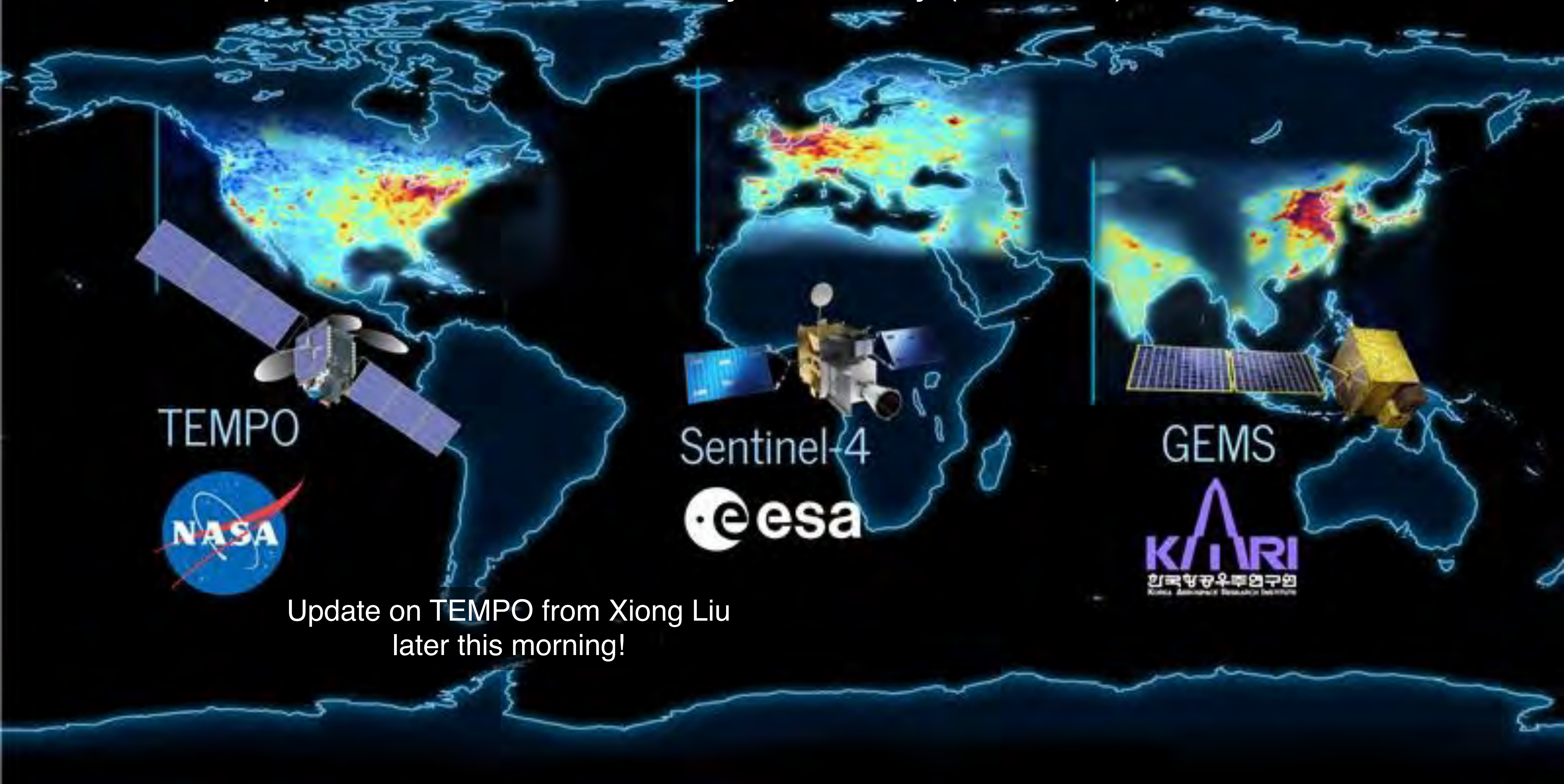
Summer 2023 offers the first opportunity for measurements over the North American component of the Geostationary Air Quality (GEO-AQ) Constellation.



