AOML Keynotes

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AOML Director Retires

Kristina Katsaros, Director of AOML, retired from federal service on September 30, 2003. She had served as the AOML Director since July 1997.

Born and raised in Sweden, Katsaros completed her education at the University of Washington, becoming the institution's first woman to earn a Ph.D. in atmospheric science in 1969. For the next 23 years, she was a faculty member with the University of Washington's Department of Atmospheric Sciences. Throughout her affiliation with the University, Katsaros was a visiting scientist and lecturer at a number of national and international organizations and institutions. In 1992, she became the Director of the Department of Oceanography from Space at the Institut Francais de Recherch pour l'Exploitation de la Mer (IFREMER) in Brest, France, a position she held until being named the Director of AOML in 1997.

Katsaros' scientific pursuits included all aspects of air-sea interaction: turbulent and radiative fluxes, wave generation, and surfactant effects. Her research also included the use active and passive microwave remote sensing for studies of storms, cloud systems, and the physics of wind and waves.

As an administrator, her leadership and effective management of personnel and resources were vital to AOML's successful operation and advancement of mission objectives. In her absence, Dr. Peter Ortner will serve as the AOML Acting Director.

Katsaros will continue conducting research on a part-time basis from her home in Washington on Whidbey Island, in close vicinity to children and grandchildren.

Dear Friends:

As I depart from my post as Director of AOML and official editor of *Keynotes*, I want to express my thanks and good wishes to my colleagues at AOML and all of our partners who read this newsletter. No man or woman is an "island," for we live in an ecosystem of human relationships that nourish and support us. Sometimes the environment gets overheated and threatens us with "coral bleaching," but in all circumstances this environment we live in is vital to our success as individuals and as a "system."

Saying farewell the other night to so many colleagues and friends from the Virginia Key science community and to folks from further afield who had come, it struck me how much I have gained personally from the associations the directorship of AOML has granted me and how seriously important one's role as the leader of a major government research laboratory is. I always felt the responsibility, but also served with great confidence because of the strength, courage, and abilities of all the folks around me, especially my inner circle of deputy director, division directors, administrative officer, and many others.

AOML is a fantastic place, rich in knowledge and the pursuit of new knowledge. Our fields of research—climate and climate variability, oceanography, tropical meteorology and hurricanes (the likes of Fabian and Isabel!), ecosystem science, the challenges of the Everglades, coral reefs and our coastal environments, even the effects of humans on whales—all of these subjects matter in a big way; that is our inspiration for each day we come to work.

It has been a privilege and an honor to be associated with the folks that make up AOML and the NOAA Research team all over the country.

I will certainly remain interested and in touch and wish you all great successes to come. Thank you!

Kristina Katsaros

Farewell Kristina...

AOML hosted a retirement party for Dr. Kristina Katsaros at the University of Miami's Rosenstiel School of Marine and Atmospheric Science on the evening of September 18th. More than 125 friends and colleagues gathered to applaud Dr. Katsaros' accomplishments, express their appreciation for her years of service as the Director of AOML, and, finally, bid her a fond farewell. Kristina will be warmly remembered and sincerely missed. Best wishes for a well deserved retirement to focus on family and friends, projects and hobbies, and, of course, science on the side.

Combined Federal Campaign

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- Boquet of flowers

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2003 CFC Coordinator

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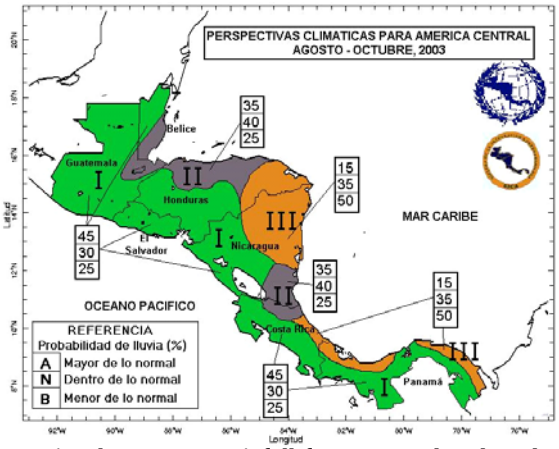
Climate Forecasts Improve for Latin America

David Enfield, Physical Oceanography Division

NOAA/AOML and its partners at the University of Costa Rica (UCR) are improving the way climate forecasts are prepared at Regional Climate Outlook Forums (RCOFs) in Latin America. The RCOFs, which began in 1997, bring outside experts together with national meteorological service representatives from regional countries. Collectively, they create composite climate expectations (typically for rainfall) for one or two ensuing seasons and assemble the information into a regional picture, or consensus forecast, for the benefit of stakeholders and decision-makers.

