Advancing our understanding of atmospheric composition and climate

Quarterly Newsletter

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*The **Chemical Sciences Laboratory (CSL)** is one of ten NOAA Research Laboratories located throughout the United States organized under the office of **Oceanic & Atmospheric Research (OAR)** . CSL is one of four individual OAR labs located within the David Skaggs Research Center (DSRC) in Boulder, Colorado. The research conducted at CSL aims to advance scientific understanding of the chemical and physical processes that affect Earth's atmospheric composition and climate.*

Recent News from CSL

Non-local ozone sources create a springtime air quality challenge for Las Vegas

The last two decades have witnessed significant air quality improvements in the United States with broad reductions in nitrogen dioxide (NO2), one of the photochemical precursors of ground-level ozone (O3), a serious lung irritant that is regulated by the EPA. While NO2 (which is also regulated) has declined by approximately 38% across the country, the corresponding improvements in ozone have not been uniform, with decreases of 25% in the southeastern U.S. but only 11% in the southwest.

The weaker ozone reductions in the western states are partially attributable to population growth and increased emissions from oil and gas operations; but Western cities such as Las Vegas are also plagued by high background ozone levels in the late spring and early summer months from non-local, and more importantly non-controllable, sources that create a challenge for air quality managers. Now, new results from an in-depth study of ozone production and transport in the greater Las Vegas area, published in Atmospheric Chemistry & Physics, reveal just how much of the city's ground-level ozone may be coming from these non-local and non-controllable sources.

Read the full story >>

Icy cirrus clouds born from desert dust

Every year several billion tonnes of mineral dust are lofted into the atmosphere from the world's arid regions, making dust one of the most abundant types of aerosol particles in the atmosphere. Now, scientists are learning that tiny bits of dust from the hottest and driest parts of the Earth are a surprisingly large driver in forming the delicate, wispy ice clouds known as cirrus in the cold, high-altitudes of the atmosphere.

While scientists have known that desert dust particles can seed certain clouds, the extent of that relationship has been a long-standing question. New research, based on the largest-ever airborne atmospheric sampling mission and published in Nature Geoscience, sheds light on the role of dust in the climate system, revealing that dust plays a dominant role in forming cirrus clouds across both the northern and southern hemispheres, and that certain deserts are far more efficient than others when it comes to cloud creation.

Read the full story >>

Projected increase in space travel may damage the ozone layer

Projected growth in rocket launches for space tourism, moon landings, and perhaps travel to Mars has many dreaming of a new era of space exploration. But a NOAA CSL study suggests that a significant boost in spaceflight activity may damage the protective ozone layer on the one planet where we live.

Kerosene-burning rocket engines widely used by the global launch industry emit exhaust containing black carbon, or soot, directly into the stratosphere, where a layer of ozone protects all living things on the Earth from the harmful impacts of ultraviolet radiation, which include skin cancer and weakened immune systems in humans, as well as disruptions to agriculture and ecosystems.

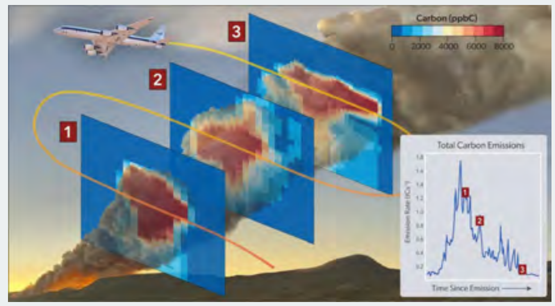
According to new CSL research published in the Journal of Geophysical Research Atmospheres, a 10-fold increase in hydrocarbon fueled launches, which is plausible within the next two decades based on recent trends in space traffic growth, would damage the ozone layer, and change atmospheric circulation patterns.

Read the full story >>

Air pollution reduced during the COVID-19 pandemic

A decrease in emissions of ozone precursor gases during the COVID-19 economic downturn likely explains the unusual reduction in ozone concentrations observed during the spring and summer of 2020.

Read more >>



Measuring total emissions from Western U.S. wildfires

Carbonaceous emissions from wildfires are a dynamic mixture of gases and particles that have important impacts on air quality and climate. New CSL research presents a novel method to estimate total carbon emission rates using a unique combination of lidar remote sensing and in situ measurements.

