



ARM TBS: Recent Campaigns and Data

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Sandia National Laboratories

ARM/ASR PI Meeting 2022

ARM TBS Crew



TBS in flight at SAIL in July 2022.

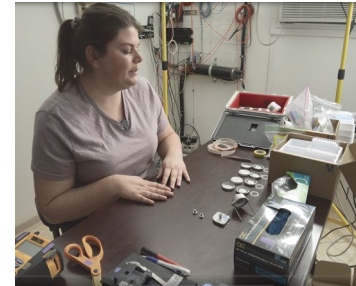
NSA Site Manager: Andy Glen
 Atmospheric Scientist: Dari Dexheimer
 Geoscience Engineer: Gabbi Whitson
 Mechanical Engineer: Casey Longbottom
 Electronics Engineer : Dennis DeSmet
 Camera Operations: Brent Peterson
 Administrative Support: RaeAnn Cook
 Part-time Staff: Steve Storch & Matt Tezak



Matt Tezak clipping fiber to tether (SGP EF36)



Top: Steve Storch during IFFEXO IOP(Oliktok Pt);
 Bottom: Dari Dexheimer monitoring the flight (TRACER S3)



RaeAnn Cook processing impactors (SGP CF)



Gabbi Whitson operating winch controller and DTS (TRACER S3)



Casey Longbottom manning winch (SGP CF)



Brent Peterson preparing MWIR camera (SAIL)



Andy Glen, ARM NSA Site Manager

February, April and October 2022 ARM TBS Activities at SGP

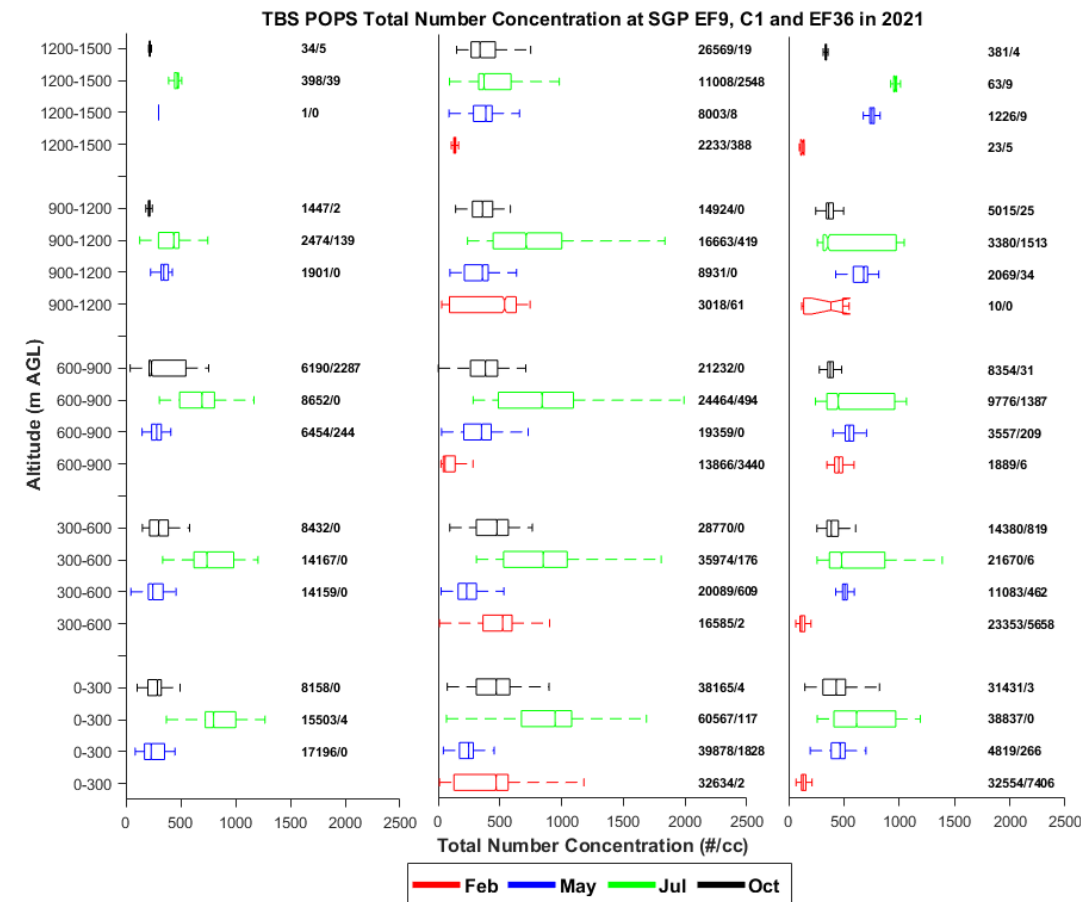
• ARM TBS flights occurred at SGP CF, EF36 and EF9 in February, and at the CF in April and October 2022:

