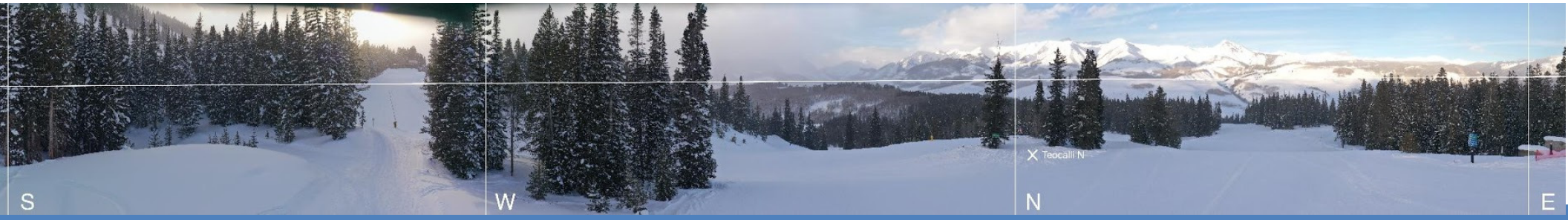
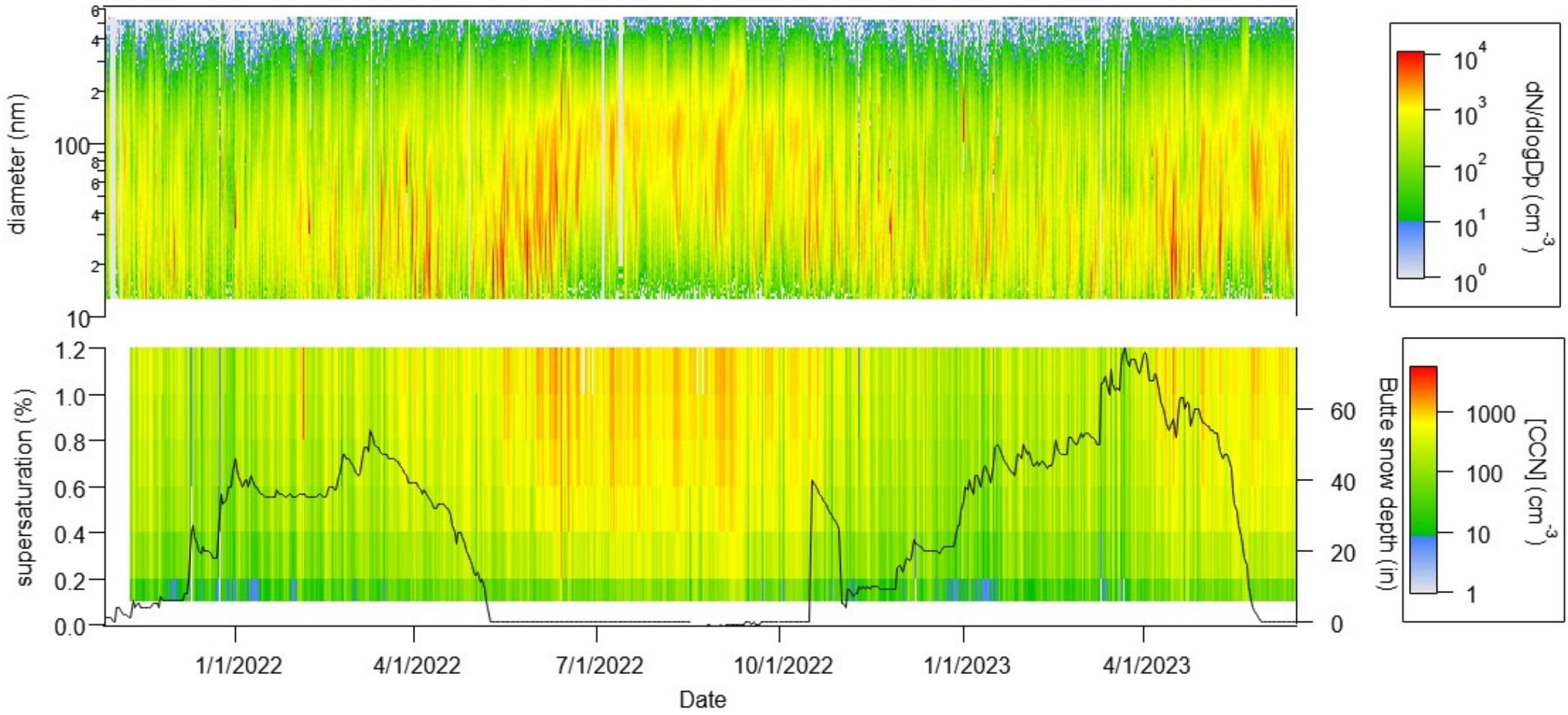


