# NCEP Quarterly Newsletter - March 2014

Print

## Service Center Activities

### AWC Improved Web Site

On March 25, 2014 the National Weather Service (NWS) Aviation Weather Center (AWC) rolled out a design refresh of the www.AviationWeather.gov website. This design refresh was the continuation of a phased effort to update the entire NWS web presence and improve customer access to information and services. The new website will improve content organization, navigation, look and feel, functionality, and usability of www.AviationWeather.gov as well as improve access from mobile devices.

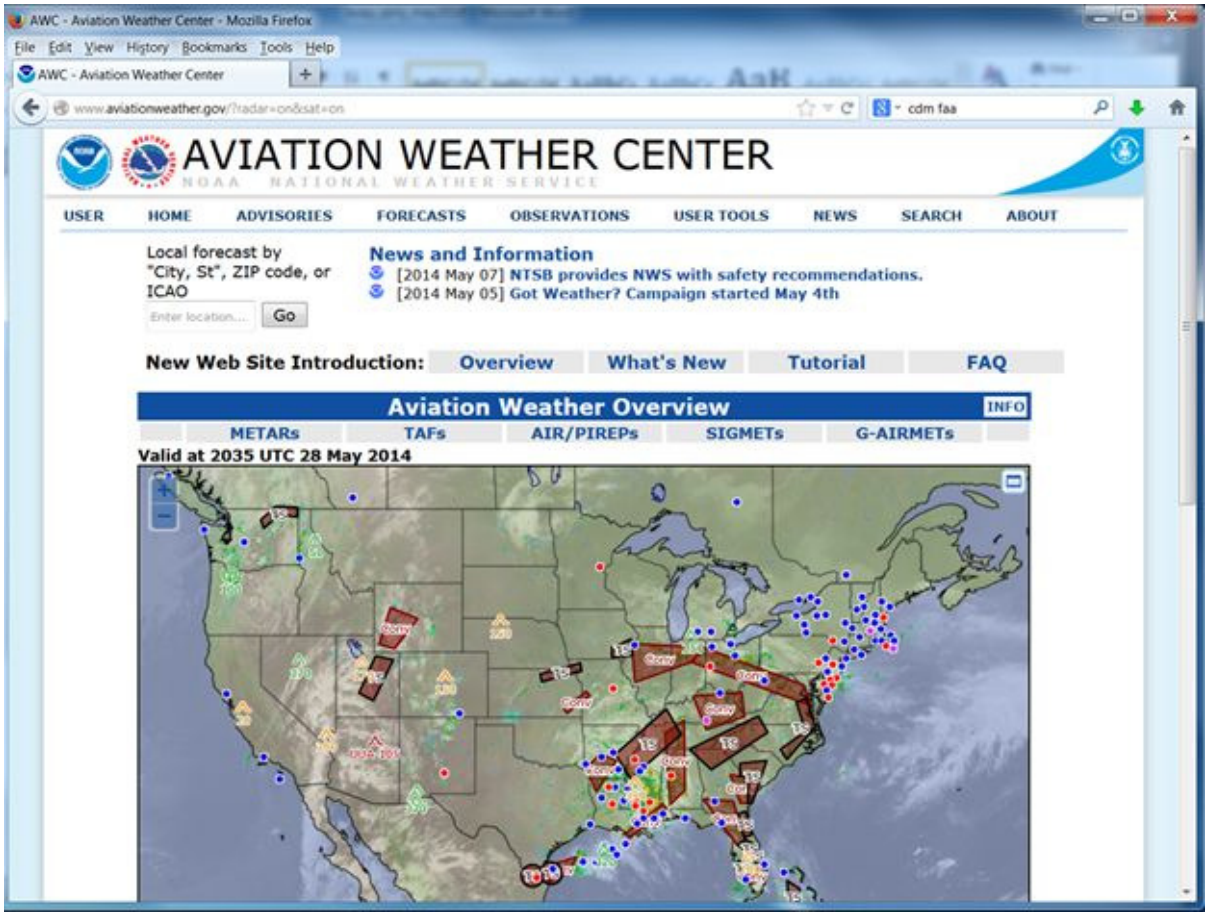
Along with a new look, the refresh better organizes the menu and navigation structure. "This provided an opportunity to review the whole www.AviationWeather design layout and provide pilots, briefers, and other users a more interactive experience", stated AWC Director Bob Maxson.

