CIRA

Cooperative Institute for Research in the Atmosphere

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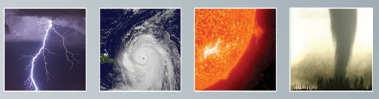
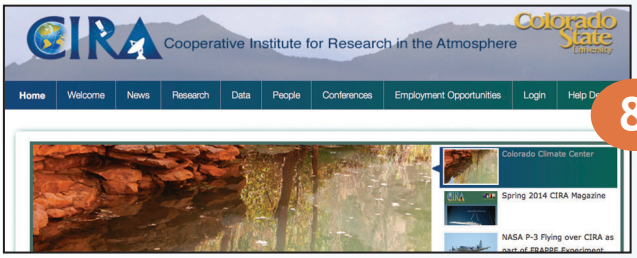
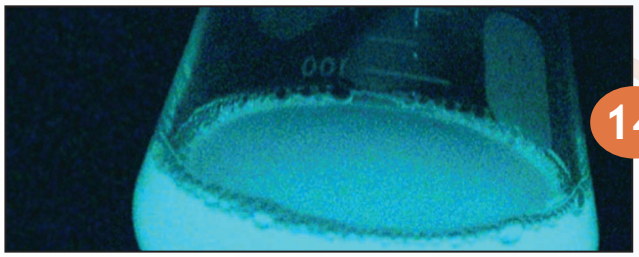


College of ENGINEERING

Beauty and Light: Rare Phenomenon Appears over CIRA

Colorado State University





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FORTCAST Logo: courtesy of FORTCAST
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From the Director's Desk . . .

In an e-mail last August, I began talking about reconnecting CIRA to its origins dealing with the improvement of models through the use of observations. If I look at our current activities, I see a strong modeling effort associated with new state-of-the-art global forecast models, a strong satellite effort related to creating new products and bringing those to the forecasters, and data assimilation activities that are embedded in nearly all activities associated with CIRA. In the data assimilation area, we will be bringing in a pair of interns starting January 2015. The idea is to increase the size of the workforce that can work on the theory and practice of data assimilation within the NOAA environment. I personally look forward to CIRA initiating the internship program that will add to our data assimilation effort.

Related to improving model physics or processes, I believe that our national satellite fleets and surface observations can be exploited far more than we have done in the past. With global models now running at cloud permitting scales, satellite observations and models are resolving similar scales. This really implies that dynamical and microphysical processes can be compared. Do models produce the right clouds at the right time? Is the local environment being properly simulated? Is the model microphysics consistent with the observations? As a simple example, I believe we must use our new and expanding observational capabilities not only to guide forecasters and verify models but to develop diagnostics that the modeling community can use to improve the processes being simulated in our weather and climate models. The time for these advances is now, and CIRA is ideally positioned with large communities in the areas of modeling and observations to take advantage of this.

Administratively, CIRA continues to be on solid financial footing. We received fairly substantial funding through the Hurricane Sandy Supplemental Act and that has kept the overall program on an even keel if not growing slightly. The Cooperative Institutes have also just renegotiated a new base funding formula with NOAA, and I am happy to reiterate that under this new formula CIRA may have a little extra funding to invest in students. As such, we plan to expand the program of students we support. We may also expand in the post-doc areas. Unlike the students, however, the post-docs might be limited to a few hires over the next couple of years specifically aimed at increasing our expertise related to data assimilation and the weather and climate process understanding from observation. We have also managed to finally replace our leave card system with an electronic leave request system. While it is an interim system as we wait for the University to fully implement integrated Human Resource software, the University's wheels might not always spin as fast as one might imagine.

Let me end by recalling that 2 years ago, I invited many of the CIRA supervisors from Fort Collins and Boulder to a 1-day retreat to simply meet one another and try to find ways of leveraging each other's expertise. While it was nice for everyone to meet, I thought the second objective of leveraging our expertise never really got much traction. With relatively infrequent contact between people, it was difficult to integrate our activities particularly well. Based on that experience, we did have a much more successful meeting last year where we focused on a specific scientific subject; namely, air quality as done by the different groups associated with CIRA. By focusing on a particular problem, we did much better; and I think some very good collaborations have ensued from that meeting. I would like to follow that up this spring. My initial thought was to bring together satellite and data assimilation researchers around the topic of Optimal Estimation – What can we learn from each other? More on this as we get closer to Spring 2015. First, we'll have to get through another winter in Colorado. Fortunately, as I write this text on October 14, the CIRA weather station says it is 71.7 degrees with a dew point of 31.9, an ENE wind at 3.0 mph and not a cloud in the sky. I may have to request a few hours of vacation.

Chris Kummerow

FORTCAST

CIRA and the American Meteorological Society

By Matt Rogers

Founded almost one hundred years ago, the American Meteorological Society (AMS) serves as one of the key professional organizations for meteorologists, climatologists, and atmospheric scientists. Besides serving as the publisher of multiple scientific journals germane to the field, including the time-honored *Bulletin of the American Meteorological Society*, the AMS serves as an important networking and professional development organization for the field as a whole. Professionals from television forecast meteorologists providing updates on-screen to research scientists developing new scientific techniques benefit from the interaction provided by the Society, including the opportunity to see literally thousands of talks at the annual meetings provided by the Society.

Aside from these large-scale operations, the real backbone of the AMS is found in the local chapters of the AMS. These local chapters, where membership in the national AMS isn't required, perform a role of serving the public interest in weather and climate-related topics by bringing together professionals such as meteorologists, research scientists, and climate researchers with interested members of the public in a manner that isn't easily possible within the confines of the national AMS. By bringing the science of atmospheric research to the common citizen, the many local chapters nationwide of the AMS increase public awareness of our field to the benefit of all.

And CIRA is now participating with one of the AMS' newest local chapters. Founded in 2013 from the remnants of the old student AMS chapter at CSU, the FORT Collins Atmospheric ScientisTs, or FORTCAST chapter, has now expanded to include professionals and members of the public. Covering a region stretching from southern Wyoming through Northern Colorado, FORTCAST has increased its membership options and is in the process of developing larger community-involved quarterly meetings to increase visibility of the chapter and grow involvement in the AMS in northern Colorado.

Lisa Kriederman/NWS

One of the key activities of FORTCAST is public education and outreach – to that end, FORTCAST members have been engaged in several activities that bring atmospheric research to the public eye. CIRA researcher Bernie Connell has developed a weather club for a local elementary school program, called 'Club Trés', that provides a weekly 90-minute opportunity for underprivileged students to interact directly with scientists, talking about topics such as clouds, winds, rainbows, and tornadoes. Along with help from fellow CIRA-affiliated scientists Kristi Gebhart and Matt Rogers, the weather club developed several activities for students to enjoy; with the involvement of graduate students through FORTCAST in 2013, the program took off. Now, a weekly influx of new projects and a new scientist to meet every week keeps students participating in the program engaged and excited about weather, while lessening the workload of providing volunteer outreach activities to researchers.

CIRA researchers, along with colleagues from the Department of Atmospheric Science and the Fort Collins Museum of Discovery, put on a successful Earth Day program at the Museum last April. With several interactive displays, including simulated satellite platforms, demonstrations of principles of scattering, absorption, and emission of light, and regular radiosonde launches along with a historical overview of upper-atmospheric observations, the activity brought the fundamentals of atmospheric research to hundreds of visitors to the museum. Opportunities for members of the public to directly talk to scientists about their research are at the heart of what local AMS chapters are all about, and the positive public perception that results from these interactions only boosts the relevance and support for CIRA research.

Recently, the chapter has taken a new approach to regular meetings. Long the bane of any organization, the phrase 'regular meeting' is a hoary one, replete with notions of procedural discussion and planning of activities. Given the dynamic nature of opportunities, the capable nature of the executive board for FORTCAST to respond to and plan for said opportunities as they arise, and most importantly, the incredibly valuable and interesting nature of the work done by FORTCAST members, it was decided that the quarterly meetings of the chapter would be held in the community, open to the public, and would feature an invited speaker, bringing expertise and topics of interest to the local community. The first of these meetings featured the incident meteorologist and fire program leader from the NWS Boulder forecast office, Lisa Kriederman. Having served as the incident meteorologist for the Hewlett Gulch, Waldo Canyon, and Royal Gorge fires, her expertise in fire weather and incident meteorology matched with the interests of a community affected by wildfire. Following this talk, a brief program to cover the chapters' needs (including picking a logo) followed by a long period of interaction with the public finished the meeting. A larger-than-usual crowd, including members of the public who saw notices in the local newspaper advertising the meeting, heard more about opportunities to get involved with atmospheric research through interaction with their local chapter of the AMS.

Public perception of science is an important topic; with the technological advances of the present day increasingly bringing scientific concepts to the forefront of our daily existence, knowing who the scientists in one's community are and what it is, exactly, that they do is more important. Continuing to support community interaction through the work done by FORTCAST is an enjoyable part of work for several CIRA researchers, and this collaboration is likely to continue, and grow, for years to come.