SAIL Seasonal Aerosol Properties

Jim Smith, Anna Kapp
UC Irvine

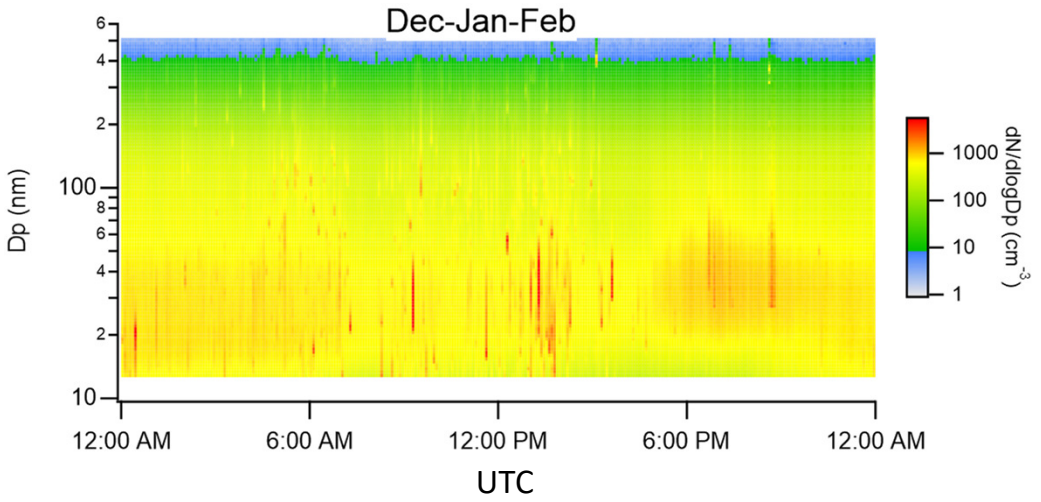
SAIL Breakout
ARM/ASR STM
August 2023

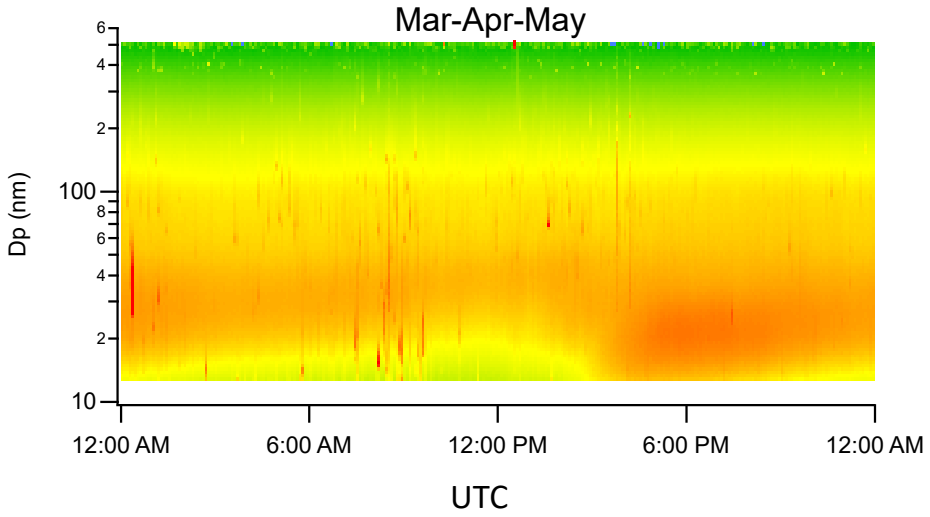
Particle size distribution and [CCN] – Entire campaign