The old web site was over ten years old. Many of the old displays no longer worked with modern software and browsers. Many users have been looking for better interactivity with their mobile devices. The old layout was somewhat disorganized as pieces of the web site were upgraded and new technology became available. It was clear there were many technology upgrades and changes to the web site over the years that were not well-integrated with each other. This led to a lack of consistency throughout the web site, compromising the user experience. With the new design, the web pages are unified under a consistent layout. For example, the way users obtain raw METAR observations and TAF forecast data are now identical. The output of decoded weather data is the same regardless of its source or content.

Some of the benefits of the new web site include:

- Consistent Page Layout
- Simplified URLs
- No Pop-ups
- URL Parameters
- Mobile Support
- OpenLayers GIS Displays
- Plot de-cluttering through priority sourcing

The new web site is available at www.aviationweather.gov. The main page has descriptions of the improvements, and tutorials on the new site. Users can provide feedback directly to developers at http://new.aviationweather.gov/contact.



New homepage of aviationweather.gov.

## AWC DOT Secretary Visits NAMs

U.S. Department of Transportation Secretary Anthony Foxx recently visited the FAA's Air Traffic Control System Command Center (ATCSCC) in Warrenton, Virginia. The ATCSCC's mission is to strategically plan and manage the National Airspace System. It coordinates with 21 FAA Air Route Traffic Control Centers (ARTCC) and Airline Dispatch Centers across the United States.

The National Weather Service (NWS) operates an Impact Decision Support Service (IDSS) at the ATCSCC. As a part of the NWS' Aviation Weather Center, the "National Aviation Meteorologists" (NAMs) provide real time weather support to the ATCSCC operations. The strategic NAS planning is conducted in partnership between the FAA and the airlines to safely and efficiently route traffic across the country. Weather, specifically thunderstorms, makes up the majority of NAS disruptions and therefore requires a coordinated plan.

Secretary Foxx discussed the support the NWS provides to the ATCSCC and the National Airspace System. National Aviation Meteorologist Brandon Smith explained how the NAMs coordinate forecast support with NWS Weather Forecast Offices, NWS Center Weather Units, and airline dispatchers, to deliver timely and accurate weather decision support to the FAA. They discussed how major airport arrival rates are determined when they are being impacted by weather, and how NWS forecasts are used to route aircraft. This was an excellent opportunity from Secretary Foxx to better understand how the NWS/FAA partnership serves to meet the mission of both agencies.

National Aviation Meteorologist Brandon Smith (right) explains to Department of Transportation Anthony Foxx (left) how the NAMs coordinate forecast support.

## OPC Winter Storms over North Atlantic

The NOAA P-3 Research Aircraft are known as the Hurricane Hunters but are used for a variety of weather and oceanographic research missions. During February 2014, National Weather Service/Ocean Prediction Center (OPC) scientist Joe Sienkiewicz took part in the Ocean Winds Winter Experiment based out of Halifax, Nova Scotia. The goal of the experiment was to sample very high winds in ocean storms with the observing systems on the P-3 (Figure 1) and to synchronize the sampling with satellite overpasses. The satellites have instruments that can estimate the wind speed and direction near the ocean surface. Data collected are then used to improve the wind retrieval methods from the satellite scatterometers. Joe helped plan three missions and adapt the flight plans underway to ensure the P-3 was positioned in the area of highest winds.

Figure 1. NOAA WP-3D N42R on a cold February morning in Nova Scotia waiting to head out into a storm over the North Atlantic.