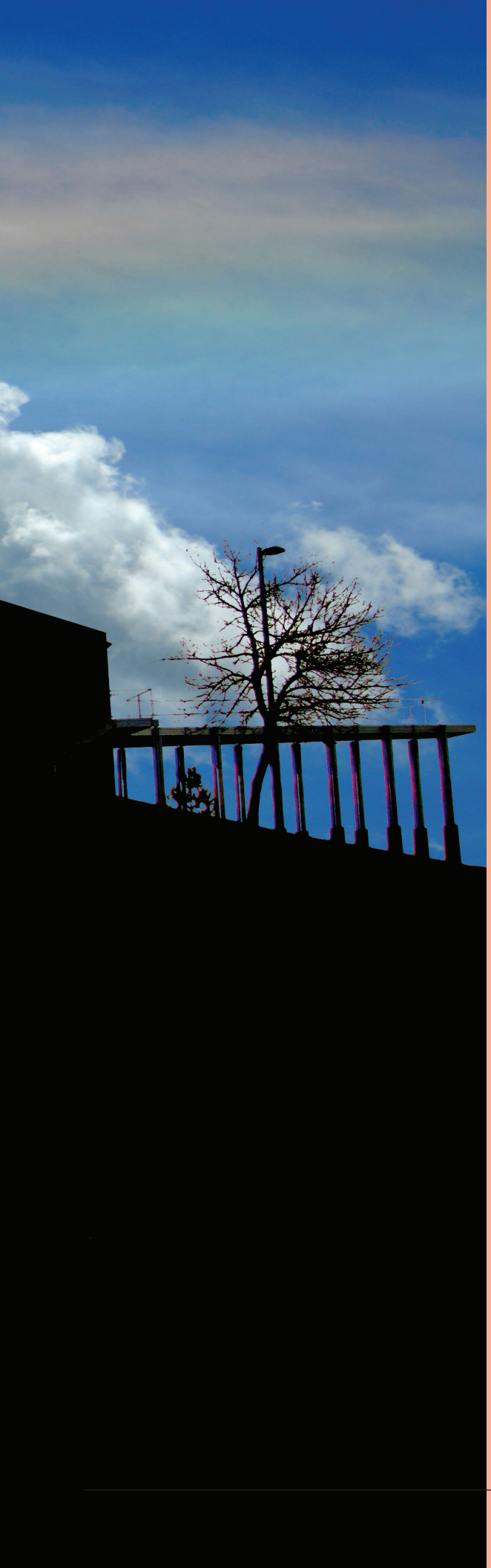
More information about FORTCAST can be found online at:
http://fortcast.atmos.colostate.edu

Science Off The Deck

By Matt Rogers

Ever since its founding, the central thrust of CIRA's research has traditionally been directed towards advances in satellite observations and retrievals and computer models of the atmosphere, typically finding ways to leverage advances in one of these fields to improve the other. Given the huge advances in technology over the past three decades, focusing on these areas provides the best way to make inroads into the complex and subtle state of atmospheric observation and prediction. There remains, however, a real need for in-situ observations in atmospheric science, and for the dedicated atmospheric scientist, seemingly chained to a desk endlessly poring over code and imagery, the opportunity to occasionally involve one's five senses directly in atmospheric observation is a welcome respite.

The atmospheric observation deck and weather station at the CIRA Foothills Campus location in Fort Collins is a great place for CIRA researchers to do just this (for more information about the weather station, see the Fall 2012 issue of CIRA Magazine). And recently, CIRA employees were treated to two such examples of real-world science, easily observable right from the atmospheric observation deck.



P-3 lining up over the buildings of the Foothills Campus

Vertical Profiling the fun way: P-3 Overflights of CIRA location

As part of the Front Range Air Pollution and Photochemistry Experiment (FRAPPE) run by the National Center for Atmospheric Research (NCAR) and in partnership with NASA's DISCOVER-AQ 2014 program, the summer of 2014 saw multiple research aircraft equipped with a variety of air-quality and ozone measuring instruments, buzzing up and down the Front Range taking regular observations of air quality. One notable aircraft participating in the campaign was the NASA Goddard Space Flight Center (GSFC) P-3 Orion aircraft. Originally an airliner before being pressed into service as the U.S. Navy's premier submarine-hunting aircraft through the end of the Cold War, the venerable P-3 aircraft is notable for its range and ability to fly at a range of speeds, making it the perfect candidate for conversion to a scientific research aircraft. As part of the FRAPPE and DISCOVER-AQ mission, one of the roles of the GSFC P-3 aircraft was to take high- and low-level atmospheric observations, including getting a vertical profile of air quality as a function of height. To accomplish this role, several locations around the Front Range were selected for a specific flight maneuver – the P-3 would swoop in at very low altitude, enter a tight spiraling climb, and then exit at high altitude. Performing these maneuvers requires a certain freedom in airspace, and one of the locations where these maneuvers could be performed is over the inoperative runways of Christman Field, just a stone's throw from CIRA's Foothills Campus location.

Using a website provided by NASA, CIRA researchers were able to see when the P-3 would approach Christman Field in real-time. Typically, the approach would begin from the south over Horsetooth Reservoir lining up over the buildings of the Foothills Campus and then entering a tight right-hand spiral once over the airfield proper. The approach path took the P-3 just hundreds of yards away from the CIRA building, and more than once did the approach of the P-3 happen in front of a full deck of CIRA researchers with cameras in hand. Other researchers noted the presence of the P-3 by the slight shaking of their monitors and the brief roar of the aircraft's turboprop engines, before getting back to work.

A rare circumhorizontal arc sometimes call a 'fire rainbow', occurred right off CIRA's Observation Deck

Air quality and ozone observations continue to be a high priority for atmospheric science, as are satellite missions dedicated to measuring these properties. Improving the correlation between surface-based observations from disparate locations to the complex and sophisticated retrievals used by satellite observations requires diligent work and extensive field campaigns – and occasionally, some light aerobatics. CIRA was lucky to have front-row seats to this latter demonstration of our scientific capability for observation.

Marvelous light and wondrous cloud – circumhorizontal arc over CIRA

As any researcher who works in remote sensing can testify, the many ways that light interacts with its environment is a complicated, subtle, and often beautiful thing. Many optical phenomena in the atmosphere are well-known; the rainbow being the most commonly experienced, but sun dogs (parhelia) and sun rays (both of the crepuscular and anti-crepuscular varieties) are commonly seen in Colorado. CIRA researchers who spend enough time flying from conference to conference have likely seen the colorful halo around their craft's shadow known as "the glory" as well. Recently, a much rarer phenomenon was experienced- again just off the atmospheric observation deck- a circumhorizontal arc manifested as a beautiful rainbow-like display of color.

Requiring a specific alignment of geometry between the observer and the sun, as well as a relatively precise alignment of flat, hexagonal ice crystals located in the precise location to refract light, the circumhorizontal arc (sometimes called

a ‘fire rainbow’ despite having nothing to do with either fire or the rainbow) results from sunlight refracting through the thin ice crystal layer, creating a prismatic display of the colors of the refracted light. And for one day the specific requirement of ice cloud, geometry, and sunshine occurred right off the CIRA observation deck… and again, CIRA researchers flocked to catch this rare phenomenon with cameras in hand.

With a few notable exceptions the majority of CIRA researchers spend their days in comfortable offices, communicating with colleagues near and distant over email and developing new ways to understand the vast atmosphere outside their windows by peering into a smaller, fluorescent window. In their screens they turn logic and hypothesis into retrievals and forecasts using their computers as their laboratory, recreating the atmosphere and its many parts virtually inside memory chips and processors. Once in a while, however, it’s a privilege to step outside and simply look up and experience the atmosphere; doing so from the CIRA atmospheric observation deck will sometimes provide a remarkable show.

Photo: NASA Langley P-3 on approach

Welcome To The New CIRA Website

By Matt Rogers and Rob Viola

It happens every few years – new innovations in the world of web development bring new capabilities and new features to the forefront, and the old and increasingly clunky website (that maybe we just got used to!) simply doesn't pass muster any more. For some, the prospect of a new website proffers terrors of new database interfaces, document incompatibility, and navigational nightmares. For the technologically-savvy crowd at CIRA, however, a new website means new capabilities, enhanced function, and better and more responsive design.

The new CIRA website, online for several months now, is built on the Drupal framework, and offers several exiting new features over the old website. Included in the new features are:

- Indexing by principal investigator, research topic, funding source, etc.
- Improved search and editing capabilities
- Simpler navigation and organization
- More updated news links
- An evolving look to the website, to match the season

The second bullet point is perhaps the most immediately apparent of all the changes to the website – the old model of having a single point-of-contact webmaster/webmistress, solely responsible for content updating for all the myriad functions of the CIRA website, has been replaced by a role system, where critical members of the CIRA staff have enhanced capabilities on sections of the website germane to their tasks. Research coordinators and principal investigators, for example, have edit capabilities for the projects in their purview, while HR specialists have editing capabilities over employment and HR functions.

Additionally, the ability to update the website with news items, and tying functionality between the website and the increasingly popular CIRA Facebook page helps keep the site fresh and relevant. All of this is made possible through simple 'what-you-see-is-what-you-get' editing directly

from a web browser – no coding skill required – for CIRA employees with the correct login credentials.

Of additional import is the built-in keyword system provided by the Drupal framework – the ability to 'tag' any page or content within with keywords related to projects, scientists, and other topics of import means that, contextually, the webpage essentially serves as its own search engine. As the new website continues to grow and develop content, visitors to the website will be able to search for relevant keywords and find all instances of research or activities related to their interest, easily indexed by the website. Such functionality is beginning to become commonplace on the websites of leading research institutes, and CIRA is taking its place at the forefront of this trend.

