Emerging Observational Needs in Atmospheric Chemistry Workshop

Meeting the Challenges of Atmospheric Chemistry Observations

June 16-17, 2025, Boulder, CO, USA

(updated March 31, 2025, subject to change)

Program Chairs: Eric Apel (NCAR), Becky Alexander (UW), and Joel Thornton (UW)

Steering Committee: Steven Brown (NOAA), Allen Goldstein (UC Berkeley), Steve Wofsy (Harvard), Kristie Boering (UC Berkeley), Ron Cohen (UC Berkeley), Armin Sorroshian (U Arizona), Patrick Veres (NCAR EOL), Kelley Barsanti (NCAR ACOM), Sam Hall (NCAR ACOM)

To better serve the atmospheric chemistry community, the National Science Foundation will sponsor a workshop on emerging observational needs in the atmospheric chemistry community. This two-day workshop will bring together scientists supported by the NSF Division of Atmospheric and Geospace Sciences (AGS) Atmospheric Chemistry (ATC) program with scientists and staff that support the NSF Lower Atmosphere Observing Facilities (LAOF) and Community Instruments and Facilities (CIF). The first day is optional. For those who feel up to date with their knowledge about LAOF, CIF, NSF NCAR EOL (Earth Observing Laboratory), and NSF NCAR ACOM (Atmospheric Chemistry and Modeling) facilities and how processes work, they will only attend the second day. Please note, event organizers encourage anyone who wants to attend this workshop to use the travel support application form in the black box above. We intend to support as many participants as the budget allows. .

Themes of the workshop include:

Discuss current and future status (5 yr) of Lower Atmosphere Observing Facilities (LAOF) - aircraft:

NSF NCAR GV and C130, and the Wyoming King Air

Discuss current and future status (5 yr) of laboratory Community Instrument and Facilities (CIF):

Storm Peak Laboratory (SPL) (University of Utah), Pi Convection-Cloud Chamber (Michigan Tech University), Ice Nucleation Code Stage freezing assay (NC State CS) (North Carolina State)

What are the emerging needs for CIF?

Discuss Lower Atmosphere Observational Facilities - Airborne Instrumentation:

Radiation, gas phase, aerosol, flux, cloud chemistry, and meteorological measurements and instrumentation including inlets

Current status – are requestable instruments meeting the present community needs?

Future Status – what new facility provided instrumentation will be needed to 1) provide basic support for community airborne field programs; and 2) answer outstanding questions in atmospheric chemistry?

Discuss university led instrumentation purchases and developments

Custom developments and partnerships with private industry
Emerging new certification requirements and paths forward to meet these
Holistic considerations of community wide assets

Further themes are to 1) Improve communication and knowledge about atmospheric chemistry research activities being conducted by PIs and scientists supported by the NSF-Atmospheric Chemistry Program (ATC) and at NSF supported facilities; 2) Encourage new and continued collaboration between ATC-supported PIs and scientists at NSF supported facilities.

Registration is limited to approximately 100 participants due to space and budgetary limitations. Invited oral presentations will inform participants of current and emerging LAOF facilities, as well as major research challenges. Topical breakout sessions will be the heart of the Workshop. Contributed posters that feature results using LAOF and/or science that could be furthered by additional or updated LAOF capabilities are welcome and will be exhibited for the entire meeting. A Synthesis Committee will meet on 17 or 18 June to integrate topical findings and begin the reporting process.

AGENDA

Monday 16 June

0830-0900: Coffee, tea, light refreshments

0900-0910: Opening remarks – Everette Joseph (NCAR)

0910-0920: Sylvia Edgerton (NSF)

0920-0930: Pieternel Levelt (NCAR)

0930-0940: Logistics and workshop format: Joel Thornton, Eric Apel, and Becky Alexander

0940-1010: Nick Anderson: LAOF and CIF: NSF perspective

Current Lower Atmosphere Observing Facilities: Aircraft

1010-1030: King Air B200T: Shane Murphy plus others from U. WY will discuss the new aircraft and current status

1030-1050: Break

1050-1120: NSF C130 and GV Aircraft Update: Greg Fahrenbruch + others TBD will discuss the current state of the NSF NCAR aircraft (C130/GV) followed by a discussion on the outlook for the program

1120-1145: Recent and future LAOF Projects: NCAR EOL representative

(these are projects that the community is requesting and serves as a starting point for discussing topics of interest to the community)

1145-1210: General discussion and Q & A from the mornings presented information

1210-1330: Lunch

1330-1415: Community Instruments and Facilities (CIF) Overview and Status: Current Laboratories

Pi Convection-Cloud Chamber: Will Cantrell will discuss this facility
Ice Nucleation Cold Stage: Markus Petters will discuss this facility and give a perspective from his experience
Storm Peak Laboratory: TBD person will discuss this facility

1415-1445: Current Lower Atmospheric Observing Facilities: Airborne Instrumentation from NCAR and the university community

Description of what EOL/RAF provide for each mission: Person from RAF
E.g., Aerosol Measurements: RAF with input from ACOM – requestable
Gas Phase Measurements: ACOM with input from EOL – requestable instruments
Meteorological and radiation measurements, etc.