Satellite derived ocean surface winds from radar instruments called scatterometers are used by forecasters at the Ocean Prediction Center (OPC), the National Hurricane Center (NHC), coastal Weather Forecast Offices and other national weather centers to monitor wind conditions, to raise or lower wind warnings, assess the accuracy of weather model analyses and forecasts, and verify forecasts. Scatterometer based winds help forecasters provide the most accurate information to help keep mariners safe.

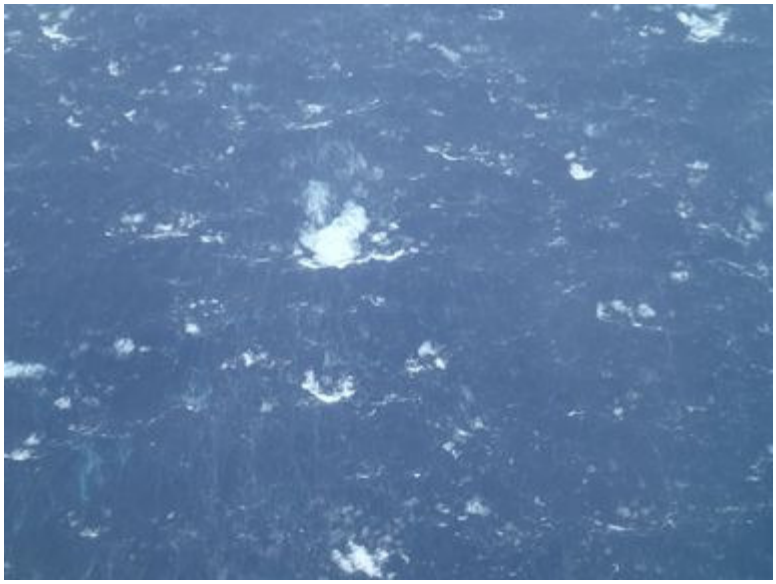


Figure 2. Waves 25 to 30 feet in height as seen from the NOAA P-3 on Feb 14, 2014 south of Nova Scotia with winds to 65 knots (Hurricane Force).

The OPC, NHC and other warning centers across the globe warn for dangerous conditions at sea which are based on the Beaufort Wind Scale. Winter storms over the North Atlantic can be very intense with over forty storms this past winter season reaching hurricane force strength (Beaufort Force 12 - winds 72 MPH (64 knots) and greater). These storms move rapidly and often undergo explosive intensification with winds and waves becoming dangerous very quickly. That is why it is critical that winter ocean storms be sampled by the NOAA team on the P-3 and that satellite measurements be improved. Waves of 25 to 30 feet are shown south of Nova Scotia in Figure 2 from Feb 14, 2014. The highest winds were measured by the P-3 over the warm waters of the Gulf Stream.

Winds and waves are not the only hazard over the North Atlantic. February is cold and sea ice becomes a hazard over the Labrador Sea as shown in Figure 3. The prevailing winds were from the west and northwest and were forcing large areas of ice to break away from the main ice pack and drift into the open ocean. Figure 3 shows how the pack ice breaks up due to the wind forcing with large pieces breaking into smaller pieces and drifting away from the main pack.

Figure 3. Ice breaking away from the main pack over the Labrador Sea on 18 Feb 2014.

The P-3 can be used to validate other satellite measurements. After a flight over the Labrador Sea on Feb 18,

sea ice was observed visually just off the eastern end of Nova Scotia in Cabot Strait. The sky was exceptionally clear and large areas of ice could be seen. The VIIRS imaging instrument on the Suomi NPP satellite passed over the same area within an hour of the P-3 and also observed the ice from space. The RADARSAT-2 Synthetic Aperture Radar followed a short while later and using its sophisticated, very high resolution radar was also able to sample the ice. All three images are in Figure 4. The view from the P-3 is highlighted by the red arrows in the VIIRS Visible image. Ice is the white mass in the photo from the P-3. To match the VIIRS and Radarsat-2 images the P-3 photo was inverted. The ice from VIIRS, Radarsat-2 (orange) and P-3 photo all match. Images from the NOAA NESDIS RADARSAT-2 winds product can be found at: http://www.ospo.noaa.gov/Products/ocean/sar/index.html.

