



# 2013 annual report

executive summary

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COOPERATIVE INSTITUTE FOR RESEARCH IN ENVIRONMENTAL SCIENCES

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Waleed Abdalati

**CIRES Interim Director (July 1, 2012–June 30, 2013)**  
William M. Lewis Jr.

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## From the Interim Director



**William M. Lewis Jr.**

Dear Colleagues,

CIRES is as steady as a battleship most of the time, but occasionally she pitches and rolls in rough water. This was the case during the University of Colorado Boulder's 2013 fiscal year (July 2012 to June 2013, FY13), which began calmly enough. As we were preparing ourselves to

meet the challenge of a request for proposals (RFP) from NOAA to submit a recompetition proposal for the CIRES-NOAA Cooperative Agreement, however, we experienced the loss of Suzanne Van Drunick, Associate Director for Science, and then Konrad Steffen, Director. The lead time for preparation of the proposal was short, and the administrative staff was anxious, to say the least. CIRES hired Kristen Averyt, to become the new Associate Director for Science. As a veteran of proposal preparation for NOAA, she proved a great asset for our response to the RFP. The administrative staff put forth considerable effort, and we relied on the expertise of senior CIRES scientists working with the federal laboratories to identify research areas to meet the nine new themes identified for us by NOAA for future research. The outcome was success: CIRES received a five-year award for up to \$160 million and will have the opportunity to submit a renewal proposal for a second five years.

Also in FY13, we experienced an undefined budget threat, as did all federal and federally supported programs. Sequestration or other budget measures could have affected CIRES severely. There was some shortfall of projected income in the NOAA-CU collaboration, but it was absorbed by programmatic changes that did not result in layoffs or other personnel actions.

Yet another challenge for FY13 was the search for a new CIRES Director. After a process much longer than anticipated, and well into 2013, CIRES successfully made an offer to Waleed Abdalati, a CU-Boulder faculty member and most recently Chief Scientist for NASA, who became Director on July 1, 2013. It seems that FY13

will be a good year for recuperation, enjoyment of the new Cooperative Agreement, and new leadership.

Despite administrative turbulence, the CIRES-NOAA science machine worked smoothly and productively during FY13. As our full 2013 annual report shows, CIRES scientists turned out some fundamentally important and, in some cases, surprising observations and analyses during FY13. For example, CIRES and NOAA scientists collaborated on the first comprehensive quantitative analysis of black carbon (soot), which is released in quantity through fossil fuel combustion as well as fires. The importance of black carbon to the heat balance of Earth has been greatly underestimated; the NOAA-CIRES analysis has produced more accurate estimates of its effects and will allow projections into the future, including evaluation of potential benefits to come from control of black carbon in the atmosphere.

In a study of regional significance, CIRES scientists showed through field sampling of the atmosphere in the vicinity of Colorado oil and gas wells that emission of ozone precursors from gas wells is much higher than previously estimated, and several times as high as in comparable extraction fields at a number of other locations in the United States.

As part of a long series of studies on mass balance of ice, CIRES scientists showed in FY13 that an important mechanism for melting of the Greenland Ice Sheet stems from the distribution of thin, low-lying clouds over the ice sheet. In addition, the CIRES National Snow and Ice Data Center, which provides international access to data on global ice cover, reported Arctic sea ice in September 2012 at its lowest extent since the initiation of satellite records.

CIRES accomplishments in science for FY13 were diverse, abundant, and significant. We anticipate the same for FY14.

Sincerely yours,

William M. Lewis Jr.



# CIRES: science in service to society

Since its inception more than 45 years ago as NOAA's first cooperative institute, the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder has emerged as an international leader in research that addresses the pressing challenges facing our planet.

CIRES researchers use time-honored and cutting-edge approaches to study diverse aspects of Earth system science, with a focus on research that NOAA's Research Council terms "use-inspired." That is, CIRES science seeks to improve fundamental understanding of the changing world and to produce applications that are useful and used by decision makers, educators, the private sector, and others.

William M. Lewis Jr., served as CIRES' Interim Director during the 12 months of this reporting period (July 1, 2012, to June 30, 2013). Under his leadership, CIRES continued its tradition of excellence in research and training, helping to ensure NOAA advanced its mission and met strategic goals.

This summary highlights a few of the past year's activities and research successes. In the Project Reports section of the full 2013 annual report (available online), accomplishments are reported in full, organized by CIRES' nine themes. Here, highlights are presented in alignment with NOAA's priorities: the overarching goals outlined in NOAA's Next Generation Strategic Plan (NGSP) and two enterprise objectives.



### **Climate Adaptation and Mitigation (NGSP)**

- With NOAA partners, CIRES researchers continue to track global abundances of all major long-lived greenhouse gases. This year, CO<sub>2</sub> levels exceeded 400 parts per million (daily average) at Mauna Loa Observatory in Hawaii for the first time.
- CIRES scientists worked closely with colleagues around the world on parts of the Intergovernmental Panel on Climate Change reports expected in late 2013 and 2014.
- CIRES researchers provided enhanced forecasts for wind energy production, and continue to conduct research on the impact of those forecasts on grid integration of renewable energy.

