



Mariners

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U.S. Department of Commerce

Jane Lubchenco Ph.D.
Under Secretary of Commerce for
Oceans and Atmosphere

NATIONAL WEATHER SERVICE
Dr. John "Jack" L. Hayes
NOAA Assistant Administrator for
Weather Services

EDITORIAL SUPERVISOR
Paula M. Rychtar

LAYOUT AND DESIGN
Leigh Ellis • www.EllisGS.com

ARTICLES, PHOTOGRAPHS, AND LETTERS SHOULD BE SENT TO:

Ms. Paula M. Rychtar, Editorial Supervisor
Mariners Weather Log
NDBC (W/OPS 51)
Bldg. 3203
Stennis Space Center, MS 39529-6000
Phone: (228) 688-1818 Fax: (228) 688-3923
E-Mail: paula.rychtar@noaa.gov

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SEE THESE WEB PAGES FOR FURTHER LINKS.

From the Editor

Paula Rychtar

Hello and welcome back for another great issue of the Mariners Weather Log. We have some great articles that I know you will really enjoy as well as some informative articles to help the VOS program continue to be a vital program within NOAA's National Weather Service.

Our featured cover story, "Tear of Grief", has been submitted by our New York PMO, Jim Luciani. Since September is right around the corner, I thought this particular issue of the MWL would be suitable to present this article. Jim spotlights a beautiful gift from Russia to the United States following the 9/11 attacks. I myself, as I am sure many others, was not aware of this wonderful gift or the chosen site of which it is displayed, Cape Liberty. What a treasure this is and I am so glad that Jim recognized how important it would be to bring this to light for us all. In addition to this article, I would like to bring attention to yet another endeavor on Jim's part. Jim has been training for quite some time in preparation for the Unite Half Marathon at Rutgers University which took place this past April. Well, he did it; he finished in a time of 2:10:53. I threw in a small article on that as well as I think it is a big deal!

Hurricane season is upon us! Please keep that in mind, **only YOU know the weather!** So take the time to send in good quality observations so that the National Hurricane Center can have the best data available to provide you with the best forecasting possible. For all your hurricane needs, remember <http://www.nhc.noaa.gov/> is your one stop shop.

Marine debris has become a big concern and VOS has become an intricate part in the effort towards monitoring and gathering information to assist the Marine Debris Program. The MWL will have an ongoing piece giving updates, news and addressing the overall concerns. It is estimated by the government of Japan that the tsunami swept about 5 million tons of debris into the Pacific Ocean and that about 70 percent sank right away, leaving 1.5 million tons floating off the coast of Japan. Larry Hubble, our Anchorage PMO, has submitted an article on how some of this debris has reached the Southern Alaska Coastlines and how NOAA is coordinating new interagency reporting and monitoring efforts that will provide critical information on the location of the marine debris generated by the tsunami. I am sure some of you have already been approached by our PMO's to provide sightings to the appropriate email address at DisasterDebris@noaa.gov. Please know that your input will provide critical information supporting this effort.

I know there are some questions out there on equipment issues, in particular the older marine barographs. In addition, I am sure there are some AMVER/SEAS vs. TURBOWIN questions and perhaps confusion. Inside this edition I will provide a little input from my desk trying to clear that up and provide some insight. Also....quality, quality, quality. I will touch on that as well.

In this issue you will see that our PMO's were busy presenting awards to our top performers. As always, it is wonderful to see all of the photos of our VOS fleet award winners and your smiling faces! Congratulations to you all!

~ Paula

ON THE COVER:

Tear of Grief

Photo Courtesy of Jim Luciani





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PMO Corner: Tear of Grief

By Jim Luciani, PMO NY/NJ



Imagine this; you are a young Third Officer pulling into Global Terminal in Bayonne New Jersey for the first time. As you approach you notice a large sculpture, a gift to the U.S. from a foreign country, a symbol of hope for future generations. No, it's not the Statue of Liberty, it is a gift from Russia following the 9/11 attacks known as the "Tear of Grief".

The sculpture is a product of Russian artist Zurab Tsereteli. He took a large granite block with a jagged tear in it, from which hangs a 40 ft. stainless steel teardrop. At the base of the sculpture there are eleven granite pieces etched with the names of the victims of the twin tower collapse. As you approach the site you notice the pavers that surround the statue with names and messages from loved ones who lost family members in the attacks.

Finding an appropriate home for the sculpture was not an easy task. He looked for a suitable site from the

Manhattan skyline and zeroed in on the Bayonne site almost in-line with the Statue of Liberty. The site chosen is at the tip of the old Navy base known as Marine Ocean Terminal, which has recently become home to Cruise Ships and Car Carriers and is now known as “Cape Liberty”. The Peninsula is in the midst of redevelopment organized around the construction of residential and commercial districts to create a vibrant waterfront community. The two acre site itself is called Harbor View Park.

The site was dedicated on the sixth anniversary of the 9/11 attacks in a ceremony attended by former President Bill Clinton, the then governor of New Jersey Jon Corzine, New Jerseys two Senators, many other dignitaries and the family and friends of the victims. Few, really know this treasure exists, but it is a wonderful gift and should be better recognized. Perhaps this brief article can help in this regard. ⚓





Photo courtesy of brightroom.com



Bragging rights go to Jim Luciani PMO extraordinaire for completing the Unite Half Marathon at Rutgers University Campus this past April 22nd. Jim was one of nearly 4,500 runners and finished 1657th in a time of 2:10:53. This was his first ever such race. Pictured here you can see that Jim donned a VOS tee that he designed just for this particular race and his new VOS hat, so he really represented well. ⚓



Photo courtesy of brightroom.com

Topics

By Paula Rychtar

MARINE BAROGRAPHS

The old style marine barographs that require the stylus (pens) and paper will be phased out. As they break, the PMO's will collect them and replace them with a digital style barograph rather than repair the existing older style. This is due to a couple of reasons; the cost of replacing the expensive chart drive that often breaks from over winding. Since this type of barograph is no longer manufactured, parts and labor on these can get quite pricey. The price of a new, high precision digital replacement costs less than the repairs/replacement for the older style marine barograph. Also, the paper (barograms) is no longer manufactured at the original location so we had to find someone who would print the barograms and the quality did not hold up...thus the "bleed-o-grams". There is a fine layer of wax on the barograms, this wax begins to deteriorate with time and that is when the paper becomes porous and will "draw" the ink right out of the stylus creating this dark thick blob. Usually, the pens will then run out of ink before the paper needs changed. Those pens are quite expensive as well and we just can't keep up with the demand due to this problem. So, the digitals will solve all of these problems. ⚓

E-LOGBOOK SOFTWARE

AmverSEAS vs. TURBOWIN.... SEAS software is undergoing a major "tune-up". As you know, VOS is an international program and we have to adhere to strict guidelines set forth by the World Meteorological Organization (WMO). Under such guidelines, we must be compliant on the software that we use in regards to archival methods as well as metadata collection and how it is coded and transmitted. Sadly, our SEAS has become outdated over the last couple years. With that said, until our software updates are completed and compliant, VOS should begin incorporating the use of the foreign VOS software, TURBOWIN. TURBOWIN was developed by the Dutch and it is compliant. So it has been asked that the PMO's offer this software when a ship needs upgrading, becomes recruited, or just preference of the captain/crew. PMO's can install and train crew members on the use of TURBOWIN, as they are knowledgeable on the use of this e-logbook. Of course, if you insist and just want SEAS, we will be glad to keep the AMVER/SEAS on your ship for producing your observations. The main need for compliancy with the WMO is if your ship wants to participate in the VOSclim program, you must use TURBOWIN in that case. If you would like to download TURBOWIN and give it a go, <http://www.knmi.nl/turbowin/download.html>. ⚓

QUALITY, QUALITY, QUALITY

Keeping in subject with compliancy issues, it must be noted and addressed that marine ship observations have specific guidelines for data collection. Temperatures are to be observed and recorded in **whole degrees and tenths of degrees**. Sea Level Pressure (PPPP) is the atmospheric pressure reported in **tenths of a hectopascal (hPa)/millibar(mb)**. We are seeing more and more ships sending in weather observations with these units rounded to the nearest whole number. This is incorrect and it has a profound and a direct effect on all products stemming from these data. This is becoming a real quality issue/problem, so please, report the correct format. ⚓

Storm Surges in New York Harbor During Hurricane Irene

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

Abstract: During the passage of Hurricane Irene in 2011, New York Harbor experienced about 4 feet (above the normal astronomical tides) setup produced by persistent and strong easterly winds (up to 30 knots) and 6 ft set-down by even stronger westerly winds (up to 40 kts). It is found that approximately 92% of the setup and 72% of the set-down can be explained by the contribution of the wind stress, which can be represented by the wind speed squared. For rapid estimation of these wind stress tides, analytical formulas are also provided for operational use.

1. Introduction

According to Avila and Cangialosi (2011), Hurricane Irene (see Fig.1) produced a storm surge of 3 to 6 feet caused hundreds of millions of dollars in property damage in New York City and Long Island. Tropical-storm-force winds along with heavy rains resulted in power outages for up to 3 million residents that lasted to around 1 week, mainly across

Connecticut and Long Island.

The purposes of this report are first to characterize the nature of the storm surge including positive surge or setup and negative surge or set-down in New York Harbor and then to provide analytical formulas to explain these water-level changes during Irene. Data employed in this study are based on National Data Buoy Center (NDBC) and National Ocean Service (NOS) Stations (see Fig.2) available online at www.ndbc.noaa.gov.

2. Met-Ocean Conditions at Sandy Hook, NJ

Since Sandy Hook, NJ, is located near the entrance of New York Harbor, the meteorological and oceanographic (met-ocean) conditions are presented first in Figs.3 through 5. As shown in Fig.3, the minimum sea level pressure at Sandy Hook (see Station SDHN4 in Fig.2) was 962.9 mb occurred at 7:36 AM LST on Aug 28. Fig.4 indicates that before 7:36 AM, the winds were persistently from the east. After the

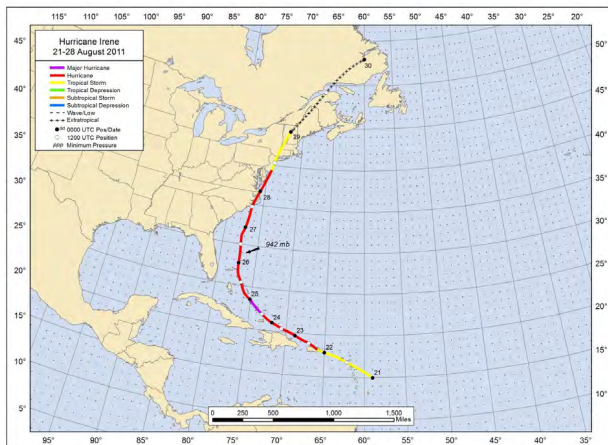
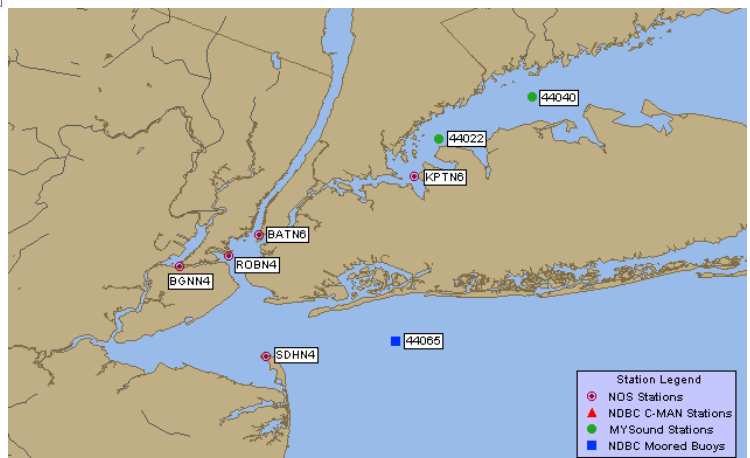


Fig.1. Storm track of Hurricane Irene in 2011. (See www.nhc.noaa.gov).

Fig.2. NOAA Stations in the Port of New York and New Jersey area during Irene.



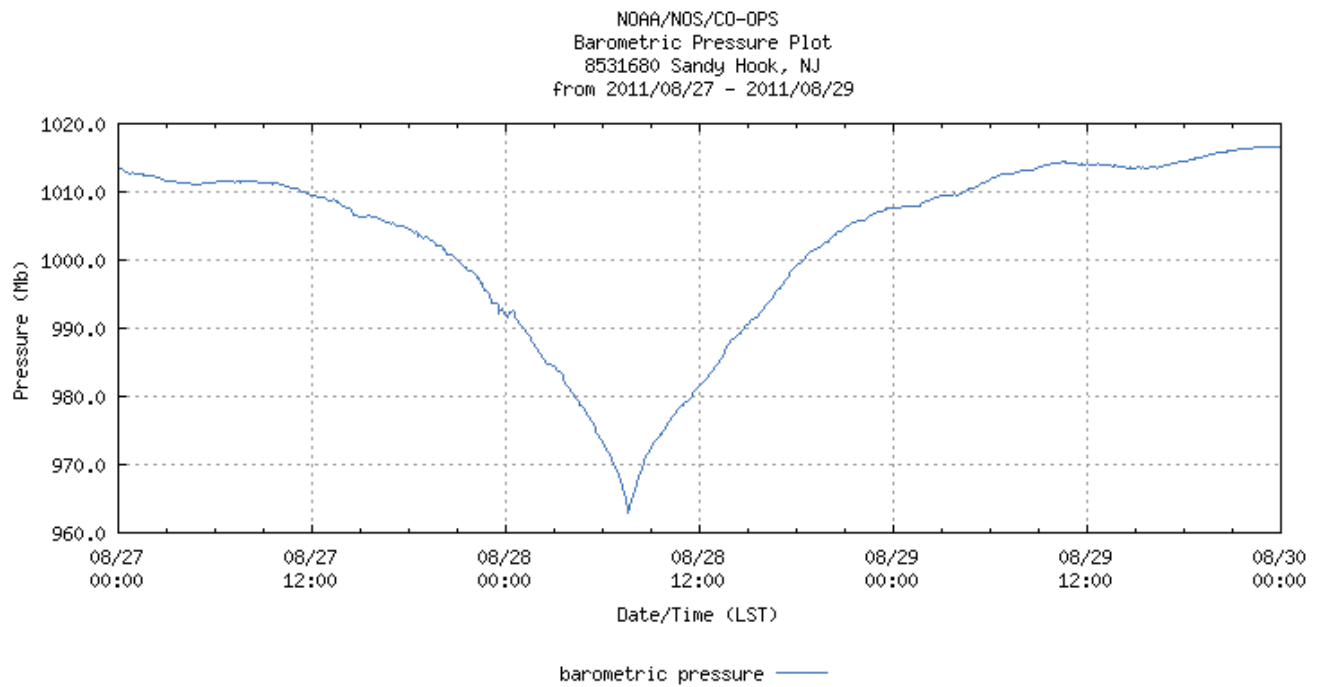


Fig.3. Barometric pressure measurement at Sandy Hook, NJ, during Irene.

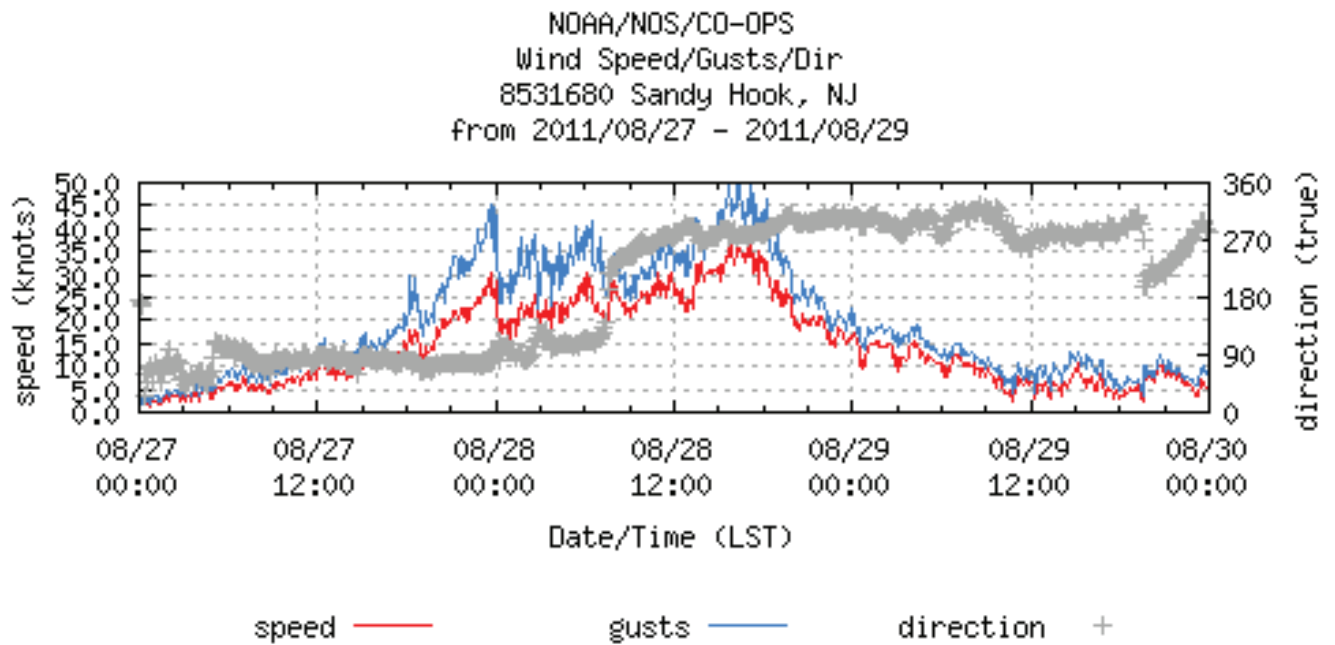


Fig.4. Wind speed, gust, and direction at Sandy Hook, NJ, during Irene.

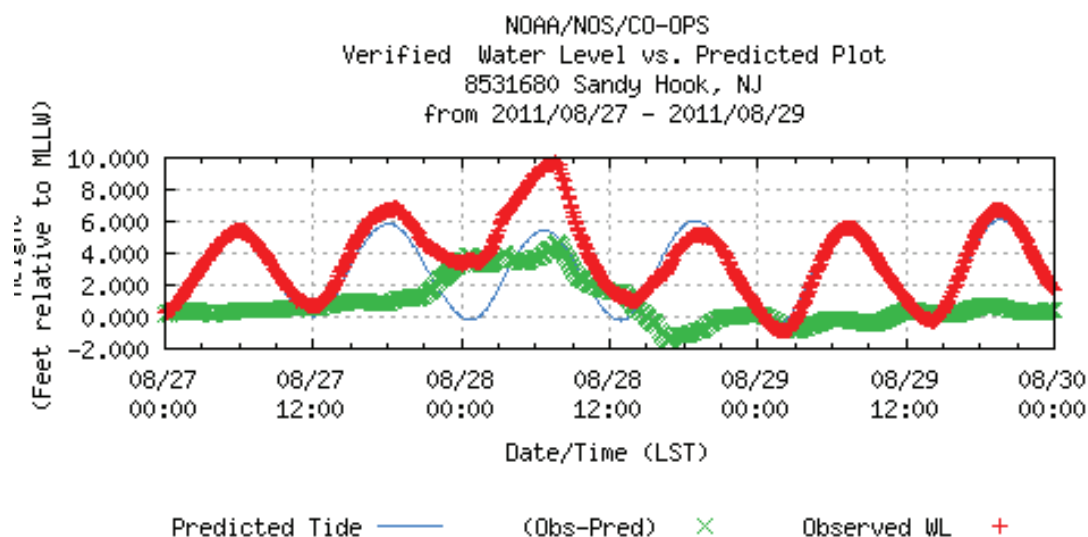


Fig.5. Storm surge in green and storm tide in red (both in ft) at Sandy Hook.

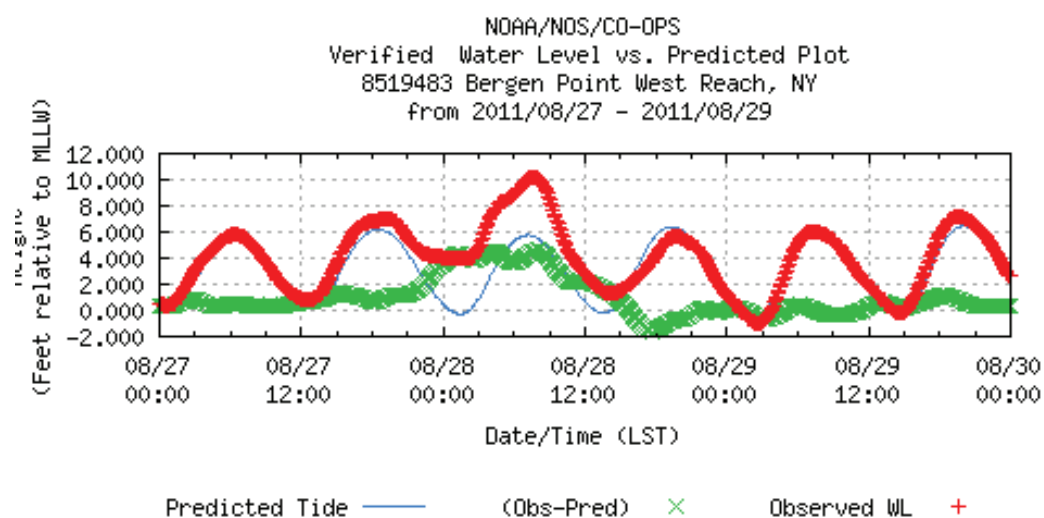


Fig.6. Same as Fig.5 but for Bergen Point Reach, NY

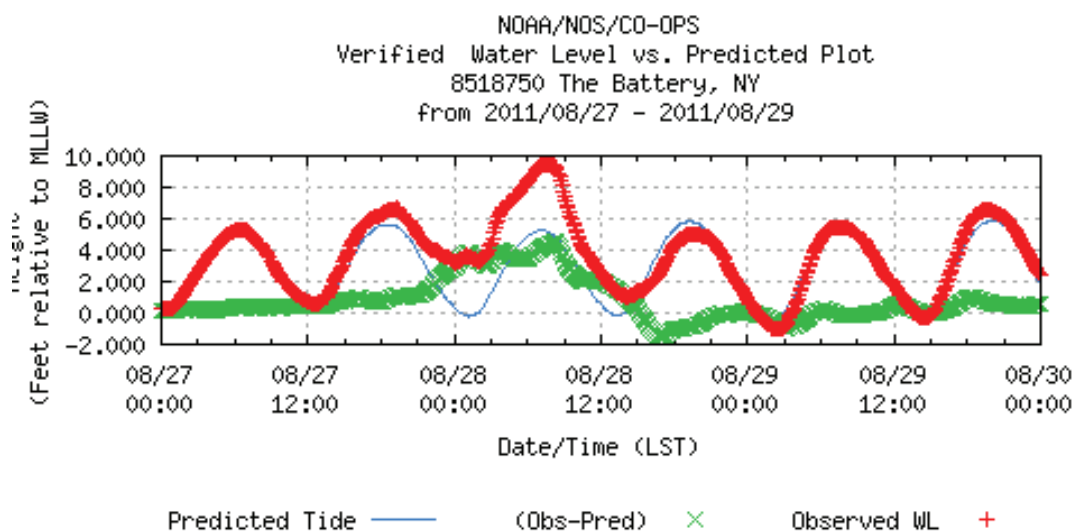


Fig.7. Same as Fig.5 but for The Battery, NY

occurrence of this minimum pressure, the wind direction switched very rapidly to the west with maximum sustained wind speed around 40 kts. The storm surge was 4.63 ft and storm tide 9.75 ft (Fig.5) (see also Avila and Cangialosi, 2011). From these Figures, it is clear that when the strong wind (up to 30 kts) blew from the east prior to the occurrence of minimum pressure, we have setup and when the wind direction switched to west with even stronger speed (up to 40 kts) after the occurrence of minimum pressure, we have set-down. The setup can reach 4 ft whereas the set-down can amount to 6 ft.

3. Conditions at Upper Reaches

Storm surge conditions at Bergen Point Reach and The Battery, NY (see Figs.5 and 6, respectively) are very similar to that at Sandy Hook, NJ. There were about 4 ft setup (positive storm surge) and 6 ft set-down (negative storm surge) in both places, indicating that the entire New York Harbor was experiencing the same effects of storm surge during the passage of Irene. Note that after the maximum set-down, the Harbor experienced some effects of seiches.

4. 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.

This physical explanation can also be applied to both setup and set-down in New York Harbor as analyzed in Figs. 8 and 9, respectively. Fig.8 shows that

For setup estimation in New York Harbor, for S in ft and V in kts, we have

$$S = 0.0028V^2 \quad (2)$$

With $R^2 = 0.92$

Or $R = 0.96$

Where R is the correlation coefficient and R^2 is the coefficient of determination.

