



The NWA: Connecting  
operational meteorologists  
in pursuit of excellence  
in weather forecasting,  
communication, and  
service.

No. 12 – 2

# Newsletter

## FEBRUARY 2012

### Flood Safety Awareness Week

*March 12 - 16*

National Flood Safety Awareness Week is fast approaching. It is an ideal opportunity to stress the dangers associated with floods (i.e., not driving through standing water as pictured!), and how to best protect both life and property before or during a flood.



For additional information including many informative videos, visit:

[www.nws.noaa.gov/floodsafety/](http://www.nws.noaa.gov/floodsafety/)

### Weather: From Passion to Profession

Driving across the Texas Panhandle recently, the vista from the Caprock was breathtaking. Low, dark clouds and occasional light rain only heightened the contrast in colors. I slowed to well below the speed limit in order to stretch the drive out and was enlightened once again by the awesome beauty of weather. I have only anecdotal evidence of this, but I believe a vast majority of people who professionally interact with weather on a daily basis do so out of some life-changing experience or long-held love of weather, followed by an ever-growing amazement at the many forms weather takes.



This passion also connects us with so many others. How often have you talked to someone who, when they found out you are in the weather business, said something like, "Well, if I hadn't gone into aviation, I would probably have gone into weather."? Perhaps while you staffed a booth at the state fair, someone shook your hand and immediately told you about the tornado that flattened their homestead but spared the crystal in the china cabinet.

Your passion gets channeled at college when an equally passionate professor points your research in the direction of the sea breeze, lake effect snow, or in understanding societal risk. It gets channeled when you find yourself at 3 a.m. issuing a tornado warning for a small rural community; you and the emergency manager hope you've done enough to enable the protection of the citizens in the storm's path. It gets channeled when you've been on the air with non-stop commercial-free severe weather coverage for six hours straight and a brand new line of storms moves into your broadcast area. If you can't see how what you do connects you with each of these stories, then the NWA provides one way for you to find out.

This month's newsletter brings to us the call for abstracts for the 2012 NWA Annual Meeting in Madison, Wis. Each of you has a unique vantage point from which you can see challenges and solutions that face the weather community, and the citizens at large. Regardless of what got you interested in weather, please consider sharing your unique perspective in Madison, and prepare to be amazed as you learn from others doing the same.

Liz Quetone, President

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# Physical Assessment of Hurricane Rapid Intensification using Kernel Principal Component Analysis

Andrew E. Mercer<sup>1,2</sup> and Jamie L. Dyer<sup>2</sup>

<sup>1</sup> *Northern Gulf Institute, Mississippi State University*

<sup>2</sup> *Department of Geosciences, Mississippi State University*

While general understanding of hurricane dynamics has improved over time, forecasters still struggle with identifying the exact features responsible for rapid intensification of tropical cyclones. Interestingly, no consensus definition exists for rapid intensification, adding to the inherent difficulty of identifying relevant physical controls. The methodology used herein identified a decrease of 25 mb in 24 hours as a rapidly intensifying tropical cyclone, based on the percentile limits of all tropical cyclone pressure changes from 1979-2011.

Upon formulation of a definition of rapid intensification, 15 rapidly intensifying storms and 15 non-rapidly intensifying storms were selected randomly from the full tropical cyclone record from 1979-2008. A kernel principal component analysis was used to formulate three-dimensional composite atmospheric profiles associated with each intensification type using the National Aeronautics and Space Administration (NASA) Modern Era Retrospective Analysis for Research and Applications (MERRA) reanalysis dataset (<http://gmao.gsfc.nasa.gov/merra/>) at 1.25° horizontal grid spacing with 25 vertical levels from the surface up to 100 mb. Kernel principal component analysis was selected due to the inherent nonlinear relationships between the primary meteorological conditions composited including temperature, geopotential height, specific humidity, and u and v wind components. Three composites of each class of rapid intensification resulted from the analysis.

