Brookhaven National Laboratory

ASR Atmospheric System Research

ARM

Measurements and variability of composition, optical properties and hygroscopicity of aerosol in Houston, TX

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with contributions from: Chongai Kuang, Ashish Singh, Janek Uin, Rebecca Trojanowski, Arthur J. Sedlacek III, Olga Mayol-Bracero and Michael Jensen

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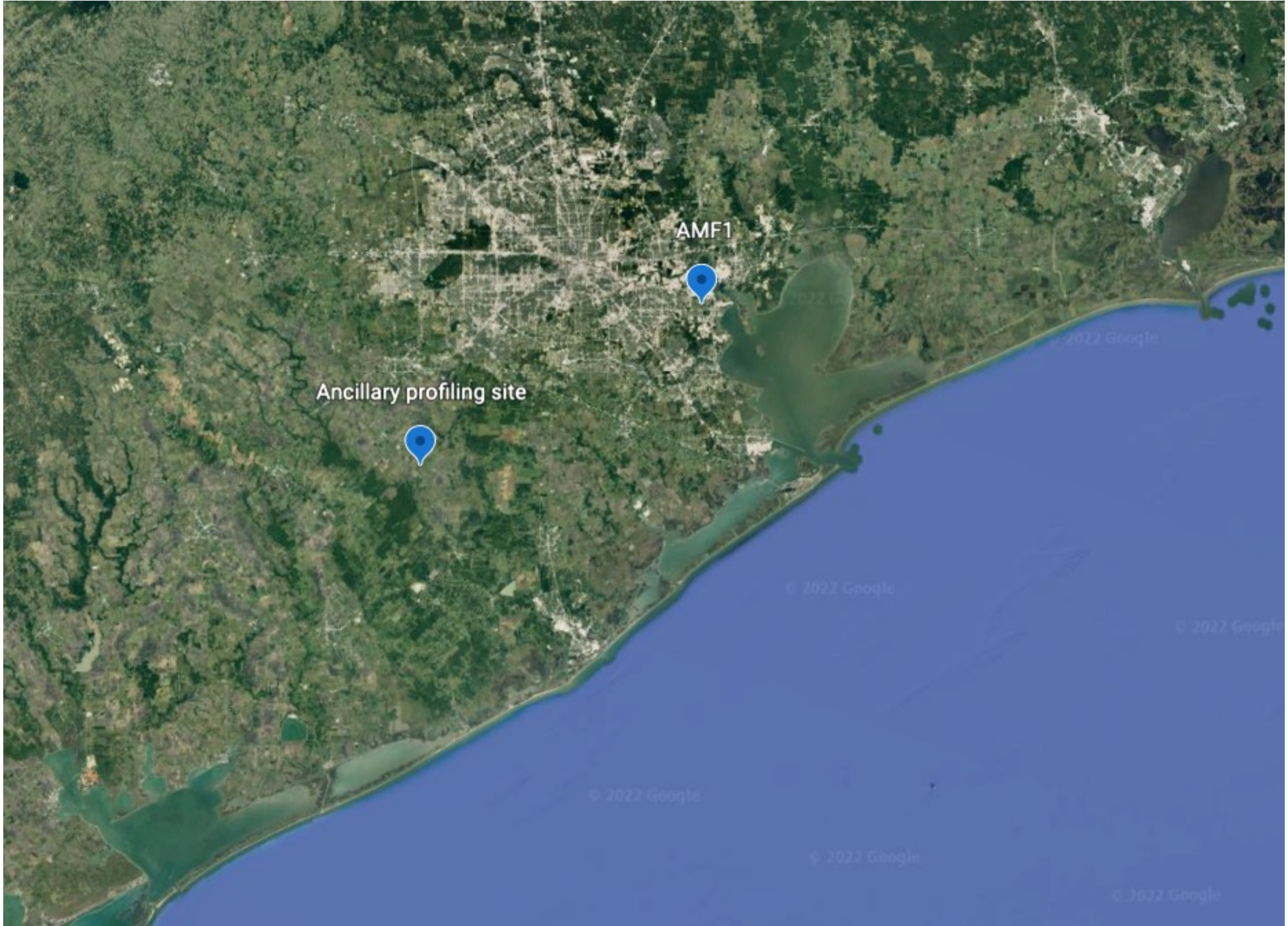
August 7, 2023


