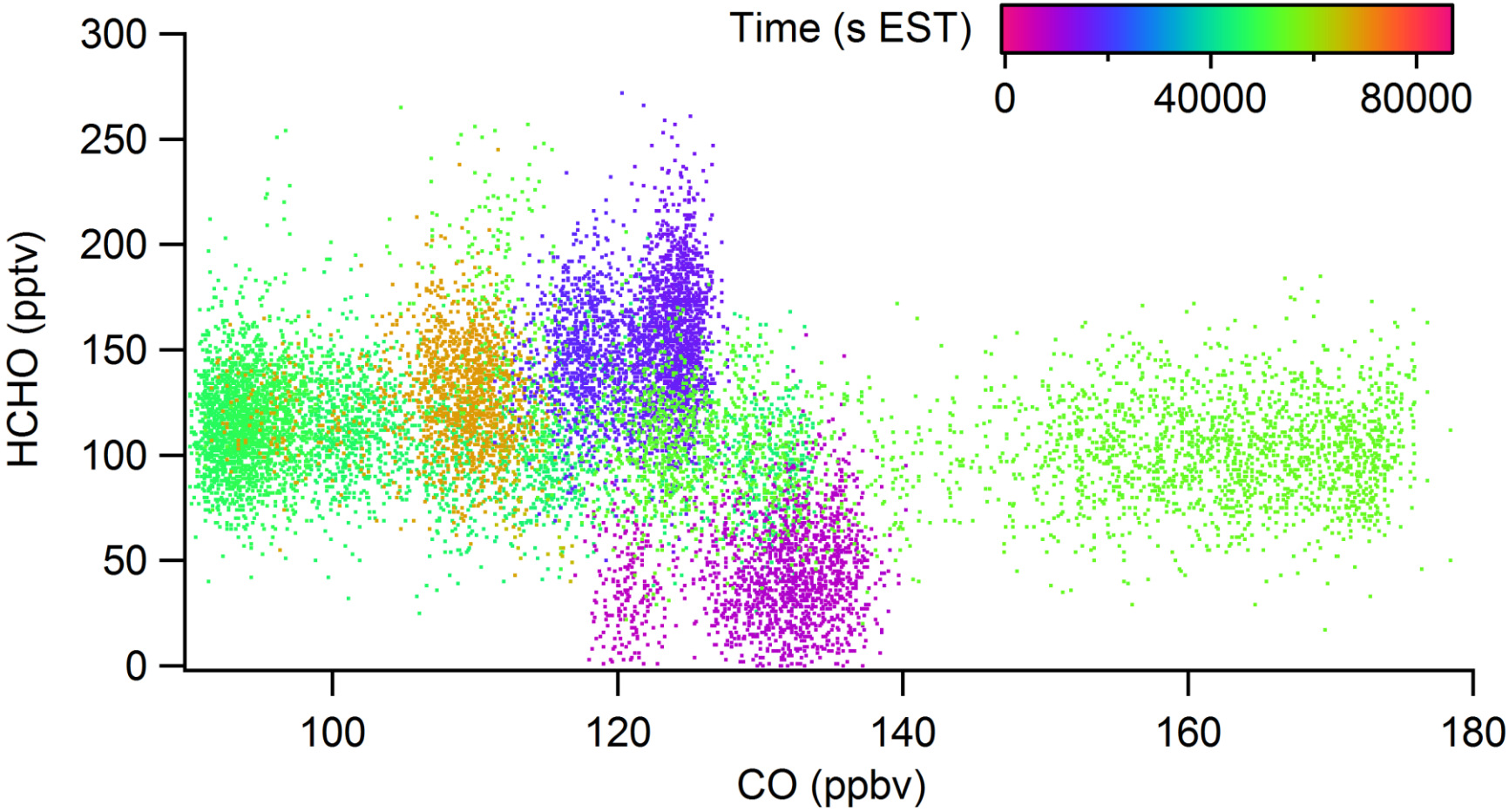


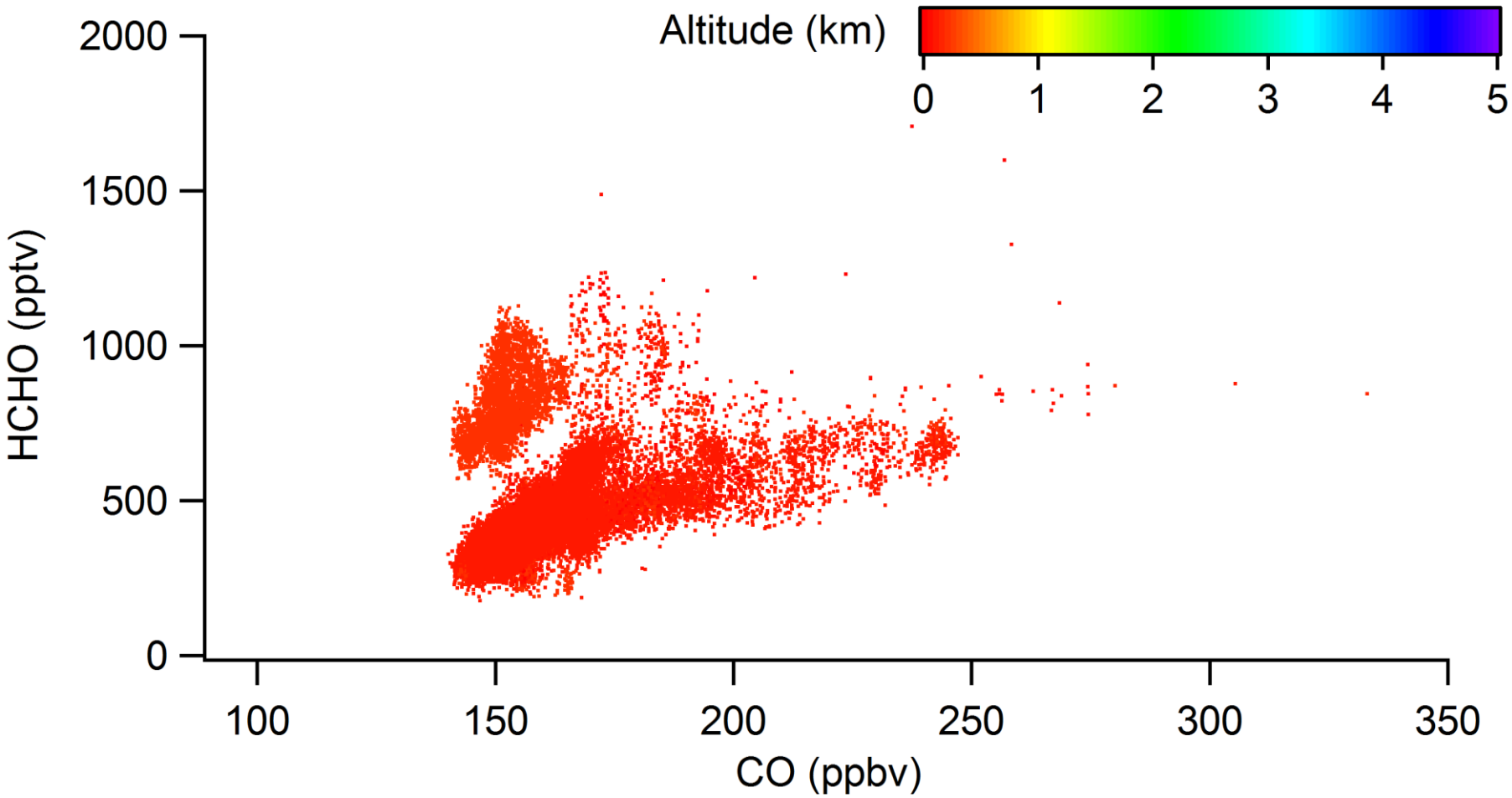
WINTER Alt > 3 km



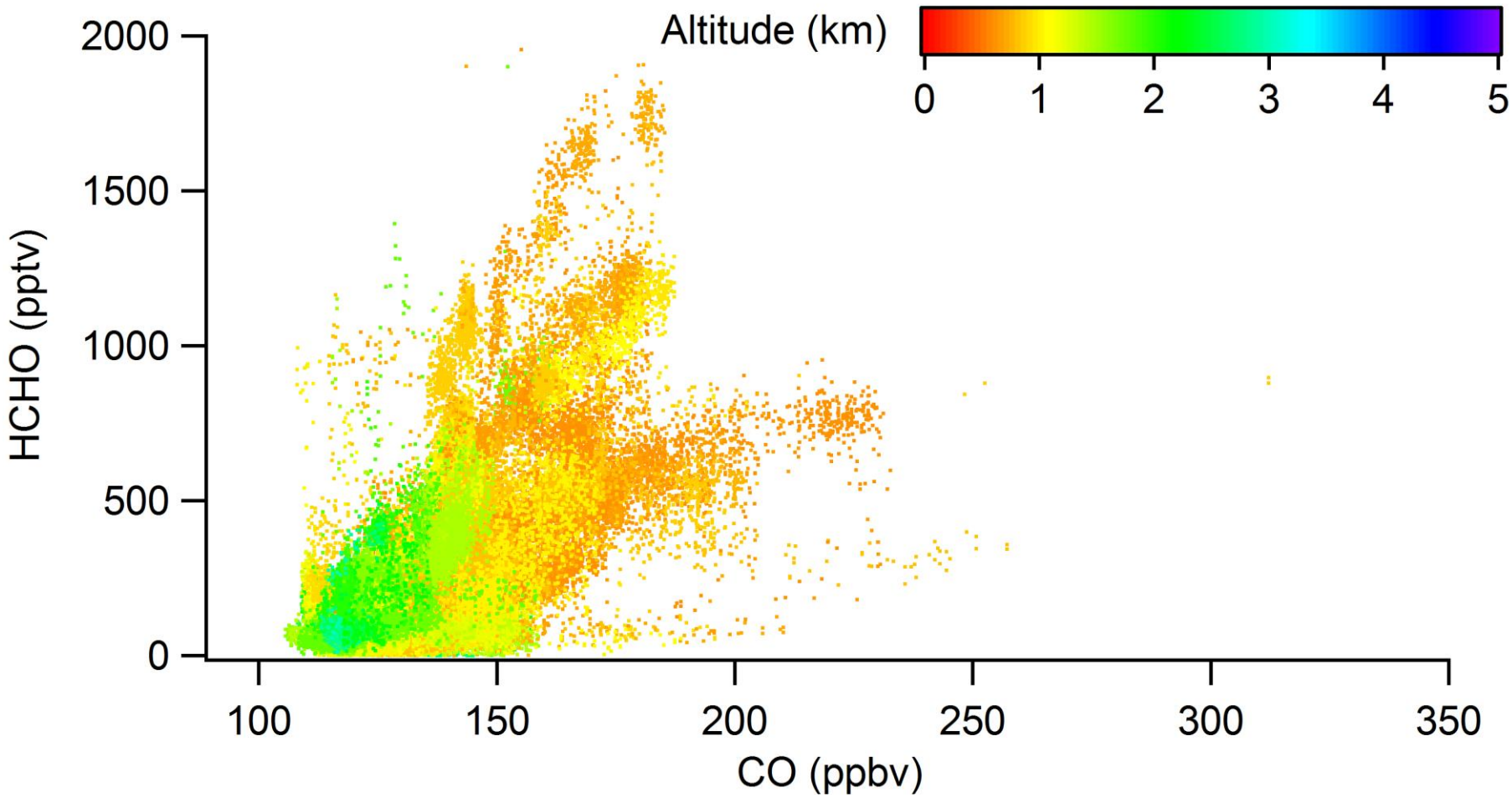
