



Cooperative Institute for Research in the Atmosphere

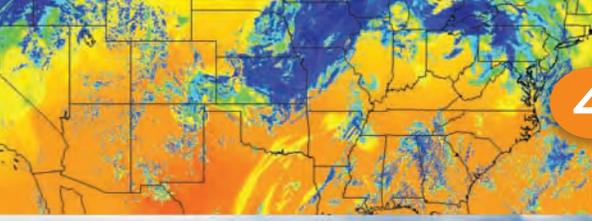




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COMMUNIQUE' 14

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FROM THE DIRECTOR ...

As we move into the Summer of 2011 and I complete my first year as Director, I must confess that it has been quite a learning experience for me. Not only did I get to deal with the usual proposal cycles and the development of our strategic plans, but also with unexpected funding issues during the government shut-down threat in early April and a myriad of problems related to offices that had too much heating or too little heating or the right heating but during the wrong time of day. A new experience to be sure. Throughout this process, however, I have been incredibly pleased by the level of commitment and dedication that I see throughout CIRA. It has been such a pleasant surprise to find that everyone, both researchers and support staff alike, have an attitude of rolling up their sleeves and getting things done. The work environment is truly conducive to great work and I commend all CIRA employees for their contribution to this culture.

Strategically, I set out to strengthen the ties between CIRA, the Dept. of Atmospheric Science, and the College of Engineering. As part of the effort, we now have two graduate students supported by CIRA. Todd Jones will be working towards a Ph.D. with Prof. David Randall and Dr. Jin Lee from ESRL on a project to assess the impact of explicit cloud physics in the NIM model, while Leah Grant will be working with Prof. Sue van den Heever and Dr. Lixin Lu on an M.S. project to better understand effects of clouds and aerosols on terrestrial carbon and water cycles. In parallel, we have successfully begun an activity linking the carbon research done in the Dept. of Atmospheric Science with the Carbon Tracker activity led by Pieter Tans at NOAA. Linking the academic research with operations is not only exciting but also offers potential for future collaborations related not just to carbon modeling but the work we do at CIRA related to algorithm development for the Orbiting Carbon Observatory. Along this same vein, we have also been involved with the University and its goals of highlighting some of the water related research in order to bridge the activities in that area as well. Seminar and Colloquium speakers from NOAA and CIRA have further helped bring our communities closer.

In our efforts to continuously assess and fine tune our relationships with NOAA, I am happy to report that John Schneider (Director at ESRL's Global Systems Division), Marty Ralf (Branch Chief, PSD Water Cycle Branch), Pieter Tans (Branch Chief, GMD Carbon Cycle and Greenhouse Gases) and Fuzhong Weng (Branch Chief, Satellite Calibration & Data Assimilation Branch) have all agreed to serve on CIRA's Council of Fellows. In addition, we have asked CIRA's Senior Research Scientists as well as Robert Rabin from NSSL and George Smith from Riverside Technology to serve in the capacity of CIRA Fellows. I believe this makes a robust advisory body that will serve us well into the future.

Chris Kummerow

Spotlight on Outstanding Researchers

Dr. Glen Liston



Way above Hudson Bay in the northernmost reaches of Canada, there is a remote community of about 800 people. **Kangiqtugaapik, or Clyde River, is located on Baffin Island** in the Arctic archipelago of eastern Canada. So far north is Clyde River in fact, that it is only separated from Greenland by a vast and icy bay – also named Baffin. While most of us will only dream of venturing to such a remote locale, CIRA senior research scientist Dr. Glen Liston has made routine visits to this community as part of his research.

Since 1985, Dr. Liston, now a senior research scientist at CIRA, has been working in the Arctic on projects related to snow, weather, and environmental change. Dr. Liston received his B.S. in Atmospheric Sciences from the University of Washington in 1982, his M.S. in Snow, Ice, and Permafrost Geophysics from the University of Alaska in 1986, and his Ph.D. in Mathematics and Engineering from Montana State University in 1991.

As an active researcher, Glen has considerable time in the field in Earth's coldest regions, including wintering over at the Amundsen-Scott South Pole Research Station in Antarctica, and several research trips to both the Arctic and Antarctic. His most recent expedition included a two-week jaunt by snowmachine from Prudhoe Bay through Barrow, and a week at Toolik Lake, collecting observations of snow depth and





density. The properties of snow, including stratigraphy, grain size, and chemical properties tie snowfall into larger patterns of change in the Arctic.

Connecting with the people most impacted by change in the Arctic is also of importance; to this end a collaborative study – called “**Silalirijit**” (Inuit for “**those who work with and think about weather**”) – was designed to understand environmental change from an Inuit perspective. Last fall, **CIRA staff in Fort Collins had the rare opportunity to meet six Inuit from Clyde River** as Dr. Liston hosted them during a visit to Colorado.



The visit to Colorado represented reciprocal gesture to the Inuit in that they have consulted and worked closely with the research team. Dr. Liston and his associates set up a network of weather stations around the area to collect data about conditions for a **full climate record**. These real-time measurements are compared with the weather record as compiled and kept by the Inuit people themselves. The **juxtaposition of data to Inuit record** makes for a fascinating study of climate change through the generations. During their visit to Fort Collins, the group gave a presentation about the seasons of the year in their tradition. What we would call year round winter interrupted by a brief spring thaw, they have refined to a number of individual seasons. These seasons are distinguished by how much light they see in a day, the animals and plants that appear in the region and what fish and game they hunt during particular times.



CIRA researchers are well known for contributions in a number of fields, and bold exploration and investigation of Earth’s remote regions is part and parcel of Dr. Liston’s body of research. What would be the **adventure of a lifetime for many** is ‘**another day at the office**’ for Glen, and we look forward to both the scientific knowledge produced by his research as well as the stories of a scientist in the field that go along with it.

Solar Irradiance Forecasting

Generation of electrical power from solar farms is an increasingly important source of energy, and the unique needs of these power generation facilities present several opportunities for taking advantage of the research expertise at CIRA. Working with NOAA/ESRL, the National Renewable Energy Laboratory (NREL) and industry partner WindLogics, CIRA researchers have been utilizing satellite and model data to investigate nearcasting of solar irradiance.