AMF1
Ancillary profiling site
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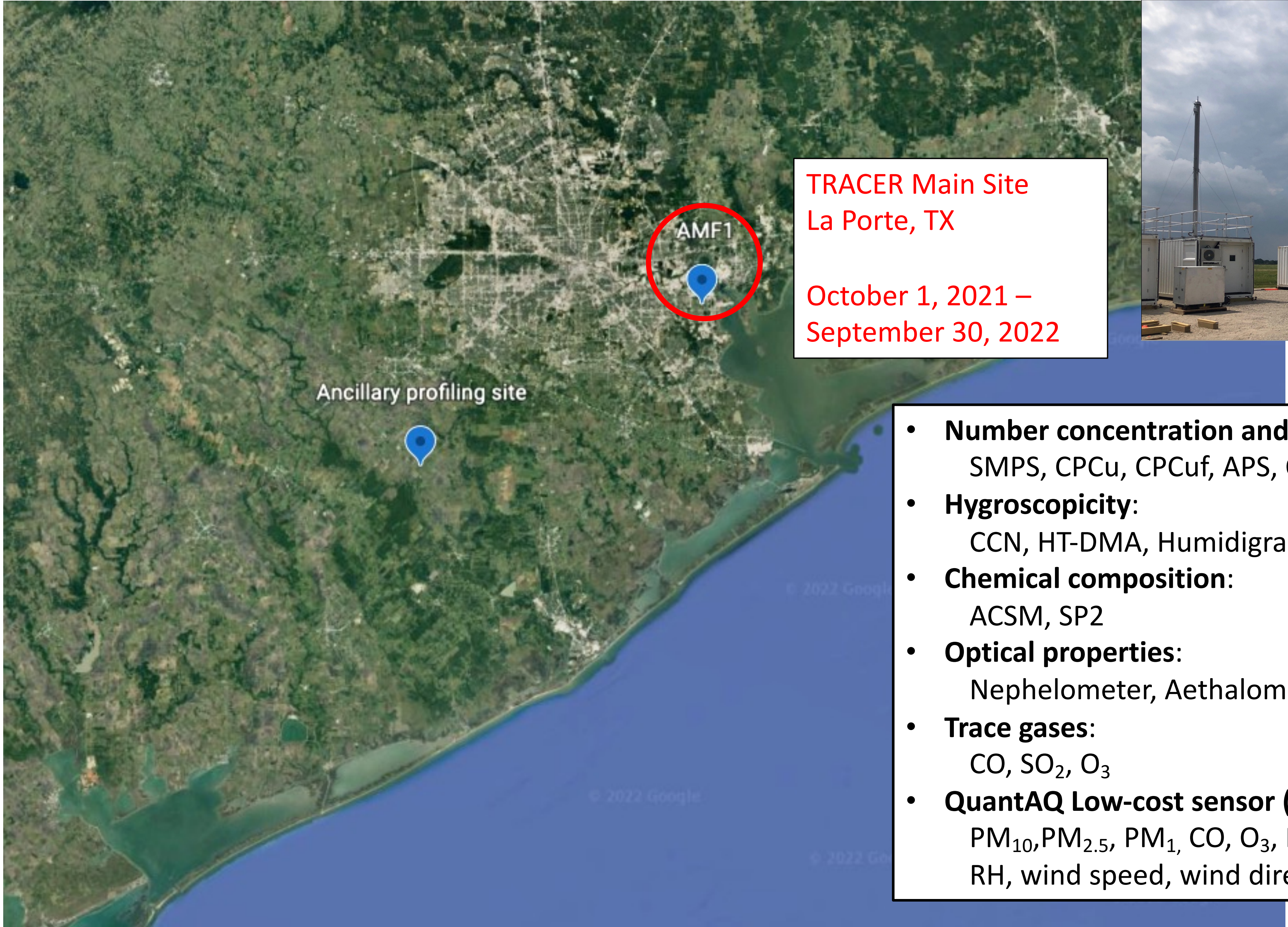
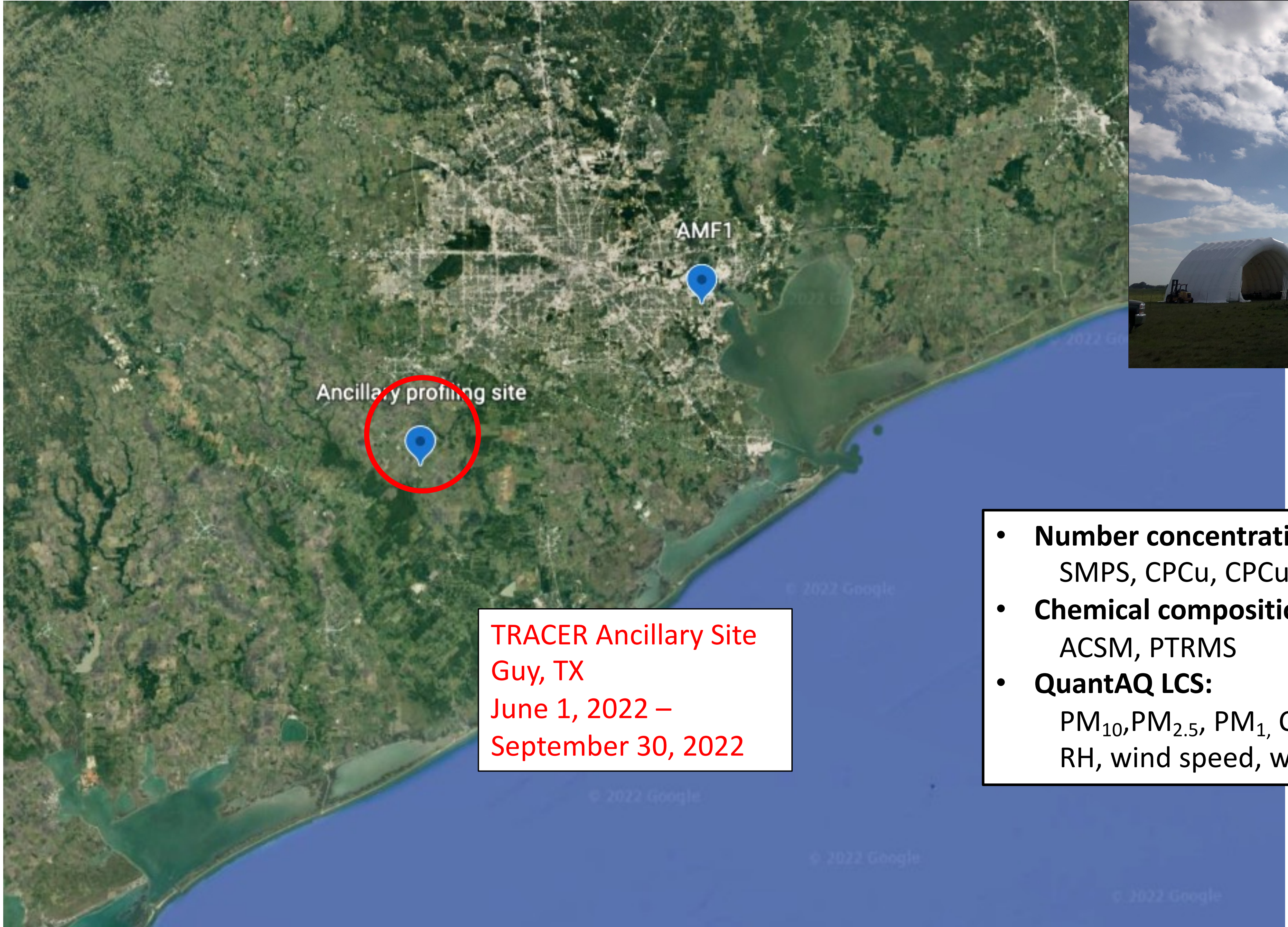


TRACER Main Site
La Porte, TX

October 1, 2021 –
September 30, 2022

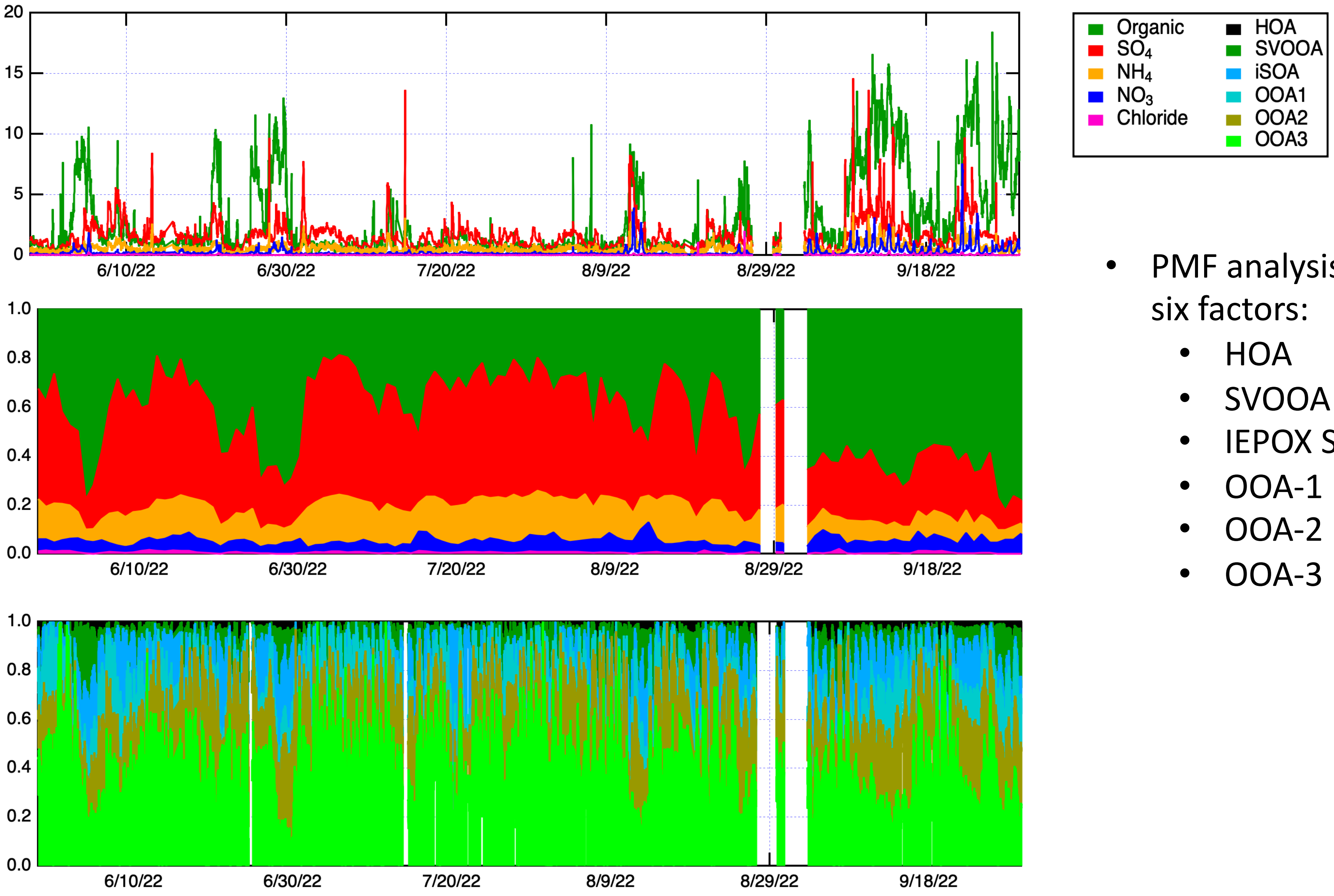
- **Number concentration and size**:
  SMPS, CPCu, CPCuf, APS, OPC, UHSAS
- **Hygroscopicity**:
  CCN, HT-DMA, Humidigraph
- **Chemical composition**:
  ACSM, SP2
- **Optical properties**:
  Nephelometer, Aethalometer, PSAP
- **Trace gases**:
  CO, SO_2, O_3
- **QuantAQ Low-cost sensor (LCS):**
  PM_{10},$PM_{2.5}$, PM_1, CO, O_3, NO, NO_2, T, RH, wind speed, wind direction