The process leading to the development of the new website happened over several months, and consisted of a team led by Assistant Director Mary McInnis-Efaw and lead webmaster Rob Viola, assisted by Matt Rogers. The web team met with constituent groups over these months, demonstrating trial versions of the site, getting feedback on functionality and feature wishlists, and then iterating the site until ready for prime-time. Having been launched, the website continues to undergo development, with feedback encouraged from CIRA employees and site visitors alike.

The final chapter of the new website will unfold over the coming months, as 'how-to' documentation is distributed and training materials on using, editing, and improving the CIRA website are disseminated. Login information and instructions on editing profiles, projects, and other content relevant to your work will be staged for the sake of simplicity, and eventually, the collaborative nature of content management on the CIRA website will take over. Please stay tuned as we continue the development of your CIRA website, and we hope you enjoy the new experience it provides!

OCO-2 Launches – A Long Journey Finally Begun

The scene: early, very early, on the morning of July 2nd 2014. Vandenburg Air Force Base, in California, where a Delta-II rocket sits on a launchpad, under a totally cloudy sky. Just over a mile away, the launch control room buzzes with activity, technicians and managers certain they've corrected an issue with a water-based acoustic suppression system for the launchpad that prevented yesterday's launch.

By Matt Rogers, with input from Chris O'Dell and Kortny Rolston

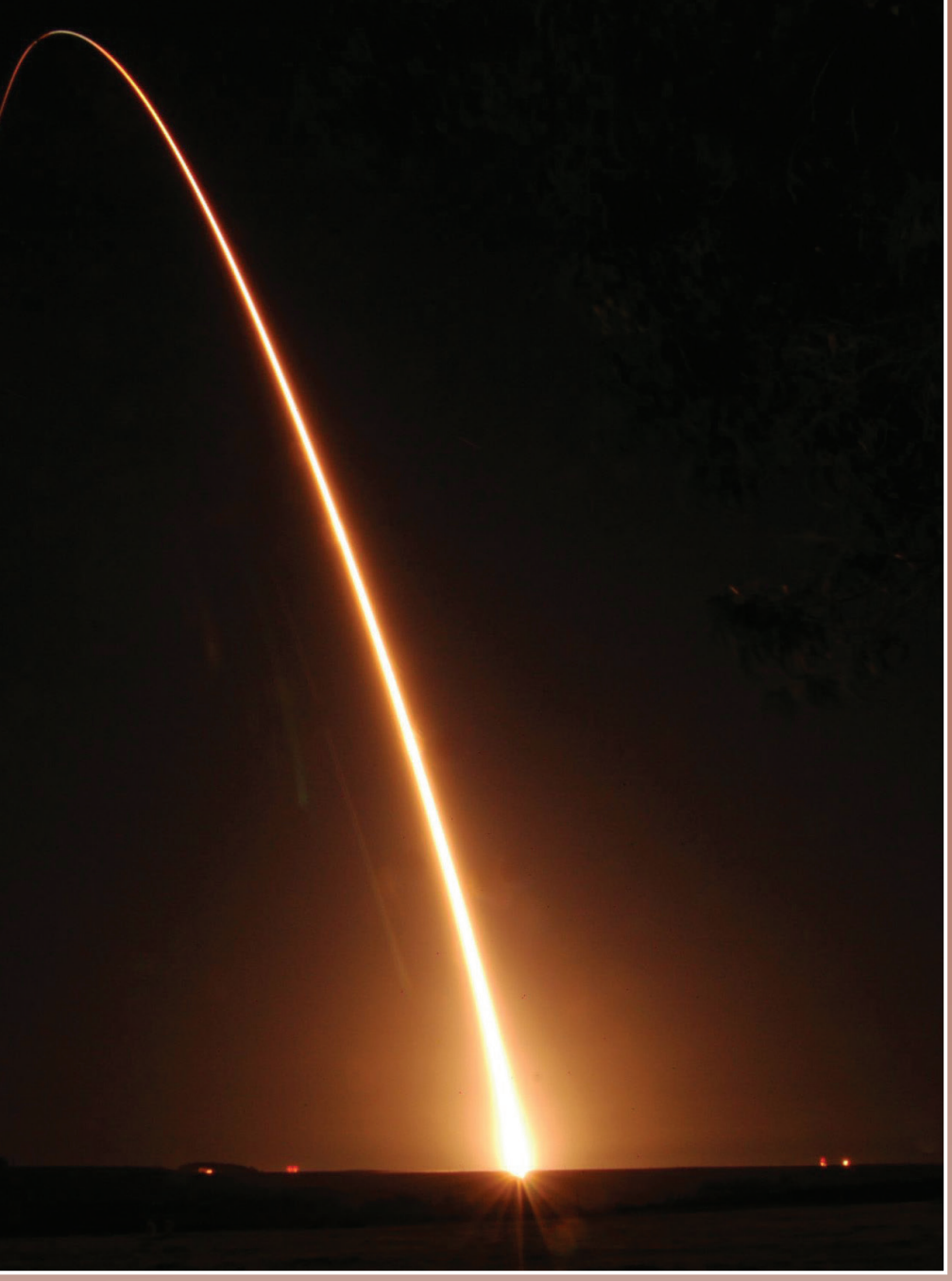
OCO-2 launches on July 2, 2014 (JPL/NASA)

As the clock ticks down to T-0, all systems check in as nominal, and at 2:56 AM Pacific Standard Time, the Delta-II rocket lifts off, immediately shrouded by clouds, heralding its final moments surrounded by the Earth's atmosphere.

As the rocket soars into the dark early morning sky, the calm, measured voice of NASA launch announcer George Diller marks waypoints on its journey, an initial orbit that will eventually position its payload to join the A-Train constellation of Earth-observing satellites.

Once above the Earth's atmosphere, the fairing atop the rocket divides evenly and jettisons cleanly, perfectly, dropping back to Earth to reveal the satellite within to the darkness of space for the first time. Rocket stages have separated, engine burns have completed nominally and on-target, and eventually, the satellite reaches its intended orbit, marking another launch success for the seasoned team at Vandenburg AFB, the United Launch Alliance, and NASA. Just another hard day's work for this group, but for the science team behind the satellite, the Orbiting Carbon Observatory-2 (OCO-2), the successful launch brings forward a flood of emotions, capping a nearly five-year journey through disappointment, uncertainty, and rebuilding. As OCO-2 continued to go through its on-orbit checkout in the days and weeks that came, unfolding its solar arrays and testing its systems, team members including scientists from the Department of Atmospheric Science at Colorado State University and the Cooperative Institute for Research in the Atmosphere got busy with jobs they'd intended to start years ago – looking at the distribution and fluxes of carbon dioxide gas in the atmosphere. After years of holding their breath, these scientists could finally get about the business of watching the Earth breathe, from space.

OCO-2, a $467 million NASA mission, carries a sophisticated suite of instruments to accurately measure the amount of atmospheric carbon dioxide in the Earth's atmosphere. Orbiting the Earth once every 98 minutes at an altitude of 438 miles, the seven-foot long, 999 pound OCO-2 spacecraft will spend the next two years of its planned mission providing global observations of carbon



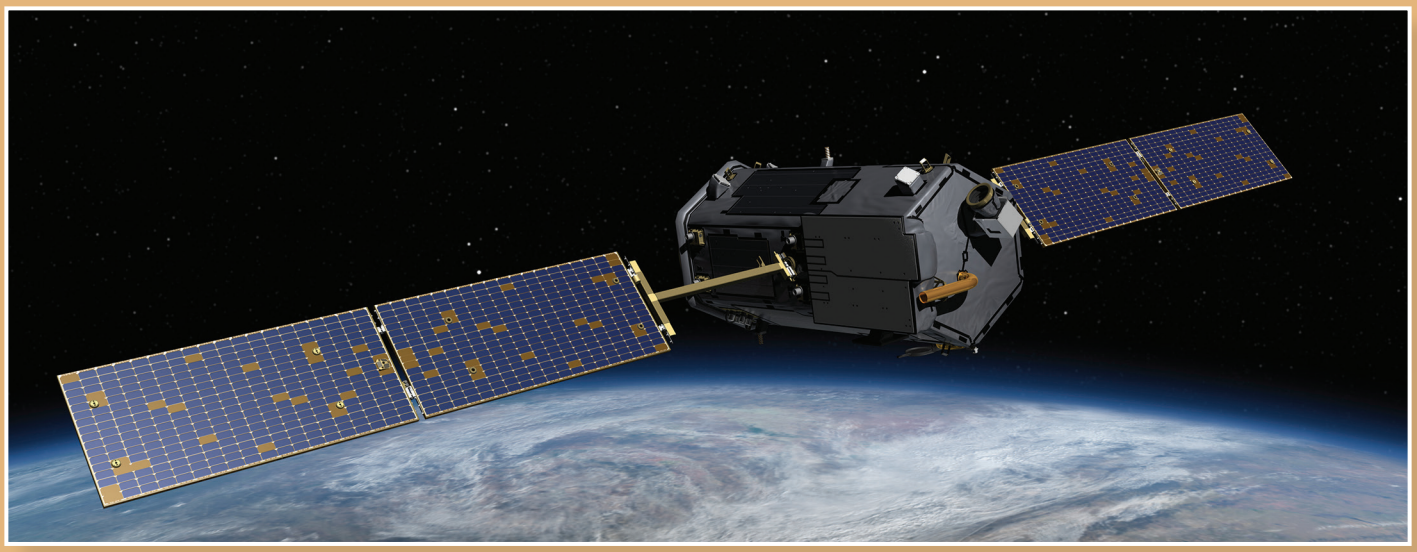
Original OCO launch, resulting in mission failure, February 24, 2009 (Matt Rogers/CIRA)