In other words, since over 90% of the total variation in storm surge can be explained by the wind stress for setup, our physical explanation is acceptable.

Similarly, for set-down estimation, according to Fig.9, we have

$$S = -0.0052 V^2 + 1.1 \quad (3)$$

With $R^2 = 0.72$

Or $R = 0.85$

Since the set-down is forced by the westerly winds which blew mainly from land to the sea, the lower value of R^2 may be affected by regional geography including urbanization. However, since 72% of the total variation in set-down can be explained by the wind stress, Equation (3) is a useful formula for operation application (for rapid estimation of negative storm surge or set-down).

5. Conclusions

Characteristics of the storm surge in New York Harbor during the passage Hurricane Irene in 2011 have been analyzed. It is shown that when strong and persistent winds (up to 30 kts) blew from the east, there were about 4 ft increase in water level (above the normal astronomical tides) over the entire harbor. On the other hand, when the wind direction switched to the west with even stronger winds (up to 40 kts), the entire harbor experienced about 6 ft water level decrease (above the astronomical tide). It is found that these positive surges or setups and negative surges or set-downs are related most importantly to the wind stress (as represented by the wind speed squared). For rapid estimations of these water level changes, analytical formulas are also provided in Eq. (2) for setup and Eq. (3) for set-down. ⚓

ACKNOWLEDGMENTS:

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

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Avila, L.A., and J. Cangialosi, 2011: Tropical Cyclone Report, Hurricane Irene, 21-28 August, 2011 (see www.nhc.noaa.gov).

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.

Fig.8. Relationship between setup at Sandy Hook, NJ, and wind speed measurements at NDBC Buoy 44065.

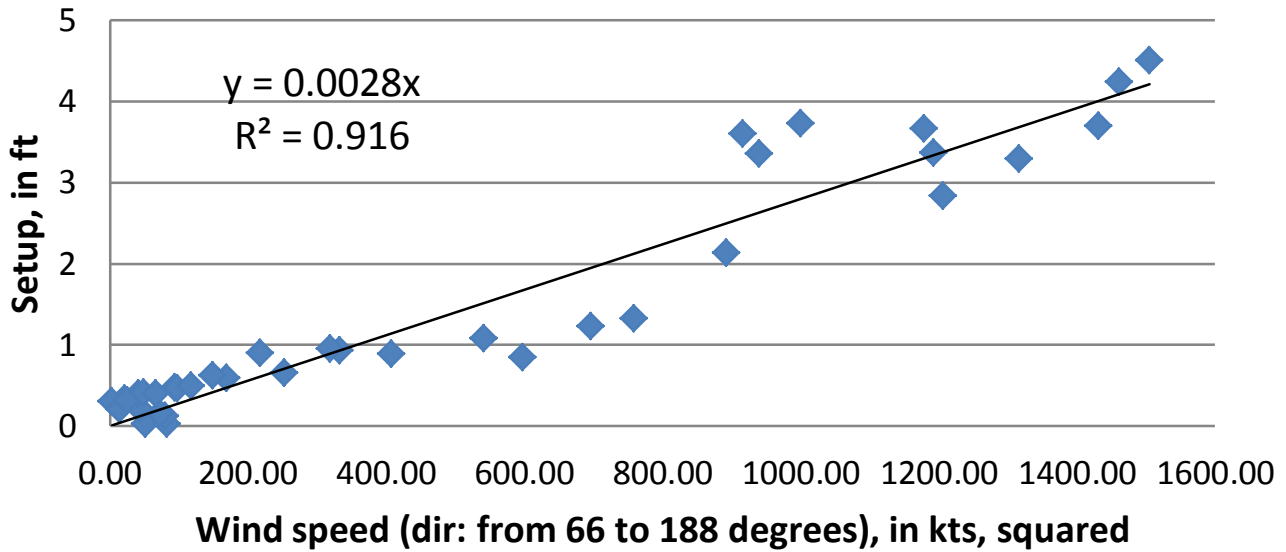
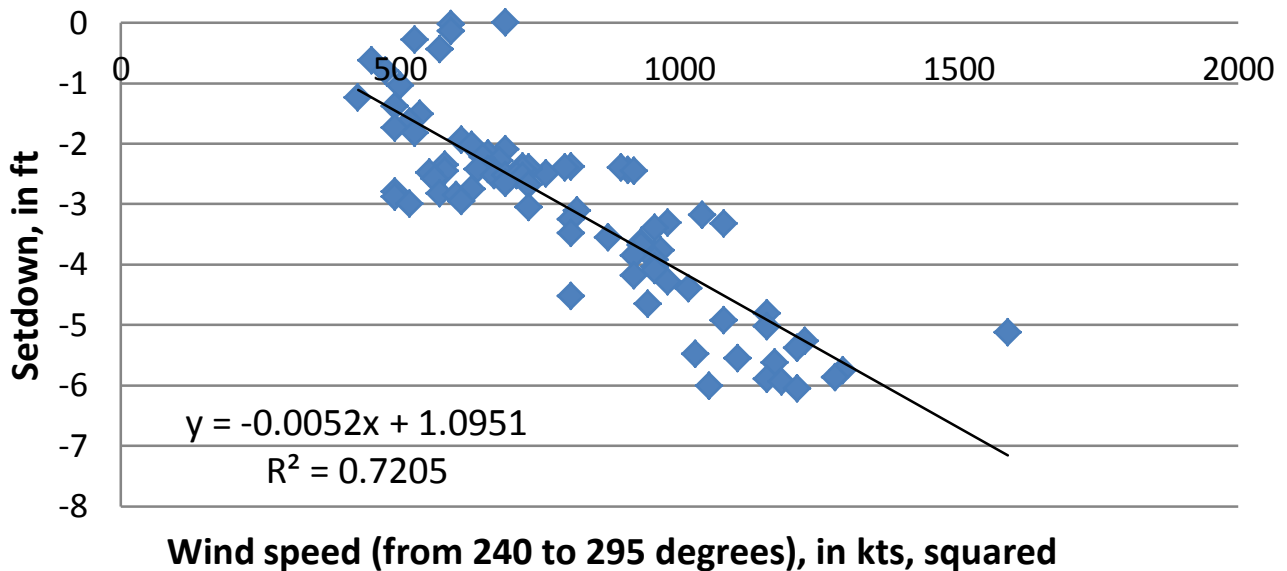


Fig. 9. Relationship between setdown at The Battery, NY, and wind speed squared at Sandy Hook, NJ.



Japan Tsunami Debris

Larry Hubble, Anchorage PMO

As the tsunami that hit Japan in March 2011 receded from land, it washed much of what was in the coastal inundation zone into the ocean. Boats, pieces of smashed buildings, appliances, and plastic, metal, and rubber objects of all shapes and sizes washed into the water either sinking near the shore or floating out to sea. The refuse formed large debris fields captured by satellite imagery and aerial photos of the coastal waters. The Japanese government estimated that the tsunami generated 5 million tons of rubble, but there is no clear understanding of exactly how much debris was swept into the water or what remained afloat. Today, debris fields are no longer clearly visible. Winds and ocean currents scattered the items in the massive North Pacific Ocean.



The rust-streaked "ghost ship" Ryou-Un Maru ship which was set adrift by the Japan tsunami was sunk 180 miles off the Southeast Alaska coast when a smaller U.S. Coast Guard cutter blasted the vessel with cannon fire. It had been deemed a high seas hazard. The derelict fishing vessel sank at 6:15 p.m. on April 15 in 6,000 feet of water.



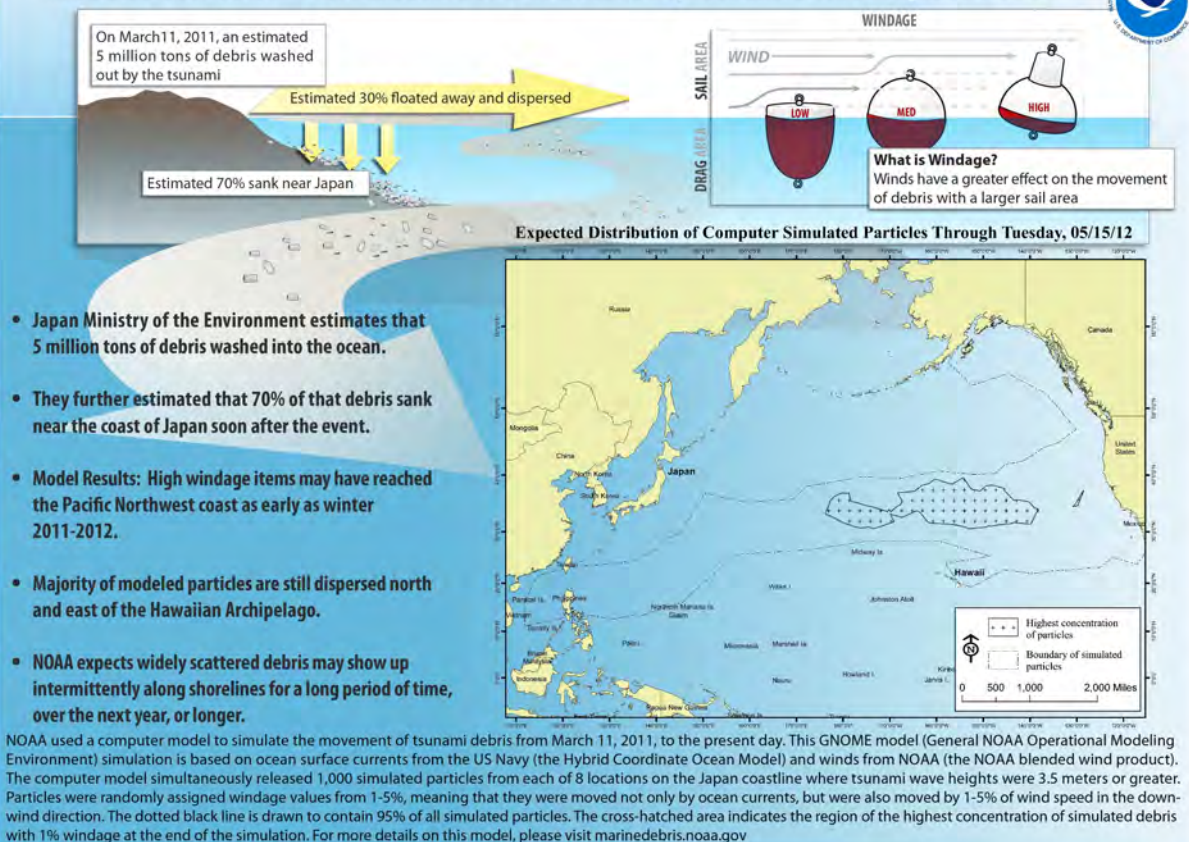
U.S. Pacific Navy Fleet. Debris off the coast of Japan after the tsunami, March 12, 2011





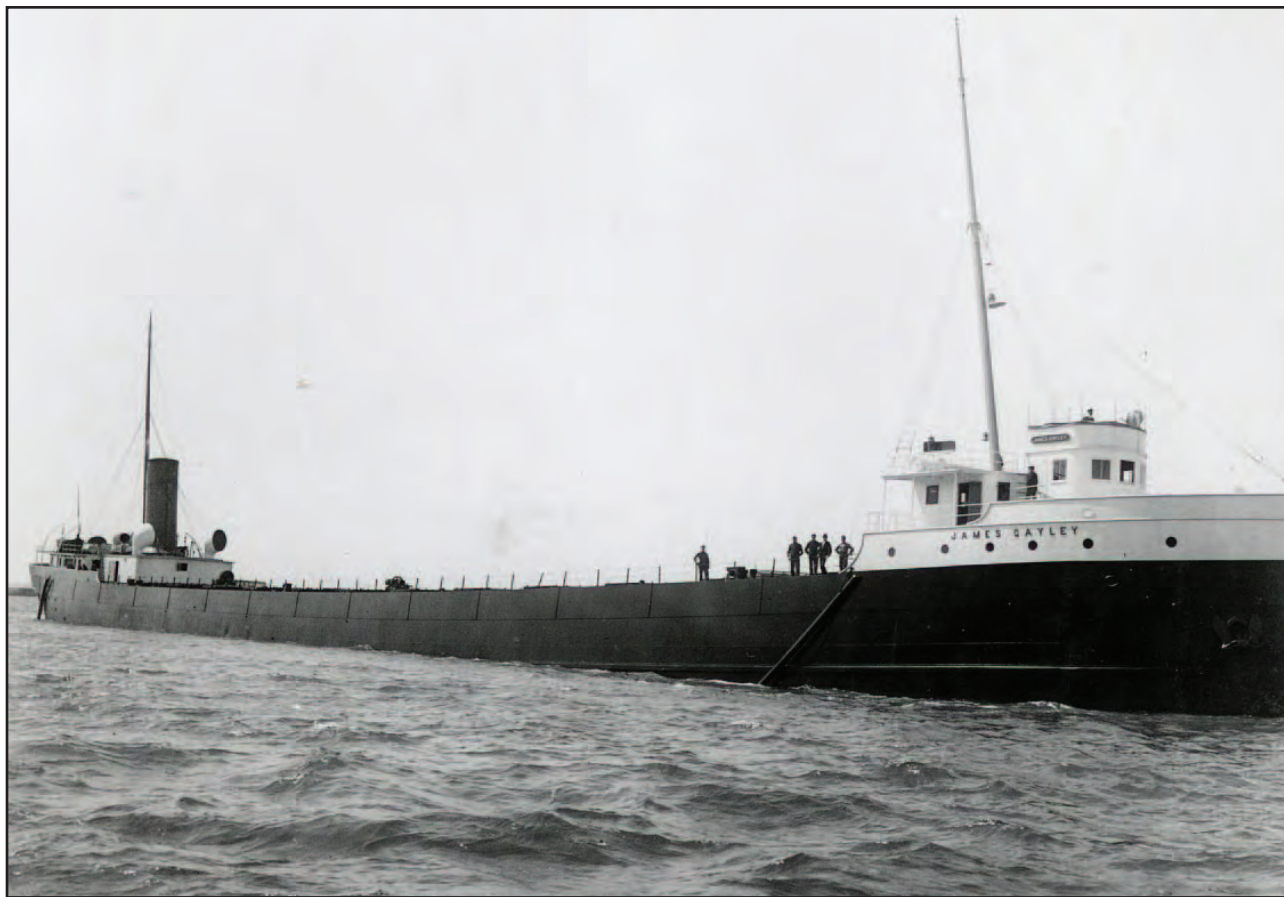
In the spring of 2012, certain southern Alaska Coastlines reported a significant increase in debris washing ashore such as buoys, drums, and Styrofoam. NOAA is coordinating new interagency reporting and monitoring efforts that will provide critical information on the location of the marine debris generated by the tsunami. Ships and beach-goers can report debris sightings and individuals or groups can request shoreline monitoring guides at DisasterDebris@noaa.gov. If possible include the LAT/LON of the sighting, date of sighting, debris description, and photos if possible. NOAA has convened experts to review available data and information from computer models and provide their perspectives on debris fate and transport. They are gathering information on significant sighting of marine debris in the North Pacific through NOAA's Office of Marine and Aviation Operations' Pacific fleet, the NOAA NWS Voluntary Observing Ship Program which includes industry long-haul transport vessels, as well as the NOAA Pacific Island Regional Observer Program and their work with the Hawaii longline fishing industry. NOAA is also working with the U.S. Fish and Wildlife Service and the State of Hawaii on shoreline debris monitoring in the Papahānaumokuākea Monument.

Modeled Movement of the Marine Debris Generated by the March 2011 Japan Tsunami



Shipwreck: James Gayley And Rensselaer

By Skip Gillam
Vinland, Ontario, Canada



James Gayley

Heavy fog persisted over Lake Superior on August 7, 1912, but, for the most part, navigation was proceeding as usual. Unfortunately, one ship lost its way and ended up in the wrong channel with tragic consequences.

The ore laden steamer RENSSELAER, part of the Pittsburgh Steamship Division of United States Steel, was downbound towing the barge GEORGE H. CORLISS when it collided with the JAMES GAYLEY, carrying a cargo of coal for the Cleveland Steamship Co.. The latter was struck on the port side, about 65 feet behind the bow and sank within about 16 minutes. The accident

occurred at 0200 hours about 43 miles east of Manitou Light and there were no casualties. The loss of the ship and cargo were reported as \$330,000.

The JAMES GAYLEY had been built by the Globe Iron Works at Cleveland, Ohio. This was one of the many excellent shipyards around the Great Lakes at the start of the 20th Century but it no longer exists. The ship was 436 feet in overall length by 50 feet at the beam and tonnage was registered at 4,777 gross. A steamship, it was active in the ore, grain and coal trades for a decade before being lost a century ago. It is shown in a photo from the

collection of the Marine Historical Society of Detroit.

RENSSELAER had also been built at Cleveland only two years earlier. It was a product of the Cleveland Shipbuilding Company. This ship was launched on July 26, 1900, and completed for Andrew Carnegie and his Pittsburgh Steamship Company. Many of their ships honored prominent northeastern universities and the RENSSELAER was named for the school in Troy, NY.

This vessel was 474 feet long by 50 feet at the beam and was registered at 5,124 gross tons. It was powered

by a 2,000 horsepower quadruple expansion engine and was often used to tow consort barges of similar size and capacity. With the creation of United States Steel, via mergers in 1901, this bulk carrier joined their Pittsburgh Steamship Division, the largest fleet of vessels on the Great Lakes.

RENSSELAER had two other mishaps as well but of far less serious consequence. There was a minor collision with the big bulk freighter SHENANGO entering Ashtabula harbor on July 26, 1910, but the bill for this accident came to only about \$1,000. Then, on June 4, 1912, the ship was in a collision with the

WILLIAM H. GRATWICK in Lake Erie off Conneaut, Ohio. This time one a lifeboat was carried away and a cabin was damaged. RENSSELAER is shown in a photo courtesy of Ron Beaupre.

The collision of August 7, 1912, left RENSSELAER leaking with bow damage. Temporary repairs allowed the ship to sail safely to Marquette, MI. After permanent work on the hull damage, the vessel resumed service later in the year and remained active for U.S. Steel into World War Two.

The United States Maritime Commission built 16 new lakers during

World War Two to accommodate the need for increased ore for making steel. These new ships were traded to existing fleets, for outdated tonnage but most of the older ships were chartered back to the previous owners for the duration of hostilities. As a result, title to RENSSELAER moved to the U.S.M.C. but it continued in the Pittsburgh SS Co. fleet. It was laid up at Erie, PA in 1946 and sold to the Steel Company of Canada for scrap. RENSSELAER arrived in Hamilton, ON, under tow, in December 1946 and was broken up in 1947 ⚓



Rensselaer

"The Ships" featuring The Storm

"Stolt Surf" in the North Pacific, 1977



"Stolt Surf" - in Texas City 1978 - (Photography by Karsten Petersen ©)



"Stolt Surf" - photographed in 1990 (Photography by Karsten Petersen ©)

Stolt Surf Details

Type: Chemical Tanker
 Owners: Stolt-Nielsen Inc.
 Builder: Eriksbergs, Gothenburg, Sweden, - 1970
 Length Overall: 169,621 M (556' 6")
 Breath Moulded: 24,766 M (81' 3")
 Deadweight: 23,299 LT

A storm - - - -

All sailors have experienced storms at sea, which are quite different from the land based versions, mainly because another element is heavily involved, - water!

And on the open ocean, there is nothing to stop or deflect the howling wind. Also it makes a big difference, that your base is not solid ground,- but a moving platform,- a ship!

On the great oceans of the world, the height of the storm waves usually does not exceed 8 to 10 meters, which actually is quite impressive.

Image a "wall" of water at the same height as a two story house coming crashing towards you with an incredible speed! it can be quite awesome to experience!

But what happens if the waves are NOT just 10 meters tall, but more likely 20 meters??? Or more???

It is VERY seldom that huge waves over 20 meters are developed, - and normally sailors do not even see them, because ships nowadays will try to avoid such conditions by altering course in good time before the storm hits.

But not so with the good ship "Stolt Surf", - which on a voyage across the Pacific from Singapore to Portland -, headed straight into a very strong hurricane, - went through its center -, and was hit again on the other side of the "eye"!

"Stolt Surf" was a chemical tanker, and on October 4th. 1977, she left Singapore on a routine voyage across the Pacific ocean to Portland, USA.

Already in those days it was normal to obtain advice from a weather routing agency before such a voyage was commenced, and in this case the advice was to keep far to the north, in order to avoid the possibility of hitting a developing storm further south.

I clearly remember Captain Oddenes saying that going north at this time of the year is quite contrary to what his sailor experience would have recommended. But since the routing agency had all sorts of satellites and computers to help them to predict the weather, - Captain Oddenes decided to take their advice and go north, instead of following his own instincts and years of experience!

What a big mistake!

On October 18th. 1977, the barometer started to drop and the weather worsened.

This continued through Oct. 19, and by late that night the wind had increased to a force 9/10, - the sea was becoming rough, and the sea/air temperature had fallen to 8°C and 10°C, respectively.

The ships steering speed was at that time down to about 5 knots, and in the early hours of Oct. 20, - as the condition really started to worsen -, the auto pilot was switched off, and manual steering was introduced.

What happened next is best described in extracts from the log:

0700:

One life raft on forecandle taken overboard by heavy seas.

0930:

Heavy sea broke windows of the officers mess and bar, damaging furniture. Galley and electrical system were shut down due to short circuit. Crew's accomodation heavily damaged due to emergency doors broken. Two gangways broken, completely damaged.

1600:

Two steel doors on the forecandle broke down and washed overboard.

We had simply ended up right in the middle of the strongest storm I have ever experienced in my almost 40 years at sea! Also Captain Oddenes had never seen anything like it!

At this point I have to tell you, that taking photographs at the peak of a hurricane at sea is almost impossible. You simply cannot see anything! The howling wind tears off the top of the waves, and sends it as a horizontal spray across the ocean covering everything in a white mist. Also the portholes and windows on the ship are hit by this spray, and prevents all possibilities for having a clear look at what is going on! All shapes and forms are simply gone, and all you hear is a deafening noise from the sea and the wind! Also it is quite dark due to the dense clouds covering the sky. To go outside in order to have a better look is of course totally ruled out! You would fly away as a kite - - - -

However,- when the wind calms down, it is possible to take some fantastic wave pictures, because the waves usually first calm down long time after the wind has died.

The following pictures here are mostly taken from the bridge through a rotating window, that throws off the water, so that the visibility appears quite good!

During the storm, it soon became clear, that this one was NOT one of the usual storms with "only" 10 meter waves!

No,- on the "Stolt Surf" we experienced to our astonishment, that when the big waves came crashing towards us, we had to look UP in order to see the top of the waves! And that was from the bridge deck, which is already 22 meters above sea level!

22 meters!!! And still you had to look UP!!! Crazy!

Several times we also experienced huge waves coming crashing OVER the bridge,- more than 22 meters up -, and in some very, very long seconds we only saw sea water through the bridge windows, while tons of water ran off the bridge roof,- the so-called "monkey island"!

In those terrible moments we did not know if the ship was below the water or still floating! But like a miracle the windows cleared again, and "Stolt Surf" continued its brave battle against the waves.

Of course the ship suffered quite a lot of damage that showed the incredible force of the water. Three of the solid tank hatches on deck were simply torn off, and so was the door to the pump room, in spite of the fact that such a door is made of steel, and secured with 6 strong dogs! Straight pipelines on deck were now S-shaped, - and likewise the gangways, which was found as a mess of folded and twisted metal.

Steam pipes were torn off and electric cables found ripped apart. Inside the ship, all decks except the deck just below the bridge were filled with water through smashed windows and doors, and the crashing waves smashed furniture and wall paneling to pulp, so that only naked steel bulkheads were left at the crew's quarters down below!

After the storm the electricity supply to many parts of the accommodation was knocked out as well, so the cook had to prepare food for 35 men on a single portable cooking plate, but never had a meal tasted better on any ship!

Surprisingly enough nobody were seriously injured, so we were indeed very, very lucky with only 4 sailors injured, of which only one had to stay in hospital for some time, but a couple of weeks later he was able to join his ship again.

However, if we did not manage to keep the diesels running, so that we could control the ship, we would for sure have ended up sideways in the waves. If that happened, the ship would possibly have turned upside down.

In that case it is frightening to think about what could have happened, but I have good reasons to believe, that none of us might have survived, if we lost the engines!!

However,- the faithful and highly reliable B&W engine never let us down, and just kept running and running and running!

About one week later, - October 26th. -, the ship arrived in port, - crippled but safe -, and it is quite "fun" to think about the BIG problems the shore people now faced, when they wanted to get onboard!

All our gangways were totally smashed or lost in the storm, and apparently it was now considered to be the biggest problem in the world, that company people and U.S. Coast Guard representatives could not easily get onboard due to the missing gangways!