The approach taken for deriving the consensus forecast has been to estimate the expected probabilities for the highest (wet), middle, and lowest (dry) one-thirds (terciles) of the statistical rainfall distributions. When taken over many years, the tercile probabilities are simply 33.3% each ("normal"), summing to 100%. For example, in situations where El Niño conditions are expected, a country that typically gets more than a normal amount of rainfall during El Niño episodes might see outlook probabilities of perhaps 50% (high), 30% (middle), or 20% (low). Once determined, the various national tercile estimates are integrated into the consensus forecast to aid the individual meteorological services in their various outreach activities. Unfortunately, in the past, the RCOF process has not been fully successful due to a lack of in-depth statistical expertise, uniform methods, and the use of common predictors required to produce a regionally integrated, objective, and quantitative forecast.



Regional consensus rainfall forecast produced at the July 2003 Central American Regional Climate Outlook Forum in Guatemala using the beta version of the climate forecast software. Green (A), brown (B), and gray (N) represent predominantly wet, dry, and neutral rainfall outlooks, respectively, under a postulated climate scenario of neutral-to-cool ocean conditions in the tropical Pacific Ocean.

With the help of a grant from NOAA's Office of Global Programs and the work of scientists at UCR, an easy-to-use software program has been created that incorporates standard statistical methodologies with uniform predictor indices. The user-friendly program requires no statistical expertise and objectively produces tercile climate forecasts using the local climate data of each Latin American country. The methodology is one in which the probabilities for rainfall are derived from a set of two-variable contingency tables between a predictor index (*e.g.*, El Niño index) and a useful predictand (*e.g.*, local rainfall), along with a set of statistical reliability indices.

David Enfield, an oceanographer with AOML's Physical Oceanography Division, leads the project. Enfield channels resources to the UCR staff, who developed the software and documentation, and administers support for special software training days appended to RCOFs in Central America, South America, and the eastern Caribbean. A "beta" version of the software has been produced and was used to train 15 regional meteorologists at a Central American RCOF in Honduras this past April. Most of the involved meteorological services subsequently used the software to bring objective national tercile forecasts to the following RCOF held in Guatemala in July 2003. The software-derived contributions enabled the July RCOF to quickly and efficiently piece together the regional consensus forecast and dedicate more time to the all-important task of properly disseminating a well-crafted and understandable outlook to stakeholders and decision-makers (see figure above).

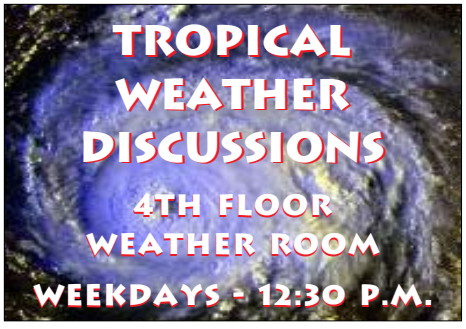
Additional software training is currently planned for South America (Guayaquil, Ecuador, November 2003) and the Caribbean (Kingston, Jamaica, April 2004). Under a partnership arrangement with UNESCO (United National Educational, Scientific, and Cultural Organization), the International Hydrological Programme will edit, translate, and publish the users' manual in English and Spanish to accompany distribution of the software to future RCOF participants in Latin America and elsewhere in the world.

NOAA Training Improves Track Forecasts

Meteorologists at the National Taiwan University and the Central Weather Bureau in Taipei, in collaboration with NOAA, conducted the first of a the series of aircraft surveillance missions around Typhoon Dujuan on August 31st in the western Pacific Ocean. The project, named DOTSTAR, Dropsonde Observations for Typhoon Surveillance near the Taiwan Region, builds upon work pioneered at AOML's Hurricane Research Division (HRD) to improve track forecasts for tropical cyclones. The key to the project is the use of airborne sensors, called dropwindsondes, released from jet aircraft flying above 42,000 feet in the environment of a tropical cyclone. These sensors gather temperature, humidity, pressure, and wind velocity information as they fall to the surface.