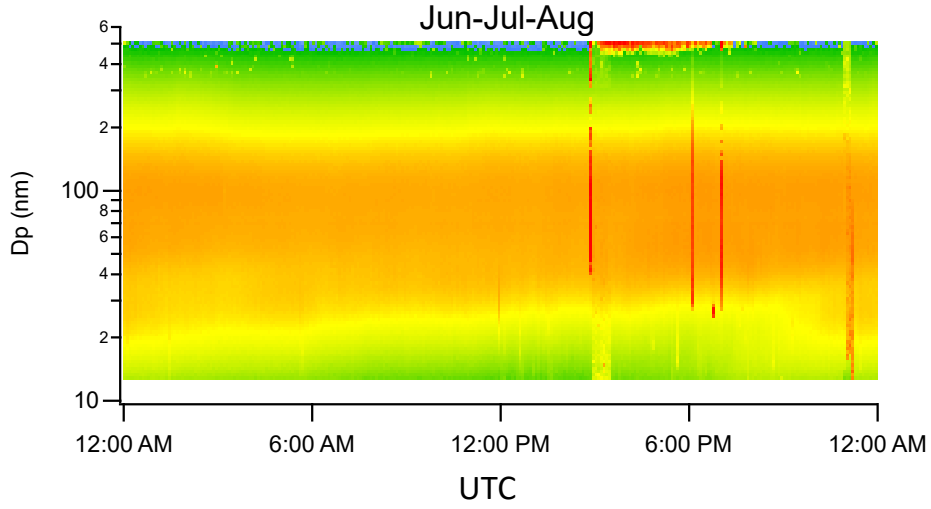


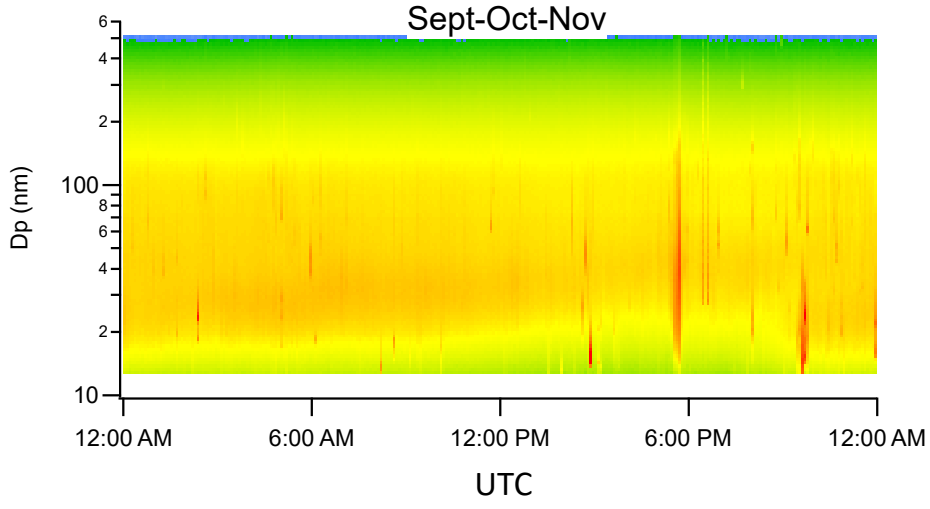
- New particle formation events in Spring and Fall. Spring events reappeared in 2023.
- CCN concentrations peak in summer months and correspond to periods of >100 nm particles.