### **Weather-Ready Nation (NGSP)**

- CIRES researchers and colleagues published papers evaluating the roles of climate change and variability on extreme weather events such as the Texas heat wave of 2011 and the warm spring of 2012 in the Central United States.
- CIRES solar physicists worked with NOAA colleagues in the Space Weather Prediction Center to improve understanding and prediction of solar disturbances in the geospace environment. Such disturbances can affect Earth's atmosphere and technological systems.
- CIRES scientists played critical roles in several intensive field studies of air quality–climate connections, in Utah and California, and in planning for a third field study, in the southeastern United States.

## Engagement Enterprise

- CIRES researchers and collaborators improved the weather prediction systems (the Advanced Weather Interactive Processing System II) used at all NOAA National Weather Service Weather Forecast Offices, adding functions to help forecasters visualize and annotate maps and other data.
- During the 12 months of this reporting period, 11 new Science On a Sphere® exhibits were installed in five countries, bringing NOAA, CIRES, and other science to global audiences.
- CIRES researchers at the National Snow and Ice Data Center (NSIDC) added daily sea-ice data to archives, to meet user needs and interest, and published “All About Arctic Climatology and Meteorology,” a website for educators and high school students.

## Science and Technology Enterprise

- CIRES researchers at the National Geophysical Data Center developed new digital elevation models in support of NOAA’s tsunami programs.
- CIRES staff continue to work closely with colleagues on tools to improve the reliability, resilience, and usability of NOAA’s high-performance computing systems.
- CIRES staff working on satellite imagery of Earth at night began working with much higher-resolution data from a new instrument on a new satellite. The work, collaborative with NOAA, NASA, and others, is revealing more-detailed information about power use, biomass burning, fishing, gas flaring, and other human activities around the world.

In Institute news, CIRES continued to grow during the University’s FY13 (July 2012 through June 2013), with expenditures of about \$64 million. The Institute’s financial health is supported by a diversity of funding sources beyond NOAA and the University of Colorado Boulder: These include NASA, the National Science Foundation, the Department of Defense, Department of Energy, the U.S. Agency for International Development, and more.

In FY13, CIRES included 47 Fellows, nearly 200 research scientists, 250 associate scientists, 38 visiting scientists, 29 postdoctoral researchers, and 131 graduate students—many of them supported by NOAA (page 143 in the full annual report, available online). Those researchers and graduate students published more than 500 peer-reviewed papers, earned numerous honors and awards, and were profiled in local, national, and international news outlets. All three measures of success speak to the eminence of CIRES researchers in their fields.

In March 2013, the CIRES Council of Fellows nominated Waleed Abdalati—CIRES Fellow and former NASA Chief Scientist—to be the new CIRES Director. His appointment was approved by CU-Boulder after the current reporting period and will be reported on in the next Annual Report.

The Cooperative Institute for Research in Environmental Sciences (CIRES) was established in 1967 to facilitate collaboration between the University of Colorado Boulder and the National Oceanic and Atmospheric Administration (NOAA). CIRES' original and continuing purpose is to support NOAA goals by facilitating interdisciplinary studies that crosscut traditional scientific fields. CIRES fosters interdisciplinary science through four centers and two key programs: the National Snow and Ice Data Center, the Center for Limnology, the Center for Science and Technology Policy Research, the Earth Science and Observation Center, the Western Water Assessment, and the Education and Outreach program. Such interdisciplinary combinations provide unique opportunities for discovery and for application of knowledge to meet societal needs. The work of the CIRES enterprise strengthens the scientific foundation upon which NOAA's many services depend, and allows coordinated studies on a scale that could not be addressed by university research units or NOAA alone.



University of Colorado  
Boulder



### University of Colorado Boulder Departments

Aerospace Engineering Sciences  
 Atmospheric and Oceanic Sciences  
 Chemistry and Biochemistry  
 Civil, Environmental, and  
 Architectural Engineering  
 Ecology and Evolutionary Biology  
 Electrical and Computer Engineering  
 Geography  
 Geological Sciences  
 Molecular, Cellular, and  
 Developmental Biology  
 Physics  
 Environmental Studies Program

### CIRES Divisions

Cryospheric and Polar Processes  
 Ecosystem Science  
 Environmental Chemistry  
 Environmental Observations, Modeling,  
 and Forecasting  
 Solid Earth Sciences  
 Weather and Climate Dynamics

### Interdisciplinary Research Centers

Center for Limnology  
 Center for Science and Technology  
 Policy Research  
 Earth Science and Observation Center  
 National Snow and Ice Data Center

### Programs

Education and Outreach  
 Western Water Assessment

### NOAA Earth System Research Laboratory (ESRL)

Chemical Sciences Division  
 Global Interoperability Program  
 Global Monitoring Division  
 Global Systems Division  
 Physical Sciences Division