"Information from the surveillance flights is transmitted by a satellite phone aboard the aircraft in near real-time to the Central Weather Bureau (CWB)," said project lead scientist Chun-Chieh Wu from the National Taiwan University (NTU). "The data are used immediately in the CWB's 72-hour typhoon forecast report and give us a much better handle on storm development and conditions and help us to improve the accuracy of forecasts of typhoon tracks by up to 30 percent."

The initiative is a collaborative effort between researchers from the NTU, CWB, and the National Science Council, partnered with scientists at HRD and NOAA's National Centers for Environmental Prediction (NCEP). During the 2002 hurricane season, four researchers from the National Taiwan University, the Chinese Culture University, National Central University, and CWB worked with HRD scientists to learn the operational and scientific aspects of using aircraft to sample the hurricane environment.



Fabian and Isabel Offer Clues about Intensification

NOAA researchers zeroed in on Hurricanes Fabian and Isabel this past September to tackle one of the most challenging aspects of hurricane forecasting: predicting tropical cyclone intensity change. Armed with an array of instruments that included probes for measuring turbulence and vapor flux, a scanning radar altimeter, a digital camera system, air-deployed drifting buoys and floats, global positioning system dropsondes, and several airborne scatterometer, microwave radiometer, and Doppler radar wind profiling systems, a wealth of data was collected about the extreme ocean surface winds and sea swell found in tropical cyclones.

The sampling effort required the collaboration of NOAA's Aircraft Operations Center, AOML's Hurricane Research Division (HRD) and other NOAA Research laboratories, the National Environmental Satellite, Data and Information Service (NESDIS), NASA's Wallops Flight Center, the U.S. Air Force Reserve Command's 53rd Weather Reconnaissance Squadron, and several university researchers. "The hurricanes offered us an opportunity to make measurements we've never made before, said Peter Black of HRD. Black is the chief scientist for the Coupled Boundary Layer Air-Sea Transfer (CBLAST) experiment, funded by the Office of Naval Research with flight hour support from NOAA's Office of Atmospheric and Oceanic Research under the U.S. Weather Research Program. CBLAST is a component of HRD's 2003 hurricane field program. Its goal is to gain greater understanding of air-sea interactions in high winds, specifically the complex hurricane environment, to improve hurricane intensity forecasting skill.

Scientists and Aircraft Operations Center crew members pose for a photograph with NOAA's WP-3D aircraft on the ramp at St. Croix after several research flights into Isabel.

"Different things happen in high winds than in low winds," Black said. Current understanding of the air-sea transfer process that drives hurricane intensification is based on field measurements in winds up to tropical storm force strength (36 miles per hour). Large extrapolations must be made to obtain estimates for powerful hurricanes. Fabian and Isabel provided the opportunity to measure this energy transfer in the stronger winds present in intense tropical cyclones.

During Fabian, while it was a category 4 storm, and Isabel, while a rare category 5 hurricane, researchers flew intricate flight patterns specifically designed for the CBLAST experiment and the Ocean Winds and Rain Experiment of NESDIS, which seeks to derive a more accurate algorithm for mapping hurricane ocean surface winds from satellite scatterometers. NOAA's two WP-3D aircraft, as well as the Air Force's WC-130H aircraft, all flew into the hurricane eye at similar altitudes, a feat that required significant communication to keep all three planes at an appropriate distance.

The NOAA aircraft flew at various altitudes between 400 and 7,500 ft, where precision alignment and timing was essential to gather wind speed and turbulence data. These missions also required the hurricane hunter aircraft to occasionally fly at much lower altitudes than typical, sometimes only 250 feet above the tumultuous ocean surface in hurricane force winds. Meanwhile, using forecasts from the National Hurricane Center, HRD scientists determined where the Air Force WC-130J aircraft should place buoys and floats in the waters in front of Fabian. There they successfully measured surface winds, ocean currents, and air and sea temperatures as Fabian passed overhead.

"This has been a fantastic team effort," Black said. Analysis of the data should advance understanding of the physical processes that lead to the extreme winds and heavy precipitation found in hurricanes. Researchers hope to use this knowledge to develop an integrated hurricane simulation and forecasting system that produces skillful forecasts of intensity change and precipitation in tropical cyclones.