Update on TEMPO from Xiong Liu
later this morning!

Synergistic TEMPO Air Quality Science

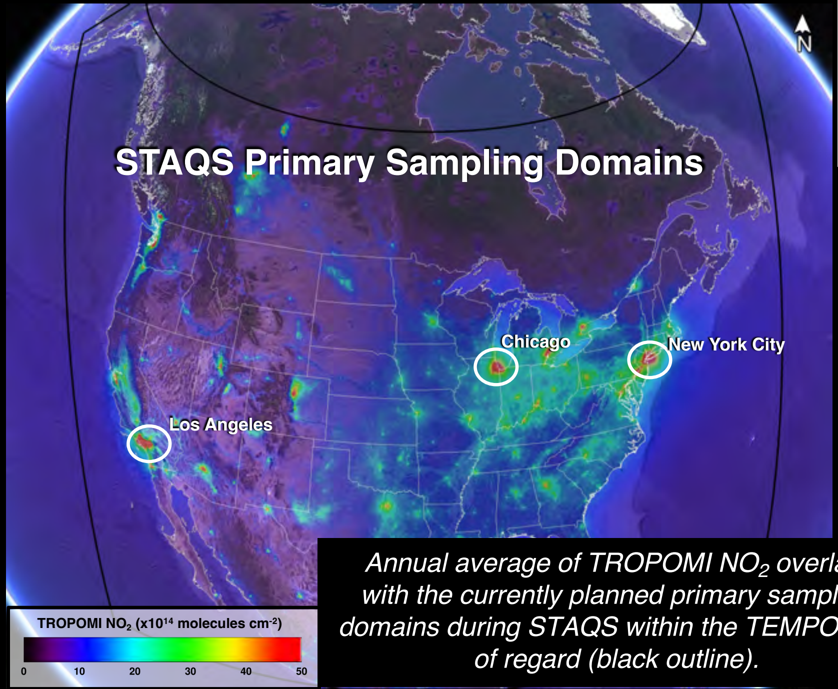
In June-August 2023, STAQS seeks to integrate TEMPO observations with traditional and enhanced air quality monitoring to improve the understanding of air quality science for increased societal benefit.

Under TEMPO, we will:

→ Build an integrated observing system consisting of ground-, airborne-, and satellite-based platforms and air quality models.

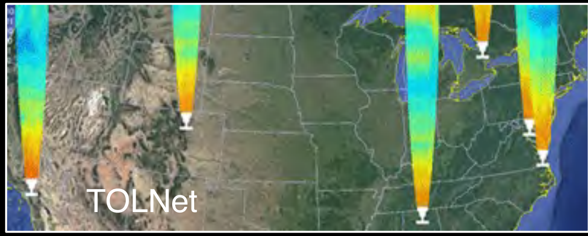
→ Prioritize repeated systematic sampling in predefined domains during morning, midday, and afternoon over at least 4 days in each primary target areas (LA, NYC, Chicago).

→ Collaborate with research teams engaged with multiple activities (AGES+) occurring in summer 2023 with federal and academic partners.



Annual average of TROPOMI NO_2 overlaid with the currently planned primary sampling domains during STAQS within the TEMPO field of regard (black outline).

Includes deployment of airborne and ground-based remote sensing observations



STAQS Science Objectives

Using the integrated multi-perspective point of view from satellite-, airborne-, and ground-based instruments under TEMPO:

1) Evaluating TEMPO level 2 products geo-physically, spatially, and temporally
2) Interpreting the temporal and spatial evolution of air quality events tracked by TEMPO
3) Improving temporal estimates of anthropogenic and biogenic trace gas and GHG emissions
4) Assessing the benefit of assimilating TEMPO data into chemical transport models
5) Linking air quality patterns to socio-demographic data