They simply did not understand, that the damaged gangways in fact was a VERY minor "problem" compared to the real problems the ship and its crew had experienced during and after this unusual strong storm!

The ship was heavily damaged, and could very easily have sunk, but to the shore people it was much more a concern, that the red carpet were NOT immediately laid out for them.

Well,- if any of those people see the following pictures, then maybe they will understand, that there really was far more important things in the world than the lack of a readily available gangway!

But for now,- please have a look at the following pages, and try to "feel" the tremendous power such extreme storm waves have.

However, photographs will never be able to create the true feeling of actually being there, right in the middle of an unusual strong storm.

What is missing is the extreme sounds of the ship, - the howling wind and crashing waves, the violent movements, the fatigue, and not at least the feeling of being very, very small and insignificant in this truly great, and awesome performance of "Mother Nature"!



1977-11-041

Party on the poop deck, Capt. Oddenes is entertained by the crew (Photography by Karsten Petersen ©)



1977-11-044

"Stolt Surf" — the happiest of crews — party on the poop deck celebrating a successful turnaround in Asia, and preparing for a 3 week long Pacific crossing (Photography by Karsten Petersen ©)



1977-11-049

My right hand, 1st. Engineer Gunnar Eriksen -, being entertained by Filipino sailor (Photography by Karsten Petersen ©)



1977-11-051

"Stolt Surf" — Great harmony — From left to right: Motorman Olivar, our local Eric Clapton, Captain Guttorm Oddenes, 1st. Engineer Gunnar Eriksen (Photography by Karsten Petersen ©)



1977-11-54

and the party goes on, nobody knows what is coming, only joy and happiness (Photography by Karsten Petersen ©)

A few days later, a storm coming up - - -



1977-11-066

"Stolt Surf" — into a storm, the wind picking up, like so many times before (Photography by Karsten Petersen ©)



1977-11-067

"Stolt Surf" — but just routine for a sailor, really nothing to worry about, but of course all work on deck is impossible (Photography by Karsten Petersen ©)



1977-11-070

"Stolt Surf" — it's getting worse, waves getting bigger, but still absolutely nothing to worry about, NOT YET! (Photography by Karsten Petersen ©)



1977-11-071

"Stolt Surf" — quite a spectacular sight, and it's still possible to be outside to photograph the scenery (Photography by Karsten Petersen ©)



"Stolt Surf" — but it gets worse and worse, the waves just grow and grow, it does not stop, and it's impossible to stay outside (Photography by Karsten Petersen ©)

- and the gates to hell opened -

1977-11-072

"Stolt Surf" — in the storm, some quite impressive waves ahead (Photography by Karsten Petersen ©)



"Stolt Surf" — the ocean "boils" (Photography by Karsten Petersen ©)



1977-11-078

"Stolt Surf" — misty sea spray flying in the air (Photography by Karsten Petersen ©)



1977-11-079

"Stolt Surf" — diving into a wall of water (Photography by Karsten Petersen ©)





"Stolt Surf" — it becomes quite obvious, that this is NOT one of those normal storms sailors often meet, this one means problems (Photography by Karsten Petersen ©)



"Stolt Surf" — big problems, a giant wall of water ahead (Photography by Karsten Petersen ©)

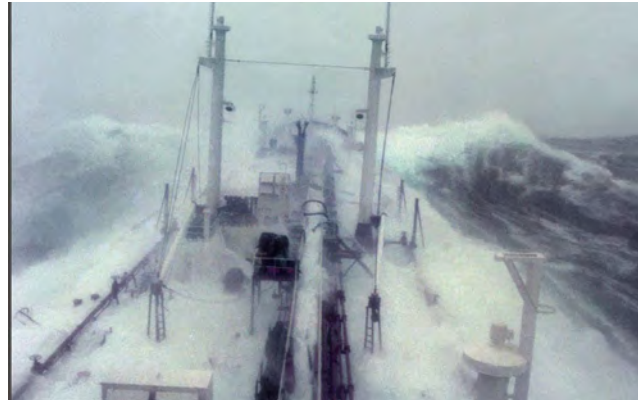


1977-11-082
"Stolt Surf" — crashing through huge mountains of water (Photography by Karsten Petersen ©)



"Stolt Surf" — and they keep coming and coming, bigger and bigger, certainly NOT like in a normal routine storm (Photography by Karsten Petersen ©)

"Stolt Surf" — "Stolt Surf" was like a toy ship in waves like this (Photography by Karsten Petersen ©)



"Stolt Surf" — crashing through another monster wave (photography by Karsten Petersen ©)



"Stolt Surf" — white ghost (Photography by Karsten Petersen ©)



"Stolt Surf" — in the storm (Photography by Karsten Petersen ©)



Eventually "Stolt Surf" managed to survive the first part of the storm.

Very sudden the wind died, and it became unusual quiet compared to the deafening roar of wind and waves we experienced during the period before . . .

But it was a false sense of security.

"Stolt Surf" had just entered the "eye" of the hurricane, giving us a short time of relative peace, then the hurricane came back again, and once again we entered the "Gates of Hell" as if the ocean would not let go its grip of us! But "Stolt Surf" won, and "Mother Nature" lost, at least for this time —

Now time to inspect the ship for damage - - -

The Damage Done



"Stolt Surf" — the most important room, the Officer's Bar. The bar suffered relatively little damage because it is placed on the second highest deck. (Photography by Karsten Petersen ©)



"Stolt Surf" — Another view of the Officer's Bar. (The "priceless" painting of "Madonna" by famous Norwegian artist Edward Munch has survived.) (Photography by Karsten Petersen ©)

"Stolt Surf" — However, the deck below with the Senior Officer's Mess was not spared — moments later the still intact chairs on the picture were totally smashed to bits and pieces (Photography by Karsten Petersen ©)



"Stolt Surf" — the Senior Officer's Mess again, furniture now turning into pulp (Photography by Karsten Petersen ©)



"Stolt Surf" — another shot of the Senior Officer's Mess (Photography by Karsten Petersen ©)



"Stolt Surf" — the Junior Officer's Mess, a depressing sight. Chief Steward Erik Schønnemann tries to save whatever can be saved (Photography by Karsten Petersen ©)





"Stolt Surf" — Junior Officer's Mess with damaged ceiling, the waves must have been quite violent here (Photography by Karsten Petersen ©)



"Stolt Surf" — alleyways inside she ship filled with water (Photography by Karsten Petersen ©)



"Stolt Surf" — a very depressing look into the Chief Engineer's Office, my office (Photography by Karsten Petersen ©)

"Stolt Surf" — water filled alleyways — Chief Steward Erik Schønnemann inspecting the crew's accommodation for damage (Photography by Karsten Petersen ©)



"Stolt Surf" — Chief Steward Erik Schønnemann tries to save the furniture in his cabin. (Photography by Karsten Petersen ©)



"Stolt Surf" — After the storm, Captain Guttorm Oddenes inspecting the damage. Here looking, deeply concerned, into the Officer's Bar (Photography by Karsten Petersen ©)



"Stolt Surf" — wreckage on the catwalk (Photography by Karsten Petersen ©)





"Stolt Surf" — the stairway down below to the crew's quarters. Take note of the damaged wall panels. (Photography by Karsten Petersen ©)



"Stolt Surf" — one of the gangways curled up on the catwalk
(Photography by Karsten Petersen ©)



"Stolt Surf" — but "Stolt Surf" made it and could continue
towards Portland, U.S.A. (Photography by Karsten Petersen ©)



"Stolt Surf" — over an ocean of extreme beauty (Photography
by Karsten Petersen ©)



PRODUCT CHANGES FOR THE 2012 HURRICANE SEASON

The National Hurricane Center will implement the following changes to its text and graphical products for the 2012 hurricane season, effective May 15:

Changes:

1) Saffir-Simpson Hurricane Wind Scale modification.

A minor modification of the Saffir-Simpson Hurricane Wind Scale (SSHWS) will be made to resolve rounding issues associated with the conversion of units from knots to mph which are used for wind speed. This change follows a public comment period conducted in 2011.

Category 4 on the SSHWS will be broadened by one mph at each end of the range, yielding a new range of 130-156 mph. This will also result in a minor modification of the Category 3 and 5 wind speed thresholds. The SSHWS will change as follows:

From:

Category 3: 111-130 mph (96-113 kt, 178-209 km/h)

Category 4: 131-155 mph (114-135 kt, 210-249 km/h)

Category 5: 156 mph or higher (136 kt or higher, 250 km/h or higher)

To:

Category 3: 111-129 mph (96-112 kt, 178-208 km/h)

Category 4: 130-156 mph (113-136 kt, 209-251 km/h)

Category 5: 157 mph or higher (137 kt or higher, 252 km/h or higher)

There will be no change to the wind speeds currently assigned to Categories 1 and 2.

With this change, a 115-kt Category 4 hurricane will have its intensity properly converted to mph and rounded to the nearest 5 mph (130 mph) and remain within the Category 4 mph range.

Important note: Since intensities are assigned using 5-kt increments, neither storms in the historical record nor any future storms will have their SSHWS category changed as a result of this modification to the scale.

The NWS wishes to remind media, partners, and the public that the Saffir-Simpson Hurricane Wind Scale provides information on wind impacts only. The scale does not provide commentary or information on other impacts (i.e., storm surge, rainfall, and tornadoes) or characteristics of tropical cyclones.

Additional information on this change can be found at:

<http://www.nhc.noaa.gov/aboutsshws.php>

Mean Circulation Highlights and Climate Anomalies

January through April 2012

By Anthony Artusa, Meteorologist, Climate Operations Branch,
Climate Prediction Center NCEP/NWS/NOAA

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

January-February 2012

The 500 hPa circulation pattern over the Northern Hemisphere during January featured above average heights over the eastern North Pacific Ocean, the central North Atlantic, and northern Russia. Below average heights were observed over the western North Pacific, Alaska, western Canada, and the eastern Mediterranean Sea (Figure 1). The sea level pressure (SLP) pattern mirrored the mid tropospheric pattern fairly closely (Figure 2).

The mid tropospheric circulation pattern during February 2012 featured above average heights over the eastern North Pacific, much of western and central Canada, the eastern North Atlantic, and north central Russia. Below average heights were observed over the high latitudes of the North Pacific, northern Africa, southern Europe, southern Russia, and eastern Siberia (Figure 3). The SLP map again largely mirrored the mid tropospheric pattern, with the larger anomalies pole ward of 40N latitude (Figure 4).

The Tropics

Mature La Nina conditions continued during January 2012 as sea surface temperature (SST) anomalies remained below -0.5C across much of the eastern and central equatorial Pacific Ocean. The monthly SST index for the El Nino 3.4 region was -1.1C. The oceanic thermocline, measured by the depth of the 20C isotherm, was shallower than average across this same area, with sub-surface temperatures 1-4C below average in January. Atmospheric

convection was enhanced over Indonesia, and suppressed over the western and central Pacific. Equatorial low level easterly trade winds and upper level westerly winds remained stronger than average over the central and west central equatorial Pacific. In February, La Nina weakened as reflected by the development of positive SST anomalies in the eastern Equatorial Pacific, and by a decreased magnitude of the negative SST anomalies in the central Equatorial Pacific. The monthly El Nino index for the El Nino 3.4 region was -0.7C. The oceanic thermocline remained shallower than average in the east central Equatorial Pacific, although corresponding subsurface temperatures were only 1-3C below average. In addition, the equatorial low level easterly trade winds were stronger than average over the central and west central Equatorial Pacific. Convection remained suppressed in the western and central Equatorial Pacific and enhanced across the Indian Ocean and the Philippines.

March-April 2012

The 500 hPa circulation pattern during March 2012 featured above average heights over the central North Pacific, eastern North America and Europe. Below average heights were observed from eastern Siberia and Alaska to western Canada and the US Pacific Northwest, and western Russia (Figure 5). The sea level pressure and anomaly map (Figure 6) resembled the 500 hPa circulation, especially in regard to its zonal wave-3 pattern over the Western Hemisphere.

The month of April was characterized by above average heights over the Arctic Ocean, northwestern and central North America, central North

Atlantic, western and central Russia, and Kamchatka; below average heights over Europe (Figure 7). The SLP and anomaly field (Figure 8) largely mirrored the middle tropospheric circulation pattern, with SLP values as much as 8-10 hPa below average across northwestern Europe.

The March through April period was characterized by more extreme weather and climate conditions. Record and near record breaking temperatures dominated the eastern two-thirds of the contiguous United States and contributed to the warmest March since record keeping began in 1895 (Reference 1). Many areas in the north central United States reported temperatures 11-22 Celsius degrees above average. The March through April period was also very active in regard to multiple severe weather outbreaks (References 1, 2). A few of the more noteworthy episodes include tornadoes in the Dallas-Fort Worth area (April 3), localized hail drifts about a meter deep near Amarillo, Texas (April 11, Reference 3), and large damaging hail in Norfolk, Nebraska (April 14) as well as St. Louis, Missouri (April 28). Severe weather was not limited to the lower 48 states. On March 9 in Hawaii, a rare EF-0 tornado affected the towns of Lanikai and Kailua on Oahu, while in a separate storm, the largest hailstone on record for the state was reported (10.8 cm long, 5.7 cm tall, and 5.1 cm wide). On the flip side, Anchorage, Alaska reported its snowiest winter season on record, with 341.6 cm of snow. The previous record was 336.8 cm, during the winter of 1954-55.

The Tropics

La Nina conditions continued to weaken during March, and transitioned

to ENSO-neutral conditions during April. Positive SST anomalies steadily increased in the eastern Equatorial Pacific during March and April, and the magnitude of negative SST anomalies in the central Equatorial Pacific decreased. The monthly El Nino index for the El Nino 3.4 region was -0.6C (March) and -0.4C (April). The depth of the oceanic thermocline became near average in the east central Pacific in April. The equatorial low level easterly trade winds weakened substantially during the course of the two month period. Convection remained suppressed in the western and central Pacific and enhanced across Indonesia and the Philippines in March. During April however, suppressed convection was observed across the equatorial Indian Ocean and Indonesia. Overall, these oceanic and atmospheric anomalies reflect a transition from La Nina to ENSO-neutral conditions. ⚓

References

1. <http://www.ncdc.noaa.gov/sotc/national/2012/3>
2. <http://www.ncdc.noaa.gov/sotc/national/2012/4>
3. <http://www.srh.noaa.gov/ama/?n=april1survey>

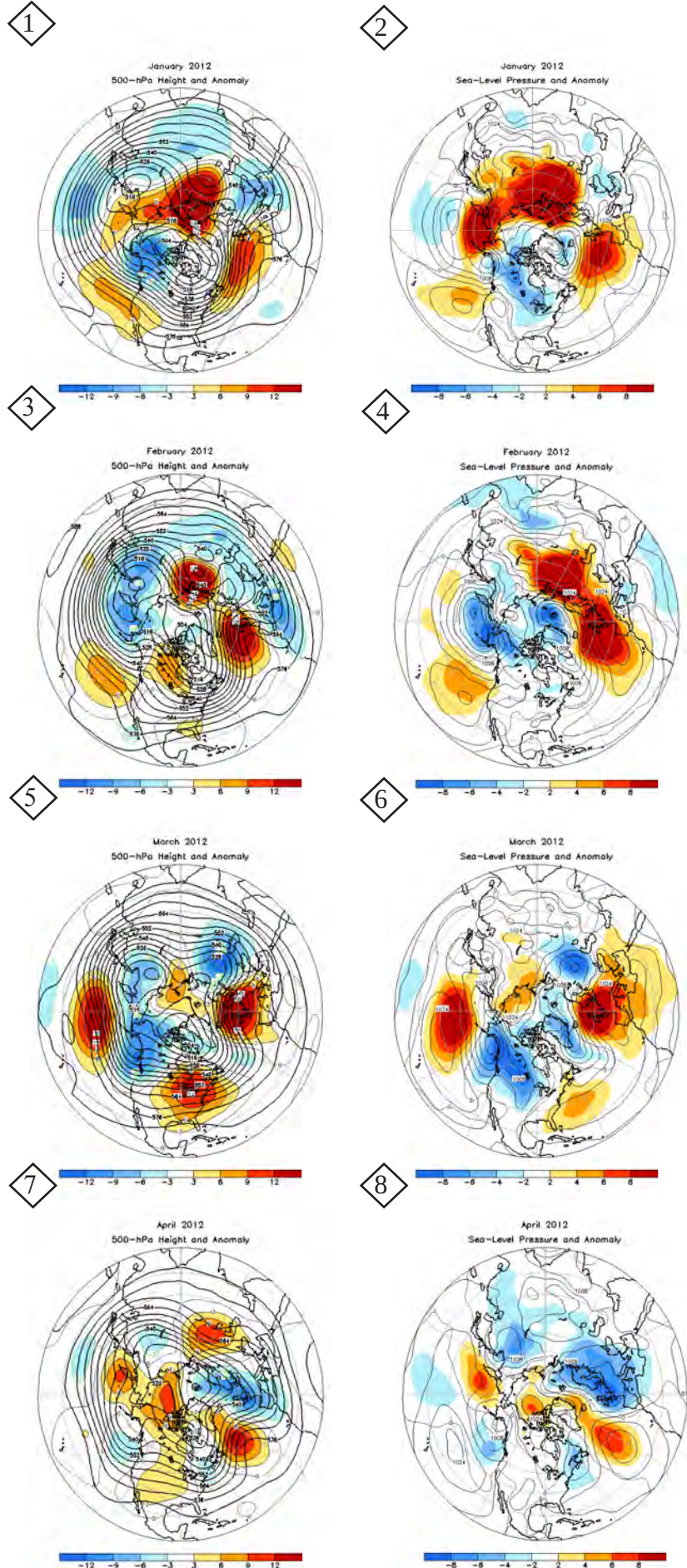
Much of the information used in this article originates from the Climate Diagnostics Bulletin archive: (http://www.cpc.ncep.noaa.gov/products/CDB/CDB_Archive_html/CDB_archive.shtml)

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.

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.



Tropical Atlantic and Tropical East Pacific Areas

January through April 2012

Marshall Huffman and Scott Stripling
Tropical Analysis and Forecast Branch,
National Hurricane Center, Miami, Florida
NOAA National Center for Environmental Prediction

During the four month period from January through April 2012, the National Hurricane Center's (NHC) Tropical Analysis and Forecast Branch (TAFB) issued a total of 27 warnings for gale or storm force winds within their area of responsibility. This was down from the five-year average of 40 warnings during the January through April period, with most of the difference attributed to a decrease in Atlantic warnings.

Tropical North Atlantic Ocean including the Caribbean Sea and the Gulf of Mexico

The TAFB Atlantic High Seas area of responsibility (AOR) extends from 7°N to 31°N west of 35°W, including the

Caribbean Sea and Gulf of Mexico. 14 warnings were issued for this area in 2012. This was down from the January through April five-year average of 23.4 warnings. The lower number of warnings was due to a dominant ridge centered over the eastern half of the United States that was responsible for record warm temperatures. **Figure 1** shows the 90-day mean temperature anomalies over the continental United States ending on 15 Apr 2012. Temperatures averaged between 2-7°F above normal along the Gulf coast during this period. The ridging over the eastern United States extended into the Gulf of Mexico and southwest North Atlantic Ocean and limited the intrusion of strong cold fronts into that portion of the TAFB AOR.

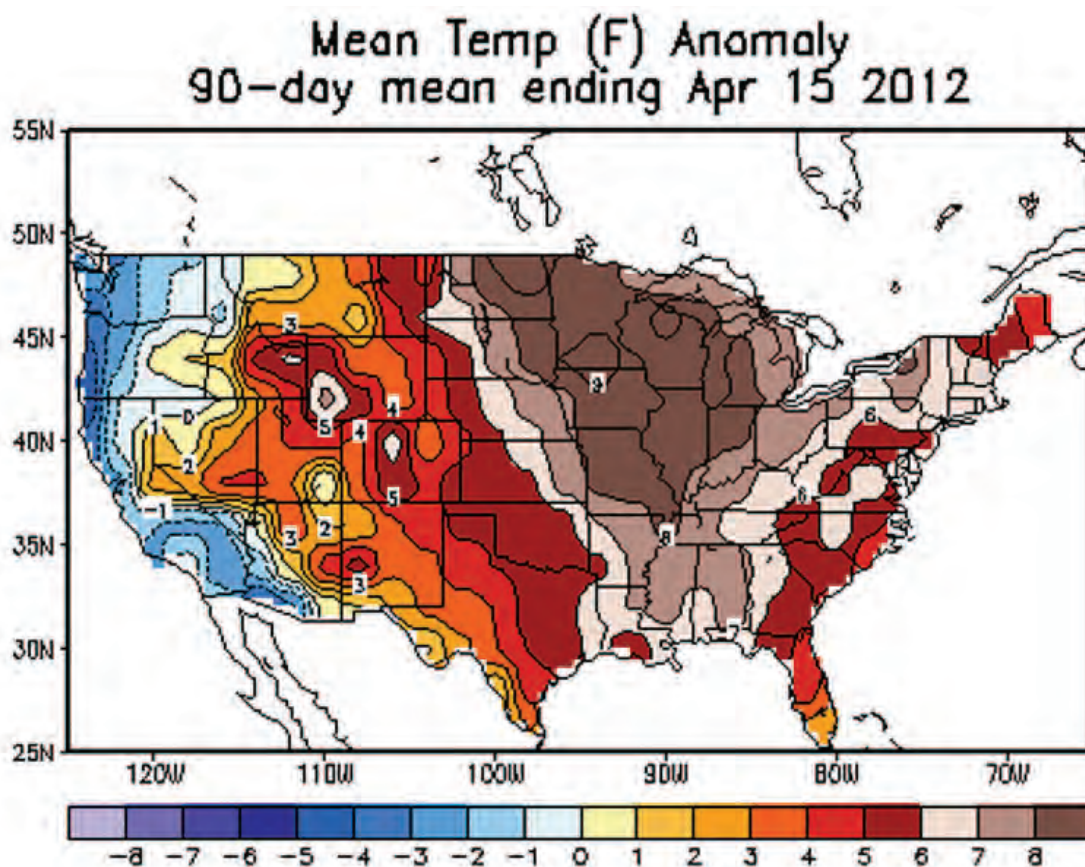


Figure 1. 90-day mean temperature anomalies in degrees Fahrenheit for the continental United States ending 15 Apr 2012 courtesy of the National Weather Service's (NWS) Climate Prediction Center.

Table 1. Non-tropical cyclone warnings issued for the Gulf of Mexico between 01 January 2012 and 30 April 2012.

Onset	Region	Peak Wind Speed	Duration	Forcing
0600 UTC 02 Jan	Western Gulf of Mexico	40 kts	24 hr	West of Cold Front
1800 UTC 12 Jan	Western Gulf of Mexico	35 kts	06 hr	Cold Front
1800 UTC 05 Feb	Western Gulf of Mexico	35 kts	12 hr	West of Cold Front
0000 UTC 25 Feb	North-Central Gulf of Mexico	45 kts	36 hr	West of Cold Front
2100 UTC 03 Mar	Southwest Gulf of Mexico	40 kts	15 hr	West of Cold Front

Gulf of Mexico Gale Warnings

Table 1 details the warnings issued in the Gulf of Mexico from January through April 2012. Only five warning events occurred during this period. They were all gale warnings that were initiated by cold fronts. The two longest-duration events are highlighted below.

The first gale warning of the period began 0600 UTC 02 Jan and lasted 24 hours. This was the second-longest event within the Gulf of Mexico. Several cruise ships transiting from New Orleans to the northwest Caribbean Sea, including the **Carnival Conquest** (3FPQ9), the **Carnival Magic** (3ETA9), and the **Norwegian Spirit** (C6TQ6) reported gale force winds north of the frontal boundary in the vicinity of 28.0N 90.0W between 0600 UTC 02 Jan and 1200 UTC 02 Jan as the cold front was moving off the Texas and Louisiana coastline. Furthermore, partial passes from the MetOp Advanced

SCATterometer (ASCAT) that occurred within the 24 hour warning time-frame are highlighted in **Figure 3**. Gale force winds are noted on this 1630 UTC 02 Jan pass and are mostly confined to the area south of 23°N west of 94°W.

Of the five gale force events in the Gulf, this cold front was accompanied by the strongest surface high pressure, a 1045 hPa high centered near the northeastern portion of the Mexican state of Coahuila as noted on the 1800 UTC 02 Jan Unified Surface Analysis in **Figure 2**. **Figure 2** also shows the position of the cold front as it moved south and east into the southwest North Atlantic Ocean and northwest Caribbean Sea. The front went on to produce gale force conditions within the southwest North Atlantic offshore waters zone.