- 23 hours in February 2022
- 43 hours in April 2022
- 21 hours in October 2022



Supported proposals included:

- Vertically-Resolved New Particle Formation and Transport Study (PI Chongai Kuang, BNL)
- Toward a 4D Aerosol Characterization (PI Allison McComiskey, BNL)
- Vertical profile of atmospheric particle composition via TBS (PI Swarup China, PNNL)
- Dust contribution to vertical profiles of INP (PI Susannah Burrows, PNNL)
- AGINSGP supplemental sampling (PI Susannah Burrows, PNNL)



May and July 2022 ARM TBS Activities at SAIL

- ARM TBS flights occurred at two separate locations in Gothic, CO in May and July 2022:

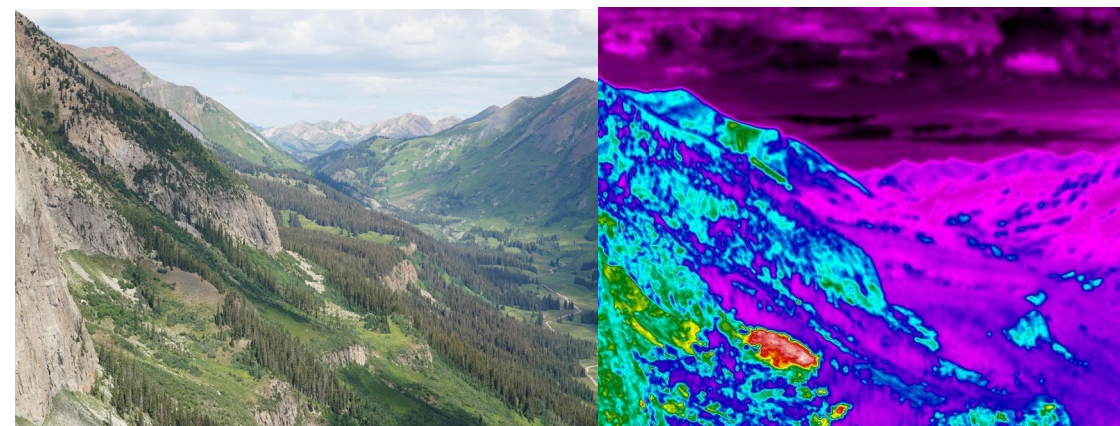
- 23 hours in May 2022
- 29 hours in July 2022



TBS aloft in Gothic, Colorado, in July 2022 for ARM SAIL (Surface Atmosphere Integrated Field Laboratory).

Supported proposals included:

- Size and Time-Resolved Automated Aerosol Sampling (STRAAS); (PI: Swarup China, PNNL)
- ARM TBS Ice Nucleating Particle Samples (PI Jessie Creamean, CSU)
- Investigation of the Aerosol Impact on the Surface (SAIL-AIS); (PI Alex Laskin, Purdue University)
- Vertical Aerosol Profiling During SAIL (SAILVAPS); (PI Russell Perkins, CSU)



Images collected from TBS in July 2022 at SAIL from visible (left) and mid-wave infrared imager (right).