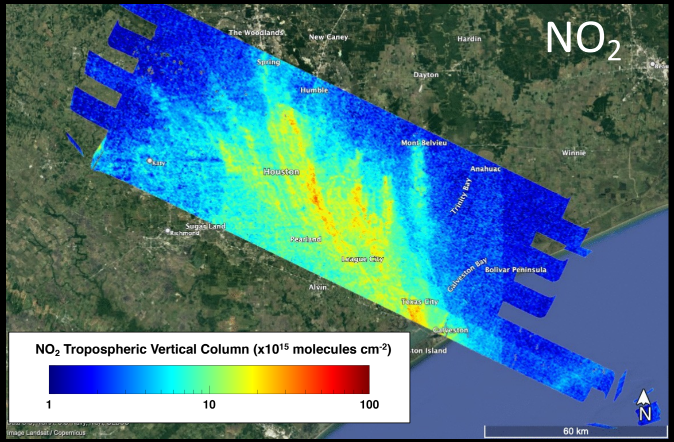
STAQS POCs

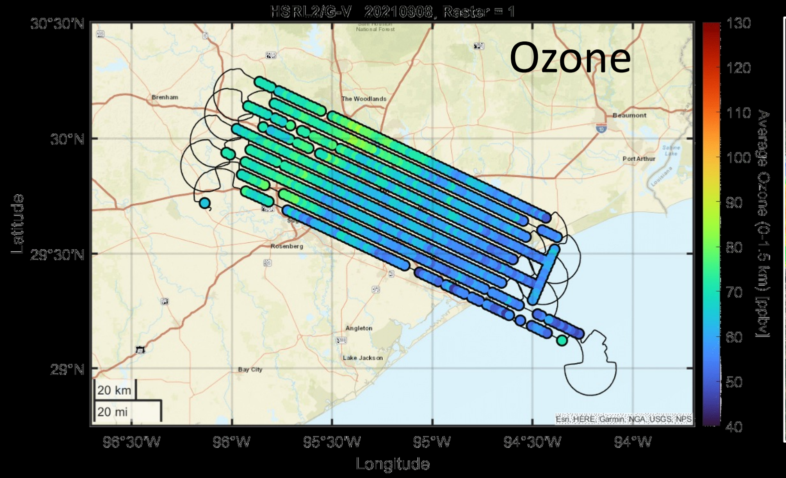
→Laura Judd (Airborne Lead)
→John Sullivan (Ground Lead/TOLNet PI)
→Scott Janz (GCAS PI)
→John Hair (HSRL2 PI)
→Taylor Shingler (HSRL2 co-lead for STAQS)
→Amin Nehrir (HALO PI)
→Robert Green (AVIRIS-NG PI)
→Ian McCubbin (AVIRIS-NG STAQS Liaison)
→Tom Hanisco (NASA Pandora Project PI)
→Luke Valin (EPA Pandora Project Liaison)
→Paul Walter (Sonde-lead)
→Barry Lefer (Tropospheric Composition Program Manager)
→Melissa Yang Martin (Atmospheric Composition Program Scientist)
→Gao Chen (Data Manager)
→Michael Shook (Data Manager)

