



Cooperative Institute for Research in Environmental Sciences

University of Colorado Boulder

Science to **BENEFIT** society

CIRES scientists conduct world-class Earth system and data science research. Our work helps people and communities build resilience in the face of a changing environment.



University of Colorado
Boulder



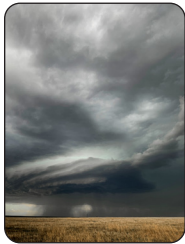
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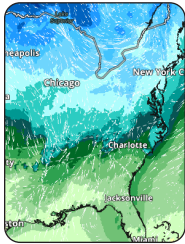
Weather and Water

CIRES work in weather and water encompasses advancing weather observing systems, developing weather information dissemination tools, and providing communities with actionable information for managing water resources.

Key Successes



Providing actionable weather information
CIRES scientists developed a decision support tool that translates weather forecasts into personalized guidance for emergency managers, transportation officials, and event planners. The tool helps decision-makers evaluate when to close roads, cancel events, or order evacuations.



Advancing weather forecasts
CIRES scientists helped develop the Rapid Refresh Forecast System (RRFS), which provides higher resolution, faster-updating, and more accurate weather forecasts. Their work provides guidance for emergency managers, aviation, energy grid operators, and communities across the country.



Supporting water management
The CIRES Western Water Assessment program partners with decision-makers in Colorado, Utah and Wyoming to make the best use of science to manage drought and wildfire impacts in their communities.

Innovations

Environmentally-friendly weather instruments
CIRES scientists developed new instruments to measure water vapor in the atmosphere using dry ice and alcohol or liquid nitrogen instead of HFC-23, a powerful greenhouse gas.



Sample return technologies
CIRES scientists designed an aerial glider system designed to steer weather balloon payloads back to their original launch location, allowing scientists to collect atmospheric observations in regions that are difficult to access.



Fire and Air

CIRES research on Earth's atmosphere has a particular focus on fire weather and air quality. Our scientists study the composition and chemistry of the atmosphere, how wildfires spread, and how indoor and outdoor pollutants are made.

Key Successes



Collecting first-of-their-kind observations

CIRES scientists have pioneered new ways to study wildfires and their impacts. For the first time, they have examined indoor air quality immediately following a wildfire and studied active wildfires in real time from aircraft, trucks, and satellites simultaneously.



Understanding human impacts to the upper atmosphere

CIRES researchers studying the composition of aerosols in the upper atmosphere have found metallic aerosols from satellite re-entry litter the stratosphere and could impact Earth's climate in unforeseen ways.



Changing how we think about wildfire risk

CIRES research shows that fires in the western United States are getting faster and more destructive. The findings suggest communities should prepare for future fires by hardening homes and making robust evacuation plans.

Innovations

A drone-based wildfire observing system

CIRES scientists developed a lightweight, drone-based payload to study active wildfires both during the day and at night.



Compact, affordable atmospheric instruments

CIRES scientists designed two new low-cost, lightweight instruments for measuring trace gases relevant to climate and air quality studies: an ozone photometer and an ice spectrometer.



Earth and Sun

CIRES researchers explore topics from the solid Earth to the surface of the Sun. Our research encompasses Earth's core and mantle, the oceans, changes in polar regions, and how solar activity influences geomagnetic storms.

Key Successes



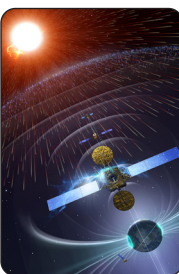
Revolutionizing tsunami warning capabilities

CIRES scientists are helping NOAA standardize its tsunami warning system. Their work will streamline workflow and provide seamless backup capabilities across the United States tsunami warning centers, ultimately saving lives and property.



Documenting a fundamental continent-building process

CIRES scientists observed dense portions of Earth's lithosphere peeling off and dropping into the mantle below the Sierra Nevada mountains, providing rarely-seen evidence for how continents are built all over the planet.



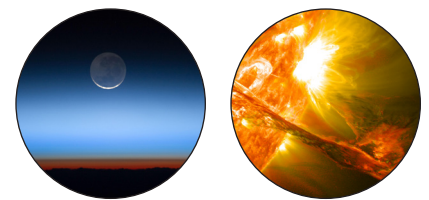
Supporting a new solar observatory

CIRES scientists develop, calibrate, and validate instruments that monitor the Sun and warn of solar storms—including those on the world's first satellite dedicated to space weather monitoring, launched in 2025. CIRES-built warning systems give utilities, airlines, and the military time to protect critical infrastructure.

Innovations

A real-time global model of the upper atmosphere

CIRES scientists developed a model that tracks how solar activity disrupts GPS and communication signals, giving forecasters the time needed to protect systems that millions of Americans depend on every day.



A next-generation space weather forecasting tool

CIRES scientists developed an essential tool to predict if and when coronal mass ejections—among the most hazardous solar events—will impact Earth.