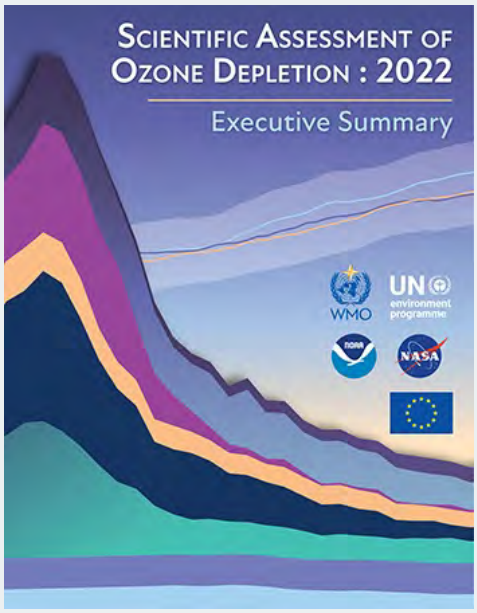
Advancing our understanding of atmospheric composition and climate

Quarterly Newsletter

Fall 2022 | Issue 3

*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



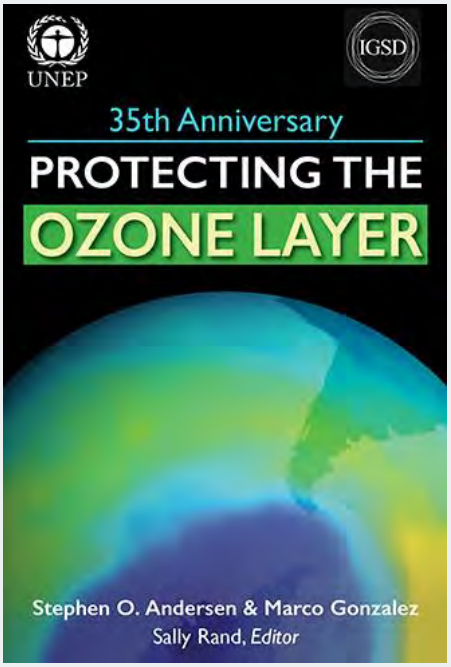
MOP34 Conference Marks the 35th Anniversary of the Montreal Protocol

The Thirty-Fourth Meeting of the Parties to the Montreal Protocol (MOP34) was held from 31 October - 4 November in Montreal, Canada, marking the 35th anniversary of this groundbreaking international treaty.

This year's conference of the Parties coincides with the 2022 Scientific Assessment of Ozone Depletion, a quadrennial report organized and chaired by the Scientific Assessment Panel (SAP) of the Montreal Protocol. The SAP is one of three scientific and technical advisory panels to the Protocol and is co-chaired by NOAA CSL Director David Fahey, Paul Newman of NASA Goddard, John Pyle of the University of Cambridge, and Bonfils Safari of the University of Rwanda. The SAP presented the Executive Summary of the 2022 Assessment to the Parties at the high-level plenary session on Thursday, 3 November, highlighting the major findings from

this year's report.

On Monday, 31 October, delegates gathered at a side event for the launch of a new book celebrating the 35th Anniversary of the Montreal Protocol. Protecting the Ozone Layer was written by Montreal Protocol veterans Stephen O. Andersen, former Co-Chair of the Technology and Economic Assessment Panel (TEAP), and Marco Gonzalez, former Executive Secretary of the Ozone Secretariat. It tells the story of the "inspired treaty design" underpinning the Montreal Protocol's successes and aims to inspire "new ambition" to protect both the ozone layer and the climate. NOAA CSL's Communications Lead Chelsea Thompson is a contributor to the book, authoring a section on Art in Scientific Communication that highlights graphics, both past and present, depicting aspects of ozone depletion science and the Montreal Protocol.



Read the full story >>

AGES Workshop in Boulder Brings Together Researchers for Multi-Campaign Collaboration in 2023

From 27-29 September, CSL and CIRES hosted the AGES Workshop at the Sustainability, Energy, and Environmental Community (SEEC) facility at the University of Colorado Boulder. The AGES Workshop brought together researchers and stakeholders from all of the different field activities occurring during the summer of 2023, including AEROMMA+CUPiDS, GOTHAAM, EPCAPE, and STAQS, to discuss science goals, planning, and coordination. The objective of the AGES initiative is to increase collaborations both logistically and scientifically between participants from all of the campaigns, between researchers and environmental managers/stakeholders, and between researchers collecting the measurements and those using the measurements for model and/or satellite evaluation. These numerous collaborative field campaigns include observations from a variety of research aircraft from several different agencies and universities, mobile platforms, and satellites on both the West Coast and East Coast of the US, along with extensive modeling and emissions inventory activities. NOAA CSL is the lead agency

for both the AEROMMA and CUPiDS projects. The AGES Workshop was organized by CSL scientists Rebecca Schwantes, Carsten Warneke, and Chelsea Stockwell. Funding for the AGES Workshop was provided by the **NOAA Climate Program Office AC4 Program**.