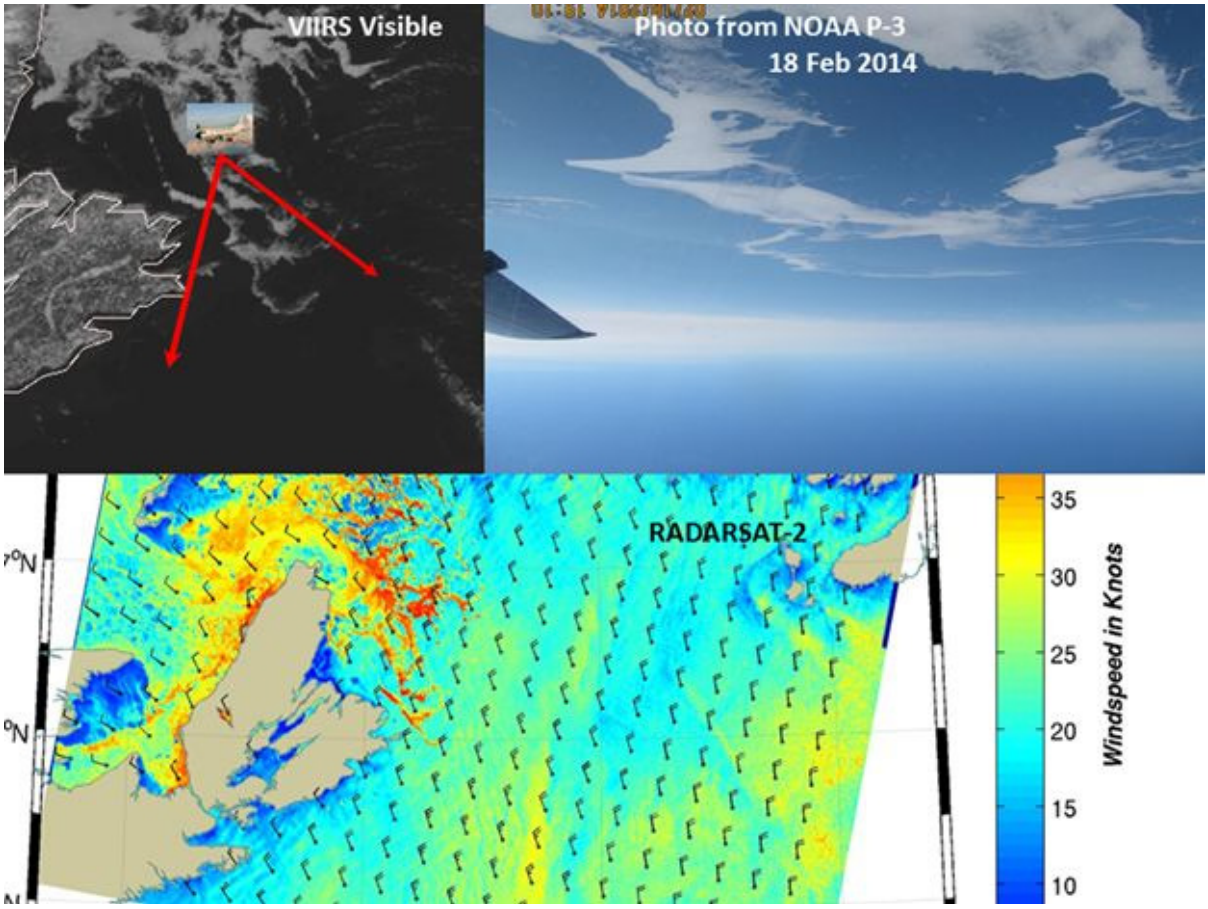



Figure 4. Sea ice just east of Cape Breton, Nova Scotia as seen from the Suomi NPP satellite VIIRS imager (upper left), the NOAA P-3 (upper right), and the RADARSAT-2 Synthetic Aperture Radar (bright orange strands east of Nova Scotia)(lower).