TRACER Ancillary Site
Guy, TX
June 1, 2022 –
September 30, 2022

- **Number concentration and size**:
  SMPS, CPCu, CPCuf, OPC,
- **Chemical composition**:
  ACSM, PTRMS
- **QuantAQ LCS:**
  PM_{10},$PM_{2.5}$, PM_1, CO, O_3, NO, NO_2, T, RH, wind speed, wind direction

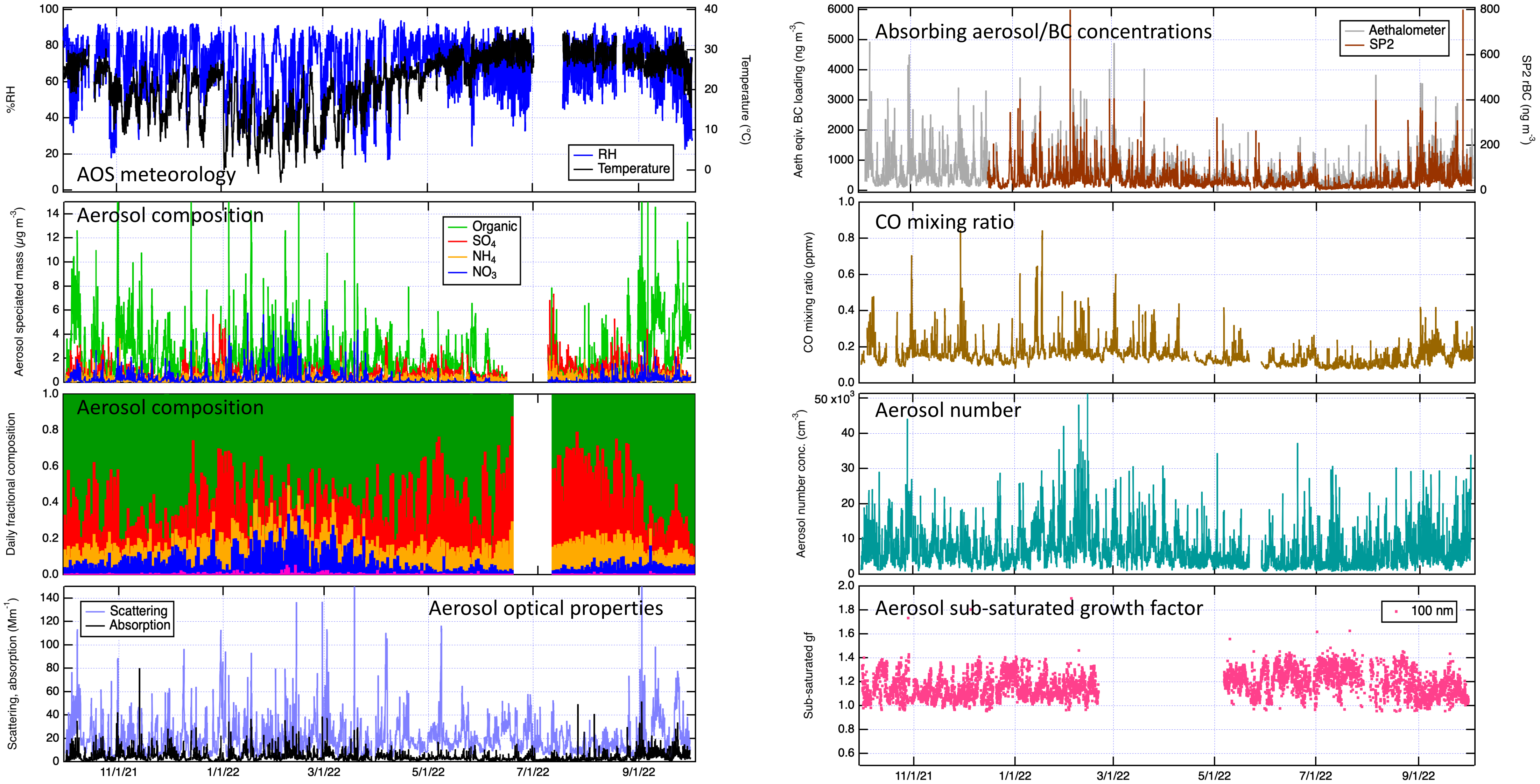
TOF-ACSM measurements at TRACER Ancillary Site



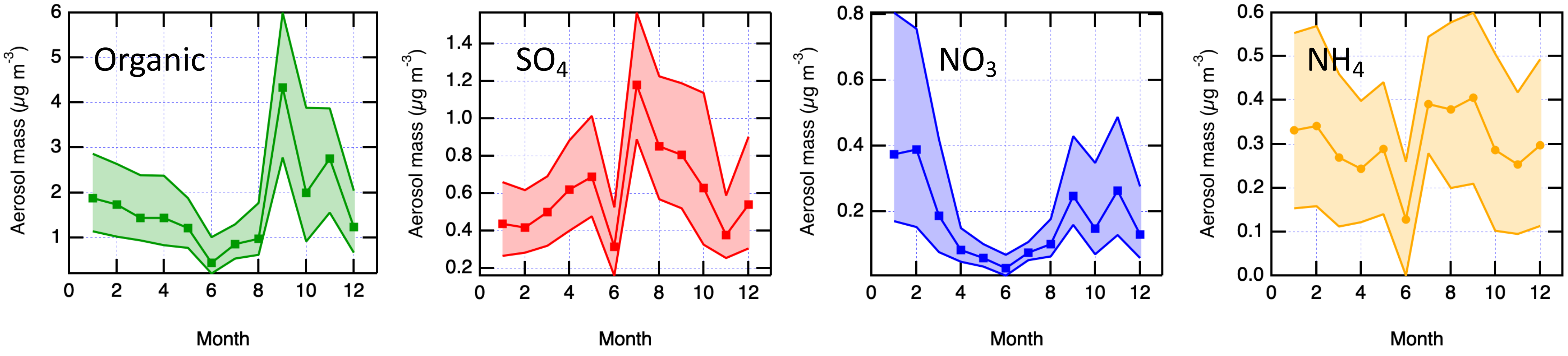
- PMF analysis of OA mass spectra results in six factors:
  - HOA
  - SVOOA
  - IEPOX SOA (iSOA)
  - OOA-1 (oxidized)
  - OOA-2 (more oxidized)
  - OOA-3 (most oxidized)

Aerosol composition, optical properties, size distributions and hygroscopicity were directly measured during TRACER