Solar power generation naturally depends on sunshine, the amount of which varies throughout the day. Passing clouds can generate drop-offs (also called 'ramps') in the amount of sunlight reaching the surface, which then in turn create drop-offs in power generation. Having the ability to forecast solar 'ramps' is of great interest to the solar power generation community; the challenge is in finding the optimal technique to forecast cloud positions (and their associated shadows).

Patterns of solar irradiance are typically measured using surface instruments such as those found in the SURFRAD network, online at <http://www.srb.noaa.gov/surfrad/>. One simple technique to estimate solar irradiance is to use a radiative transfer model to provide the clear-sky irradiance in conjunction with a single measurement of the atmospheric transmittance at a given time; assuming

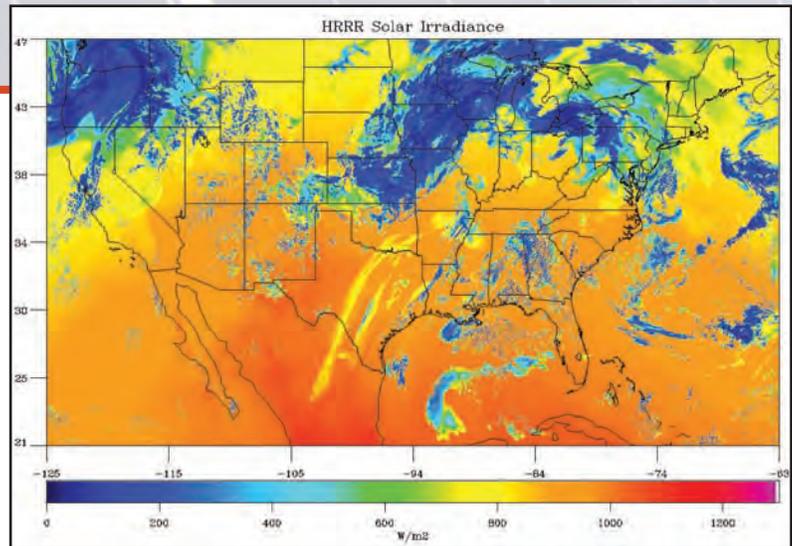


Figure 1.

that the transmittance remains constant throughout the day, the transmittance is combined with the clear-sky irradiance to compute a 'persistence' forecast. Persistence forecasts are a useful tool for days with a constant cloud cover, haze, or for clear-sky days, but the transient nature of clouds soon demonstrates the need for more sophisticated forecast techniques.

Satellite observations provide good guidance for short-term prediction (for prediction times less than three hours) but the resolution of data from geostationary platforms is much more coarse than the size of most solar power generation fields. Cloud resolving models can provide the needed resolution, but the complications of correctly initializing models, especially cloud microphysical parameters, along with the additional complications of unresolved sub-gridscale features often lead to difficulties in producing realistic cloud cover, and particularly cloud elements at the exact locations observed in nature. Numerical weather prediction models often have better representations of cloud cover, albeit at a reduced resolution; combinations of model data and satellite observations then form

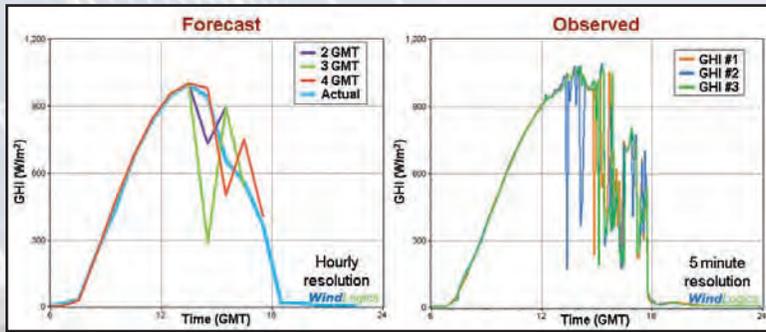


Figure 2.

the basis for investigating techniques for skilled short-term forecasts of solar irradiance.

One such model is the High Resolution Rapid Refresh (HRRR) model, run by NOAA ESRL/GSD. HRRR data has 3 km resolution, is updated hourly, is initialized using radar observations, and can be had at 15-minute or hourly resolution, over the continental United States (CONUS.)

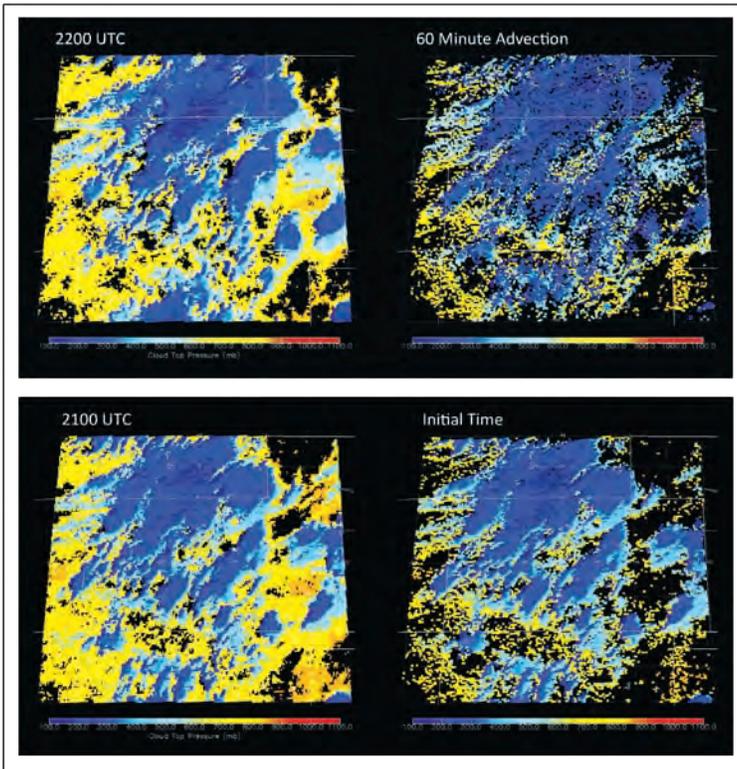


Figure 3.

An example of a six-hour forecast of solar irradiance from a 1200 UTC initialization is shown as *Figure 1*. For a specific location, solar irradiance as a function of time can be plotted against HRRR forecasts, such as the example shown in *Figure 2*. Continued research on the properties

of HRRR solar irradiance forecasts compared to surface observations is underway at CIRA.