### NOAA Centers

National Geophysical Data Center  
 Space Weather Prediction Center



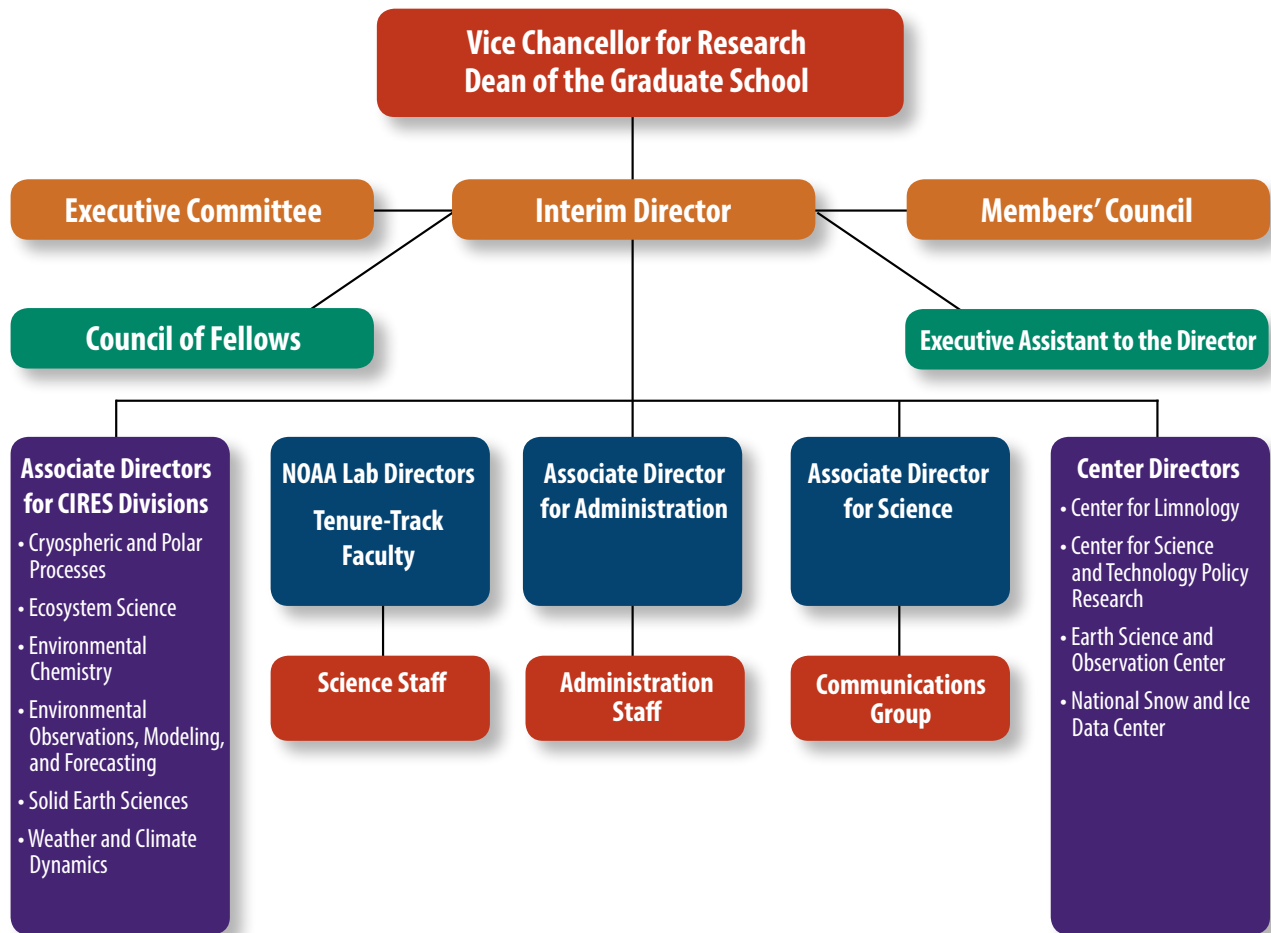
An ice bridge near Anvers Island, on the Antarctic Peninsula. For scale, a person is sitting under the arch. Photo credit: Grant Glenn/CIRES



# Governance, Management, and Organization

CIRES is governed and managed through its Council of Fellows, an advisory Executive Committee, and the CIRES Members' Council. The CIRES Centers (Center for Limnology, Center for Science and Technology Policy Research, National Snow and Ice Data Center, and the Earth Science and Observation Center) link NOAA to 11 different university departments. Coordination among all these entities is facilitated through the Communications Group. In FY13, William M. Lewis Jr. led CIRES as Interim Director.

## CIRES Organizational Structure





## Council of Fellows

The Council of Fellows constitutes the “Board of Directors” and chief governing body of CIRES. It is comprised of individuals with an outstanding record of achievement and ability in diverse areas of environmental sciences. They are university faculty, senior research scientists, and government scientists who form the core leadership of the Institute. Members of the Council of Fellows 1) provide leadership at all levels in environmental science, 2) maintain an active scientific research and education program, 3) support the CIRES infrastructure through indirect cost recovery and in-kind contributions, 4) participate in CIRES management, and 5) contribute interdisciplinary expertise and participate in collaborative work. Fellows personify the spirit of collaboration that is the founding principle of the NOAA Cooperative Institutes Program. Ex-officio individuals include representatives of the Members’ Council and CIRES administration. Fellows meetings are held monthly during the academic year. The Council of Fellows met nine times during this reporting period: September 20, October 18, November 15, and December 13 of 2012; and January 24, February 28, March 21, April 18, and May 16 of 2013.

## Executive Committee

The Executive Committee assists and advises the Director in matters regarding day-to-day management of the Institute. Members of the Executive Committee include the Associate Directors for CIRES’ six divisions, two Fellows elected at large for two-year terms (renewable for one term), and two Members’ Council representatives. The Associate Director for Administration, Associate Director for Science, and the Director’s Executive Assistant are ex-officio members.

## Career Track Committee

This committee is charged with consideration of all nominations for promotion within the CIRES career tracks of Research Scientist, Associate Scientist, and Administrative Associate. Nominations are made once yearly, and the committee’s recommendations are forwarded to the Director for consideration and action.