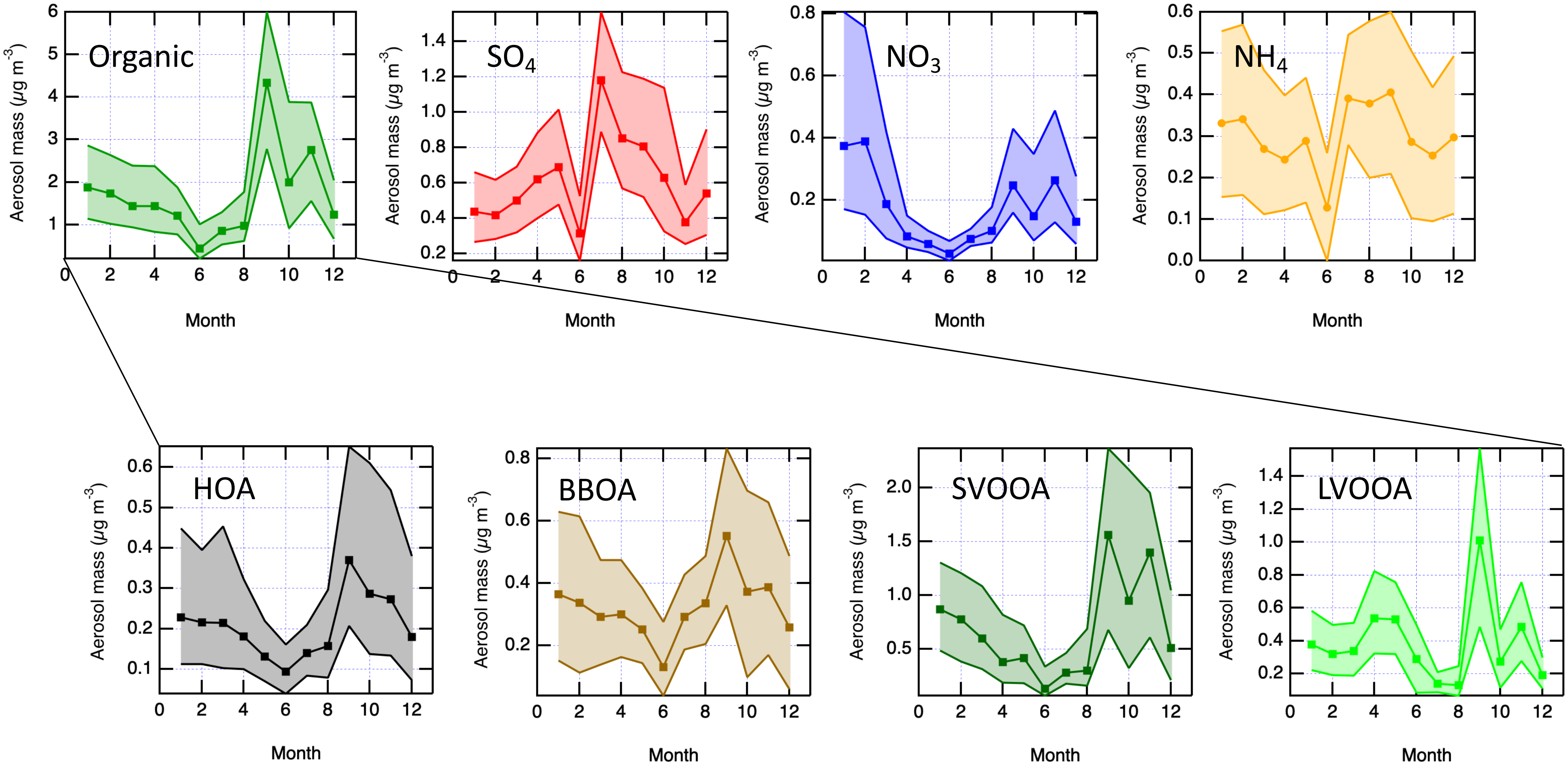
ARM AOS Data Acquired at the TRACER Main Site



Strong seasonal cycle of chemical and hygroscopic properties



Strong seasonal cycle of chemical and hygroscopic properties



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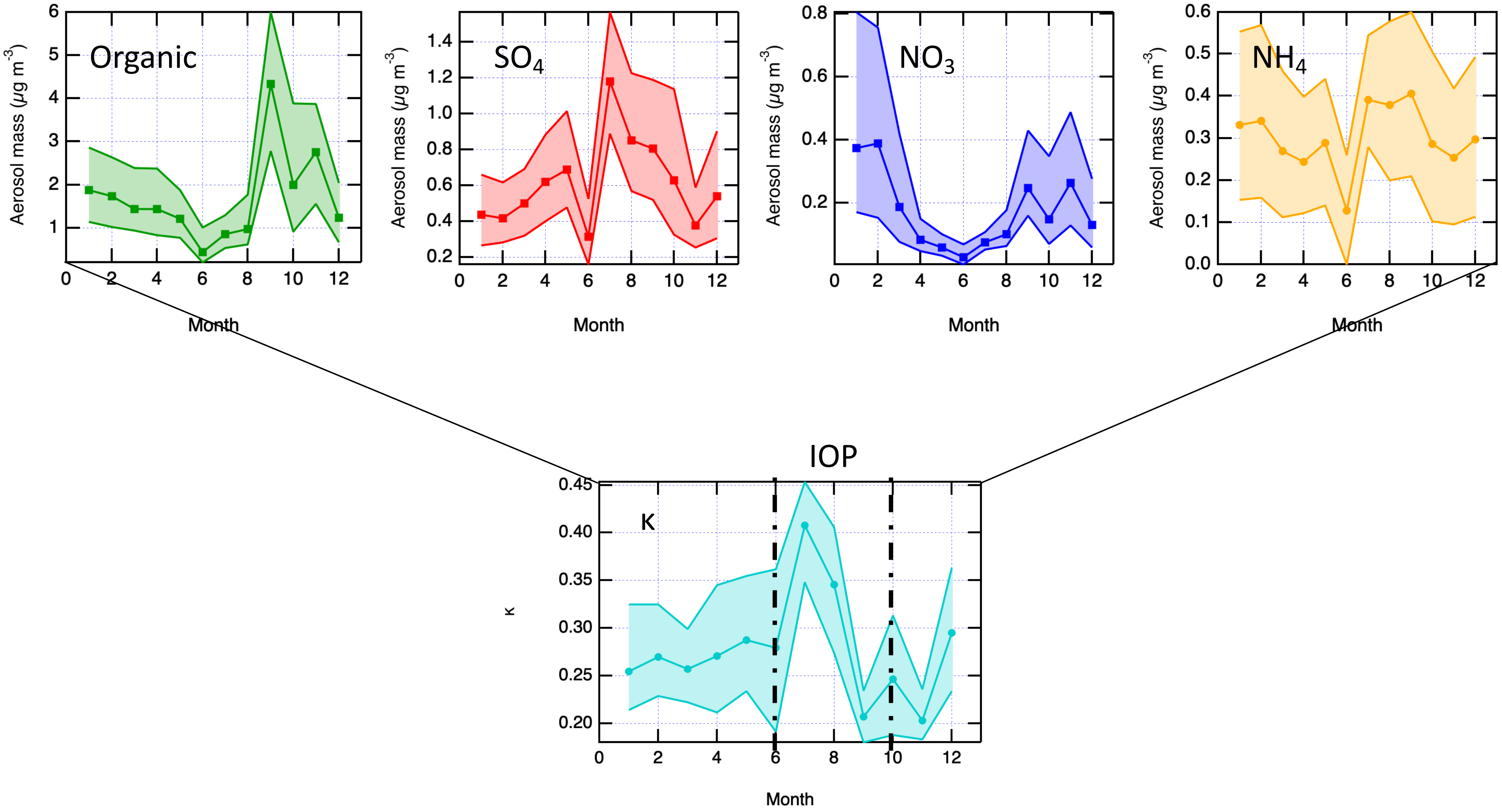

