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Photo by Denice Drass

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AMVER Program
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VOS Program
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SEAS Program
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http://www.vos.noaa.gov/mwl.shtml

Marine Dissemination
http://www.nws.noaa.gov/om/marine/home.htm

U.S. Coast Guard Navigation Center
http://www.navcen.uscg.gov/marcomms/

SEE THESE WEB PAGES FOR FURTHER LINKS.

From the Editor

Paula Rychtar

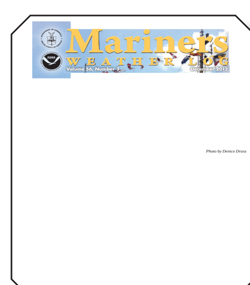
Welcome once again to the Mariners Weather Log! December is upon us and I just cannot believe how this year flew by. As promised and to our dismay, our hurricane season was extremely active and consequently very devastating. I want to take this opportunity to thank you all for your diligence and care, providing the National Weather Service and the National Hurricane Center with quality weather observations. This most certainly helped in their ability to provide good analysis and guidance. We had two devastating hurricane events, both impacting the lives and commerce for hundreds if not thousands. Events such as these emphasize how vital marine weather observations are…and the need for accurate and timely data. Good analysis is always critical for giving adequate advance notice for watches, warnings and appropriate evacuation procedures when deemed necessary. I want to give mention to *Hurricane Isaac*; hitting the Gulf Coastline, Tuesday evening, September 28th, the eve of the 7-year anniversary of Hurricane Katrina's arrival. All of us who experienced Hurricane Katrina were very attentive and amazed of the timing with Isaac. The eye of Isaac made landfall just southwest of the mouth of the Mississippi River; Isaac then decided to move back over the water only to crawl offshore just off southeastern Louisiana before once again making landfall September 29th, just west of Port Fourchon. Then there was Sandy. *Hurricane Sandy* developed late in the hurricane season and made landfall October 29th near Atlantic City, New Jersey. Sandy is now documented as the largest Atlantic hurricane on record and the second costliest, only surpassed by Katrina in 2005. While *re-writing* my editors note to include the event of *Hurricane Sandy*, large portions of the east coast remain without power, gasoline food or shelter. Homes and businesses have simply vanished in the storm's path. Cold weather descending upon the coast is compounding problems with a Nor'easter forecasted to hit them later this week. Please keep these people in your thoughts as they repair their lives.

Our featured cover story is in celebration of the NOAA RESEARCH SHIP OREGON II. The OREGON II first set sail in 1967 and just recently celebrated her 300th expedition for the National Marine Fisheries Service. This ship is truly the workhorse of all NOAA Vessels. The size of the vessel, the smaller draft along with her design gives an advantage over most research vessels. The cost of operation on average is much lower than some of the larger NOAA ships and her ability to maneuver in the more shallow waters makes her indispensable and necessary for particular survey designs. In association with the 300th expedition on the OREGON II, I included an article on the "Teacher at Sea" program. Steve Frantz, a teacher who got to ride on the OREGON II during the 300th expedition gets to tell his story on his experiences from participating/volunteering on the shark Long line Survey. Our PMO Corner will spotlight our Charleston South Carolina PMO, Tim Kenefick. Tim will be sharing his time riding on the one of the maritime training ships, the EMPIRE STATE. Training the cadets is a huge undertaking and one that Tim is passionate about. His dedication to the cadets and the staff on the training ships need to be commended, as he never falters from this task.

You may have noticed, we have been concentrating on instilling the new mindset that quality observations are more important than the quantity of observations. In light of that, I am including an article on this topic from none other than John Wasserman, our program manager. His article will provide guidance and insight on the need for a change of mindset in regards to quality over quantity.

I would like to finish this by wishing all a wonderful holiday season. Remember to be loving, kind and thoughtful to those close to you as well as those far away.

~ Paula



ON THE COVER:
Photo taken by Dennis Drass.

Mariners WEATHER LOG

Page 14

Page 16

Departments:

Marine Weather Review

VOS Program

NOAA SHIP OREGON II

NOAA Ship OREGON II (circa 1967)

When the NOAA Ship OREGON II first set sail in 1967 (homeport NOAA/NMFS/SEFSC/Mississippi Laboratories, Pascagoula, MS), the expectation was the vessel would have a service span of 20–25 years; not the remarkable 45 years of service the ship has completed. Globally and historically there are few research ships that can compare, and with the deployment of the 300th expedition the OREGON II has certainly secured an honored place in the annals of scientific history. The OREGON II has logged over 10,000 days at sea and steamed more than 1,000,000 nautical miles, with projects ranging from as far south as the Amazon River Delta in Brazil, the Caribbean Sea and Gulf of Mexico, and extending north in the Atlantic Ocean to Cape Cod. With such a noteworthy and extensive record it speaks well of NOAA's mission when considering the impact the OREGON II has had not only on fisheries research and marine science in general, but also on the lives of the many that have sailed aboard her.

With the departure of the 300th expedition (the annual red snapper/shark bottom longline survey) scheduled for July 26, 2012, the OREGON II will dutifully continue its tradition of providing a research platform that is uniquely adaptable to a changing diversity of scientific objectives. The OREGON II has been the platform for many different stock assessment surveys including groundfish/shrimp, sharks, reef fish, mammals and plankton and has deployed many types of gear such as pelagic and bottom longline gear, trawl gear(with turtle excluder devices and bycatch reduction devices), plankton nets and remotely operated vehicles/traps/cameras. The OREGON II has provided NOAA's National Weather Service's *Voluntary Observing Ship Program* with well over 25,000 marine weather observations supporting many efforts; forecasting, hurricane tracking, environmental analysis, oceanography and climatology, just to identify a few. The OREGON II was used as a test bed platform for the automation of marine weather observations and has proven to be a success, thus currently sending in hourly data while underway conducting surveys. In addition, the OREGON II has been used as a training platform for numerous sea going personnel including ship captains, NOAA Corps officers and also opportunities for the NOAA Teacher at Sea Program where it was the first NOAA vessel to accommodate a teacher at sea.

An example of how the vessel has had to adapt to over four decades of conducting science is best demonstrated by at-sea data collection; an activity that in 1967 was primarily a paper and pencil technology that has since transitioned to its present state-of-the-art-technology that links weatherproof on-deck data collection computers with ship computer systems that are capable of transmitting data in real time. With the possible exceptions of providing memorable days at sea and fostering a comradeship founded in accomplishments that are their own unique reward, it is inevitable that the OREGON II has had to change as the scientific world continues to change. It is the adaptability to change that hopefully will continue to characterize the OREGON II well into the future.

Pictured left to right: Ex-Captain Jim Rowe and Captain Dave Nelson

Pictured left to right: ENS Cassowe, Lt Miller, Captain Dave Nelson, Lt. Harris and ENS Adornato

Pictured is Karen Mitchell, SEFSC Vessel Coordinator, Mississippi Laboratories, presenting Captain Dave Nelson with the 300th Survey Plaque

Pictured is the Crew, Officers and all the scientists/ biologists involved with the NOAA SHIP OREGON II

Flags flying on the OII

Onlookers of the celebration and in the center with the blue shirt, Dave Jones, Port Meteorological Officer

Pictured is the OREGON II Crew and Officers

Oregon II design for the 300th survey celebration...Design by Charles Godwin and Glenn Zapfe

When All The Stars Align

By Steven L. Frantz

It has been around fifteen years ago when I first heard about NOAA's (National Oceanographic and Atmospheric Administration) Teacher At Sea program. Too busy. Too old. Too tired. All the excuses for not applying certainly applied to me. Over the years, Teacher At Sea was placed in the back of my crowded brain.

In 2006, I attended a teacher workshop that granted three graduate credit hours for free. This workshop turned out to be with the GLOBE Program (Global Learning and Observation to Benefit the Environment Program). As it turned out, after a few very exciting and successful years participating in the GLOBE Program with my students, this workshop has turned out to be a career changer.

While being engaged in the GLOBE program and attending a conference, it was announced that NOAA was once again a partner with the GLOBE Program; with that partnership came the opportunity to partake in the Teacher at Sea Program. Needless to say, everyone was very excited at this announcement yet I still had not brought Teacher At Sea to my frontal lobe for any consideration.

The following year, the GLOBE Program office contacted me and invited me to present at the Teacher to Researcher Conference in Washington, D.C. This sounded like fun as well as a great opportunity to boast to the world about my dedicated and successful students in Akron, Ohio. At this conference I met the staff from the Teacher At Sea Program and some former Teachers At Sea. Through meeting the staff and past participants, those old thoughts of Teacher At Sea came to the surface of my memory in short order. It was determined at that point, as soon as I returned to Ohio I would promptly apply for the Teacher at Sea; to my excitement, I was selected.

As a participant in the Teacher at Sea, I was able to ride on a NOAA vessel and work as a volunteer on one of many fisheries surveys collecting data particular to that survey. The survey which I was lucky enough to have participated in was the *shark long-line* onboard the NOAA Ship OREGON II. During my two weeks at sea on the NOAA Ship OREGON II, I couldn't help but think of all the correlations between Teacher At Sea and the GLOBE Program. It became clear why NOAA would take such a keen interest in the GLOBE Program by becoming one of its sponsors. This is outreach at its best!

As stated earlier, I was lucky enough to go out on the shark long-line survey. This survey was established 18 years ago

This photograph of an impressive anvil at sunset was taken by Steve Frantz off of the stern of the NOAA Ship OREGON II.

and has become the standard as well as the prime example of how successful surveys should be run. To run a successful data collection survey, the methods and protocol must be consistent in order for the data to be used as a comparable over time. In other words, the benefits to standardizing the observer data collection procedures are essential to improve global assessments of various impacts. It is for this reason that since conception of the shark long-line survey, the hooks, bait, line test and hook increments as well as all other protocol has remained the same. This protocol is the same basis for the protocols set within the GLOBE Program and their data collection process. Over the programs life of 20 years, data collection protocols were developed to enhance and insure accuracy, quality and standardization. This guidance remains steadfast for all 112 countries that participate in the GLOBE Program.

HANDS-ON

It goes without saying that on a NOAA research survey you will be involved in hands-on learning. The researchers and crew gave you every opportunity to be as hands-on as your comfort level allows. Some of those experiences included touching the skin of a nurse shark, tagging a sand shark, and looking at a scalloped hammerhead shark eye to eye. This was and is hands-on learning at its best!

As with my hands-on data collection experience with the NOAA survey, my students are also actively engaged in hands-on activities through the GLOBE program. Through the aforementioned protocols, my students develop a research project, then collect data in order to ascertain whether their data supports their hypothesis or not. On any given day you could see my students outside (did I mention I was in the inner city?) collecting surface, soil or air temperature, snow depth, ozone, or measuring rainfall. During end-of-year evaluations, the hands-on aspect of data collection for the GLOBE Program is a driving factor that captivates my students.

PRESENTATION OF RESULTS

At the conclusion of a trip, the Teacher at Sea Program required a presentation at a professional conference and to provide a couple of lesson plans which will be posted on the Teacher At Sea website. I also created a blog during my work on the OREGON II so that my students or anyone else could follow my day to day schedule of events as well as provide the ability for interaction. If you haven't done so yet, please visit my blog. This blog had to be vetted by the Chief Scientist and X.O. (Executive Office) of the ship to insure accuracy.

Check out my blog!

http://teacheratsea.wordpress.com/2012/08/06/steven-frantz-critters-at-sea-august-5-2012/

Teacher at Sea

http://teacheratsea.wordpress.com/

My students have requirements as well, they are expected to present their research projects at science fairs and professional conferences. Last year, my students had the opportunity to present their research at five different conferences. They also present annually at the SATELLITES Geospatial and Technology Conference. Last year they presented at the AmericaView Conference in Cleveland, Ohio. One of my students was selected to present at the Annual GLOBE Program Conference in Minneapolis, Minnesota. Attendees came from 26 different countries!

DATA SHARING/WORKING FOR OTHERS

I found it interesting that during my Teacher At Sea experience on the OREGON II, there was a list of scientists posted with requested data. Even though we were on a shark longline survey, there were requests for tissue from other fish, parasite samples and various data for sharks. I'm sure I only saw the tip of the iceberg when it comes to the amount of data shared both within and outside NOAA.

With the GLOBE Program, my students have collected data for NASA, universities, and other GLOBE Program schools. All data collected is posted to the GLOBE Program website and is available for anyone to access. We have been to conferences where other students had used my students' data. The look of disbelief and excitement all rolled into one appeared on their faces when they come running to show me someone used their data for their project. We even had a Master's Thesis sent to us where the author used data collected by my students. We were even mentioned in a college textbook on geospatial technologies published this year.

CAREERS

While on the OREGON II, I was reminded many times over to not only concentrate on the scientists, but to remember the rest of the crew. It would be hard to forget the crew of the OREGON II and an oversight to not mention them. It takes the entire ship of personnel to run the survey smooth and efficient. There are so many options for a career path in regards to the marine environment without even touching on becoming a biologist/scientist. Every one of them is essential; engineers, NOAA Corps Officers, the all powerful and very important "cook" and many more...you name it. While on the ship, I know they heard it from me first hand of how wonderful I thought they were….but now they will read how wonderful I think they are. In addition to careers on the ship, I should mention there are a wide variety of careers on shore in support of these surveys. I have barely scratched the surface.

In today's world, with the ever-growing use of geospatial technologies, teachers can go over a plethora of careers available to students using that technology as well. With the GLOBE Program at my school, science is now seen as cool and being a part of the GLOBE Program is akin to being a part of the "in crowd." The more my students are involved, the more opportunities they see as viable options for their futures. NOAA and their policy to embrace outreach such as the Teacher at Sea Program significantly impacts the world of teaching and provides a tool for instructors like no other. Keeping learning real and relevant, getting involved within a structured framework for collaborative protocols and the opportunity to grow and expand with what you know and have learned is probably the most thrilling reason for being a teacher. My ability to participate in the Teacher at Sea program, on board the NOAA Ship OREGON II, definitely enhances my ability to guide and influence my students in a positive direction towards success…and in the mean time, the kids have fun!

http://www.globe.gov/

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PMO Corner:
One step forward and two steps back!

By Tim Kenefick, NOAA – PMO – Charleston, SC

You may be asking yourself, “What does that old coot mean by that?” If you’ve met me, you’re probably saying to yourself “he didn’t take his medicines this morning”. Well, that could very well be true. Regardless, old coots such as I know a lot in the way of marine weather observing and this article deals with “going back” to “old known” successful ways of teaching weather observing and meteorology. So it’s not the lack of proper medication, it is “old coot” teaching style. You need to pay attention.

After two dozen years in the United States Navy, you’d have thought I would have had enough of going to sea. This year, I sailed on the training ship, EMPIRE STATE with SUNY Maritime for 75 days. This year, as in the last three, Master Captain Richard Smith and I have taken those critical steps backwards, to ensure that the midshipmen are learning the basics of weather observing. We provided them with the opportunity of producing weather observations by hand using pencil, weather observing handbook No. 1 and the Weather Service Form B-81. Yes, that is two steps back in many people’s minds, but read on!

Captain Smith, who has been the Master of the EMPIRE STATE since the year 2000, was a Marine Environmental Science major when he graduated. His interest in weather, especially the accuracy and timeliness of the observations, is high on his list of priorities. I’ve done my best to teach the students to do their surface observations and to utilize the computer to reduce the paperwork and improve their accuracy. When Captain Smith

A good view of the training ship EMPIRE STATE at Gibraltar Naval Station. This photo was taken from the top of the rock!

PMO Tim Kenefick with Chief Baker, Cristina Zvoristaneau

or I started asking the students about the different items of the weather observation, it became apparent that the average student was just punching buttons on the computer to "get the job done" without much understanding or thought behind the task. Three years ago Captain Smith recommended that we reverse the course on how the students observe record and transmit the OBS, because it would cause the cadets to have to "open the book and read". In doing so, they search from front to back in the handbook for the single item in question, consequently learning observing practices that they didn't know before. (Note I said BOOK and not Code Card. Code Cards are only suitable as a reminder for an experienced mate, but not for someone to learn with.).

For the past three summer sea terms with SUNY Maritime that is how I have instructed the midshipmen. I have provided training and teaching, starting with the bare basics; using the long form (B-81). Has it been successful? I do so vouch for the positive aspects of it. They are basically forced to looking things up in the handbook and relearning things that they may have been taught in a prior class a year or two earlier. Reading and browsing the book makes retention and recall more probable. With practice, the cadets who take around an hour to initially produce a weather observation is reduced to a respectful 20 to 30 minutes.

The rules were laid out early. The observation has to be checked over by the Mate of the Watch, Captain Smith, or I before the observation could be transmitted. There is always one cadet, who thinks they can do it all by themselves. One particular cadet sent an observation which indicated it was the 94th day in July, and the 52nd hour of the day, among the grossest errors. For those special observations, I created the "Wall of Shame". That particular observation made center stage indicated by the greatest amount of PINK highlighter.

I also took the time to do a refresher for the Mates on Watch to ensure they understand what each part of the message means. Many haven't done an observation in a couple of years, and although they understand weather and can identify everything, the coding is one thing that they hadn't kept up with.

Yes, it seems like it is a step back into the mid 90's or even before. Often the older ways are a better way for the students to learn. I know it is akin to rote learning of multiplication tables as opposed to using a hand held calculator; but it is a proven method of success in learning. It causes the student to look things up and in doing so; he/she will course over other items which will subsequently be retained. When a cadet least expects it, they will recall an item from their browsing of the handbook and what a great boost of confidence and motivation! I observed this personally with some of the cadets on EMPIRE STATE, and with time they were better able to identify clouds, "read" the winds and waves, plus many other of the little things that go into a proper and complete weather observation. One thing I like to emphasize to all the students and mates taking weather observations, it is *not* like riding a bike. It is a learned practice, which requires repetition to do and do well. It is akin to shooting stars or sun lines. Even in these days with GPS systems, many Mates still perform celestial reductions to keep their abilities sharp. It is no different with weather observations. <u>You have to practice observing daily.</u> Taking time to look at the clouds and identify the types and height should be practiced daily. Mentally going over your present and past weather is helpful to keep sharp. While just sitting back on a beach and gazing over the surf, these practices keep you mindful. Remembering **Buys Ballots Law** as well as looking at the sky to determine where the low pressure is located in regards to your location, and the weather you are expecting in the scheme of things.

For the mate at sea, weather reporting is part of the situational awareness while on watch. Today, with the reduced number of personnel on ships, the mate frequently has to multitask. This includes but not limited to; taking the weather observation, transmitting it on the INMARSAT "C" or via email, answering the radio, checking the radars, and plotting his position on the chart. This is usually done with no one else on the bridge, in the middle of the night. I know it takes time, but each weather observation is a valuable part in the big picture. Often it is one or two "at sea" observations which may cause a forecaster to rethink an analysis and forecast in that specific area. Yes the earth's surface is 70 percent water, but the weather observations received from ships are less than 5 percent of the surface observations at any one time. The ratio does not favor the mariner; only with better training and their understanding of the "how's" and "why's" of the observation can the puzzle be put together in order to make good sense of why taking the time to provide a weather observation matters. Part of the essential training should provide the cadet or Mate of how and why it fits into the big picture. I provide a good explanation of the surface analysis, then the follow-on steps of the forecasts. By doing so, it all comes together and supports the goal of the ship. Protecting life, property and commerce; giving the ship the prospect of arriving to their destination on time with no loss of cargo, and the safety and comfort of the crew under full consideration. When they can see how it all works, they start to take an interest in it.