Read more >>

Current Activities

Preparations underway for upcoming CalFiDE and ACCLIP field campaigns

California Fire Dynamics Experiment (CalFiDE)

CalFiDE 2022
California Fire Dynamics Experiment

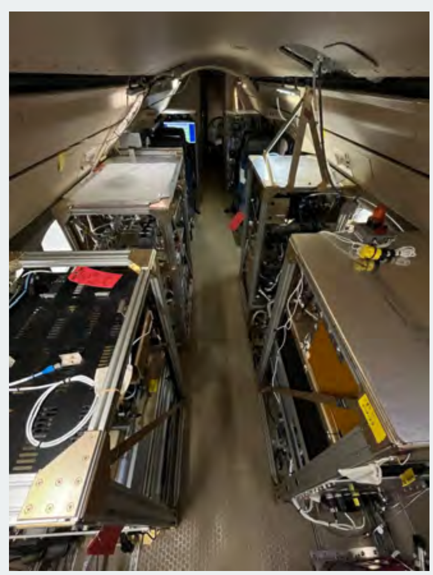
PUMAS
Pick-Up based Mobile Atmospheric Sounder

Beginning in August, NOAA CSL will be partnering with San Jose State University for a 6 week ground and aircraft-based study of wildfire behavior and its response to spatially and temporally evolving wind fields in California. During the campaign, ground-based mobile scanning radars and lidars will be positioned around the fire to track the temporally evolving wind fields, spatial structure, and internal dynamics of the fire plume, while the NOAA Twin Otter flies overhead to track fire behavior, strength, and dynamics over a larger spatial scale.

In addition to making airborne lidar measurements, CSL's Atmospheric Remote Sensing program will be deploying their PUMAS (Pick-Up based Mobile Atmospheric Sounder) mobile platform outfitted with a micro-pulse doppler lidar instrument (shown above). Researchers are currently hard at work preparing and testing PUMAS on site at our Boulder Laboratory before making the long drive out to California later next month.

Learn more about the CalFiDE project

Asian Summer Monsoon Chemical & Climate Impact Project



Also happening this summer, CSL researchers will participate in the NASA/NCAR Asian Summer Monsoon Chemical & Climate Impact Project (ACCLIP) in South Korea. In preparation for the August mission, the NASA WB-57 and NCAR G-V research aircraft are being outfitted with state-of-the-art instrumentation to investigate trace gases and aerosols in the upper troposphere and lower stratosphere transported by the Asian Summer Monsoon. Shown above are CSL researchers Chuck Brock, Shuka Schwarz, and Georgia Michailoudi installing instrumention for measuring black carbon and total aerosol distributions on the G-V.
The Asian Summer Monsoon (ASM) is the largest meteorological pattern in the Northern Hemisphere (NH) summer season. Persistent convection and the large anticyclonic flow pattern in the upper troposphere and lower stratosphere (UTLS) associated with ASM leads to a significant enhancement in the UTLS of trace species from pollution and biomass burning origins. The monsoon convection occurs over South, Southeast, and East Asia, a region of uniquely complex and rapidly changing emissions tied to both its high population density and significant economic growth. The coupling of the most polluted boundary layer on Earth to the largest dynamical system in the summer season through the deep monsoon convection has the potential to create significant chemical and climate impacts. An accurate representation of the ASM transport, chemical and microphysical processes in chemistry-climate models is much needed for characterizing ASM chemistry-climate interactions and for predicting its future impact in a changing climate.

Visit the ACCLIP Mission Website

People of CSL — Staff Spotlight

Every summer, CSL hosts a number of students at our Laboratory in Boulder, Colorado, where they gain hands-on experience working alongside our scientists and staff on projects in applied research, modeling, coding, engineering, and science communications.

Our interns come to us from a variety of training and scholarship programs, such as NCAR/UCAR Significant Opportunities in Atmospheric Research and Science (SOARS), CIRES Research Experience for Community College Students (RECCS), and NOAA's Hollings Undergraduate Scholarship and Educational Partnership Program with Minority Serving Institutions (EPP/MSI) programs, and range from high school to graduate school level.

This year, we are excited to host seven talented student interns from across the country.

Karly Beaumont
Director's Office (Communications)

NOAA Hollings Scholar

Nabhia Hasan
Tropospheric Chemistry

NOAA Hollings Scholar

Killian McSweeney
Chemistry & Climate Processes

NOAA Hollings Scholar

Divya Rea
Chemistry & Climate Processes

NOAA Hollings Scholar

Mark Irby-Gill
Clouds, Aerosol, & Climate

SOARS Program Intern

Gavin Rodriguez
Regional Chemical Modeling

Summer Intern

Dylan Simone
Aerosol Properties & Processes

Summer Undergraduate CIRES Student

Read more about our Summer students >>