Another novel technique is the combination of model wind data with satellite observation of cloud locations. *Figure 3* presents an experimental technique where pixels of GOES observations of cloud are advected by GFS winds corresponding to the GOES-derived cloud-top height for each pixel. For comparison, the GOES observation for each period is included. Several challenges remain to be met with this simple technique, but increasingly sophisticated methods of combining satellite and model observations are also currently being investigated at CIRA, with the goal of having an accurate method of forecasting cloud position in the period of interest.

Other avenues of solar research being explored by CIRA researchers include by-regime climatologies of solar irradiance using principle component analysis, and CIRA continues to develop new and innovative techniques for improving short-term solar irradiance prediction. As power generation from sunlight becomes an increasingly important component of our energy sector, CIRA will continue to make important contributions to our National capabilities, and more efficiently utilizing this valuable resource for societal benefit.

Founder's Wing Lifts CIRA^{into} the Future

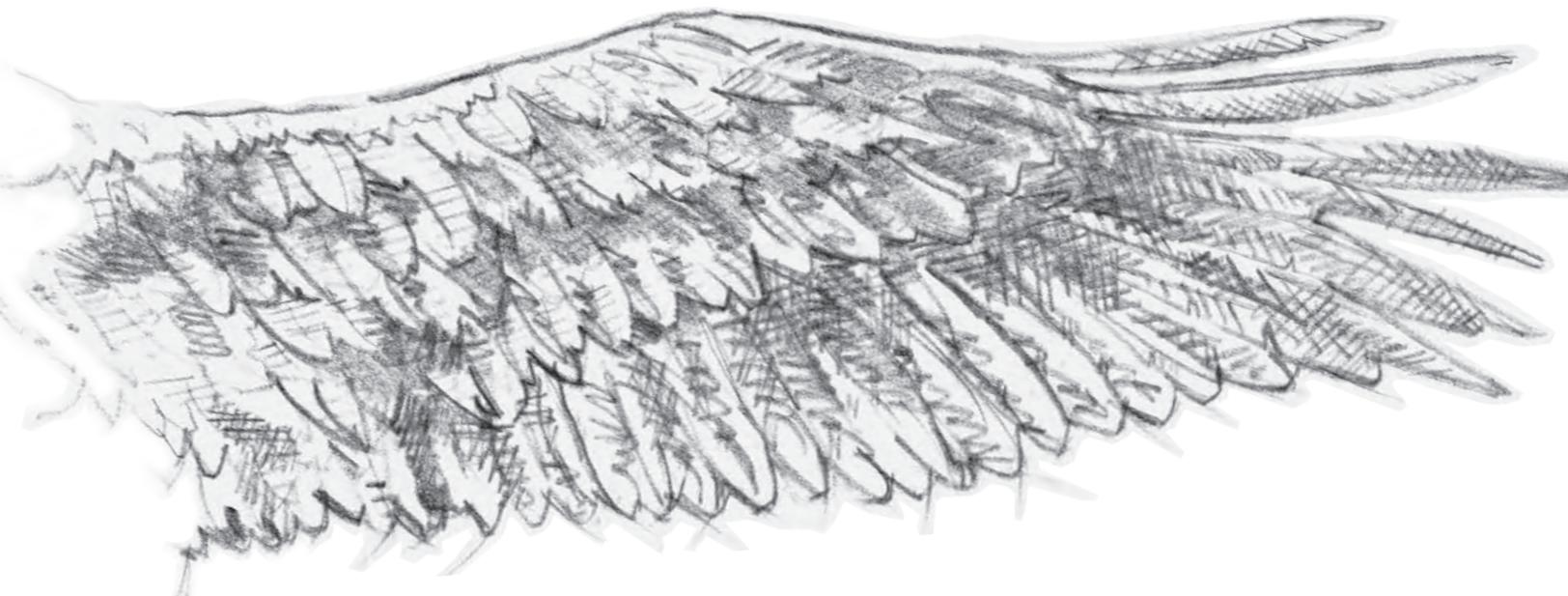
Although a few weeks before the actual start of spring, a renaissance of sorts took place March 3rd at CIRA's Fort Collins campus. On the heels of nearly a year of construction noise, dust and the displacement of many staff, CIRA employees and friends gathered to formally open the doors of its new 4100 square foot addition.

THE new wing pays tribute to CIRA's founding director, Dr. Thomas H. Vonder Haar, who served in that capacity for nearly 30 years. Many distinguished guests came to the dedication event including Dr. Sandra Woods, Dean of the College of Engineering, Dr. William Farland, the University's Vice-President for Research, and the University Provost, Dr. Rick Miranda. Dr. Vonder Haar was presented with an embossed plaque which read "CIRA Founder's Wing" and will be on permanent display in his honor.

The overall project was funded as part of CIRA's proposal to the National Oceanic and Atmospheric Administration (NOAA) for a

renewal of its cooperative agreement with CSU. The \$1.2M investment represents a significant commitment to CIRA on the part of the University and a strategic investment in its future growth. While the NOAA partnership represents the core of CIRA's mission since 1980, many other collaborations have flourished including research endeavors funded by the Department of Defense, National Park Service, NASA, and the National Science Foundation among others.

The vision behind the Founder's Wing was due in large measure to the creativity of architect Art Hoy and guided by CSU Project Manager, Milt Brown with input from a team of CIRA personnel. The addition includes a mix





of office space and public spaces including a sizable conference room, employee break room with adjoining patio and a full basement for storage and/or future computing needs.

Moreover, favorable conditions in the market at bidding time allowed CIRA to pursue several remodeling projects concurrently with the construction. A reconfigured entryway into the main building features an improved sidewalk/improved grading as well as a formal reception area with seating for guests. This had long been on CIRA's wish list and the improvement has already positively changed the way CIRA welcomes visitors and employees alike.

Perhaps the most striking feature of the remodel effort is the Atmospheric Bridge. This is a steel structure which juts out 53' into the air and provides a unique space where [CIRA employees and guests can observe and be in the atmosphere](#). The Bridge viscerally connects people to the environment we study and invites all to appreciate our locale along the Fort Collins foothills. The Bridge will be an enhancement to the planned educational and outreach center/weather lab slated to occupy what was the original Director's Conference Room.