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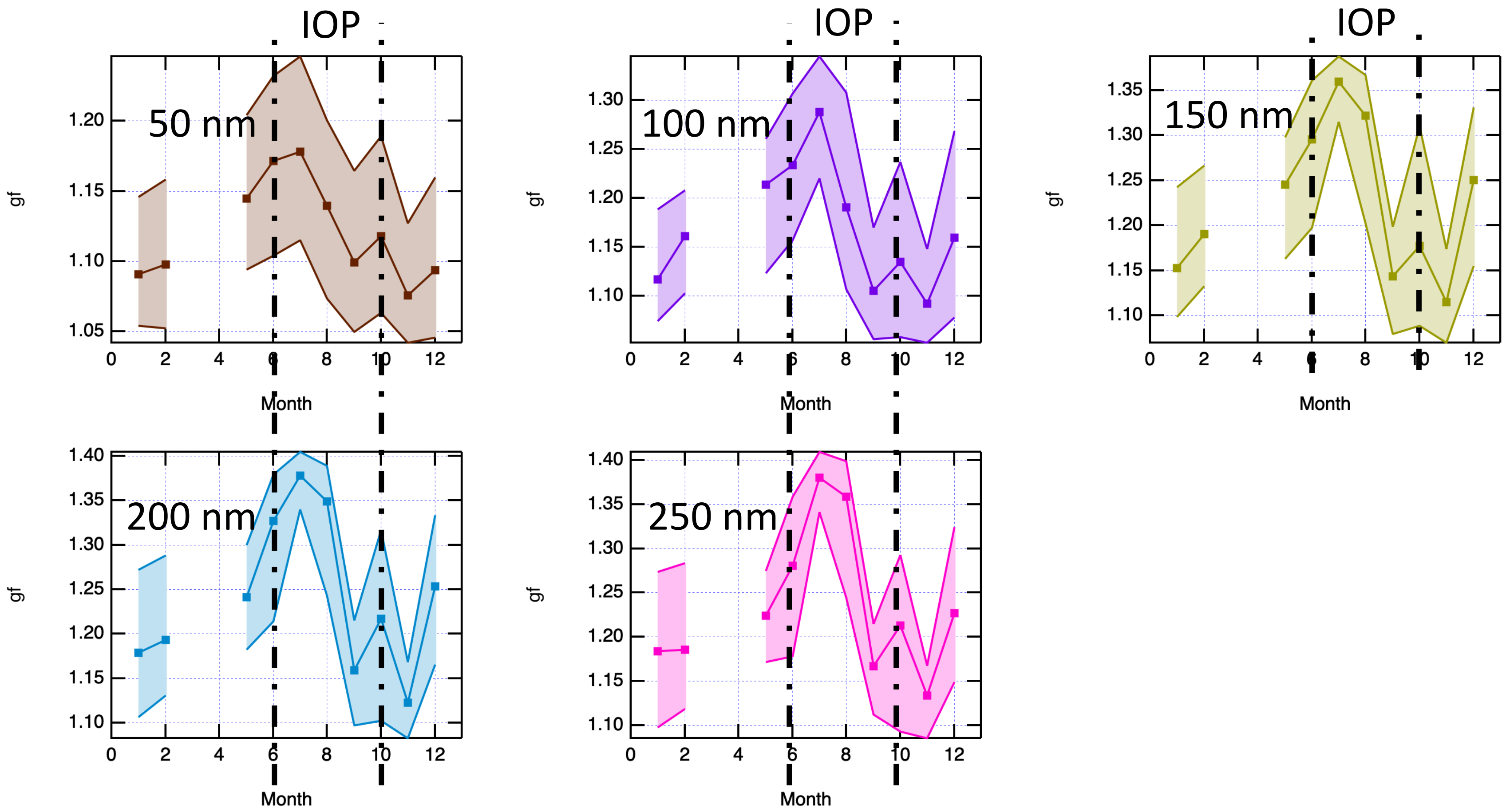

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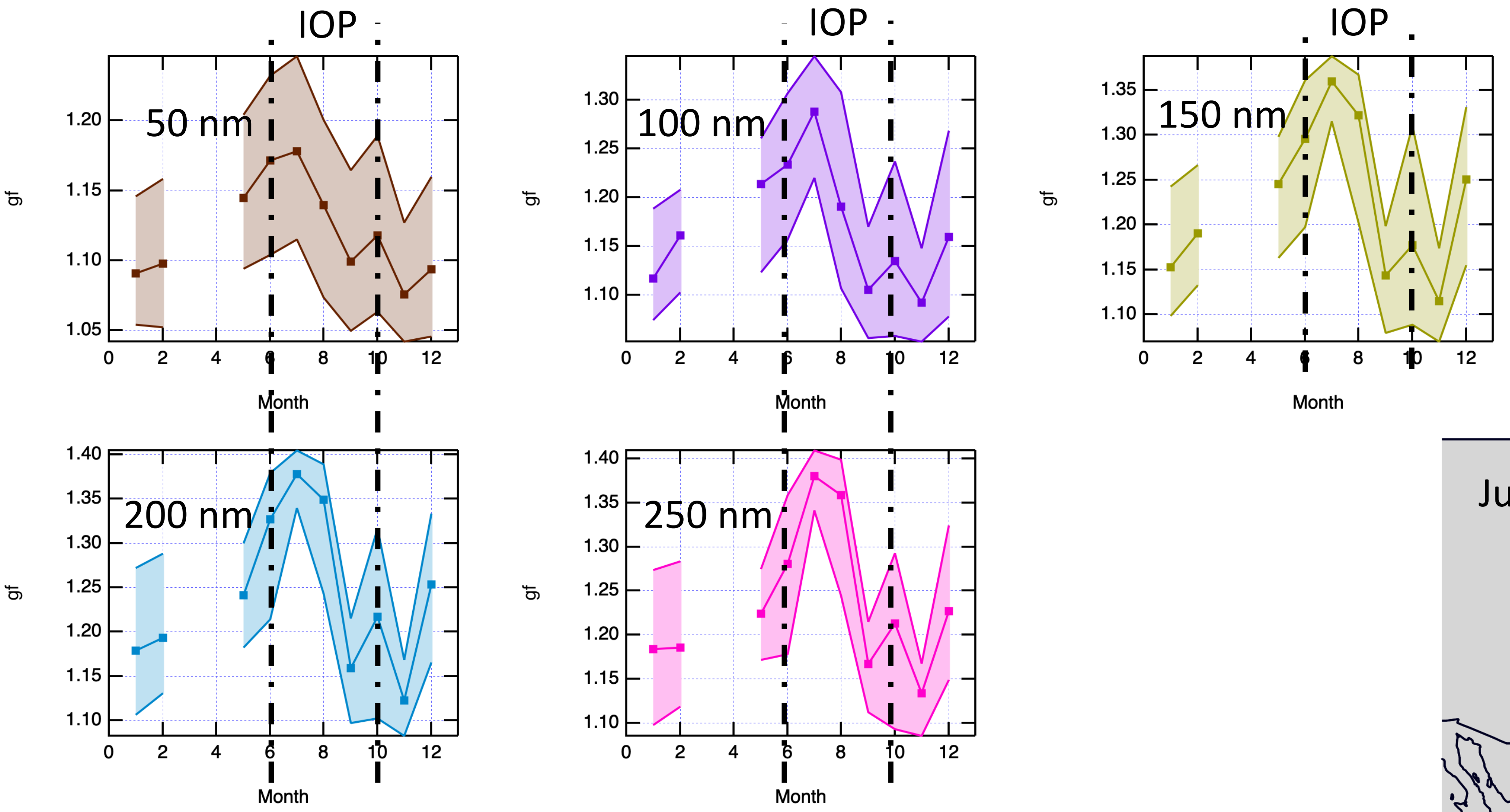