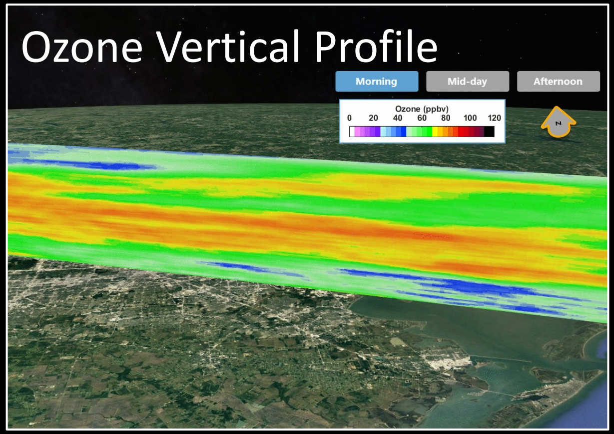
*yellow=in person

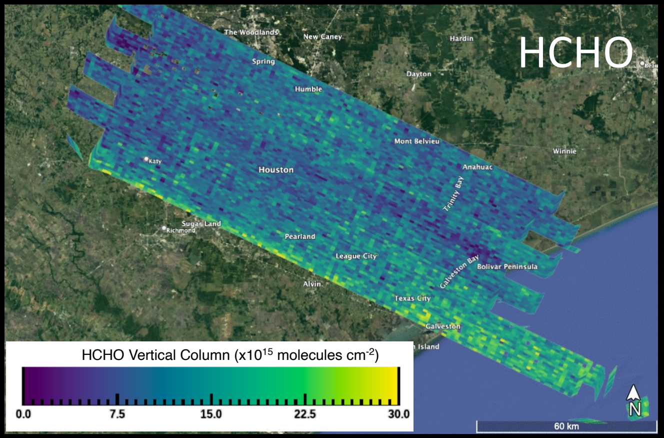
STAQS Airborne Perspective: G-V

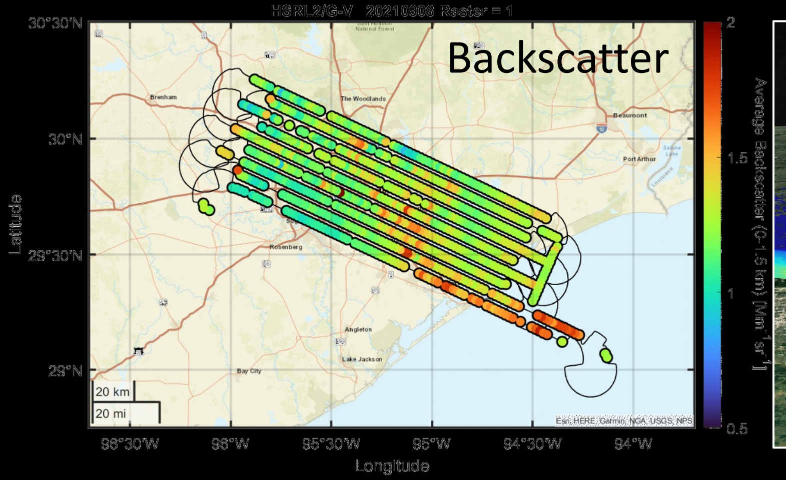
Visualizing chemical weather: example from TRACER-AQ with GCAS + HSRL2

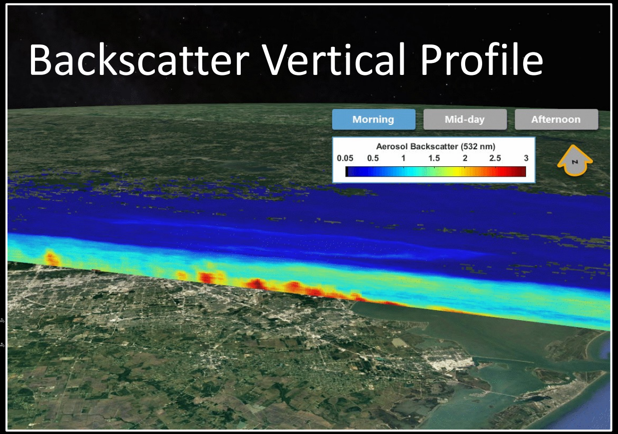












Additional HSRL2 Products:

- 532 nm Aerosol Depolarization
- Ratio of Aerosol Depolarization (532/355nm)
- Lidar Ratio (532 nm)
- Backscatter Angstrom Exponent (532/355 nm)
- Aerosol Type
- Mixed layer height

⇢ Spatial scales of these measurements reveal information about these pollution that cannot be captured by a satellites.