At this writing, CIRA staff are finally settling back in and enjoying the new digs. The thought and attention that went into developing the structure is evident to us all and we invite friends and colleagues to come and see it for yourself!





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FIRE WEATHER PREDICTION

Catastrophic wildfires occur in all parts of our nation and are feared for their destruction of life, property and critical infrastructure. The widespread resulting damage requires years of monitoring and rebuilding. Fire management and suppression in the national Wildland Urban Interface (WUI) is an ongoing concern to the American public and to the federal wildland management agencies. National, state and local land management and firefighting organizations must utilize prescribed fires and suppress dangerous wild fires while maintaining a balanced ecosystem.

The challenge of managing wildland fire has dramatically increased in complexity and magnitude over the decades. Large wildfires now threaten millions of both public and private acres, particularly where vegetation patterns have been altered by development, land-use practices and aggressive fire suppression. Potentially serious ecological deterioration is possible where fuel loads have become extremely high. Incident managers base their wildfire-control plans (and resource managers, their prescribed fire burning plans) on current and expected weather conditions. NOAA's strategic plan recognizes a significant need for forecasts containing fire weather information to protect the general public and inform local fire decision support personnel and emergency managers.

Fire in nature, wild or prescribed, is driven by interaction of three environmental components: fuels, topography and weather – the classic fire behavior triangle. Of these elements, weather is the most variable and least predictable.

Fire Fighter's Weather Information Gap

- Meteorological and optical data are lacking in and near wildland fires.
- Lack of data, high resolution data assimilation, and forecast models results in poor diagnosis of the fire environment.
- Weather and fire behavior models need to be coupled. Deficiencies in defining the environment reduce the effectiveness of fire behavior models.
- Interactive, integrated GIS, weather and fire information is not available to fire incident commanders, fire fighters and weather forecasters.

Researching the Fire Weather Information Gap

Emerging Observing Systems

To achieve accuracy in fire weather monitoring and

forecasting, it is critical to have observations and measurement for characterizing the current state of the atmosphere and forecasting the near-term-future states of the atmosphere as they may impact wildfire dynamics. Meteorological observations are extremely sparse in wildland fire areas and may be unrepresentative of the atmospheric conditions in these areas due to complex terrain.

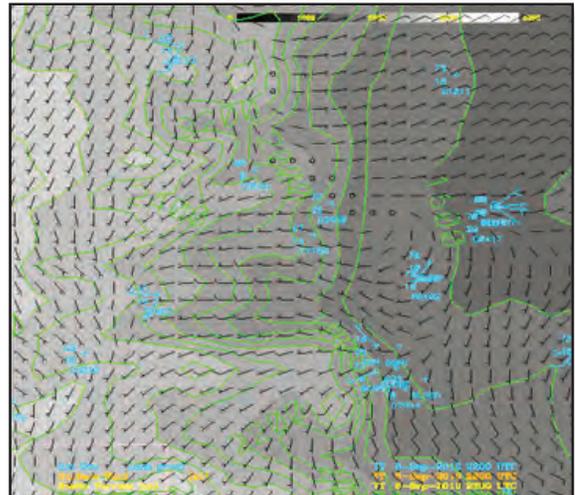


Figure 1. Surface observation network from Boulder, CO to the west. There are only 1 or 2 surface stations covering the steep terrain over the September 2010 Four-mile Canyon fire location. Hongli Jiang, CIRA at NOAA/ESRL/GSD

CIRA researchers at NOAA/ESRL/GSD in Boulder, CO, NIST, the USF, San Jose State University (SJSU) and the University of Colorado at Boulder (CU) have collaborated in building a plan to field test emerging observing systems, such as a Small Unmanned Aircraft Systems (SUAS). This combined effort is aimed at monitoring atmospheric conditions at wildfire incidents. The field data gathered will be essential to fire weather forecasters' real-time forecasts, to model developers' verification of high resolution fire weather and fire behavior models, and to fire-atmosphere researchers for modeling the interaction of fire and weather. A non-fire field test with these systems is planned for spring 2012.

Remote Sensing Systems

Synthetic GOES-R fire perimeter simulations were created by CIRA as part of the NOAA GOES-R Proving Ground project. Simulations of the 2007 California Witch fire were used during the March 2011 NWS Incident Meteorologist (IMET) Annual Meeting and Training in Boise, Idaho in a session attended by a small group of IMET forecasters. The session provided IMETs with the opportunity to become familiar with future GOES-R fire products and to use them in a realistic setting. The CIRA FX-Net developers at GSD ingested atmospheric data from the 2007 Witch fire and time-matched it with the simulated GOES-R data to provide a displaced real-time data set for the exercise. Louis Grasso, who developed the simulations, also provided a training session on the simulated data. As a result of this exercise the IMETs provided very useful feedback to the GOES-R developers on the use of this data for forecasting fire weather.

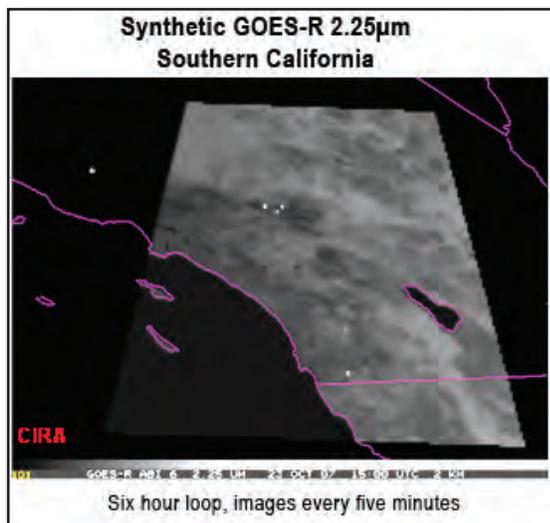


Figure 2. Simulated GOES-R imagery for the 2007 Witch fire, Simulations by Louie Grasso – CSU/CIRA. The light spots are the perimeter of several fires in the area, including the Witch fire.

Modeling Improvements – Fire scale weather models; Coupled weather-fire models

In 2009 the NOAA Science Advisory Board report specifically highlighted the need for coupled weather-fire behavior models to better understand their interactions.