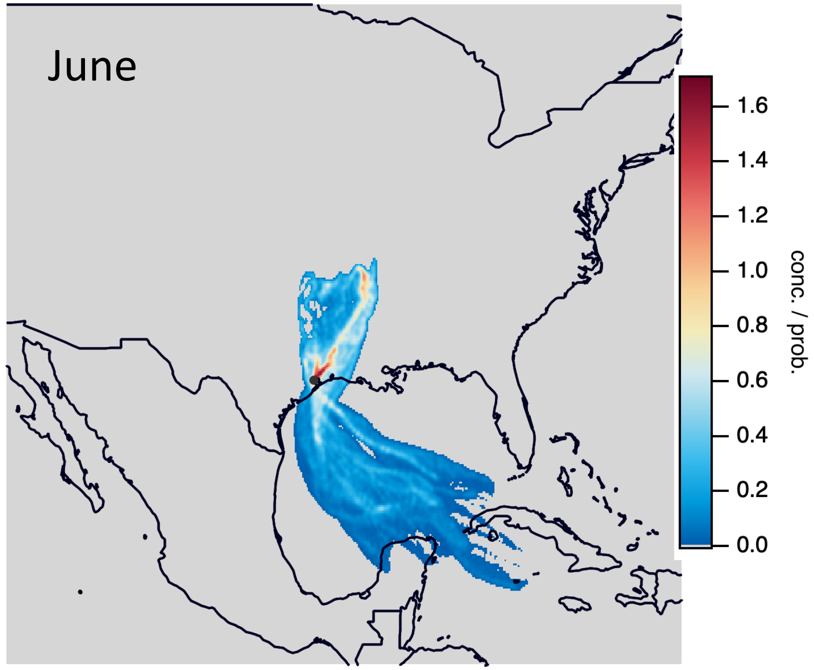

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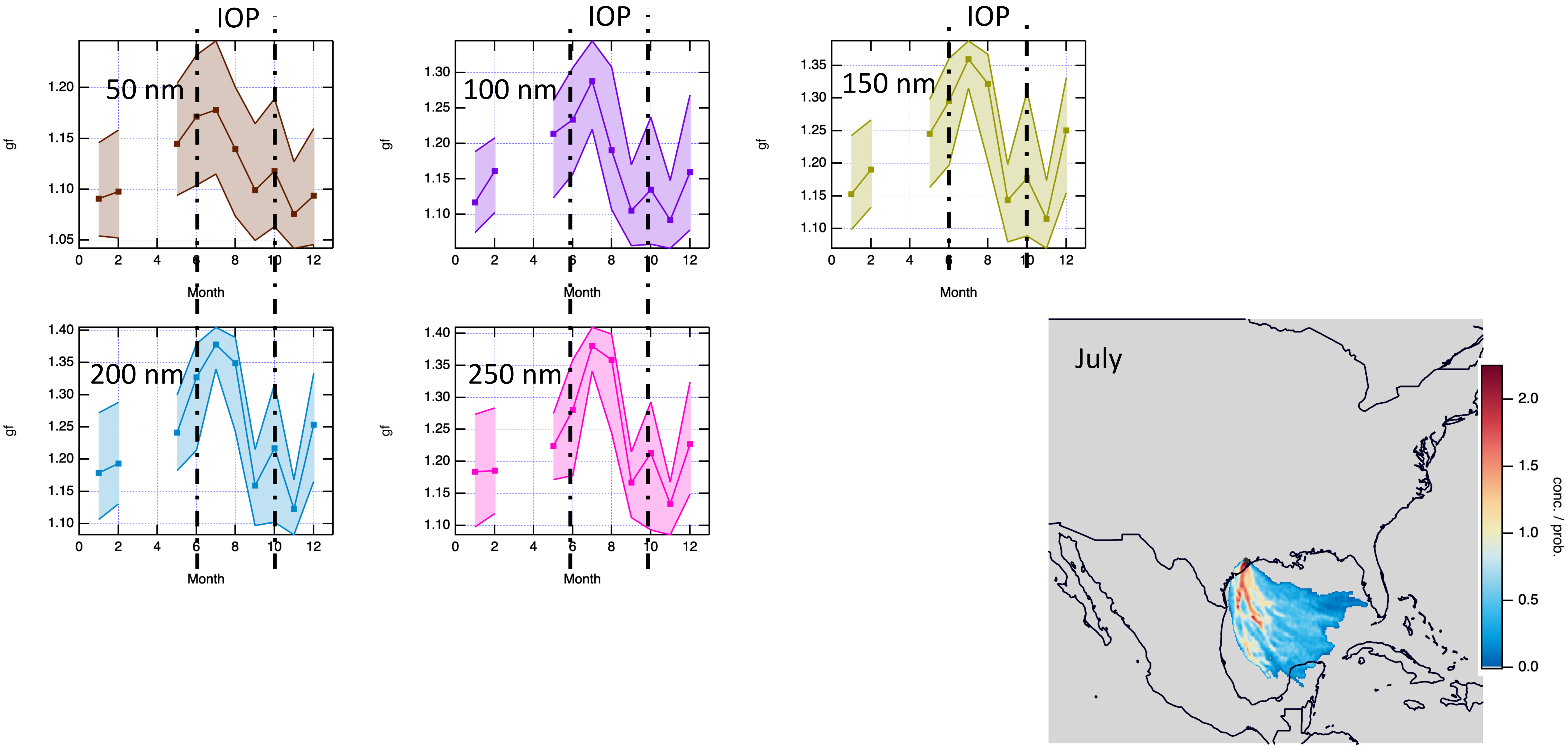