## Fellows Appointment Committee

Fellows of CIRES are selected by two-thirds vote of the Council of Fellows and are appointed or reappointed by the Director of CIRES with the concurrence of the Vice Chancellor for Research and the Dean of the Graduate School. New Fellow nominations are considered by the Council of Fellows once yearly, drawing from the community of scientists at the University of Colorado Boulder and NOAA. Project leaders present cases for appointment of new Fellows to the Council of Fellows. The initial appointment of any new CIRES Fellow is for two years and continuing-term reappointments are for five years. Qualifications for reappointment are the same as for the initial appointment, except that the established record of the appointee must show evidence of commitment to the affairs of CIRES.

## Diversity Committee

Recent studies highlight that fewer under-represented minorities are pursuing careers in science, especially in higher education. CIRES has made it a priority to extend its knowledge and community. The Diversity Committee, created in 2010, is working to achieve this goal. The Committee works with the CIRES Education and Outreach program, the Communications Group, and scientists and staff to identify opportunities for CIRES to improve diversity, enrich our science, and enhance our mission.

## Members’ Council

The CIRES Members’ Council, created in 1997, serves as an information and policy conduit between CIRES leadership and Institute members. To provide uniform representation, the CIRES membership is divided geographically into eight groups that comprise various divisions and centers across the Institute, with representation reflecting the size of each group. From the council, two elected delegates serve as the liaison between the Members’ Council and the CIRES Council of Fellows and Executive Committee. The Members’ Council, which meets monthly, then serves as a direct line of communication to the Member population at large. At meetings, the Council hears members’ inquiries and concerns, discusses and develops potential solutions to outstanding issues, and works directly with CIRES leadership to

implement these solutions. Additionally, the Members’ Council performs regular service to the Institute by, for example, sponsoring the annual CIRES Science Rendezvous, the Awards Committee for CIRES Outstanding Performance Awards, and the CIRES Bike Share Program.

## Special Committees

Additional special committees are appointed as needed by the Director. These include faculty search committees, the University Academic Review and Planning Advisory Committee, Award Committee, faculty promotion committees, and others. These are created as the need arises, exist to accomplish a specific task, and are then disbanded.

The CIRES Team	FY2013
Faculty Lines	17
Research Scientists	197
Associate Scientists	252
Visiting Scientists	38
Postdoctoral Researchers	29
Administrative Staff	32
Graduate Students	131
Undergraduate Students	83

## Other CIRES Committees

- Visiting Fellows Committee
- Distinguished Lecture Committee
- Graduate Student Research Fellowship Committee
- Innovative Research Program Committee





## Council of Fellows (July 1, 2012–June 30, 2013)

**Waleed Abdalati** Professor of Geography; Director of the Earth Science and Observation Center

**Richard Armstrong** CIRES Senior Research Scientist in the National Snow and Ice Data Center (NSIDC); Associate Director for the Cryospheric and Polar Processes Division

**Benjamin Balsley** Research Professor Emeritus, Electrical, Computer, and Energy Engineering; CIRES Senior Research Scientist

**Stan Benjamin** Chief of Assimilation and Modeling Branch, NOAA ESRL Global Systems Division

**Roger Bilham** Professor of Geological Sciences

**Maxwell Boykoff** Assistant Professor of Environmental Studies

**John Cassano** Associate Professor of Atmospheric and Oceanic Sciences

**Thomas Chase** CIRES Senior Research Scientist

**Xinzhao Chu** Associate Professor of Aerospace Engineering

**Shelley Copley** Professor of Molecular, Cellular, and Developmental Biology

**Joost de Gouw** CIRES Senior Research Scientist; NOAA ESRL Chemical Sciences Division (CSD)

**Lisa Dilling** Assistant Professor of Environmental Studies

**Randall Dole** Deputy Director for Research, NOAA ESRL Physical Sciences Division (PSD); Associate Director for the Weather and Climate Dynamics Division

**David Fahey** Research Physicist and Program Lead, Atmospheric Composition and Chemical Processes; Senior Scientist, NOAA ESRL CSD

**Christopher Fairall** Chief of the Weather and Climate Physics Branch, NOAA ESRL PSD

**Lang Farmer** Professor and Department Chair of Geological Sciences

**Fred Fehsenfeld** CIRES Senior Research Scientist, NOAA ESRL CSD; Co-Associate Director for the Environmental Chemistry Division

**Graham Feingold** Research Scientist, NOAA ESRL CSD

**Noah Fierer** Associate Professor of Ecology and Evolutionary Biology

**Baylor Fox-Kemper** Assistant Professor of Atmospheric and Oceanic Sciences

**Timothy Fuller-Rowell** CIRES Senior Research Scientist; NOAA Space Weather Prediction Center

**Michael Hardesty** Associate Director for the Environmental Observations, Modeling, and Forecasting Division; NOAA ESRL CSD

**José-Luis Jiménez** Associate Professor of Chemistry and Biochemistry

**Craig Jones** Associate Professor of Geological Sciences

**William M. Lewis Jr.** Professor of Ecology and Evolutionary Biology; Director of the Center for Limnology; Interim Director of CIRES