dioxide concentrations with an accuracy of 1 part per million or better. Only the second successful satellite to launch with the express goal of measuring carbon dioxide (and the first American mission to do so), the OCO-2 mission will improve upon the accuracy of existing carbon-measuring missions, providing higher quality data for scientists to analyze, including information that could help scientists measure natural 'sinks' of carbon dioxide. Roughly 36 billion tons of carbon dioxide is emitted into the atmosphere every 12 months, which is the equivalent of every U.S. household putting out 40 bags of trash every week for a year. About half of that stays in the atmosphere and the other half is absorbed by the earth's oceans, as well as plants on land. A Japanese satellite, the Greenhouse Gases Observing Satellite (GOSAT), was launched in January 2009 with the same mission, but the OCO-2 spacecraft carries a sophisticated suite of higher-resolution instruments. The goal of the OCO-2 mission is to provide carbon dioxide measurements accurate to one part per million – an astounding accuracy level for any scientific measurement, especially for a space borne instrument.

The road to renewal – launch failure, reshuffling, and rebuilding

The data from OCO-2 has been eagerly anticipated – not only for its groundbreaking content and accuracy, nor only for its critical use in understanding the Earth's carbon budget and its impacts of anthropogenic climate contributions. The prime source of anticipation stems from the five-year wait for OCO-2 data after the launch failure of its predecessor mission, the $280 million Orbiting Carbon Observatory (OCO.) That mission, which was destroyed following a launch failure in February of 2009, had the same goals, the same intended orbit, and even generally the same hardware specifications as OCO-2, using the same instrument package and retrieval technique. That retrieval, developed largely by a team at Colorado State University led first by Dr. Denis O'Brien and later by CIRA researcher and later Professor Chris O'Dell, took measurements from three spectrometers looking at reflected light from the Earth's surface, two from wavelengths sensitive to carbon dioxide, and one from oxygen, and promised comprehensive and accurate measurements of carbon dioxide.

With years of testing and planning behind them, the CSU team watched in awe as the original mission lifted off



Artists' rendering of OCO-2 on orbit (JPL/NASA)

from Vandenburg on a clear morning, leaving a beautiful trail of light behind it. On the way back to the hotel after the launch, however, the team received devastating news – the protective fairing (the 'nose cone' of the rocket), designed to shield the payload from the Earth's atmosphere during launch, failed to separate as planned. Cocooned in its fairing, the satellite, too heavy to reach orbit and unable to operate its instruments, re-entered the Earth's atmosphere perhaps ten minutes or so after launch, burning up in a bright fireball before crashing in the Antarctic ocean. Within minutes, years of work completed and years of research to come were destroyed; along with it, the hopes of scientists and engineers who suddenly had hard questions to answer. "What now?" "Can we start again?" "What can we do with what we have?"

In the weeks following the loss of the OCO mission, the team began to reshuffle its priorities as funding for the failed project began to be redistributed. The successful launch of the GOSAT mission in January of the same year offered a chance to test the OCO retrieval algorithm, albeit on a sensor with degraded capabilities compared to OCO. Scientists from CIRA and CSU involved with the OCO retrieval algorithm began the process of acquiring funding and project support to test this algorithm, keeping the core of the dedicated team focused on the capabilities of their code. At NASA, the project team retooled itself, and began the lengthy process of proposing a resurrected version of the mission. Flight spare instruments from the original mission were still around, and could be used to build a cost-effective, off-the-shelf duplicate of the OCO satellite (jocularly dubbed as the 'carbon copy' satellite.) Intense interest in the science of the mission and the needed data from it kept pressure on Congress, who ultimately approved money for an OCO reflight. Now called OCO-2, the project continued development of the flight hardware while testing the retrieval algorithm using GOSAT data, while a committee tackled the difficult task of determining the cause of the fairing malfunction. (A similar mishap with a fairing failing to separate destroyed the GLORY mission in March 2011.) Most importantly, finding a launch vehicle for OCO-2 became a key issue – the OCO-2 spacecraft is relatively small, with only a few available boosters of the appropriate size for its intended orbit. A Delta-II rocket was cobbled together from Department of Defense sources, and despite its much greater launching capacity, would serve as the launch vehicle for OCO-2. (When OCO-2 launched, it carried with it nearly a half-ton of ballast to account for this detail.)

Slowly, over years, the project took shape from the ashes. Good science on the carbon budget was performed, thanks to the participation of Japanese partners willing to share their satellite's data with the OCO-2 retrieval team. And finally, a launch date for the mission was announced, bringing the promise of fulfillment after years of delay for a team eagerly waiting to demonstrate their abilities to a world waiting for their data.

From the past, to the future: carbon measurements and beyond

Perhaps a few moments of terror or trepidation about the possibilities of another launch failure occurred in the minds of team members preceded the successful launch of the OCO-2 mission in July of 2014, but with the satellite on-orbit and taking measurements, there's work to do now. One of the key questions scientists seek to understand is the role of Earth's plant life in the carbon cycle. It's been

OCO-2 spacecraft after assembly (JPL/NASA)

observed that, for example, that plant life globally continues to accumulate greater and greater amounts of carbon, implying that plants are growing faster than they die. Is this phenomenon due to warming seasons and longer growing cycles? Is additional carbon dioxide in the atmosphere enhancing the growth of these plants? By studying at high resolution and great accuracy the ebb and flow of atmospheric carbon dioxide, especially around the Earth's heavily vegetated regions, scientists can finally began to answer these questions, as well as the critically important follow-up – is this continued uptake of carbon dioxide by plants sustainable?

Additionally, the OCO-2 satellite will be able to see the faint 'glow' of plants emitted during the photosynthetic process. This new capability, perfected during the period between the launch failure of the original OCO mission and the launch of the OCO-2 mission, promises to answer questions about the health of the Earth's plant life. "We will be able to tell how well and how fast plants are growing in a given area, or conversely if they are under stress and not growing well" said Prof. Chris O'Dell, one of the lead scientists working with the mission.

The process of scientific discovery is often difficult, strewn with disasters and complications that hinder our growth as a species to understand the world in which we live. Working in space increases this difficulty by an order of magnitude; the trials of developing an instrument for experiments are made tougher by the requirement of working in a hostile environment, with no hope of maintenance or repair once on-orbit. Nearly sixty years since humans first lofted objects into space, the great challenges inherent to rocket flight continue to contribute uncertainty and risk to spaceborne scientific

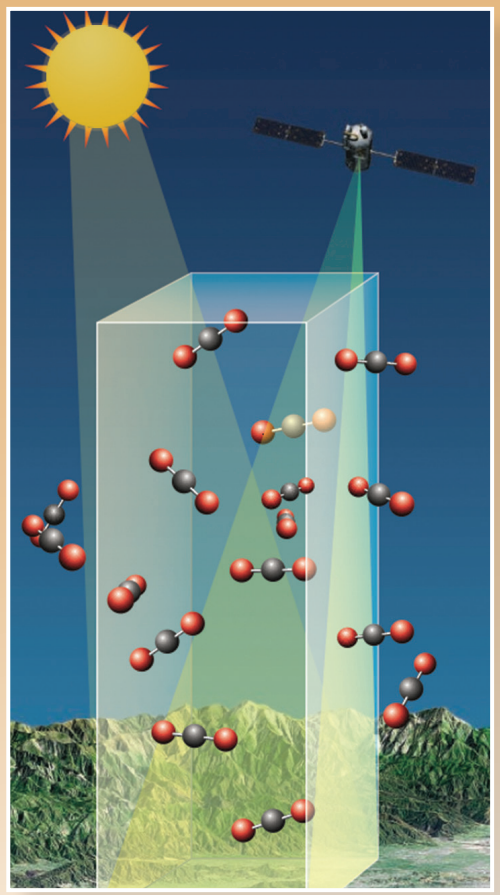


Diagram of OCO-2 observing technique (JPL/NASA)

endeavors, and failure rates which would be unacceptable to other professions are accepted as necessary evils by scientists worldwide. Continuing on in the face of these uncertainties, picking up the pieces and moving forward with needed research, is a certainty during the length of any given scientific career, but that doesn't discount the tenacity and bravery of spirit required to persevere to succeed when one's project literally just exploded into a million pieces on the other side of the planet. NASA, CIRA, and Colorado State University are fortunate that researchers with exactly these qualities work within our walls, as exciting new discoveries in carbon cycle science continue to be made by the OCO-2 team.

Bioluminescence:

New Technologies Old Science

By Matt Rogers with input from Steve Miller

"Sometimes the newest leads are hundreds of years old." As are typical of quotes from CIRA Deputy Director Steve Miller, the pithy observations ring true, especially in the case of a current project – using ultrasensitive satellite observations of the Earth at night to detect glowing (or 'milky') seas. In this case, Dr. Miller is referring to nautical records stretching back sometimes hundreds of years, where sailors of days gone by noted eerie conditions during their night watches, of glowing seawater surrounding their vessels in the dark of night in certain places seen during their travels. The oddities and unexplained phenomena of the ocean are part and parcel of the human experience dating to antiquity – but can we use satellites to observe and unravel some of these ancient mysteries?