What is the step forward? The U.S. Voluntary Observing Ship Program has begun upgrading and improving the program. In the past, NOAA/NWS has been printing and distributing the observation manuals, (WSOH1) and the cost of this has risen almost exponentially. Cost of printing is one factor, but paper consumption and thinking "greener" is another. One thing I have learned is that many of the Maritime Academies as well as other colleges and universities, are looking to going to electronic books in the next few years. There were a few students I came across who had their complete set of Bowditch Tables electronically on their laptops, I-Pads and or Kindles. I even had one student who had the Weather Service Observing Handbook Number 1, on his I-PAD. All of our resources for marine observations are available on the VOS information website. Each of the maritime service academies will receive two copies of the WSOH1 it in PDF Format. The one is for them to download to a computer ashore, from which the students may acquire it for free. The other is for doing the same on the ship. I know this will cause the students to have better posture as it will be one to two pounds less for them to tote in their backpacks, plus they will have their own individual copy of the WSOH1 to do their "homework" with. Due to the size of the Dew Point Table, it is no longer included in the WS Observing Handbook Number 1. Bowditch does provide this table as well as the computation. These are easily obtained on-line and while using provided software such as SEAS or TurboWIN, these computations are done for you.

Other than that, did I learn anything at sea this last summer? Oh yes, orcas, pilot whales, seals and porpoises don't jump out of the water to take fish out of your hand in the open ocean, only at Sea World!

18 NM off the northwest coast of Iceland. Less than 5kts of wind and hardly a cloud in the sky. Air Temp 20C, Water 2C

A Note

By John Wasserman

I want to start off by saying hello and thank you for all your support of the Voluntary Observing Ship (VOS) program. The program continues to be a great success thanks to all the mariners out there that are participating in the program.

Through the years, the VOS program has been "numbers based". In essence, you send a lot of observations, we award the ships accordingly. Awards and accolades have been given to the ships that have taken the most observations based on numbers alone. This was a very simple and objective way of distributing awards, prior to our abilities to scrutinize data quality.

The "numbers" method was unfair to ships that had different and or limited sea time missions as they weren't "underway" as often. Although their sea days were not so extensive, they were taking accurate observations religiously while underway. The "numbers" method of awards also inspired some friendly and sometimes not so friendly competition throughout the program, which in turn, has bolstered the numbers even higher. We were certainly happy about the results until we took a closer look at the data. We found that in the race for awards or recognitions some less than optimum results. It is these that I would like to bring to the reader's attention.

Some of the things we found may be construed as "cheating or gaming" the system. We found ships that were not only sending in the same observation over and over again….some were sending in the same observation every 10 minutes in an effort to increase their numbers. This unnecessary, unwarranted practice is a waste of resources and money.

I know some of you are thinking, "Well the weather doesn't change that much so it looks like we are sending the same observation every hour." This leads me to my next issue….. an alarming number of ships have started to round off the observed values and report them to the nearest whole degree and whole millibar. This is not what the code requires and this may be the reason the observation "appears" to never change.

Another issue we tend to see quite often is ships that have been issued a full complement of weather equipment by the PMO, but only report ships position and temperature. While this is useful information, it takes much less effort to do than ships that are taking a full coded observation. Regular incomplete observations don't warrant a full complement of weather equipment.

The motto for our program has always been: Only YOU know the weather at your position. Report it at 0000, 0600, 1200, 1800 UTC to NOAA's National Weather Service. We have asked for accurate weather observations to be transmitted every six hours. Some of the ships have started taking observations every hour, this is great and we appreciate the extra effort! If you want to and have the time to transmit hourly observations and you can do so without sacrificing quality then we (of course) support that. Keep in mind that transmitting a poor observation can be more harmful than no data at all.

Quality over quantity…as we press forward into 2013 we will be making some changes in how the ships observations are evaluated and how awards will be given out. Starting 1/1/2013 Awards will not be solely based on number of observations; we will also be putting a great deal of emphasis on quality. In the past we have capped the number of awards at approximately 100…we will no longer do this. We believe as quality of observations go up; we will be able to distribute more awards to more deserving ships.

We will be looking more closely at the following:

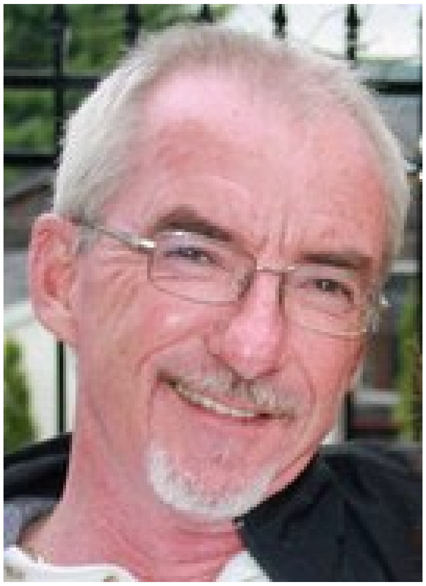
How complete the observation is. (are all elements that can be observed, being observed?)

Is the code being followed? Are elements such as pressure, temperature and dew point being taken and reported to the nearest tenth?

The timeliness of the observation, we understand that some Sat-C systems are set up to transmit and receive only a few times a day, this will also be taken into consideration. But "attachments" in an email cannot be processed unless someone happens to grab the unprocessable files, notices that there is an attachment, extracts your "attachment" and resends it "properly". Usually by then it is too late to even be used for model guidance. Sometimes those observations are received 2-4 hours late, sometimes even later.

So to the observer…. There may be some bad habits that have developed as mentioned earlier in this missive that need to be broken. If you have any questions about the code or weather observations in general, feel free to contact your PMO or us at vos@noaa.gov. Also if you are interested in seeing what your ship is sending out and what can be done to improve the quality, again feel free to contact us. We are hoping to change the mindset of the entire US program and realize this may take time. We are happy to help in any way that we can.

Tribute: PMO Ronald Douglas "Randy" Sheppard



It is with profound sadness that we announce the passing of Port Meteorological Officer, Randy Sheppard, who was an employee of Environment Canada for 32 years. Randy was one of the lucky ones who loved his job and he will be sorely missed.

Tribute: Roger Bauer — 1939 to 2012

Back in the dawn of time (oceanographically speaking) when the oceanographic community was beginning to evolve from analog to digital systems Roger Bauer created a company called Compass Systems. He along with the dedicated support of his long time colleague Margaret Robinson developed quality control, quality assurance and data processing techniques to digitize the huge Mechanical Bathythermograph data sets then being stored and archived by the U.S. Navy, NODC, many different countries and several large Oceanographic institutions. Those techniques are still in use today. That worked led to the creation of processes that related to developing and accessing databases for MBT, XBT and other marine observations. Because of that pioneering work large databases of surface and subsurface temperature data could be merged and used more effectively for spatial and long-term time series analysis that contributed immensely to ENSO (El Nino Southern Oscillation) and global climate change studies.

Roger was a great friend and cared about our projects and us. It was great to have a person on the "out side" to watch over us and tell us when we were about to do something really dumb or miss out on doing something smart and offer us a path back to logic.

He was missed when he retired and will be missed even more now and he was a great fisherman.

~ Steve Cook

ARCUS Clouds

Photos by Cezary Poninski

Chief Mate, Cezary Poninski , of the M/V OCEAN GIANT took these impressive photos of an arcus cloud on April 9th 2012, in the eastern part of the Black Sea. Thunderstorms are sometimes accompanied by an arcus cloud. There are two types of arcus clouds; a shelf cloud and a roll cloud. These types of clouds are usually associated with the leading edge of a thunderstorm outflow. Cold air rushes out of a downdraft and lifts warmer air in front of the storm complex up to condensation level, making both a fascinating and menacing sight while it is approaching at high velocity. In the absence of thunderstorms, this can be formed by outflows of cold air from a sea breeze. The photographs taken by C/M Poninski are of the "roll type" variety. A low, horizontal, tube shaped , and a relatively rare type of arcus cloud. The roll cloud, are a solitary wave called a "soliton", which is a wave that has a single crest and moves without changing shape or speed.

Pictured is Bosun Joseph Casalino

SHIPWRECK: Montrose

By Skip Gillham

It was 50 years ago this past summer that a collision in the Detroit River sank the two year old British freighter MONTROSE. The vessel, on its fifth trip to the Great Lakes, settled on its side directly beneath the Ambassador Bridge that links Windsor, Ontario, and Detroit, Michigan.

The saltwater ship, enroute from Marseilles, France, to Chicago, had just cleared the Detroit Terminal Dock when it met up with the barge ABL 502, pushed by the tug B.H. BECKER. The barge was downbound and loaded with cement clinker when the accident occurred on July 30, 1962.

MONTROSE, shown in the Welland Canal on May 13, 1961, thanks to a photo by Robert A. Zeleznik, sustained significant damage. It gradually settled and then rolled on its side in the busy waterway. All 41 on board were rescued.

Refloating the sunken ship was essential and it was raised on November 9, 1962. During salvage operations an acetylene cutting torch set off an explosion of fumes in the hull and three workers were injured.

The refloated freighter was towed to Toledo on November 19 and spent the winter at the shipyard undergoing repairs. It returned to service in the spring of 1963 as CONCORDIA LAGO. The ship was now owned by Norwegian interests and operated under the flag of that country.

The 440 foot long by 59 foot wide vessel left the Great Lakes and never returned. It later moved to Greek registry and then became the LAGO in 1981. It cleared Colombo, Sri Lanka, on May 16, 1982, for the scrapyard at Gadani Beach, Pakistan, and work on dismantling the hull got underway there by Tawakkal Ltd. on November 17, 1982.

The tug B.H. BECKER dated from 1918 and had been built at Buffalo, NY as C.C. CANFIELD. This ship became the JENNY LYNN in 1984 and is still around, although in perilous condition. The vessel sank at Cheboygan, MI on July 31, 2010, and, at this writing was still on the bottom while officials debated who was responsible to remove the hulk. JENNY LYNN (left) is shown on the bottom off Cheboygan in a photo by Jon Michaels.

Whale Sharks

Photos by Lloyd Marine, Barge Engineer for Noble Amos Runner

In our April 2012 issue of the MWL, we featured an article on the observer-based whale shark research in the northern Gulf of Mexico. This past September, I received an email from the Noble Oil Platform, AMOS RUNNER, which included photographs of whale sharks along the rig. This rig is located in the prime area of research, SE from the mouth of the Mississippi River in the northern Gulf of Mexico. In addition, September approaches the timeframe that sightings of these magnificent creatures are uncommon and should be reported to provide data for the University of Southern Mississippi Gulf Coast Research Laboratory's Whale Shark Sightings Survey. This prompted me to send out a reminder to all on the importance of reporting sightings as well as giving you all the contact information for quick reference to do so.

To Report a Sighting:
Please complete the survey at
http://www.usm.edu/gcrl/whaleshark
or email: **whalesharksurvey@gmail.com**

Include:

- Time and duration of encounter
- Location (GPS coordinates)
- Approximate size and number of individuals
- Observed behavior
- Associated species
- If possible, photographs of the spot pattern behind left gills

A warm welcome to our newest Port Meteorological Officer Emma Steventon. Emma is the newest of the PMOS for the United Kingdom and her area of responsibility will encompass Edinburgh Scotland. Her contact information can be found in the back of the MWL. Welcome Aboard Emma!!!

Storm Surges During Hurricane Isaac

By Professor S. A. Hsu, Coastal Studies Institute, Louisiana State University
Email: sahsu@lsu.edu

ABSTRACT:
From August 27 through 30, 2012, when Hurricane Isaac was over the Gulf of Mexico, storm surges occurred along most U. S. Gulf coast. It is shown that on the right-hand side of the storm track from Florida to the mouth of Mississippi River, positive surges or setups prevailed whereas from southwest coast of Louisiana to the upper Texas coast, negative surges or set-downs occurred. It is found that these surges can be explained physically by the wind stress forcing or the wind speed squared. Verifications of these relationships indicate that the correlation coefficient for the setup is 0.97 in the Mississippi Sound and for the set-down 0.84 along the southwest coast of Louisiana, respectively. Examples for using these formulas are provided.

1. Introduction
For a category one hurricane, Isaac was a large and slow-moving tropical cyclone. The size of Isaac near its landfall is shown in Fig. 1. From August 27 through 30, 2012, storm surges produced by Isaac could be felt along the U. S. Gulf of Mexico coast from Florida to Texas. The purposes of this study are first to characterize these surges along the open coast, and then to provide some physical explanation for the reasons for these surges. Since there are many ports along the Gulf coast, knowledge of storm surge caused by a tropical cyclone should be useful. Meteorological and Oceanographic (met-ocean) data used in this study are available online from National Data Buoy Center (NDBC) and National Ocean Service (NOS).

2. Storm Surges along the Coast
Storm surges consist of positive (setup) and/or negative (set-down) surge. When the water level at the shoreline is rising (or lowering), we say the surge is positive (or negative). Examples of setup or set-down in New York Harbor during Hurricane Irene in 2011 are provided in the August issue of this journal by Hsu (2012).

Figs. 2 and 3 show the met-ocean data analyses for storm surges at Naples, FL during Isaac (for station location of NPSF1, see www.ndbc.noaa.gov). Note that the storm surge is represented by the green and the storm tide by red. It is clear that when the wind blew from land to the sea, set-down occurred. On the other hand, setup prevailed when the wind blew from sea to the land. According to Hsu (2012), both setup and set-down are related to the wind stress which can be represented by the wind speed squared. This can be seen that when the weaker wind blew from land to the sea, the set-down (approximately 2 ft.) is smaller than setup (about 4 ft.) because of stronger onshore wind.

Storm surge and wind characteristics at Pensacola, FL (NDBC Station PCLF1) are shown in Figs. 4 and 5, respectively. It is seen that while the set-down was only 0.5 ft.,

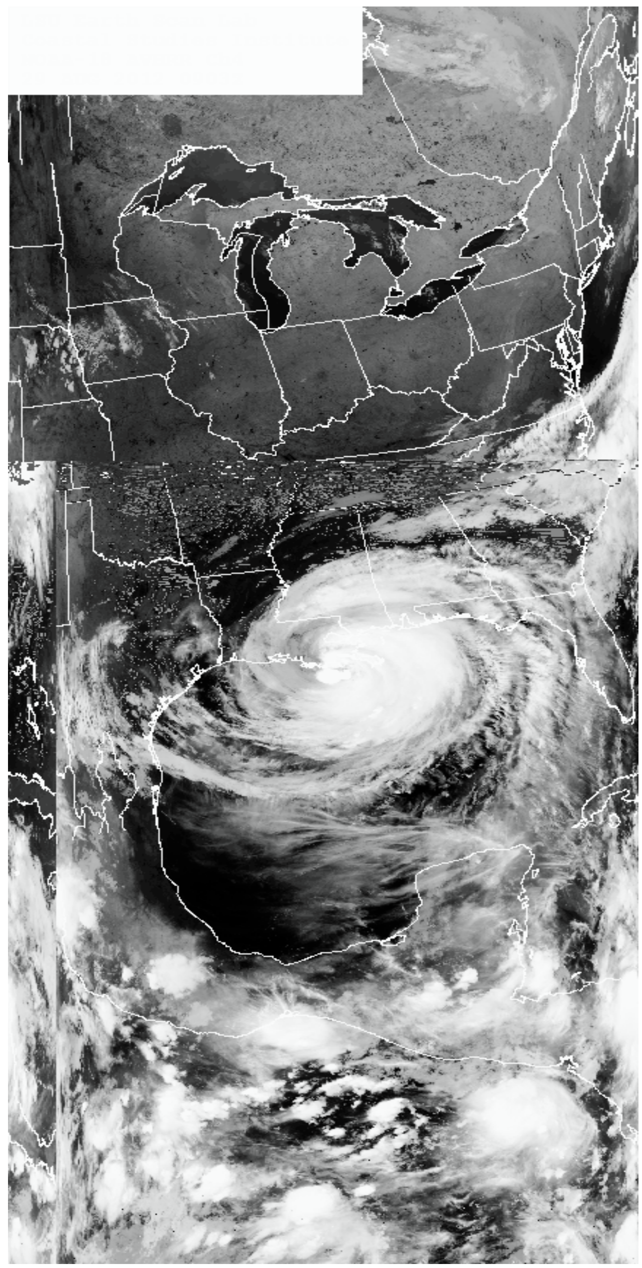


Fig.1. Hurricane Isaac near its landfall in Louisiana (image courtesy of the Earth Scan Lab at Louisiana State University, see www.esl.lsu.edu).

there were 3.5 ft. setups. Since the local wind speed did not exceed 20 knots, the over-water wind speed further offshore must be higher.

Because of the storm track and the geographic setting of Mississippi Sound and surrounding waters, both Stations at WYCM6 and SHBL1 experienced high wind speeds and storm surges as shown in Figs.6 through 9.

Fig.6 shows that there were approximately 8 ft. positive surge and 10 ft. storm tides at Bay Waveland Yacht Club, MS. At Shell Beach, LA, both positive surge and storm tides were 11 ft. (Fig.8). During the period from August 27 through 30 when Isaac was over the Gulf of Mexico, there were no set-down or negative surges measured at WYCM6 and SHBL1. At WYCM6, the wind speed and gust were over 45 and 55 knots, respectively (Fig.7), and at SHBL1, they were 55 and 70 knots, respectively (Fig.9). Note that these positive surges can propagate into nearby Lake Pontchartrain and Lake Maurepas. They can also block or prohibit the drainage of large runoff due to heavy rainfall from many streams. This phenomenon can cause wide-spread coastal flooding.

Characteristics of storm surges, wind speed and direction, wind gust, and atmospheric pressure near the center of Isaac are provided in Figs.10 through 12 for PSTL1 and Figs.13 through 15 for GISL1, respectively. Notice that during the passage of the center, wind direction changed swiftly from northerly to southerly. At the same time, wind speed decreased and then increased rapidly. Storm surge and storm tide peaked approximately 3.8 ft. and 4.5 ft., respectively. Similar condition occurred at Grand Isle, LA, where storm surge and storm tide reached 4.2 and 5.7 ft., respectively. Note that the minimum sea-level pressure was 970 millibar (mb) at both locations. Note also that at both locations, the sustained wind speed and gust reached 60 and 80 knots, respectively.

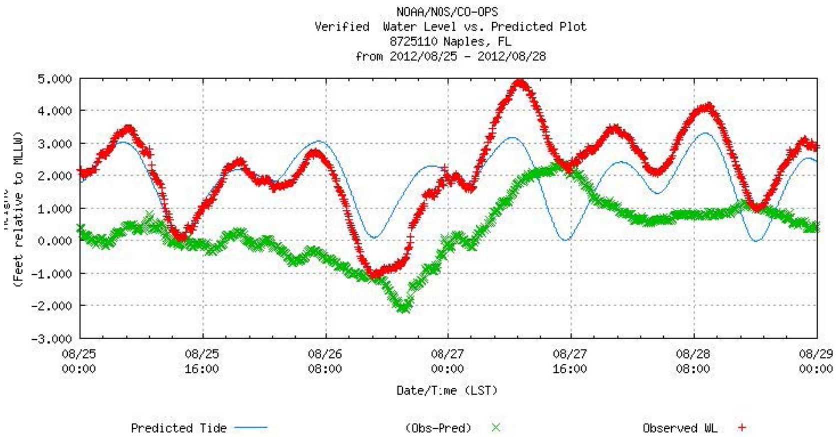


Fig.2. Storm surges at Naples, FL during Isaac.