Subjective assessments of the composites revealed strikingly different thermodynamic and dynamic structures of the two intensification types. The most evident differences were noted in the low-level moisture fields (Fig. 1) and in the low-level thermodynamic structure (Fig. 2) of the cyclones. Rapidly intensifying storms generally had a well-defined low-level moisture return region on the southeast side of the storm and associated higher potential temperatures. Non-rapidly intensifying events had substantial dry slots and regions of low potential temperature on the west and southeast sides of the storm. These features were observed up to roughly 800 mb. Additionally, tropopause heights were considerably

higher in the rapidly intensifying storms (roughly 107 mb) versus the non-rapidly intensifying events (roughly 112 mb). These thermodynamic structures were translated into the cyclone dynamics as well. The 150 mb divergence values were noticeably more focused over the center of circulation and much stronger ( $4.5 \times 10^{-5} \text{ s}^{-1}$  in a rapidly intensifying cyclone versus  $3 \times 10^{-5} \text{ s}^{-1}$  in a non-rapidly intensifying storm), and 500 mb vorticity was more than 100% stronger in a rapidly intensifying storm ( $1.6 \times 10^{-4} \text{ s}^{-1}$  versus  $6 \times 10^{-5} \text{ s}^{-1}$ ).

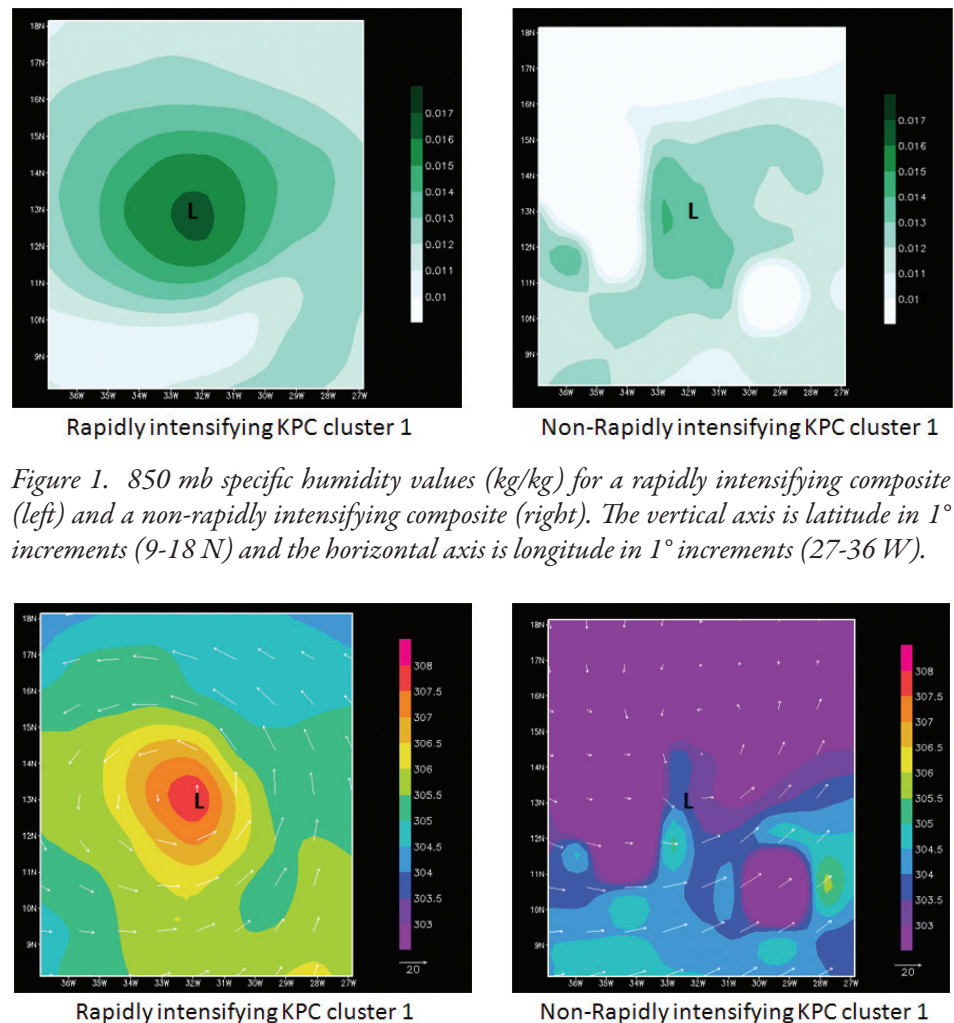


Figure 1. 850 mb specific humidity values (kg/kg) for a rapidly intensifying composite (left) and a non-rapidly intensifying composite (right). The vertical axis is latitude in 1° increments (9-18 N) and the horizontal axis is longitude in 1° increments (27-36 W).