**Peter Molnar** Professor of Geological Sciences

**Steve Montzka** Research Chemist, NOAA ESRL Global Monitoring Division

**William Neff** Senior Scientist and Director of NOAA ESRL PSD

**Steven Nerem** Professor of Aerospace Engineering

**David Noone** Associate Professor of Atmospheric and Oceanic Sciences

**Judith Perlwitz** CIRES Research Scientist; NOAA ESRL PSD

**Roger Pielke Jr.** Professor of Environmental Studies

**Balaji Rajagopalan** Professor of Civil, Environmental, and Architectural Engineering

**F. Martin Ralph** Research meteorologist and Chief of the Water Cycle Branch, NOAA ESRL PSD

**Prashant Sardeshmukh** CIRES Senior Research Scientist; NOAA ESRL PSD

**Mark Serreze** Professor of Geography; Director of the National Snow and Ice Data Center (NSIDC)

**Anne Sheehan** Professor of Geological Sciences; Associate Director for the Solid Earth Sciences Division

**Robert Sievers** Professor of Chemistry and Biochemistry; Director of the CU-Boulder Environmental Program

**Margaret Tolbert** Distinguished Professor of Chemistry and Biochemistry; Co-Associate Director for the Environmental Chemistry Division

**William Travis** Associate Professor of Geography; Director of the Center for Science and Technology Policy Research

**Greg Tucker** Associate Professor of Geological Sciences

**Veronica Vaida** Professor of Chemistry and Biochemistry

**Rainer Volkamer** Assistant Professor of Chemistry and Biochemistry

**Carol Wessman** Professor of Ecology and Evolutionary Biology; Associate Director for the Ecosystem Science Division

**Tingjun Zhang** CIRES Senior Research Scientist, NSIDC

The Centers within the CIRES enterprise link NOAA and 11 different departments at the University of Colorado Boulder. CIRES Centers provide an environment conducive to collaboration, facilitating partnerships between federal and academic entities.

### Center for Limnology

The Center for Limnology makes ecologically oriented studies of inland waters: lakes, streams, and wetlands. The goals of the center are to provide visibility, continuity, and technical support for interdisciplinary studies involving inland aquatic ecosystems; to maintain undergraduate training programs and individualized undergraduate instruction in the science of aquatic ecosystems; to attract and use research funds for the collection and analysis of data on aquatic ecosystems; to publish and disseminate research findings in the open literature; to participate at the national and international level in the study of important questions relating to aquatic ecosystems; and to help resolve important problems related to either the basic science or applied science of inland waters.

• Full report for FY13 available online.

### Center for Science and Technology Policy Research

The Center for Science and Technology Policy Research (CSTPR) was established within CIRES in 2001 to conduct research, education, and outreach at the interface of science, technology, and the needs of decision makers in public and private settings.

CSTPR focuses on the intersection of the environment and society and applying the social and policy sciences to problems of environmental change, management, and sustainability. Much of the work at CSTPR involves questions about how people and institutions make decisions under uncertainty; how perception and technical information influence choices; and how, over time, those choices affect the co-evolution of science, technology, and policy.

• Full report for FY13 available online.

### Earth Science and Observation Center

The Earth Science and Observation Center (ESOC) provides a focus for the development and application of modern remote-sensing techniques used in the research of all aspects of Earth sciences at CU-Boulder. The aim is to work on all scales of problems, from technique development at small test sites to understanding pattern and process on regional and global scales. A long-term goal of ESOC research is to investigate problems in global geosciences—questions of global change, in particular—through remote-sensing observations.

• Full report for FY13 available online.

### National Snow and Ice Data Center

The mission of the National Snow and Ice Data Center (NSIDC) is to advance understanding of Earth's frozen realms: the floating sea-ice cover, lake ice, glaciers, ice sheets, snow cover, and frozen ground, collectively known as the cryosphere. Major areas of research at NSIDC include processes driving the downward trend in Arctic sea-ice extent; environmental impacts of this sea-ice loss both within and beyond the Arctic; the behavior of the Greenland and Antarctic ice sheets; Himalayan glaciers and their contributions to sea-level rise; links among snowfall, temperature, and streamflow; and the implications of changes in Earth's permafrost. Informatics research includes developing alternative database structures to search vast data volumes to answer science questions; developing technologies to make NSIDC data more visible to more researchers; and enhancing data discovery through semantic interoperability. NSIDC also has a broad scope of education and outreach efforts.

• Full report for FY13 available online.



Columbia River Gorge, Oregon.

Photo credit: M.J. Post/CIRES



# Interdisciplinary Programs

CIRES fosters a vibrant research environment through programs and initiatives designed to stimulate interdisciplinary collaborations among CIRES, NOAA, and CU-Boulder scientists.

## Western Water Assessment

The Western Water Assessment (WWA) is CIRES' signature integrating activity, relying on multidisciplinary teams of experts in climate, hydrology, ecology, law, and policy to work with decision makers across the Intermountain West to produce policy-relevant information about climate variability and change. WWA is one of 11 NOAA-funded Regional Integrated Sciences and Assessments (RISA) programs across the country. Through relationships with networks of decision makers, WWA develops practical research programs and useful information products. WWA's mission is to identify and characterize regional vulnerabilities to—and impacts of—climate variability and change, and to develop information, products, and processes to assist decision makers throughout the Intermountain West. WWA addresses NOAA's mission, strategic goals, and crosscutting priorities, as well as other Congressional NOAA mandates, including the U.S. Global Change Research Act and the U.S. Climate Change Science Program.

• Full report for FY13 available online.