For CIRA researchers at NOAA/ESRL/GSD, the challenge is being addressed by investigating advanced data assimilation methods and new model downscaling techniques. A multiscale dynamic downscaling technique has recently been developed and evaluated in collaboration with

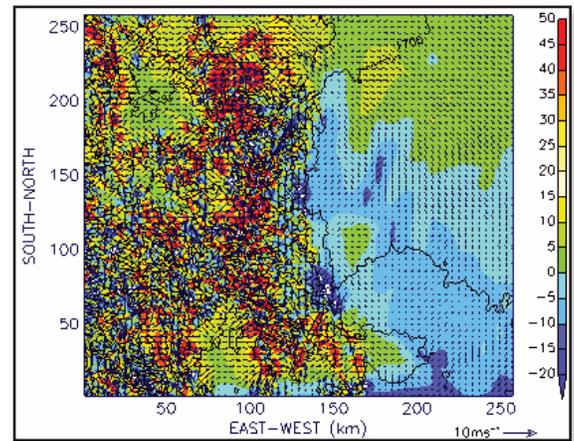


Figure 3. Surface wind from downscaling output for the Four-mile Canyon fire on 6 September 2010 at 22UTC. Color bar indicates the horizontal wind component in m/s. Darker blue indicates a strong gust from the East and darker red indicates westerly flow. This wind is in 1km resolution. Strong winds are produced in the steep terrain region over the western half of the domain. Four-mile canyon is located near the center of the domain (Lat: 40.0156, long: -105.3243). Hongli Jiang, CIRA at NOAA/ESRL/GSD.

NOAA/ESRL/GSD. It is based on a multigrid technique; combines weather information from a model forecast, observational data, and complex terrain to produce high-resolution analysis; and has demonstrated its superiority to single grid analysis. Its application to the Four-mile Canyon fire illustrates the great potential of this method for generating realistic wind structures using high-resolution terrain where observations are sparse.

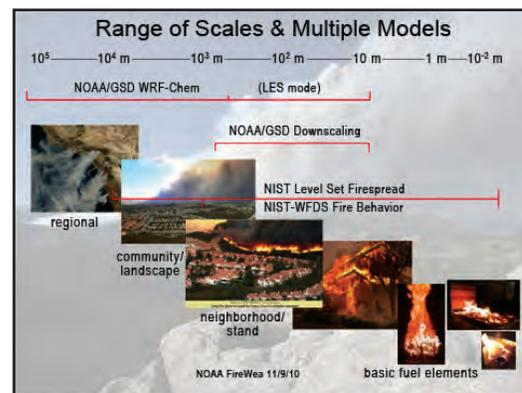


Figure 4. Placing weather and fire behavior models on the same scale presents challenges, along with the issues surrounding the physical coupling of the models.

There is currently no proven landscape-scale fire prediction system that includes the physics of fire/atmosphere interaction, fire behavior in realistic WUI and wildland settings (e.g., terrain and fuel types), and operates sufficiently faster than real time for operational use.

The focus of the NOAA/NIST collaboration is to improve both NOAA's Weather Research and

Forecasting (WRF) based fire weather prediction system and NIST's WUI fire models. NOAA's fire weather model will be extended to include the relevant physics of firespread, smoke transport, and local terrain influenced winds over spatial scales characteristic of wildland and WUI fires. In conjunction, NIST will extend its fire model to operate over larger scales, reduce the computational time required for simulations, and include the necessary atmospheric physics. Also, methodologies for creating databases of weather, fire behavior, fuels and other model inputs at the community scale will be developed.

Interactive GIS Display Systems – Weather Information Systems

The CIRA researchers at GSD have been developing atmospheric data visualization systems for 25 years. The system used by fire weather forecasters in the field has been continuously improved for their specialized needs. The FX-Net system is also used by the US Forest Service, BLM, and National Interagency Fire Center's Predictive Services fire weather forecasters. The NIFC Predictive Services forecasters also use the Gridded FX-Net system, a derivative of the AWIPS system used by the NWS as their operational forecasting system. These systems, developed by GSD researchers, have been the mainstay of NWS forecasters for nearly two decades.

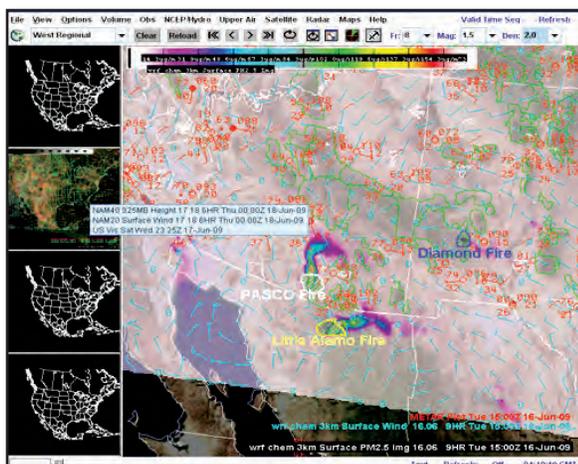


Figure 5. FX-Net showing fire outbreaks in Arizona, Mexico and New Mexico

As systems using new technologies – such as AWIPS II, NextGen web services, and web-based information systems – become operational, a new wave of derived,



Figure 6. Google earth image exported from FX-Net.

mobile systems will become part of the IMET and NIFC fire weather forecasters' toolkit. CIRA researchers at GSD are working with these new technologies to ensure that the next generation of information and decision support services will allow fire weather forecasters, fire incident commanders and emergency managers to seamlessly access data through any type of visualization system.

Communicating Fire Weather Information

Assessing societal response to how fire weather information is communicated is critical to saving lives and property. The vision for communication is to improve how high-resolution fire weather information and services are provided to the emergency managers and the public. The major objectives are to assess public awareness and understanding of fire danger based on weather information, and to assess how NOAA should develop new fire weather information products and approaches to improve the fire-prone community's response to eminent fire danger and future risk.

Collaborations include the NWS Office of Science and Technology, and CU – NSF Grant, NIST and NCAR – Societal Impacts program. CIRA researchers at NOAA/ESRL/GSD are working with these groups to develop science and technology communication tools based on evaluations of community responses to fire danger and evacuation information.