Figure 2. Same as Fig. 1, but for 850 mb potential temperature (K) and wind vectors.

These results provide some initial guidance to forecasters as to the relevant controls governing rapid intensification of tropical cyclones and will serve as a baseline for future work considering all tropical cyclone events. Ultimately, an artificial intelligence algorithm will be formulated that will assess the probability of rapid intensification along a storm's path, using these composites as initial training guidance.

# NWA 37th Annual Meeting Information

October 6–11, 2012 in Madison, Wisconsin



Monona Terrace

The meeting sessions will be held in the beautiful Frank Lloyd Wright designed Monona Terrace Convention Center in downtown Madison

## Hotels

Blocks of rooms at the NWA negotiated rates are available at these three nearby hotels in Downtown Madison

- Hilton-Madison Monona Terrace
- Madison Concourse Hotel
- Best Western Inn on the Park

For complete hotel information and links to reserve a room, please go to web link below.

## Abstract Submission

Submit abstracts for oral presentations by May 25 and abstracts for poster presentations by June 29.

Abstracts should be sent via the online form (through link below) and will be published as submitted, so please make sure that they have been carefully reviewed and edited. Presenters will be notified via e-mail regarding disposition of their abstracts by July 20. A preliminary agenda will be posted on the NWA web site by early August for presenters to review and proofread.

## Theme

*“Synthesizing Weather Information for Society: From Observations to Action across our Communities”*. Today’s meteorologists understand that the best forecast means collaborating with weather partners in education, emergency management, government, research, broadcast media and more. At this year’s meeting, the breadth of the professional community is invited to explore the emerging technologies, ideas, and science that not only allow us to improve weather forecasts but also to fine tune the message to customers and the general public.

All Annual Meeting information is located at: [www.nwas.org/meetings/nwa2012](http://www.nwas.org/meetings/nwa2012)

## New NWA Members from January 2012

### Regular/Military/Retired

Eddie Bloodsworth  
Stephen Bone  
Lynette Charles  
Jason Engle  
Jeff Halblaub  
Micah Harris  
Ilene Jones  
Kristen Kirchhaine  
Michael Lewis  
William Lincoln  
Thomas Lindley  
Andrew McCawley  
Lee McDermot  
Daniel Mike  
Amanda Tokarz

### Students

Vanessa Alonso  
Kevin Biernat  
Shane Branch  
Joshua Brewer  
Tyra Brown  
Corey Clay  
Stephen Dieli  
Spencer Faber  
Ted Farris  
Deirdre Fateiger  
Yvette Fortin  
Christopher Hampton  
Matthew Harding  
Michelle Hogenmiller  
Eric Holt

William LaForce  
Suheily Lopez  
Kira Peasley  
Christopher Porter  
Kim Quintero  
Elizabeth Ray  
Nicholas Rothfuss  
Maegan Rowison  
Jonathan Rutz  
Robert Sholtzberger  
Kenneth Smith  
Michael Soltow  
Gabriel Susca-Lopata  
Marisa Valentic  
Brandon Wills