Learn more about AGES >>

CSL Researchers Investigate Western Wildfires from the Ground and the Air

Scientists from NOAA's Chemical Sciences Laboratory and the University of Colorado CIRES were in California this summer, partnering with San Jose State University and the University of Nevada, Reno for a five-week study of wildfires and their response to evolving wind fields in the complex terrain of the Western US. The mission, called CalFiDE

(California Fire Dynamics Experiment), combined aircraft and ground-based mobile remote-sensing and in situ measurements for a comprehensive and detailed look at fire behavior, plume dynamics, and emissions. From August to September, scientists studied several wildfires in Northern California and Oregon, including, the Mosquito Fire in Placer County, CA, which made national news when it rapidly grew in size, exhibiting extreme fire behavior and generating massive pyrocumulous (PyroCb) clouds.

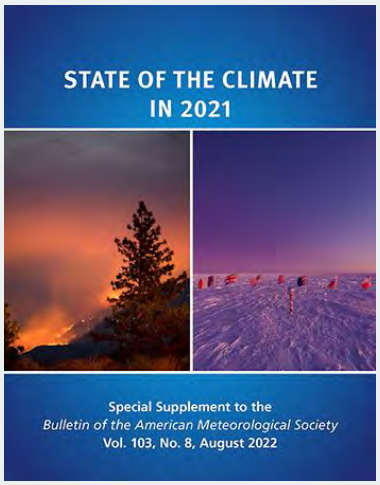
For the airborne measurements, a NOAA Twin Otter was outfitted with instruments to measure a suite of atmospheric chemistry compounds and a scanning Doppler lidar to measure vertical and horizontal winds over and around wildfires. The aircraft also carried a high-resolution infrared imaging system to track the evolution of the active flame front and other sensors to measure fire radiative power (FRP). On the ground, CSL's PUMAS (Pickup-based Mobile Atmospheric Sounder) truck was deployed with mobile Doppler lidar and radar systems from our California and Nevada partners. The combined measurements will provided new information on how spatially complex and temporally evolving inflow wind fields impact fire behavior and plume dynamics This experiment also provided new data on the emissions and chemistry leading to ozone formation and particulates in wildfire plumes, which will help advance our understanding of the significant air quality impacts affecting populated areas downwind of these plumes.

Learn more about the CalFiDE project

Wildfire Experts Provide Guidance for New Research Directions

As wildfires cause increasing devastation worldwide, dozens of fire experts across the nation are joining together in calling for a more strategic and interdisciplinary approach to pursuing wildfire research and protecting vulnerable communities.

A new study, led by a scientist at the National Center for Atmospheric Research (NCAR) and co-authored by 86 other fire experts from a breadth of disciplines, including CSL/CIRES scientist Megan Bela, highlights the obstacles for fire science and provides guidance for



State of the Climate Report Confirms Record-High Greenhouse Gases

Greenhouse gas concentrations, global sea levels and ocean heat content reached record highs in 2021, according to the State of the Climate in 2021 report.

The international annual review of the world's climate, led by scientists from NOAA's National Centers for Environmental Information (NCEI) and published by the Bulletin of the American Meteorological Society (BAMS), provides the most comprehensive update on Earth's climate indicators, notable weather events and other data

investing in future research. The study outlines five key challenges to advance the study of fire. These range from promoting coordinated research to drawing on diverse sources of knowledge.

Read more >>

collected by environmental monitoring stations and instruments located on land, water, ice and in space. Several NOAA and Cooperative Institute for Research in Environmental Sciences (CIRES) authors contributed to the report, including Amy Butler, Owen Cooper, Kai-Lan Chang, Sean Davis, Karen Rosenlof, and Michael Todt from CSL.

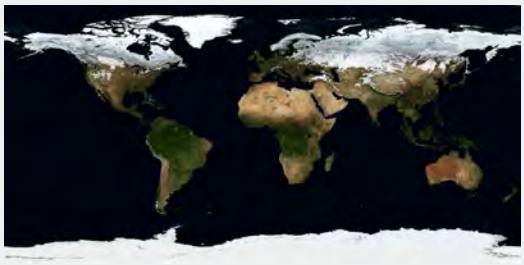
Read more >>

Global Air Quality Impacts from Wildfires, Heat Increasing and Expected to Keep Rising

In 2021, hot, dry conditions in some parts of the world fueled the spread of wildfires and worsened air quality—and both wildfires and air pollution are expected to increase as the climate continues to warm, according to an annual report from the World Meteorological Organization (WMO). Owen Cooper, a CIRES scientist in CSL, is lead editor of the 2022 WMO Air Quality and Climate Bulletin No. 2 released in September.