Updated CREWS Design Retires R/V *Kristina*

Researchers with AOML's Ocean Chemistry Division installed a newly-designed test-bed Coral Reef Early Warning System (CREWS) station at the Lee Stocking Island, Bahamas CREWS site in October. The new station replaced the R/V *Kristina*, a converted buoy donated for service by AOML's former Laboratory Director, Dr. Kristina Katsaros. The R/V *Kristina* was installed in 2001 and served as the first operating station of the CREWS network.

The new CREWS design features better stability, greater capacity for the addition of new instruments, more accurate light sensors for measurement of ultraviolet and photosynthetically available radiation, improved conductivity-temperature-depth (CTD) instruments, and remote programming of the data logger via radio interface.

The Lee Stocking Island station will be augmented with a pCO_2 sensor, a pulse-amplitude-modulation fluorometer, and acoustic modems for data transfer in December 2003.

Researchers plan to install the updated CREWS design at the St. Thomas, U.S. Virgin Islands site before the end of the year, and, hopefully, at the La Parguera, Puerto Rico and St. John (Round Bay), U.S. Virgin Islands sites before the summer of 2004.

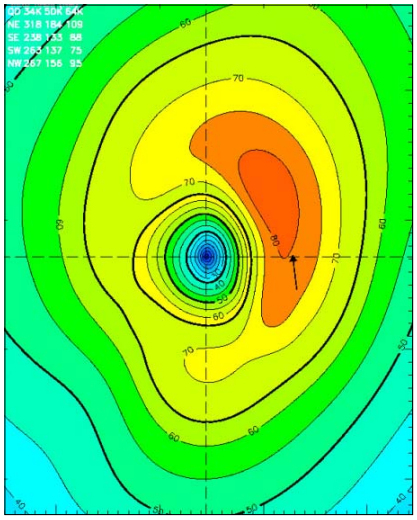
Due to the efforts of Ocean Chemistry Division personnel, an Integrated Monitoring Network (IMN) database and application is now available on the Coral Health and Monitoring Program web site (www.coral.noaa.gov/imn/IMNQuery).

IMN provides researchers, marine park managers, and the public with access to meteorological and oceanographic environmental data sets from various networks and monitoring stations located around the world.

The database currently contains observations from the Florida Institute of Oceanography, AOML's network of CREWS (Coral Reef Early Warning System) stations, and NOAA's SEAKEYS (Sustained Ecological Research Related to the Management of the Florida Keys Seascape) project.

Teamwork Nets Rich Harvest of Data About Isabel

As Hurricane Isabel made landfall in North Carolina on September 18th, researchers were ready and waiting with a collection of mobile Doppler radar systems and instrumented meteorological towers placed along the coast that enabled them to collect a unique data set about the strength and extent of Isabel's winds. These data had a significant impact upon the accuracy of H*Wind, a weather product created by meteorologists with AOML's Hurricane Research Division (HRD), and currently in transition to operations at the National Hurricane Center (NHC). H*Wind combines data from many sources (airborne sensors, offshore monitoring stations, and land-based radars and meteorological stations) and produces brightly-colored, easy-to-read wind analyses maps that detail where the most damaging winds in a storm are located, as well as the extent of gale-force winds.



H*Wind map displaying the maximum and minimum surface winds in Hurricane Isabel at 0730 UTC on September 18, 2003.

Researchers at Texas Tech University, the University of Oklahoma, and the Center for Severe Weather Research (a non-profit company) collaborated to bring five portable Doppler radars and many more portable wind towers to eastern North Carolina. Two of the radars, SMART (Shared Mobile Atmospheric Research and Teaching Radars) radars, were placed 40 miles apart and gathered 13 hours of continuous data in coordination with one another. It is hoped these data will provide researchers with new information about the severe winds and turbulence associated with hurricanes.

The Center for Severe Weather Research, in collaboration with the National Center for Atmospheric Research, brought two Doppler on Wheels and one Rapid Scanning radar systems. The radars were co-located with one of the instrumented towers to provide additional data for the H*Wind analyses. These data greatly complemented the standard data available for H*Wind, although typically such information is not available in real-time and is used largely in post-landfall research.

