Dr. Andrew W. Rollins
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Expertise
I am an expert in tropospheric and stratospheric chemical processes which control air quality, climate, and ozone. My research in recent years has centered around the development of novel in-situ measurement techniques for sulfur dioxide, nitrogen oxides and reactive halogen species, and the deployment of these instruments on stratospheric airborne research platforms. I am using these measurements primarily to explore chemistry in remote parts of the troposphere and into the lower stratosphere.

Recent and ongoing research foci:
- Understanding the budget of sulfur in the stratosphere, both by transport of biogenic and anthropogenic sulfur from the troposphere and direct stratospheric input of sulfur from aviation emissions
- Chemistry of sulfur and aerosol formation in the marine boundary layer
- Emission of reactive nitrogen from the oceans
- Heterogeneous chemical reactions in the stratosphere and their impacts on ozone

Research Positions

2018 to Present	Research Chemist with NOAA Chemical Sciences Laboratory
2010 to 2018	Research Scientist, Cooperative Institute for Research in Environmental Sciences (CIRES), and NOAA Chemical Sciences Laboratory, Boulder, Colorado.
2005 – 2010	Graduate research assistant, University of California Berkeley, Berkeley, California.

Education
Ph.D. Physical Chemistry (2010), University of California, Berkeley, California.
B.S. Physics (2001), Harvey Mudd College.

Airborne Science Research Experience
Principal Investigator for in-situ measurements of nitrogen oxides

2022	NASA Asian Summer Monsoon Chemical and Climate Impact Project (ACCLIP)
2022	NASA Stratospheric Aerosol processes, Budget and Radiative Effects (SABRE)
2019	NASA/NOAA Fire Influence on Regional to Global Environments and Air Quality (FIREX-AQ)

Principal Investigator for in-situ measurements of sulfur dioxide

2022	NASA Asian Summer Monsoon Chemical and Climate Impact Project (ACCLIP)
2022	NASA Stratospheric Aerosol processes, Budget and Radiative Effects (SABRE)
2019	NASA/NOAA Fire Influence on Regional to Global Environments and Air Quality (FIREX-AQ)
2018	NASA Atmospheric Tomography (ATom)
2016	NASA Pacific Oxidants, Sulfur, Ice, Dehydration and Convection (POSIDON)
2015	NASA Volcano-plume Investigation Readiness and Gas-phase and Aerosol Sulfur (VIRGAS)

Principal Investigator or Co-Investigator for in-situ measurements of water vapor, total water and/or ozone

2013 - 2014	NASA Airborne Tropical Tropopause Experiment (ATTREX)
2013	NASA Studies of Emissions, Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys ($SEAC^4RS$)
2011	NASA Mid-latitude Airborne Cirrus Properties Experiment (MACPEX)

Major Research Accomplishments

Developed a new laser-induced fluorescence technique for measuring nitric oxide at sub-parts per trillion mixing ratios and used this technique to investigate NO_x partitioning in the upper troposphere / lower stratosphere region.

Developed a new laser-induced fluorescence technique for measurement of sulfur dioxide at single parts-per-trillion mixing ratios. Performed the first in-situ survey of SO_2 in the tropical lower stratosphere and elucidated the role of tropospheric SO_2 as a source of stratospheric aerosols.

Developed two new in-situ calibrated tunable diode laser and chemical ionization mass spectrometric techniques for measurements of water vapor and ice water content in the upper troposphere and lower stratosphere (UT/LS). Used these instruments to re-define the observed range of relative humidity in the tropopause region and understand microphysics associated with stratospheric dehydration.

Awards

Presidential Early Career Award in Science and Engineering (PECASE, awarded 2019).

CIRES Innovative Research Proposal grant, 2017: A. Rollins, J. Schwarz, Direct spectroscopic detection of tropospheric chlorine radicals.

CIRES Outstanding Performance Award in Science and Engineering, 2016: for development and demonstration of a new laser-induced fluorescence technique to measure sulfur dioxide in the upper troposphere and lower stratosphere.

NOAA Special Early-Stage Experimental or Development (SEED) proposal grant, 2013: R.-S. Gao, D. Fahey, D. Murphy, K. Rosenlof, T. Thornberry, A. Rollins, Development of an Aerosol and Radiation Package for Deployment in an Unmanned Aerial System (UAS).

CIRES Innovative Research Proposal grant, 2013: A. Rollins, T. Thornberry, R. Neely, R.-S. Gao., A compact, sensitive LIF instrument for the measurement of SO_2.