June – September 2022 ARM TBS Activities at TRACER

- ARM TRACER (Tracking Aerosol Convective Interactions Experiment)
 - Deployments at ANC (HOU S3) in Guy, TX occurred for the first two weeks of each month from June – September
 - 191 flight hours
- Flights up to 1.5 km occurred with:
 - Handix POPS
 - TSI CPCs
 - EMSL STAC (Size and Time-Resolved Aerosol Collector) and particle impactors
 - Distributed temperature sensing
 - Ozonesondes
 - VOC sampler
 - OSU RAVEN meteorological tethersondes
 - 1 nm water-based CPC
 - Black carbon samplers

Supported proposals included:

- TBS STAC at TRACER (TRACER-VPACS); PI Swarup China, PNNL EMSL
- RAVEN TRACER; PI: Jamey Jacob, Oklahoma State University
- TRACER Ozonesondes; PI: Gary Morris, St. Edwards University and Rebecca Sheesly, Baylor University
- TRACER OPUS; PI: Ru-Shan Gao, NOAA
- TRACER-VNATS; PI: Chongai Kuang, BNL

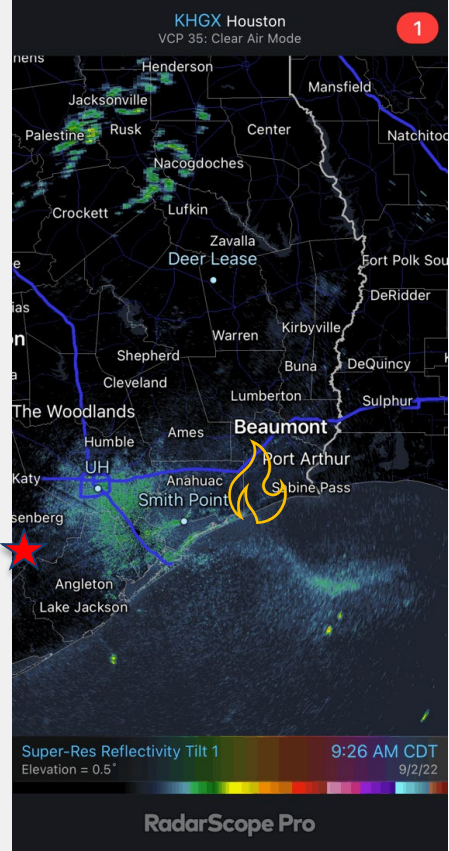
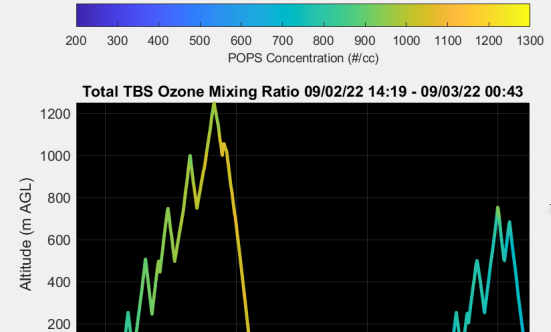
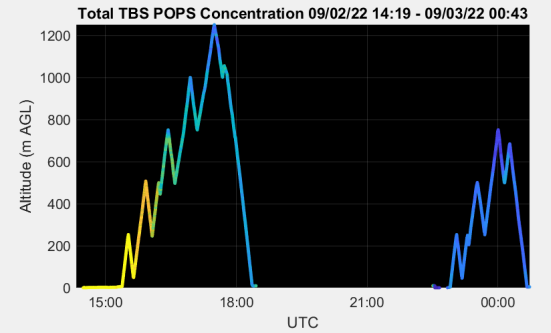


TBS in flight at TRACER in Guy, TX in September 2022 (above). TBS waiting out a storm in hangar in July 2022 (left).

June – September 2022 ARM TBS Activities at TRACER

- TBS operated during multiple conditions during TRACER including:

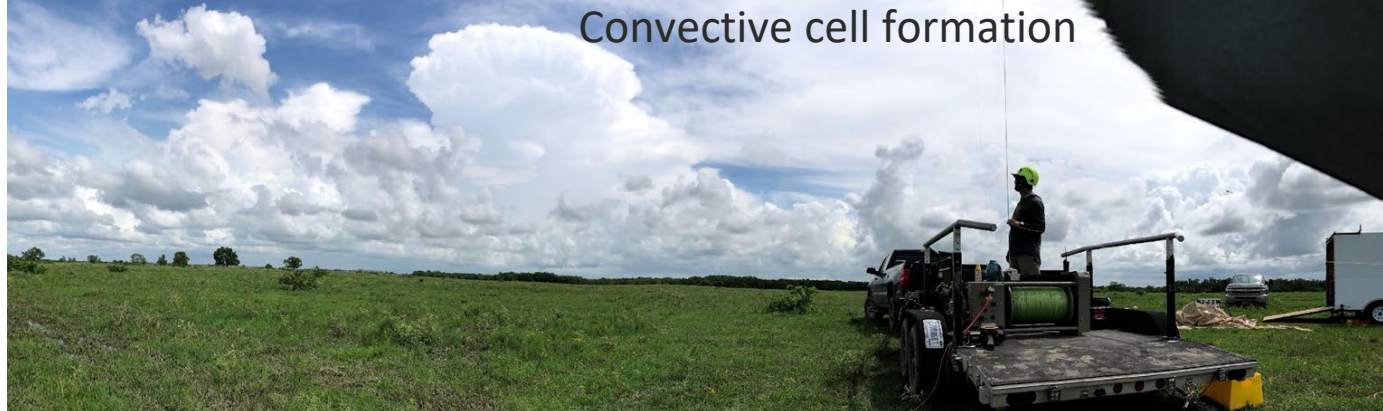
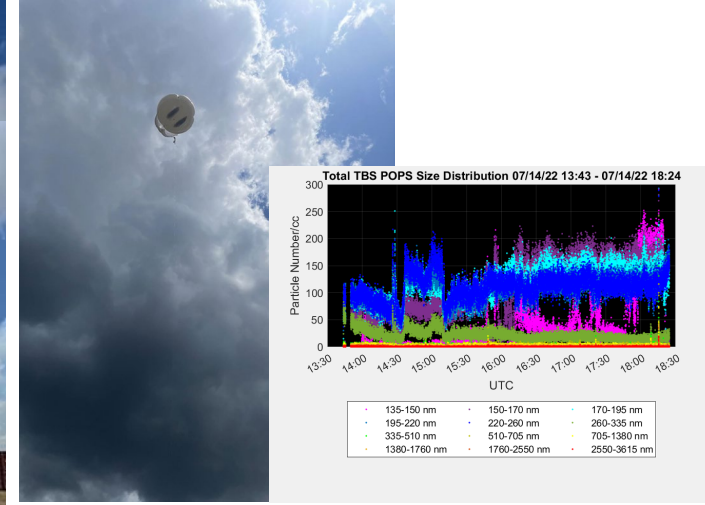
Petrochemical industry fires



RadarScope animation courtesy of Travis Griggs, University of Houston



Observed reductions in small particles after vertical development of cumulus



Anticipated TBS Deployments CY23

| January | | | | | | |
|---------|----|----|----|----|----|----|
| S | M | T | W | T | F | S |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

| February | | | | | | |
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| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | | | | |

| March | | | | | | |
|-------|----|----|----|----|----|----|
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| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | 31 | |

| April | | | | | | |
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| 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | | | | | | |

| May | | | | | | |
|-----|----|----|----|----|----|----|
| S | M | T | W | T | F | S |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |

| June | | | | | | |
|------|----|----|----|----|----|----|
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| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | |

| July | | | | | | |
|------|----|----|----|----|----|----|
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| 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| 30 | 31 | | | | | |

| August | | | | | | |
|--------|----|----|----|----|----|----|
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| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

| September | | | | | | |
|-----------|----|----|----|----|----|----|
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| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |

| October | | | | | | |
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| S | M | T | W | T | F | S |
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| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

| November | | | | | | |
|----------|----|----|----|----|----|----|
| S | M | T | W | T | F | S |
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | | |

| December | | | | | | |
|----------|----|----|----|----|----|----|
| S | M | T | W | T | F | S |
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | | | | | | |

Key

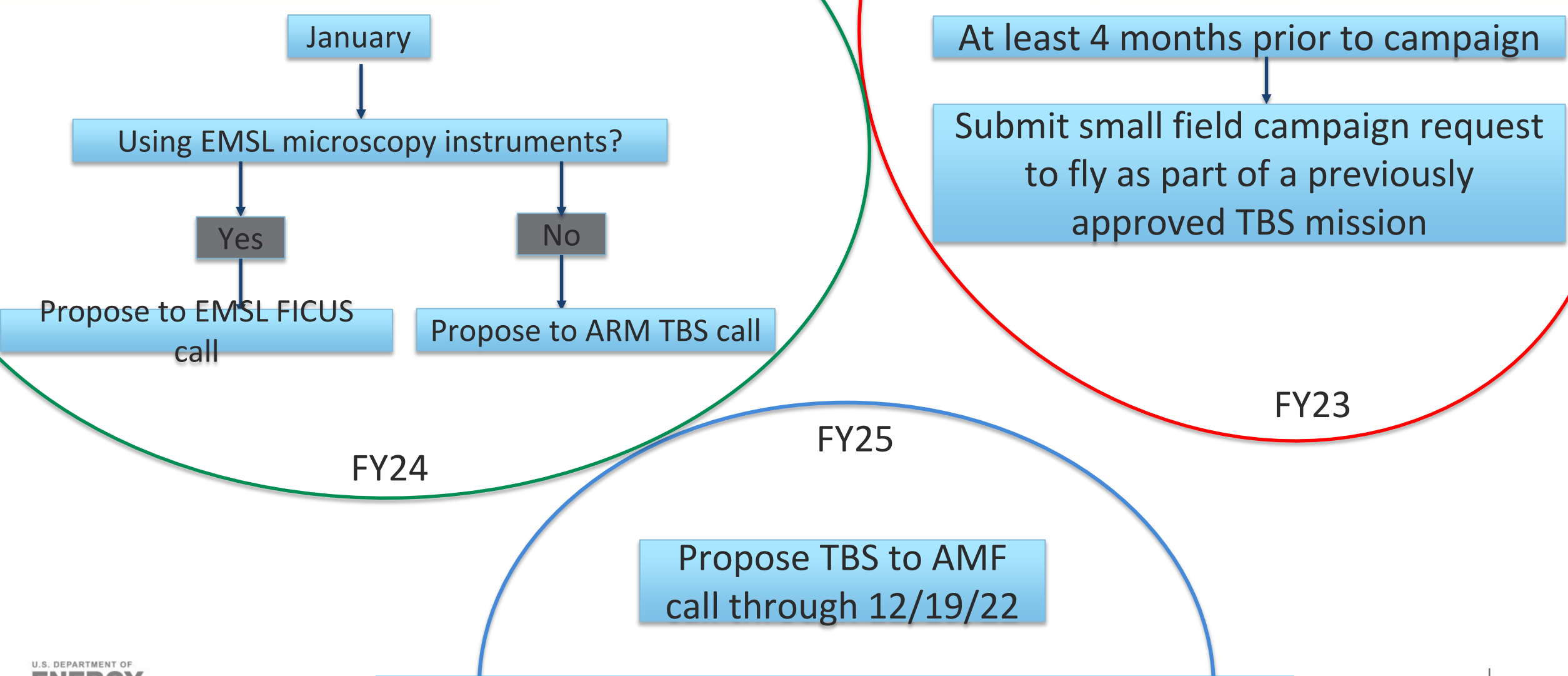
Location

- SAIL
- SGP

AFC

- Aiken-AFC10087
- Zawadowicz-AFC10083
- Browne-1-AFC10075
- Goldstein-AFC10075
- Burrows-AFC10058