The P-3 is an incredible resource and the information gathered has proven to be invaluable to gain trust in satellite remotely sensed ocean winds in high wind conditions and the basis to improve the estimation of the wind speeds.

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## OPC Support to Antarctic Field Experiment

On November 4, 2013, the Ocean Prediction Center (OPC) started to provide daily weather forecast support for the Antarctic Ecosystem Research Division of NOAA's National Marine Fisheries Service. This was to support the Antarctic Marine Living Resource (AMLR) program field campaign. The primary support area is in the Southern Ocean off the Antarctic Peninsula. From November 4, 2013 to March 16, 2014 OPC produced a daily pressure/wind forecast (Figure 1) centered on the NOAA field camp at Cape Shirreff, Livingston Island (60 deg 47' W, 62 deg 28' S, Figure 2).

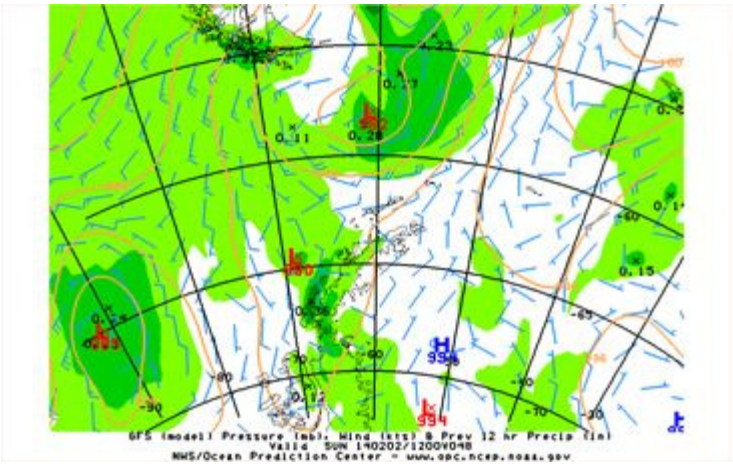

Figure 1. 48 hour Surface Forecast valid 00 UTC 02 Feb 2014.

Figure 2. Map showing Livingston Island.

NOAA research at land stations was conducted to determine the effects of fishing on pinniped and seabird populations during their reproductive cycles. Land-based field research consisted of five to six months of predator studies at two field stations in the South Shetland Islands. Pinnipeds are often generalized as seals, and they are a conspicuous component of the marine ecosystem around the South Shetland Islands. The Antarctic fur seal (Figure 3) is the most abundant pinniped at Cape Shirreff and the NOAA studies focused to a large degree on this species. The general objectives for pinniped research at Cape Shirreff were to monitor population demography and trends, reproductive success, diet and status of pinnipeds throughout the summer months.

Figure 3. An Antarctic fur seal instrumented with radio and flipper tags. Courtesy of NOAA Southwest Fisheries Science Center.

Figure 4. Chinstrap penguin courtesy of NOAA Southwest Fisheries Science Center.

Seabirds studied include chinstrap and gentoo penguins (Figure 4) as they tend to their eggs and provision for their chicks.

OPC received the following feedback from the Antarctic Ecosystem Research Group: "I'd like to take this opportunity to say thank you to both of you, and to the rest of your team for another season of great weather forecast coverage. You make our work better and safer every single day while we are in the field and we are extremely thankful."