## Education and Outreach

The research conducted at CIRES provides knowledge that helps society to build a sustainable future. The CIRES Education and Outreach (EO) group builds bridges between CIRES research and educators, com-

## 2013 Innovative Research Program Awards

Project	CIRES and NOAA Investigators
Formation-flying for atmospheric studies using small, autonomous aircraft	Ben Balsley and Dale Lawrence
Observations of wind turbine wakes using unmanned aircraft systems	John Cassano, Julie Lundquist, Brian Argrow, Eric Frew, and Katja Friedrich
Are microbes a significant component of free tropospheric aerosol?	Noah Fierer, Joanne Emerson, Anne Perring, Joshua Schwarz, and David Fahey
Science On a Sphere®: Cognition + Affect = Effect	Shilpi Gupta and Marda Kirm
Passive source imaging of Earth's ionosphere using lightning	Steven Hansen, Anne Sheehan, Paul Bedrosian, and Tim Fuller-Rowell
A new method for real-time monitoring of tsunamis with magnetic observations	Manoj Nair, Stefan Maus, Patrick Alken, Neesha Schnepf, and Arnaud Chulliat
The rise and fall of mid-Holocene Rajasthan lakes	Balaji Rajagopalan, Peter Molnar, and Emily Gill
A compact, sensitive, laser-induced fluorescence instrument for the measurement of SO <sub>2</sub>	Andrew Rollins, Troy Thornberry, Ryan Neely, and Ru-Shan Gao

municators, students, and scientists. Its work emphasizes scientific inquiry, access to current research, and foundational concepts in geosciences education. CIRES scientists often partner with CIRES Education and Outreach as part of their research projects; contribute to education projects as presenters, reviewers, and learning-resource providers; and star in scientific video clips. This involvement by scientists helps teachers have confidence that the resources provided by CIRES EO are scientifically sound and up-to-date.

• Full report for FY13 available online.

## Visiting Fellows

CIRES hosts a competitive Visiting Fellows program that promotes collaborative research at the forefront of scientific knowledge. Selected annually, Visiting Fellows conduct interdisciplinary research in areas spanning the scope of the CIRES research portfolio. Fellowships of up to one year are awarded to Ph.D. scholars (postdoctoral fellowships) and faculty planning sabbatical leave (sabbatical fellowships). A committee of CIRES Fellows reviews all applications for CIRES Visiting Fellowships. The committee chooses those best qualified for a sabbatical or postdoctoral fellowship and submits that slate to the Fellows Council for final discussion and selection. Selections for the Visiting Fellows program are based in part on the likelihood of interactions between the Visiting Fellows and CIRES scientists and the degree to which both parties will benefit from the exchange of new ideas. To further this goal, priority is given to candidates with research experience at institutions outside the Boulder scientific community. Since 1967, CIRES has awarded more than 100 Visiting Fellowships. Past recipients have included previous CIRES directors Susan Avery and Konrad Steffen.

• Full report for FY13 available online.



Crestview Elementary School, Boulder, Colo.

Photo credit: CIRES Education and Outreach



## Interdisciplinary Programs

### Innovative Research Programs

The CIRES-wide competitive Innovative Research Program (IRP) stimulates a creative research environment within CIRES and encourages synergy among disciplines and research colleagues. The program supports novel, unconventional, and/or fundamental research that may quickly provide concept viability or rule out further consideration. Activities are not tightly restricted and can range from instrument development, lab testing, and field observations to model advancement. Funded projects are inventive, often opportunistic, and do not necessarily have an immediate practical application or guarantee of success. Each year, an interdisciplinary committee of CIRES Fellows selects the award recipients. The committee reviews all proposals and recommends to the CIRES Director those that are the most inventive and bridge boundaries between traditional disciplines. The results of IRP research are presented the following year at a poster reception.

### Graduate Research Fellowships

CIRES supports two prestigious student fellowship programs: the long-established CIRES Graduate Student Research Fellowship (GSRF) and the ESRL-CIRES Fellowship, awarded to prospective master's and doctoral students every other year with the support of NOAA's Earth System Research Laboratory. The fellowships are competitively awarded to new or existing CIRES-affiliated graduate students. A Committee of CIRES Fellows serves as the review and selection committees for both fellowships.

• Full report for FY13 available online.

### CIRES Communications

It has long been a part of CIRES' mission to communicate world-class research in ways that help inform decision makers and the public about how we can best ensure a sustainable future environment. Our communications work is coordinated by the Communications Group and involves close collaborations with NOAA, CU-Boulder, our centers, and international colleagues in academic and government institutions. Through a coordinated multimedia approach, the Communications Group uses traditional and innovative methods to convey the outcomes of key research endeavors to the public.

The success of the CIRES communications strategy is exemplified by widespread coverage of our scientific work in, for example: *Science News*, *The New York Times*, *Scientific American*, CBS, *Discovery*, *Discovery News*, *National Geographic*, Time, Nature News, BBC, *Business Week*, MSNBC, Fox News, *Science NOW*, *Nature News*, and the *Los Angeles Times*.

• Full report for FY13 available online.



CIRES Ph.D. candidate Dan McGrath displays an ice core at Swiss Camp, Greenland

Photo credit: CIRES



# 2012 Highlighted Honors and Awards

The breadth and number of achievements by CIRES researchers and staff speak to the quality of research conducted at the Institute. From lifetime achievement awards to recognition of emerging young talent, CIRES scientists are among the best of the best at what they do. Among the premier awards received by CIRES scientists during 2012 were two Presidential early-career awards from the White House and a Colorado Governor's Impact award, for high-impact scientific research.