Sheldon Kusselson  
NOAA/NESDIS

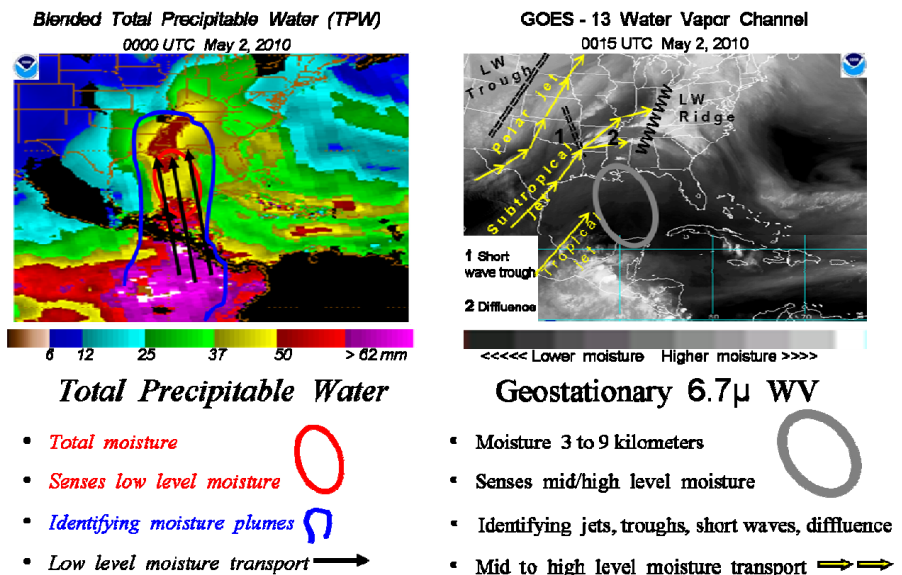
In early May of 2010, an unprecedented multi-day heavy rainfall and flash flooding event occurred over portions of Tennessee and surrounding states. Part I of this series, published in the December NWA Newsletter, showed a sequence of the National Oceanic and Atmospheric Administration (NOAA) Blended Total Precipitable Water (BTPW) and Percent of Normal product images of the large scale evolution of various deep low level moisture sources leading to the event. This month's Part II will discuss and compare the use of the Geostationary Operational Environmental Satellites (GOES) 6.7 micron water vapor (WV) channel and BTPW product for analyzing various moisture and lifting mechanisms that contributed to this event. Using different types of satellite imagery for an event of this magnitude demonstrates the need to incorporate satellite imagery into the analysis and forecast process to help improve the accuracy of the amount and location of heavy precipitation and the lead time for the issuance of flash flood watches and warnings.

The BTPW product shows total atmospheric moisture using various sensors on different remote sensing platforms, including Advanced Microwave Sounder Unit (AMSU) onboard the Polar Orbiting Environmental Satellite (POES) and European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) Meteorological Operational (MetOp) polar orbiting satellites, GOES sounders and ground-based GPS Meteorology (GPS/MET) equipment (Forsythe et.al. 2009; Kusselson et.al. 2009). Since most of the moisture in the atmosphere exists below three kilometers, the product best depicts low-level moisture, a necessary ingredient for heavy rainfall and flash flooding (Kusselson 1993). The GOES 6.7 micron channel WV image best depicts moisture above three kilometers centered in the middle and upper levels of the atmosphere.

With this event, the low level moisture plume (left side of Figure 1; BTPW product) or concentration of highest moisture, originated in the tropical eastern Pacific south of Central America and extended north through the Gulf of Mexico into the lower Mississippi Valley. In comparison, the GOES WV image (right side of Figure 1), showed very little moisture in the Gulf of Mexico. The GOES WV channel is best used for locating short wave troughs, jets and areas of diffluence at the middle and upper levels. These upper-level features can be the most important forcing mechanisms to squeeze out the low-level moisture and contribute to heavy rainfall and flash floods.

Another application of the BTPW is to overlay 850 mb winds or streamlines on the image. This can provide a sense of how efficient the rain production will be in a certain area by transporting the longest fetch of the highest moisture downstream. Where the best low-level moisture transport interacts with the best forcing mechanism(s), like the jet in this case, depicted by the GOES WV image is usually where the highest rainfall will occur. The transport of moisture at the higher levels can be identified by

### Compare and Contrast, Complement and Supplement



*BTPW (left) and GOES 6.7μ (right) moisture products at around 0000 UTC May 2, 2010; Characteristics and applications of both for comparison and help in analyzing and forecasting this multi-day heavy rainfall/flash flood event.*

### Useful Links

#### Training:

[http://weather.msfc.nasa.gov/sport/training/CIRA\\_tpw\\_training/player.html](http://weather.msfc.nasa.gov/sport/training/CIRA_tpw_training/player.html)

#### Operational NOAA Blended TPW products:

<http://www.osdpd.noaa.gov/btpw/>

#### Current GOES- E Water Vapor loop:

<http://www.goes.noaa.gov/GSSLOOPS/ecwv.html>

#### GOES-W Water Vapor loop:

<http://webmux4.nesdis.noaa.gov/GSSLOOPS/wcww.html>

See FLOODS page 5

## Recent updates to the NWA Publications

By Matthew J. Bunkers

There have been some updates to the NWA Publications that I would like to bring to your attention. In November 2011, a much-needed search engine was implemented for the Digest and Electronic Journal of Operational Meteorology (EJOM). This search engine capitalizes on the work we did last year to digitize all NWA publications in Portable Document Format (PDF). Another initiative was to update all of the citations on the Digest and EJOM pages to be consistent with current standards.