The longest duration gale force wind event in Gulf of Mexico waters during the first four months of 2012 lasted 36 hours. A strong cold front pushed off the Texas and Louisiana coast

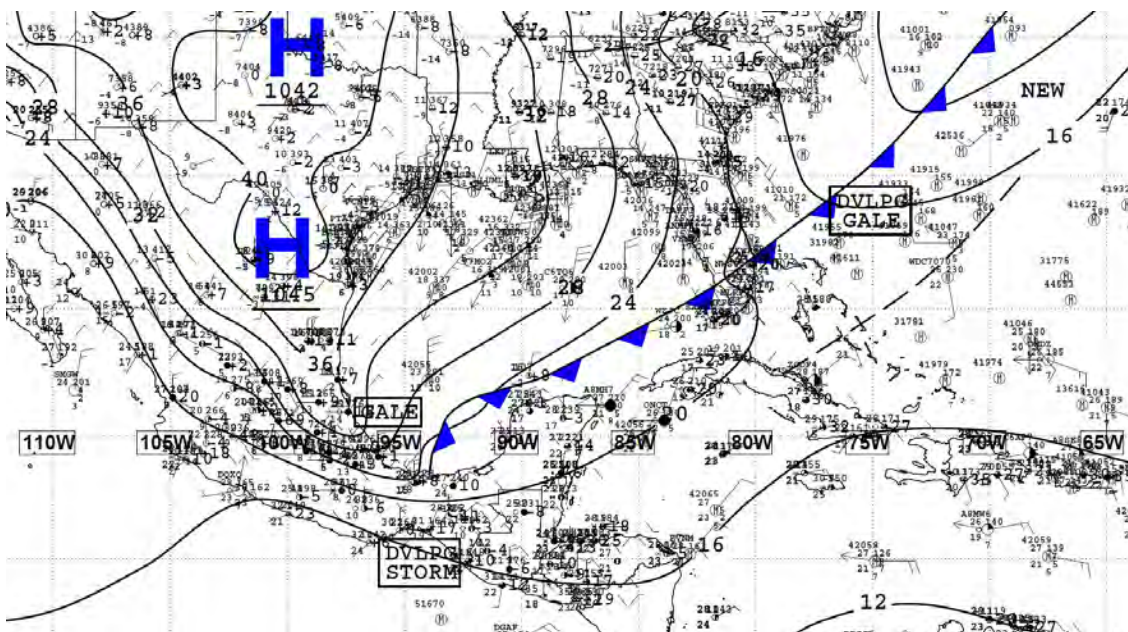


Figure 2. The NWS Unified Surface Analysis from 1800 UTC 02 Jan 2012. Strong high pressure centered over the Rio Grande river valley created a strong pressure gradient over portions of the northern and southwestern Gulf of Mexico north and west of the cold front progressing eastward across the Gulf of Mexico.

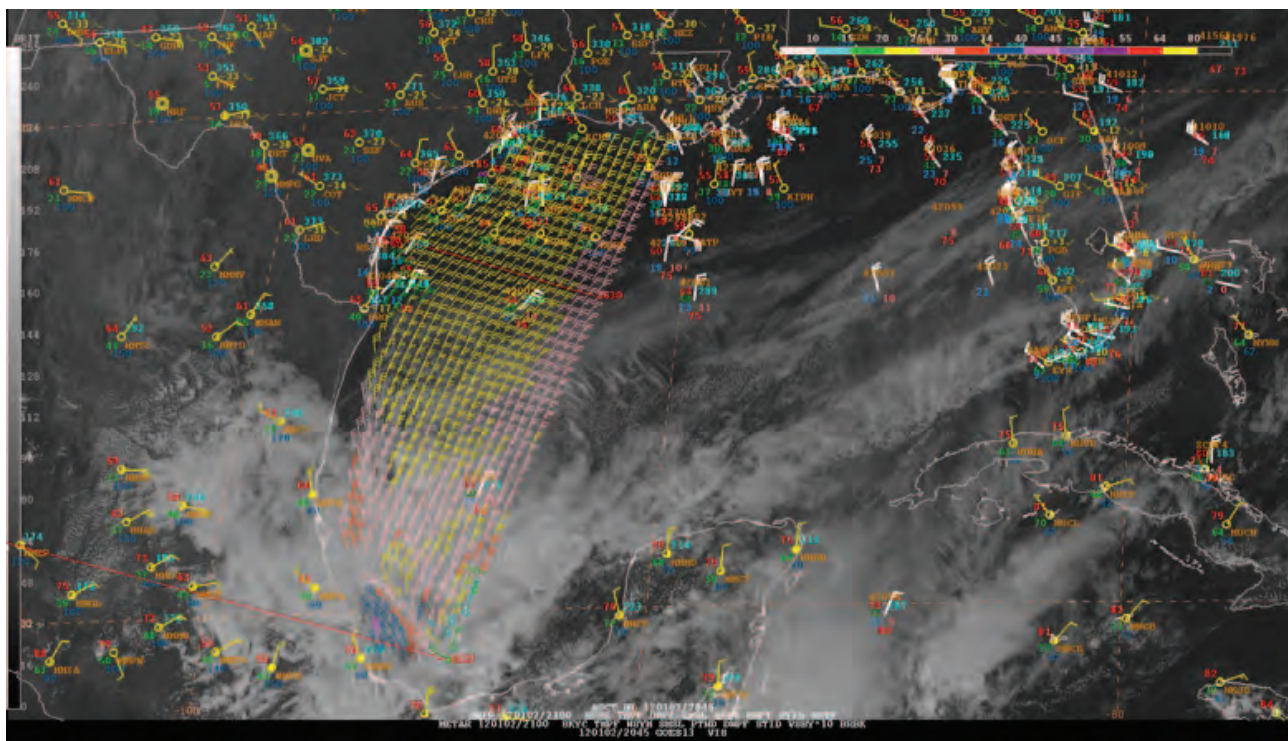


Figure 3. Geostationary Operational Environmental Satellite - East (GOES-E) visible imagery overlaid with ship and land-based observations valid at 2000 UTC 02 Jan as well as the MetOp Advanced SCATterometer (ASCAT) pass from 1630 UTC 02 Jan.

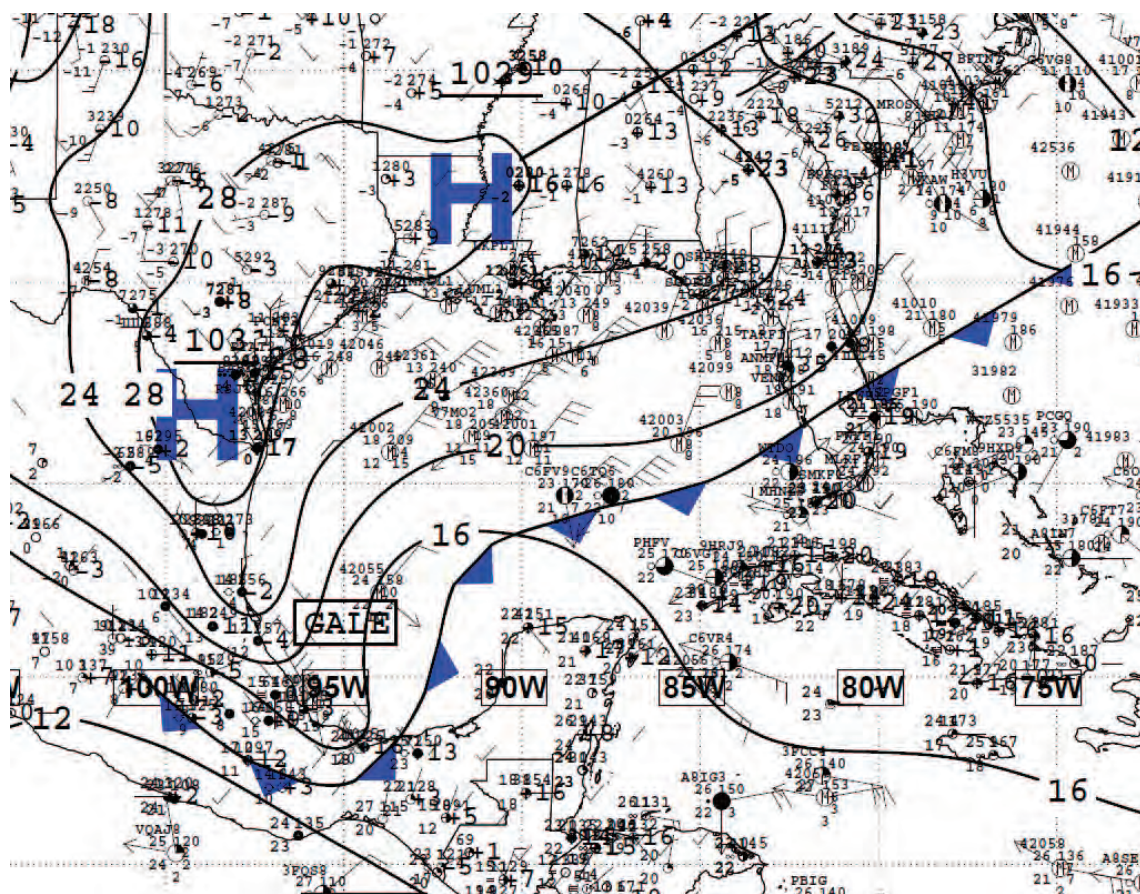


Figure 4. The NWS Unified Surface Analysis from 1200 UTC 25 Feb 12. A strong cold front followed by surface ridging building into the basin from the northwest produced a large area of gale force winds with several ship and buoy observations above 30 kts.

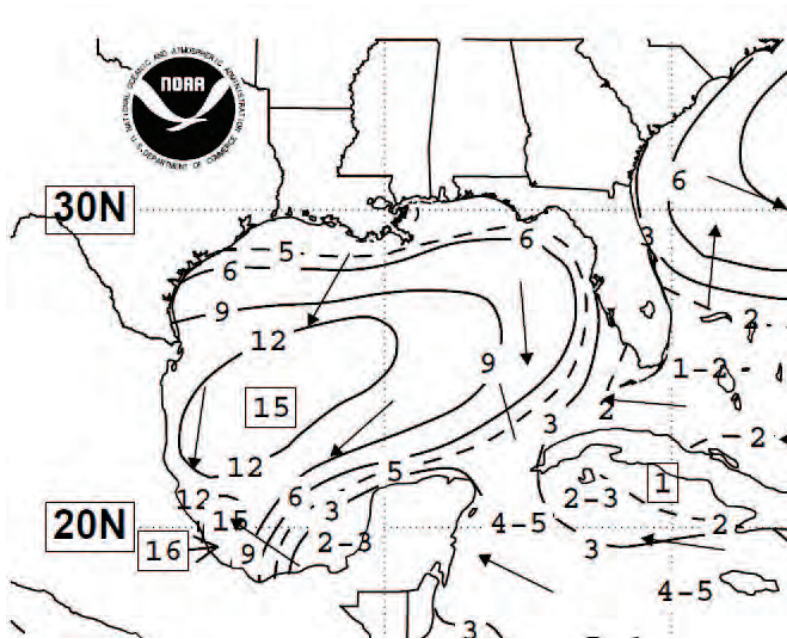


Figure 5. The TAFB Significant Wave Height Analysis for the Gulf of Mexico from 1200 UTC 25 Feb 2012. With a strong cold front extending from the southern Florida Peninsula to the eastern Bay of Campeche, significant wave heights reached 4.6 m (15 ft) over portions of the western Gulf of Mexico.

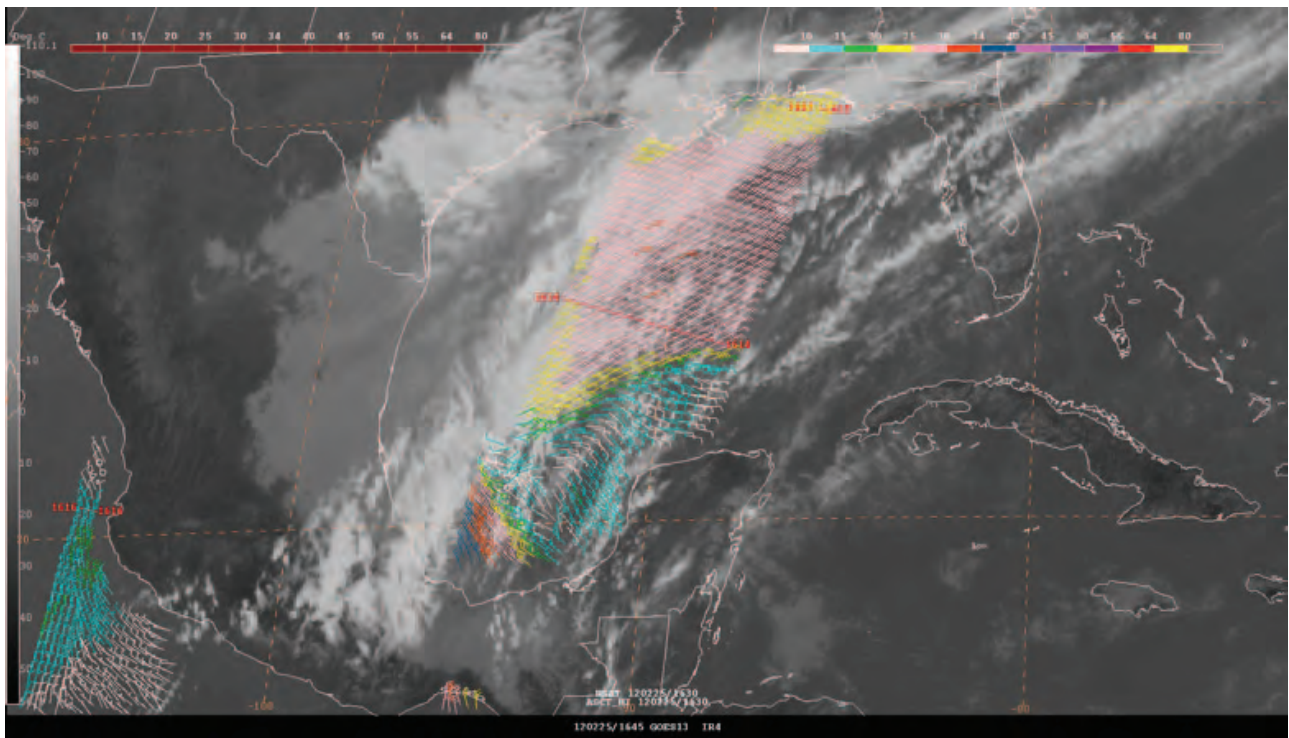


Figure 6. GOES-E infrared imagery valid at 1645 UTC 25 Feb overlaid with the ASCAT pass from 1614 UTC. Note the gale force winds in the western Bay of Campeche and winds to gale force over the north central Gulf of Mexico.

just prior to 1200 UTC 24 Feb and swiftly moved southeast over a majority of the basin as shown in the 1200 UTC 25 Feb Unified Surface Analysis in **Figure 4**. For the duration of the cold front's movement southeast, several ships reported gale force winds to the northwest of the frontal boundary that verified the warning: The **Virginian** (KSPH) reported 37 kts in the vicinity of 27.0°N 90.7°W between 1100 UTC 25 Feb and 1800 UTC 25 Feb, the **Mariner Of The Seas** (C6FV9)

reported 44 kts near 24.7°N 88.8°W at 1200 UTC 25 Feb, the **Norwegian Spirit** (C6TQ6) reported 44 kts near 25.0°N 88.0°W between 1200 UTC and 1500 UTC 25 Feb, the **MSC Flaminia** (DHZR) reported 37 kts in the vicinity of 20.2°N 94.7°W between 2100 UTC 25 Feb and 0000 UTC 26 Feb, and the **Edamgracht** (PDWZ) saw 44 kts at 0000 UTC 26 Feb. Reported sea heights from these ships generally fell within the range that was provided on the 1200 UTC 25 Feb Significant

Table 2. Non-tropical cyclone warnings issued for the Atlantic Ocean between 01 January 2012 and 30 April 2012.

Onset	Region	Peak Wind Speed	Duration	Forcing
0600 UTC 03 Jan	Southwest North Atlantic	40 kts	30 hr	West of Cold Front
1200 UTC 11 Feb	Southwest North Atlantic	35 kts	42 hr	West of Cold Front
0000 UTC 20 Feb	Southwest North Atlantic	35 kts	54 hr	NE of Developing Low
1200 UTC 04 Mar	Southwest North Atlantic	35 kts	18 hr	West of Cold Front
0000 UTC 03 Apr	South-Central North Atlantic	40 kts	36 hr	Cold Front

Wave Height Analysis as seen in **Figure 5**, with a maximum of 4.6 m (15 ft) noted over the western Gulf of Mexico. In addition, ASCAT wind retrievals on 25 Feb saw winds in the 25-34 kts range across the central Gulf of Mexico north of the cold front and in the 34-40 kts range in the southwestern Gulf as seen in **Figure 6**. Of note, NOAA Buoy 42002 moored near 25.8°N 93.7°W reported nearly continuous 15-minute interval 30-34 kts wind speeds during the warning period between 0000 UTC 25 Feb and 1000 UTC 25 Feb.

Atlantic Ocean Gale Warnings

Table 2 describes the five non-tropical warnings issued for the Atlantic Ocean between 01 Jan 2012 and 30 April 2012. Two

of those warnings were attributed to cold fronts that moved eastward from the Gulf of Mexico into the Atlantic Ocean and had prior gale force warnings associated with them in the Gulf of Mexico.

The strongest of two cold fronts that progressed eastward from the Gulf of Mexico into the southwest North Atlantic generated gale force conditions that began on 0600 UTC 03 Jan and lasted for 30 hours. The 0600 UTC 03 Jan Unified Surface Analysis in **Figure 7** shows a cold front extending into the TAFB Atlantic High Seas forecast area west of Bermuda near 31°N 70°W then southwest to western Cuba near 23°N 80°W.

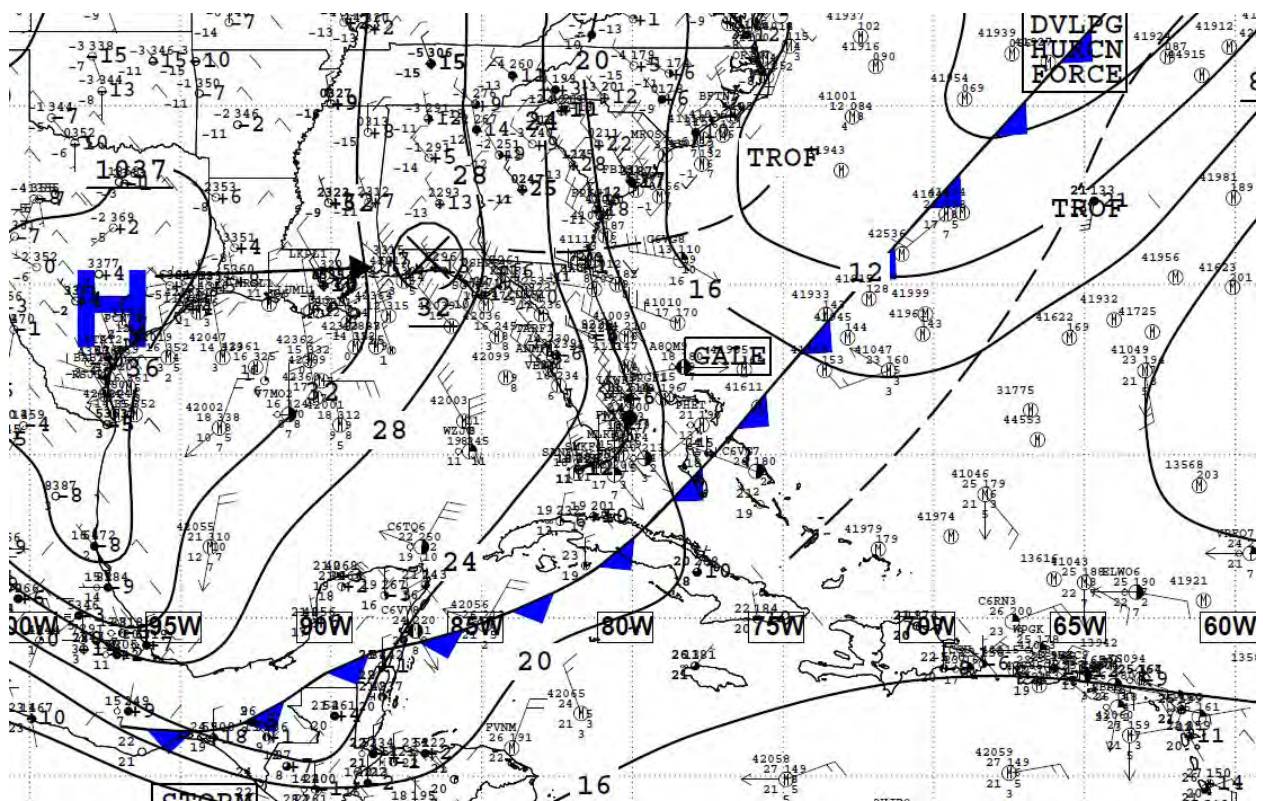


Figure 7. The NWS Unified Surface Analysis from 0600 UTC 03 Jan 2012. A cold front progressed across the Gulf of Mexico and the Florida peninsula into the southwestern North Atlantic waters producing gale force wind conditions north of 27°N west of the front.

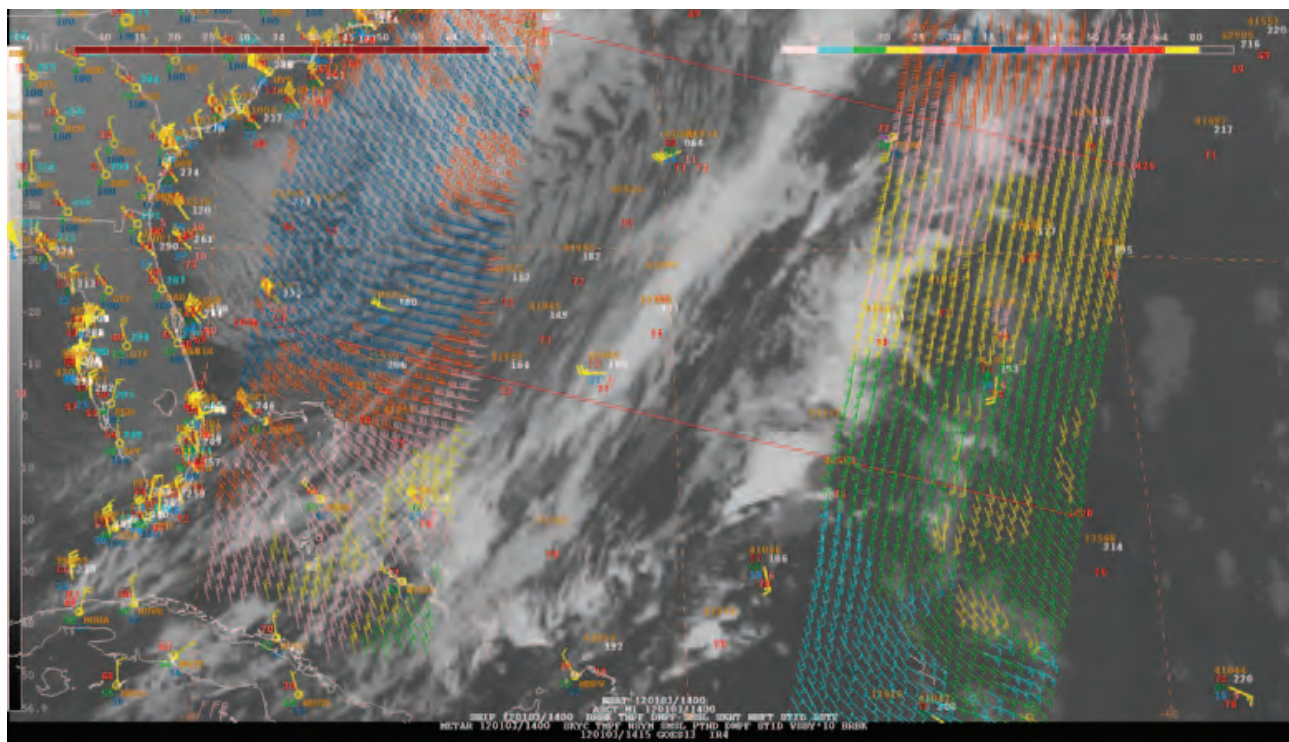


Figure 8. GOES-E infrared imagery overlaid with ship and land-based observations valid at 1400 UTC 03 Jan as well as the ASCAT pass from 1428 UTC 03 Jan. Note the large area of gale force winds off the coast of North Florida.