On this page, we highlight a few of CIRES' award winners; a more complete list can be found in the Appendices section of the full annual report, available online.

## Presidential Early Career Award for Scientists and Engineers (PECASE)

In 2012, the White House named CIRES scientists David Noone and Rebecca Washenfelder as recipients of the 2011 Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE award is the highest honor given by the U.S. government to outstanding scientists and engineers in the early stages of their careers. Noone's award citation acknowledges him for his "innova-

tive use of stable isotope tracers and modeling efforts directed towards an integrated understanding of the cycling of water and carbon dioxide through the atmosphere, and for actively engaging students in cutting-edge research at middle schools." Washenfelder was lauded for her "pioneering work in developing and applying new measurement techniques to study atmospheric chemistry related to climate and air quality and for commitment to science education and outreach."



Presidential Early Career Award for Scientists and Engineers winner Rebecca Washenfelder with Rear Admiral David Titley (retired Navy), who was then NOAA's deputy under secretary for operations, and John Holdren, assistant to the President for science and technology. Photo credit: Derek Parks/NOAA



Presidential Early Career Award for Scientists and Engineers winner David Noone. Photo credit: David Oonk/CIRES

## Governor's Impact Award

Colorado Governor John Hickenlooper presented a team of 34 CIRES and NOAA scientists with the 2012 CO-LABS Governor's Award for High-Impact Research in recognition of their "Rapid-Response Atmospheric Science to Assess the Deepwater Horizon Oil Spill Crisis."

## CIRES Awards

This year, CIRES presented Outstanding Performance Awards of \$2,000 each to individuals and teams conducting groundbreaking research and working to make science more accessible. 2012 recipients included: Tim Bardsley, Christopher Clack, Eric Gordon, Emrys Hall, Allen Jordan, Jeff Lukas, Julien Lynge, and Walt Meier. Their work is described in greater detail in the full annual report, available online. CIRES also presented Director's Awards of \$1,000 to administrative employees providing exemplary professional service. These included Ted DeMaria, Yvonne Garcia, Lisa Ho, and Nancy Lathrop.



2012 CO-LABS Governor's Impact Award winners. This CIRES/NOAA team won for its "Rapid-Response Atmospheric Science to Assess the Deepwater Horizon Oil Spill Crisis." Photo credit: NOAA



2012 CIRES Outstanding Performance award winners Photo credit: David Oonk/CIRES



# FY2013 Highlighted Events

CIRES hosts diverse symposiums, seminars, workshops, and other events throughout the year. The CIRES Rendezvous, the Distinguished Lecture Series, and the CIRES 45th Anniversary are among the highlights of CIRES events during FY13. See a complete list of FY13 events in the full annual report, available online.



**Allison McComiskey gives introductory speech to the 2013 Rendezvous research symposium.**

Photo credit: David Oonk/CIRES

## Rendezvous

About 400 people attended the eighth annual Rendezvous research symposium, sponsored by the CIRES Members' Council, on May 2, 2013. This half-day, institute-wide symposium featured more than 130 posters showcasing the depth, breadth, and quality of science being conducted by CIRES scientists, and it provided an avenue for them to share research with each other and NOAA colleagues. Interim Director William Lewis Jr. delivered the "State of the Institute" address and presented awards for years in service, the CIRES Outstanding Performance Awards, and awards for other professional achievements.

## CIRES 45<sup>th</sup> Anniversary

CIRES marked 45 years of "science in service to society" with a day of keynote addresses by current CIRES scientists, including CIRES Fellow Waleed Abdalati (NASA Chief Scientist at the time, now CIRES Director), CIRES Fellow David Fahey, and Interim Director William Lewis Jr.; retrospectives by former CIRES scientists, including past directors Konrad Steffen, Susan Avery, and Robert Sievers; a poster session; and institute-wide fellowship.



## Distinguished Lecture Series

This lecture series was created to bring in outstanding scientists and innovative thinkers who have given thoughtful consideration to environmental and Earth system science issues. A committee of CIRES Fellows determines distinguished lecture invitees.



### David Randall

A university perspective on climate modeling (October 2012)



### Christopher Landsea

Hurricanes and global warming: expectations versus observations (October 2012)



### Richard Seager

The Dust Bowl and other great North American droughts of the past, present, and future (February 2013)



### Steven Wofsy

Greenhouse gases across time and space, from the global scale to the urban dome (March 2013)



**CIRES 45th Anniversary poster session.**

Photo credit: David Oonk/CIRES

CIRES continued to grow during the University's FY13 (July 2012–June 2013), with total expenditures of nearly \$64 million, not including the University portion (nearly \$63 million in FY12). CIRES researchers continue to have great success in obtaining external research awards. As was true last year, contracts and grants expenses (48 percent of total) are greater than those in our Cooperative Agreements (46 percent). The University's monetary contribution to CIRES primarily covers faculty salaries, and it fluctuates from year to year due to changes in our rostered University faculty appointments.

Agreement expenditures by task for FY13 are shown in the top figure at right. As of May 31, 2013, NOAA provided \$7,860,609 for the first nine months of our new Cooperative Agreement (NA12OAR4320137, September 2012 to August 2017).