Seasonally-averaged particle size distributions



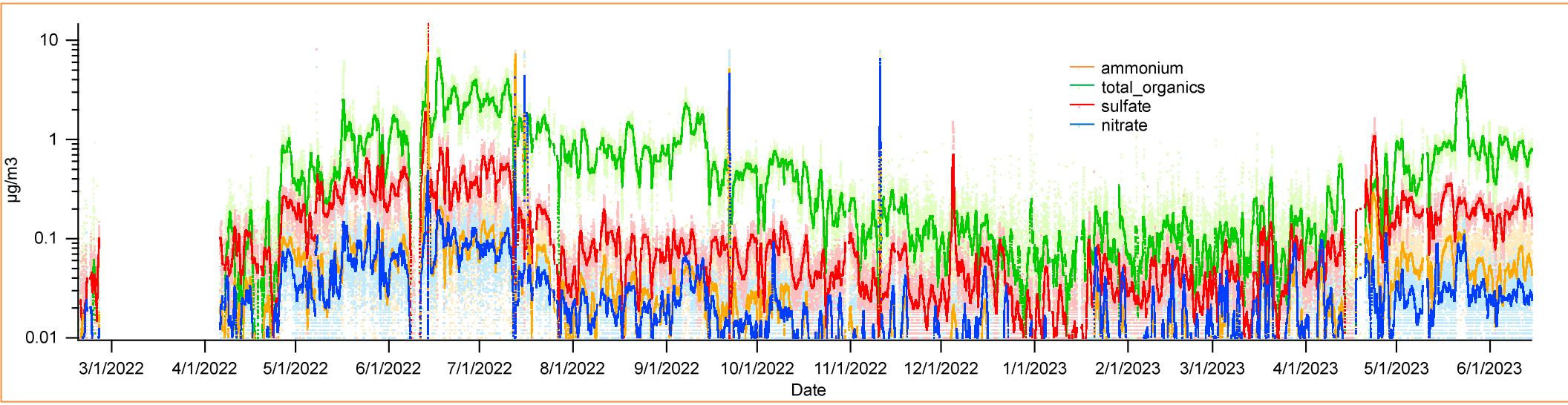


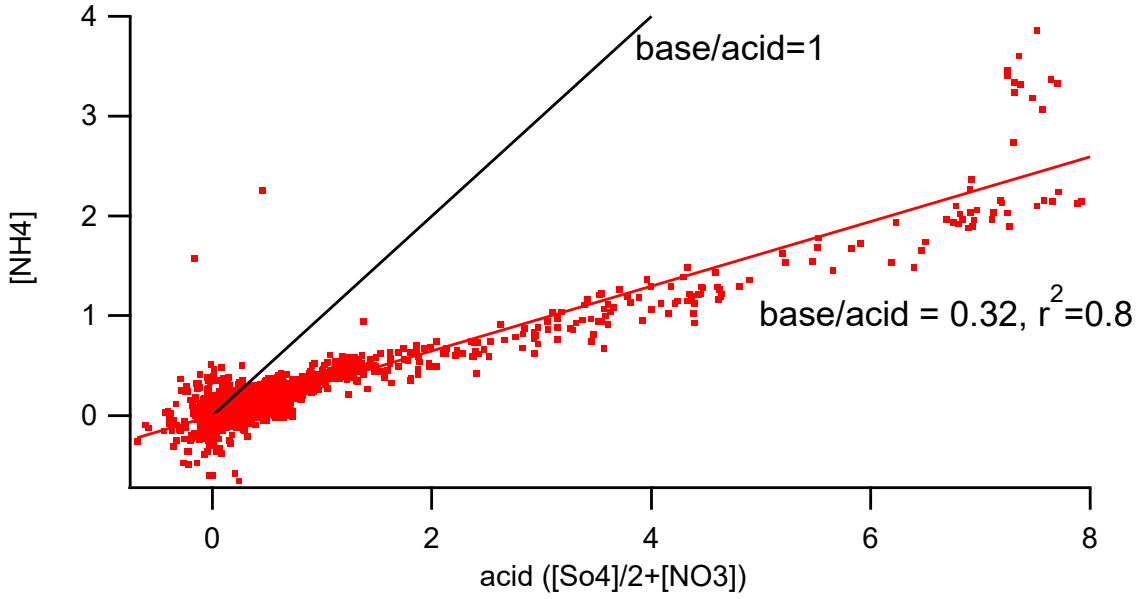




- March-April-May feature prominent nucleation mode developing at ~10AM local time
- Evidence of particle production/advection in June-July-August and September-October-November

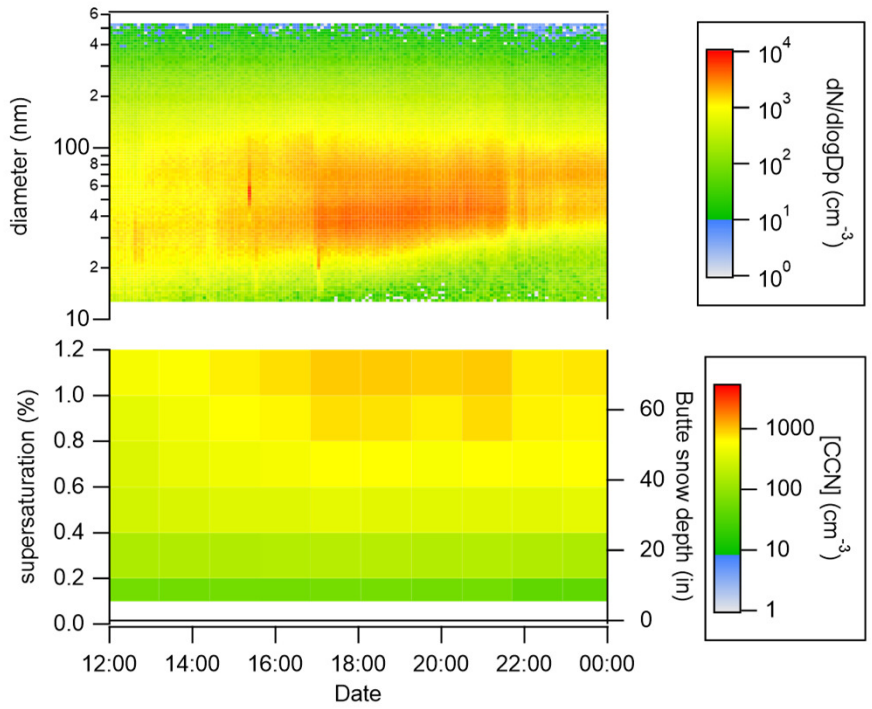
Particle composition – Entire campaign





- Summer peaks in all measured species
- Organics persist into fall
- Organics identified as "highly oxidized"
- Particulate acids and bases highly correlated. Particles appear to be fairly acidic with $\frac{[base]}{[acid]} \sim 0.32$