Thanks to innovation and careful planning, four additional portable weather stations built and operated jointly in partnership with Sea Grant at Clemson University and the University of Florida transmitted their meteorological data to NHC in real-time via a wireless Internet connection and were incorporated into the H*Wind analyses. These high-quality observations constitute the highest wind speed for which continuous, high-frequency digital observations have been recorded in a U.S. landfalling hurricane and represent a valuable contribution to hurricane research. The four sets of tower observations also provided valuable ground truth for some of the new sensors deployed on NOAA research aircraft flying above the storm.

The reliability of these real-time reports just prior to landfall was a tremendous achievement. CMAN stations, permanent monitoring stations located offshore, were not transmitting data, leaving the tower data as the only wind reports available from the coast. HRD scientists were able to relay H*Wind reports to NHC forecasters and keep them abreast of the rate of wind increase at the coast as Isabel approached, as well as how quickly conditions were deteriorating.

The efforts of the tower crews represent a shining example of how research projects can make valuable contributions to operational forecasting and community preparations while, at the same time, gathering a research data set that will be studied for years. NOAA scientists hope that such high-frequency, real-time transmissions at hurricane landfall might become more commonplace in the future.

NOAA's Gulfstream-IV jet completed its 100th surveillance mission during a flight into Hurricane Isabel on September 17th.

It's a Girl

Dawn-Marie Boyer, an oceanographer with the Ocean Chemistry Division, and her husband Joe, are the proud parents of a daughter, Olivia Mae Boyer, born August 30, 2003 at 6:29 p.m. Olivia, big brother Rowan, and her parents are all doing well.

Congratulations

Howard Friedman, a meteorologist with the Hurricane Research Division, is a member of a group of facilitators who received a 2003 Department of Commerce Bronze Medal for successfully facilitating close to 1,000 work group meetings as part of NOAA's second Survey Feedback Action process.

Welcome Aboard

Matthew Eastin joins the staff of the Hurricane Research Division as a National Research Council (NRC) post-doctoral scientist. While at AOML, he will study hurricane inner-core structure and intensity change by working with airborne Doppler radar and other aircraft data collected by the Hurricane Research Division in eastern Pacific Hurricane Guillermo (1997). Dr. Frank Marks will serve as his NRC advisor. Matthew recently earned a doctoral degree in atmospheric science from Colorado State University.

Monica Fuentes joins the staff of the Office of the Director to serve as a backup for the AOML receptionist and to assist the Administrative Group with a variety of clerical tasks.

Michael LaGier joins the staff of the Ocean Chemistry Division as a Cooperative Institute of Marine and Atmospheric Studies (CIMAS) post-doctoral scientist. Michael is a molecular biologist who will be working with Dr. Kelly Goodwin on a project funded by the National Oceanographic Partnership Program to develop a sensor to detect the DNA of problem organisms in coastal waters. The target species are dinoflagellates that cause red tide and bacteria associated with sewage contamination. He recently received a doctoral degree in biomedical sciences from the University at Albany, State University of New York.

AOML Women Honored for Achievements

Nirva Morisseau-Leroy and Shirley Murillo, both with AOML's Hurricane Research Division, were honored for their professional achievements on September 12th at the Women of Color Research Sciences and Technology Awards Conference in Nashville, Tennessee. The annual conference celebrates the technological contributions of African, Asian, Hispanic, and Native American women and strives to motivate other minority women to higher levels of accomplishment.

Nirva Morisseau-Leroy and Shirley Murillo.

Morisseau-Leroy, a University of Miami/CIMAS Oracle database administrator and senior applications developer, was honored as being a "Woman of Achievement" for her research on advanced methods for distributed scientific analysis and the use of cutting-edge technologies to address hurricane research challenges.

Murillo, a meteorologist, was honored as being a "Young Scientist/Rising Star" for her outstanding contributions to hurricane research and for leadership in promoting science education outreach.

The event was sponsored by Career Communications Group, publisher of several magazines (*U.S. Black Engineer and Information Technology Magazine, Hispanic Engineer and Information Technology Magazine, Women of Color Conference Magazine*) that promote diversity and equal employment opportunity for minorities in the fields of engineering, math, science, and information technology.