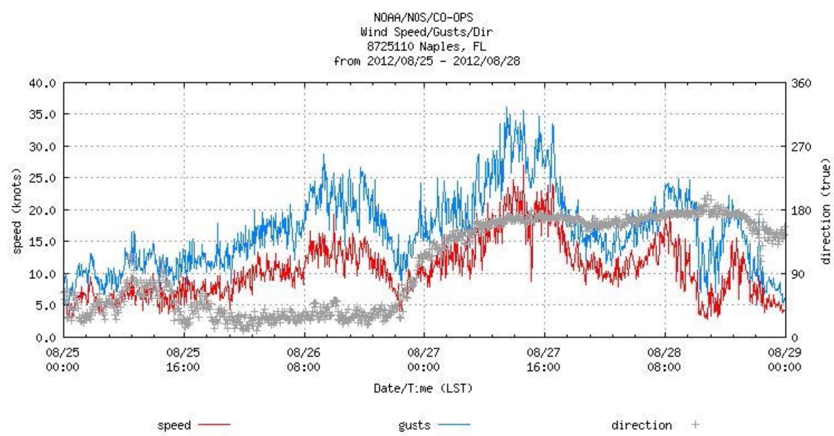


Fig.3.Wind direction, speed, and wind gust at Naples, FL during Isaac.

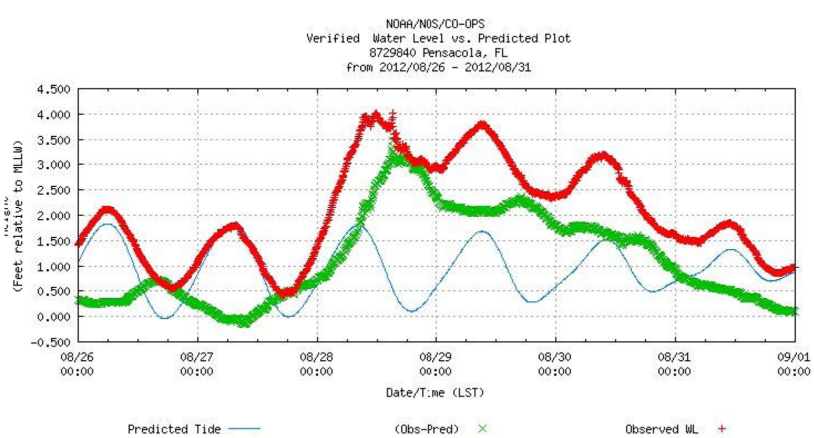


Fig.4. Storm surges at Pensacola, FL during Isaac.

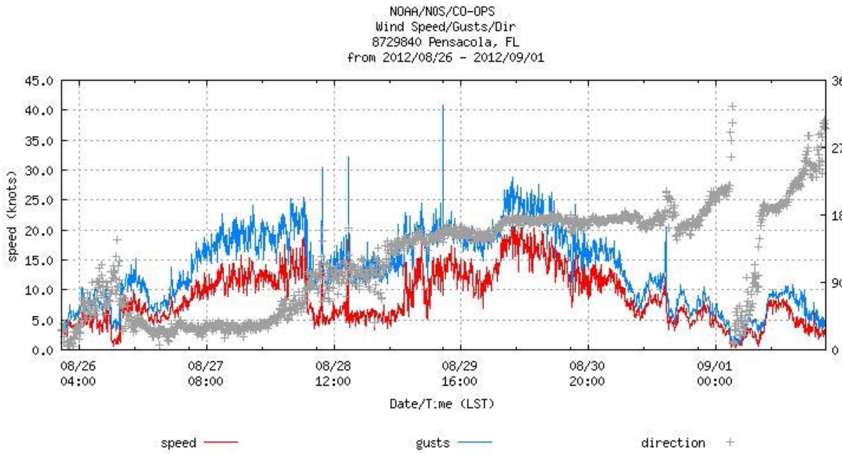


Fig.5. Wind direction, speed, and wind gust at Pensacola, FL during Isaac.

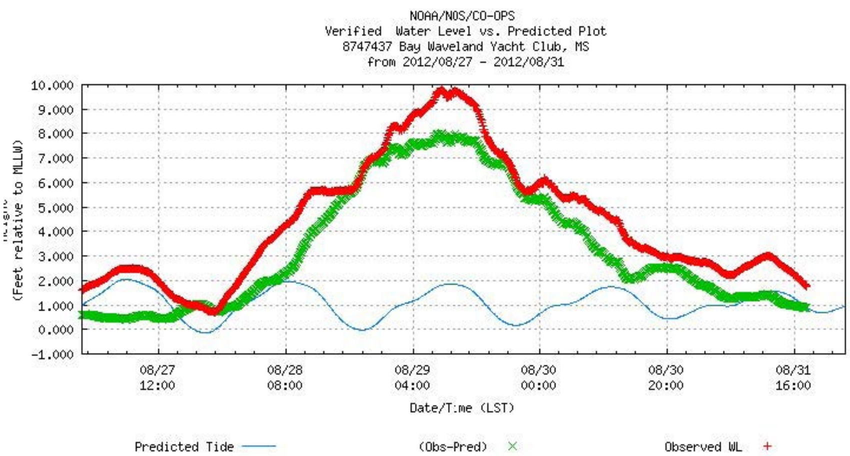


Fig.6. Storm surges at Bay Waveland Yacht Club, MS during Isaac.

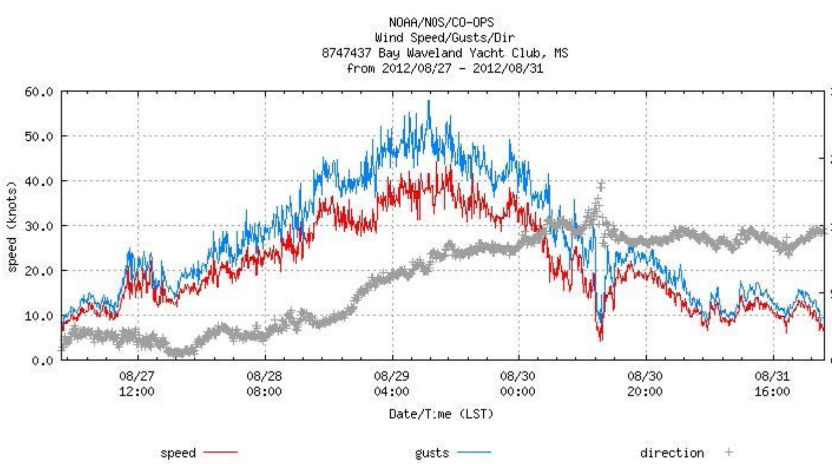


Fig.7. Wind direction, speed, and wind gust at Bay Waveland Yacht Club, MS during Isaac.

Because the track of Isaac in the Gulf of Mexico is approximately straight line between Florida Strait and the mouth of Mississippi River (see Fig.1), the coastal region west of this track should experience negative surge or set-down. This phenomenon is shown in Figs.16 and 18 for Freshwater Canal Locks (FRWL1), LA and Galveston Bay Entrance (GNJT2), TX respectively. Notice that set-downs prevailed when the wind blew persistently from land toward the sea prior to Isaac's landfall.

3. Physical Explanations

According to Hsu et al (1997), the setup (S) is related to wind
Stress, fetch along the wind direction, water depth along the fetch, and others. They found that for rapid estimation of S, the most important contribution is the wind stress such that

$$S = K V^2 \quad (1)$$

Where K is a coefficient and V is the wind speed.

During Hurricane Irene in 2011, Equation (1) was verified by Hsu (2012) for operational applications.

Similarly, in order to estimate the storm surges induced by Isaac, Figs.20 and 21 are provided. The positive surge or setup is based on the met-ocean data at SHBL1 since the highest water-level rise was recorded at this station as shown in Fig.20. Notice that 6-minute met-ocean datasets from 8:54 LST on August 27 through 23:36 on August 28 are employed for this analysis (see Fig.20). The negative surge is based on FRWL1 where the lowest water level occurred. Again, 6-minute datasets from 20:06LST on August 28 through 12:54 on 29 August are used for this analysis as provided in Fig.21. The relationship between set-down and the wind stress is illustrated in Fig.21 as an example. It is found that from Figs.20 and 21over 90 per cent of the variation for setup and 70 % for set-down can be explained by the contribution of wind stress which can be represented by the wind speed squared. These results are very similar to those found during Irene when it affected the New York Harbor proper as provided in Hsu (2012). Therefore, for operational applications, we have, for positive surge or setup,

$$S = 0.0041\ V^2 \qquad (2)$$

With $R^2 = 0.93$ or the correlation coefficient $R = 0.97$,

Whereas, for negative surge or set-down,

$$S = -\ 0.0029\ V^2 \qquad (3)$$

With $R^2 = 0.71$ or $R = 0.84$.

The unit for S is in feet and V in knots.

4. Conclusions

Characteristics of the storm surge along the U.S. Gulf of Mexico coast during Hurricane Isaac in 2012 have been analyzed. It is shown that, in general, on the right-hand side of the storm track or east of the Mississippi River Delta, positive surge or setup prevailed. Negative surge or set-down occurred mainly on the left-hand side or west of the track as expected. However, it is surprising to find that the correlation coefficient between setup and the wind stress is 97% and that between set-down and the wind stress is 84%. If one accepts these high correlation coefficients, equations provided in Figs.20 and 21 should be useful for operational applications. However, since storm surges are mainly localized phenomena, caution should be used to extend these equations beyond its general location.

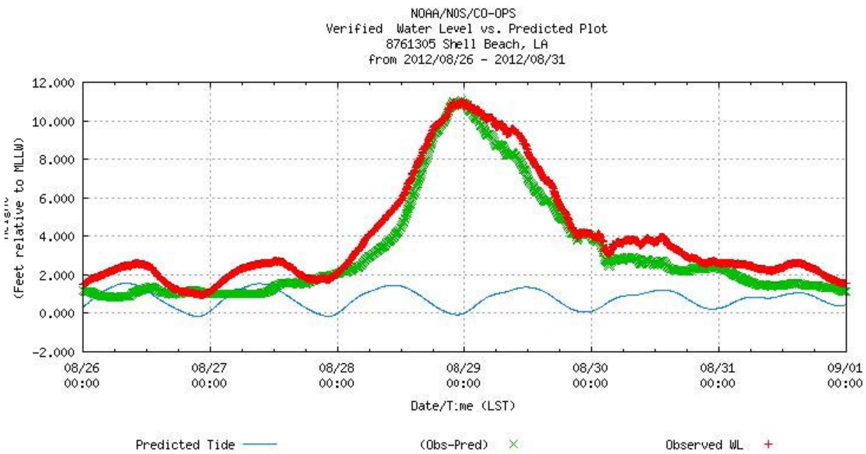


Fig.8. Storm surges at Shell Beach, LA during Isaac.

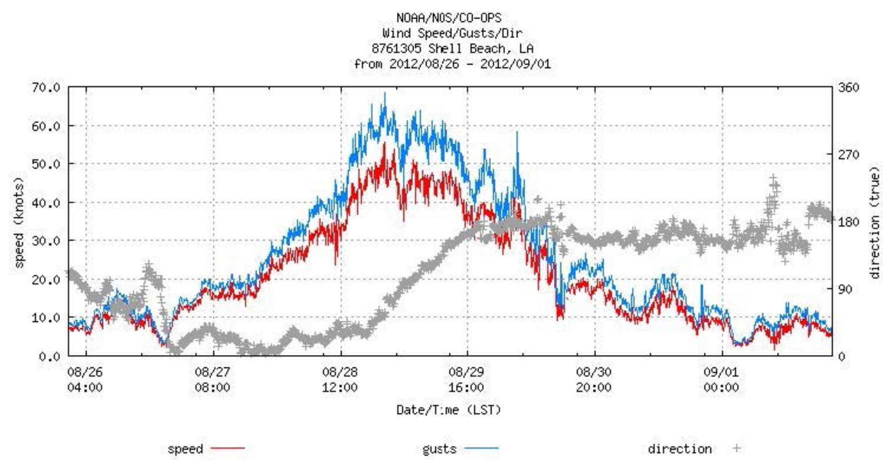


Fig.9. Wind direction, speed, and wind gust at Shell Beach, LA during Isaac.

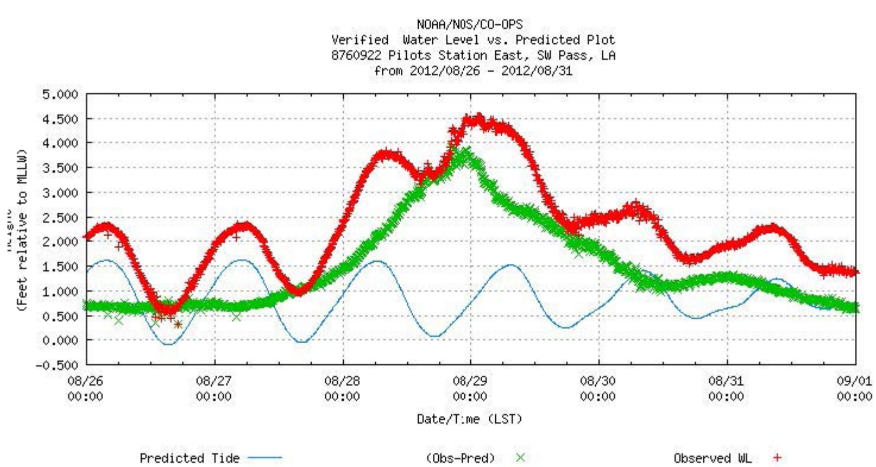


Fig.10. Storm surges at Pilots Station East, SW Pass, LA during Isaac.

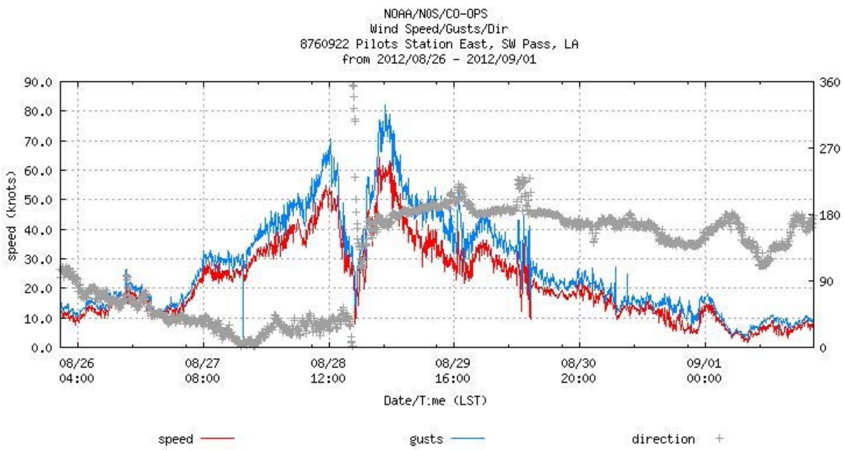


Fig.11. Wind direction, speed, and wind gust at Pilots Station East, SW pass, LA during Isaac.

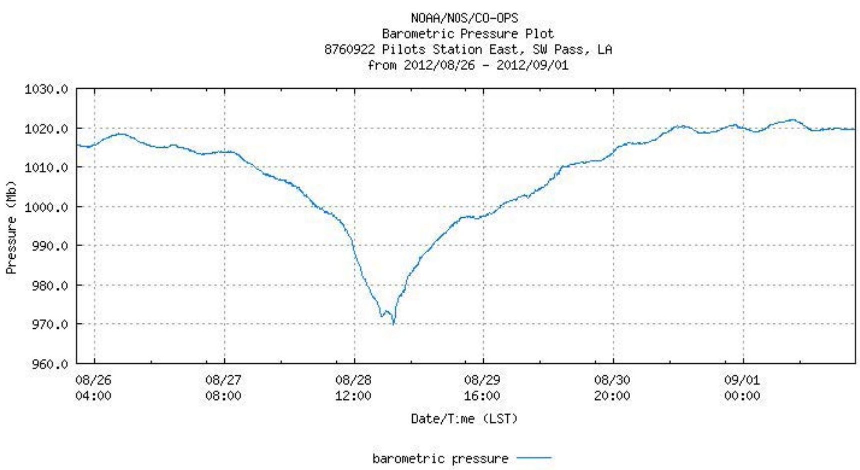


Fig.12. Atmospheric pressure reading at Pilots Station East, SW Pass, during Isaac.

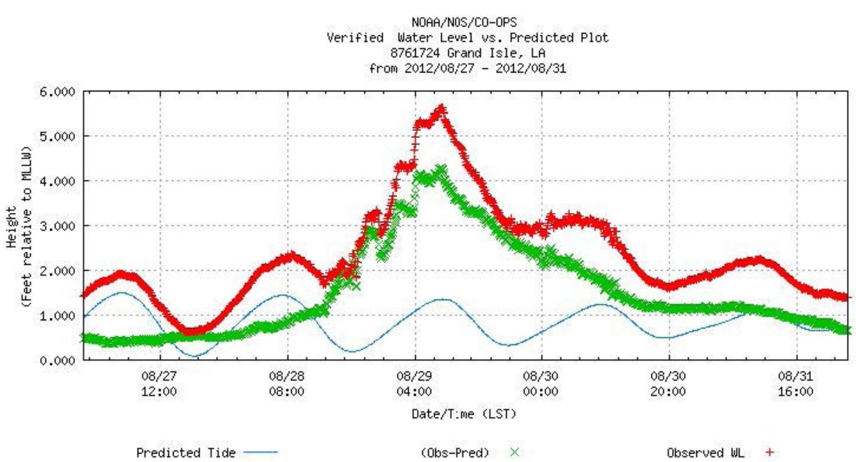


Fig.13. Storm surges at Grand Isle, LA during Isaac.

Acknowledgments:
Many thanks go to NDBC and NOS of NOAA for providing essential Datasets needed for this study.

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Hsu, S. A., J.M. Grymes, III, and Z. Yan, 1997: A simplified hydrodynamic formula for estimating the wind-driven flooding in the Lake Pontchartrain-Amite River Basin, National Weather Digest, Vol. 21, No.4, pp.18-22.

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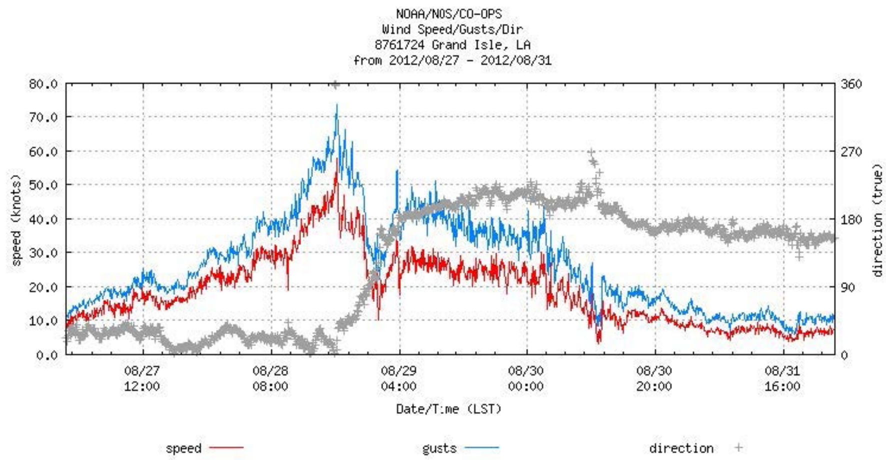


Fig.14. Wind direction, speed, and wind gust at Grand Isle, LA during Isaac.