Ongoing analysis – TBS deployments during NPF events

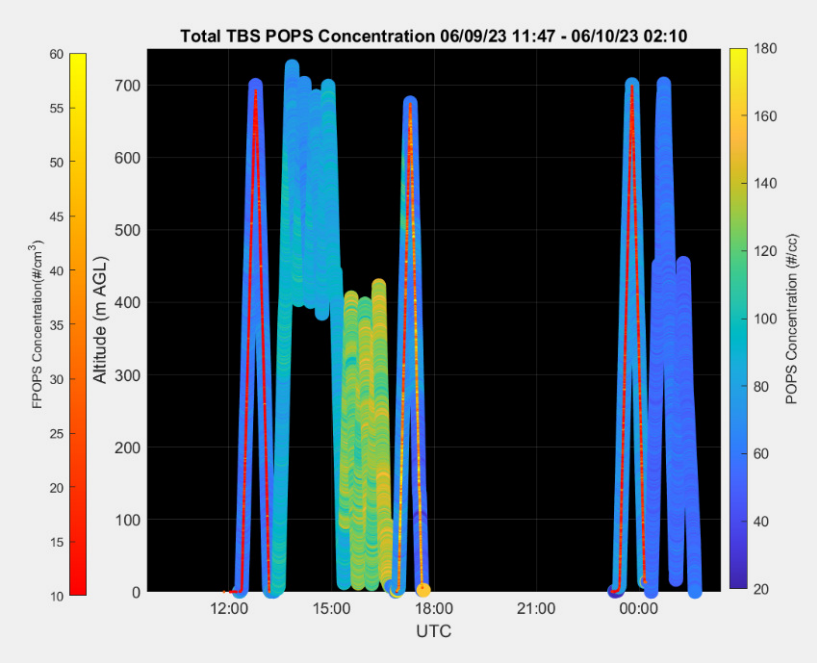


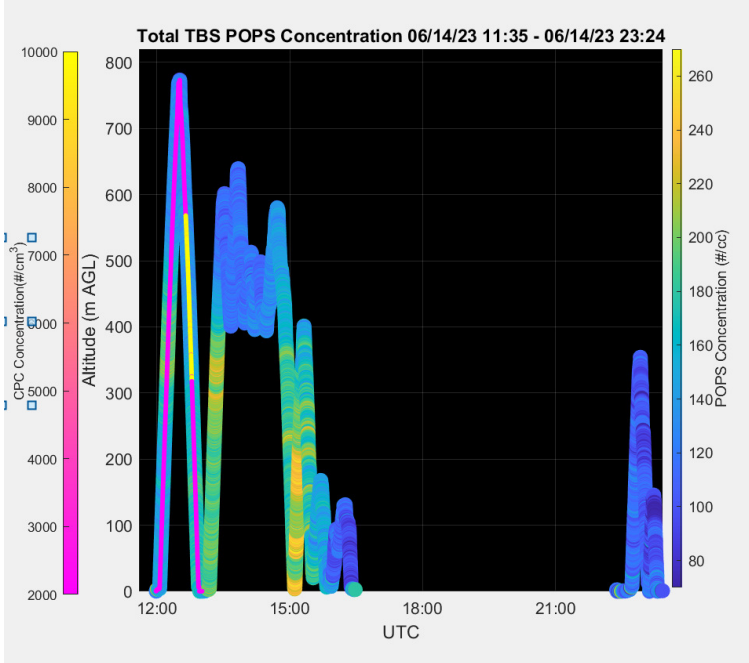
June 9th deployment

Particle collection for offline chemical analysis was carried out from 13:26 – 16:40

June 14th deployment

- CPC saturated at 300 – 550 m
  (no particle collection during this time)
- No surface NPF on this day