In order to expand our reach to non-members, free abstracts will be provided for new issues of the Digest and EJOM while the full publications continue to be available to members only. Along these lines, we have added an Images of Note option to the EJOM, which allows for a short, focused paper with no more than two figures and two pages of text. Moreover, the EJOM publications will now be in PDF and using a new, modernized template. Regarding the Digest, the editors are preparing online guidelines to assist

potential authors with their manuscripts.

Our plans for this year include the addition of optional preprints for the NWA Annual Meeting. This will afford authors the opportunity to expand on their research beyond their oral and poster presentations, thus providing a tangible document that can be readily cited. The NWA Council is also considering the Publication Committee's proposal to make the Digest and EJOM a combined, all-electronic journal.

Finally, the EJOM editors have chosen Michael Coniglio as the Editor-in-Training for 2012, advancing to Assistant Editor in 2013 and Editor in 2014. We look forward to the expertise he brings to the EJOM through his experience with the Hazardous Weather Testbed. Additional NWA publications information can be found at:

<http://www.nwas.org/committees/publications/>.



*EJOM home page*

Matthew Bunkers  
Chair, Publications Committee

### FLOODS from page 4

overlying mid- and high-level winds on the GOES WV image. This transport can contribute to the seeding of the lower-level clouds and deepening the moisture over the area of concern. In this case, the subtropical jet transported moisture from the eastern Pacific and Mexico to the Tennessee Valley. A secondary, but still important, application of the GOES WV imagery is the depiction of the depths and trends of the long wave troughs and ridges that contribute to the duration of the event.

Most forecasters realize that heavy rainfall and flooding are not just dependent on moisture and upper level forcing, but also on the placement and interaction of these important meteorological parameters. As shown in this series with this particular event, no individual satellite product provided all the information needed by the forecasters to analyze the location and magnitude of this early May multi-day heavy rainfall and

flash flooding event in Tennessee. Knowing the strengths of the BTPW and GOES WV imagery and how to use them together can be very helpful to forecasters in providing more accurate forecasts of heavy rainfall and flooding and improved, more accurate and longer lead time to help save lives and property.

The concluding Part III will show how the GOES WV and BTPW products can both supplement and complement initial model anomaly information to gain a better perspective of the potential magnitude and historic aspects of the May 2010 heavy rainfall/flash flood event.

### References

- Forsythe, J., S. Kidder, S. Kusselson, A.S. Jones, and T.H. Vonder Haar, 2009: Increasing the land coverage of blended multisensor total precipitable water products for weather analysis. Preprints, 16th Conf. on Satellite Meteorology and Oceanography, Phoenix, AZ, Amer. Meteor. Soc., JP8.12. [Available online at [http://ams.confex.com/ams/89annual/techprogram/paper\\_149348.htm](http://ams.confex.com/ams/89annual/techprogram/paper_149348.htm)].
- Kusselson, S.J., 1993: The operational use of passive microwave data to enhance precipitation forecasts. Preprints, 13th Conf. on Weather Analysis and Forecasting, Vienna, VA, Amer. Meteor. Soc., 434-438.
- Kusselson, S.J., S. Kidder, J. Forsythe, A.S. Jones, and L. Zhao, 2009: An update on the operational implementation of Blended Total Precipitable Water (TPW) products. Preprints, 23rd Conference on Hydrology, Phoenix, AZ, Amer. Meteor. Soc., 8.5. [Available online at [ftp://satepsanone.nesdis.noaa.gov/Publications/23Hydro\\_Jan\\_2009\\_extended\\_abstract.pdf](ftp://satepsanone.nesdis.noaa.gov/Publications/23Hydro_Jan_2009_extended_abstract.pdf)]

## Help Recognize a Deserving Professional!

### 2012 NWA ANNUAL AWARD

The application period is now open - make your nomination on line now!

Awards will be presented on Oct. 10 at the Awards Banquet during the 37th NWA Annual Meeting in Madison, Wisconsin.

Go to

<http://www.nwas.org/awards/>

for details.