WINTER Alt > 3 km



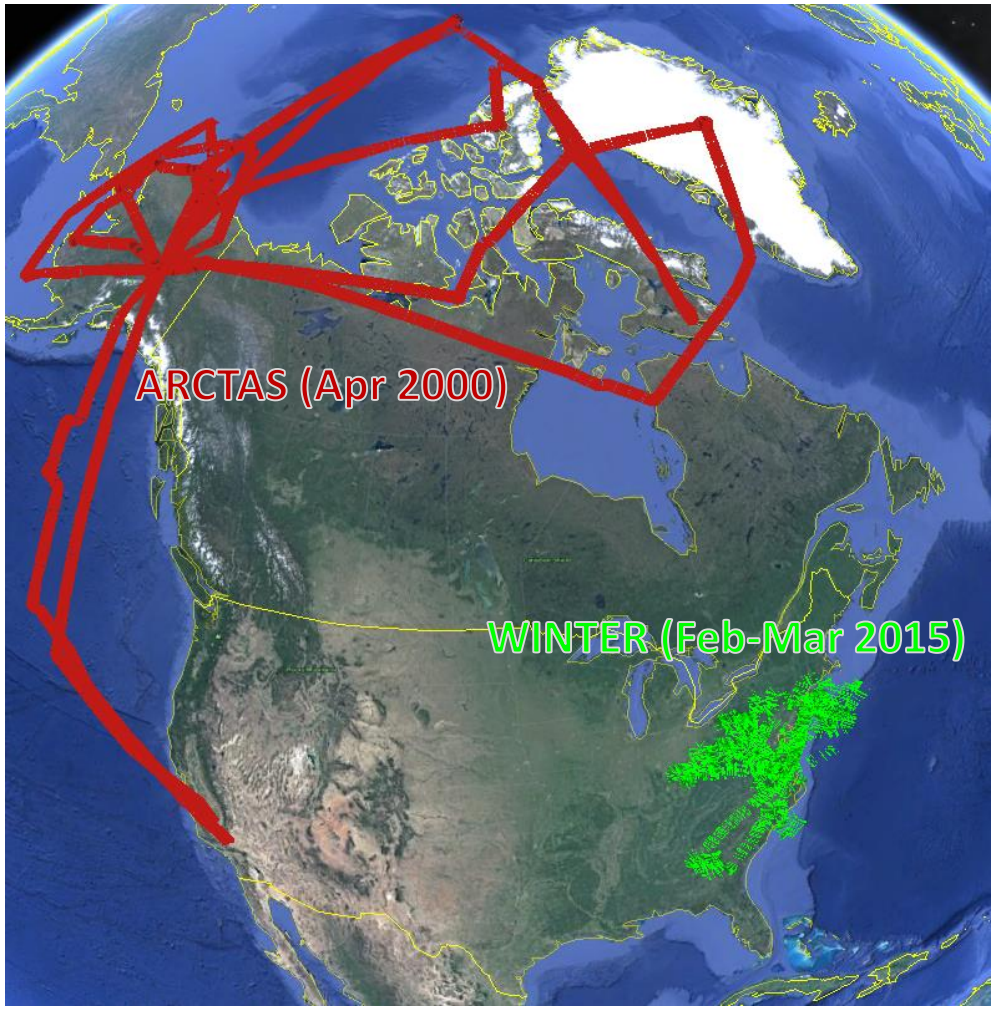
WINTER Alt < 0.5 km



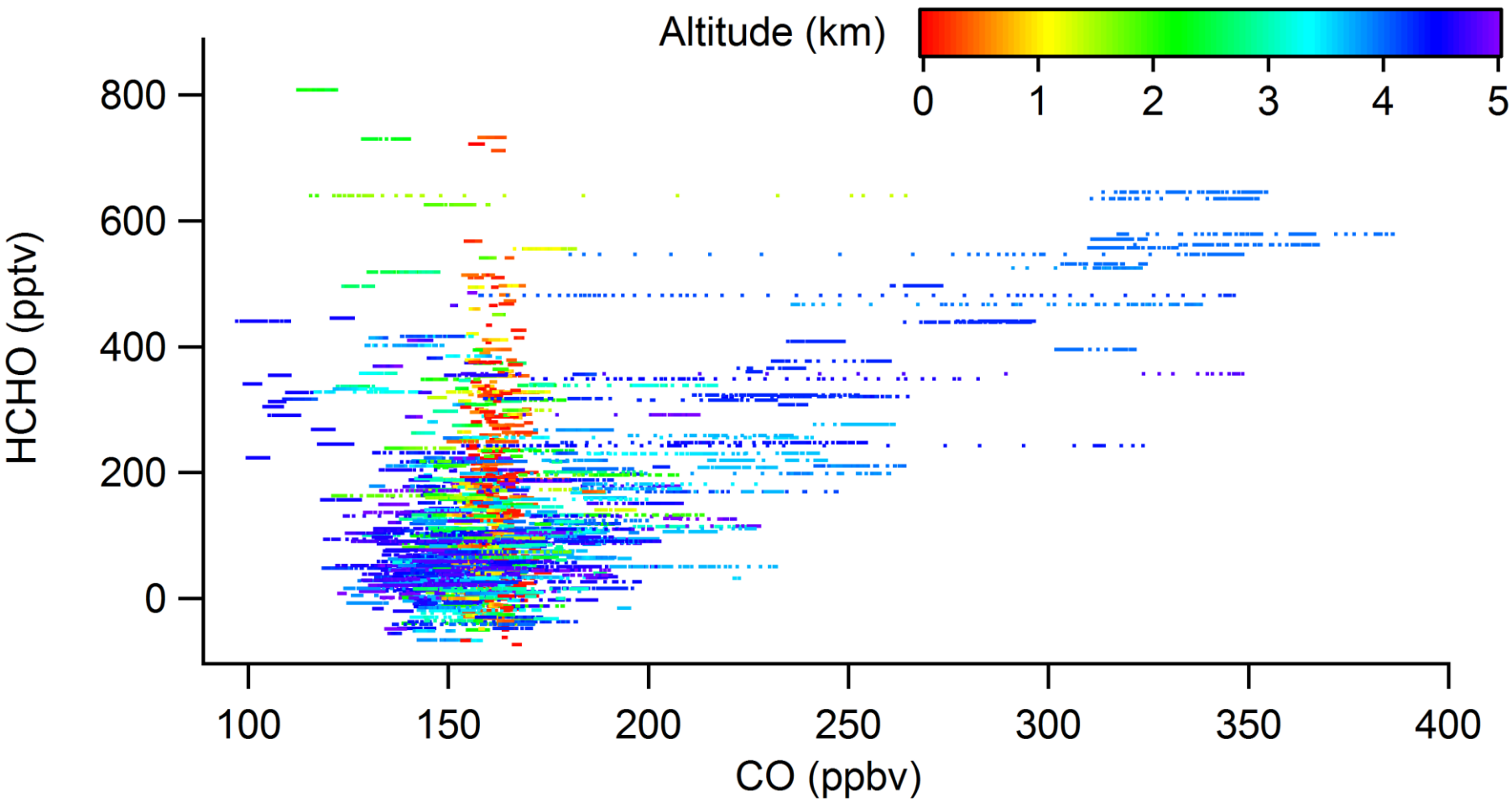