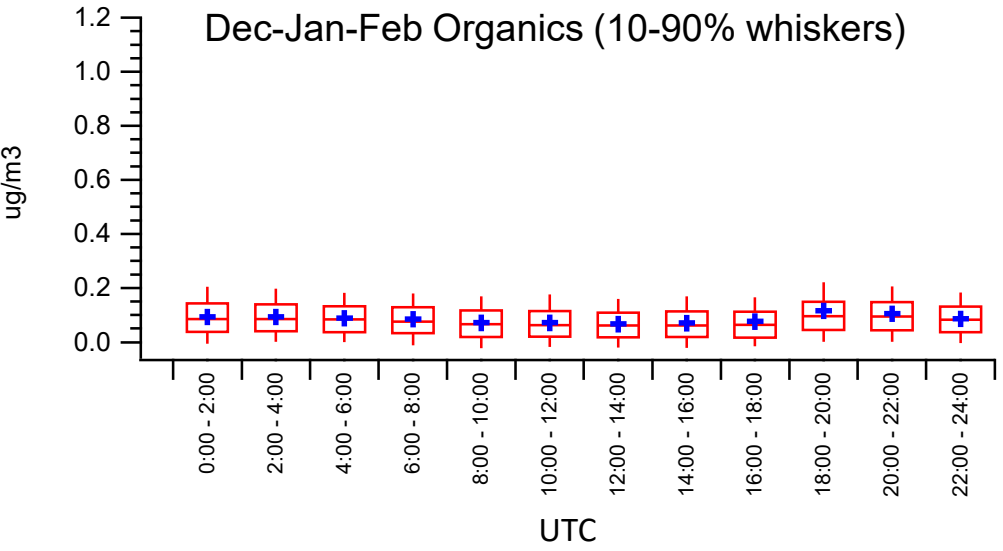


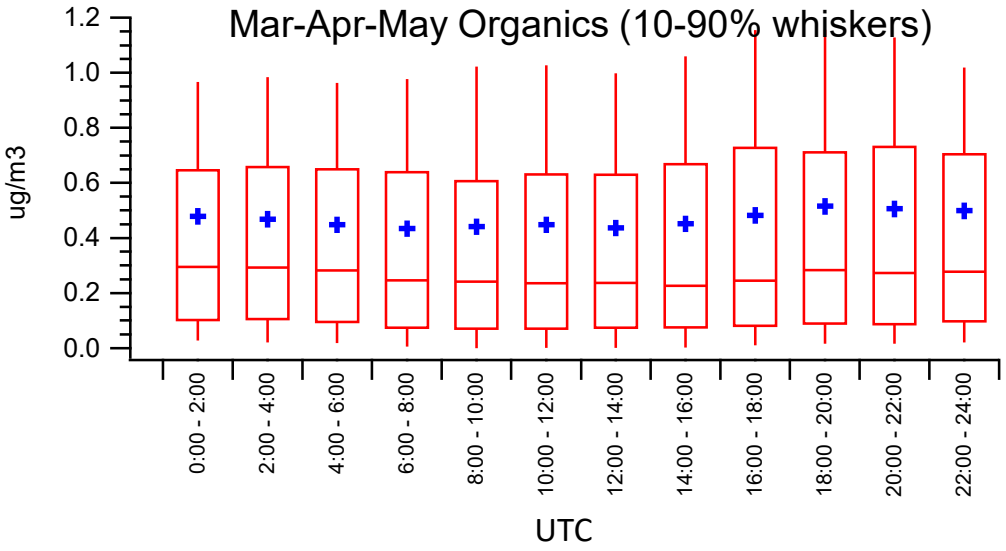
Summary

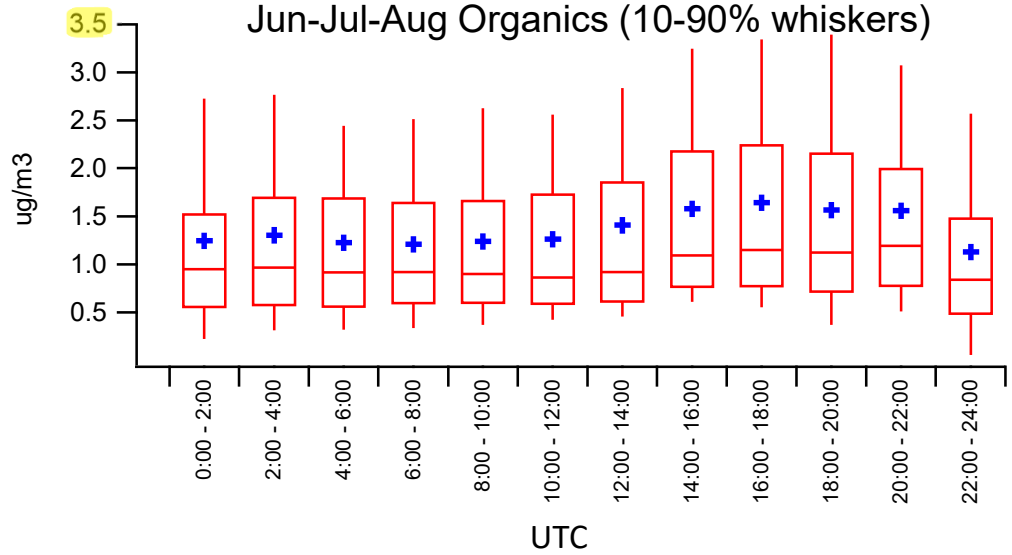
- Dramatic increase in atmospheric new particle formation events in winter-spring transition period (February – June) and, to some extent, summer – fall transition.
- Seasonal cycles in sulfate, organics, nitrate and ammonium
  - Highest in June-August for all species
  - Almost all organics identified as “highly oxidized”
  - Ammonium highly correlated with acid:base ratio of 0.32 (acidic particles)
- June TBS deployments will hopefully give us some insights into chemical drivers of boundary layer formation events.