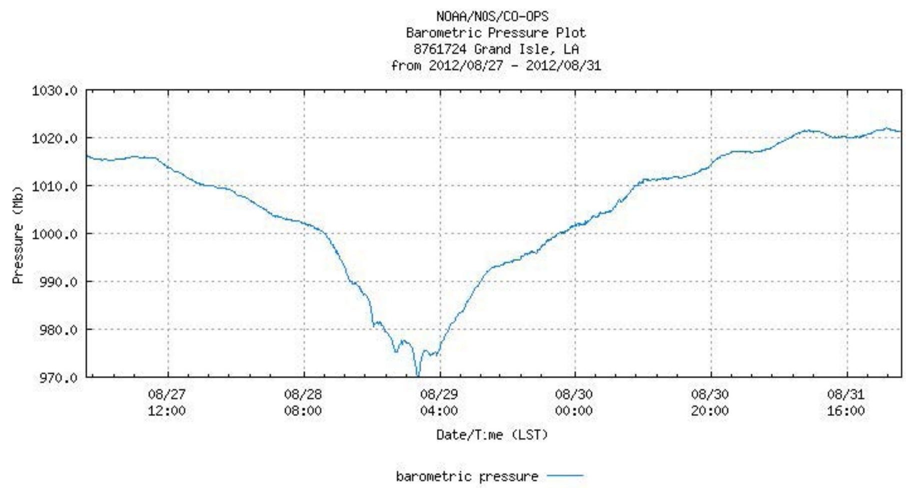


Fig.15. Atmospheric pressure reading at Grand Isle, LA during Isaac.

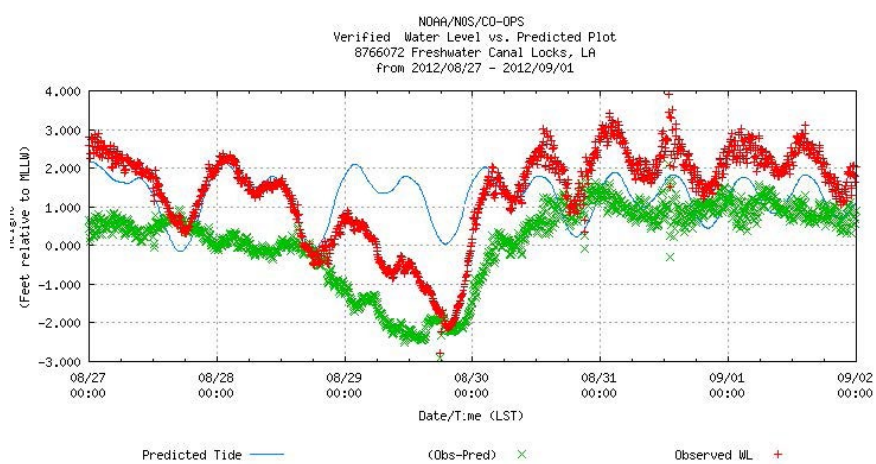


Fig.16. Storm surges at Freshwater Canal Locks, LA during Isaac.

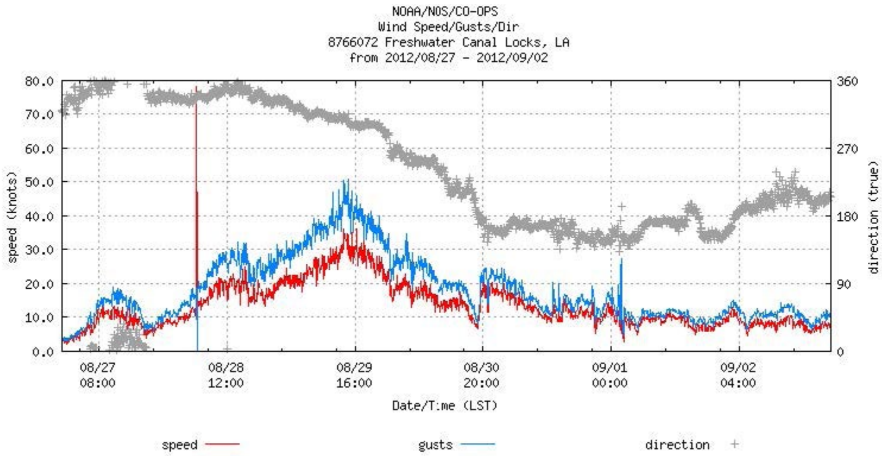


Fig.17. Wind direction, speed, and wind gust at Freshwater Canal Locks, LA during Isaac.

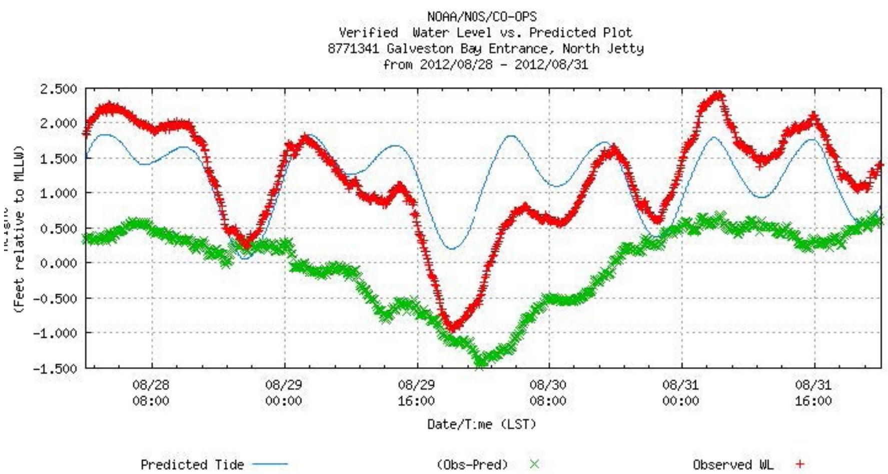


Fig.18. Storm surges at Galveston Bay Entrance, TX during Isaac.

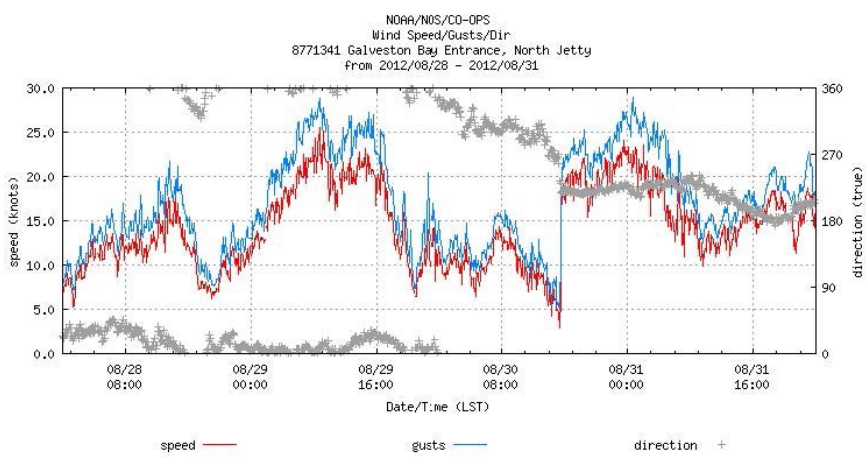


Fig.19. Wind direction, speed, and wind gust at Galveston Bay Entrance, TX during Isaac.

Marine Debris Update

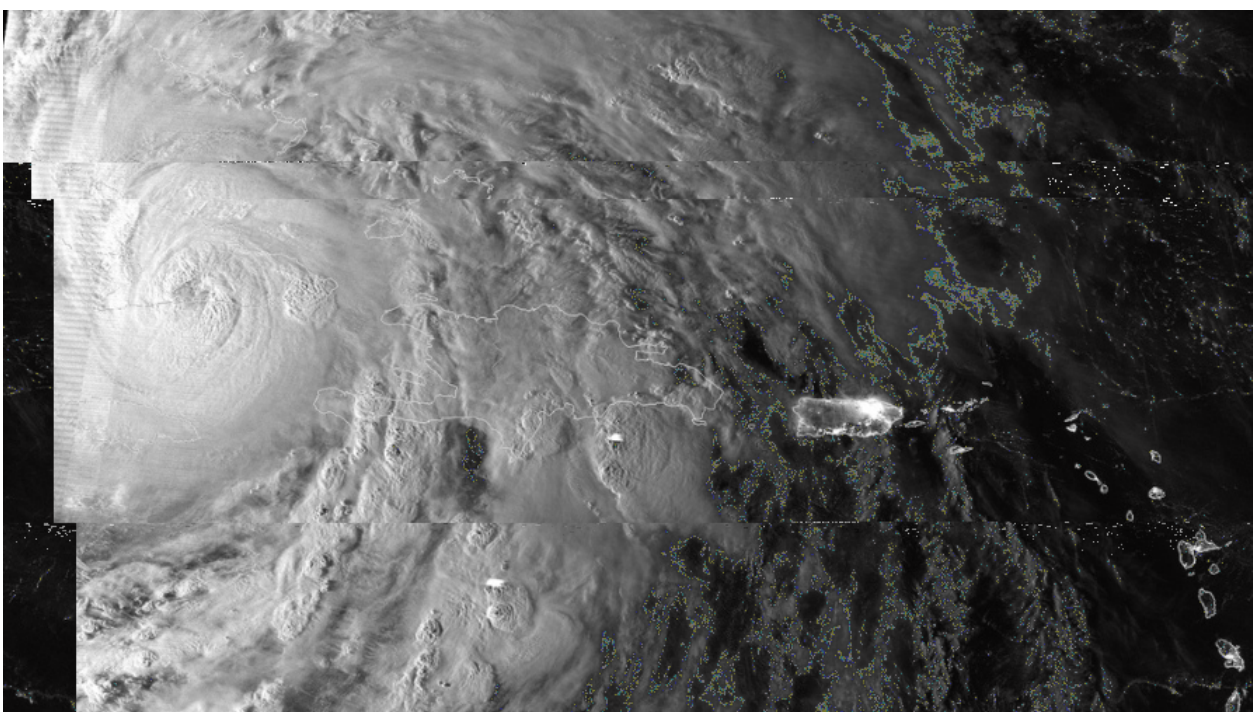
By Anna Manyak

The NOAA Marine Debris Program continues to request reports of at-sea and shoreline sightings of suspected Japan tsunami marine debris to DisasterDebris@noaa.gov. All reports are catalogued by Marine Debris Program staff, with significant sightings being shared with the proper response agency. During September 2012, the Marine Debris Program received 17 total reports, seven of which were reports of items floating at sea.

A floating dock that was spotted by some fishermen off the coast of Molokai, Hawaii.

Photographs of Interest

This photo was taken on the NOAA SHIP GORDON GUNTER, August 29, 2012 at 6pm off the coast of Texas (28 degrees 30 'N -094 degrees 30'W) During Hurricane Isaac event.
Photo by Denice Drass, Marine Biologist, Pascagoula Marine Fisheries Laboratory.



The Suomi NPP Satellite caught this image of Hurricane Sandy October 25, just as it passed over Cuba.
Credit: NOAA/NASA/GSFC/SuomiNPP

Mean Circulation Highlights and Climate Anomalies

May through August 2012

By Ed O'Lenic, Meteorologist, Chief, Operations Branch,
Climate Prediction Center NCEP/NWS/NOAA

All anomalies reflect departures from the 1981-2010 base period.

May-June 2012

May 500-hPa heights were above-average over the eastern North Pacific Ocean middle latitudes, the Canadian Archipelago, the Davis Strait, from northeastern North America to the North Atlantic Ocean just south of Greenland, and over Russia and eastern Siberia. Below-average heights were observed over Alaska, the eastern North Atlantic Ocean, the Greenland Sea, and the Taimyr Peninsula Figure 1. The sea-level pressure (SLP) pattern mirrors the 500-hPa pattern. Figure 2.

June 500-hPa heights were above-average from the Bering Sea southward to about 35^0 N, from Labrador to Greenland, over north-central Russia and the Kara Sea, and from the Caspian and Black Seas westward across the Mediterranean Sea. Below-average heights ran from northern Europe across the northern North Atlantic Ocean Figure 3. The SLP pattern featured a high over much of the eastern Arctic with an elongated low to the south. Figure 4.

The Tropics

Near-average sea surface temperature (SST) across the central and east-central equatorial Pacific heralded ENSO-neutral conditions continued during May-June. SSTs in the eastern equatorial Pacific continued to be warmer-than-average. The depth of the 20C isotherm (thermocline) remained near-average in the east-central equatorial Pacific and above-average in the eastern equatorial Pacific. Equatorial low-level easterly winds remained slightly above-average over the central and west-central equatorial Pacific. Enhanced convection was seen across Indonesia.

July-August 2012

The 500-hPa circulation pattern during July 2012 featured below-average heights from the British Isles across the Norwegian, Barents, Kara, Laptev, East Siberian and Chukchi Seas. This region was bounded on either side by anomalously high heights over northern sections of the Eastern Hemisphere and North America Figure 5. The sea-level pressure and anomaly map (Figure 6) shows a similar surface low feature, but with less extensive high pressure features.

The month of August was characterized by above-average heights over the Eastern Arctic, west-central North America, the northwestern North Pacific Ocean, and sections of southern Europe and central Russia Figure 7. The SLP and anomaly field (Figure 8) largely mirrored the middle tropospheric circulation pattern.

Severe weather and climate

May: CONUS snow cover 3rd smallest on record; northwest Oregon's wettest spring on record; tropical storms Alberto and Beryl affected southeastern CONUS; the Whitewater-Baldy Fire burned 210,000 acres, New Mexico's largest fire-ever; Alaska spring temperatures were 2.7^0 F cooler than normal, seasonal precipitation was 10.5 percent above average; Hawaiian Islands drought area rose (Reference 1).
June: Drought spread, intensified over central CONUS, wildfires destroyed homes in Colorado and Wyoming, and contributed to a derecho moving quickly from Illinois to Virginia, knocking out power to 3.4 million; tropical storm Debby dropped 12+ inches of rain in Florida.(Reference 2).

July: Alaska's wettest on record; near-record low flow in the lower Mississippi River; active monsoon in the Southwest; 63% of CONUS in drought; Long Draw Fire burns 560,000 acres in eastern Oregon, that state's largest fire since 1840s (Reference 3).

August: 63% of CONUS in drought; Wyoming and Colorado's warmest summer-ever; Wyoming and Nebraska's driest summer; 3.6 million acres burned in western and central CONUS, an August record; Hurricane Isaac hits Louisiana with up to 20 inches of rain/flooding (Reference 4).

The Tropics

ENSO-neutral conditions continued during July and August

2012. Sea surface temperature (SST) anomalies increased across the central and east-central equatorial Pacific, and SSTs in the eastern equatorial Pacific remained warmer-than-average during the period. The depth of the 20C isotherm (thermocline) remained near-average in the east-central equatorial Pacific and above-average in the eastern equatorial Pacific. Equatorial low-level easterlies were slightly enhanced over the west-central equatorial Pacific and weaker than average across the east-central equatorial Pacific.

REFERENCES

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3. http://www.ncdc.noaa.gov/sotc/national/2012/7
4. http://www.ncdc.noaa.gov/sotc/national/2012/8

Much of the information used in this article originates from the Climate Diagnostics Bulletin archive: (http://www.cpc.ncep.noaa.gov/products/CDB/CDB_Archive_html/CDB_archive.shtml)

Caption for 500 hPa Heights and Anomalies: Figures 1,3,5,7
Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981-2010 base period monthly means.

Caption for Sea-Level Pressure and Anomaly: Figures 2,4,6,8
Northern Hemisphere mean and anomalous sea level pressure (CDAS/Reanalysis). Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981-2010 base period monthly means.

Figure 1

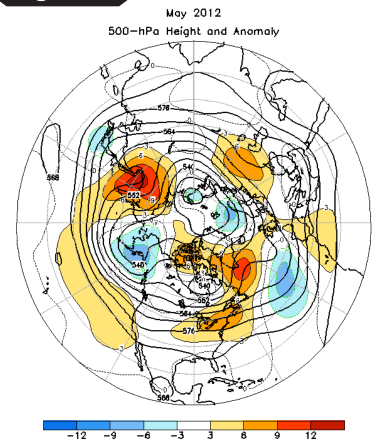


Figure 2

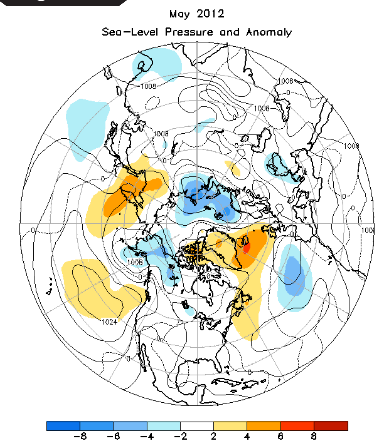


Figure 3

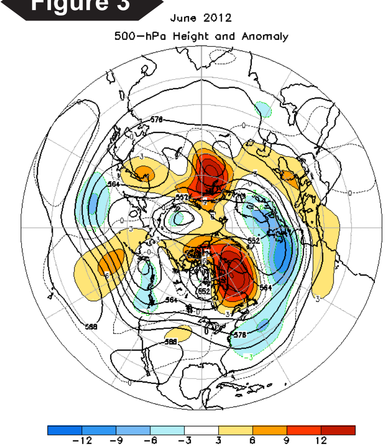


Figure 4

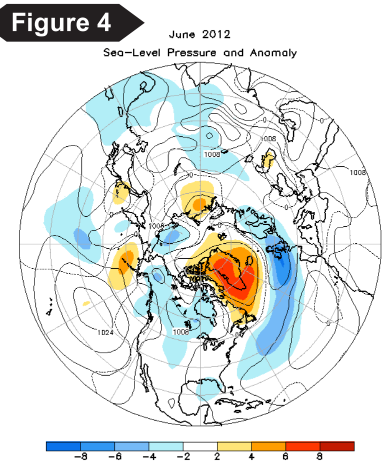


Figure 5

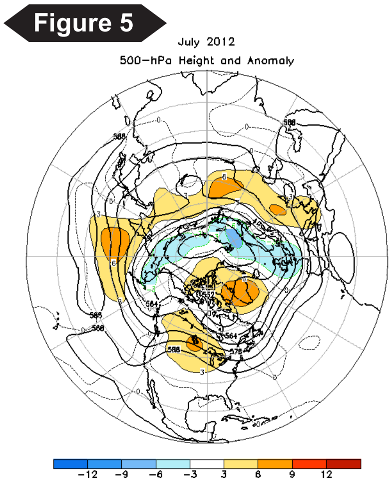


Figure 6

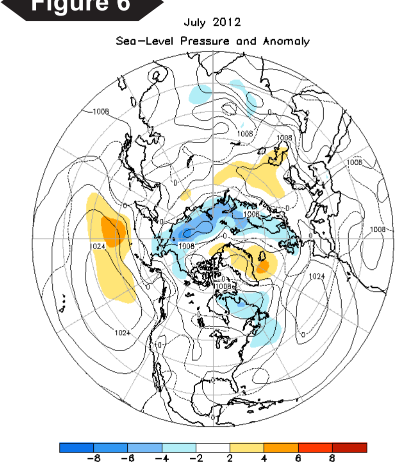


Figure 7

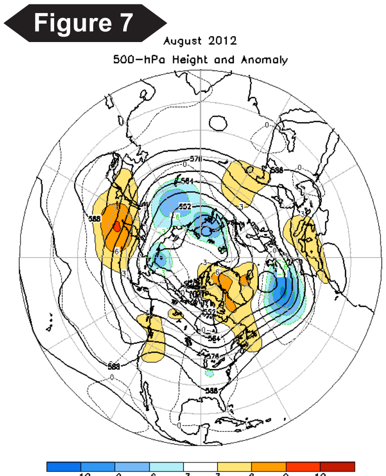
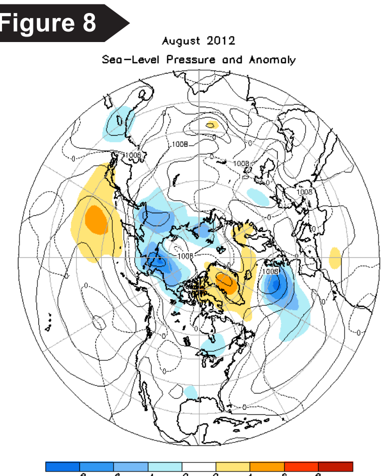


Figure 8



Tropical Atlantic and Tropical East Pacific Areas

May through August 2012

By Jorge Aguirre-Echevarria and Dan Mundell
Tropical Analysis and Forecast Branch,
National Hurricane Center, Miami, Florida,
NOAA National Centers for Environmental Prediction

Table 1. Non-tropical cyclone warnings issued for the subtropical and tropical Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea between 1 May and 31 August 2012.