Visitors

Professors Natalie Grigorieva and Gregory Fridman, Department of Applied Mathematics, Saint Petersburg State Marine Technical University, Saint Petersburg, Russia, visited AOML from September 15 through September 24. They were in Miami to participate in a workshop hosted by Dr. David Palmer, an oceanographer with AOML's Ocean Chemistry Division. The workshop was devoted to Drs. Grigorieva and Palmer's joint project on acoustic propagation in the ocean sponsored by the U.S. Office of Naval Research.

Professors Natalia Grigorieva and Gregory Fridman, Saint Petersburg State Marine Technical University, Russia, visited AOML from September 15-24th.

The NOAA application of their work focuses primarily on acoustic remote sensing of the ocean for the purpose of monitoring and studying its state and its dynamics. The project was formulated during Prof. Grigorieva's first visit to AOML in January 2001. Professor Grigorieva presented a seminar at AOML on September 16th entitled "Long-range acoustic propagation in the frequency and time domains."

"Spring Forward, Fall Back"
Daylight Savings Time Ends October 26, 2003

Travel

Robert Kohler visited NOAA's Office of the Chief Information Officer (CIO) in Silver Spring, Maryland on September 23-26, 2003.

Robert Castle and Rik Wanninkhof attended the first annual meeting of NOAA's Volunteer Observing Ship (VOS) pCO_2 project at the Lamont-Doherty Earth Observatory of Columbia University in Palisades, New York on September 25-26, 2003.

David Enfield met with a group of meteorologists at the University of Chile in Santiago, Chile on October 2, 2003 and gave a presentation entitled "Variability of the Western Hemisphere warm pool and its effects on the climate of the Americas."

Kelly Goodwin attended a Prokaryotic Annotation and Analysis training course at the Institute of Genomic Research in Rockville, Maryland on October 6-7, 2003.

Judy Gray participated in a Coastal Storms Initiative meeting in Astoria, Oregon on October 6-10, 2003.

Peter Ortner attended the Ecosystem Goal Team and the Senior Research Council meetings in Silver Spring, Maryland on October 7-9, 2003.

Christopher Landsea attended the 28th Annual Meeting of the National Weather Association in Jacksonville, Florida on October 20, 2003 and made a presentation about the Atlantic hurricane re-analysis project.

Nirva Morisseau-Leroy, Mark Powell, and Russell St. Fleur attended the NOAATech 2004 Workshop in Silver Spring, Maryland on October 21-23, 2003.

Frank Marks participated as a science team member in a NASA workshop about the Tropical Rainfall Measuring Mission (TRMM) satellite in Greenbelt, Maryland on October 27-31, 2003.

Jeffrey Absten, Jules Craynock, James Hendee, Clarke Jeffris, Jeffrey Judas, Skeet Perry, and Michael Shoemaker installed a newly designed CREWS (Coral Reef Early Warning Station) station at Lee Stocking Island, Bahamas on October 27-31, 2003.

Rosen Onboard as New OAR Assistant Administrator

Dr. Richard Rosen became the Office of Oceanic and Atmospheric Research's (OAR) new Assistant Administrator on October 6th. He is the former vice president and chief scientist of Atmospheric and Environmental Research, Inc., of Lexington, Massachusetts, where he was engaged in a broad range of studies related to large-scale atmospheric dynamics.

Rosen has been a principal investigator on a number of grants and contracts with NOAA, the National Science Foundation, and NASA to study large-scale characteristics of the atmosphere. He hold three degrees from the Massachusetts Institute of Technology, where he serves as a senior lecturer in the Department of Earth, Atmospheric, and Planetary Sciences. Rosen is also a past president of the American Meteorological Society.

Dr. Richard Rosen

Recent AOML Publications (August-September 2003)*

ABERSON, S.D., 2003: Targeted observations to improve operational tropical cyclone track forecast guidance. *Monthly Weather Review,* 131(8):1613-1628.

CIONE, J.J., and E.W. UHLHORN, 2003: Sea surface temperature variability in hurricanes: Implications with respect to intensity change. *Monthly Weather Review,* 131(8):1783-1796.

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Lee, W.-C., F.D. MARKS, and C. Walther, 2003: Airborne Doppler radar data analysis workshop. *Bulletin of the American Meteorological Society,* 84(8):1063-1075.

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*Names of AOML authors appear in capital letters.

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