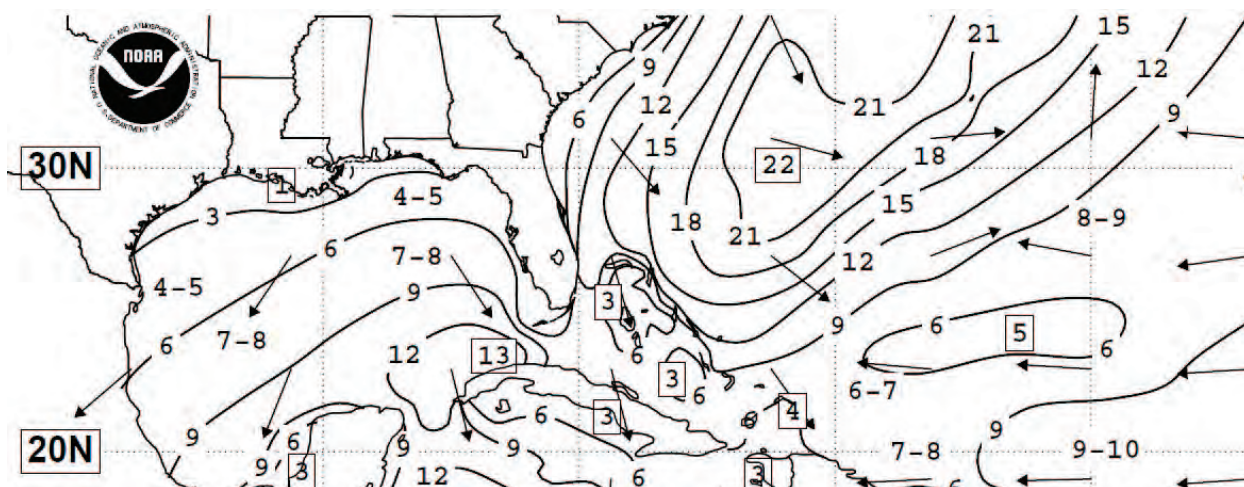


Figure 9. The TAFB Significant Wave Height Analysis for the Southwest North Atlantic from 0000 UTC 04 Jan 2012. A strong cold front extended across the southwest North Atlantic to eastern Cuba. With a large wave generation region extending from the eastern United States coast to near 30°N 70°W, significant wave heights reached a maximum of 6.7 m (22 ft).

The warning area was primarily confined to north of 27°N and west of the cold front. By the end of the warning period, the warning area had begun to slowly drift northeastward and eventually north of the High Seas area as the low-pressure system associated with the front intensified over the western North Atlantic Ocean. Several ships reported gale-force winds within the warning area including the **Norwegian Gem** (C6VG8) for several hours between 0500 UTC 03 Jan and 1400 UTC 03 Jan, the **Henry** (9HA258) in the vicinity of 29.2°N 75.9°W between 1100 UTC 03 Jan and 2300 UTC 03 Jan, the **Fantasy** (H3GS) which reported 40 kts in the vicinity of 27.3°N 79.8°W between 1200 UTC 03 Jan and 1500

UTC 03 Jan, the **Conti Greenland** (A8QM9) near 27.6°N 78.6°W at 1800 UTC 03 Jan, and the **Ha Sklanar** (C6CL6) near 28.0°N 70.6°W at 0300 UTC 04 Jan. The ASCAT pass around 1429 UTC 03 Jan captured wind retrievals in the range of 35-45 kts west of the cold front as seen in **Figure 8**. The TAFB Significant Wave Height Analysis for 0000 UTC 04 Jan (**Figure 9**) indicated a maximum of 6.7 m (22 ft) over the southwestern Atlantic Ocean near 30°N 72°W, with observations supporting the highest seas near the front over the northwestern waters.

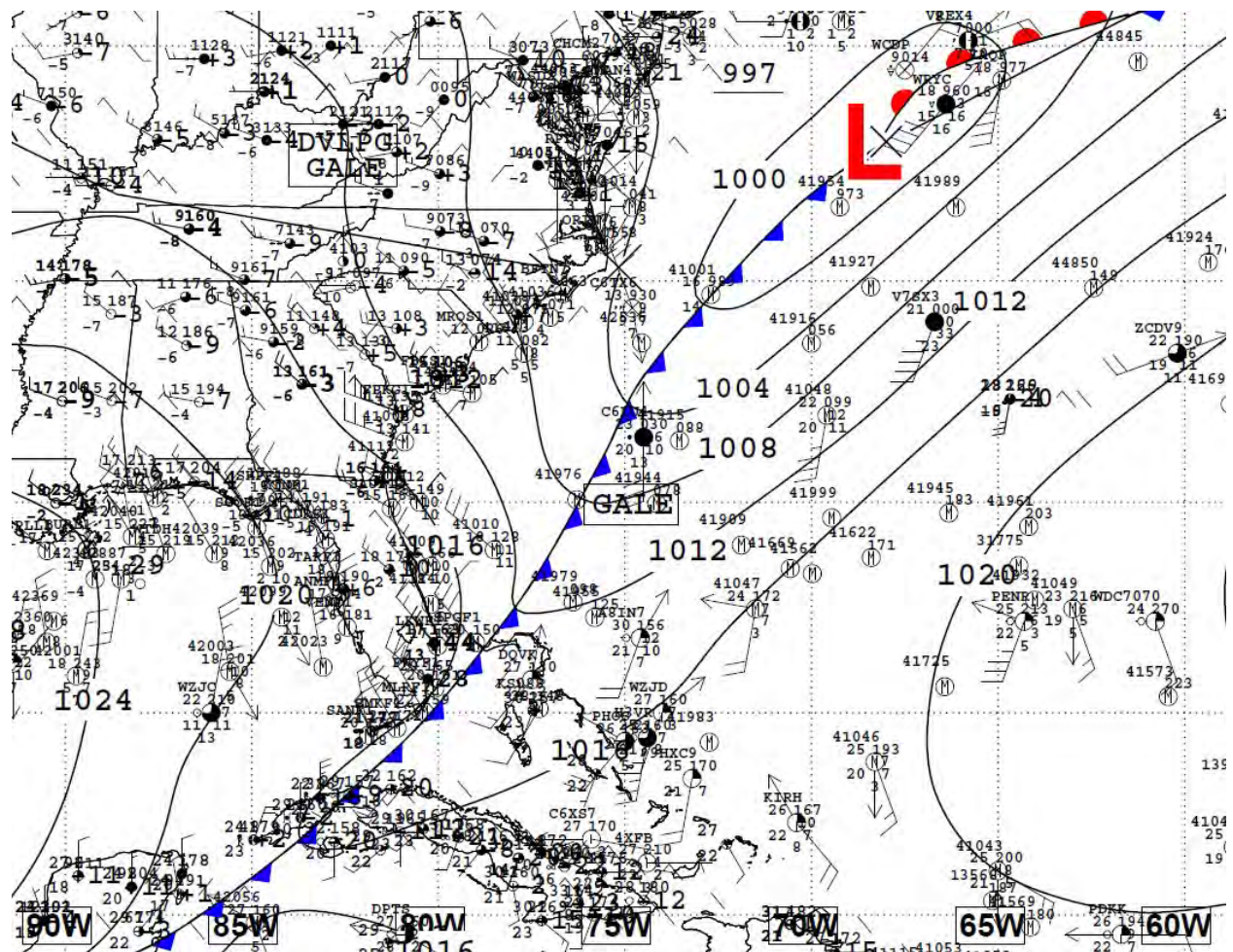


Figure 10. The NWS Unified Surface Analysis from 1800 UTC 04 Mar 2012 shows a developing low pressure area east of the Mid-Atlantic United States coast with an associated cold front extending southwestward to the Florida Straits. Southwesterly gale force winds first occurred east of the front and then northerly gale force winds followed in wake of the front as it moved across the forecast waters of the Southwest North Atlantic.

The shortest-duration gale warning in the Atlantic Ocean forecast area began on 1200 UTC 04 Mar and lasted 18 hours. A developing area of low pressure and its associated cold front moved off the eastern United States coast and provided minimal gale force winds on both sides of the cold front. The NWS Unified Surface Analysis from 1800 UTC 04 Mar is shown in **Figure 10**. One ship, the **Benguela Stream** (BENR), reported southwest winds of 37 kts east of the front near 27.2°N 64.3°W at 1800 UTC 04 Mar. West of the front, five ships located across the southwest North Atlantic reported northerly gale winds: The **Monarch Of The Seas** (C6FZ9) near 26.2°N 78.8°W at 1900 UTC 04 Mar, the **Celebrity Equinox** (9HXD9) in the vicinity of 25.8°N 77.3°W between 2300 UTC 04 Mar and 0300 UTC 05 Mar, the **Norwegian Sky** (C6PZ8) near 26.0°N 78.1°W between 0200 UTC 05 Mar and 0400 UTC 05 Mar, the **Nieuw Amsterdam** (PBWQ) near 26.1°N 78.7°W at 0300 UTC 05 Mar, and the **Norwegian Jewel** (C6TX6) near 30.9°N 77.5°W at 0500 UTC 05 Mar. Also, partial ASCAT wind retrievals reached the 25-30 kts range in a 1507 UTC 04 Mar pass as seen in **Figure 11**.

Caribbean Sea Gale Warnings

Two winter season gale warning events persisted for over 100 hours across the Caribbean Sea. Both of these warning periods were synoptically driven by an increased pressure gradient across the southwest and south-central Caribbean Sea.

The second longest event of the January through April 2012 period lasted 102 hours and began at 0600 UTC on the 31st of January. **Figure 12** shows the Unified Surface Analysis from 1800 UTC on 31 Jan with the designated gale warning area at its greatest extent from 11N to 14N between 73W and 78W. Winds reached minimal gale force during this event with several ships in the vicinity of the area that verified the warning. These ships included the **Island Princess** (ZCDG4), the **Statendam** (PHSG), and the **Coral Princess** (ZCDF4). Seas observed by these ships spanned from 2.1 to 3.7 m (7 to 12 ft).

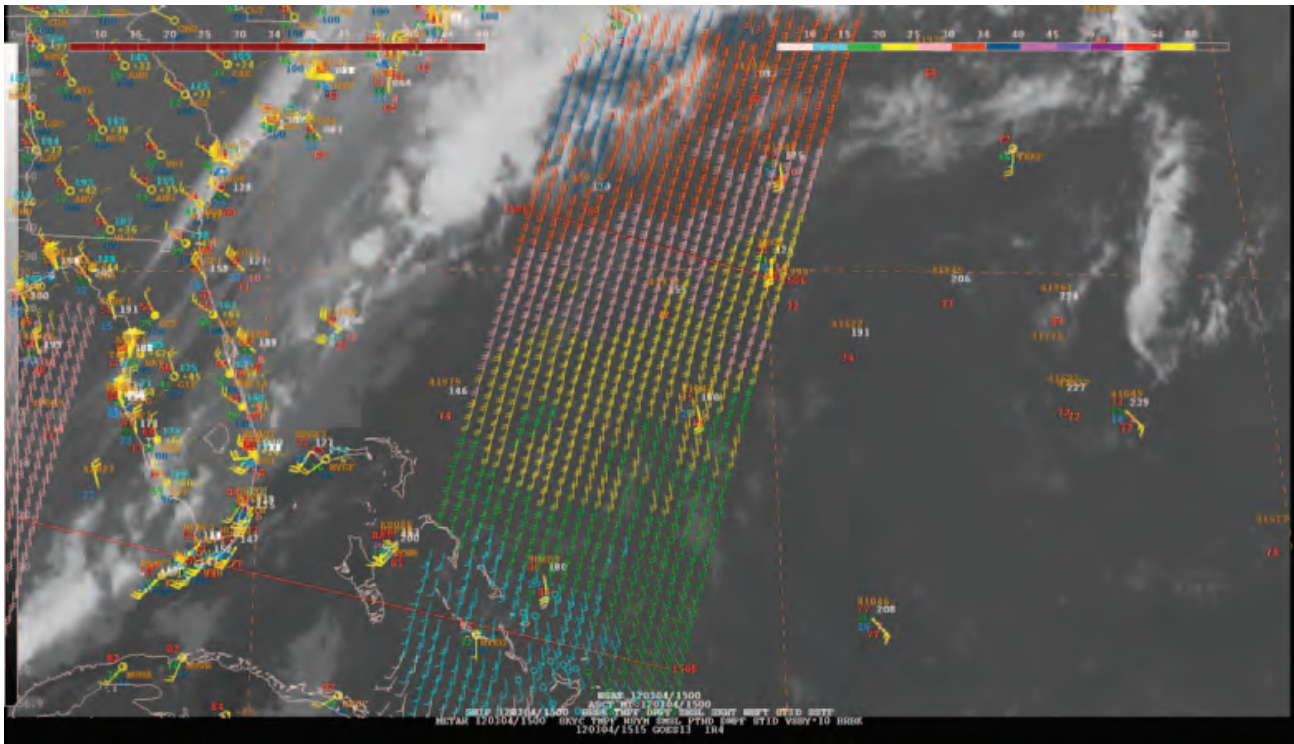


Figure 11. GOES-E infrared imagery overlaid with ship and land-based observations valid around 1500 UTC 04 Mar as well as the ASCAT pass valid 1507 UTC 04 Mar.

Table 3. Non-tropical warnings issued for the Caribbean Sea between 01 January 2012 and 30 April 2012.

Onset	Region	Peak Wind Speed	Duration	Forcing
1800 UTC 16 Jan	Southwest Caribbean	35 kts	42 hr	West of Cold Front
0600 UTC 31 Jan	Southwest Caribbean	35 kts	102 hr	Pressure Gradient
0600 UTC 25 Feb	Southwest Caribbean	35 kts	138 hr	Pressure Gradient
0600 UTC 06 Mar	Southwest Caribbean	35 kts	84 hr	Pressure Gradient
0000 UTC 03 Apr	South-Central North Atlantic	40 kts	36 hr	Cold Front

A few weeks later, the longest duration gale warning within TAFB's Area of Responsibility (AOR) was issued. Gale winds were generated off the coast of Colombia due to the strong pressure gradient between a stationary ridge ahead of a stalled frontal boundary over the southwest North Atlantic Ocean and southern Gulf of Mexico and lower pressure over northern South America. This pattern enhanced easterly trade winds across the southwest and south-central Caribbean Sea. The gale warning covered the area from 11°N to 13°N between 73°W and 77°W as noted on the 1800 UTC 26 Feb Unified Surface Analysis in **Figure 13**. During the warning period, numerous partial ASCAT passes traversed over the warning area with wind retrievals reaching 25 to 35 kts. **Figure 14** gives a sample of these passes. Ships reporting gale force winds included the **Grandeur Of The Seas** (C6SE3) near 11.1°N 75.9°W at 0400 UTC 28 Feb, the **Bahia** (A8SF7) near 11.0°N 75.7°W at 1800 UTC 28 Feb, and the **Conti Daphne** (A8OZ6) between 0600 UTC 01 Mar and 1500 UTC 01 Mar.

Tropical Eastern North Pacific Ocean

The TAFB eastern North Pacific AOR extends equatorward of 30°N and east of 140°W. Thirteen warnings were issued from January through April 2012. This is below the five-year average of 16.6 warnings issued during the January through April period. All thirteen warning events in the eastern North Pacific are cataloged in Table 4.

Gulf of Tehuantepec Gale and Storm Warnings

All but three of the eastern North Pacific warning events were in the Gulf of Tehuantepec. These events were driven by cold frontal passages through the narrow Isthmus of Tehuantepec into the Pacific. During such events, a strong north to south pressure gradient between high pressure over the western Gulf

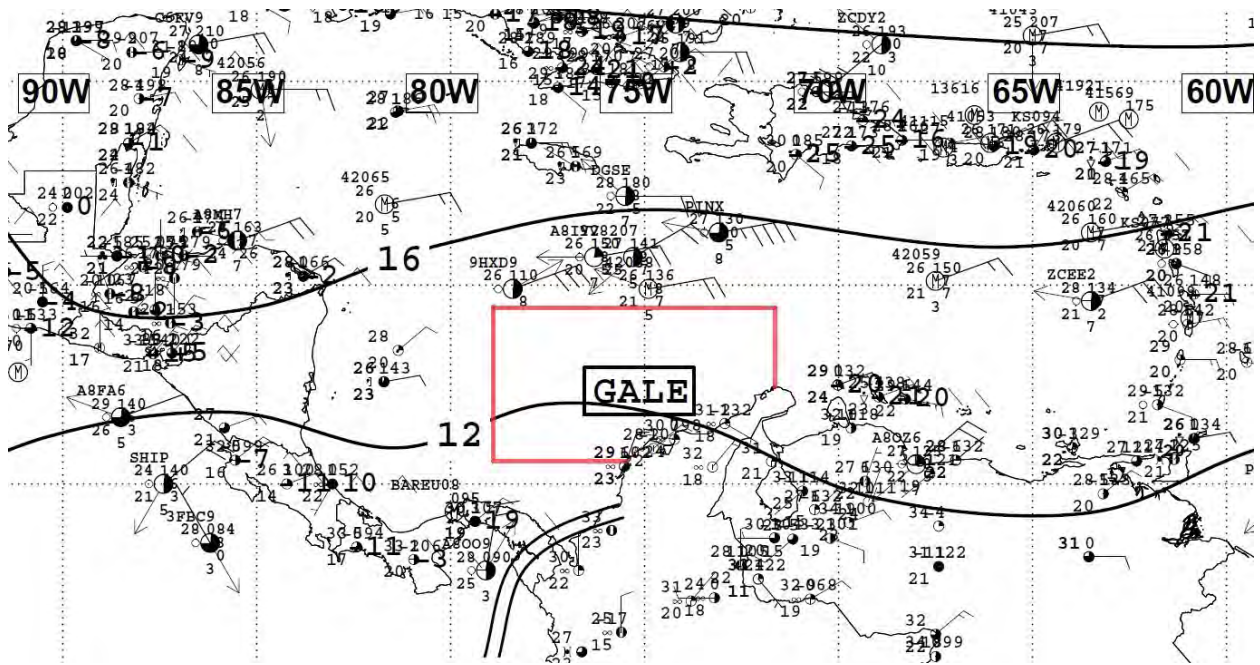


Figure 12. The NWS Unified Surface Analysis from 1800 UTC 31 Jan 2012. Outlined area in red denotes greatest areal extent of the gale warning issued by TAFB across the southwestern Caribbean Sea.

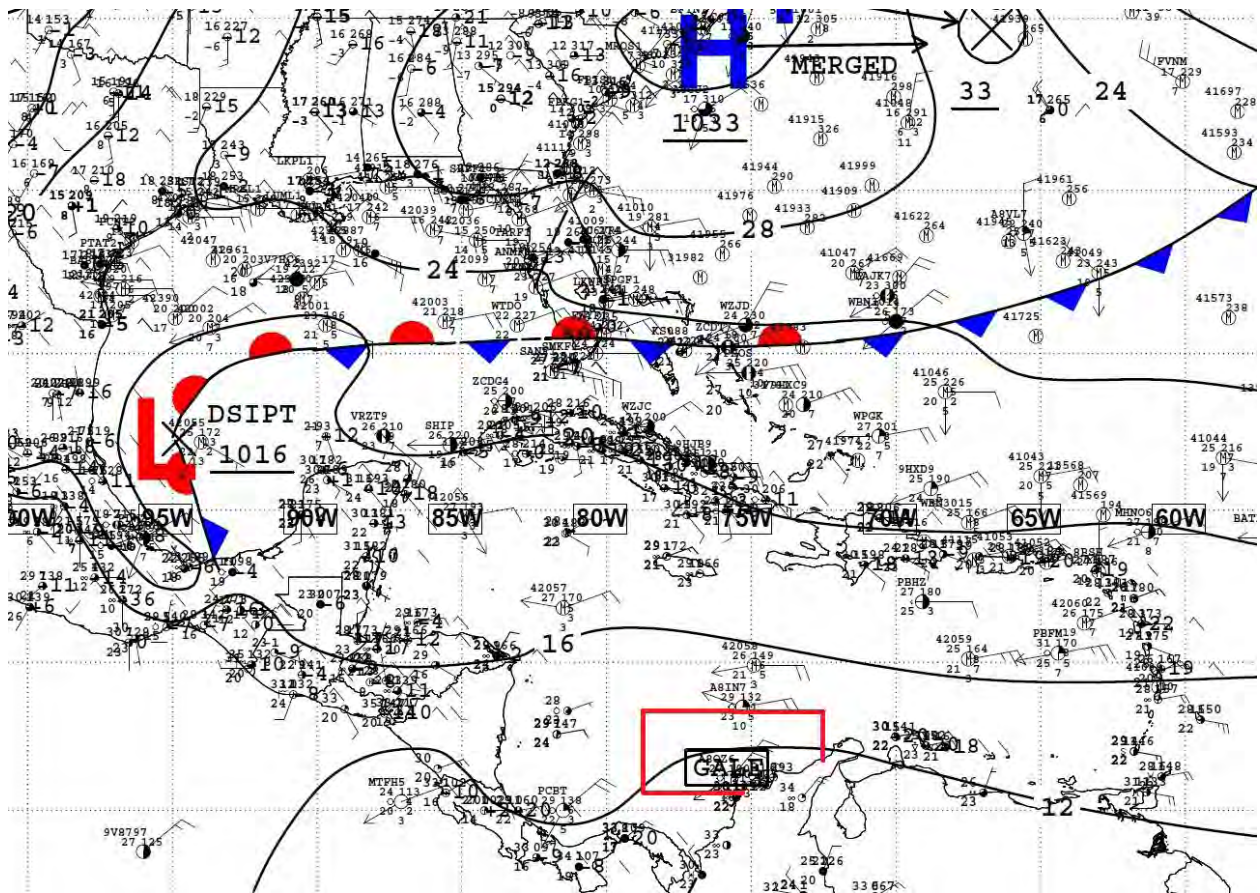


Figure 13. The NWS Unified Surface Analysis from 1800 UTC 26 Feb 2012. With a stationary front draped along 25N, strong surface ridging persisted for several days over the southwestern North Atlantic producing a tight pressure gradient across the western Caribbean Sea. The outlined area in red denotes the greatest areal extent of the gale warning issued by TAFB across the southwestern Caribbean Sea.

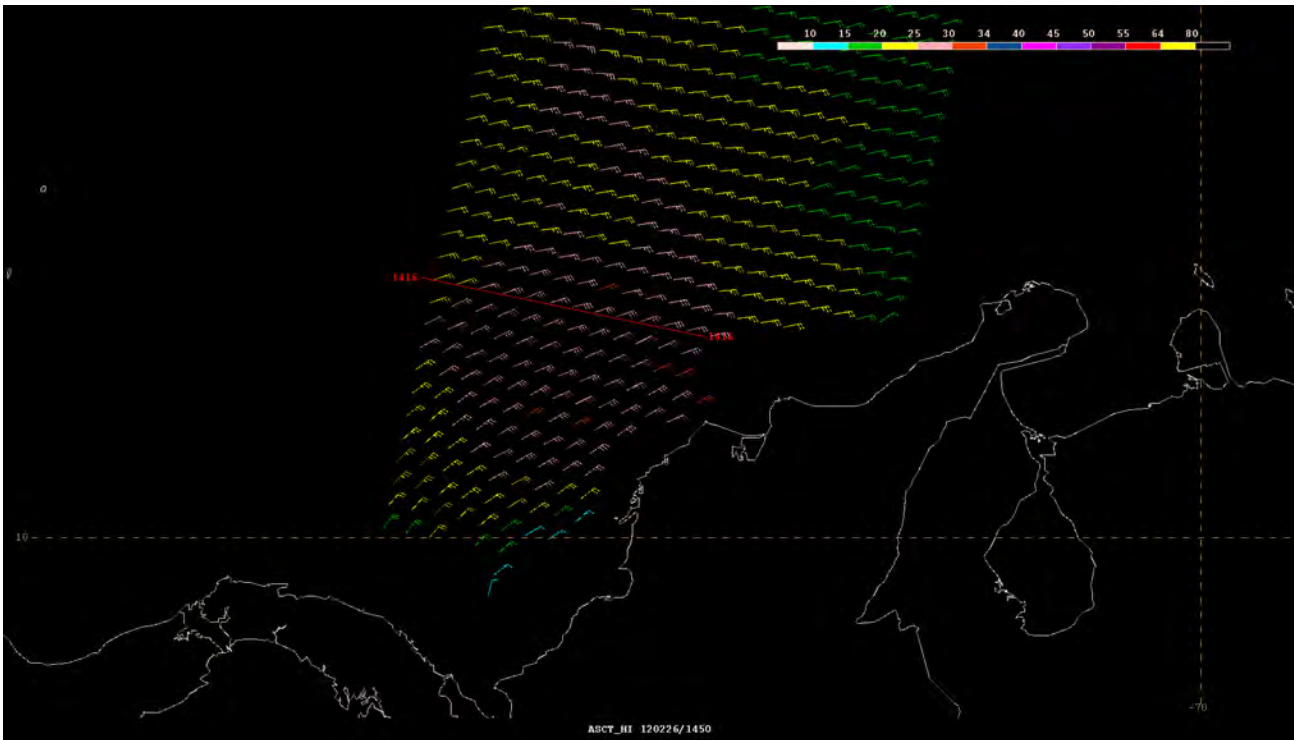


Figure 14. ASCAT pass valid 1416 UTC 26 Feb. Note the retrievals to gale force along the coast of Colombia.