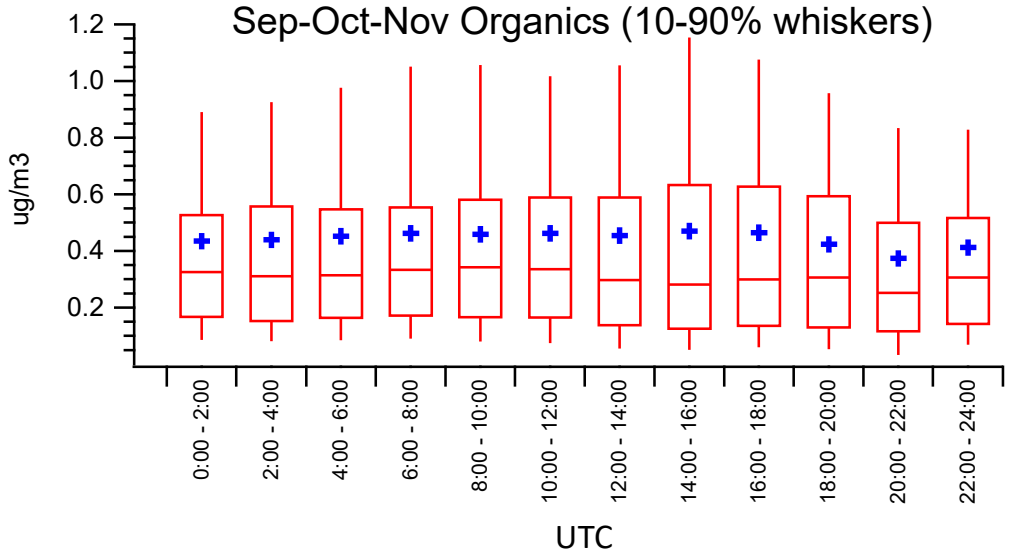

Photo: Dari Dexheimer June 14 2023

Particulate organics – Seasonal diurnal patterns



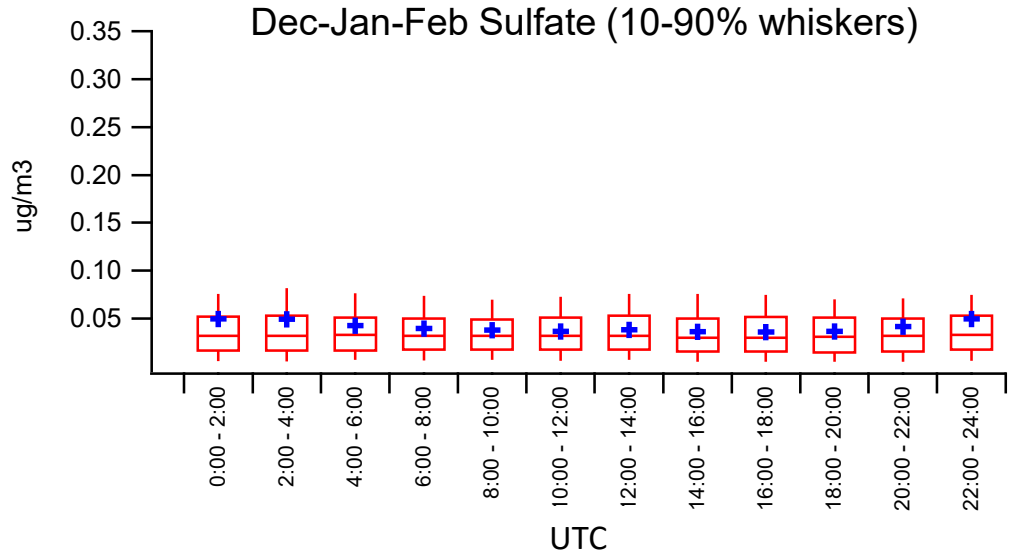


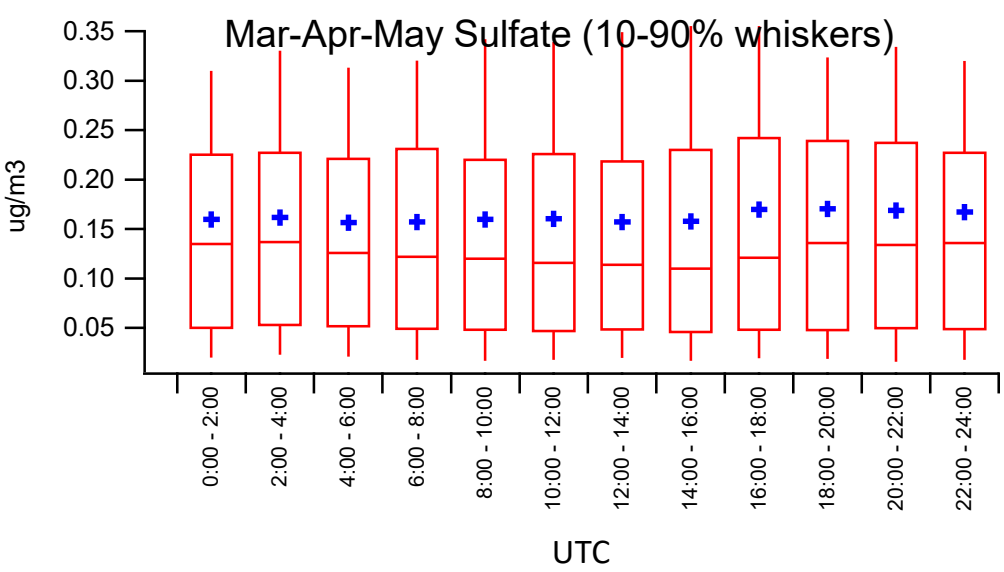


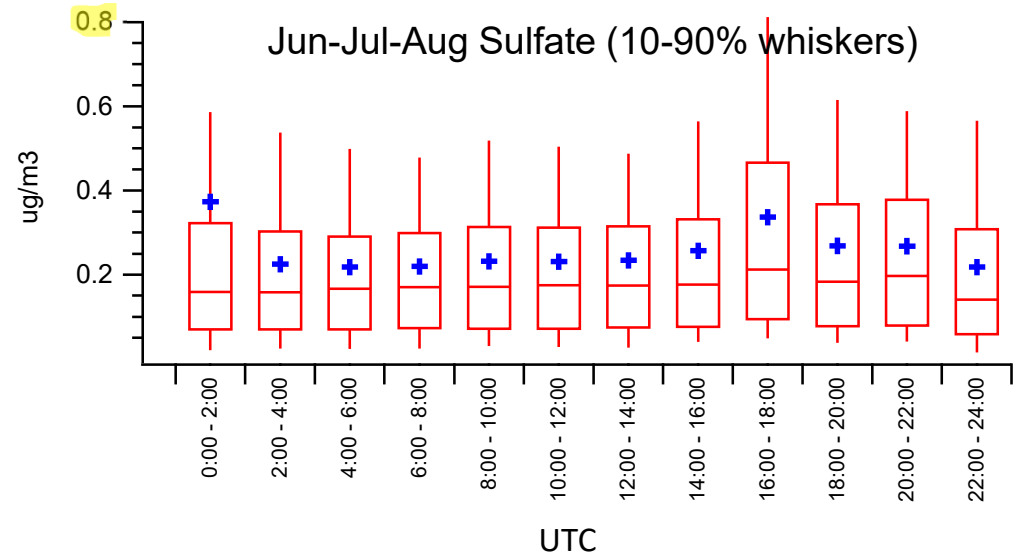