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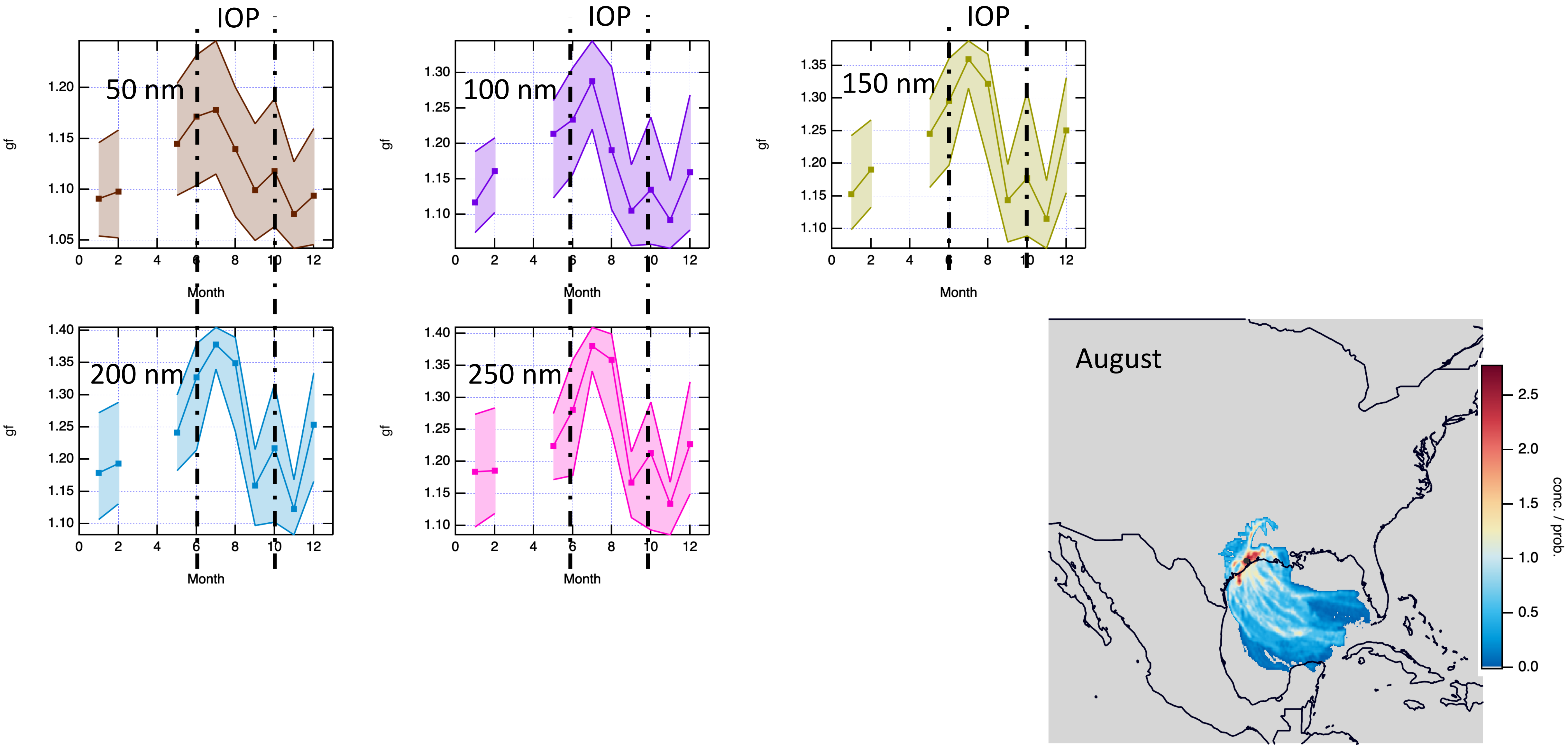
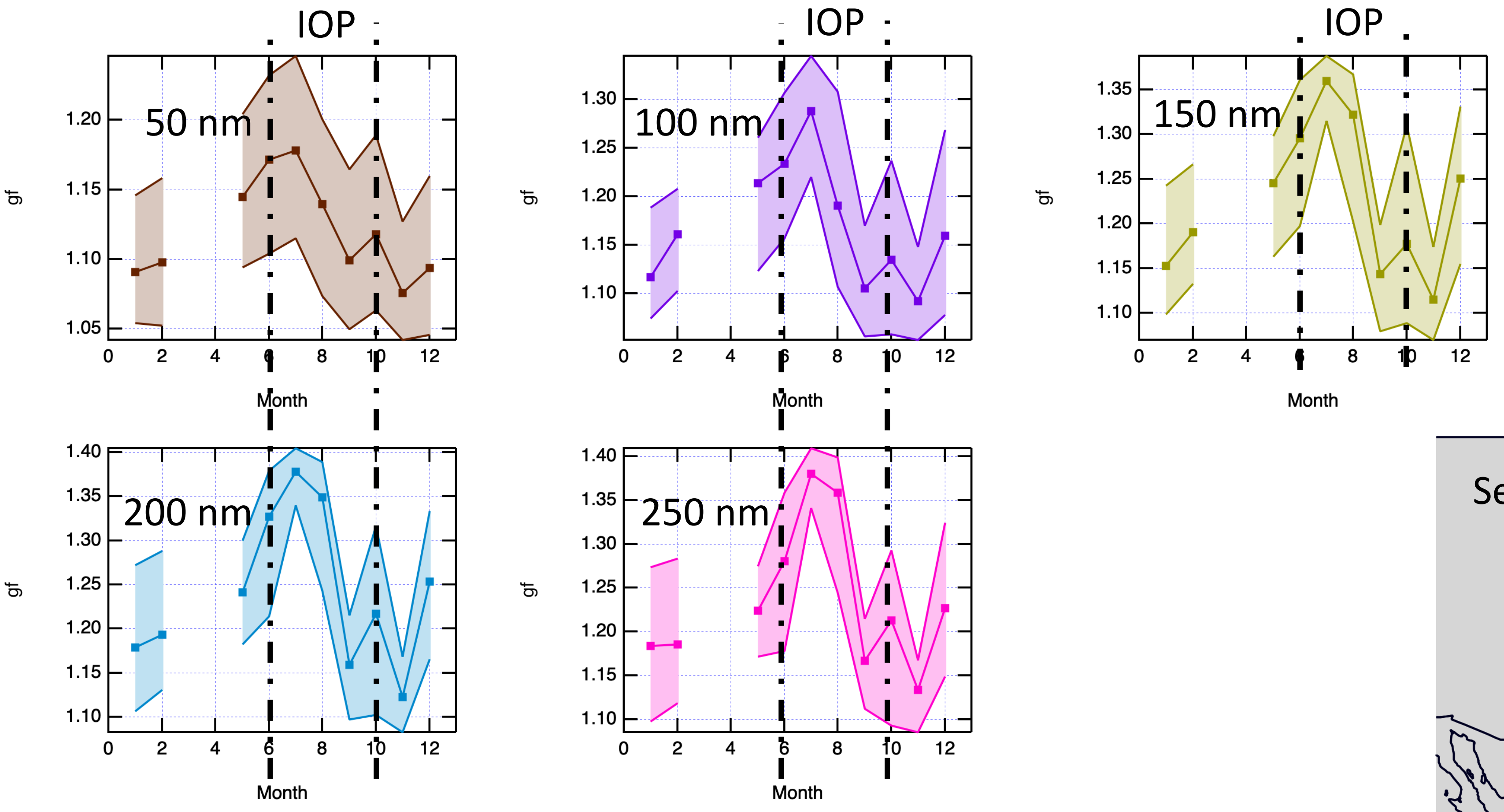
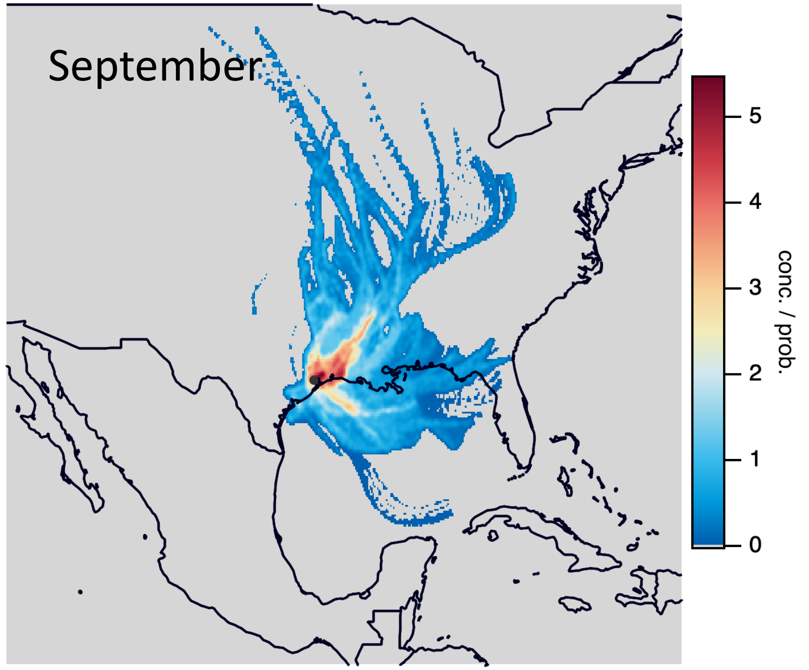
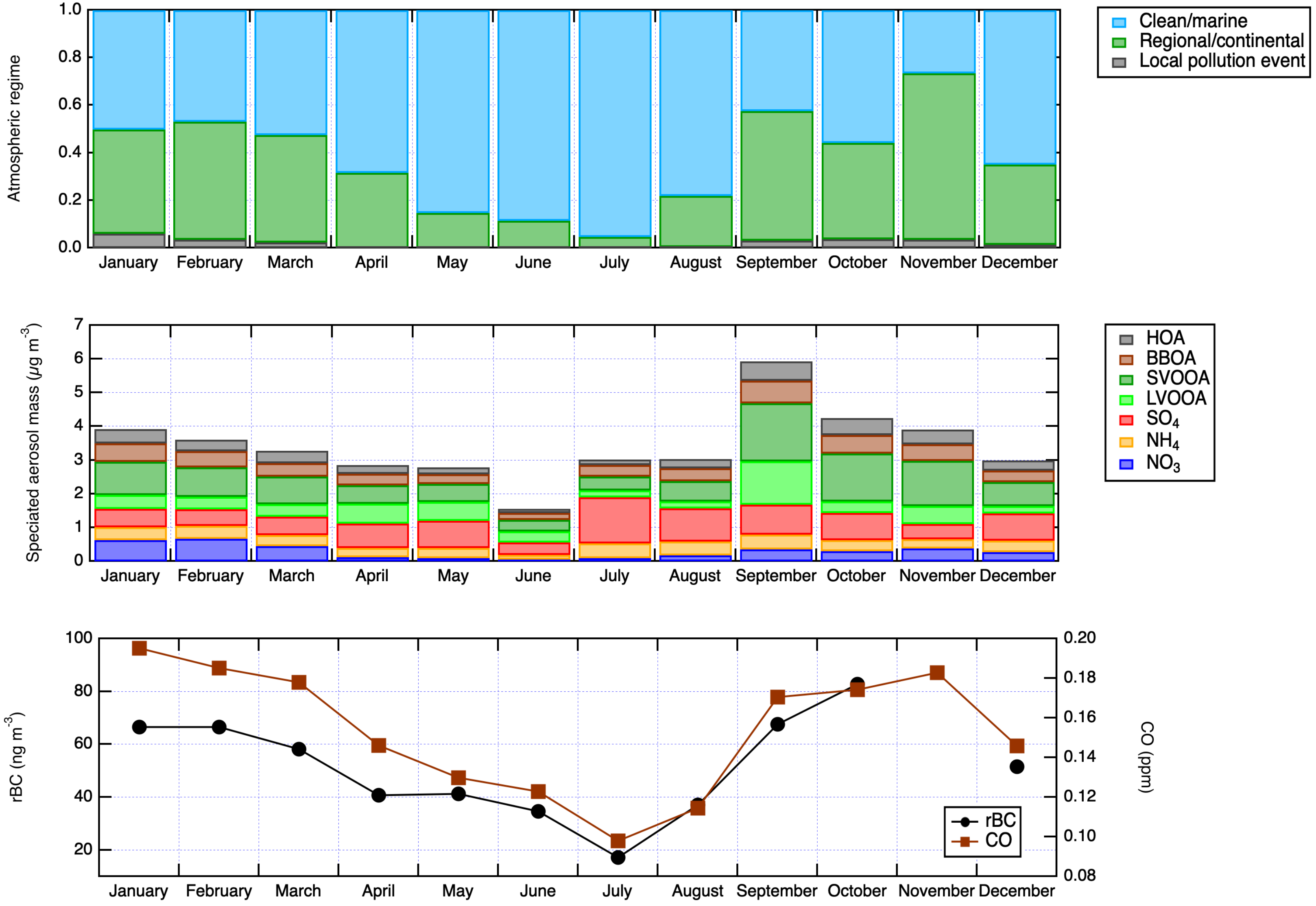