Onset	Region	Peak Wind Speed	Gale Duration	Weather Forcing
00 UTC 23 Jun	Gulf of Mexico	35 kt	24 hr	Low
12 UTC 27 Jun	SW N Atlantic	35 kt	12 hr	Low
12 UTC 28 Jun	Caribbean Sea	35 kt	6 hr	Pressure Gradient

Pre and Post Debby Gale Events

Prior to the development of Tropical Storm Debby, TAFB issued a gale warning at 1200 UTC 23 Jun for 6 hours in association with Debby's precursor low in the eastern portion of the Gulf of Mexico**.** ***Figure 1*** shows the high resolution (12.5 km) Met-Op ASCAT scatterometer wind retrieval from 1600 UTC 23 June overlaid onto visible satellite imagery from that morning. During this pre-tropical cyclone phase of Debby, the low was rather broad, a pattern not too often seen in the Gulf of Mexico portion of TAFB's marine domain. The large wind field associated with the broad low was confined to the eastern semicircle where the ASCAT pass confirmed these winds. This is also where the deep convection, far removed from the system center, was located. These characteristics defined the low as a rather disorganized hybrid system, similar to systems of monsoon origin more common in the West Pacific basin. With the low characterized as such, the Dvorak (Dvorak, 1984) classification technique used to estimate the intensity of tropical cyclones based on satellite imagery was applied with difficulty. With deep convection and gale force winds far removed from the center, winds near and at the center were rather light adding to the unique aspect of the broad low. The ship **Carnival Destiny** (C6FN4) happened to be sailing from northwest to southeast across the Gulf during the period the gale warning was in effect. The ship was very instrumental in providing vital wind data during this time with reports of 37 kts in the overnight hours of 22 Jun with a peak wind gust of 37 kts near 27N92W and winds of 30-35 kts near 22N86W at 1200 UTC 23 Jun. In addition, the ship **Overseas Houston** (WWAA) reported a peak gust of 39 kts near 28N85W at 1800 UTC 23 Jun and 37 kts near 27.5N84.5W at 2300 UTC 23 Jun. Quality control of these ship reports indicated that they were a few kts too high.

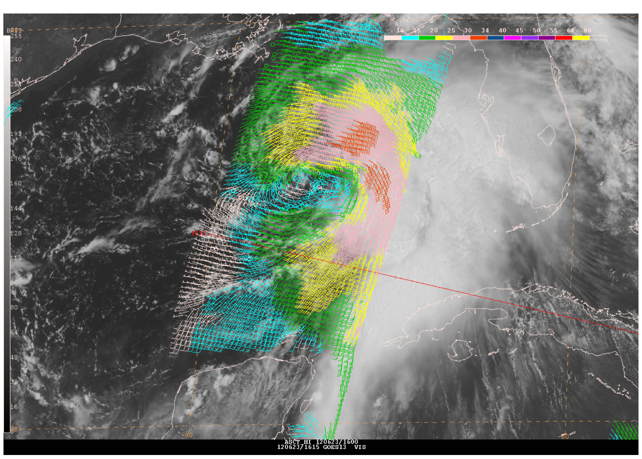


Figure 1. Visible satellite imagery with high resolution ASCAT winds from around 1600 UTC 23 Jun showing minimal gale force winds (red flags) in the eastern semicircle of the pre-tropical cyclone Debby gale center. Note the light winds near and around the elongated center.

The 12 UTC 23 Jun NWS Unified Surface Analysis (USA) shown in ***(Figure 2)*** clearly depicted the broad cyclonic circulation associated with the low. By 2100 UTC 23 Jun the broad structured low was upgraded to Tropical Storm Debby. Once Debby moved northeastward across north-central Florida and into the far northwest portion of TAFB's Atlantic Ocean domain near 29N78W on 27 Jun it was downgraded to a post-tropical low at 2100 UTC that same day as it no longer qualified to be classified as a tropical system ***(Figure 3).*** However, a tight enough pressure gradient to the northeast and east of the post-tropical cyclone low was enough to allow for gale force winds of 30-35 kts to materialize in those quadrants as a low level baroclinic zone had begun to impact it. The gale force winds lasted through 0600 UTC 28 Jun in TAFB' s Atlantic forecast area of responsibility (AOR), at which time the gale warning was lowered. The ship **Carnival Fascination** (C6FM9) near 27N79W along with ship **Veracruz Express** (ZCDJ2) just north of the area near 32N69.5W made several reports of gale force winds, in the general range of 30-35 kts just prior to 2100 UTC on 27 Jun. The following morning, the oceanographic research ship, **NOAA Pisces** (WTDL) made a few reports of 30 to 35 kts near 26N72W just prior to the low undergoing weakening as it became more involved with the low level baroclinic zone. The low continued to track northeastward, and was north of the forecast area near 32N73W by 1200 UTC 28 Jun ***(Figure 4)*** with winds down to 30 kts as it became more involved with the cold front associated with the low level baroclinic zone.

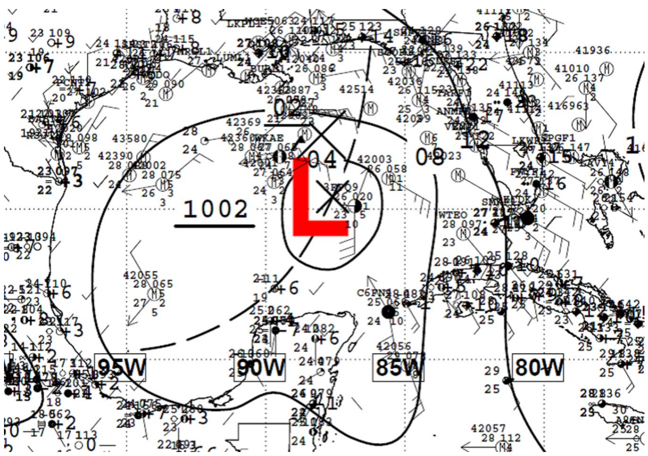


Figure 2. National Weather Service USA from 1200 UTC 23 Jun 2012 showing the pre-Debby low pressure system.

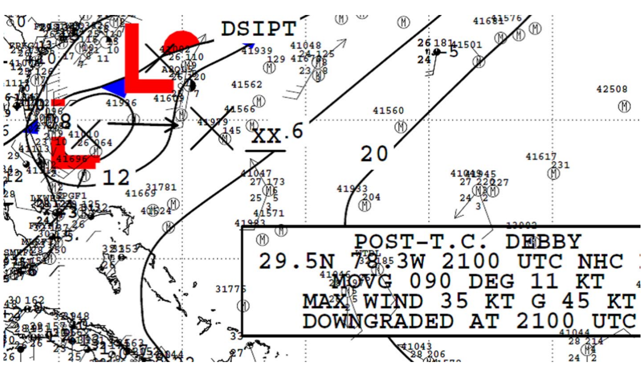


Figure 3. National Weather Service USA from 1200 UTC 27 Jun 2012 showing the post-tropical cyclone.

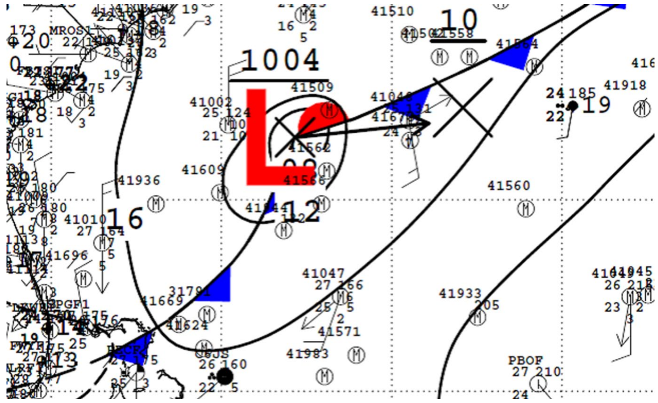


Figure 4. National Weather Service USA from 1200 UTC 28 Jun depicting low pressure, formerly the post tropical gale low, involved with the surface cold front.

Caribbean Sea Gale Event

There was only one very short-lived Southwest Caribbean Sea gale event that commenced on 12 UTC Jun 28 in the favorable climatological area of strongest trade winds found in the SW sector of the Caribbean Sea south of 14N to the coasts of Colombia and northwestern Venezuela. This particular event was confined to between 73W and 76W. The tight pressure gradient between high pressure over the sub-tropics and low pressure across the Colombian basin initiated NE to E 30-35 kts winds across that region of the Caribbean. An observation from the freighter ship **Demete**r (A8KM6) located near the coast of Colombia reported northeast winds of 35 kts at 18 UTC Jun 28 ***(Figure 5).*** The gale winds diminished to below gale force just after 18 UTC on the same day as the pressure gradient weakened due to the high pressure breaking down in response to the eastward advancement of the post gale low from former Tropical Storm Debby, and an associated cold front over the northwest part of the TAFB's Atlantic forecast area.

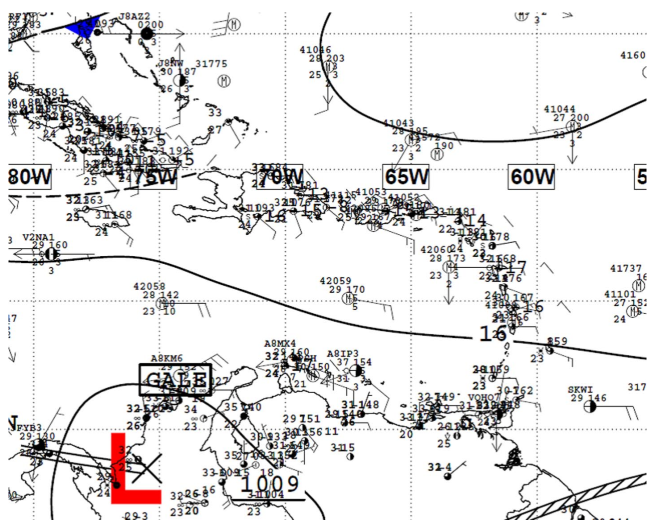


Figure 5. National Weather Service USA valid at 1800 UTC 28 Jun. Note the 35 kt wind observation from the ship Demeter (A8KM6) near the coast of Colombia.

Onset	Region	Peak Wind Speed	Gale Duration	Weather Forcing
0300 UTC 14 May	Gulf of Tehuantepec	40 kt	15 hr	Pressure Gradient
0300 UTC 22 May	Gulf of Tehuantepec	40 kt	12 hr	Pressure Gradient

Table 2. Non-tropical cyclone warnings issued for the subtropical and tropical eastern North Pacific between 1 May and 31 August 2012.

Eastern North Pacific Ocean

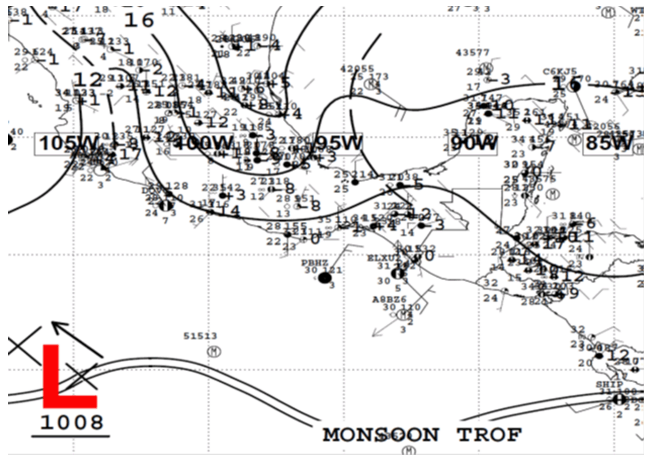
Gales and significant wave events are almost exclusively attributed to tropical systems across the tropical eastern North Pacific during the summer months. Two significant non-tropical warning events were documented primarily by scatterometer data due to the lack of supporting ship observations in the May through August 2012 time period. **Table 2** provides details on these brief gale events.

Late Season Gulf of Tehuantepec Gales

Gulf of Tehuantepec cold season wind events typically end by the first week of April. However, in mid May 2012, there were two occurrences of unusually strong late season winds that briefly surged to gale force lasting 15 hours or less.

Typical cold season Gulf of Tehuantepec wind events are initiated by strong northerly winds across the western Gulf of Mexico. This strong flow, which advects cold air southward, is supported by a steep pressure gradient between strong high pressure over Mexico or southern Texas and lower pressure over the Pacific Ocean south of Mexico. Funneling of the wind from the Gulf of Mexico into the eastern North Pacific Ocean is due to terrain variations over southern Mexico, and is most pronounced across the Isthmus of Tehuantepec. These events were atypical due to the existence of a broad area of low pressure associated with an active early season monsoon trough in the eastern North Pacific Ocean, which helped initiate two tropical cyclones in May (Tropical Storm Aletta and Hurricane Bud). As a result, moderate high pressure over southern Texas around 1020 hPa created enough of a pressure gradient across the region in each case to initiate gale force winds surging into the Gulf of Tehuantepec.

The first gale event commenced around 0300 UTC May 14th. A ridge of high pressure west of a cold front in the central Gulf of Mexico extended southward from a 1024 hPa high in Texas along the east coast of Mexico, while a weak trough was located over the Bay of Campeche and a broad monsoon trough was across the eastern North Pacific ***(Figure 6).*** In the early morning hours of May 14th, winds increased to 20 kts at Salina Cruz.



Moderate high pressure was building into southern Mexico, toward the Isthmus of Tehuantepec.

An Advanced Scatterometer (ASCAT) pass at 0310 UTC showed an unexpected increase in surface winds compared to the previous pass, with a narrow swath of 35 kts. Based on these data, a gale warning was immediately issued ***(Figure 7).*** An Oceansat-2 Scatterometer (OSCAT) pass nearly 3 hours later indicated peak winds of 40 kts in the Gulf of Tehuantepec (***Figure 8***), while a subsequent ASCAT pass at 1542 UTC showed winds had fallen below gale force, but strong to near-gale winds extending more than 200 km downstream from the Isthmus of Tehuantepec (***Figure 9***). This anticyclonically curved plume of high winds eventually became entrained into the north semicircle of the circulation associated with Tropical Storm Aletta.

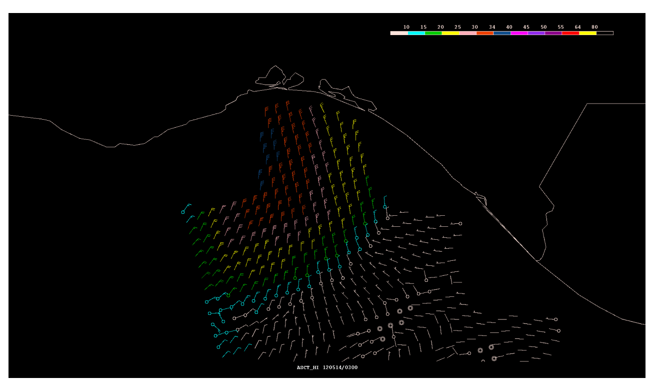


Figure 7. ASCAT wind retrieval from 14 May 2012 at 0310 UTC shows the onset of gale force winds over the Gulf of Tehuantepec.

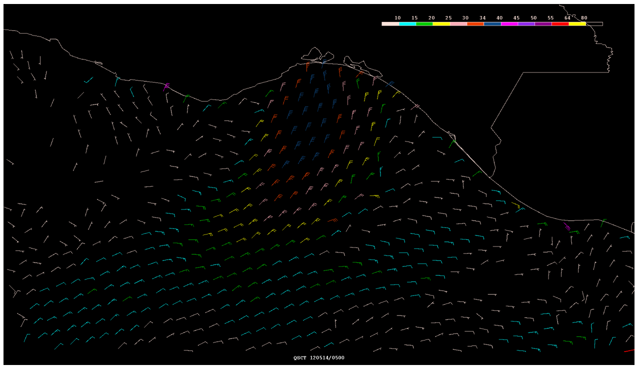


Figure 8. OSCAT wind retrieval from 14 May 2012 at 0551 UTC shows peak winds of 40 kts in the Gulf of Tehuantepec.

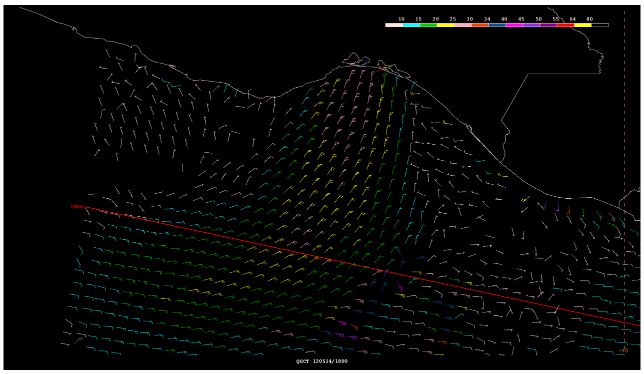


Figure 9. ASCAT wind retrieval from 14 May 2012 at 1542 UTC shows a large area of 25 to 30 kts extending downstream from the Gulf of Tehuantepec in response to the gale wind event earlier in the day.