Table 4. Non-tropical cyclone warnings issued for the subtropical and tropical eastern North Pacific between 01 January 2012 and 30 April 2012.

Onset	Region	Peak Wind Speed	Gale / Storm Duration	Forcing
02 Jan 00 UTC	Gulf of Tehuantepec	55 kts	78 hr / 36 hr	Gap Wind Event
04 Jan 12 UTC	Gulf of Papagayo	35 kts	42 hr	Gap Wind Event
13 Jan 12 UTC	Gulf of Tehuantepec	40 kts	66 hr	Gap Wind Event
27 Jan 06 UTC	Gulf of Tehuantepec	40 kts	84 hr	Gap Wind Event
05 Feb 00 UTC	North of 25N West of 125W	35 kts	54 hr	Low Pressure System/Front
06 Feb 06 UTC	Gulf of Tehuantepec	40 kts	36 hr	Gap Wind Event
08 Feb 18 UTC	North of 27N West of 135W	35 kts	24 hr	Cold Front
11 Feb 18 UTC	Gulf of Tehuantepec	40 kts	60 hr	Gap Wind Event
20 Feb 00 UTC	Gulf of Tehuantepec	35 kts	12 hr	Gap Wind Event
25 Feb 18 UTC	Gulf of Tehuantepec	45 kts	24 hr	Gap Wind Event
04 Mar 12 UTC	Gulf of Tehuantepec	55 kts	72 hr / 18 hr	Gap Wind Event
10 Mar 06 UTC	Gulf of Tehuantepec	35 kts	12 hr	Gap Wind Event
22 Apr 06 UTC	Gulf of Tehuantepec	40 kts	66 hr	Gap Wind Event

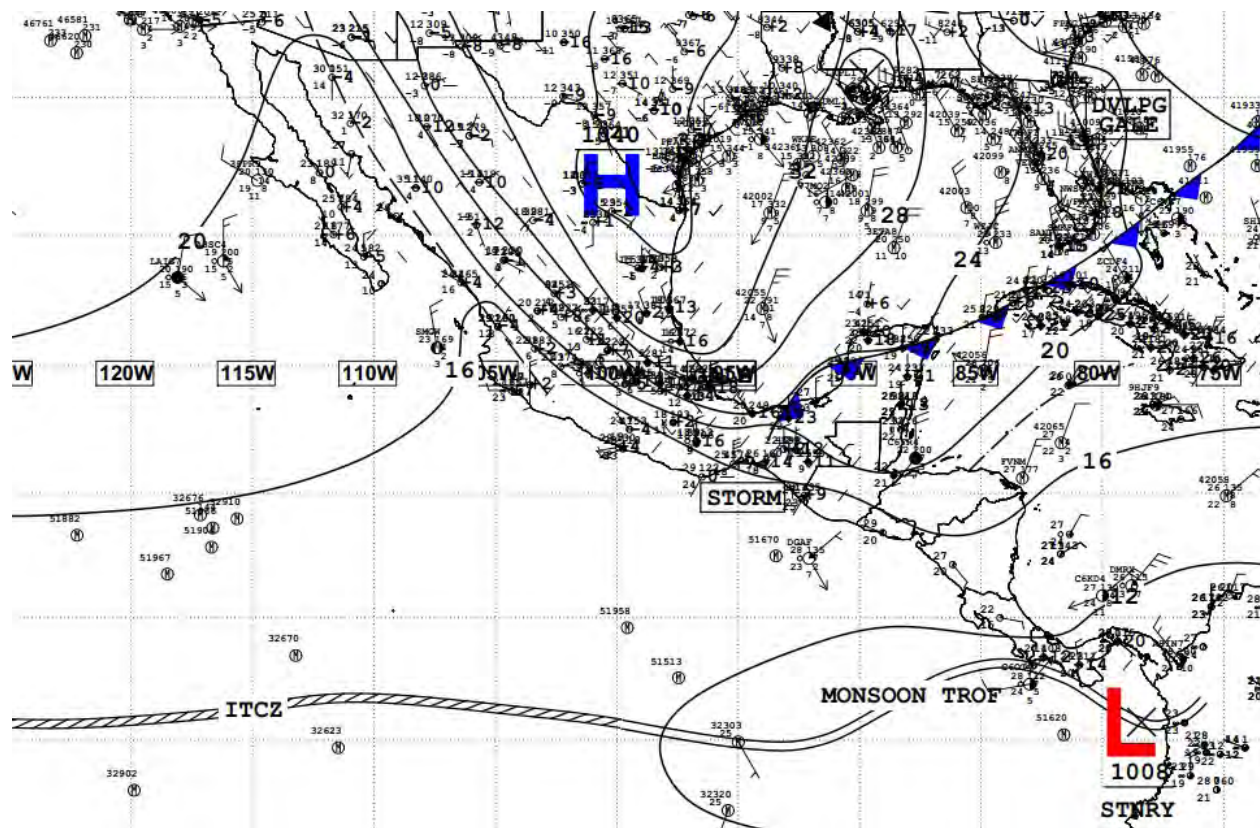


Figure 15. The NWS Unified Surface Analysis from 1000 UTC 03 Jan 2012. Note the pressure gradient between the monsoon trough to the south of the Gulf of Tehuantepec and the 1040 hPa high pressure system near the border of Texas and Mexico.

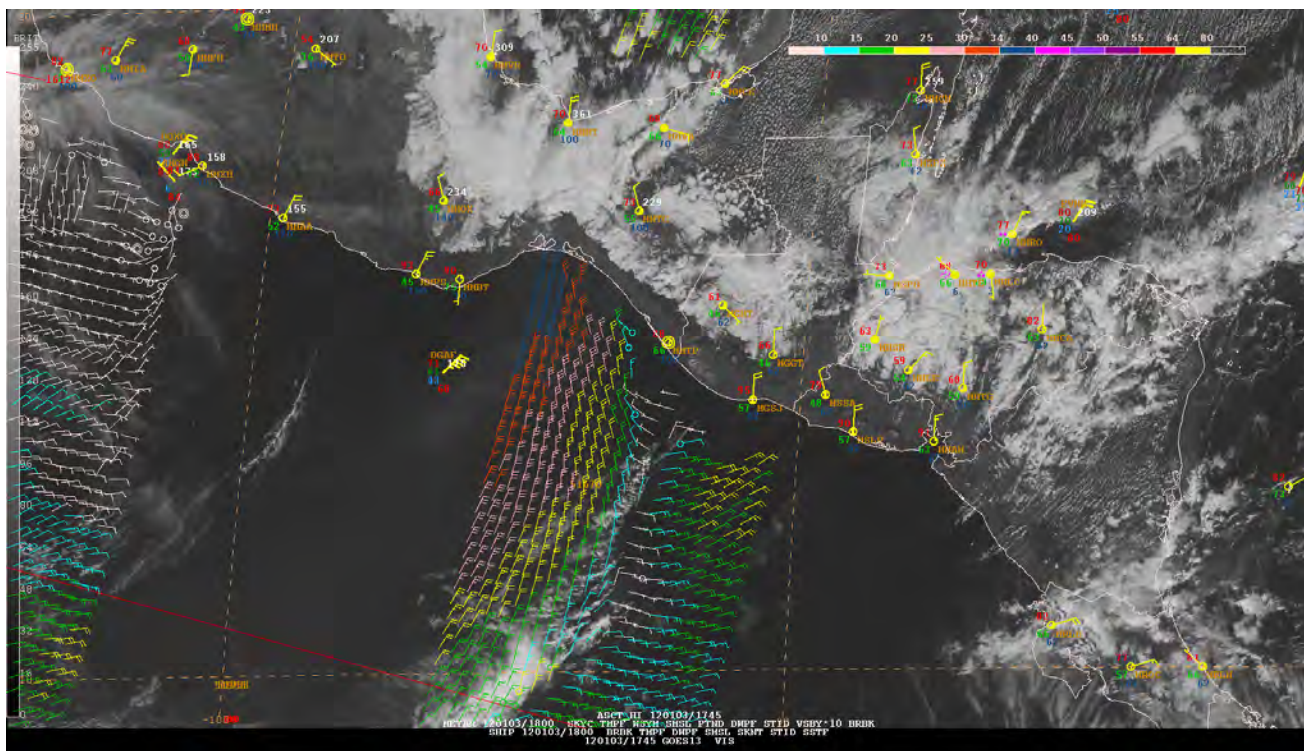


Figure 16. Conditions in the Gulf of Tehuantepec around 1800 UTC on 03 January 2012 including GOES-E visible satellite imagery, an ASCAT pass, and surface observation from ships and land-based stations.

of Mexico behind the front and lower pressure to the south of Tehuantepec drives the northerly flow through the break in the Sierra Madres in southern Mexico (Brennan et al, 2010).

Of the ten occurrences of gale force winds in the Gulf of Tehuantepec from January through April, two events produced storm-force winds. Meanwhile, the period from October 2011 through April 2012 saw a total of 20 gale warnings and 3 storm warnings. The number of gale warnings is higher than the 10-year average of 11.9 gale events noted by Brennan et al, 2010. However, the number of storm warnings was lower than their 10-year average of 6.4 storm events. Mean ridging over the Gulf of Mexico described in the Tropical North Atlantic Section of this article likely weakened the cold fronts before they reached the Isthmus of Tehuantepec, leading to a lower number of storm-force events than average.

The first eastern North Pacific gap wind event of 2012 began on 02 Jan at 0000 UTC. The strong pressure gradient between continental high pressure over Texas and northeast Mexico and the monsoon trough found south of the area between the equator and 07°N generated storm force winds in the Gulf of Tehuantepec and gale force winds in the Gulf of Papagayo. **Figure 15** shows the NWS Unified Surface Analysis from 03 Jan at 0000 UTC while the storm event was ongoing in Tehuantepec, but winds had yet to increase to gale force in Papagayo. The cargo ship **Dallas Express** (DGAF) saw winds as strong as 43 kts as it tracked along 14°N in the area south of Tehuantepec on 03 Jan. **Figure 16** shows the

ship and land-based observations and the ASCAT pass from approximately 1800 UTC on 03 Jan.

There was one other storm force gap wind event during the January through April 2012 period. This event began with the onset of storm-force winds in the Gulf of Tehuantepec on 04 Mar at 1200 UTC. Winds diminished to gale force by 0600 UTC the next day, and the gale warning was canceled at 1200 UTC on 07 Mar. **Figure 17** shows the ship and land-based observations valid at 0600 UTC 05 Mar as well as the 0358 UTC ASCAT pass. The tanker **California Voyager** (WDE538) reported 30 kts winds south of Tehuantepec at this time with seas to 4.3 m (14 ft) while the container ship **Cap Palliser** (A8OH4) showed only 10 kts of westerly wind with 3.0 m (10 ft) seas just west of the primary gap area downwind of the Gulf of Tehuantepec. The tanker **California Voyager** (WDE538) had previously reported winds as high as 35 kts near 11°N 98°W at 0000 UTC on 05 Mar.

The other eight events in the Gulf of Tehuantepec listed in **Table 4** saw gale force gap winds. A number of ships reported gale force winds during these events. The passenger cruise ship **Coral Princess** (ZCDF4) traveled south of the Gulf of Tehuantepec on 13 Jan as well as on 27 Jan and captured the onset of gale force winds during both voyages. The **Paris Express** (DIHE) and the **Overseas Joyce** (V7NV4) also saw gale force winds here on 27 Jan. The Tehuantepec gales in February were all observed by the ASCAT scatterometer rather than ships. In March, the cruise ship **Statendam** (PHSG) observed a short lived gale event that occurred

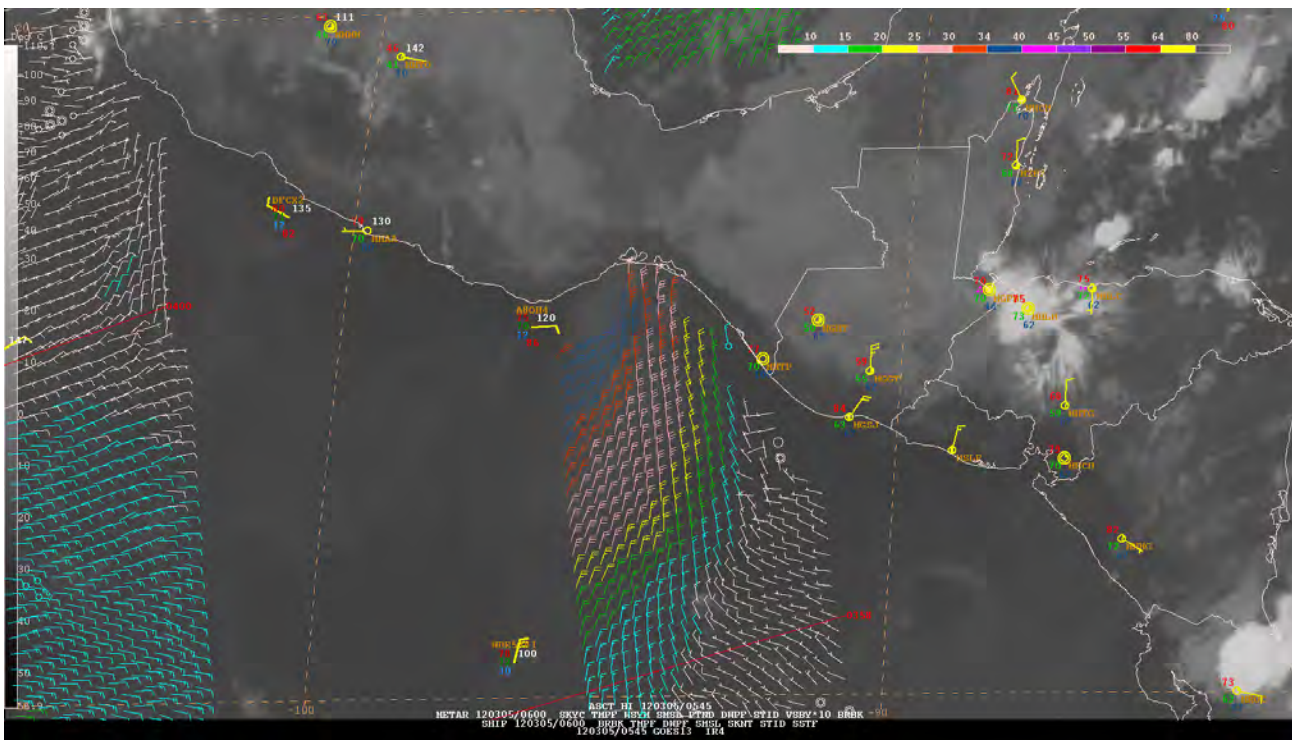


Figure 17. GOES-E infrared imagery overlaid with ship and land-based observations valid at 0600 UTC 05 Mar as well as the 0358 UTC ASCAT pass. The cargo ship **California Voyager** (WDE538) was reporting 30 kts north-northeasterly winds approximately 360 nmi south-southwest of the Gulf of Tehuantepec at this time.

after the storm-force event earlier in the month. The final observations of gale force winds in the Gulf of Tehuantepec for the season occurred during the event beginning 22 Apr. The cargo ships **Carmen** (SMGW) and **Cap Portland** (A8MQ9) and the cruise ship **Norwegian Pearl** all witnessed this late season event.

Gales Associated with Cold Fronts near 30°N 140°W

On 05 February, a cut off low began to make its way into the northwestern portion of the TAFB forecast area bounded by 30°N to the north and 140°W to the west. Gale conditions began in the southerly flow ahead of the low beginning at 0000 UTC when the 994 hPa low pressure system was near 30°N 145°W, just west of the forecast area. The NWS Unified Surface Analysis from 0000 UTC on 05 Feb is shown in **Figure 18**. Gale force winds and seas to 4.5 m (15 ft) were observed by the **Golden Princess** (ZCDA9) on 05 Feb as it traveled eastward from the Hawaiian Islands. This low was overtaken by another cold front around 0600 UTC on 06 Feb, but gale conditions continued in the southerly to southwesterly winds ahead of this front. As the front pushed eastward into the TAFB forecast area, a gale warning was also issued for the westerly to northwesterly winds behind the front. The cargo ships **Mokihana** (WRND) and **Horizon Reliance** (WFLH) and the cruise ship **Sapphire Princess** (ZCDG7) noted gale force winds ahead of the front on 06 Feb while the **Horizon Spirit** (WFLG) saw winds near gale

force behind the front. The 0704 UTC ASCAT pass on 06 Feb shown in **Figure 19** confirmed the gale conditions behind the front. The gale warning was dropped at 06Z on 07 Feb.

Another strong cold front entered the northwest portion of the TAFB AOR on 09 Feb at 0000 UTC, but gale conditions were noted in the southerly flow ahead of the front six hours earlier. **Figure 20** shows the NWS Unified Surface Analysis at the onset of gales in the TAFB AOR at 1800 UTC 08 Feb. Gale warnings were also in effect in adjacent portions of the NWS Honolulu and NWS Ocean Prediction Center AORs as noted by the gale stamps in **Figure 20**. The **Sapphire Princess** (ZCDG7) and the cargo ship **Brooklyn Bridge** (3FFI8) both saw gale force winds just west of the TAFB forecast area to as far south as 27°N. The 08 Feb 1848 UTC ASCAT pass showed winds to 33 kts within the TAFB forecast area and the **CMA CGM Orfeo** (A8NO6) recorded 34 kts winds just north of the TAFB area near 31°N135°W at 0600 UTC 09 Feb. Winds dropped below gale force within the TAFB AOR by 1800 UTC on 09 Feb.

References

Brennan, M. J., H. D. Cobb III, and R. D. Knabb, 2010: Observations of Gulf of Tehuantepec Gap Wind Events from QuikSCAT: An Updated Event Climatology and Operational Model Evaluation. *Wea. Forecasting*, 25, 646-658.

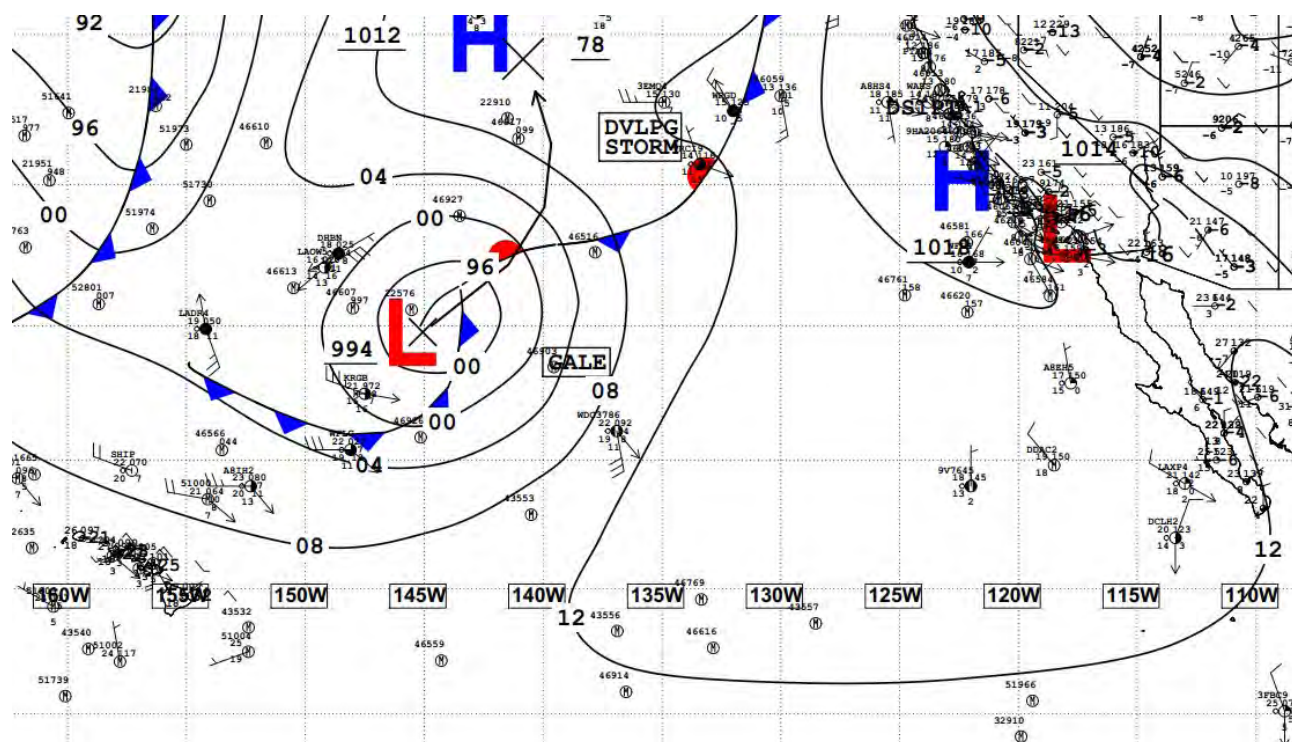


Figure 18. The NWS Unified Surface Analysis from 0000 UTC 05 Feb 2012. A gale warning was in effect for the northwest portion of the TAFB AOR at this time.

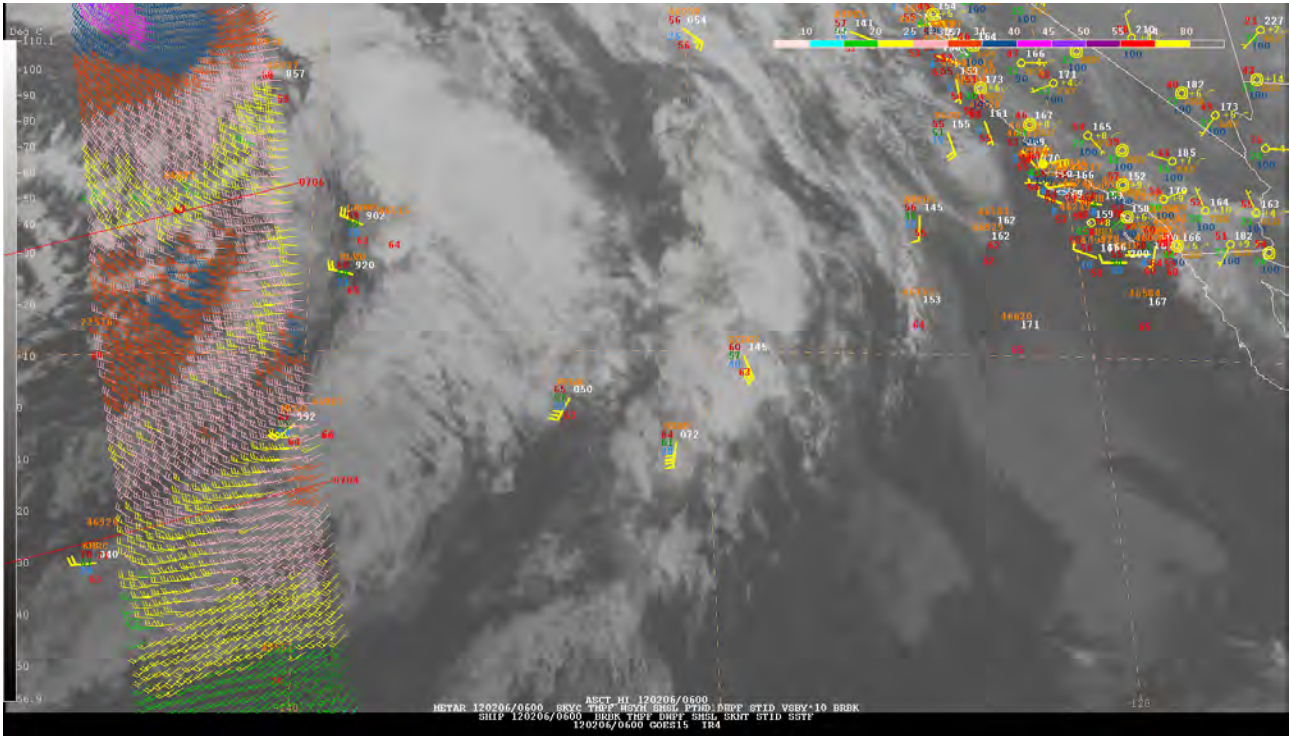


Figure 19. Geostationary Operational Environmental Satellite - West (GOES-W) infrared imagery overlaid with ship and land-based observations valid at 0600 UTC 06 Feb as well as the 0706 UTC ASCAT pass. Note the patch of gale force west-northwesterly winds in dark blue just south of 30°N and east of 140°W. Ships **Mokihana** (WNRD) and **Sapphire Princess** (ZCDG7) are reporting gale force southerly winds ahead of the front at this time.