1445-1515: Examples of recent uses of LAOF

WE-CAN/ SLC-SOS/Trans2Am	Emily Fischer
MAIRE24	Steve Wofsy

1515-1540: Break

1540-1600: Discussion of current instrumentation that needs to be maintained/supported (e.g., WAS)

1600-1620: Overview from recent ACOM science advisory board (experimental part) – speaker TBD

1620-1700 Science talk(s) to motivate instrumentational needs. E.g., Coupling laboratory (chamber) and field measurements (with advanced CIMS instrumentation) with the hyper explicit GECKO-A model (Generator of Explicit Chemistry and Kinetics of Organics in the Atmosphere) for a better understanding of urban and fire impacted atmospheric chemistry – Brett Palm and Kelly Barsanti. Where is this field leading us?

1700: Reception and Poster Session

Refreshments will be served

1930: End Reception and Poster Session

Tuesday 17 June

Topical breakout sessions will discuss instrumentation needs, tradeoffs between centralized instrumentation versus flexibility to develop new methods and train students, and barriers to getting new instruments tested and certified. People will rotate between the different topics. I have three 1-hour slots for people to rotate, allowing each person to spend an hour each on 3 topics. If we want people to be able to attend all 6, we can do 30 min each or extend the time. We will need someone from the steering committee to co-chair each session, take notes, and provide a verbal summary at the end. Topics for breakout sessions:

1. Radiation
2. Trace gases
3. Aerosol chemistry and microphysics
4. Cloud chemistry and microphysics
5. Surface fluxes
6. Meteorological parameters

Some guiding thoughts and questions for each session regarding instrumentation:
Instrumentation including inlets needed for measurements in the science areas listed above (+ others?).
Current status – are requestable instruments meeting the present community needs? What should be maintained that we are in danger of losing? (e.g. WAS)
Future Status – what new facility provided instrumentation will be needed to 1) provide basic support for community airborne field programs; and 2) answer outstanding questions in atmospheric chemistry?
What are the barriers to getting new instrumentation on the planes and the ground (CIF)? (Funding, developmental and certification barriers, lack of a working knowledge of LAOF and CIF (e.g., early career scientists, non-R1 institutions, Certifications, etc.)

Discuss center or university led instrumentation purchases and developments

Custom developments and partnerships with private industry
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Additional thoughts to consider:

1) There are instruments that exist and are demonstrated which could advance science problems we are currently studying but which LAOF doesn't have or doesn't have enough of - what are those?

2) There are science problems we are currently studying where there are prototype instruments that if made more robust or cheaper or lower detection limits, etc, that would advance the science - what are those?

3) There are science problems we should be studying but are not due to a lack of observational capabilities - what are those?

4) New instruments often don't just help advance existing science questions, they often help us ask new questions or start new fields, etc.

0830-0900: Coffee, tea, light refreshments

0900-0910: Remarks on previous day and guidance from co-chairs on breakout sessions

0910-1040: Topical breakout sessions

1040-1100: Break

1100-1200: Topical breakout sessions continue

1200-1315: Lunch, included with registration

1315-1345: Topical breakout sessions continue

1345-1445: First summaries of topical breakout sessions (15 min each, allow for some feedback from the larger group)

1445-1515: Break

1515-1545: Summaries continue of topical breakout sessions (15 min each, allow for some feedback from the larger group) continue

1545-1645: Open discussion and concluding remarks

1645: Adjourn

Either Tuesday afternoon/dinner etc. or Wednesday 18 June

Synthesis committee meeting:

- Integrate findings and recommendations derived from the breakout sessions
- Provide overarching findings and recommendations derived from considerations such as scientific and technological readiness, urgency, breadth of applications, other considerations
- Draft a report
- Distill a high-level summary for website postings

Wednesday 18 June

1030: RAF tour for those interested

Note: Please register for this event on the registration site, space limited. More information here on the facility.