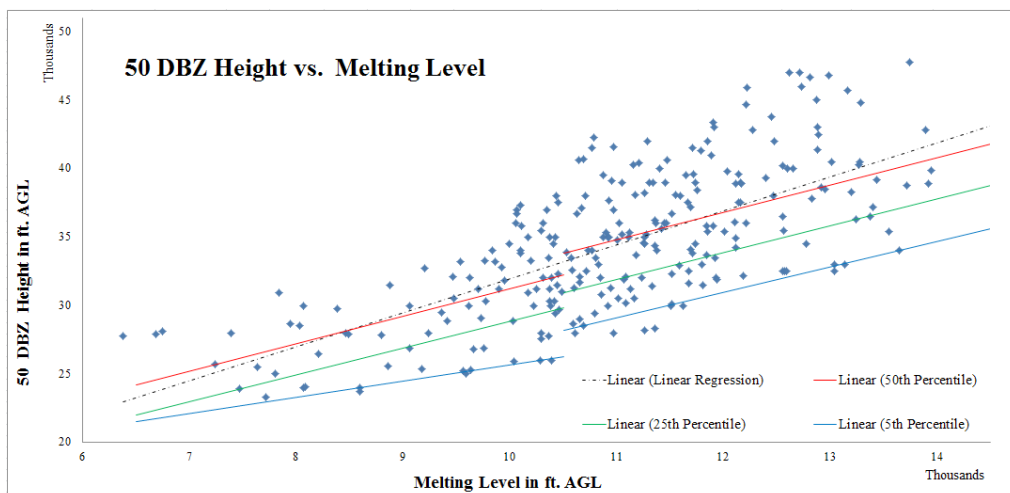
## The February 23, 2012 High Plains NWA Chapter Meeting

The High Plains (HP) Chapter held a special conference call on Feb. 23. Rick Ewald, the Science Operations Officer (SOO) from the National Weather Service (NWS) office in Hastings, Neb., served as the call organizer. There were 13 other members logged into the conference call, including the current officers, three Meteorologists in Charge (MICs), and one Acting MIC, as well as several other members. The purpose of the this call was to discuss whether or not the HP Chapter should host the HP conference this year, scheduled to be held in Hastings, Neb. Travel budgets have been severely reduced for NWS employees, and since most of our conference attendees have been government employees, the attendance would likely be significantly reduced. It was the consensus from each WFO to postpone the 2012 HP conference until at least 2013, and still hold it in Hastings. The group decided to wait until the 2013 funding is approved and released before deciding to have the conference in 2013. Aaron Johnson, the SOO from the NWS office in Dodge City, Kan., suggested that the members start thinking about creative ways to host the conference, and even regular HP meetings, such as through webinars, Go-To-Meetings, virtual speakers, etc. Teresa Keck from the NWS office in North Platte, Neb., suggested checking into the distant learning centers available in many colleges and libraries to hold Interactive TV or virtual meetings. The next meeting will be March 14 via a conference call.

## New EJOM Paper

A new paper has just been published in the NWA EJOM: 2012-EJ1, "WSR-88D Signatures Associated with One Inch Hail in the Southern Plains" by Dennis E. Cavanaugh of the NWS in Fort Worth, Texas, and Jessica A. Schultz of the Radar Operations Center in Norman, Okla.

This paper evaluates four severe hail detection methods using base data from NWS Doppler radars in the southern Plains. Signal detection theory is used to evaluate these methods and identify the one that best discriminates between severe and non-severe hail-producing thunderstorms. Findings suggest that the 50-dBZ reflectivity echo relative to the altitude of the melting level is the most effective method of those evaluated in this study. Signal detection theory was used again to determine which warning decision threshold will maximize probability of detection and minimize false alarms. These warning decision thresholds and suggested severe hail warning criteria for other methods evaluated in this study are presented in an effort to improve the warning decision-making process for severe hail-producing storms across the southern Plains.



*The 50-dBZ height hail detection method with the 50th, 25th, and 5th percentile regression lines plotted.*

37<sup>th</sup> NWA Annual Meeting  
October 6 to 11  
Madison, Wisconsin

*"Synthesizing Weather Information for  
Society: From Observations to Action across  
our Communities"*

### *NWA sponsored Annual Meetings, Conferences and Special Events*

#### **March 29-31: 16th Annual Severe Storms & Doppler Radar Conference**

Sponsored by the NWA Central Iowa Chapter will be held at the Courtyard by Marriott Hotel in Ankeny, Iowa. Details at: <http://www.iowa-nwa.com/conference/>.