The bulletin documents the connections between air quality and climate change, including how the growing frequency and intensity of wildfires led to increased particulate matter pollution in 2021. The report also outlines a range of possible air quality outcomes throughout the 21st century as the climate warms under high- and low-emissions scenarios.

Read more >>



The Rise and Fall of Earth's Strong Clear-sky Albedo Symmetry

The amount of sunlight that gets reflected by earth's Northern and Southern Hemispheres is identical, but we don't yet know why.
New research from CSL/CIRES researcher Michael Diamond shows that the asymmetric clear-sky component of the global albedo symmetry is strongly influenced by aerosol and ice, and will likely decline in future emissions scenarios.

The article was published in September in Nature Communications Earth & Environment.

Also check out the Behind the Paper post about this research from the author.

Awards & Recognition

NOAA CSL receives 2022 Healthy Community Award from Boulder County Public Health

NOAA CSL was recognized for their work in supporting our communities impacted by the Marshall Fire. The work of NOAA in providing outdoor air monitoring immediately after the fire throughout the burn area to measure gaseous air pollutants caused by the fire was essential in ensuring residents in and around the burn area were safe. Their findings provided much needed answers to outdoor air quality health concerns of the community and is to be commended.

CSL scientists Carsten Warneke, Jessica Gilman, Matt Coggon, Jeff Peischl, Chelsea Stockwell, and Steve Brown responded in January 2022 with the CSL Mobile Laboratory.

Read more >>

Tropospheric Chemistry Program Leader Steven Brown Elected as AGU Fellow

Steven S. Brown has been elected as a Fellow of the American Geophysical Union (AGU), in recognition of remarkable innovation and sustained scientific impact.

Dr. Brown's research at NOAA has focused on the chemistry and impacts of nitrogen oxides in the Earth's atmosphere. His scientific impact is evident in both his leadership of integrated field studies, and his innovative development of high sensitivity optical instrumentation for laboratory and field studies of atmospheric trace gases and aerosols.

Read more >>

People of CSL — Staff Spotlight

Elizabeth Asher

Elizabeth (Lizzy) Asher is a CIRES research scientist in CSL in the Atmospheric Composition & Chemical Processes research program. She joined CSL in February of 2019.

Lizzy grew up in Austin, Texas, but spent several years as a child in both Stuttgart, Germany and

Toulouse, France. Although originally wanting to be an engineer, she decided in college to be a scientist. Lizzy majored in Earth Sciences at Dartmouth, then got a PhD in Oceanography at the University of British Columbia studying emissions of dimethyl sulfide (DMS) and other related sulfur compounds in the ocean. After that, she spent one year as a postdoctoral research associate in the Atmospheric Sciences department at UC Davis, California, and two years as an ASP postdoc at NCAR in the Atmospheric Chemistry Observations and Modeling (ACOM) department studying emissions of volatile organic compounds before joining CSL.

Here at CSL, Lizzy primarily studies stratospheric aerosol size distributions and works on a variety of project using the Portable Optical Particle Spectrometer (POPS). In her free time, she enjoys rock climbing, skiing, gymnastics, tennis, and reading.

Learn more about Lizzy

Sunil Baidar

Sunil Baidar is a CIRES research scientist in the Atmospheric Remote Sensing program in CSL. He joined the Lab in October of 2015.

Sunil is from Banepa, Nepal, a small time outside the Kathmandu Valley, which includes the capital city, Kathmandu. He went to a boarding school in Kathmandu Valley at 10, so was mostly away from home.

Sunil came to the U.S. to attend Dickinson College, a small liberal arts school in Pennsylvania. At Dickinson, he worked for an organization that was originally founded to study the impact of acid deposition on Pennsylvania's waterways and the effectiveness of the Clean Air Act amendments. Wanting to study air quality, he then applied to the chemistry graduate program at University of Colorado Boulder and was very fortunate to receive the ESRL-CIRES graduate fellowship to work together with CSL scientists from the Atmospheric Remote Sensing (ARS) group on synergistic applications of active and passive remote sensing instruments. After finishing graduate school, he joined ARS to work on validating the Green Optical Autocovariance Wind Lidar (GrOWL), an airborne prototype of a future space-based system.

At CSL, Sunil's research is focused on developing new retrievals and data products from Doppler

lidar measurements, understanding interactions between marine boundary layer and clouds, and characterizing urban boundary layer dynamics that affect air quality. He is the principal Investigator for the upcoming Coastal Urban Plume Dynamics Study (CUPiDS) field experiment looking at the role of coastal dynamics on air quality in the New York City region.

In his free time, Sunil enjoys spending time with his two daughters, who are now 1 and 5 years old.

Learn more about Sunil