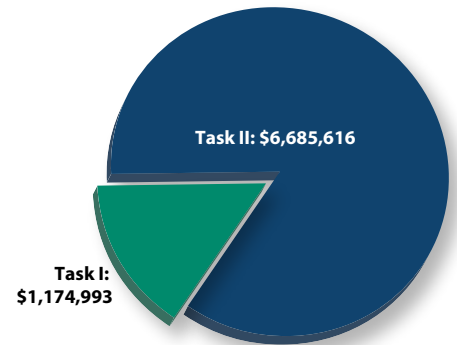
Task I funding is for CIRES administration and internal scientific programs, such as the Visiting Fellows and Graduate Student Fellowship programs; Task II funds CIRES' collaboration with NOAA's Earth System Re-

search Laboratory, the National Geophysical Data Center, and the Space Weather Prediction Center, all in Boulder, Colo.

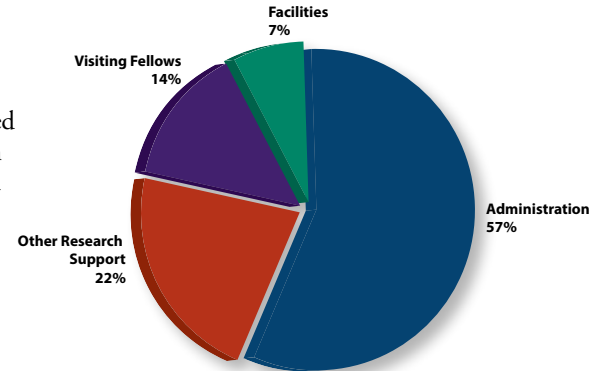
The middle chart at right breaks down Task I expenditures from FY13, including expenditures under our current and new Cooperative Agreements (NA10OAR4320142 and NA12OAR4320137). The largest share (57 percent) of Task I base funds supports CIRES administration, primarily salaries and benefits for the administrative staff. The Visiting Fellows program received 14 percent of Task I base fund support in FY13 and is subsidized by other Institute funding as well. Task I also provides partial support of CIRES' Education and Outreach program, other research support, and the physical plant facilities.

NOAA Task I base funding is augmented by CIRES' portion of the University's indirect cost recovery (ICR), which is distributed annually to University units as a proportion of indirect costs collected from institutional research grants and awards.

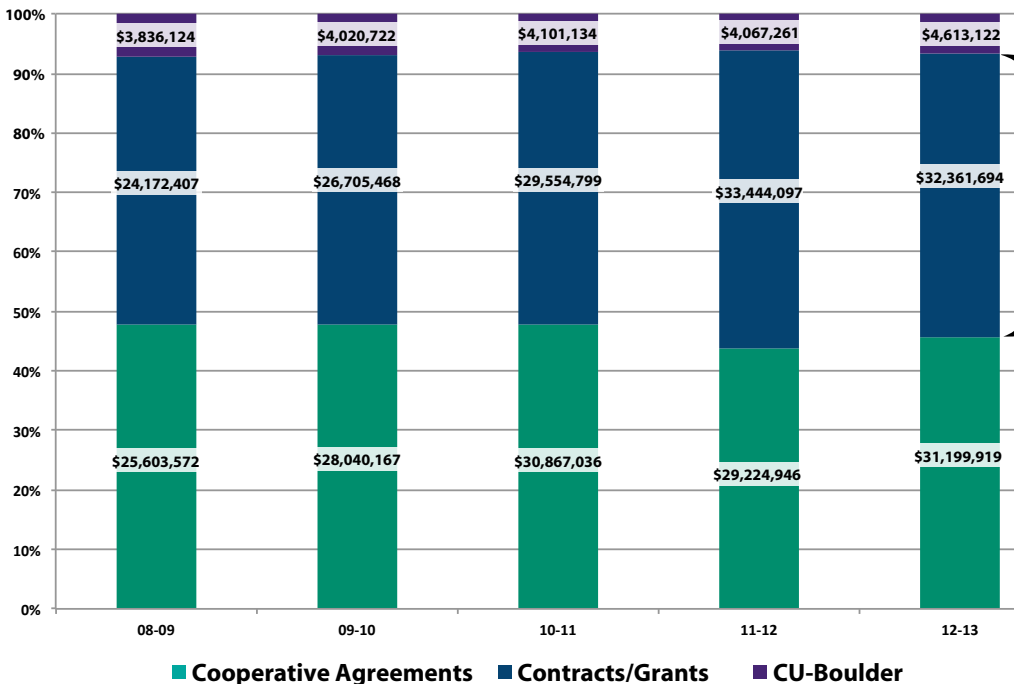
**Cooperative Agreement NA12OAR4320137 funding by task (September 2012–May 2013)**



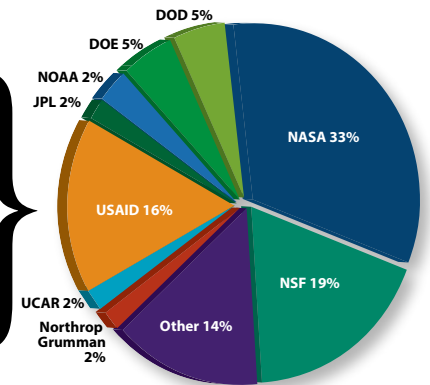
**2012–2013 CIRES Task 1 base fund expenses**



**Expenditures by NOAA Cooperative Agreements, individual awards, and University of Colorado Boulder funds**



**Breakdown by funding agency**



DOD: Department of Defense  
 DOE: Department of Energy  
 JPL: Jet Propulsion Laboratory  
 NSF: National Science Foundation  
 UCAR: University Corporation for Atmospheric Research  
 USAID: U.S. Agency for International Development



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