GOES-R

The next generation of the venerable GOES series isn't scheduled to launch until at least October 2015, but CIRA scientists are already hard at work preparing for the wealth of new information that GOES-R will provide to operational forecasters and researchers alike. In addition to vastly improved space and solar environment instruments, GOES-R will fly with the Advanced Baseline Imager (ABI), a 16-band instrument covering key portions of the visible, near-IR, and thermal-IR spectrum at higher spatial and temporal resolution than the 5-band imagers on previous GOES missions. Also flying on GOES-R is the Geostationary Lightning Mapper (GLM), a unique instrument designed to detect lightning strikes from orbit.

As a key partner in the GOES-R Proving Ground collaboration, CIRA researchers are sharing with National Weather Service forecasters and other operational groups some of the capabilities anticipated from these new instruments, and are developing forecast and research products that utilize the new information that the ABI and GLM will provide. Critically, CIRA is also leading the way in developing the much needed training for operational use of these new products, so that forecasters and other operational specialists will be ready to use GOES-R data immediately after launch.

Nearly 30 advanced products using the GLM and ABI are being demonstrated at CIRA; one example of a product harnessing the advanced capabilities

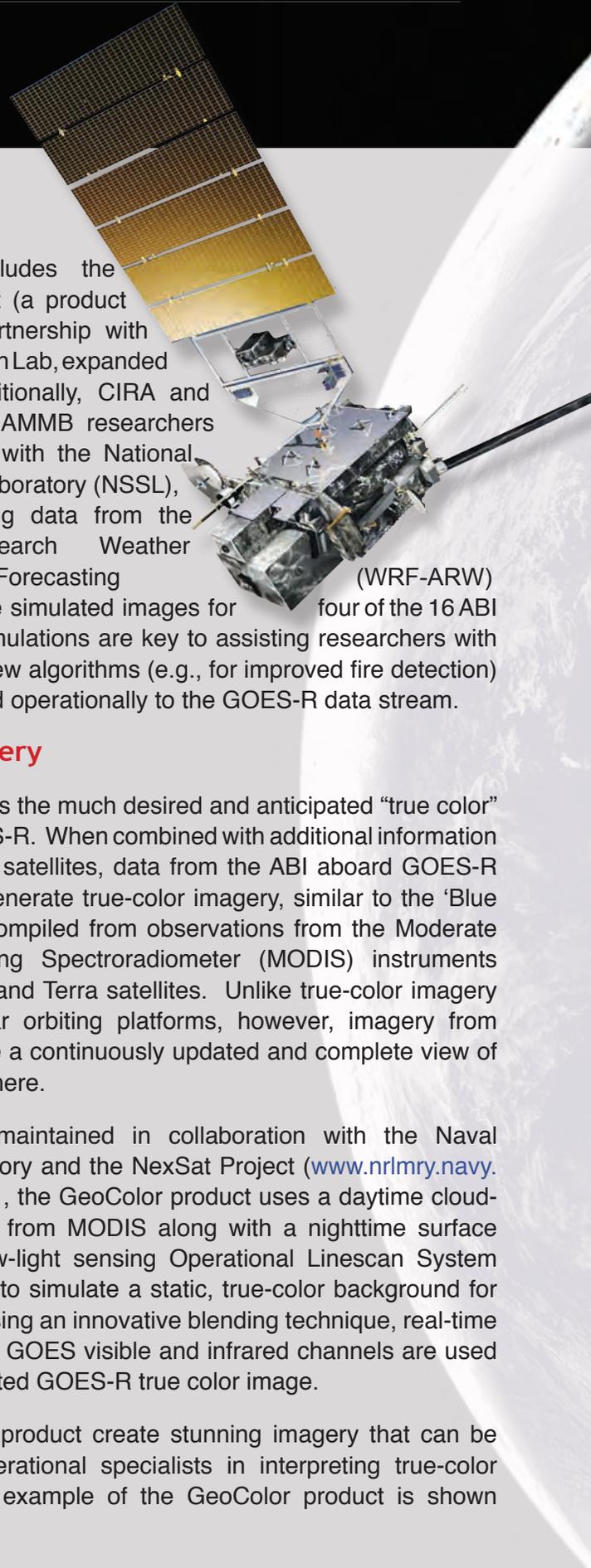
of the ABI includes the GeoColor product (a product maintained in partnership with the Naval Research Lab, expanded on below). Additionally, CIRA and NOAA/NESDIS RAMMB researchers are collaborating with the National Severe Storms Laboratory (NSSL), who are providing data from the Advanced Research Weather Research and Forecasting (WRF-ARW) model to generate simulated images for four of the 16 ABI bands. These simulations are key to assisting researchers with development of new algorithms (e.g., for improved fire detection) that will be applied operationally to the GOES-R data stream.

GeoColor Imagery

GeoColor previews the much desired and anticipated "true color" capability of GOES-R. When combined with additional information from other NOAA satellites, data from the ABI aboard GOES-R can be used to generate true-color imagery, similar to the 'Blue Marble' dataset compiled from observations from the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments aboard the Aqua and Terra satellites. Unlike true-color imagery compiled by polar orbiting platforms, however, imagery from GOES-R will have a continuously updated and complete view of the entire hemisphere.

Developed and maintained in collaboration with the Naval Research Laboratory and the NexSat Project (www.nrlmry.navy.mil/NEXSAT.html), the GeoColor product uses a daytime cloud-free surface map from MODIS along with a nighttime surface map from the low-light sensing Operational Linescan System (OLS) instrument to simulate a static, true-color background for cloud imagery. Using an innovative blending technique, real-time observations from GOES visible and infrared channels are used to create a simulated GOES-R true color image.

Examples of this product create stunning imagery that can be used to train operational specialists in interpreting true-color observations. An example of the GeoColor product is shown



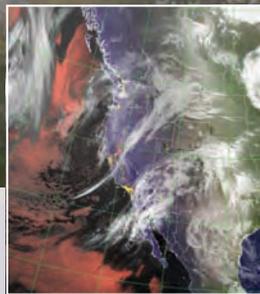


Figure 1



Figure 2

as Figure 1. This image is compiled from GOES-West observations from 1300 UTC, 1 June 2011, and shows the transition from night to day as the terminator passes through Utah. Still in pre-dawn darkness, the large population centers of the West Coast are as seen in the OLS database. As seen from GOES infrared observations, high clouds over the Pacific appear in white, while clouds identified as either low cloud or fog (of particular interest as an aviation and surface commuter hazard) appear artificially colored in pink.