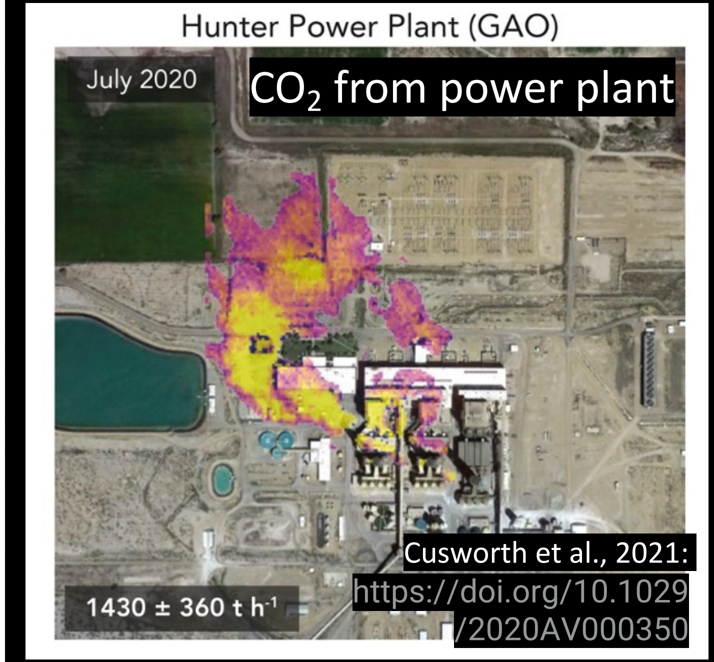
⇢ The temporal sampling strategies give us a glimpse of the future with hourly view expected from TEMPO.

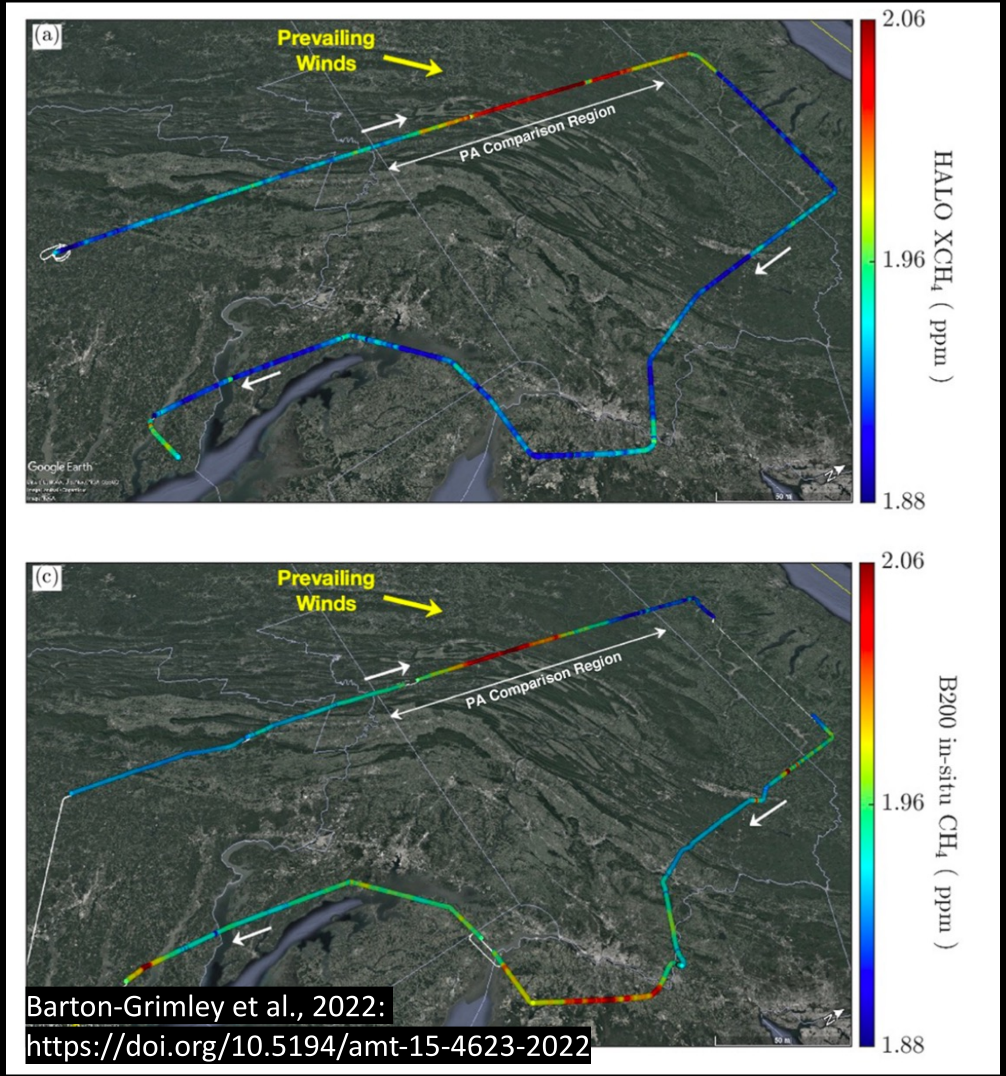
STAQS Airborne Perspective: G-III

Adding synergistic perspectives between air quality and greenhouse gases with HALO and AVIRIS-NG