CIRES Outstanding Performance Award in Science and Engineering: 2012, for development and demonstration of a new chemical ionization mass spectrometry technique to measure water vapor in the upper troposphere and lower stratosphere.

Outstanding Poster Presentation Award: World Climate Research Programme Open Science Conference, 2011.

Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS) XI participant, 2011.

Lawrence Berkeley National Laboratory Advanced Light Source Doctoral Fellowship, 2009-2010.

Invited Presentations
Harvard University Atmospheric and Environmental Chemistry Seminars: *A little goes a long way: The importance of trace SO_2 in remote parts of the atmosphere*, October 2020

National Oceanic Atmospheric Administration Global Monitoring Annual Conerence: *Single-Photon LIF: A potential new benchmark for atmospheric measurements of nitric oxide*, November 2020

National Center for Atmospheric Research: *Single-Photon LIF: A potential new benchmark for atmospheric measurements of nitric oxide*, July 2020

National Center for Atmospheric Research, Atmospheric Chemistry Observations & Modeling Seminars: *Constraining the stratospheric sulfur budget: aircraft observations of SO_2 in the Tropical UT/LS*, February 2018

Publications
As-of May 2022, I have authored or coauthored 54 peer-reviewed publications, and have a Hirsch index of 20.

First-Author Publications

1. Rollins A. W., et al. “Single-photon laser-induced fluorescence detection of nitric oxide at sub-parts per trillion mixing ratios.” Atmos. Meas. Tech. Discuss, doi:10.5194/amt-2020-24, 2020.
2. Rollins, A. W. “Laser Induced Fluorescence Technique for Direct Measurement of Nitric Oxide Using a Fiber Laser and Measurement of Nitrogen Dioxide by Photolytic Conversion to Nitric Oxide.” U.S. Provisional Pat. Ser. No. 62/815,552, filed 03/08/2019.
3. Rollins, A. W., et al., “SO_2 Observations and Sources in the Western Pacific Tropical Tropopause Region.” Journal of Geophysical Research, doi:10.1029/2018JD029635, 2018.
4. Rollins, A. W., et al., “The Role of Sulfur Dioxide in Stratospheric Aerosol Formation Evaluated Using In- Situ Measurements in the Tropical Lower Stratosphere.” Geophysical Research Letters, doi:10.1002/2017GL072754, 2017.
5. Rollins, A. W., et al., “A laser-induced fluorescence instrument for aircraft measurements of sulfur dioxide in the upper troposphere and lower stratosphere.” Atmospheric Measurement Techniques, 9, 4601-4613, 10.5194/amt-9-4601-2016, 2016.
6. Rollins, A. W., et al., “Observational constraints on the efficiency of dehydration mechanisms in the tropical tropopause layer.” Geophysical Research Letters, doi:10.1002/2016GL067972, 2016.

7. Rollins, A. W., et al., “Evaluation of UT/LS hygrometer accuracy by intercomparison during the NASA MACPEX mission.” Journal of Geophysical Research, doi:1002/2013JD020817, 2014.
8. Rollins, A. W., et al., “Gas/particle partitioning of total alkyl nitrates observed with TD-LIF in Bakersfield.” Journal of Geophysical Research, doi:10.1002/jgrd.50522, 2013.
9. Rollins, A. W., et al., “Evidence for NO_X Control over Nighttime SOA Formation.” Science, doi:10.1126/science.1221520, 2012.
10. Rollins, A. W., et al., “Catalytic oxidation of H_2 on Platinum: a robust method for generating low mixing ratio H_2O standards.” Atmospheric Measurement Techniques, 4, 2059-2064, doi:10.5194/amt- 4-2059-2011, 2011.
11. Rollins, A. W., et al., “Real time in situ detection of organic nitrates in atmospheric aerosols.” Environmental Science and Technology, 44, 5540-5545, doi:10.1021/es100926x, 2010.
12. Rollins, A. W. et al., “Elemental analysis of aerosol organic nitrates with electron ionization high-resolution mass spectrometry.” Atmospheric Measurement Techniques, 3, 301 – 310, doi:10.5194/AMT-3-301-2010, 2010.
13. Rollins, A. W. et al., “Isoprene oxidation by nitrate radical: Alkyl nitrate and secondary organic aerosol yields.” Atmospheric Chemistry and Physics, 9, 6685-6703, 2009, doi:10.5194/acp-9-6685-2009, 2009.