Tanker Ship Lima

That's what Dr. Miller and his team are hoping to find out, using high-resolution and highly-sensitive observations from the well-heralded Day-Night Band (DNB) instrument, part of the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument aboard the Suomi National Polar-orbiting Partnership (NPP) mission, launched in October of 2011. (For more on the DNB instrument, see the Spring 2013 issue of CIRA Magazine.) Dating back to his time at the Naval Research Laboratory (NRL) in Monterey, CA, Dr. Miller has had an interest in the milky sea phenomenon, when he made a chance discovery.

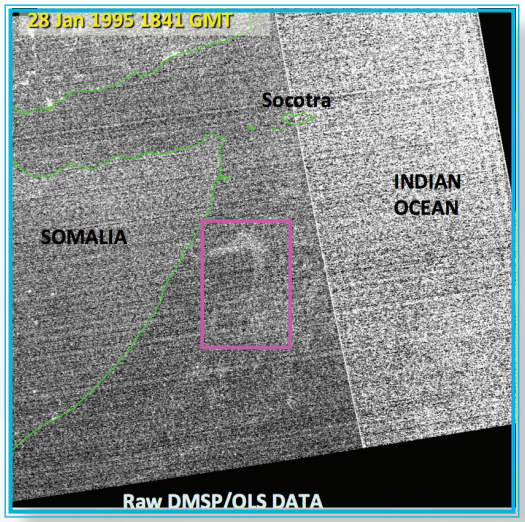


Figure 1. Faint comma-shaped signature of visible light

In January 1995, the crew of the S.S. Lima, a tanker ship with a displacement of 318,000 tonnes, were sailing off the coast of Somalia. As described by Captain James Briand, they encountered the following:

"At 1800 UTC on a clear moonless night while 150 n.mile east of the Somalian coast a whitish glow was observed on the horizon and, after 15 minutes of steaming, the ship was completely surrounded by a sea of milky-white colour with a fairly uniform luminescence. The bioluminescence appeared to cover the entire sea area, from horizon to horizon […] and it appeared as though the ship was sailing over a field of snow or gliding over the clouds […] The bow waves and the wake appeared blackish in colour and thick black patches of oil were passing by. Later, the Aldis lamp revealed that the 'oil patches' were actually light green kelp, amazingly black against the white water."

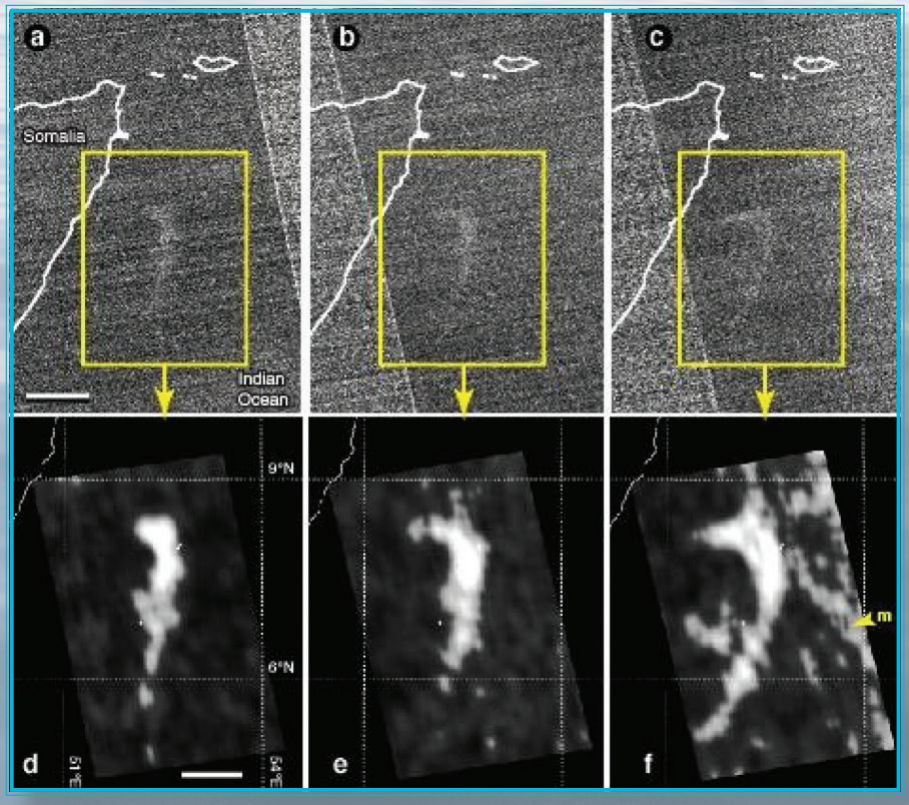


Figure 2. Detection of 'milky sea' phenomenon

The notion of glowing seas, over such a large area, piqued the interest of Dr. Miller, who dug into the archive of satellite data available. One satellite with coverage over the region and time of interest was visible data from the Defense Meteorological Satellite Program (DMSP) Operational Linescan System (OLS) instrument. Although not as sensitive as the DNB sensor to fly on Suomi NPP nearly two decades hence, the DMSP-OLS sensor has some ability to see the Earth at night – the first maps of city light as seen from space were derived from DMSP-OLS data. Satellite observations from the DMSP-OLS sensor over Indian Ocean off the Somalian coast were obtained, and in the raw data, a faint comma-shaped signature was seen (Figure 1.) When enhanced, a large patch of ocean, emitting a signature of visible light, was discovered (Figure 2.) – the first confirmed detection of the 'milky sea' phenomenon. What causes milky seas is a question still very much open to investigation. Biologists can tell us that, in certain patches

Figure 3. species of *vibrio fischeri*

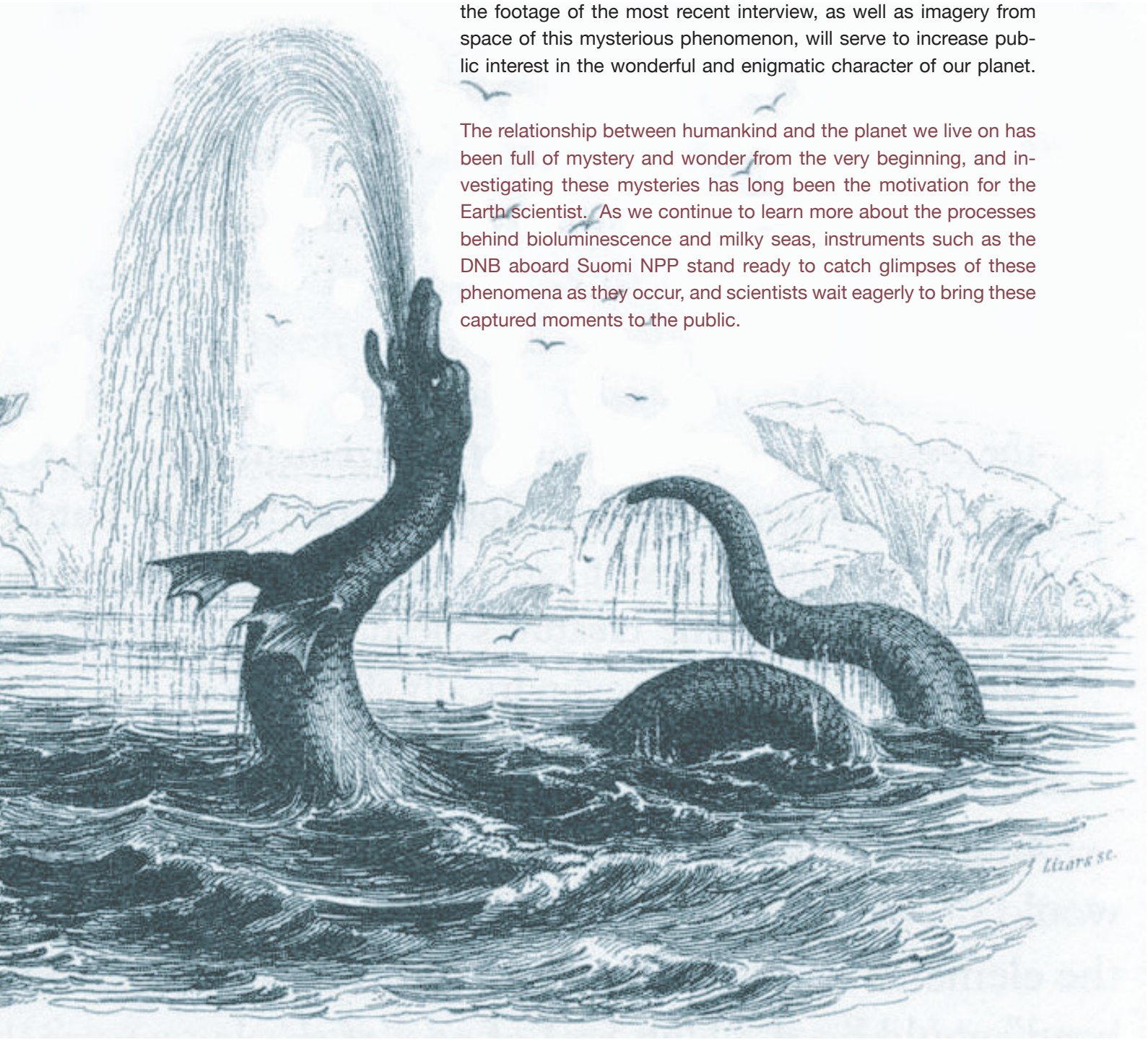
of the ocean containing nutrient-rich upwelling waters, ideal growing conditions for phytoplankton blooms exist. Consisting of microscopic forms of life sustained by photosynthesis, the many species of phytoplankton sustained by the nutrient-rich waters become the target for bacterial colonization. When concentrations of bacteria (perhaps similar to the species of *vibrio fischeri* shown in Figure 3.) exceed a certain limit, the bacteria begin to emit light, along with signal chemicals that trigger additional light emission from nearby bacteria. However, this explanation, along with other, exists as a hypothesis based on laboratory knowledge and biology – the exact circumstances that lead to milky seas in the wild are essentially unobserved by science.