Methane emissions for sources > 10s kg/hour

CO_2: very large point sources (e.g., power plants, refinery)



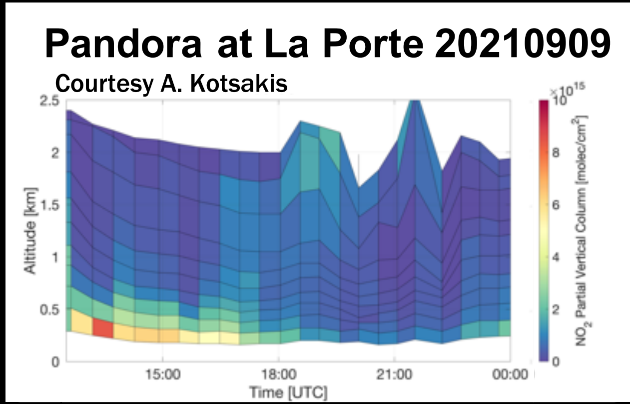


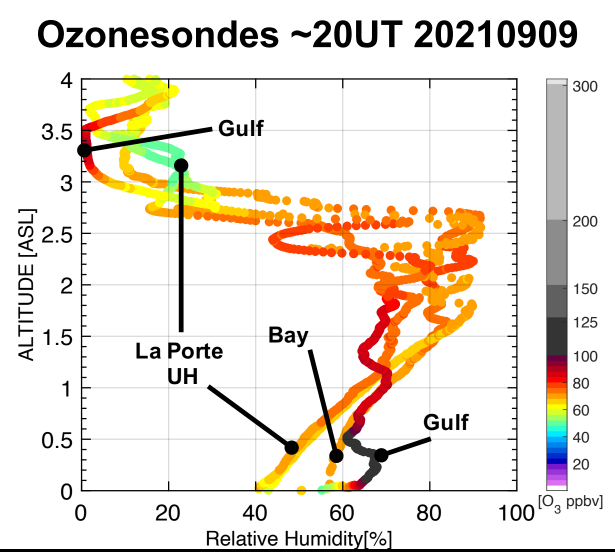
STAQS Ground Perspective

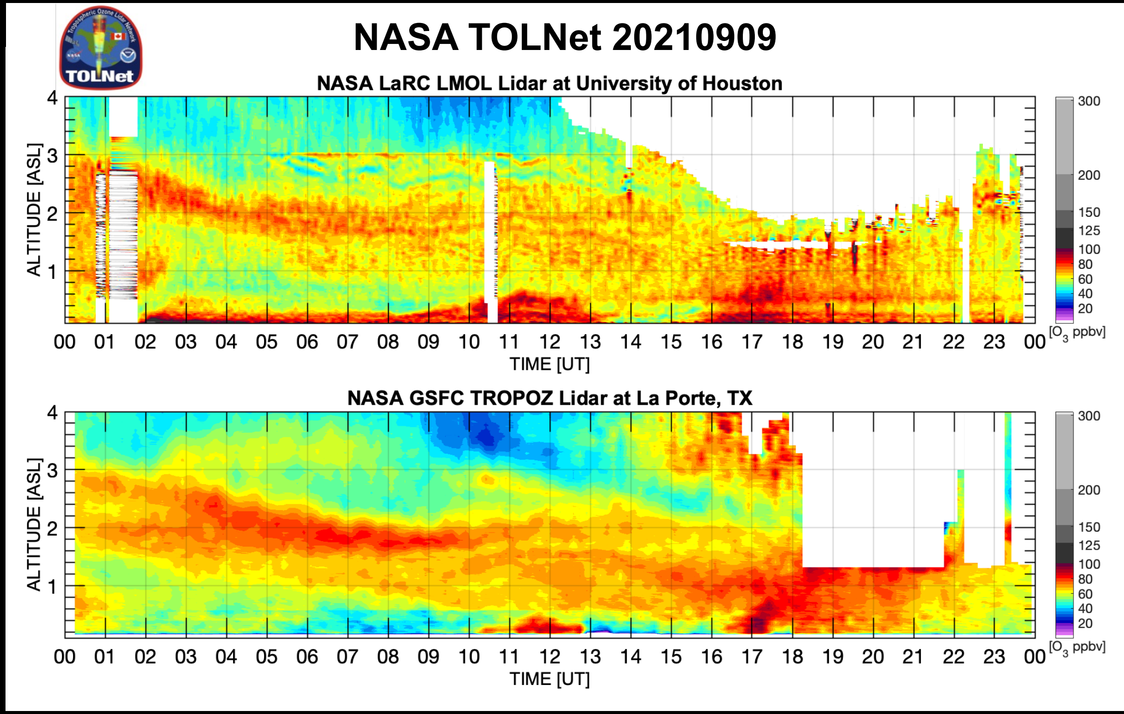
Ground Support Platforms for STAQS include TOLNet, Pandora and Ozonesondes (similar to TRACER-AQ-examples below).