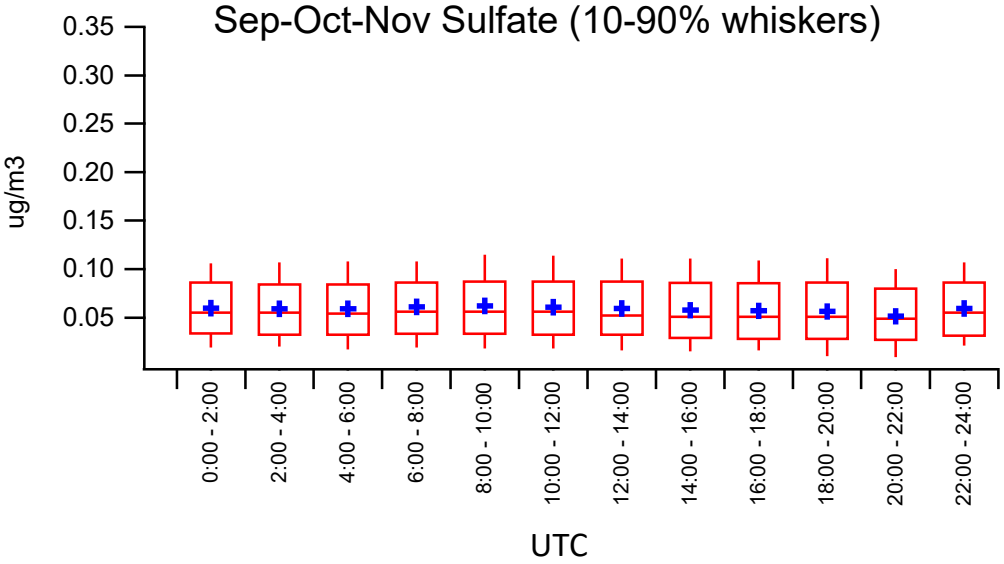
Particulate organics highest in June-July-August with noontime peak

Particulate sulfate – Seasonal diurnal patterns









Particulate sulfate highest in March-April-May (flat diurnal pattern) and June-July-August (noontime peak)