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## OPC Tall Ships America Conference

On February 3-5, 2014, Joe Sienkiewicz, Chief of the Ocean Applications branch at NCEP's Ocean Prediction Center (OPC), attended the Tall Ships America Annual Conference in San Diego, CA. He presented two talks entitled Advanced Weather and Weather 101 - Atmospheric Pressure and participated in a variety of forums and training sessions. Tall Ships America is a nonprofit organization focused on youth education, leadership development and the preservation of the maritime heritage of North America, through sail training, by promoting sail training to the North American public, and supporting education under sail.

The loss of Bounty in Hurricane Sandy in 2012 and its significance to the traditional sail training vessel community is still a significant focus for this community as are the lessons learned from the loss of Concordia, which capsized off Brazil in 2010. These tragedies raised awareness of the need to understand and benefit from available weather information. Evidence of this is the fact that Joe's airfare, hotel, registration, and meals were paid for by Tall Ships America.

A panel session with Jessica Hewitt (Bounty survivor), Captain Bill Curry, master of Concordia and survivor, and former USCG rescue swimmer Mario Vittone, was extremely informative. Each shared their experience of getting away from a capsized sinking sailing vessel with lines and rigging in the water and the challenges they faced. Older survival suits are a real challenge as once on, their large mitted (lobster claw) hands are relatively useless for any function such as pulling the release cord on an uninflated life raft or even pulling one's self into an inflated life raft. Mario provided insight into the experiences of both Jessica and Bill and was able to compare and contrast the conditions they experienced.

In Joe's Advanced Weather course, he discussed the sources of forecast information and the forecast process and how it is changing with migration to Graphical Forecast Editing and what that means to the role of the forecaster. About 40 people attended and were quite engaged. In Weather 101, he gave a lesson on sea level pressure, its relationship to the 3-D structure of the atmosphere and to the wind speed and direction. With the help of Captain Miller of Maine Maritime, the lecture was followed up with a practical routing exercise

heading south from New York to Charleston using a series of analyses and forecasts to make decisions. It was an excellent session and a real opportunity to apply the tools and services OPC provides. The case was typical for fall with high pressure passing across New England and a front stalling across the waters off the SE coast and then developing a slow moving coastal storm. In essence the weather window closes and remains closed. Captain Mark Waddington recommended that this type of basic weather exercise be a core part of the annual training effort.

Tall Ships America Annual Meeting - Advanced Weather session. Courtesy Tall Ships America.

## SWPC ICAO Meeting

On 17 February, SWPC staff traveled to Melbourne, Australia to support the International Civil Aviation Organization's (ICAO) 8th International Airways Volcano Watch Operations Group (IAVWOPSG) meeting as part of the US delegation in support of the Federal Aviation Administration. ICAO is a specialized agency of the United Nations (UN) with the mandate to ensure the safe, efficient and orderly evolution of international civil aviation. The IAVWOPSG charge is to assist the ICAO Secretariat in the development of appropriate guidance material and operational requirements for not only volcanic ash issues, but space weather too. Space Weather events can have a detrimental impact on aviation systems. Space weather storms can result in lost or degraded communications, radiation hazards to crew and passengers, unreliable navigational equipment, and problems with flight-critical electronic systems.

The provision of space weather services for international aviation was addressed at the Melbourne meeting, including initial discussions on how these services will be provided. The formal requirements for these services should be approved at ICAO's 2014 Meteorology Divisional Meeting held conjointly with the Fifteenth Session of the World Meteorological Organization (WMO) Commission for Aeronautical Meteorology (CAeM-XV) in July in Montréal. Additionally, it was agreed at the IAVWOPSG that the requirements underpinning the top level service requirement should be contained in a stand-alone Space Weather Manual to be produced and ready for endorsement by IAVWOPSG-9 in September 2015; the US is the lead on this action.

These important initiatives will support global harmonization of end products and services, and enable the formal exchange and delivery of consistent and reliable space weather information to aviators worldwide.

The delivery of space weather information to the international aviation community was a topic for discussion at the ICAO meeting held recently in Melbourne.