Enhanced ground-based monitoring on September 9th revealed information about the vertical profiles of pollution that cannot be captured by a satellites.

⇢ Synchronous sonde, Pandora and lidar sampling strategies reveal the multi-species complexity of vertical chemical transport







TRACER-AQ is a NASA-led air quality mission, leveraging DOE's TRACER study, with main partners in air quality management from the Texas Commission on Environmental Quality (TCEQ) observing pollution from aircraft, boats, mobile labs, and ground sites.

Where will STAQS be?

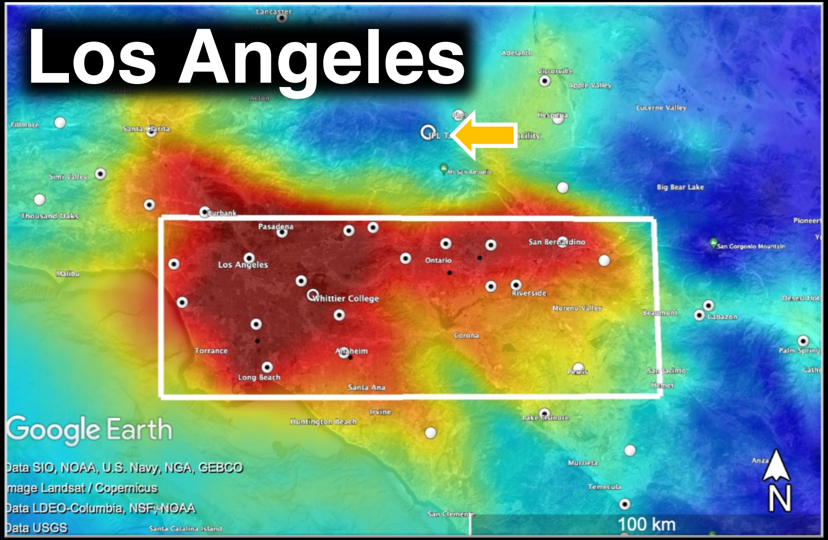
Boxes represent initial areas that could be sampled in each region every 2.5 hours by the Gulfstreams. Aim for the final area would be to optimize emission sources and ground-site mapping.