Strong seasonal cycle of chemical and hygroscopic properties





TRACER aerosol seasonal characteristics



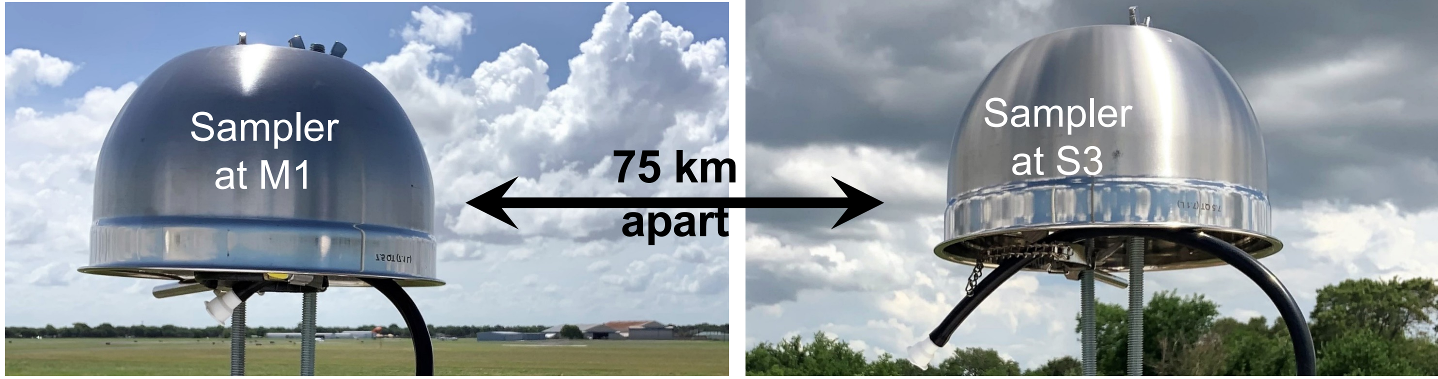
- Summer is generally cleaner than winter, spring and autumn. Marine-influenced air masses most frequent.
- Summer marine air masses are also associated with more hygroscopic particles.
- Strong seasonal control on aerosol properties at TRACER

COLORADO STATE UNIVERSITY

TRACER Ice nucleating particles (INPs)

Tom Hill*, Carson Hume and Jessie Creamean*

*Co-mentors

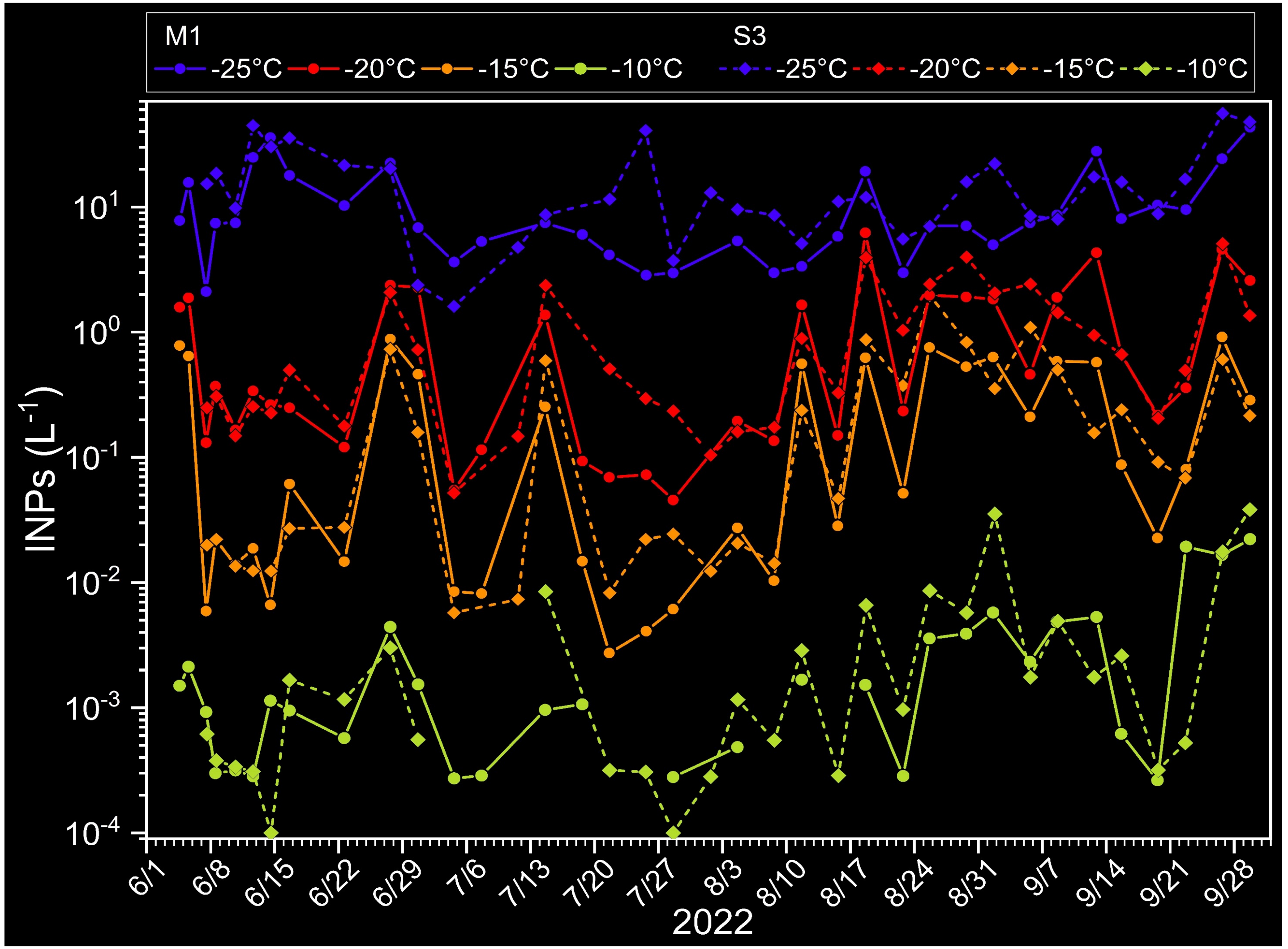


INPs catalyze the formation of ice in clouds. INPs influence: precipitation, latent heat release, cloud electrification, cloud albedo and cloud lifetime.

0.2 µm pore filters run for 24 h every 3-4 days.
Samples retested after heating (95°C) and H_2O_2 digestions to estimate abundance of biological INPs, heat stable organic INPs, and inorganic INPs.

INP concs ≥-20°C often comparable at both sites.

Contributions of biological and heat-stable organic INPs also often similar at M1 and S3.



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