## SWPC Space Weather Discussion with Insurance Companies

On January 20, the Space Weather Prediction Center (SWPC) participated with government, electric utilities, and insurance sector leadership in a roundtable discussion on geomagnetic storm-threat resilience strategy. The roundtable was held in the UK at the House of Lords, Westminster Palace, and at Lloyds of London, and focused on threats to electricity grids worldwide.

SWPC had the opportunity to make a presentation on NOAA's efforts to provide new observations and services that will support improved products for the electric power grid. The projected impact of severe space weather on the global meta-economy has become a particular focus of the global insurance industry; consequently, space weather has the attention of all major risk management specialists and insurers. Insurance consultants are working to identify and understand space weather risk management issues, with a goal to develop and implement strategies for addressing those risks. Major international insurance companies and organizations have reached out to NOAA in an effort to better understand space weather and the potential impacts on critical infrastructure. Understanding the threat of space weather, as well as the accuracy and timeliness of SWPC forecasts, are key for establishing policy.

Numerous reports were released over the last 18 months, from both government and insurance groups, attempting to assess the risk of an extreme geomagnetic storm. In a March 2013 report from the US Department of Energy (DOE) - "Insurance as a Risk Management Instrument for Energy Infrastructure Security and Resilience" - the DOE examined the key risks confronting critical energy infrastructure and looked at ways in which the insurance industry can help manage these risks. The report recognized that the insurance industry plays a key role in raising awareness about emerging risks such as space weather and educates their clients on these emerging risks so that they may implement risk-mitigating measures. Major global reinsurance companies, such as Lloyd's, Allianz, Swiss Re, and Zurich have all studied the space weather threat and published reports. The report "Solar Storm Risk to the North American Electric Grid," produced by Lloyd's in cooperation with AER, was launched in May of 2013. It suggested an extreme geomagnetic storm could affect 20-40 million people in the U.S. with economic costs exceeding a trillion dollars. And Zurich Services Corporation acknowledged that "An extreme space weather event today can be an unrecognized catastrophic risk event due to ever growing dependence on technology in our interconnected global economy."

Participants recognized that improved awareness is a critical element in responding constructively to space weather risks. It was also accepted that regardless of engineering approaches to address vulnerability, space weather predictions will always have a vital role in mitigation strategies.

SWPC contributed to space weather threat strategy discussion held at the House of Lords in London, UK.

## WPC Galvez-Davison Index

On Tuesday March 11, after two years of research and development, the WPC introduced the Galvez-Davison Index for Convective Instability (GDI) for field testing. The index was developed by Dr. Jose Galvez, WPC International Desks Research Meteorologists, and Mr. Michel Davison, Chief of the WPC International Desks, as an aid to accurately forecast the potential for convective precipitation (thunderstorm) events in the Tropics and Subtropics.

Forecasters have found that traditional thunderstorm indices used in the mid-latitudes, such as the K-index, do not perform well for thunderstorm prediction in the Tropics and Subtropics. Dr. Galvez and Mr. Davison set out to develop a more useful index. They found that the distribution of heat and moisture in the lower-troposphere, the stability effects associated with mid-level disturbances, and the drying and stabilizing effects of subsidence inversions are key factors that modulate convective precipitation in trade wind regimes (Fig. 1). They then created an algorithm which accounts for these factors by using temperatures and mixing ratios from four pressure levels. Extensive verification confirms that the GDI provides substantial improved skill in these regions relative to traditional indices, such as the K-index. Areas of improved skill extend as far north as the southeastern USA and as far south as northeastern Argentina. Validation shows that the GDI not only identifies the potential for thunderstorms, but also helps discern between different regimes of shallow convection, which can produce a wide range of precipitation accumulations in tropical regions.