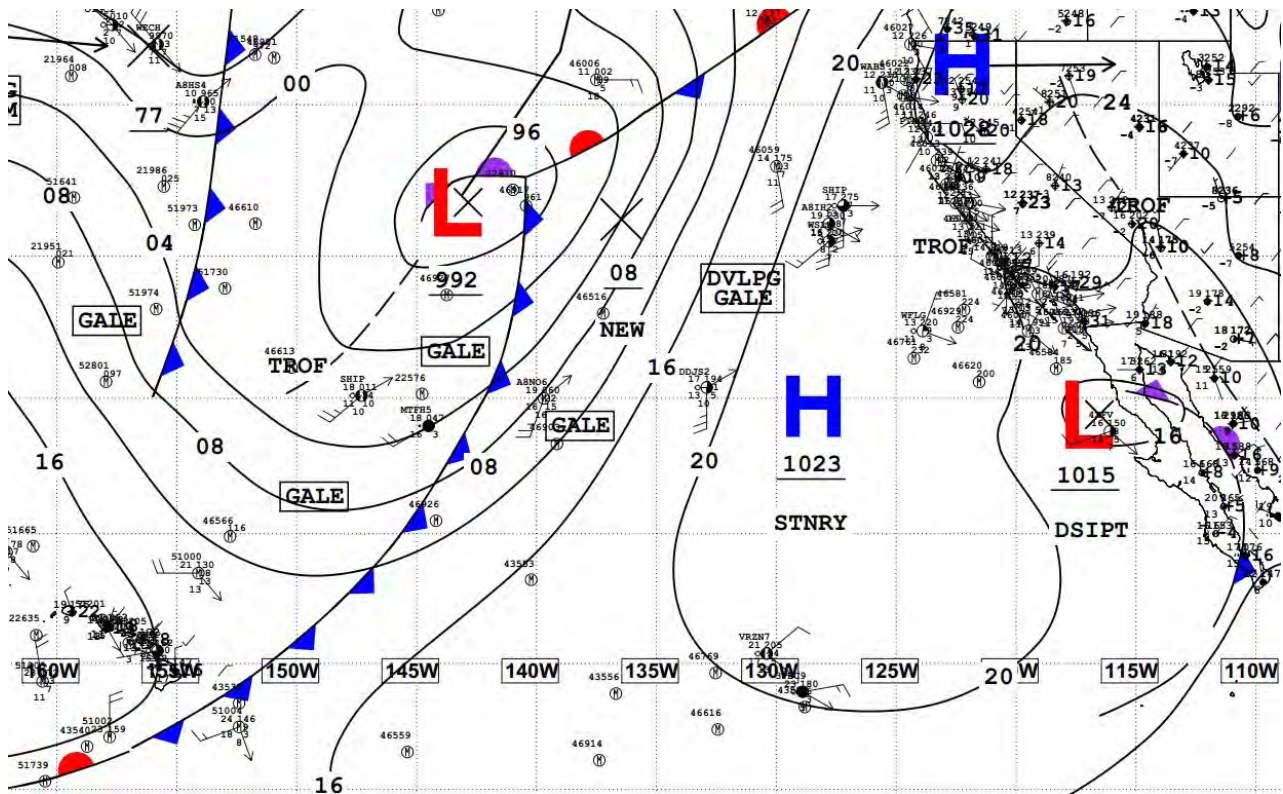


Figure 20. The NWS Unified Surface Analysis from 1800 UTC 08 Feb 2012. Gale warnings were in effect for the northwest portion of the TAFB AOR at this time in addition to the northeast corner of the NWS Honolulu AOR south of 30°N and west of 140°W as well as the southern portion of the NHC Ocean Prediction Center AOR just north of 30°N near 145°W.

Marine Weather Review – North Atlantic Area

July to December 2011

By George P. Bancroft

Ocean Forecast Branch, Ocean Prediction Center, Camp Springs, MD
NOAA National Center for Environmental Prediction

Introduction

The pattern over the North Atlantic during this period was generally progressive from southwest to northeast, originating near the U.S. East Coast or Atlantic provinces of Canada but with some originating over the central Atlantic waters. A more northern track was favored into September. There was a lack of the type of high latitude blocking that would cause systems to stall or move erratically after moving out over the North Atlantic, or even turn west. The first cyclone of non-tropical origin producing hurricane force winds was in mid-September. There were three and five such cyclones in October and November, respectively. December was the most active month in the six month period, producing ten hurricane force lows. November and December produced the most intense cyclones, with five having central pressures in the 940 hPa, including the deepest of the five month period, 940 hPa, in late November.

This five month period includes much of the Atlantic hurricane season, which was active in 2011. During the period from mid-July to early November eight tropical storms and four hurricanes either formed in or moved through OPC's southwestern waters before becoming post-tropical (extratropical). These included one major hurricane, Ophelia in early October, and Hurricane Irene which impacted the U.S. East Coast in late August. Hurricane Katia and Tropical Storm Philippe redeveloped into strong extratropical lows with hurricane force winds. Other tropical systems occurred during the period but remained south of OPC's area including Emily which weakened to a remnant low upon entering OPC's

far southwestern waters on August 7. More detailed information on tropical cyclones may be found in NHC's postseason summaries (Reference 2).

Tropical Activity

Tropical Storm Bret: Bret entered OPC's marine area near 31N 74W early on July 20 as a tropical storm with maximum sustained winds of 45 kts with gusts to 55 kts. While moving slowly northeast the top sustained winds weakened to 35 kts the following evening. On the evening of the 21st, Bret weakened to a tropical depression near 36N 68W and then at 1500 UTC on the 22nd was downgraded to a post-tropical low with maximum sustained winds of 30 kts. The cyclone then dissipated as a trough south of Newfoundland on the 23rd.

Tropical Storm Cindy: Cindy developed from a nontropical low near 35N 54W at 2100 UTC July 20 with maximum sustained winds of 35 kts with gusts to 45 kts. Early the next day the tropical storm reached peak strength while passing near 38N 49W with maximum sustained winds of 50 kts and gusts to 60 kts. The cyclone then gradually weakened while tracking northeast on the 21st and 22nd. The **Maersk Iowa** (KABL) reported southwest winds of 35 kts and 5.5 m seas (18 ft) near 41N 42W at 0000 UTC on the 22nd. Cindy became an extratropical gale with maximum sustained winds of 35 kts on the evening of the 22nd near 49N 32W before dissipating as a trough the next morning.

Tropical Storm Franklin: Franklin was another short lived cyclone over the southwestern waters, originating from an area of low pressure on a slow moving front. Low pressure passing

150 nm northwest of Bermuda early on August 12 became Tropical Depression Six near 36N 64W at 2100 UTC that day and Tropical Storm Franklin twelve hours later near 38N 60W with maximum sustained winds of 35 kts with gusts to 45 kts. Franklin's sustained winds peaked at 40 kts at 1500 UTC on the 13th before weakening later that day. Franklin became a post-tropical frontal gale near 41N 51W the following evening with maximum sustained winds of 35 kts, before turning toward the east-southeast on the 14th and dissipating 600 nm southwest of the Azores Islands on the 16th.

Tropical Storm Gert: Tropical Storm Gert moved north into OPC's marine area southeast of Bermuda near 31N 63W early on August 15 with maximum sustained winds of 50 kts and gusts to 60 kts. Gert reached peak intensity later that morning while passing 90 nm east of Bermuda when its maximum sustained winds reached 55 kts. The cyclone then turned toward the northeast and began to weaken, becoming a post-tropical remnant low with gales near 37N 58W on the morning of the 16th. The **Veendam** (PHEO) reported southwest winds of 35 kts near 33N 65W at 0900 UTC August 16 as Gert passed to the north. Later, the **Honor** (WDC6923) near 38N 55W encountered south winds of 45 kts at 1800 UTC on the 16th. The top winds diminished to below gale force on the 17th as the center passed 250 nm south of Cape Race. Gert's remains became absorbed by a larger low pressure area passing east of Newfoundland late on the 17th.

Hurricane Irene: Hurricane Irene entered OPC's marine area 180 nm south of Cape Fear, North Carolina at mid-day August 26 with maximum

sustained winds of 85 kts with gusts to 105 kts or Category 2 on the Saffir-Simpson scale (Reference 4). Irene's sustained winds dropped to 75 kts at a first landfall near Cape Lookout on the morning of the 27th and to 65 kts inland over eastern North Carolina that afternoon. The hurricane then moved just offshore from the Virginia capes the following evening before passing near Atlantic City, New Jersey early on the 28th when the top sustained winds weakened to tropical storm strength, 60 kts. Irene then moved inland near New York City shortly thereafter and became an extratropical low over northern New England the following evening with maximum sustained winds 45 kts (*Figure 1*). *Figure 2* is an infrared satellite image showing Hurricane Irene off the New Jersey coast just before downgrade to a tropical storm. It shows the circular central dense overcast typical of hurricanes. An expanding cloud shield to the north associated with a frontal zone and drier air entering the south

portion of Irene's circulation indicate a beginning of extratropical transition. Post-tropical (extratropical) Irene then weakened while tracking inland over eastern Canada and became absorbed by a frontal system on the night of the 29th. **Table 1** lists some ship, buoy and C/MAN station observations taken during passage of Irene.

Tropical Storm Jose: A non-tropical low pressure which became Jose is seen in the first part of *Figure 1* as the 1008 hPa low near 28N 63W. Tropical Storm Jose moved into OPC's area near 31N 66W with maximum sustained winds of 40 kts on the morning of August 28th and passed 55 nm west of Bermuda shortly thereafter. The second part of *Figure 1* shows a weakening Jose north of Bermuda and southeast of the departing Irene shortly before becoming a post-tropical low, with top winds dropping to below gale force on the night of the 28th. The remains of Jose were absorbed by a frontal system on the 29th.

Unnamed Tropical Storm: A reanalysis by the National Hurricane Center indicated that a short lived low pressure area passing between Bermuda and Nova Scotia from August 31st to September 3rd (*Figure 3*) briefly had sufficient tropical characteristics to be reclassified as a tropical storm. It existed as a tropical storm from the morning of September 1st to the evening of September 2nd, when it became extratropical about 300 nm south of Halifax, Nova Scotia. At its maximum strength at 0600 UTC on the 2nd NHC estimated a central pressure as low as 1002 hPa and maximum sustained winds of 40 kts.

Hurricane Katia: Katia passed north between Bermuda and the southeast U.S. coast, crossing 31N at 70W on the evening of September 7th as a Category 1 hurricane with maximum sustained winds 70 kts with gusts to 85 kts. After developing sustained winds as high as 80 kts on the morning of the 8th, Katia then maintained an intensity of

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Horizon Trader (KIRH)	36N 71W	28/0000	SE 45	15.8/52
Caribbean Princess (ZCDG8) WKAB	41N 68W	28/1200	S 55	5.0/16
	41N 65W	28/2200	S45	8.0/26
	40N 67W	28/2100	S37	9.0/30
Buoy 41004	32.5N 79.1W	27/0000	NW 43 G54 Peak gust 56	
		26/1900		7.5/25
Buoy 41013	33.4N 77.7W	26/2200	NE 43 G56 Peak gust 60	7.5/25
		27/0100	Maximum	8.5/28
Buoy 41036	34.2N 77.0W	27/1600	SW 49 G64 Maximum	6.0/20 8.5/28
Buoy 41001	34.7N 72.7W	27/1900	S 39 G47 Peak gust 51	8.5/28
		27/1600	Maximum	10.0/33
Buoy 44009	38.5N 74.7W	27/2200	E 39 G54	4.5/15
		28/0700	Maximum	6.5/21
Oregon Inlet	35.8N 75.4W	27/200	S 51 G68 Peak gust 70	
Cape Lookout	34.6N 76.4W	27/0700	NE 58 G66	
		27/0800	Peak gust 68	
		27/1200	Pressure 953.3mb	

Table 1. Selected ship, buoy and C/MAN platform observations taken during passage of Hurricane Irene.

75 kts for sustained winds as it turned toward the northeast through the 9th and passed near 41N 58W late on the 9th. Katia weakened only slightly when approaching a stationary front to the north on the night of the 9th. Katia quickly transitioned into an intense extratropical low as shown in *Figure 4* over only a twelve hour period. *Figure 5* is an OSCAT image taken about at the time Katia was declared a post-tropical low by NHC, showing a relatively tight circulation of winds to 75 kts, highest on the south side as the cyclone takes on more of an asymmetric structure of an extratropical low. Buoy 41048 (32.0N 69.6W) reported southeast winds of 68 kts with gusts to 93 kts and 12.0 m seas (39 ft) at 0600 UTC on the 8th as the hurricane passed nearby. This buoy reported a peak gust of 97 kts at 0400 UTC on the 8th and a pressure of 976.8 mb five hours later. The Canadian buoy 44140 (42.9N 51.5W) at 1200 UTC September 10 reported northwest winds of 62 kt and 7.5-m seas (25 ft), and a pressure of 957.0 hPa at 1100 UTC on the 10th. The **Caribbean Princess** (ZCDG8) near 41N 70W reported northeast winds of 43 kts at 0900 UTC on the 9th. Post-tropical Katia then moved out over the central North Atlantic on the 11th with its top winds lowering to storm force, and passed just north of the British Isles the next day before moving inland over southern Norway as a gale force low early on the 13th.

Hurricane Maria: Maria entered OPC's marine area near 31N 68W on the morning of September 15th as a strong tropical storm with maximum sustained winds of 60 kts and gusts to 75 kts. Maria became a hurricane six hours later while moving northeast, and passed north of Bermuda near 37N 65W on the evening of the 15th when it reached a maximum intensity of 70 kts for sustained winds and gusts to 85 kts. The cyclone weakened the next day with the approach of a cold front and passage over cooler water (*Figure 6*) and became absorbed into the rapidly developing hurricane force low moving into the Labrador Sea as depicted in *Figure 6*. The **P&O Nedlloyd**

Marseille (MYSU5) reported west winds of 47 kts and 7.0 m seas (23 ft) near 48N 61W at 2300 UTC on the 16th, while the **Umia Vut** (PFQE) near 52N 56W encountered west winds of 50 kt. **Hibernia Platform** (VEP717, 46.7N 48.7W) with an anemometer height of 139 m reported southwest winds of 70 kts at 2100 UTC on the 16th, while **Terra Nova FPSO** 46.4N 48.4W with an anemometer height of 53 m encountered south winds 51 kts. The observations were taken after Maria was absorbed late on the 16th and were in the circulation of the developing hurricane force low.

Hurricane Ophelia: Hurricane Ophelia moved into OPC's marine area southeast of Bermuda on the afternoon of October 1st and developed into a Category 4 major hurricane later that day while passing 120 nm east-northeast of Bermuda, when it was accompanied by maximum sustained winds of 120 kts with gusts to 145 kts. Ophelia then accelerated northeast toward cooler water and a stationary front to the north with a weakening trend setting in the next day. Ophelia's maximum sustained winds diminished to 70 kts on the evening of the 2nd as the center passed near 44N 59W and to tropical storm strength, 60 kts, early on the 3rd. The Canadian buoy 44141 43.0N 58.0W reported southeast winds of 52 kts with gusts to 68 kts and 9.5 m seas (31 ft) at 0100 UTC October 3rd, followed by a report of 14.0 m seas (46 ft) one hour later. Buoy 44139 44.2N 57.1W reported southeast winds of 43 kts with gusts to 56 kts and 7.5 m seas (25 ft) at 0400 UTC on the 3rd, followed one hour later by a report of 12.0 m seas (39 ft). Ophelia then became extratropical over the island of Newfoundland on the morning of the 3rd before passing northeast of the Grand Banks later that day as a gale force low. Post-tropical Ophelia then passed northwest of the British Isles early on the 5th before becoming absorbed by a developing low near Iceland.

Tropical Storm Philippe: Philippe, a hurricane south of the area, moved into OPC's marine area near 31N 51W

early on October 8th as a strong tropical storm with maximum sustained winds of 60 kts. Later that day Philippe became an extratropical storm near 35N 46W with maximum sustained winds of 50 kts. *Figure 7* shows post-tropical Philippe as a storm force low in the first part. A high resolution ASCAT pass from 1222 UTC on the 9th revealed wind 50 kts on the west and southwest sides of the cyclone. Over the next three days Philippe moved slowly north with some strengthening, followed by more rapid strengthening as it passed east of Greenland on the 12th and 13th (*second part of Figure 7*). The cyclone developed a lowest central pressure of 962 hPa in the east Greenland waters on the 13th. *Figure 8* is an ASCAT image showing an area of strongest winds from the west to northwest off the southern tip of Greenland, revealing winds up to 60 kts. The **Mary Artica** (BATEU00) near 61N 49W reported northwest winds of 50 kts at 0600 UTC on the 13th. The cyclone subsequently moved east away from Greenland late on the 14th and the 15th and its top winds lowered to storm force on the 15th. After passing just north of the British Isles late on the 17th the storm moved into southern Norway late on October 18th. The **Sirrah** (WKAP) reported north winds of 55 kts near 64N 24W at 1400 UTC on the 17th while the **Sea-Land Racer** (WKAP) near 58N 21W reported northwest winds of 45 kts and 10.5 m seas (34 ft) one hour later.

Tropical Storm Sean: Tropical Storm Sean initially entered OPC's marine area on a track similar to that of Katia on the afternoon of November 10th, with maximum sustained winds of 55 kts and gusts to 65 kts. The cyclone weakened the next day as a cold front approached. *Figure 14* shows Sean merging with the front and becoming an extratropical gale late on the 11th. It did not merge with the developing hurricane force low to the north but instead remained a distinct low on the front as it tracked east along 42N on the 12th and early on the 13th before turning southeast and dissipating near the coast of Morocco late on the 16th. The **APL Japan** (WDE8288) reported southeast

winds of 45 kts and 5.0 m seas (16 ft) near 36N 55W at 0600 UTC on the 12th. Three hours later the **Power** (ZCBF3) near 41N 44W encountered northwest winds of 45 kts and 3.0 m seas (10 ft).

Other Significant Events of the Period

North Atlantic Storm, July 10-11:

An unseasonably deep low developed while passing just south of the Atlantic provinces of Canada on the 9th and 10th with center developing a central pressure of 984 hPa near the island of Newfoundland early on July 10th, along with storm force winds in what is usually the least active month. It originated near the New England coast on the night of July 8th. The **Blue Puttees** (VXKF) near 46N 60W reported northeast winds of 45 kts at 0000 UTC on the 10th. **Hibernia Platform** (VEP717) 46.7N 48.7W reported southwest winds of 60 kts at 1200 UTC on the 10th at an anemometer height of 139 m, while the **GSF Grand Banks** (YJUF7) 46.7N 48.0W reported south winds of 45 kts at its anemometer height of 82 m. The cyclone subsequently moved northeast out over the North Atlantic with its central pressure dropping to 981 hPa as it passed near 56N 43W at 1800 UTC on the 11th. The ship **BATEU04** (60N 43W) at 1300 UTC on the 11th reported northeast winds of 50 kts. The **Arnafell** (OZ2048) encountered northeast winds of 45 kts near 58N 46W eight hours later. The cyclone then weakened to a gale force low on the night of the 11th while drifting northeast, and dissipated near Iceland late on July 14th.

Northwestern Atlantic Storm, September 3-4:

An inland low over northeastern Canada developed a new center near 61N 61W with a 978 hPa central pressure 1200 UTC September 3rd and developed storm force winds that day. A high resolution ASCAT pass at 2253 UTC on the 3rd revealed southeast winds 35 to 50 kts off the southwest Greenland coast. The cyclone drifted northeast and weakened to a gale in the Davis Strait the next day, before dissipating over southwest Greenland on the 5th.

Northwestern Atlantic Storm, September 16-19: The development of this hurricane force low is depicted in *Figure 6* and mentioned in the earlier paragraph on *Hurricane Maria*. The central pressure fell 34 hPa in the twenty-four hour period ending at 0600 UTC on the 17th. A 25 km ASCAT pass from 1452 UTC on the 17th revealed an area of north to northwest winds to 50 kts off the southern Labrador coast on the back side of the low and resembled the winds in the October 29th-30th event over the southwestern waters (*Figure 12*). The second part of *Figure 6* shows the cyclone at maximum intensity. The cyclone then moved northeast and weakened, with its winds lowering to storm force late on the 17th and to gale force as the center approached Iceland late on the 19th. The cyclone passed northeast of Iceland on September 22nd.

North Atlantic Storm, October 25-28:

Figure 9 depicts the development of this intense low over a thirty-six hour period, ending in the center attaining a lowest central pressure of 951 hPa. This was the deepest cyclone south of 50N during the period, and was the deeper of two storms crossing that area late in October. The cyclone originated as a wave of low pressure near 32N 72W at 1800 UTC October 24th. The central pressure dropped 43 hPa in the twenty-four hour period ending at 1200 UTC on the 26th. The ASCAT image in *Figure 10* reveals numerous wind vectors in the 50 to 60 kts range south of the well defined center. OPC analyzed this cyclone as a hurricane force low from 0600 UTC on the 26th through 1800 UTC on the 27th when the center passed northeast of the Grand Banks. Some ship, buoy and platform observations taken in this event are listed in **Table 2**. The cyclone subsequently weakened to a gale near 55N at 1800 UTC on the 28th before becoming absorbed by a low near Iceland on the 29th.

North Atlantic Storm, October 28-30:

Originating as a low pressure wave over Georges Bank late on the 27th, this developing cyclone tracked east-northeast and became a hurricane force low over the central waters on the 29th

with a central pressure as low as 969 hPa late on the 29th. The first part of *Figure 11* shows this as a complex system east of Newfoundland. A 25 km ASCAT pass over the central waters revealed an area of southwest winds to 50 kts south of the center at 1348 UTC on the 29th. The cyclone subsequently weakened to a gale force low in the eastern waters off Great Britain before turning north and dissipating near Iceland November 1st.

North Atlantic Storm, October 29-November 3:

A low pressure wave near Cape Hatteras on the morning of October 29th (*Figure 11*) rapidly intensified into a hurricane force low within eighteen hours, with the central pressure falling 30 hPa in the twenty-four hour period ending at 1200 UTC October 30th. The ASCAT winds in *Figure 12* show an area of north to northwest winds 50 kts and an isolated 55 kt on the west side of the cyclone and extending into the Gulf of Maine. Hurricane-force winds lasted through the 30th as the system passed south of Nova Scotia, and occurred long before the cyclone developed its lowest central pressure of 968 hPa, when the cyclone was well out over the central North Atlantic as a storm force low near 49N 31W at 1200 UTC November 1st. The cyclone became multi-centered on November 2nd with the main center 49N 18W becoming absorbed by a new cyclone developing to the north by the 3rd.

North Atlantic Storm, November 5-7:

This developing cyclone, one of two to develop central pressures below 950 hPa in November, originated as a low pressure wave 300 nm south of Cape Race, Newfoundland on the morning of November 5th. *Figure 13* depicts its subsequent development over a two day period into the second most intense low of the five month period. The central pressure fell 29 hPa in the twenty-four hour period ending at 1800 UTC November 7th, when the cyclone developed its lowest central pressure of 946 hPa near 58N 32W. **Table 4** lists the more notable ship and platform reports taken during passage of this storm, including a report of hurricane force

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Sea-Land Champion (WKAU)	38N 59W 37N 54W	25/1800 26/0600	SW 45 W 50	10.5/34
Mary Artica (BATEU00)	53N 44W	27/1200	NE 50	
Atlantic Compass (SKUN)	52N 45W	27/1800	NE 50	
Buoy 44139	44.2N 57.1W	26/1100 26/1200 26/1300	NW 51 NW 49 G66 Maximum	7.0/23 8.0/26
Buoy 44141	43.0N 58.0W	26/0600 26/0700 26/1900	NW 58 NW 52 G66 Maximum	7.5/25 9.0/30
Buoy 44140	42.9N 51.5W	26/1900 27/0500	W 47 G54 Maximum	9.5/31 11.0/36
Hibernia Platform (VEP717)	46.7N 48.7W	27/1200	W 71 (height 139 m)	
Terra Nova FPSO (VCXF)	46.4N 48.4W	27/1500 28/0000	W 66 W 60 (height 53 m)	8.2/27
GSF Grand Banks (YJUF7)	46.7N 48.0W	27/1800	W 54 (height 82 m)	

Table 2. Selected ship, buoy and oil platform observations taken during passage of the North Atlantic storm of October 25-28, 2011.

winds. A high resolution ASCAT pass from near the time of the second part of *Figure 13* revealed north to northeast winds of 50 kts to as high as 65 kts off the southeast Greenland coast to the west and north of the low center. The cyclone subsequently weakened rapidly the night of November 7th and early on the 8th, and dissipated near the Greenland coast on the 8th.

Northwestern Atlantic Storm, November 10-12: The next major storm formed from the merging of a low over the Gulf of St. Lawrence with another over northern Quebec over a twenty-four hour period as shown in *Figure 14*. The cyclone is at maximum intensity in the second part of *Figure 14* and unlike other major lows during this period moved north through the Davis Strait. *Figure 15* shows some ASCAT wind retrievals in the 50kts to 60 kts in the enhanced flow between an approaching cold front and the southwest Greenland coast. The cyclone subsequently weakened as it

passed through the Davis Strait on the 13th.