WINTER Alt 0.5-3 km



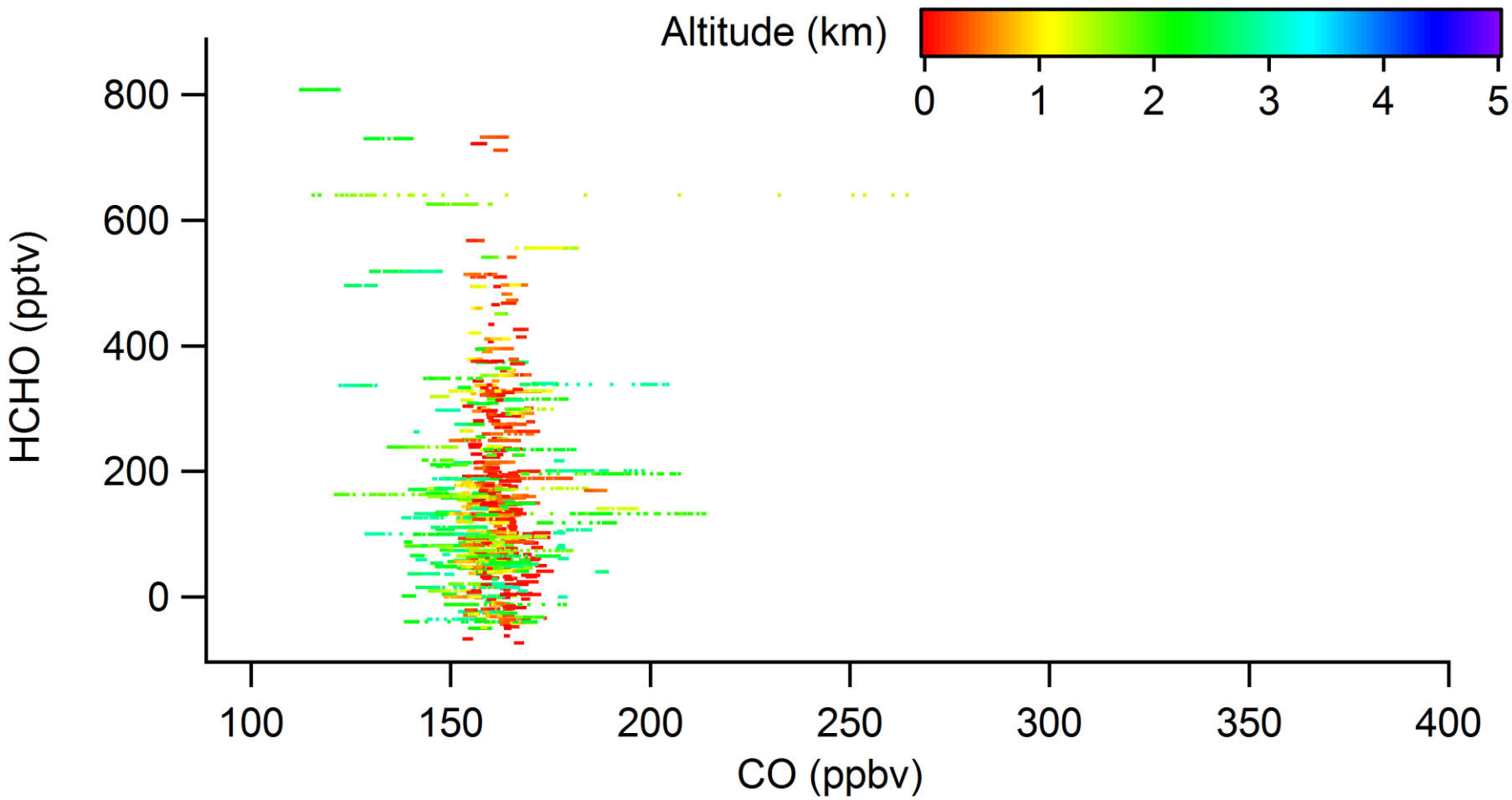
ARCTAS Campaign



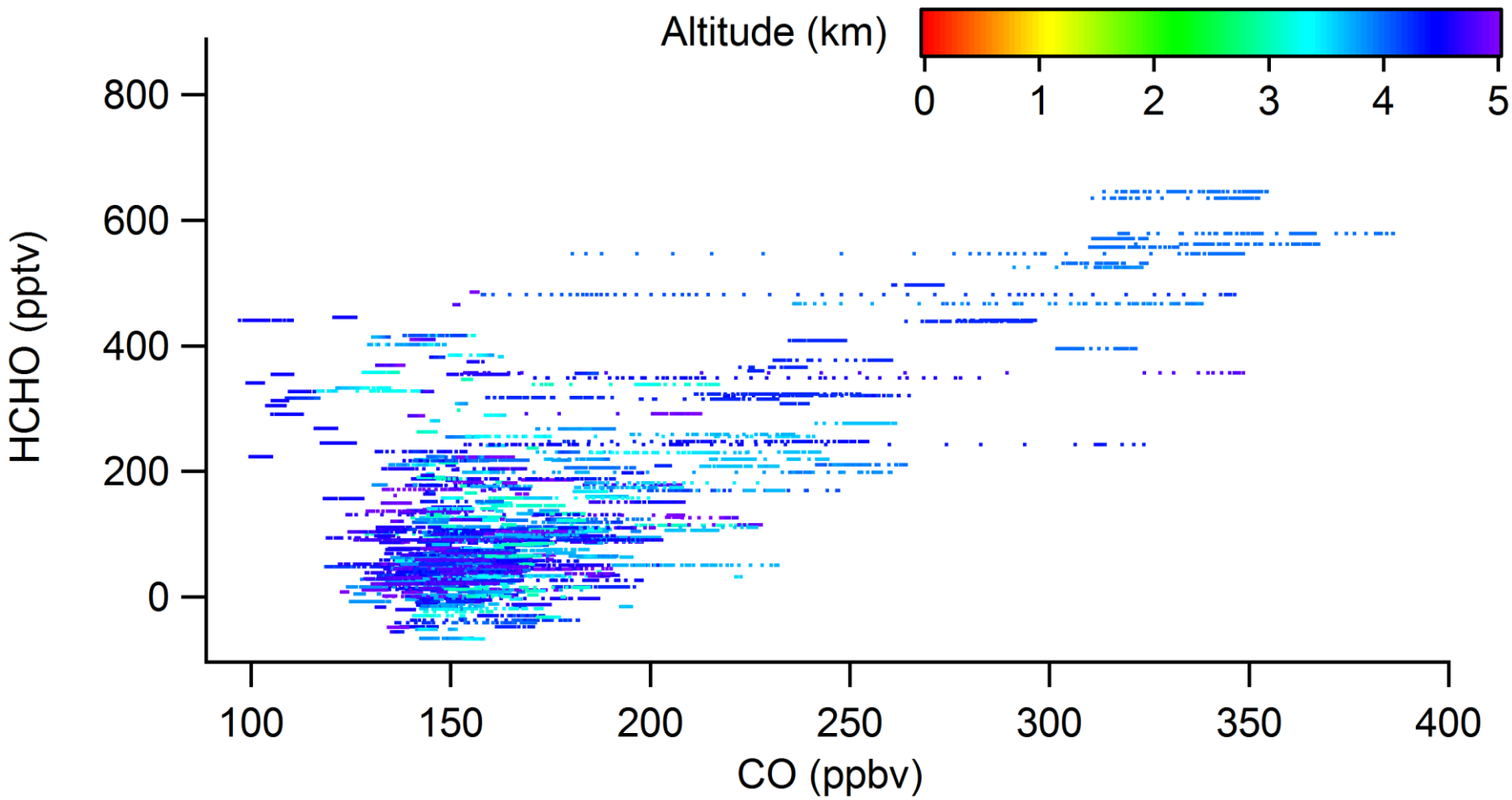
ARCTAS HCHO vs CO



Altitude < 3 km



Altitude > 3 km



Conclusions

- Little diurnal variability in HCHO, mostly regional
- Free troposphere HCHO concentrations typically very constant (and low)
  - Exception midmorning offshore Hampton Roads: higher marine BL or other process?
- CO shows variable correlation with HCHO
  - Upper/lower boundary layer contrast suggests secondary HCHO formation
  - Different correlative behavior than observed during ARCTAS
- Next steps are examining more case studies for insight into emission contributions