Crossing the night-day terminator from west to east, infrared data are blended with visible data, and the surface map transitions to the MODIS observations. Cirrus clouds associated with the strong jet stream passing from California northeast through Montana are seen in both IR and visible data.

Synthetic WRF-ARW Imagery

Simulated satellite imagery derived from forecast model data is extremely useful to evaluate model performance. It's a matter of "comparing apples with apples" – if the forecast model has an accurate picture on the state of the weather, the simulated satellite images should agree very well with real satellite observations. CIRA scientists, including members of the NOAA/NESDIS RAMMB team, are taking observations of water vapor from GOES and are comparing them to simulated water vapor imagery from forecast model

data from the WRF-ARW forecast model, provided by scientists from NSSL.

The forecast model contains simulations of temperature, water vapor, and cloud properties that affect how radiation at different wavelengths interacts with the properties of the forecast model. Simulated radiation information is then packaged into the same format used for satellite observations, and is made available to researchers for comparison. An example is shown as Figure 2, which represents a picture of simulated emissions from water vapor over the continental United States from 1300 UTC, 1 June 2011. Researchers working with the forecast model can evaluate the position and timing of water vapor features in the model (such as the low-level flow of moisture from the Pacific over the desert Southwest) with observations, and analyze the accuracy of their forecasts.

Currently, four simulated ABI channels are being generated using the forecast model data (three in the water vapor band, and one in the thermal infrared band). CIRA is cooperating with its sister Cooperative Institute, CIMMS at the University of Wisconsin-Madison, to produce a full time-series of synthetic imagery for operational use. These products have been used by forecasters associated with the NOAA Hazardous Weather Testbed (HWT) Spring Experiments to examine the ability of numerical weather prediction (NWP) models to predict severe weather. Continued evaluation of these products will simultaneously improve our ability to accurately forecast the weather, while training forecasters on what to expect from the next generation of satellite observations.

More GOES-R Proving Ground Products

The two examples described above comprise only a small fraction of the products being put together for the GOES-R Proving Ground project – a full list of products, with explanations, is available online at: http://rammb.cira.colostate.edu/research/goes-r/proving_ground. As we move closer to the launch of GOES-R, CIRA researchers are continuing to develop products designed to utilize the advanced features available, as well as provide training on these products to the people who will use them to improve our understanding of the Earth and its environment.

COMMUNIQUE

CIRA BOARD, COUNCIL and FELLOWS

May of this year found CIRA staff busy with hosting duties as the Director convened two important meetings in the new Founder's Wing conference room. Having spent the first six months of his tenure learning about the organization and its vast array of research activities, Dr. Kummerow was ready to convene the CIRA Fellows and the CIRA Executive Board to solicit their input on targets for the coming year. Owing to a few personnel changes and some new policies recently instituted at CIRA, the roster for both advisory groups has changed since the 2010 meetings. Dr. Kummerow has expanded the Fellows to include all CIRA senior research scientists as well as colleagues from the federal government and industry whose research aligns with future goals.

The CIRA Executive Board is a senior group composed of NOAA and University employees who advise the Director on matters associated with CIRA business, as well as the Annual Research Plan among other things. In contrast, the Fellows focus primarily on science matters and membership draws quite broadly from CSU, NOAA, other Federal groups as well as the aforementioned CIRA senior researchers. The Council of Fellows is a subset of the greater Fellow population and takes primary responsibility for advising the Director. Below is the updated membership information.

CIRA EXECUTIVE BOARD

*Bill Farland, Colorado State University
Vice President for Research*
*Jodie Hanzlik, Colorado State University
Interim Vice Provost for Graduate Studies*
*Jeff Collett, Colorado State University
Department Head, Atmospheric Science*
*Christian Kummerow (ex officio), Colorado State University
Director, CIRA and Professor of Atmospheric Science*
*A.E. "Sandy" MacDonald, NOAA, Deputy Assistant
Administrator for Labs/Cooperative Institutes
And Director, ESRL*
Al Powell, NOAA, Director NOAA/NESDIS/STAR
*Sandra Woods, Colorado State University
Dean of Engineering*

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NOAA RAMM Branch*
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Director, CIRA and Professor of Atmospheric Science*
*Marty Ralph, Branch Chief, PSD Water Cycle Branch
NOAA/ESRL*
*John Schneider, NOAA, Acting Director, Global Systems
Division/ESRL*
*Pieter Tans, Senior Scientist, NOAA/Climate Monitoring and
Diagnostics Lab*
*Fuzhong Weng, Chief, NOAA/NESDIS/STAR/Satellite
Calibration and Data Assimilation Branch*

CIRA FELLOWS

*Mahmood R. Azimi-Sadjadi, Electrical & Computer
Engineering, CSU*
Daniel Birkenheuer, NOAA/ESRL/GSD
V. Chandrasekar, Electrical & Computer Engineering, CSU
Jeffrey L. Collett, Jr., Atmospheric Science Department, CSU
William R. Cotton, Atmospheric Science Department, CSU
Mark DeMaria, NOAA/NESDIS/RAMMB
Scott Denning, Atmospheric Science Department, CSU
Graham Feingold, NOAA/ESRL
*Douglas Fox, Senior Research Scientist Emeritus, CIRA,
CSU, USDA (Retired)*
Ingrid Guch, NESDIS Cooperative Research Program
Jay Ham, Soil and Crop Sciences, CSU
Richard H. Johnson, Atmospheric Science Department, CSU
Andrew Jones, Senior Research Scientist, CIRA, CSU
Pierre Y. Julien, Civil Engineering, CSU
Stanley Q. Kidder, Senior Research Scientist, CIRA, CSU
Sonia Kreidenweis, Atmospheric Science Department, CSU
*Christian Kummerow, CIRA Director, Atmospheric
Science Department, CSU*