Numerous groups have been trained on the use of the GDI, including NCEP Centers, the San Juan Forecast Office, the USAF Weather Agency, as well as WMO Region-III and Region-IV members, and some Latin American Institutions. The experimental GDI guidance is available in real-time at: http://www.wpc.ncep.noaa.gov/international/gdi/

This innovation represents a successful research to operations project of benefit to the international community.

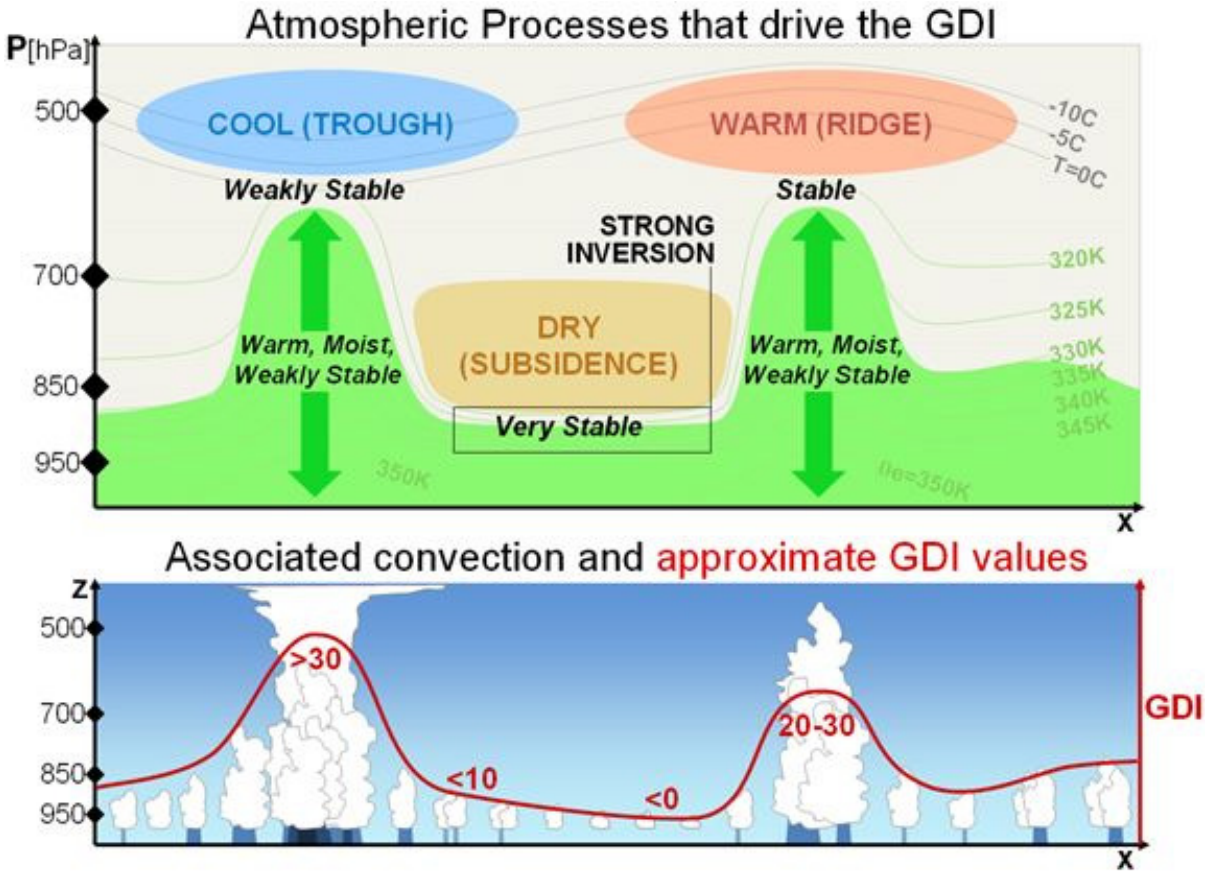


Figure 1. Scheme of processes that drive GDI values (top) and associated convection with approximate GDI values (bottom).