Since 1915, more than 230 incidents of sailors encountering milky seas have been documented. One incident, in 1988, found luminous bacteria colonizing an algal bloom in the Arabian Sea. More data is clearly needed to further study this phenomena, and satellite observations may be a key to locating milky sea conditions, which would serve to better coordinate research vessels to reach the phenomenon in time to study it comprehensively.

Part of that process is developing instruments capable of sensing such faint signals from low-Earth orbit, and critically, developing the retrieval code needed to process the images accurately. As part of the ongoing work with the Suomi NPP mission, CIRA researchers continue to scour data for potential cases of bioluminescence in the wild, seeking likely candidate images and then doing the hard work of verifying the images however possible. Such work is difficult but rewarding, and the prospect of making another 'Eureka!' discovery in the thousands of megabytes of NPP data is an old one in science, even if the data comes from a cutting-edge research satellite.

Another part of that process comes through education and public relations – no stranger to the camera, Dr. Miller recently completed an interview with the Discovery Channel in partnership with WAG TV. Based in the United Kingdom, WAG TV sent a film crew to interview Dr. Miller on camera, discussing the history of milky seas encounters and research. This interview follows a similar one from 2012 by a BBC World TV crew. Still a month or more from completion, the footage of the most recent interview, as well as imagery from space of this mysterious phenomenon, will serve to increase public interest in the wonderful and enigmatic character of our planet.

The relationship between humankind and the planet we live on has been full of mystery and wonder from the very beginning, and investigating these mysteries has long been the motivation for the Earth scientist. As we continue to learn more about the processes behind bioluminescence and milky seas, instruments such as the DNB aboard Suomi NPP stand ready to catch glimpses of these phenomena as they occur, and scientists wait eagerly to bring these captured moments to the public.



COMMUNIQUÉ

CIRA Research Initiative Award Winner Announced

Dan Vietor was recently recognized with the 2014 CIRA Research Initiative Award.

Dan is a Senior Research Meteorologist who has been working tirelessly as part of the CIRA-NOAA partnership to modernize the NOAA/NWS Aviation Weather Center website. The AWC's mission has been focused on the use of web services to deliver operational interactive decision support services. This necessitated addressing many backend functionalities including an easy-to-maintain data back-end leveraging ADDS (Aviation Digital Data Service), formatting the data for efficient and reliable delivery to the browser, better support for domestic and especially international customers, better support for mobile devices, the application of modern Open Geospatial Consortium standards, and the upgrade of the Aviation Weather website to incorporate these new tools. Dan's work culminated in the debut of the new website at last year's Oshkosh air show. There Dan and his team were able to collect immediate user feedback on many of the changes they'd deployed. The opinions were strongly positive and the user feedback was incorporated into the website for its operational release in March of this year.

GSD's Team Member of the Month for March 2014

The NOAA Assimilation and Modeling Branch nominated CIRA Research Scientist Dr. Haidao Lin as GSD's Team Member of the Month in March 2014.

The nomination included the following highlights: "Since joining AMB in late 2010, Haidao has become a vital contributor to the Rapid Refresh (RAP) development team, an expert on satellite data assimilation, and a highly visible member of the national satellite data assimilation community. His work in developing and improving mesoscale satellite radiance assimilation methods for the Rapid Refresh has enabled noticeable forecast improvement from these data within the hourly updated RAP model. These type of improvements are difficult to achieve within limited-area models and have occurred because of Dr. Lin's diligent work in optimizing the radiance bias correction and channel selection algorithms within the community-based Gridpoint Statistical Interpolation (GSI) analysis package used for the RAP. Dr. Lin's work has involved coordination and collaboration with the operational satellite data assimilation community, and developing this collaboration with key member groups, including NCEP's Environmental Modeling Center, has significantly enhanced GSD's ability to participate in community-based satellite assimilation efforts for both regional and global modeling. Dr. Lin is a very talented and hard-working and a great team member. We are grateful for his valuable contributions and he is well deserving of this award."

Two CIRA Fellows named University Distinguished Professor (UDP)

The title of UDP is restricted to approximately 1% of the CSU faculty and is granted in recognition of outstanding scholarship and achievement. This rare and eminent honor was just awarded to two of CIRA's own Fellows. We proudly salute **Dr. Sonia Kreidenweis-Dandy** and **Dr. V. "Chandra" Chandrasekar** for their initiation into this illustrious group. Dr. Kreidenweis-Dandy was recognized for her outstanding research involving atmospheric aerosols and their impacts on cloud formation, haze, and climate. Sonia is the 4th member of the ATS faculty to be designated as UDP, following Tom Vonder Haar, Graeme Stephens, and Dave Randall. Also, Dr. V. "Chandra" Chandrasekar, from the Department of Electrical and Computer Engineering was recognized for his pioneering contributions in the area of polarimetric radar observations of the atmosphere and urban observation networks. Sincerest congratulations from all of your colleagues at CIRA!

STAR Scientist and CIRA Associate, Dr. Don Hillger Honored with Dept. of Commerce Bronze Medal

On Thursday, January 23, NOAA Acting Under Secretary Dr. Kathy Sullivan announced the names of this year's Bronze Medal and Distinguished Career awards. The Department of Commerce Bronze Medal is the highest honor award that the Under Secretary of Commerce for Oceans and Atmosphere may bestow. 18 STAR scientists were honored with Bronze Medals including long-time CIRA Associate, Dr. Don Hillger. Don was recognized for his work as part of the Suomni NPP Environmental Data Product team. The Team was cited for their efforts to increase the scientific value of the Suomi satellite environmental data products to meet NOAA users' needs. The award recipients were honored at a ceremony on May 20, 2014, at the NOAA Auditorium in Silver Spring, Maryland.

CIRA Recipients of the First Annual NOAA/NESDIS/STAR Awards

CIRA scientists were well represented on the winners list in the first annual NOAA/NESDIS/STAR awards. The announcements came in late May and were in categories such as Science, Technology, and Best Paper. Please read below for the list of winners.

Wei Shi: NOAA/NESDIS/STAR Award for Science

Dr. Shi was recognized for scientific excellence in the demonstration of innovative methods leading to significantly improving satellite ocean color products in coastal and inland waters. He was further commended for his significant contribution in the development and demonstration of an innovative approach using shortwave infrared (SWIR) bands on NASA's Moderate Resolution Imaging Spectroradiometer (MODIS) sensor. His work has helped improve the satellite-derived ocean color products in the coastal ocean regions and he has conducted several studies to further improve the SWIR algorithm. From 2009 to present, Dr. Shi has authored and co-authored 23 peer-reviewed publications.

Xingming Liang: Member of the SST Team selected for NOAA/NESDIS/STAR Award for Technology

As a member of the SST Team along with Yury Kihai (GST), John Stroup (GST), and Boris Petrenko (GST), Dr. Liang was cited for contributions to the development of the Advanced Clear-Sky Processor for Ocean (ACSPO) System. The ACSPO line of SST products has been extensively evaluated and compared with similar community products produced by the EUMETSAT, Navy and NASA. In all cases, the ACSPO retrieval domain was found to be larger, and SST performance statistics superior, than for the alternate products. The ACSPO POES and JPSS, and future GOES-R SST operational products, are widely used by many customers by the scientific community, commercial and sport fishing industries, environmental decision-makers, shipping industry, fisheries managers, educators, weather and climate forecasters, at NOAA (e.g., Coral Reef Watch, POES/GOES blended SST, NCEP, Coast Watch/NOS) and elsewhere.

Steven Miller:

NOAA/NESDIS/STAR Award- Best Paper

Dr. Miller was recognized along with his colleagues Stephen Mills (NGAS), Christopher Elvidge (NGDC), Thomas Lee (NRL), Jeffrey Hawkins (NRL), and Dan Lindsey (CoRP) for their influential paper describing new capabilities to image cloud and surface features by way of reflected airglow, starlight, and zodiacal light illumination. The Suomi satellite brings to light a unique frontier of nighttime environmental sensing capabilities is a comprehensive publication printed in September 2012. It is the first paper that thoroughly described how the Suomi-NPP Day-Night-Band scan see clouds at night, even without a moon, using airglow, starlight, and zodiacal light illuminations.