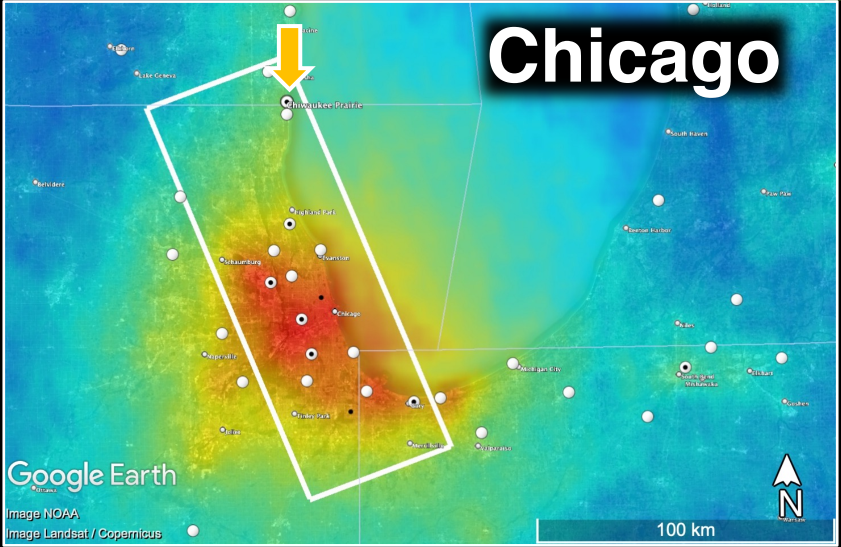
Priority is systematic sampling of the same area with the GV 3x per day (morning-midday-afternoon) and GIII 2x per day (morning-afternoon)

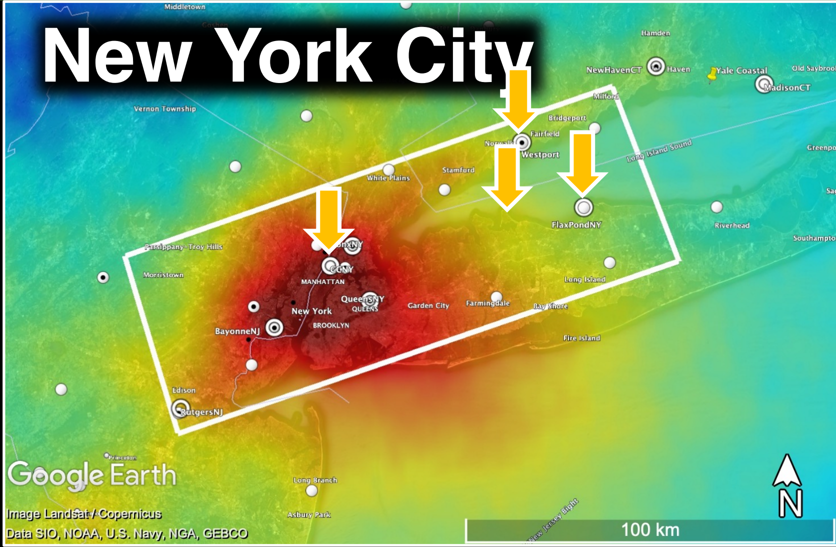
Opportunity targets will be considered secondarily and include extended legs to hit additional ground sites or source regions, cross sectioning the raster between rasters aiming for hitting ground sites at a new viewing/solar geometry,.

More detailed flight planning details on Thursday

Box: 2.5 hour raster
White open circles: Pandora
White closed circles: Ozone monitors
Dark dots: NO_2 monitors
Yellow arrow: TOLNet







STAQS Schedule

Gulfstreams:
Aircraft Integration: ~June 1
Los Angeles Flight Window: June 19-July 7 (10-day window/4 flight days)
Dayton, Ohio for East coast cities: July 30-August 29th (one month window/8+ flight days)

G-V: 120 Science Hours (~ 13 flight days/one 9 hours flight per day)
G-III: 104 Science Hours (~ 13 flight days/two 4-hour flights per day)
Aiming for at least 4 days in each primary target city.

TOLNet:
NYC systems Aiming for a 5 week window from mid-July through end of August. Timing TBD based on TEMPO's launch and consideration for other missions. Sonde efforts align with this timeline. UAH system schedule is still TBD but will at the very least align with the NYC window.

Pandora:
Leveraging existing Pandoras in PGN including the potential for new one in Los Angeles through **Increasing Participation of Minority Serving Institutions in Earth Science Division Surface-Based Measurement Networks selections**

Looking forward to working together next summer!

Contact:

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Laura Judd (laura.m.judd@nasa.gov)