The second gale event was similar in many respects to the one a week earlier. A ridge of high pressure extended southward along the coast of Mexico into the Isthmus of Tehuantepec from a 1019 hPa high in the Gulf of Mexico near Corpus Christi, Texas. A trough of low pressure extended from a low in the Gulf of Honduras to Tropical Depression TWO-E, with an estimated pressure of 1005 hPa, in the eastern North Pacific ***(Figure 10).***

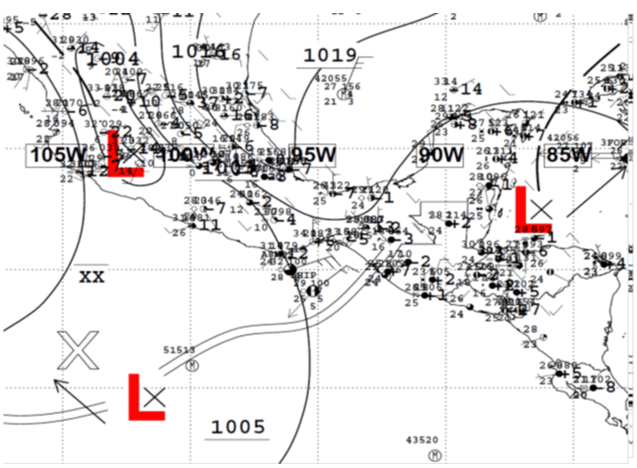


Figure 10. National Weather Service USA chart from 0000 UTC 22 May 2012, centered on southern Mexico and Central America. High pressure in southern Mexico and a deep trough of low pressure extending WSW from Guatemala increased the pressure gradient near the Isthmus of Tehuantepec.

The resulting pressure gradient across the Chivela pass initiated gale force winds spilling into the Gulf of Tehuantepec during the early morning hours of May 22nd. A gale warning was issued for 0300 UTC based on the expected onset of 35 kt winds from Global Forecast System (GFS) model guidance over the previous day or so. An OSCAT pass at 0551 UTC documented a small area of 35 kts in the Gulf of Tehuantepec ***(Figure 11).***

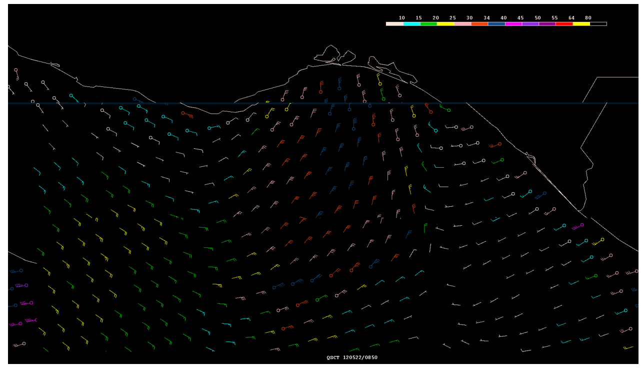


Figure 11. ASCAT wind retrieval from 22 May 2012 at 0551 UTC shows the swath of gale force winds to 40 kts in the Gulf of Tehuantepec.

The passenger cruise ship **Celebrity Millennium** (9HJF9) transiting the Gulf of Tehuantepec on 22 May reported 43 kts sustained winds at 1400 UTC near 14.7N 94.7W . A subsequent OSCAT pass at 1807 UTC indicated peak winds had diminished to around 30 kts.

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Dvorak, V., 1984: Tropical cyclone intensity analysis using satellite data. NOAA Tech. Report NESDIS 11. Available from NOAA/NESDIS, 5200 Auth Rd., Washington DC, 20233, 47pp.

Marine Weather Review – North Atlantic Area

January to June 2012

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Introduction

The period of January to March featured an active winter pattern with an energetic southwest to northeast storm track established in a continuation of the previous season's pattern. The numbers of hurricane force lows were highest in January and March with six and five, respectively, with February featuring four such cyclones forming. The numbers, however, were down from the ten occurring in the very active December 2011 (Reference 1). In the past the maximum frequency of hurricane force lows in the North Atlantic has been found to occur in January (Sienkiewicz and Von Ahn, 2005). Several cyclones developed central pressures in the 950s or below during these three months including the deepest, at 944 mb, passing near Iceland early in March. The numbers of hurricane force systems then dropped to two in April and to none in the late spring and early summer months of May and June when such cyclones are relatively rare. Tropical activity affecting in OPC's marine area north of 31N consisted of three named cyclones which formed outside the tropics in OPC's southwestern waters in late May and June, described below. One of these briefly developed minimal hurricane strength, and another re intensified as a strong post tropical low out over the central North Atlantic in early June.

TROPICAL ACTIVITY

Tropical Storm Alberto: The first named tropical cyclone of 2012 originated as a non tropical low near the southwest end of a stationary front near 31N 78W on the afternoon of May 18th and became subtropical early on the 19th before becoming Tropical Storm Alberto the following evening near 32N 78.5W with maximum sustained winds of 45 kts. Alberto then drifted southwest over the following day and slowly weakened before drifting northeast on the 21st and weakening to a tropical depression near 31N 76.5W late on the 21st and to a remnant low on the evening of the 22nd. The remains of Alberto then dissipated north of Bermuda late on May 23rd.

Tropical Storm Beryl: The second named tropical cyclone of 2012 originated as a non tropical gale near 31N 75W with a 1009 mb central pressure at 1800 UTC May 25 and drifted north, becoming subtropical storm Beryl the following evening with maximum sustained winds of 40 kts. Beryl then drifted southwest, passing south of OPC's southern boundary of 31N on the night of the 26th and intensifying into a 60 kts tropical storm before moving onshore over northern Florida on the night of the 27th. The Carnival Pride (H3VU) near 34N 76W reported east winds of 45 kts at 1500 UTC on the 26th. At 2000 UTC May 25 the buoy 41002 (31.9N 74.8W) reported southeast winds of 33 kts with gusts to 45 kts and 4.0 meter seas (13 feet), and highest seas 4.5 meters (15 feet) one hour later. Beryl weakened to a tropical depression while moving inland over the southeastern states on the 28th and 29th. Beryl then lost tropical characteristics as it emerged off the North Carolina coast as a post tropical gale force low by 2100 UTC May 30 (Figure 1). Post tropical Beryl then maintained central pressures near 1000 mb while tracking east northeast and then rapidly intensified after passing 300 nm south of the Grand Banks on June 2nd while turning more north. The second part of Figure 1 shows extra-tropical Beryl as it re intensified into a storm force low. The cyclone developed a lowest central pressure of 969 mb near 50N 35W six hours later as it began to turn westward, and became the deepest cyclone of May and June period in terms of central pressure. The visible satellite image in Figure 2 reveals an intense circulation of cloud bands around a well defined center. Although the cyclone has the frontal features of an extra-tropical low as seen in Figures 1 and Figure 2, the OSCAT image of the cyclone near maximum intensity (Figure 3) reveals a band of strongest winds to 55 kts close to a well defined center, a feature of tropical cyclones. Post tropical Beryl subsequently weakened while moving west and then south later on the 3rd and its top winds diminished to gale force. The system became absorbed by a developing low passing to the south late on the 5th.

Hurricane Chris: A non tropical low which became Chris is shown in the first part of Figure 4 as a non-tropical gale south of Newfoundland with dissipating frontal features. The low was upgraded to Tropical Storm Chris at 2100 UTC June 19 by the National Hurricane Center with maximum sustained winds of 40 kts. The second part of Figure 4 shows Chris two days later as a tropical storm at the 1200 UTC analysis time but accompanied by a text label indicating upgrade to a 65 kts hurricane at the 1500 UTC advisory time. Chris then weakened to a tropical storm six hours later while turning north, and continued weakening the following day before becoming a post tropical gale just south of the Grand Banks at 1800 UTC June 22. The remains of Chris, like Beryl before, became absorbed by another low passing to the south late on the 23rd.

Other Significant Events of the Period

North Atlantic Storm, January 1-4: The first significant event of the period originated as a low pressure wave near New England late on December 31st and became a storm south of the island of Newfoundland at 1800 UTC January 1st (Figure 5). At that time the hurricane force conditions near Greenland in the first part of Figure 5 were associated with a low pressure system which passed east of Greenland late in December, covered in a previous Marine Weather Summary (Reference 1). The cyclone tracked northeast over the North Atlantic on the night of the 1st and on the 2nd and intensified rapidly over the northeastern waters, becoming a hurricane force low in the North Sea on January 3rd (second part of Figure 5). The central pressure fell 32 mb in the twenty four hour period ending at 1200 UTC on the 3rd, when the cyclone developed a lowest central pressure of 956 mb. The buoy 63118 (59.1N 1.6E) reported northwest winds of 72 kts and 4.5 meter seas (15 feet) at 1800 UTC on the 3rd. Buoy 62147 (57.8N 0.9W) reported northwest winds of 60 kts and 6.0 meter seas (20 feet) at 1400 UTC on the 3rd. To the east buoy 62146 (57.2N 2.1E) reported seas of 9.5 meters (31 feet) six hours later. The cyclone subsequently passed inland over southern Norway on the night of the 3rd.

North Atlantic Storm, January 3-7: A wave of low pressure near 36N 66W at 1200 UTC January 3rd moved northeast and briefly developed hurricane force winds with a 978 mb center passing near the island of Newfoundland on the afternoon of the 4th. **Hibernia Platform** (VEP717, 46.7N 48.7W) reported southwest winds of 65 kts and 4.5 meter seas (15 feet) at 0000 UTC on the 5th (anemometer height 139 m). Buoy 44139 (44.2N 57.0W) reported west winds of 50 kts and 5.5 meter seas (18 feet) at 1800 UTC on the 4th, and 7.5 meter seas (24 feet) one hour later. Buoy 44138 (44.3N 53.5W) reported west winds of 45 kts and 9.0 meter seas (30 feet) at 2000 UTC on the 4th. The cyclone moved out over the North Atlantic and developed a lowest central pressure of 964 mb as a storm force low in the Labrador Sea early on the 5th before beginning to weaken and passing between Greenland and Iceland on the 6th and northeast of Iceland on the 7th. The ship **BATEU08** (59N 6W) encountered northwest winds of 50 kts at 0900 UTC on the 7th, and one hour prior to this buoy 64045 (59.2N 11.7W) reported 10.0 meter seas (33 feet).

North Atlantic Storm, January 6 10: The next low pressure system moved from the northern Gulf of St. Lawrence late on January 5th to the northern Labrador Sea late on the 6th, where it developed storm force winds, and to east of Greenland by 1800 UTC on the 8th, where it developed hurricane force winds and a central pressure of 966 mb. The cyclone stalled in the east Greenland waters on the 9th and spawned a new center near Iceland later that day. A European scatterometer pass (ASCAT) at 2208 UTC on the 9th revealed a swath of 50 to 55 kts winds from near Greenland to south of Iceland, similar to Figure 17 for the early March 944 mb low but not as strong. The second low center then weakened to a gale northeast of Iceland on the 10th while the primary low passed north through the Denmark Strait.

Western North Atlantic Storm, January 10-13: The initial development of this hurricane force low over a twenty four hour period is depicted in Figure 6. It originated as a frontal wave of low pressure off the southeastern U.S. coast on the 22nd. The central pressure fell 28 mb during this initial rapid intensification. Figure 7 reveals winds of 50 to 70 kts around the low center except the east side from an Indian scatterometer (OSCAT), offering coverage similar to that of QuikSCAT which went out of service in November 2009. The cyclone then passed northeast across the Grand Banks on the 11th and developed a lowest central pressure of 962 mb south of Greenland near 57N 47W at 1200 UTC on the 12th. **Hibernia Platform** VEP717 (46.7N 48.7W) reported west winds of 75 kts at its anemometer height of 139 m at 2100 UTC on the 11th and seas of 7.0 meters (23 feet) three hours later. The **Atlantic Cartier (**SCKB) near 47N 43W encountered west winds of 45 kts and 11.5 meter seas (37 feet) at 1800 UTC on the 12th. The ship **BATEU08** (61N 48W) reported east winds of 50 kts at 0900 UTC on the 12th. Buoy 44140 (42.9N 51.9W) reported west winds 47 kts with gusts to 60 kts and 6.5 meter seas (21 feet) at 1400 UTC January 11th, and highest seas 7.5 meters (25 feet) two hours later. The cyclone then moved across southern Greenland and weakened to a storm force low late on the 12th and then passed through the Denmark Strait as a gale by the 14th.

Northeastern Atlantic Storm, January 17 19: This cyclone developed from a complex of low pressure waves over the central waters well south of Greenland and tracked northeast toward Iceland, with rapid intensification occurring east of 30W. The central pressure fell 33 mb in the twenty four hour period ending at 0000 UTC January 18 resulting in the hurricane force low near Iceland in Figure 8. Near this time an OSCAT pass revealed an area of westerly winds to 75 kts south of Iceland (Figure 9). By comparison, an ASCAT pass from 2241 UTC January 17 showed winds as high as 65 kts in the same area. The system developed a lowest central pressure of 956 mb while passing east of Iceland six hours later. The **Federal Saguenay** (8PNQ) near 58N 9W reported west winds of 45 kts and 12.8 meter seas (42 feet) at 1200 UTC on the 18th. Buoy 64045 (59.2N 11.7W) reported southwest winds of 45 kts with gusts to 62 kts and 8.0 meter seas (26 feet) at 0500 UTC on the 18th, and 11.6 meter seas (38 feet) six hours later. The cyclone then weakened to a gale northeast of Iceland on the 19th.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Singelgracht (PCGM)	37N 64W 37N 66W	03/1200 03/1800	NW 60 NW 50	 4.5/15
Sol Do Brasil (ELOQ4)	39N 64W	03/1800	NE 50	7.6/25
Adrian Maersk (OXLD2)	38.5N 46W 39N 43W	03/1800	NE 50	7.6/25
President Polk (WRYD)	42N 55W	04/0600	N 55	8.8/29
Integrity (WDC6925)	36N 43W	04/1200	SW 65	7.6/25
Washington Express (WDD3826)	39N 41W	04/1200	SW 50	5.0/16
Hibernia Platform (VEP717)	46.7N 48.7W	04/2100 05/0000 05/0300	NW 65 W 55 W 55	6.5/21 6.5/21 7.0/23
Buoy 44140	43.8N 51.5W	04/0900 04/1100	NW 45 G58 Maximum	6.5/21 8.0/26
Buoy 44138	44.3N 53.6W	04/0600	N 41 G52	7.5/25

Table 1. Selected ship and buoy observations taken during passage of North Atlantic storm, February 26, 2012.

North Atlantic Storm, January 22-25: A developing low passed northeast across Atlantic Canada late on January 20th and on the 21st and became a storm with a lowest central pressure of 978 mb in the northern Labrador Sea on the night of the 22nd. The cyclone re formed east of southern Greenland on the 23rd, where it briefly developed hurricane force winds late on the 23rd. The **Irena Artica** (BATEU05) encountered north winds of 50 kts near 59N 42W at 1200 UTC on the 24th. The low pressure system then drifted southeast and slowly weakened over the following two days and dissipated west of Ireland on the 25th.

North Atlantic Storm, February 2-6: A frontal wave of low pressure moved off the mid Atlantic coast of the U.S. on the morning of February 2 and rapidly intensified, with the central pressure falling 32 mb in the twenty four hour period ending at 1800 UTC on the 3rd. The cyclone continued to intensify over the following two days while it lifted to the north northeast. The system developed two periods of hurricane force conditions, one late on the 3rd when it was south of Newfoundland and the other on the 5th when it was over the Labrador Sea (Figure 10). Some notable reports from ships and buoys in this event are listed in Table 1. After reaching peak intensity on the 5th the cyclone weakened rapidly near the southern tip of Greenland late on the 6th and on the 7th, before dissipating by the 8th.

North Atlantic Storm, February 8-10: Figure 11 depicts the rapid initial development of this hurricane force storm over the southwestern waters over a twenty four hour period, when the central pressure dropped 28 mb. In spite of the relatively high central pressure in this event, the cyclone's compact circulation resulted in hurricane force winds to 70 kts as detected by OSCAT imagery (Figure 12) around the southwest and west sides of the low. The **Sea-Land Champion** (WKAU) near 46N 57W reported north winds of 50 kts at 0600 UTC on the 10th. **Hibernia Platform** (VEP717, 46.7N 48.7W) reported west winds of 65 kts and 6.5 meter seas (21 feet) at 2100 UTC on the 10th. The buoy 44141 (43.0N 58.0W) reported northwest winds 47 kts with gusts to 62 kts and 7.0 meter seas (23 feet) at 0400 UTC on the 10th. The cyclone tracked northeast toward Iceland and gradually weakened beginning on the 10th and its top winds diminished to gale force by the 11th. The gale force low then turned east along 65N on February 12th and moved inland over Norway the next day.

North Atlantic Storm, February 19-23: Developing low pressure moved off the southeast U.S. coast on the afternoon of February 19th and developed hurricane force winds with a 968 mb center over the central waters near 42N 46W two days later. A high resolution ASCAT pass from 1200 UTC on the 22nd revealed winds 50 to 60 kts in the south semicircle of the low center similar to those of Figure 14 for the next event except not quite as strong. The **Kaveri Spirit** (C6WK2) near 37N 44W reported south winds of 45 kts and 11.3 meter seas (37 feet) at 1700 UTC on the 21st. Thirteen hours later the **Porto**

(A8UN3) encountered northwest winds of 50 kts and 5.5 meter seas (18 feet). The cyclone moved northeast with its top winds diminishing to storm force on the afternoon of the 22nd. After reaching Iceland twenty four hours later the storm turned east along 65N and moved inland over Norway the next day. The **Mary Artica** (BATEU00) near 62N 7W reported west winds of 50 kts at 0200 UTC on the 24th.

North Atlantic Storm, February 28-March 4: Figure 13 depicts the development of a hurricane force low over the northern waters from a complex low southeast of Nova Scotia. The southern low took over and rapidly deepened after passing 50W with the central pressure falling 33 mb in the twenty four hour period ending at 0600 UTC March 1st , with the cyclone developing its lowest central pressure at that time. The high resolution (25 km) ASCAT image in Figure 14 reveals numerous wind barbs of 50 to 60 kts in the south semicircle of the low and some 65 kts winds. The **Tyco Responder** (V7CY9) near 41N 59W reported northwest winds of 50 kts and 6.5 meter seas (21 feet) at 0000 UTC February 29th . The **Sea-Land Eagle** (WKAE) near 50N 45W reported west winds of 50 kts and 6.5 meter seas at 1200 UTC March 1st , and the **London Senator** (DEDM) encountered northeast winds of 60 kts near 56N 37W six hours later. The cyclone maintained hurricane force winds from late on the 29th until early on March 2 when it passed east of Greenland. The system remained in the east Greenland waters on the 2nd and 3rd before weakening rapidly late on the 3rd and passing northeast of Iceland on the 4th.