Proposing to ARM TBS



FY24

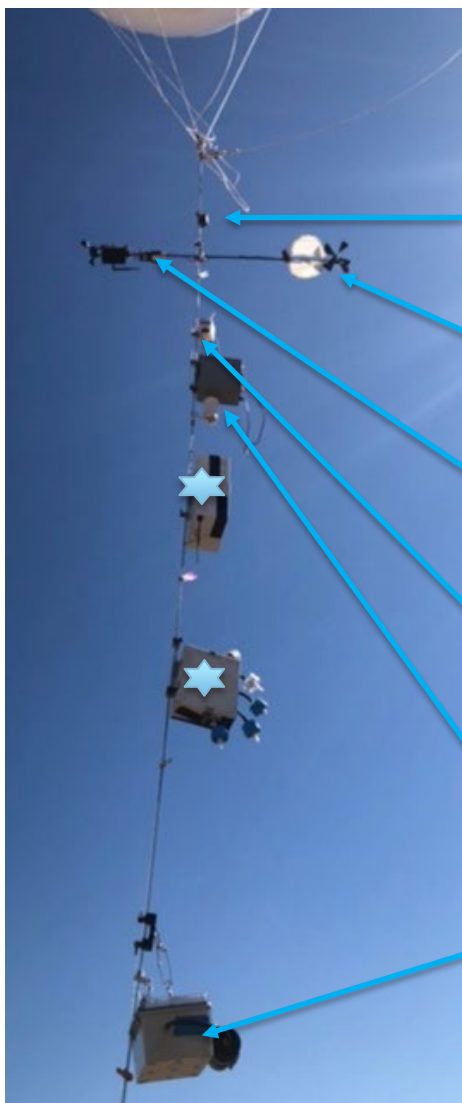
FY25

FY23

Propose TBS to AMF call through 12/19/22

<https://www.arm.gov/policies/campaign-guidelines/tbs>

TBS Data Overview



| Datastream | Primary Measurements | Location |
|------------|--|-----------------------------|
| dtsprof | temperature every 0.25 m between surface and balloon | sgp, oli (guc, hou pending) |
| tbswind | 3D wind speed, wind direction | sgp, oli, guc, hou |
| tbsimetxq2 | temperature, RH, pressure | sgp, oli, guc, hou |
| tbsimet | temperature, RH, pressure | sgp, oli, guc (hou pending) |
| tbspops | aerosol size distribution from 140 nm to 3 μm | sgp, oli, guc, hou |
| tbscpc | total aerosol concentration from 0.01 μm to 1 μm | sgp, oli, guc, hou |

★ EMSL/ARM STAC and TBAC microscopy analyses are expected to be available in 2023.

TBS Merged Data Products

- sgptbsmerged
- olitbsmergedincloud

This product merges data from:

- tbspops (aerosol size distribution from 140 nm to 3 μm)
- tbscpc (total aerosol concentration from 0.01 μm to 1 μm)
- tbswind (3D wind speed, wind direction)
- tbsimet (temperature, RH, pressure)
- tbsimetxq2 (temperature, RH, pressure)
- surface-based ceilometer (boundary layer height, cloud base heights)
- olitbsmergedincloud includes tbsslwc (supercooled liquid water content)

★ These are evaluation data products available on Data Discovery as of 10/19/22. (Krista Gaustad, developer)

Soliciting user input on any issues and requested additions.

Dari Dexheimer, ddexhei@sandia.gov

These products will be run for guc and hou after the evaluation stage is completed (expected in spring 2023).

TBS Merged Data Products



- TBS Merged Data Products plots are available at: <https://www.dmf.arm.gov/ql.php>

Select date

Select data

Plots of each variable for all flights on that date.

Sessions and Posters with Recent TBS Data Use Examples

Poster sessions:

Session 1, Wed 8:00 – 9:30

- Feldman, A Year in the Colorado Rockies -- Perspectives on science opportunities from the first half of SAIL
- Burrows, The Agricultural Ice Nuclei at SGP (AGINSGP) experiment: Understanding sources and variability of ice-nucleating particles in the Great Plains
- Browne, New Particle Formation and Growth in the Southern Great Plains: Seasonal Differences and Vertical Gradients

Session 2, Wed 9:30 – 11:00

- Subba, Characterization of new particle formation events during the TRACER campaign
- Walter, Preliminary results from TRACER-TetherSonde

Session 3, Wed 9:30 – 11:00

- Cornwell, Single particle measurements of ice crystal residuals at the Southern Great Plains site during the AGINSGP experiment

Virtual

- Chen, Gradient of Phase States of Atmospheric Particles at the Southern Great Plains Site
- Lata, Size Resolved Chemistry of Ice Fog Processed Aerosol Particles over the Arctic

Breakout sessions:

Session 5, Wed 2:00 – 4:00

- Scientific Findings from the First Year of SAIL and SPLASH Observations and Directions for the Coming Year

Session 6, Wed 4:15 – 6:15

- Vertical distribution of aerosol properties

- Jessie Creamean (CSU) – TBS INP Measurements
- Swarup China (PNNL EMSL) – Size and Time-resolved Aerosol Collector Results
- Chongai Kuang (BNL) – Vertically-resolved Atmospheric Cluster Observations