Glen Liston, Senior Research Scientist, CIRA, CSU
Alexander E. "Sandy" MacDonald, NOAA
*William Malm, Senior Research Scientist, CIRA;
National Park Service (retired)*
Denis O'Brien, Senior Research Scientist, CIRA
Roger A. Pielke, Sr., Senior Research Scientist, CIRES, U of Colorado
James F.W. Purdom, Senior Research Scientist, CIRA, CSU
Robert Rabin, NOAA/National Severe Storms Laboratory
Marty Ralph, NOAA/ESRL
Steven A. Rutledge, Atmospheric Science Department, CSU
John Schneider, NOAA/GSD/ESRL
George Smith, Riverside Technology, Inc.
*Graeme L. Stephens, JPL and Atmospheric
Science Department, CSU*
Pieter Tans, NOAA/CMDL
*Thomas H. Vonder Haar, CIRA Director Emeritus and Atmospheric
Science Department, CSU*
*Fuzhong, Weng, NOAA/NESDIS/STAR Satellite Calibration &
Data Assimilation Branch*
Milija Zupanski, Senior Research Scientist, CIRA

Nolan Doesken: The Colorado Foundation for Water Education's 2011



President's Award

Nolan Doesken, Colorado's State Climatologist and a CIRA Principal Investigator, was recently honored for his tireless efforts on behalf of educating the public on water issues. Nolan's work is legendary in Colorado as he is responsible for establishing the Community Collaborative Rain, Hail and Snow Network (CoCoRaHS). This citizen network began in the state and expanded into a nation-wide effort engaging people in collecting measurements of precipitation right in their backyards. Nolan was honored at a reception at NCAR

on April 8, 2011. CIRA is a long-time supporter of the CoCoRaHS effort and we are proud of Nolan's well-deserved recognition!

Two Important Awards for CIRA Fellow, Dr. Sonia Kreidenweis



Professor of Atmospheric Science and CIRA Fellow, Dr. Sonia Kreidenweis, has been recognized with two recent fellowships. At the American Association for Aerosol Research 29th Annual Conference this past October, Dr. Kreidenweis received one of only two openings to become an elected Fellow. A few short months later, she was recognized a second time by the American Meteorological Society as an elected Fellow during the 91st Annual Meeting in Seattle this past January. CIRA is privileged to have Dr. Kreidenweis serve on its own Council of Fellows where her well-regarded expertise on the

nature and behavior of particulate matter in the atmosphere and its effects on climate and visibility contribute greatly to the CIRA science.

Revelle Medal at AGU to CIRA Fellow, Dr. Pieter Tans



Dr. Pieter Tans, a new CIRA Fellow, was recently awarded the Revelle Medal in acknowledgement for his work in understanding Earth's carbon cycle. The ceremony took place during the fall meeting of the American Geophysical Union in San Francisco. Dr. Tans works in the Earth System Research Lab in Boulder where many CIRA staff are collocated to work with NOAA scientists on research topics of mutual interest. Dr. Tans' findings have advanced our understanding of the global carbon cycle and climate change.

He is best known for his discovery that the carbon dioxide released by burning fossil fuels which is not accounted for in the ocean and atmosphere can be found stored in the land ecosystems of the Northern Hemisphere. He was further recognized for his invention of a formula now used throughout the scientific community as well as his founding role in the Carbon Tracker system.

NOAA/Global Systems Division Team Member of the Month

CIRA has recently had a number of employees recognized as GSD Team Member of the Month by our federal partners at the NOAA lab in Boulder.

November 2010 - **Michael Leon** of the Aviation, Computing, and Evaluation (ACE) Branch was honored for leading the NextGen Network-Enabled Weather (NNEW) program.

April 2011 - **Bob Lipschutz** has done an excellent job serving as the Central Facility production control manager. He keeps the Data Systems Group processing cluster functioning as a highly-reliable data delivery service for GSD.

May 2011 - **Leigh Cheatwood-Harris** has made very significant contributions in several areas related to the Geo-Targeting Alert System (GTAS) and the Next Generation Aviation Transportation System (NextGen).

June 2011 - **Missy Petty's** work as deputy program manager for the Forecast Impact and Quality Assessment (FIQAS) Section of ACE is outstanding. She provides excellent project management for many of the section's scientific assessments through extensive coordination with external sponsors.

New Employees

Karina Apodaca
Jamie Cismoski
Ashley Fisher
John Haynes
Jordan Lavelle
Irfan Nadiadi
Tomohiro Oda
Matthew Rogers
Stacy Sandhoff
Wesley Smith
Thomas Taylor
Natalie Tourville
John Weaver
Ka Yee Wong

Promotions

Steven Fletcher - Research Scientist III
Michael Leon - Research Associate IV
Patrick Purcell - Research Associate IV
Donald Reinke - Senior Research Associate
Jeffrey Smith - Research Associate IV
Jennifer Valdez - Research Associate III

Years of Service

Renate Brummer - 15 years
David Cismoski - 20 years
Daniel Coleman - 10 years
Randall Collander - 15 years
Cindy Combs - 20 years
Shripad Deo - 10 years
Jack Dostalek - 15 years
Joanne Edwards - 15 years
James Fluke - 15 years
John Forsythe - 15 years
James Frimel - 15 years
Brian Jamison - 15 years
Thomas Kent - 15 years
Stanley Kidder - 15 years
Holli Knutson - 10 years
Lixin Lu - 15 years
Chris MacDermaid - 10 years
Scott O'Donnell - 15 years
MarySue Schultz - 15 years
Edward Szoke - 15 years
Ning Wang - 15 years
Marilyn Watson - 20 years
Milija Zupanski - 10 years

CIRA Vision and Mission

The Cooperative Institute for Research in the Atmosphere (CIRA) is a research institute of Colorado State University.

The overarching Vision for CIRA is:

To conduct interdisciplinary research in the atmospheric sciences by entraining skills beyond the meteorological discipline, exploiting advances in engineering and computer science, facilitating transitional activity between pure and applied research, leveraging both national and international resources and partnerships, and assisting NOAA, Colorado State University, the State of Colorado, and the Nation through the application of our research to areas of societal benefit.

Expanding on this Vision, our Mission is:

To serve as a nexus for multi-disciplinary cooperation among CI and NOAA research scientists, University faculty, staff and students in the context of NOAA-specified research theme areas in satellite applications for weather/climate forecasting. Important bridging elements of the CI include the communication of research findings to the international scientific community, transition of applications and capabilities to NOAA operational users, education and training programs for operational user proficiency, outreach programs to K-12 education and the general public for environmental literacy, and understanding and quantifying the societal impacts of NOAA research.

Cooperative Institute for Research in the Atmosphere

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