North Atlantic Storms, March 3-8: Three hurricane force lows developed in rapid succession during this most active period of the first six months of 2012. The first originated over New England on March 3rd and moved to near Greenland late on the 4th (Figure 15) and to the east Greenland waters on the 5th where it stalled through the 8th and maintained hurricane force west to northwest winds in a swath off the coast of southern Greenland (Figure 17) from late on the 5th into the 8th. The cyclone developed a central pressure as low as 952 mb at 0600 UTC on the 6th, the second deepest of the period. The system then weakened late on the 8th and passed north of Iceland on the 9th. The second cyclone is shown as a low pressure wave off the U.S. mid Atlantic in Figure 15 and two days later northeast of Iceland with the center off the chart at 67N 14W with a 944 mb center (Figure 16), when it briefly developed hurricane force winds. This was the deepest cyclone of the six month period and the only one with a central pressure below 950 mb. The central pressure dropped 34 mb in the twenty four hour period ending at 1800 UTC on the 6th. The **British Kestrel** (MGRL4) near 40N 51W reported southwest winds of 45 kts and 5.2 meter seas (17 feet) at 1800 UTC on the 5th then the low center was near Newfoundland. The third event was a low moving off the mid Atlantic coast of the U.S. at 1800 UTC March 5th and briefly developing hurricane force winds south of the island of Newfoundland late on the 6th (Figure 16). The compact circulation of this cyclone was able to develop such winds while surrounded by strong high pressure especially to the west, with a relatively modest central pressure of 995 mb. The lowest central pressure was 988 mb six hours later, a drop of 24 mb over twenty four hours. The buoy 44141 (43.0N 58.0W) reported northwest winds of 47 kts with gusts to 64 kts at 2300 UTC on the 6th, and highest seas 7.5 meters (25 feet) eleven hours later. Buoy 44140 (42.9N 51.9W) reported southwest winds 43 kts with gusts to 58 kts at 0700 UTC on the 7th and highest seas of 10.0 meters (33 feet) one hour later. The cyclone subsequently moved across the Grand Banks and then out over the central North Atlantic late on the7th and weakened as a new center formed to the northeast and moved toward Iceland.

North Atlantic Storm, March 11-13: The development of this cyclone from a flat low pressure wave off Newfoundland over a thirty six hour period is depicted in Figure 18. The central pressure fell an impressive 36 mb in the final twenty four hour period and the low center was at maximum intensity in the second part of Figure 18. At 1000 UTC March 11 the ship **BATEU01** (46N 49W) encountered northwest winds of 50 kts. In an area lacking surface observations, the ASCAT image in Figure 19 shows winds to 55 kts on the south side of the cyclone and up to 60 kts northwest of the occluded front apparent on the image. The system then moved into the east Greenland waters by the 13th and began to weaken, with the center passing north of the area by the 14th.

Central North Atlantic Storm, March 21 24: Blocking high pressure developing over Europe forced the next major storm to move slowly and erratically with Figure 20 showing a hurricane force low developing from the merging of southern and northern lows. The consolidated center then deepened slowly over the next two days while making a cyclonic loop to the northwest, reaching a lowest pressure of 952 mb near 51N 43W at 0600 UTC March 24. An ASCAT pass from 2352 UTC on the 21st revealed winds 50 to 60 kts around the southwest and west sides. The **Porto** (44N 43W) reported northwest winds of 62 kts at 2100 UTC on the 21st, and northwest winds of 60 kts and 10.0 meter seas (33 feet) near 43N 39W nine hours later. The ship **BAREU12** (48N 39W) encountered west winds of 45 kts and 12.8 meter seas (42 feet) at 1200 UTC on the 22nd. The cyclone then drifted northeast and weakened on the 24th before becoming absorbed by a low to the north by the 25th.

Southwestern North Atlantic Storm, April 2-4: Figure 21 shows the development of low pressure off the mid Atlantic coast of the U.S. into a storm south of Newfoundland at 1200 UTC April 3rd. The low developed a lowest pressure of 966 mb eighteen hours later with the center near 44N 54W. The **Nedlloyd Maxima** (A8JR6) near 40N 59W reported northwest winds of 50 kts and 9.8 meter seas (32 feet) at 2100 UTC on the 3rd. The **Sea-Land Mercury** (WKAW) encountered seas of 10.4 meters (34 feet) along with northwest winds of 35 kts near 40N 58W twelve hours later. Blocked by high pressure to the east, the cyclone lifted north across Newfoundland on the 4th and weakened before becoming absorbed by another cyclone to the east by the 6th.

North Atlantic Storm, April 14-15: Low pressure moved off the mid Atlantic coast of the U.S. early on April 11th and moved to near the island of Newfoundland on the 13th before intensifying into a hurricane force low south of Greenland late on the 14th (Figure 22). A high resolution ASCAT pass near the time of the second part of Figure 22 showed northeast winds to 70 kts north of the occluded front where the flow is channeled against the southern tip of Greenland. This was the last non tropical hurricane force event of the period. The cyclone subsequently slowed down southeast of Greenland and weakened late on the 15th before moving southeast and becoming absorbed by the 17th.

Northeastern Atlantic Storm, May 12-14: Figure 23 shows the development of an unseasonably deep storm center north of Great Britain from a low pressure wave near 60N 36W over a thirty six hour period. This was almost as deep as the post tropical storm Beryl described above. The central pressure dropped 33 mb in the twenty four hour period ending at 1200 UTC on the 13th, as rapid a drop as in some of the winter storms. The buoy 63057 (59.2N 1.5E) reported southwest winds of 50 kts at 0200 UTC on the 14th, and seas up to 6.0 meters (20 feet) four hours later. The Stena Carron (2BKQ8) near 61N 3W encountered northwest winds of 35 kts and 8.2 meter seas (27 feet). The cyclone subsequently weakened and moved through the Norwegian Sea as a gale on the 15th.

Central North Atlantic Storm, May 30-31: The low pressure complex seen over the central waters in the first part of Figure 24 consolidated into one 976 mb low near 50N 34W by 1200 UTC on the 31st with the 990 mb low coming from the west absorbing the others. This became the southern low with storm conditions seen in the second part of Figure 24. The Kiel Express (DEHZ) reported southeast winds 45 kts near 49N 27W at 0600 UTC on the 31st, and 5.8 meter seas (19 feet) three hours later. Figure 25 is an OSCAT image of the consolidating cyclone circulation containing storm force winds. Weakening of this slow moving system followed on the 31st as the system drifted to the west and became absorbed by the intensifying post tropical Beryl turning north toward it early on June 3rd.

Northeastern Atlantic Storm, June 14-15: A low pressure wave near Bermuda early on June 9th moved northeast and intensified as it turned north toward Ireland late on the 13th and the 14th, becoming a storm force low near 50N 12W with a lowest central pressure of 984 mb at 1800 UTC on the 14th. The system drifted to the north and weakened to a gale near Ireland on the 15th, before turning northeast and dissipating in the North Sea on the 17th. Buoy 62023 (51.4N 7.9W) reported southwest winds of 39 kts with gusts to 49 kts at 1800 UTC on the 15th, and seas of 5.5 meters (18 feet) seven hours later.

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Marine Weather Review – North Pacific Area

January to June 2012

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Introduction

The most active storm track during the period was from the western North Pacific Northeastward, with the cyclones passing near or south of the Aleutian Islands on their way toward the Gulf of Alaska with some originating in the central or eastern waters before tracking northeast toward the Canadian coast or Southeast Alaska. A blocking pattern in early April forced two intense cyclones near Japan to instead turn north into the Sea of Okhotsk where they stalled and weakened. In a continuation of the active pattern of the previous two months, ten cyclones developed hurricane force winds in January. The three hurricane force events of April occurred early in the month with one producing the highest winds seen in scatterometer data during the six month period, near Japan. The only hurricane force low to occur during May and June had tropical origins (Typhoon Mawar early in June). Mawar was one of three tropical systems to re-curve into the mid latitude westerly's off Japan before becoming extratropical during late May and June.

Tropical Activity

Typhoon Sanvu. Sanvu moved northwest to appear on OPC's radiofacsimile analysis charts late on May 22, passing near 17N 140E at 0600 UTC on the 23rd as an intensifying tropical storm with maximum sustained winds of 55 kts. Sanvu became a typhoon at 1800 UTC on the 23rd and reached maximum strength near 22N 139E with sustained 80 kts winds while beginning a turn to the northeast into the mid latitude westerly's. The cyclone then slowly weakened, becoming a strong tropical storm at 1800 UTC on the 26th while passing near 26N 1144E. Sanvu then merged with the southwest end of a trailing frontal zone and became a post tropical gale force low near 29N 149E at 1200 UTC on the 27th. At that time the **Ever Divine** (9V7956) to the north near 32N 149E reported northeast winds of 40 kts and 9.0 meter seas (30 feet). The remains of Sanvu then moved northeast and dissipated near 35N 165E early on May 30.

Typhoon Mawar: Northeastward moving Mawar passed south of Japan near 29N 135E as a weakening typhoon with maximum sustained winds of 65 kts 1200 UTC June 5. Mawar weakened to a tropical storm six hours later before transitioning into an intense post tropical low with hurricane force winds and frontal features as depicted in Figure 1. The **London Express** (DPLE) near 33N 136E reported northeast winds of 55 kts at 1800 UTC on the 5th when Mawar was still a tropical storm. The infrared satellite image in Figure 2 shows Mawar near maximum intensity as a post tropical low. It displays the cloud features found in an extratropical low such a comma head and tail (occlusion and trailing front) but also a semicircular central dense cloud feature around the north side of a partial eye like feature near 40N 151E as Post tropical Mawar retains some tropical like features. Figure 3 is a 25 km OSCAT image of winds around Mawar about thirteen hours after it became post tropical. The strongest winds still appear in close to the center, a tropical like feature. There are 70 kts wind appearing among data that is not rain flagged (white). Post tropical Mawar then moved east northeast and began to weaken with its top winds lowering to storm force 0600 UTC on the 7th and to gale force twenty four hours later. At 0600 UTC on the 7th a vessel with the **SHIP** callsign near 41N 150E reported north winds of 60 kts and 9.5 meter seas (31 feet). The weakening cyclone then passed west of the Aleutian Islands early on the 10th before dissipating in the western Bering Sea on June 13.

Tropical Storm Guchol: Guchol passed near 32N 135E just south of Japan as a northeastward moving weakening tropical storm at 0600 UTC June 19 with maximum sustained winds of 55 kts. Guchol moved inland over Japan shortly thereafter and became a post tropical storm force low north of Tokyo near 37N 140E with a 985 mb central pressure at 1800 UTC on the 19th, and then passed offshore with winds weakening to gale force the following night. At 1200 UTC on the 19th with Tropical Storm Guchol over western Japan, the ship **DHDE** near 34N 141E reported south winds of 45 kts. The **Antwerpen** (VRBK6) near 35.5N 140E encountered southwest winds of 60 kts and 4.3 meter seas (14 feet) three hours later. Post tropical Guchol continued to weaken slowly on the 20th and the 21st and dissipated near 44N 147E late on the 21st.

Other Significant Weather of the Period

Western North Pacific Storm, January 2-4: The first hurricane force low of the January to June period formed from southern low pressure system absorbing a northern system over a twenty four hour period as depicted in Figure 4. The central

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Overseas Joyce (V7NV4)	37N 147E 38N 149E	11/1800 12/0000	NW 50 NW 50	9.8/32 8.2/27
MOL Innovation (9VVP)	46N 153E	12/1200	W 50	
Hanjin Philadelphia (A8CN8)	53N 174E 55N 178E	12/1800 13/0600	SE 50 SE 45	7.9/26 8.5/28
Othello (SBLW) SHIP SHIP	47N 154E 56N 166E 56N 164E	12/1800 12/1800 14/0000	 S 50 NE 55	 6.5/21 6.5/21
Buoy 46070	55.1N 175.3E	13/0100 13/0200	SE 39 G49 Peak gust 52 Maximum	9/0/30 10.5/34
Buoy 46072	51.7N 172.2W	13/2100 14/0100	SE 35 G45 Peak gust 49 Maximum	7.5/25 8.5/28

Table 1. Selected ship and buoy observations taken during Northwestern Pacific Storm, January 11-14.

Introduction

The most active storm track during the period was from the western North Pacific Northeastward, with the cyclones passing near or south of the Aleutian Islands on their way toward the Gulf of Alaska with some originating in the central or eastern waters before tracking northeast toward the Canadian coast or Southeast Alaska. A blocking pattern in early April forced two intense cyclones near Japan to instead turn north into the Sea of Okhotsk where they stalled and weakened. In a continuation of the active pattern of the previous two months, ten cyclones developed hurricane force winds in January. The three hurricane force events of April occurred early in the month with one producing the highest winds seen in scatterometer data during the six month period, near Japan. The only hurricane force low to occur during May and June had tropical origins (Typhoon Mawar early in June). Mawar was one of three tropical systems to re-curve into the mid latitude westerly's off Japan before becoming extratropical during late May and June.

Tropical Activity

Typhoon Sanvu. Sanvu moved northwest to appear on OPC's radiofacsimile analysis charts late on May 22, passing near 17N 140E at 0600 UTC on the 23rd as an intensifying tropical storm with maximum sustained winds of 55 kts. Sanvu became a typhoon at 1800 UTC on the 23rd and reached maximum strength near 22N 139E with sustained 80 kts winds while beginning a turn to the northeast into the mid latitude westerly's. The cyclone then slowly weakened, becoming a strong tropical storm at 1800 UTC on the 26th while passing near 26N 1144E. Sanvu then merged with the southwest end of a trailing frontal zone and became a post tropical gale force low near 29N 149E at 1200 UTC on the 27th. At that time the **Ever Divine** (9V7956) to the north near 32N 149E reported northeast winds of 40 kts and 9.0 meter seas (30 feet). The remains of Sanvu then moved northeast and dissipated near 35N 165E early on May 30.

Typhoon Mawar: Northeastward moving Mawar passed south of Japan near 29N 135E as a weakening typhoon with maximum sustained winds of 65 kts 1200 UTC June 5. Mawar weakened to a tropical storm six hours later before transitioning into an intense post tropical low with hurricane force winds and frontal features as depicted in Figure 1. The **London Express** (DPLE) near 33N 136E reported northeast winds of 55 kts at 1800 UTC on the 5th when Mawar was still a tropical storm. The infrared satellite image in Figure 2 shows Mawar near maximum intensity as a post tropical low. It displays the cloud features found in an extratropical low such a comma head and tail (occlusion and trailing front) but also a semicircular central dense cloud feature around the north side of a partial eye like feature near 40N 151E as Post tropical Mawar retains some tropical like features. Figure 3 is a 25 km OSCAT image of winds around Mawar about thirteen hours after it became post tropical. The strongest winds still appear in close to the center, a tropical like feature. There are 70 kts wind appearing among data that is not rain flagged (white). Post tropical Mawar then moved east northeast and began to weaken with its top winds lowering to storm force 0600

UTC on the 7th and to gale force twenty four hours later. At 0600 UTC on the 7th a vessel with the **SHIP** callsign near 41N 150E reported north winds of 60 kts and 9.5 meter seas (31 feet). The weakening cyclone then passed west of the Aleutian Islands early on the 10th before dissipating in the western Bering Sea on June 13.

Tropical Storm Guchol: Guchol passed near 32N 135E just south of Japan as a northeastward moving weakening tropical storm at 0600 UTC June 19 with maximum sustained winds of 55 kts. Guchol moved inland over Japan shortly thereafter and became a post tropical storm force low north of Tokyo near 37N 140E with a 985 mb central pressure at 1800 UTC on the 19th, and then passed offshore with winds weakening to gale force the following night. At 1200 UTC on the 19th with Tropical Storm Guchol over western Japan, the ship **DHDE** near 34N 141E reported south winds of 45 kts. The **Antwerpen** (VRBK6) near 35.5N 140E encountered southwest winds of 60 kts and 4.3 meter seas (14 feet) three hours later. Post tropical Guchol continued to weaken slowly on the 20th and the 21st and dissipated near 44N 147E late on the 21st.

<u>Other Significant Weather of the Period</u>

Western North Pacific Storm, January 2-4: The first hurricane force low of the January to June period formed from southern low pressure system absorbing a northern system over a twenty four hour period as depicted in Figure 4. The central pressure fell 40 mb during this period. Rapid or explosive intensification is considered to be 24 mb in twenty four hours and is latitude dependent. The cyclone developed a lowest central pressure of 960 mb near 43N 155E at 1200 UTC January 3. The **Hanjin Copenhagen** (DHDM) reported east winds of 45 kts and 4.5 meter seas (15 feet) near 48N 154E at 0600 UTC on the 3rd. The high resolution ASCAT image in Figure 5 reveals winds to 60 kts on the south side of the cyclone but since this is only a partial view of the circulation the image could miss the highest winds. Actual winds are likely at least 65 kts due to the low bias of ASCAT winds. The cyclone subsequently moved northeast on the 3rd and turned more southeast on the 4th while weakening, and then dissipated well south of the western Aleutians late on the 7th.

Northeastern Pacific Storm, January 3-4: This short lived event consisted of a developing low pressure wave near 40N 140W at 1800 UTC on January 3 moving rapidly north northeast and briefly becoming a hurricane force low near 52N 135W with a 978 mb central pressure twelve hours later before moving inland over Southeast Alaska and northwestern Canada on the morning of the 4th. A vessel with the SHIP callsign reported south winds of 50 kts near 55N 134W at 1200 UTC on the 4th. Many of the Canadian buoys east of the low reported south to southeast winds 35 to 41 kts with gusts as high as 51 kts. The buoy 46185 (52.4N 129.8W) reported seas up to 7.5 meters (25 feet) at 0800 UTC on the 4th.

North Pacific Storm, January 4-9: A developing low pressure system moved from near Japan late on January 3rd to the central waters on the 6th and the northern Gulf of Alaska on the 9th, where it dissipated. The cyclone developed hurricane force winds with the low center as it passed near 44N 178W at 0600 UTC on the 6th with a 965 mb central pressure. The low center developed a lowest central pressure of 960 mb near 51N 157W at 1200 UTC on the 7th before beginning a weakening trend. The Hanjin Copenhagen (DHDM) near 55N 159W reported north winds of 70 kts and 7.3 meter seas (24 feet) at that time, while the Cosco Shenzhen (A8GF4) encountered north winds of 55 kts and 8.5 meter seas (28 feet) at 54N 161W. The buoy 46075 (54.0N 160.8W) reported north winds of 40 kts and 8.2 meter seas (27 feet), also at that time.

Northwestern Pacific Storm, January 11-14: A southern low pressure system seen in the first part of Figure 6 explosively deepened over the next twenty four hours while absorbing two lows to the north, with the central pressure falling 48 mb, the highest rate of intensification of any cyclone in both the North Pacific and the North Atlantic during the six month period. Figure 7 is a 500 mb analysis valid at the start of this rapid development, showing a short wave trough and 100 kts wind maximum and also diverging winds ahead of the trough supporting this development. More information on the use of the 500 mb chart may be found in the References (Sienkiewicz and Chesneau, 2008). The second part of Figure 6 shows the cyclone at maximum intensity, 944 mb (27.88 inches). This was the deepest cyclone of the period in the North Pacific and one of three with central pressures in the 940s. The ASCAT imagery in Figure 8 reveals a swath of west to northwest winds 50 to 75 kts in the southwest semicircle of the low and winds to 55 kts to the east. Some notable ship and buoy observations during this event are listed in Table 1. The cyclone subsequently made a cyclonic loop to the west and then south while weakening, and then dissipated near the Kurile Islands on the 15th.

Eastern North Pacific Storm, January 18: A primary gale force low well offshore from the U.S. Pacific Northwest coast of the U.S. spawned a secondary low on the associated front approaching the coast on the night of January 17th. At 1200 UTC on the 18th the secondary low was near 46N 130W and moving northeast with hurricane force conditions near the coast to the east. The low and front moved onshore later that day and winds diminished. The **Tokyo Express** (DGTX) reported south winds of 45 kts and 10.7 meter seas (35 feet) near 43N 125W at 1800 UTC on the 18th. The Cape Arago C/MAN station (CARO3, 43.3N 124.3W) reported south winds of 45 kts with gusts to 58 kts at 1400 UTC on the 18th and a peak gust of 69 kts at 0000 UTC on the 19th. Buoy 46050 (44.2N 124.6W) at 1500 UTC on the 18th reported south winds of 40 kts with gusts to 51 kts and 8.5 meter seas (28 feet). Three hours later that buoy reported 9.0 meter seas (30 feet).