GSD Scientific Poster of the Month Winners

Jebb Stewart, Chris MacDermaid, Randy Pierce, and **Jeff Smith** along with colleagues Julien Lynge and Eric Hackathorn were selected for the GSD Scinetific Poster of the Month Award in May 2014. Their poster was titled, **"NOAA Earth Information System."** The poster with identifying banner was displayed on the bulletin board in the GSD Director's Office hallway and an electronic copy was posted on the GSD Intranet where it remains for folks to view at their leisure.

Please welcome the following new employees:

Rodger Ames

Rodger is a Research Associate II who joined the NPS group at CIRA in Fort Collins in June 2014. Previously he worked as the Knowledge Transfer Manager for the Center for Modeling of Atmospheric Processes (CMMAP), next door to CIRA, and before that he worked for CIRA as a website and database developer for the National Park Service Group and the Western Regional Air Partnership (WRAP), and was instrumental in helping develop the WRAP Technical Support System, which is currently hosted at CIRA. In this position Rodger brings his extensive air quality data management expertise to the Three State Data Warehouse (TSDW) project, which is collaborative effort between the EPA, the National Park Service, the BLM, and the Forest Service to develop a data warehouse to store environmental impact information about the oil and gas development in the three state region of Colorado, Wyoming, and Utah. His supervisor is Shawn McClure.

Jeffrey Beck

Dr. Beck is a Research Scientist/Scholar I who joined the Earth Modeling Branch (formerly the Forecast Applications Branch) of CIRA in Boulder in August 2014. He comes to us from a post-doctoral position at Meteo-France and works with fellow researchers on ensemble forecasting post-processing, model assessment and data assimilation. Jeff supports the joint Developmental Testbed Center (DTC), and the Hydrometeorological Testbed (HMT) in their severe weather forecast improvement activities. His supervisor is Hongli Jiang.

Alan Brandt

Alan is a Student Hourly General Labor I who joined CIRA in Fort Collins in April 2014. A senior in Marketing here at Colorado State University from Federal Way, Washington, Alan supports our Facilities Manager, Marilyn Watson. At present he is revamping CIRA's paper archive storage unit at Christman Airfield, and he assists with the myriad upkeep, surplus, and inventory duties necessary to keep our institute running smoothly. As an extra bonus, because of Alan's previous experience with a national office supply company, he has been especially helpful in sourcing office products for our staff. His supervisor is Marilyn Watson.

Hans Engler

Dr. Engler is a Visiting Scientist who joined CIRA in College Park, Maryland in July 2014. A Mathematics Professor on sabbatical from Georgetown University in Washington D.C., he collaborates with the Joint Center for Satellite Data Assimilation to help advance satellite data assimilation techniques. In particular, he investigates mathematical and statistical challenges that surface from new sensor capabilities and from designing optimal sensor placement. His supervisor is Cliff Matsumoto.

Paula Etala

Dr. Etala is a Visiting Scientist who joined CIRA in College Park, Maryland in September 2014. Dr. Etala, currently on sabbatical from the Marine Prediction Services at the Naval Hydrographic Service in the Ministry of Defense of Argentina, joined CIRA in College Park, as a Visiting Scientist in September 2014 for 3 months. She collaborates with scientists at the Joint Center for Satellite Data Assimilation at the NOAA Center for Weather and Climate Prediction to incorporate an Ensemble Kalman Filter-based data assimilation in the WAVEWATCH III wave model and implement the global prototype in a 6-hour data assimilation cycle at NCEP. Her Technical Advisor is Sid Boukabara and her Supervisor is Cliff Matsumoto.

Kathy Fryer

Kathy is a part-time Research Coordinator who returned from retirement to resume work at CIRA in Fort Collins in May 2014. After many years of service with the RAMM Branch in Fort Collins, Kathy continues part-time as a specialist who assists the group with maintaining and updating of the RAMMB/CIRA Intranet pages, soliciting input for RAMMB quarterly reports, collecting GOES-R and GIMPAP-related semi-annual project reports written by NESDIS CI PIs and posting these reports on the web. Kathy also spends some time training her successor in learning the ropes of the RAMMB administrative assistant position. Her supervisor is Mary McInnis-Efaw.

Michael Giebler

Mike Giebler is a Research Associate IV who joined the NWS/MDL Decision Assistance Branch of CIRA in Boulder. Mike leads and participates in the development and enhancement of the Virtual Laboratory for the NWS/NOAA. He brings extensive leadership and technical experience to the team with more than 5 years of experience as a Liferay Server administrator and developer (Liferay is a key component of the NOAA's VLab) and over 7 years of experience leading a team of IT developers/managers. His supervisor is Ken Sperow.

Colleen Goodwin

Colleen is a Non-Student Hourly Employee (Coordinator) who began work with the RAMM Branch at CIRA in Fort Collins in October 2014. Her work consists of a variety of tasks primarily centered around the use of geostationary and polar-orbiting satellites in tropical cyclone research. A senior at Rocky Mountain High School, Colleen is an Honor Student who is also an active member of the Golden Key Club. Her supervisor is Jack Dostalek.

Isabelle Granger-Frye

Isabelle is a Non-Student Hourly Employee (Coordinator) who began to work with the RAMM Branch at CIRA in Fort Collins in October 2014. A student at Rocky Mountain High School who plans to major in political science while attending college in the Washington DC area after graduation, she works on administrative tasks related to VISIT and SHyMet training. This includes production and mailing out training certificates of completion, record keeping in the Learning Management System and mailing out DVD's of training sessions to offices with low bandwidth. Isabelle also assists other RAMM team members with projects as needed. Her supervisor is Dan Bikos.

Kevin Manross

Kevin is a Research Associate III who joined CIRA in Boulder in January 2014. As a member of ESRL/GSD's Evaluation and Decision Support branch (formerly Information Systems Branch) he works on various AWIPS II projects including the Hazard Services and Forecast Decision Support Environment applications. His supervisor is Sher Schranz.

Cliff Matsumoto

Dr. Matsumoto began an appointment as a Non-Student Hourly Sr. Research Associate in February 2014 after retiring from his position as the CIRA Associate Director of CIRA in Boulder. Using his extensive experience in working with University employees embedded within Federal Government facilities, Cliff oversees research and administrative activities associated with the NESDIS Environmental Applications Team (NEAT) in College Park, MD. His supervisor is Chris Kummerow.

Zachary Partain

Zach is a Non-Student Hourly Intern who joined CIRA in Fort Collins in July 2014 to work with the Cloudsat group. He is a homeschooled freshman in high school and replaces Jaimie Cismoski as the CloudSat DPC QA Assistant. His duties include tagging features in cloudsat images and searching Cloudsat and MODIS data for specific cases for study. His supervisor is Cindy Combs.

Sarah Pontius

Sarah is a Research Associate III who joined CIRA in Boulder in December 2013. As a member of ESRL/GSD's Evaluation and Decision Support branch (formerly Information Systems Branch) she works on various components of the AWIPS II Hazard Services application. Her supervisor is Sher Schranz.

Hasibur Rahaman

Dr. Rahaman, currently on sabbatical from the Indian National Centre for Ocean Information Service in Hyderabad, India, joined CIRA in College Park, as a Visiting Scientist in September 2014 for 3 months. He

collaborates with scientists at the Joint Center for Satellite Data Assimilation at the NOAA Center for Weather and Climate Prediction to assimilate in-situ and satellite-derived data into the Regional Indian Ocean model to improve the state of the North Indian Ocean nowcast/forecast assimilation system. His Technical Supervisor is Sid Boukabara and his Supervisor is Cliff Matsumoto.

Dustin Schmidt

Dustin is a Research Associate II who joined the NPS at CIRA in Fort Collins in July 2014. He previously worked for Garmin Aviation Technology in Salem, Oregon as a member of their Infrastructure Tools Team, which was responsible for maintaining Garmin's internal software lifecycle tools used in the development of avionic systems. At CIRA, Dustin works as both a front- and back-end software developer for the Three State Data Warehouse (TSDW) project, which is a collaborative effort between the EPA, the National Park Service, the BLM, and the Forest Service to develop a data warehouse to store environmental impact information about the oil and gas development in the three state region of Colorado, Wyoming, and Utah. His supervisor is Shawn McClure.

Keith Searight

Keith is a Research Associate IV who joined CIRA in Boulder in December 2013. As a member of ESRL/GSD's Advanced Visualization and Outreach branch (formerly Technology Outreach Branch) he is the lead developer for Science On a Sphere®. Keith supervises the software development team and leads efforts to create new tools and technology to further enhance SOS's outreach and education capability. His supervisor is Sher Schranz.

Lynn Sherretz

Dr. Sherretz is a part-time Research Associate IV who joined CIRA in Boulder in August 2014. As a member of ESRL/GSD's Advanced Visualization and Outreach branch (formerly part of the Aviation, Computing and Evaluation branch) he works with the FAA's NextGen program and the National Weather Service's Integrated Dissemination Program (IDP). Lynn's activities center around the web services and data descriptions needed to support the data delivery components of both programs. His supervisor is Sher Schranz.