#### **March 31: The 10th Annual Great Lakes Meteorology Conference**

Sponsored by the Northwest Indiana American Meteorological Society (AMS)/NWA local Chapter, it will be held at the Strongbow Inn in Valparaiso, Ind. Registration and other details at: <http://www.valpo.edu/student/nwa/conference>.

#### **Oct. 6-11: 37th National Weather Association Annual Meeting**

This Annual Meeting will be held in Madison, Wis. The meeting sessions will occur in the beautiful Frank Lloyd Wright designed Monona Terrace Convention Center in downtown Madison. See page 3 . Details on past and future Annual Meetings is at <http://www.nwas.org/meetings/nwa2012>.

### *Other Meetings, Conferences and Special Events*

#### **March 10: Central Indiana Severe Weather Symposium**

This biennial all-day event, aimed toward spotters and weather enthusiasts, will include The Weather Channel's Mike Bettes, nationally-known tornado damage expert Tim Marshall, along with Fox 59's Brian Wilkes and meteorologists from NWS Indianapolis and NWS Northern Indiana. Breakfast, lunch , and coffee breaks are provided. Find all the information on the symposium, including the registration form, cost, and directions at: [www.crh.noaa.gov/news/display\\_cmsstory.php](http://www.crh.noaa.gov/news/display_cmsstory.php).

#### **March 14-16: 20th Annual U.S.-Canadian Great Lakes Operational Meteorology Workshop**

Topics will include winter storms, severe convection, flooding and flash flooding, marine forecasting, lake effect snow forecasting, international collaboration, aviation forecasting, and climatology. Presentations on case studies, research findings, technological advances, meteorological decision support, and customer service are all welcome. Workshop will be held in downtown Chicago. <http://www.crh.noaa.gov/lot/?n=glomw>.

#### **March 26-29: 2012 National Hurricane Conference**

This annual conference will be held at the Hilton Orlando in Orlando, Fla. <http://www.hurricanemeeting.com/>.

#### **July 15-20: Short-course: Studies in Air Quality for Science Educators**

The Science Center for Teaching, Outreach, and Research on Meteorology (the STORM Project) at the University of Northern Iowa (Cedar Falls) will sponsor this intensive, one-week course designed specifically for middle school and high school science teachers. Participants will receive a stipend. Most expenses, including travel, will be covered by the STORM Project. Out-of-state teachers are encouraged to apply. For more information, see: <http://www.uni.edu/storm/saqse/> and register before Feb 17.

#### **July 18-20: ORBCRE Symposium 2012**

The Ohio River Basin Consortium for Research and Education Symposium 2012 will be held at Ohio University in Athens, Ohio. Abstracts are due March 15. Theme is: Research and Education of Ohio River Basin: Transportation, Energy and Environment. Details at: <http://www.orbcre.org/>.

## Students & Teachers!

### 2012 NWA Scholarships and Grants Applications Period is Open!

This year, the NWA is offering six scholarship opportunities and one grant for university students.

Four scholarships will be available this spring and two in the summer. Additionally, there will be seven education grants for K-12 Teachers.

Information for scholarships and grants are online:

[www.nwas.org/committees/ed\\_comm/application/](http://www.nwas.org/committees/ed_comm/application/)

[www.nwas.org/grants/index.php](http://www.nwas.org/grants/index.php)

#### NWA Scholarships and Grants

#### Application Closing Date

Broadcast Meteorology Scholarship	March 15
David Sankey Minority Scholarship	April 15
AccuWeather Undergraduate Scholarship	May 15
Dr. Roderick A. Scofield Scholarship	May 15
Meteorological Satellite Application Award Grant	June 15
2012 Sol Hirsch Education Fund Grant for K-12 Teachers	June 1
Arthur C. Pike Scholarship	Oct. 25
Phillips Family Undergraduate Scholarship	Oct. 25

## IMPORTANT DATES

March 15: Application period for NWA Broadcast Scholarship closes.

March 26-29: 2012 National Hurricane Conference, Orlando, Fla.

March 29 – 31: 16th Severe Storms & Doppler Radar Conference, Ankeny, Iowa.

March 31: 10th Great Lakes Meteorology Conference, Valparaiso, Ind.

April 15: Application period for NWA David Sankey Minority Scholarship closes.

May 15: Application period for NWA AccuWeather and Dr. Scofield Scholarships closes.

Oct. 6-11: 37th NWA Annual Meeting, Madison, Wisc.

#### NWA Newsletter (ISSN 0271-1044)

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