Eastern North Pacific Storm, January 19-21: A 1000 mb frontal wave of low pressure formed near 30N 160E early on January 17th and moved to the central waters on the night of the 18th while rapidly developing into a storm force low near 39N 165W with a 976 mb central pressure. The system gradually intensified further over the next two days while moving into the Gulf of Alaska and slowing (Figure 9). The cyclone briefly developed hurricane force winds late on the 20th before drifting north and weakening, and dissipating in the northeast Gulf of Alaska early on the 22nd. At 0000 UTC on the 20th the **APL Philippines** (WCX 8884) near 40N 155W reported southwest winds of 55 kts and 13.4 meter seas (44 feet). At 2000 UTC on the 20th the **Polar Resolution** (WDJK) encountered east winds of 60 kts and 12.2 meter seas (40 feet). Four hours later the **North Star** (KIYI) reported east winds of 50 kts and 12.0 meter seas (39 feet). Then the **Hanjin Copenhagen** (DHDM) near 54N 143W at 1800 UTC on the 21st encountered northwest winds of 60 kts and 9.0 meter seas (30 feet).

Eastern North Pacific Storm, January 21-22: Low pressure formed near 34N 175E with a 996 mb pressure early on January 19th and moved to 42N 157W as the 993 mb developing storm two days later (Figure 9). The cyclone deepened by 24 mb over the next twenty four hours and briefly developed hurricane force winds by 1800 UTC on the 22nd off Vancouver Island. Figure 10 shows a compact system just prior to moving inland over British Columbia. Figure 11 is a high resolution ASCAT image with parts of two passes showing winds to 60 kts south of the center and also in the southeast flow near Vancouver Island. The **Sea-Land Intrepid** (WDB9949) near 46N 135W reported northwest winds of 60 kts at 1200 UTC on the 22nd. The **Maui** (WSLH) encountered southeast winds of 50 kts and 8.2 meter seas (27 feet) near 48N 125W at 1800 UTC on the 22nd. Buoy 46207 (50.9N 129.9W) reported southeast winds of 43 kts with gusts to 56 kts at 1800 UTC on the 22nd and seas as high as 9.5 meters (31 feet) three hours later. Buoy 46206 (48.8N 126.0W) reported southwest winds of 43 kts with gusts to 60 kts at 0000 UTC on the 23rd and seas as high as 8.5 meters (28 feet).

North Pacific Storms, January 21-25: A gale force low near 29N 161E (Figure 9) move northeast and intensified into the 968 mb hurricane force low 39N 173W shown in Figure 10. The central pressure fell 30 mb in the twenty four hour period ending at 0000 UTC on the 23rd. At 1200 UTC on the 23rd the cyclone developed a lowest central pressure of 962 mb near 41N 169W. An ASCAT high resolution pass from 0637 UTC on the 23rd showed a partial view of the south side of the cyclone with southwest winds to 60 kts. Twenty four hours later, there were two hurricane force lows with the primary low 47N 148W with a 966 mb central pressure and a secondary center to the northeast near 54N 135W with a 964 mb pressure. Both weakened on the 24th with the second center becoming absorbed and the main low moving inland over Southeast Alaska by the 25th. The Canadian buoy 46185 (52.4N 129.8W) reported southeast winds of 47 kts with gusts to 60 kts at 1000 UTC on the 24th and highest seas 10.5 meters (34 feet) two hours later. Buoy 46004 (50.9N 136.1W) reported west winds 47 kts with gusts to 62 kts at 0200 UTC on the 25th and seas reaching 9.0 meters (30 feet) four hours later.

North Pacific Storm, January 26-29: The next major storm was a developing cyclone that moved from off Japan on the 24th east northeast and developed hurricane force winds mainly over the western waters, with the center developing a lowest central pressure of 952 mb near 44N 165E at 1200 UTC on the 27th. The central pressure dropped 35 mb in the twenty four hour period ending at 0600 UTC on the 27th. A WINDSAT image from 1941 UTC on the 27th revealed west winds to 60 kts in a partial coverage of the south side of the cyclone. See Reference 5 for more information on WINDSAT and other satellite wind products. The system reached the central Aleutians late on the 29th but by then its winds were down to gale force. It passed south of the eastern Aleutians on February 1 and became absorbed by low pressure passing to the east.

North Pacific Storm, February 9-11: The development of the second most intense cyclone of the period from a weak low pressure wave over a thirty six hour period is depicted in Figure 12. During the first twenty four hours the central pressure dropped 43 mb. Hurricane force conditions accompanied the low mainly on the 10th. Figure 13 is an ASCAT image near the time of maximum intensity showing winds to 60 kts in a partial view of the south side of the circulation. The ship **A8HS4** near 36N 167W reported southwest winds of 50 kts and 9.0 meter seas (30 feet) at 1200 UTC on the 10th. At 1000 UTC on the 11th the ship **KF001** (55N 159W) encountered east winds of 50 kts. The cyclone subsequently originating in the far southern waters near the dateline early on February 5th, this cyclone developed a compact circulation with hurricane force winds on the 6th near 36N 166W with a 976 mb central pressure. ASCAT imagery from 2157 UTC on the 6th revealed some 50 kts wind retrievals south of the center near 33N 164W. The cyclone subsequently weakened while approaching southwestern Alaska on the 11th and dissipated inland on the 12th.

North Pacific Storm, February 12-15: The rapid development of this cyclone over a twenty four hour period is displayed in Figure 14. Like the January 944 mb low in the northwestern Pacific this low deepened 48 mb in twenty four hours and attained the same lowest pressure, but it occurred in a different part of the Pacific. OSCAT imagery in Figure 15 reveals a relatively compact circulation with highest winds 70 kts south of the low and some storm force winds ahead of the occluded front on the north side. The **Green Ridge** (WZZF) encountered southwest winds of 55 kts near 38N 174W at 1100 UTC on the 13th. Hurricane force winds lasted from the 13th to early on the 14th. Satellite radar altimeter imagery in Figure 16 has a center pass through the storm and includes a significant wave height of almost 49 feet (14.9 meters) near 45N 170W on the south side of the cyclone. The cyclone then stalled and weakened near the eastern Aleutians on the 15th and 16th before dissipating late on the 16th.

North Pacific and Bering Sea Storm, February 23-26: This event originated as a wave of low pressure over Japan late on February 22. It moved over the northwestern Pacific waters east of the Kurile Islands where it briefly developed hurricane force winds on the 24th and a lowest central pressure of 962 mb at 1800 UTC on the 24th. A high resolution ASCAT image from 1057 UTC on the 24th revealed west winds to 60 kts in a partial view of the south side of the cyclone and was similar to Figure 13 for the February 9-11 storm. The **Hanjin Philadelphia** (A8CN8) near 53N 173E reported southeast winds of 50 kts and 5.2 meter seas (17 feet) at 1800 UTC on the 24th. The buoy 46070 (55.1N 175.3E) reported northeast winds 43 kts with gusts to 54 kts at 1500 UTC February 25 and seas up to 10.0 meters (33 feet) seven hours later. The cyclone subsequently weakened slowly and expanded in area, passed through the southern Bering Sea as a gale force low on the 26th and then re formed in the northern Gulf of Alaska on the 27th before dissipating at the end of the month.

Northeastern Pacific Storm, March 7-9: A stalled gale force low in the southeastern waters near 34N 153W at 0600 UTC March 6th was allowed to lift to the north-northeast as a ridge to the north weakened. The low rapidly intensified and moved to 49N 145W with a 980 mb center and hurricane force winds at 1200 UTC on the 8th. The central pressure fell 30 mb in the preceding twenty four hours. High resolution ASCAT imagery from 2023 UTC on the 8th revealed a swath of west winds 50 kts south of the low. The **M/V Manukai** (WRGD) reported northwest winds of 50 kts and 6.7 meter seas (22 feet) near 46N 152W at 0000 UTC on the 8th, followed by a report of seas 11.6 meters (38 feet) near 45N 149W six hours later. The **Alaskan Navigator** (WDC6644) near 51N 137W encountered southwest winds of 50 kts and 8.5 meter seas (28 feet) at 0000 UTC on the 9th. The cyclone weakened beginning late on the 8th and dissipated near 60N 147W March 9th.

North Pacific and Bering Sea Storm, March 9-13: Figure 17 depicts the development of this cyclone over a 48 hour period. It was already a storm when passing east of Japan and developed hurricane force winds late on the 11th as the center passed near 49N 165E. A 25 km ASCAT pass from 1007 UTC on the 12th, close to the time of maximum intensity, shows winds to 60 kts on the south side and is similar in appearance to Figure 13 for the February 9-11 event. The **Moran** (4XIM) near 54N 164E reported north winds of 55 kts and 12.5 meter seas (41 feet) at 0600 UTC March 12th, while the **APL China** (WDB3161) near 52.5N 165E encountered north winds of 50 kts and 10.7 meter seas (35 feet). The **Kobe Express** (DGSE) near 35N 144E reported northeast winds of 55 kts and 9.8 meter seas (32 feet) at 0600 UTC on the 10th. Buoy 46035 (57.1N 177.8W) reported east winds of 45 kts with gusts to 54 kts at 1200 UTC on the 12th and, eleven hours later, seas reaching 8.0 meters (26 feet). The system turned toward the east and weakened while crossing the southern Bering Sea on the 12th and 13th then dissipated in the Gulf of Alaska on the 14th.

Northeastern Pacific Storm, March 18-20: The development of this cyclone over a thirty six hour period is shown in Figure 18. The second part of Figure 18 shows the hurricane force low at maximum intensity in terms of pressure. The **Overseas Boston** (WJBU) near 51N 133W reported south winds of 60 kts and 8.5 meter seas (28 feet) at 0600 UTC on the 20th, followed by a report of northwest winds 70 kts near 50N 132W six hours later. The **Horizon Anchorage** (KGTX) near 49N 129W encountered seas of 11.9 meters (39 feet) along with southwest winds 35 kts at 1800 UTC March 20. The buoy 46036 (48.4N 133.9W) reported west winds of 43 kts with gusts to 54 kts at 0900 UTC on the 20th, and one hour prior, seas as high as 11.5 meters 38 feet). The cyclone then moved onshore over Southeast Alaska and weakened rapidly late on the 20th.

Eastern North Pacific Storm, March 29-31: The first is shown fully developed as a hurricane force low off Northern California in Figure 19. It originated in the Sea of Okhotsk on the 24th and tracked southeast and then east across the North Pacific and did not intensify until it crossed 160W. It is at maximum intensity in Figure 19. A 25 km OSCAT image 0914 UTC reveals northwest winds to 70 kts on the southwest side of the low and winds as high as 55 kts ahead of the occluded front. The **Ever Diamond** (3FQJ8) near 38N 160W reported northwest winds of 45 kts and 8.5 meter seas (28 feet) at 0300 UTC on the 30th. The ship **WRTF** (44N 129W) encountered east winds of 55 kts at 0900 UTC on the 31st. The cyclone then moved inland over Oregon and weakened on the night of the 31st.

North Pacific Storm, March 30-April 2: This major storm was the most intense in the eastern Pacific during the period. It originated near 30N 159E at 1800 UC March 29 and tracked east northeast and developed storm force winds after crossing 180W. Figure 19, Figure 20 and Figure 21 show the final forty eight hours of development. The central pressure dropped 38 mb in the twenty four hour period ending at 0600 UTC April 2nd. High resolution ASCAT data from a 2026 UTC April 1st pass showed winds 50 to 60 kts in the south semicircle. The **Westwood Columbia** (C6SI4) reported east winds of 55 kts near 53N 138W at 0500 UTC April 2nd. The **Nighthawk** (V7VR4) near 52N 136W encountered southwest winds of 50 kts and 10.4 meter seas (34 feet). The **Polar Resolution** (WDJK) reported south winds of 50 kts and 11.3 meter seas (37 feet). After reaching peak intensity the cyclone drifted toward Southeast Alaska and weakened to a gale by early on the 3rd and then turned southeast and dissipated southwest of Vancouver Island on the 5th.

Western North Pacific Storm, April 2 4: A rapidly intensifying low moved northeast across the Sea of Japan and northern Japan late on April 2nd and on the 3rd, reaching a peak intensity of 956 mb in the southern Sea of Okhotsk at 0600 UTC on the 4th. Also see Figure 22. The central pressure dropped 30 mb in the twenty four hour period ending at 0000 UTC on the 4th. The OSCAT image in Figure 23 shows some wind vectors up to 80 kts in the Sea of Japan, the highest seen during this period in OSCAT imagery. The **Sea-Land Charger** (WDB9948) near 37N 146E reported seas of 10.4 meters (34 feet) at 1700 UTC April 3rd. The **Lutoga** (UFLC) reported west winds of 60 kts near 45N 145E at 1200 UTC on the 4th. The **Admiral Makarov** (UGSN) encountered northwest winds of 60 kts near 50N 141E at 0000 UTC on the 5th. The cyclone lingered over the southern Sea of Okhotsk from the 5th into the 7th while weakening and then moved east and dissipated near the western Aleutians by the 9th.

Northeastern Pacific Storms, May 5 6 and 11 12: A developing wave of low pressure near 34N 174W at 0000 UTC on the 4th moved northeast and briefly developed storm force winds in the Gulf of Alaska as it intensified into a 994 mb low near 57N 145W at 1200 UTC on the 6th before weakening inland the following night. The **Prince of Wales** (WDA6378) reported southeast winds of 50 kts and 2.5 meter seas (8 feet) near 55.4N 132.1W at 1800 UTC on the 6th. At 0000 UTC May 11th another developing wave formed near 42N 155W and briefly became a storm near 56N 140W with a 996 mb center at 0600 UTC on the 12th before moving inland the following morning. Buoy 46083 (58.2N 138.0W) reported a southeast wind of 37 kts with gusts to 51 kts at 1300 UTC on the 12th and seas as high as 6.5 meters (21 feet) six hours later. At 1600 UTC on the 12th the same buoy reported a southeast wind of 39 kts.

VOS Program Awards

Norwegian Jade won a 2011 VOS Award with an outstanding total of 1,468 valuable marine observations! This was a new ship's record and their 3rd consecutive VOS Award.
in the photo
1st Officer - Robert Hammerin
St. Captain - Jonas Kruger
Ch. Officer - Niklas Nordlund
2nd Officer - Ray Flores
2nd Officer - Restituto Padilla
Captain - Mikael Hilden
3rd Officer - Santiago Filevich
1st Officer/Navigation - Ricardo Anguizola

VOS Award for the Norwegian Spirit:
pictured left to right:
2nd Officer Collen Engada,
2nd Officer Edler Bongo,
1st Officer Safety Eduardo Peralta
and 3rd Officer Pio Punzalan.
PMO Dave Jones, Navigator Dennis Reddy
and Staff Captain Matko Candrlic

VOS Program Awards

Discoverer Clear Leader:
From left to right:
Capt. John Anderson
PMO New Orleans Dave Jones
Senior DPO Marty White
3rd Mate Clyde Myers
3rd Mate Chris Lafrenaye
Cadet Jeff Lencioni
2nd Mate Bill Kelleher

Captain Barry Costanzi and 1/O Steve Itson, not pictured 2/O Paul Grepo and 3/O Jack Walker of the Horizon Reliance receive the 2011 VOS award in recognition of outstanding performance in the Voluntary Observing Ship program of the United States of America.

VOS Program Awards

Captain McCarthy, 1/O Chris Luck and Eric Sinkevitch receiving the 2011 VOS award in recognition of HORIZON SPIRIT's outstanding performance in the Voluntary Observing Ship program.

Also pictured receiving the 2011 VOS award for the Horizon Spirit, 2/M Chris Groark

VOS Program Awards

Congratulations go out to the MAUNAWILI for their outstanding performance, receiving the 2011 VOS award.
Pictured from left to right:
William Palmer, PMO Brian Holmes, 1/O Dawai Chang
Not pictured: Captain Brian McNamara, 2/O Gary Frame and 3/O Kyra Moon

Cargo Ship Optimana won a 2011 VOS Award with an excellent total of 849 marine observations! They have a worldwide itinerary. This was a new ship's record.
Starting from left:
3/O Gilbert Cometa,
C/M Robert O. Omlas
CaptainOrlando D. Manicio
2/O Ronald Ian A. Juntado

VOS Program Awards

Maerski Utah crew.
Pictured are, from right to left:
Captain Robert Sienel, Deck Cadet Joshua Asaro, Chief Mate Matthew Bakis, 2nd Mate Bruce Forbush, 3rd Mate Sea Chan.

National Weather Service VOS Program New Recruits:

June 1 through September 30, 2012

SHIP NAME	CALL SIGN
Affinity	9VDT5
Algocanada	CFN5193
Am Point Lisas	A8XD2
American Courage	WDD2879
APL Holland	9VKQ2
APL Oman	9VMJ4
Atlantic Hope	VRDT5
Axel Maersk	OUUY2
Bergamot Ace	ZGAS5
Clementine Maersk	OUQK2
Davidson	5NLQ
Eagle Kuching	9V8132
Fennica	OJAD
Glen Canyon Bridge	3EFD9
Global Spirit	ELTL3
Harvey Explorer	WDB4217
John B. Aird	VCYP
Kaan Kalkavan	TCTX2
Maersk Texas	WMLF
Marvellous	VRJI2

SHIP NAME	CALL SIGN
McKee Sons	WCZ9703
MOL Majesty	V7SV4
MOL Modern	V7V56
MOL Motivator	V7VG6
Nordica	OJAE
NYK Artemis	HOVU
NYK Rosa	3FJM9
Ocean Giant	WDG4379
Ranger	WBN5979
Sisuaq	WDG2721
Star Kirkenes	LAHR7
Tawa Arrow	3ER04
Tiger	9HA2271
TOR Viking II	SLIT
Tug Michigan	WDF5344
Unique Guardian	VRJM6
Vega Dream	7JHY
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The Cooperative Ship Reports can now be found online by **clicking here.**

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NOAA WEATHER RADIO NETWORK

(1) 162.550 mHz
(2) 162.400 mHz
(3) 162.475 mHz
(4) 162.425 mHz
(5) 162.450 mHz
(6) 162.500 mHz
(7) 162.525 mHz

Channel numbers, e.g. (WX1, WX2) etc. have no special significance but are often designated this way in consumer equipment. Other channel numbering schemes are also prevalent.

The NOAA Weather Radio network provides voice broadcasts of local and coastal marine forecasts on a continuous cycle. The forecasts are produced by local National Weather Service Forecast Offices.

Coastal stations also broadcast predicted tides and real time observations from buoys and coastal meteorological stations operated by NOAA's National Data Buoy Center. Based on user demand, and where feasible, Offshore and Open Lake forecasts are broadcast as well.

The NOAA Weather Radio network provides near continuous coverage of the coastal U.S, Great Lakes, Hawaii, and populated Alaska coastline. Typical coverage is 25 nautical miles offshore, but may extend much further in certain areas.