Matthew Sienkiewicz

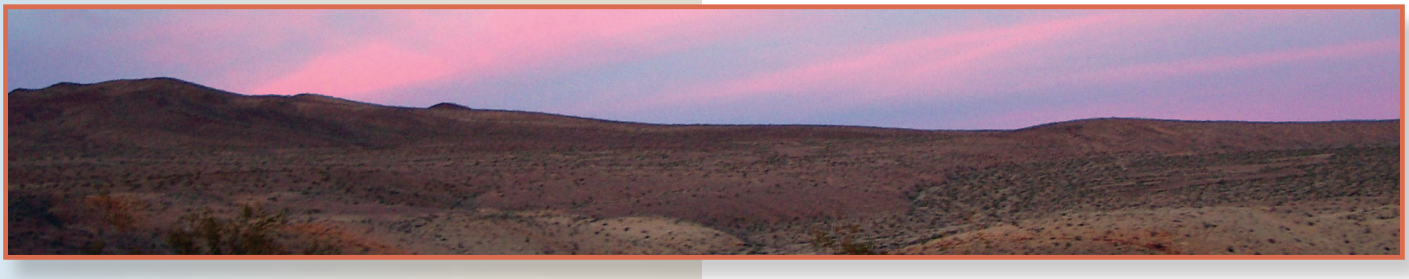
Matthew is a Non-Student Hourly Intern who joined the CIRA branch located at the Aviation Weather Center in Kansas City, MO in August 2014. From his duty station, which is located at the State University of New York - Stony Brook, Matt pursues operational linkages between the NOAA-CSTAR grant "An Evaluation and Application of Multi-Model Ensembles in Operations for High Impact Weather over the Eastern U.S." (PI: Prof. Brian Colle) and the Aviation Weather Testbed's Ensemble Processor (EP). Specifically, Matt investigates ensemble-based predictive capabilities that support the meteorological and air traffic requirements of NextGen, and decision support capabilities for the NWS's aviation weather services. His supervisor is Daniel Vietor.

Vanessa Vincente

Vanessa is a Research Associate II who joined CIRA in Fort Collins in October 2014 to work in a collaborative role between the CIRA VISIT training program in Fort Collins and the COMET training program at UCAR in Boulder. She focuses upon development of education and training materials that fill critical gaps in assessing tropical cyclone threats and communicating their risks and impacts. Vanessa recently completed the CSU Masters Program in Atmospheric Science and was involved in Hurricane Research as part of the Significant Opportunities in Atmospheric Research and Science (SOARS) program that is run by UCAR. Her supervisor is Bernie Connell.

Ting-Chi Wu

Dr. Wu is a Postdoctoral Fellow who joined CIRA in Fort Collins in September 2014. As a member of the CIRA Data Assimilation group, Ting-Chi collaborates on the development and application of a data assimilation system for assimilation of precipitation observations from several satellites using NOAA hurricane WRF (HWRF) model. She works with various NOAA and JCSDA systems including HWRF, Gridpoint Statistical Interpolation (GSI), and Community Radiative Transfer Model (CRTM), and she investigates the impact of precipitation observations on the structure and intensity of tropical cyclones, within a hybrid variational-ensemble data assimilation system. Her supervisor is Milija Zupanski.



Visiting Scientists from Brazil join CIRA in collaborations with NOAA/ESRL/GSD

Dr. Saulo de Frietas and Dr. Karla Longo de Frietas

Dr. Saulo de Frietas and Dr. Karla Longo de Frietas arrived in Boulder in August 2014 from Brazil. As visitors for one year, Drs. De Frietas and Longo De Frietas collaborate with scientists in ESRL/GSD's Assimilation and Modeling Branch at CIRA in Boulder. Specifically, they work with Dr. Georg Grell on the HRRR/Chem/Smoke model. Both scientists are internationally recognized for the their contributions to understanding the impacts of atmospheric chemistry on weather and climate models, and will give a seminar on their work at CIRA in the near future. Sher Schranz is their host/supervisor at CIRA.

Please congratulate the following employees on their recent promotions/transitions:

Rosemary Borger

Rosemary is a Research Coordinator who joined the RAMM Branch of CIRA in Fort Collins in March 2014. As the Administrative Assistant for the branch she handles all administrative matters including purchasing, travel arrangements, budget and staffing reporting, preparation of proposal packages, and much more.

Galina Chirokova

Dr. Galina Chirokova joined CIRA in Fort Collins as a Postdoctoral Fellow in August 2012 and in July 2014, she transitioned to a Research Scientist I. Galina is a member of the Regional and Mesoscale Meteorology Branch (RAMMB) and supports the hurricane and tropical cyclone research conducted by this branch. Galina is the Principle Investigator on CIRA/RAMMB's Joint Polar Satellite System (JPSS) Proving Ground Risk Reduction Tropical Cyclone project as well as on one of our Joint Hurricane Testbed projects. In addition, she supports activities aimed at transitioning CIRA/RAMMB tropical cyclone products to NESDIS operations.

Virginia "Jenna" Dalton

Jenna, formerly a CIRA Research Coordinator for the CIRA office located at the Aviation Weather Center in Kansas City S transitioned into a Technical/Support III position in September 2014. She now works in the Learning and Support/Educational Development area of NOAA's Office of Marine and Aviation Operations (OMAO) detachment. Jenna works with NOAA personnel from both OMAO and the National Weather Service's Training Center to develop distance and resident courses for NOAA's Learn Center and to support and maintain OMAO's training portal. She transitioned from Research Coordinator to Technical/Support III in September 2014.

Beth Kessler

Beth Kessler is an employee of CIRA in Fort Collins was promoted to a new managerial role in July 2014. Beth's new title is Research Accounts Finance Manager (officially Professional/Individual Contributor II) and as such, she jointly heads the CIRA Finance Team by specializing in oversight of the majority of our research accounts. Her new duties include working closely with Principal Investigators to manage their awards and providing personalized financial management tools and analysis tailored to each client's needs. In addition to these duties, Beth supervises another CIRA employee on the Finance Team and serves as Co-Chair of the Campus Administrative Processing Advisory Council (CAPAC).

Recent promotions/transitions:

Melissa Petty

Dr. Petty is an employee of CIRA in Boulder who was promoted to Sr. Research Associate in March 2014. She has been a key member of the Forecast Impact and Quality Assessment Section (FIQAS) of ESRL/GSD's Aviation, Computing and Evaluation branch for many years and served as project manager for the group. In her new role, Missy serves as Section Chief for the FIQAS group, and leads technical and program planning activities to develop aviation weather decision support tools and aviation forecast verification studies. Her development and verification teams work closely with FAA and NWS aviation weather forecasters to ensure the applications meet the needs of operational forecasters.

Evan Polster

Evan is an employee of CIRA in Boulder who was promoted to Research Associate IV in July 2014. In his new role, Evan serves as the FX-Net project manager whereby he leads development efforts to convert FX-Net users to AWIPS II remote clients. His work is key to the continued collaboration with and support of NWS, BLM and USFS fire weather forecasters. These forecasters rely on Evan's support and the real time remote clients during fire season, both in their offices and at wildland fire incidents.

Edward Szoke

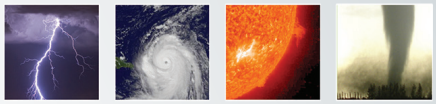
Ed is an employee of CIRA in Fort Collins who was promoted to Research Associate IV in July 2014. He spends 60% of his time supporting RAMMB's GOES-R Proving who Ground (PG) as well as RAMMB's VISIT and SHyMet Training Activities at CIRA in Fort Collins. The other 40% of his time, Ed works with the NOAA/ESRL/GSD team on FIM model and on RAP/HRRR model assessment tasks in Boulder. He has taken on many different management responsibilities for the GOES-R PG project, and has become the liaison between CIRA and CIRA's GOES-R PG participating WFOs and NWS Regional Centers. He runs CIRA's GOES-R PG related telephone conferences and collaborates directly with other GOES-R PG development teams. As a Co-Principle Investigator, Ed is was in charge of writing this year's successful CIRA GOES-R PG proposal; since then he has made other, important contributions to the CIRA/RAMMB training programs VISIT and SHyMet.

Melissa Petty

Congratulations to Dr. Missy Petty on her upcoming graduation (October 16, 2014) from the federal Office of Personnel Management's (OPM's) Center for Leadership Development, Colorado Leadership Development Program (CLDP) Class of 2014. The CLDP is dedicated to transforming leaders to better serve the Federal government. The year-long program uses a 'whole person' model to develop those specific competencies that research shows are needed to be successful in senior level public sector leadership positions. Missy's nomination and acceptance into the program allowed her to attended classes in Aurora, CO once a month and participate in private coaching sessions with a local expert provided through the program.

Please congratulate the following employees on their service milestones:

1. Linn Barrett – 15 years
2. Dan Bikos – 15 years
3. Kevin Brundage – 20 years
4. Leigh Cheatwood-Harris – 10 years
5. Scott Copeland – 20 years
6. Paul Hamer – 15 years
7. John Haynes – 10 years
8. Patrick Hildreth – 10 years
9. Jeff Lemke – 20 years
10. Mary McInnis-Efaw – 15 years
11. Musgrave – 10 years
12. Evan Polster – 15 years
13. Dale Reinke – 25 years
14. Daniel Schaffer – 15 years
15. Andrew Schuh – 10 years
16. Jebb Stewart – 10 years
17. Dave Watson – 25 years
18. Loretta Wilson – 30 years
19. Tong Zhu – 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 disciplines, 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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If you know of someone who would like to receive the *CIRA Magazine*, or if there are corrections to your address, please notify us.

Colorado State University