North Atlantic Storm, Greenland area, November 18-20: A complex area of low pressure just south of the Atlantic provinces of Canada merged with low pressure over the Labrador Sea over a thirty-six hour period to form an intense 952 hPa low near the southern tip of Greenland as shown in *Figure 16*. The central pressure dropped 35 hPa in the twenty-four hour period ending at 0600 UTC on the 19th. **Hibernia Platform** (VEP717) 46.7N 48.7W reported southwest winds of 65 kts at 1800 UTC November 18th at a height of 139 m. The **Jaeger Arrow** (C6RM7) encountered west winds of 50 kts and 10.7 m seas (35 ft) near 59N 47W at 0600 UTC on the 20th. An ASCAT pass at 1309 UTC on the 19th showed west winds of 50 kts at a pass edge near 57N 49W. The cyclone subsequently moved into the east Greenland waters on the 20th where it stalled, with its winds weakening to gale force late by the 21st.

The stalled low dissipated on the 26th.

North Atlantic Storms, November 22-27: Two strong cyclones developed in close succession late in November, with the first originating from a complex area of low pressure over the south-central waters with the northern low breaking off, merging with a front to the north and explosively deepening while passing west and northwest of the British Isles (*Figure 17*). The central pressure fell 40 hPa in the twenty-four hour period ending at 0000 UTC November 25th, when the lowest pressure of 940 hPa was reached. This made it the deepest cyclone of the period in the North Atlantic. The infrared satellite image in *Figure 18* shows the cyclone near maximum intensity with well defined cold topped cloud bands spiraling toward the center and deep convective clouds in the cold air south of the storm center. Some ship and buoy observations taken in this event are listed in **Table 5**. ASCAT imagery from 1936 UTC on the 24th

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Sea-Land Mercury (WKAW)	41N 69W	29/2200	NE 50	6.7/22
President Jackson (WRYC)	37N 64W	30/1200	SW 40	8.8/29
Westermoor (A8CH2) BATEU04	41N 23W	01/1200	W 50	4.5/15
	46N 13W	02/1200	W 50	5.0/16
	58N 30W	02/1800	N 50	
Stuttgart Express (DGBE)	52N 29W	03/1200	NW 55	11.3/37
Buoy 44011	41.1N 66.6W	30/1300	W 47 G56 Peak gust 62	7.5/25
		30/1500	Maximum	9.5/31
Buoy 44137	42.3N 62.0W	26/0600	NW 58	
		26/0700	NW 52 G66	7.5/25
		26/1900	Maximum	9.0/30
Buoy 44140	42.9N 51.5W	26/1900	W 47 G64	9.5/31
		27/0500	Maximum	11.0/36
Hibernia Platform (VEP717)	46.7N 48.7W	27/1200	W 71 (height 139 m)	
Terra Nova FPSO (VCXF)	46.4N 48.4W	27/1500	W 66	
		28/0000	W 60 (height 53 m)	8.2/27
GSF Grand Banks (YJUF7)	46.7N 48.0W	27/1800	W 54 (height 82 m)	

Table 3. Selected ship, buoy and oil platform observations taken during passage of the North Atlantic storm of October 29-November 3, 2011.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Talisman (LOAW5)	49N 25W	07/0000	SE 45	8.2/27
	49W 18W	07/1100	S 55	9.0/30
Celebrity Eclipse (9HXC9)	37N 32W	07/0000	NW 55	
	38N 33W	07/0200	NW 50	6.5/21
Walther Herwig III (DBFR) BATFR04 BATEU08	62N 50W	07/1500	NW 50	4.5/15
	62N 51W	08/0200	NW 65	5.0/16
	44N 33W	07/0000	W 45	
	61N 49W	08/0200	NW 50	
Hibernia Platform (VEP717)	46.7N 48.7W	06/0000	N 55	
Terra Nova FPSO (VCXF)	46.4N 48.4W	06/0000	N 45	3.5/11
		06/0600	Maximum	5.8/19

Table 4. Selected ship and oil platform observations taken during passage of the North Atlantic storm of November 5-7, 2011.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Schiehallion (MWYG6)	60N 4W	24/2200	SW 55	
Stena Carron (2BKQ8)	61N 3W	25/0300	SW 50	13.0/43
3ERR2	63N 5E	25/1200	SW 50	10.5/34
Buoy 62095	53.2N 15.8W	24.0500	S 40	6.0/20
		25/1200	Maximum	9.8/32
Buoy 64045	59.2N 11.7W	24/1700	SW 50	14.3/47
Buoy 64046	60.5N 4.8W	25/0000	SW 45	10.5/34
		25/0300		11.3/37
Buoy 64041	60.7N 2.6W	25/0100	SW 50	9.0/30
		25/0400		11.0/36
Buoy 63115	61.6N 1.4E	25/0600	SW 40	11.3/37

Table 5. Selected ship and oil platform observations taken during passage of the North Atlantic storm of November 22-25, 2011.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
BATFR04	57N 11W	8/0900	W 65	
	57N 11W	8/1000	W 80	
Schiehallion (MWYG6)	60N 4W	8/1800	N 65	
2BKW3	61N 3W	9/0900	NW 65	10.0/33
Global Producer 3	58N 1E	9/0000	NW 60	8.2/27
		8/2200		11.0/36
Buoy 62117	57.9N 0.0W	8/1700	SW 55	5.8/19
		9/0100		6.7/22
Buoy 62116	57.6N 1.1E	8/1800	SW 55	7.9/26
		9/0600		9.5/31
Buoy 62114	58.3N 0.0W	9/0100	NW 60	

Table 6. Selected ship and oil platform observations taken during passage of the North Atlantic storm of December 7-10, 2011.

revealed an area of southwest winds 50 to 60 kts on the edge of the pass and likely missed the strongest winds. The cyclone then quickly passed northeast of the area by the 25th. The second part of *Figure 17* shows a frontal wave of low pressure entering the picture south of Greenland, which originated near the northeast U.S. coast on the 23rd. It passed just north of the British Isles with a 972 hPa central pressure, still mostly an open wave late on the 26th. It then briefly developed hurricane-force winds around mid-day on the 27th as it moved inland over southern Norway

with a 968 hPa central pressure.

Northeastern Atlantic Storm, December 7-10: A significant cyclone originating in the north-central waters late on December 6th moved northeast while rapidly intensifying, passing just north of Scotland on the 8th (*Figure 19*). The central pressure fell an impressive 42 hPa in the twenty-four hour period ending at 1200 UTC on the 8th. Six hours later, the low center passed near 60N 0W with a lowest central pressure of 954 hPa. The Ocean Prediction Center (OPC) analyzed a

hurricane-force low on the 8th. Some notable ship and buoy observations taken in this event are listed in **Table 6**. The cyclone then passed through the North Sea on the night of the 8th and weakened inland over southern Norway early on the 10th.

Western Atlantic Storm, December 8-11: This cyclone developed rapidly after moving off the mid-Atlantic coast of the U.S. late on December 7th and was one of five that developed central pressures in the 940 hPa range during the late November to December period.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Schiehallion (MWYG6)	61N 5W	25/1200	SE 50	
Stena Carron (2BKQ8)	61N 3W	25/1500 25/2100	W 76	10.0/33 12.5/41
West Navigator (3ERR2)	63.5N 5E	25/1800 26/0300	SW 45 G68	8.5/28
Draugen (LF3F) (platform)	64.3N 7.8E	26/0000 26/0300	W 45 G62	8.5/28 10.0/33
Troll A (LF4B) (platform)	60.6N 3.8E	26/0000 25/1800	W 30 G68 SW 50 G66	7.0/23 6.4/21
Buoy 64046	60.5N 4.9W	25/1500 25/1700	W 49	11.0/36 13.4/44

Table 7. Selected ship, oil platform and buoy observations taken during passage of the Northeastern storm of December 24-26, 2011.

Figure 20 depicts the development of this cyclone over a twenty-four hour period with the maximum intensity of 946 hPa reached at 0600 UTC on the 9th as depicted in the second part of Figure 20. The central pressure dropped 43 hPa in the same twenty-four hour period. Wind retrievals from the ASCAT scatterometer (Figure 21) show an extensive area of west winds 50 kts to as high as 70 kts on the south side of the cyclone, and similar winds from the east on the north side ahead of the occluded front which was approaching the southern tip of Greenland at that time. The **Maersk Patras** (MYSU5) reported south winds of 60 kts near 46N 54W at 0000 UTC on the 9th. Three hours later **Hibernia Platform** (VEP717) 46.7N 48.7W reported southwest winds of 65 kts at an anemometer height of 139 m, and 3.5 m seas (11 ft). The cyclone turned east along 60N after passing near the southern tip of Greenland early on the 10th and its top winds weakened to storm force. After passing north of the British Isles on the night of the 11th as a gale force low, the cyclone dissipated southeast of Iceland late on the 12th. The buoy 62095 (53.1N 16.0W) reported seas reaching 10.5 m seas (34 ft) at 1600 UTC on the 11th.

Northeastern Atlantic Storms, December 11-14: The stronger of two cyclones that formed in this part of the Atlantic during this time developed

from the merging of two lows south of Greenland (Figure 22) and became the hurricane-force low shown near Scotland in the second part of Figure 22. Six hours prior, the cyclone developed a lowest central pressure of 944 hPa while passing near 57N 12W, making it the second deepest North Atlantic low of the six month period. The central pressure fell 44 hPa in the twenty-four hour period ending at 1800 UTC on the 12th, within the period covered by Figure 22. Winds from the ASCAT scatterometer revealed a swath of west to southwest winds 50 to 55 kts west of the British Isles from 54N to 56N close to time of the second part of Figure 22. Buoy 62105 (55.0N 13.3W) reported west winds of 50 kts and 12.8 m seas (42 ft) at 1000 UTC on the 13th, and a report of 14.0 m seas (46 ft) four hours prior. A second cyclone originating in the east Greenland waters on the 12th moved southeast toward Ireland as shown in the second part of Figure 22 and briefly developed hurricane-force winds on the south side on the night of the 13th similar to those of its predecessor. After developing a lowest central pressure of 968 hPa on the 13th, the cyclone's top winds weakened to storm force before reaching the Irish coast the next day. Further weakening followed as the low passed across southern England late on the 14th.

North Atlantic Storm, December 21-23: Several strong cyclones developed

and moved over the northern Atlantic waters after December 20. The first of these originated near the island of Newfoundland on the 20th and then intensified out over the North Atlantic, briefly developing hurricane-force winds while passing just northeast of Iceland with a 963 hPa central pressure at 0000 UTC on the 23rd (Figure 23). The **Stena Carron** (2BKQ8) near 61N 4W reported southwest winds of 65 kts and 7.9 m seas (26 ft) at 0300 UTC on the 23rd followed six hours later by a report of west winds 40 kts and 10.7 m seas (35 ft) near that location. WindSat imagery in Figure 26 reveals a swath of southwest to west winds 50 to 65 kts south of Iceland between 57N and 61N at 1812 UTC on the 22nd when the satellite passed over. Also see Reference 5 for more information on WindSat. The **Finnpine** (SFIR) near 45N 42W encountered west winds of 50 kts and 4.3 m seas (14 ft) at 1200 UTC on the 21st. Buoy 64045 (59.1N 11.5W) at 2200 UTC on the 22nd reported west winds of 45 kts with gusts to 62 kts and 10.7 m seas (35 ft), and four hours later seas 11.9 m (39 ft). The cyclone subsequently weakened to a gale northeast of the area late on the 23rd.

North Atlantic Storm, December 22-25: Originating over the Atlantic provinces of Canada on the night of the 21st, the cyclone that followed passed near the island of Newfoundland at 0000 UTC (Figure 23) and then tracked

northeast to near Iceland thirty six hours later (*Figure 24*) where it briefly developed hurricane-force winds. A 25 km ASCAT pass from 1100 UTC on the 24th showed west winds 50 to 55 kts on the south side, south of Iceland. The central pressure dropped 41 hPa in the twenty-four hour period 0600 UTC on the 24th before reaching a lowest pressure of 947 hPa six hours later. The **Helgafell** (OZ2049) encountered southwest winds of 60 kts near 61N 15W at 1800 UTC on the 24th. Buoy 64045 (59.1N 11.5W) reported west winds of 40 kts with gusts to 58 kts and 10.0 m seas (33 ft) at 1700 UTC December 24th, and maximum seas 11.0 m (36 ft) three hours later. Another buoy, 64046 (60.5N 4.9W), reported west winds of 45 kts at 0000 UTC on the 25th, and five hours later 12.2 m seas (40 ft). The cyclone then weakened northeast of Iceland on the 25th.

Northeastern Atlantic Storm, December 24-26: A frontal wave of low pressure passed just south of New England on the morning of December 23rd, moved over the Grand Banks the following night as a gale, and then rapidly intensified while moving over the northern Atlantic waters. The cyclone's central pressure fell 37 hPa in the twenty-four hour period ending at 0600 UTC on the 25th when the center passed near 60N 20W with a 962 hPa central pressure. The system developed hurricane-force winds as it passed near and to the east of Iceland on the afternoon of the 25th (*Figure 25*) with a lowest central pressure of 954 hPa. The cyclone passed inland over Norway by early on the 26th. Some ship, buoy and platform observations taken during this event are listed in **Table 7**.

Southwestern North Atlantic Storm, December 26-28: This cyclone originated inland over the northeastern U.S. late on December 25th and moved or redeveloped southeast to just south of Georges Bank on the morning of the 26th before turning east and intensifying. It developed hurricane-force winds the following night while passing 500 nm south of the island of Newfoundland with a central pressure as low as 991 hPa. Limited 25 km ASCAT data near

the time of maximum intensity showed a few 50 kts northwest wind retrievals on the edge of a pass at 1329 UTC on the 27th. The **Charleston Express** (WDD6126) near 33N 60W reported west winds of 45 kts and 10.4 m seas (34 ft) at 0000 UTC on the 27th, followed twelve hours later by a report of 12.5 m seas (41 ft) near 32N 61W. The **Tyco Decisive** (V7DI7) encountered northwest winds of 50 kts and 10.0 m seas (33 ft) near 37N 56W at 1800 UTC on the 27th. The cyclone weakened later on the 27th and early on the 28th south of the Grand Banks before becoming absorbed by a developing low over Canada's Atlantic provinces on the 29th.

Northeastern Atlantic Storm, December 26-29: After originating over the south-central Atlantic basin on the 25th, a developing cyclone tracked northeast to 180 nm northwest of Scotland late on the 27th, where it briefly developed hurricane-force winds and a central pressure as low as 968 hPa. A high resolution ASCAT pass from 2131 UTC on the 27th revealed some northwest winds of 50 kts on the edge of the pass, near 56N 21W, indicating it may not have captured the strongest winds with this low. The **Atlantic Concert** (SKOZ) near 52N 22W reported southeast winds of 50 kts at 0600 UTC on the 26th. The **Global Producer 3** (ZQSD5) near 58.3N 0.7E reported west winds of 45 kts and 8.0 m seas (27 ft) at 1900 UTC on the 28th, and seas of 9.0 m (30 ft) one hour prior to this. Buoy 62105 (55.4N 12.1W) reported northwest winds of 40 kts with gusts to 59 kts at 0900 UTC on the 28th, and seas as high as 11.6 m (38 ft) five hours later. Buoy 64045 (59.1N 11.6W) reported northwest winds of 45 kts with gusts to 68 kts and 9.5 m seas (31 ft) and 1200 UTC on the 28th. The cyclone subsequently turned east and weakened inland over southern Norway on the night of the 28th.

North Atlantic Storm, December 28-January 1 (2012): The next significant low pressure system followed a more western track late in the month, intensifying as it tracked northeast through the St. Lawrence Valley and Gulf of St. Lawrence on

December 28th and then into the Labrador Sea late on the 29th with storm force winds. Upon approaching southern Greenland the cyclone reformed as a new hurricane-force low center east of Greenland near 61N 41W on the morning of the 31st with a central pressure of 965 hPa. Hurricane-force winds lasted into the next day as the center deepened to 955 hPa near 63N 25W. An ASCAT pass from 2330 UTC on the 31st resembled that of the preceding event with northwest winds of 50 kts on the edge of the pass. The **Sea-Land Racer** (WKAP) near 46N 52W encountered west winds of 45 kts and 13.4 m seas (44 ft) at 1200 UTC on the 30th, although the author is not certain of the accuracy of the reported seas. **Hibernia Platform** (VEP717) 46.7N 48.7W reported southwest winds of 60 kts at 0600 and 1800 UTC on the 30th. The ship **BATEU04** reported northwest winds of 50 kts near 59N 46W at 0700 UTC January 2nd. The cyclone then weakened northeast of Iceland late on January 2nd.

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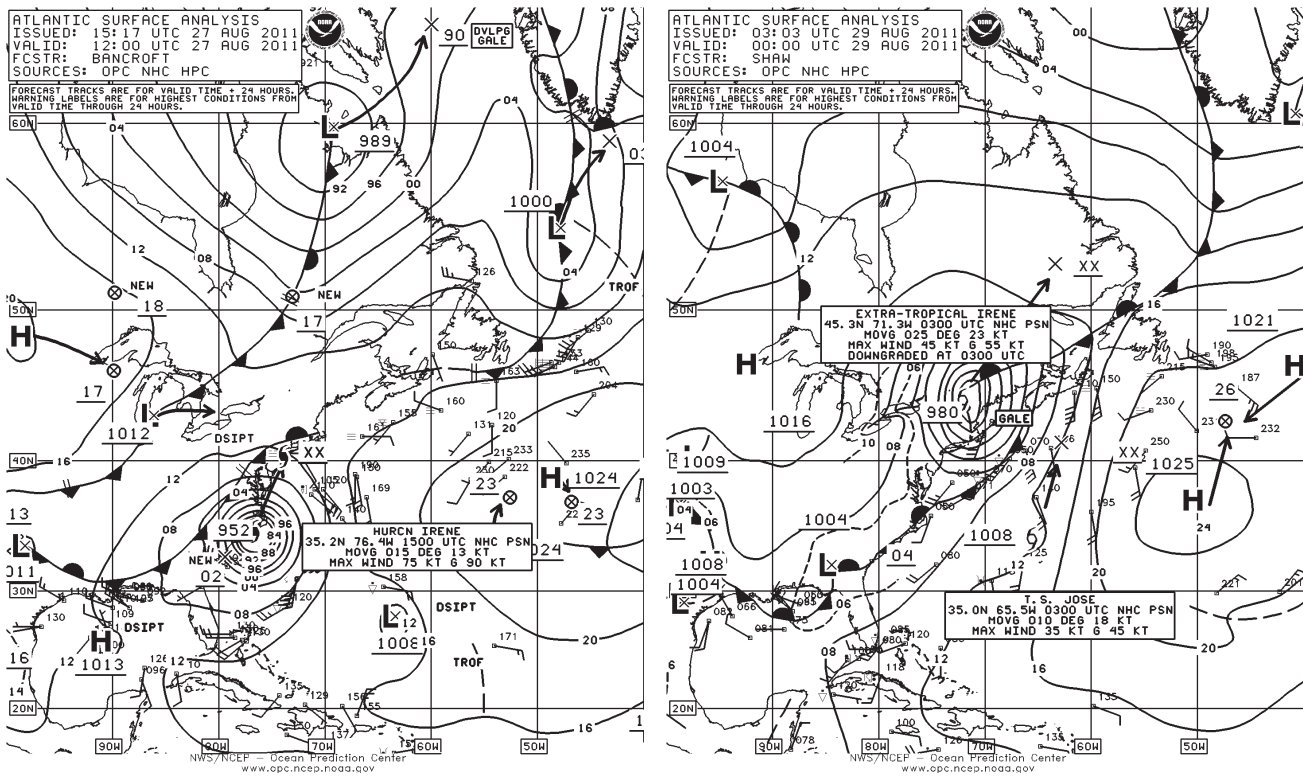


Figure 1. OPC North Atlantic Surface Analysis charts (Part 2 - west) valid 1200 UTCAugust 27 and 0000 UTC August 29, 2011. Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars except XX for tropical cyclones. Text boxes contain information on tropical cyclones based on the latest advisory times (in this case 1500 UTC and 0300 UTC).

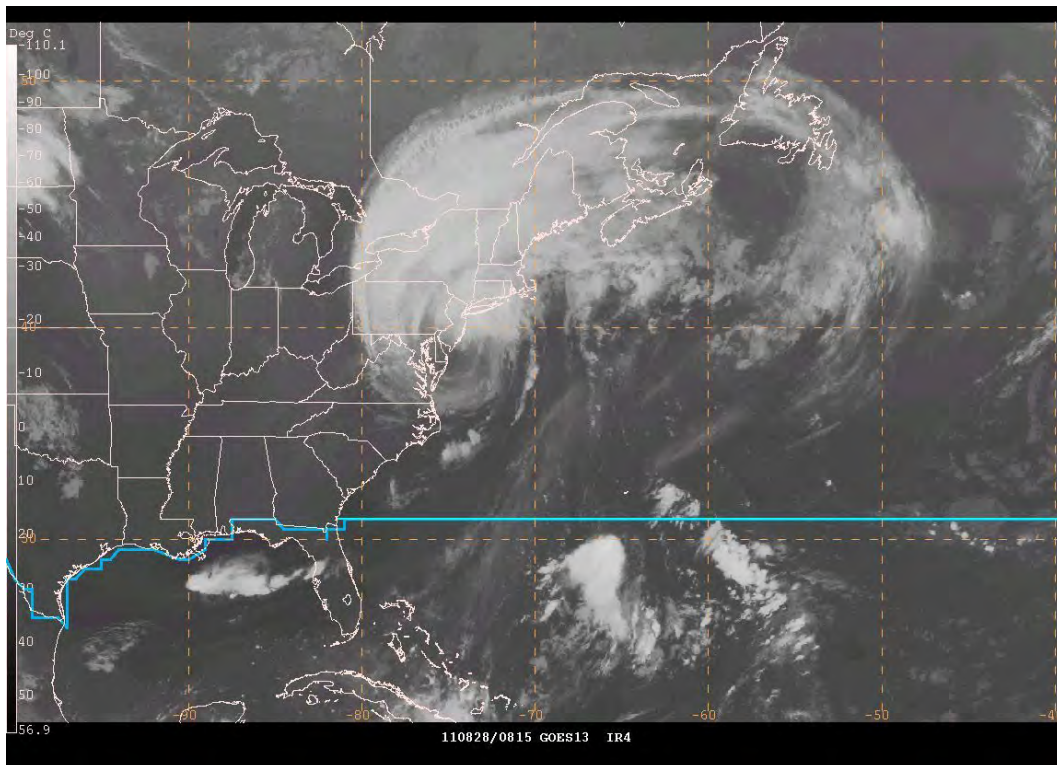


Figure 2. GOES-13 infrared satellite image valid 0815 UTC August 28, 2011. The satellite senses temperature on a scale ranging from black (warm) to white (cold) in this type of imagery.

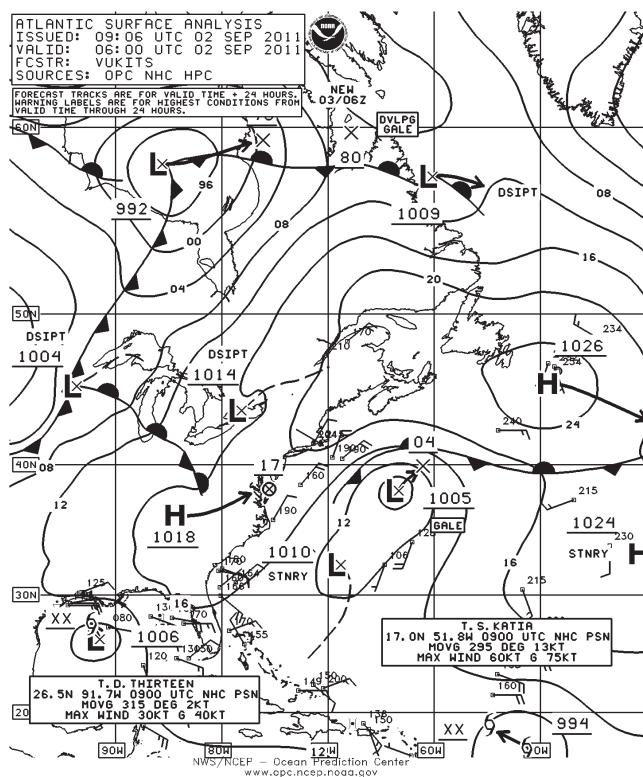


Figure 3. OPC North Atlantic Surface Analysis chart (Part 2) valid 0600 UTC September 2, 2011. The gale-force low near 38N 64W was later reclassified by the National Hurricane Center as an unnamed tropical storm.

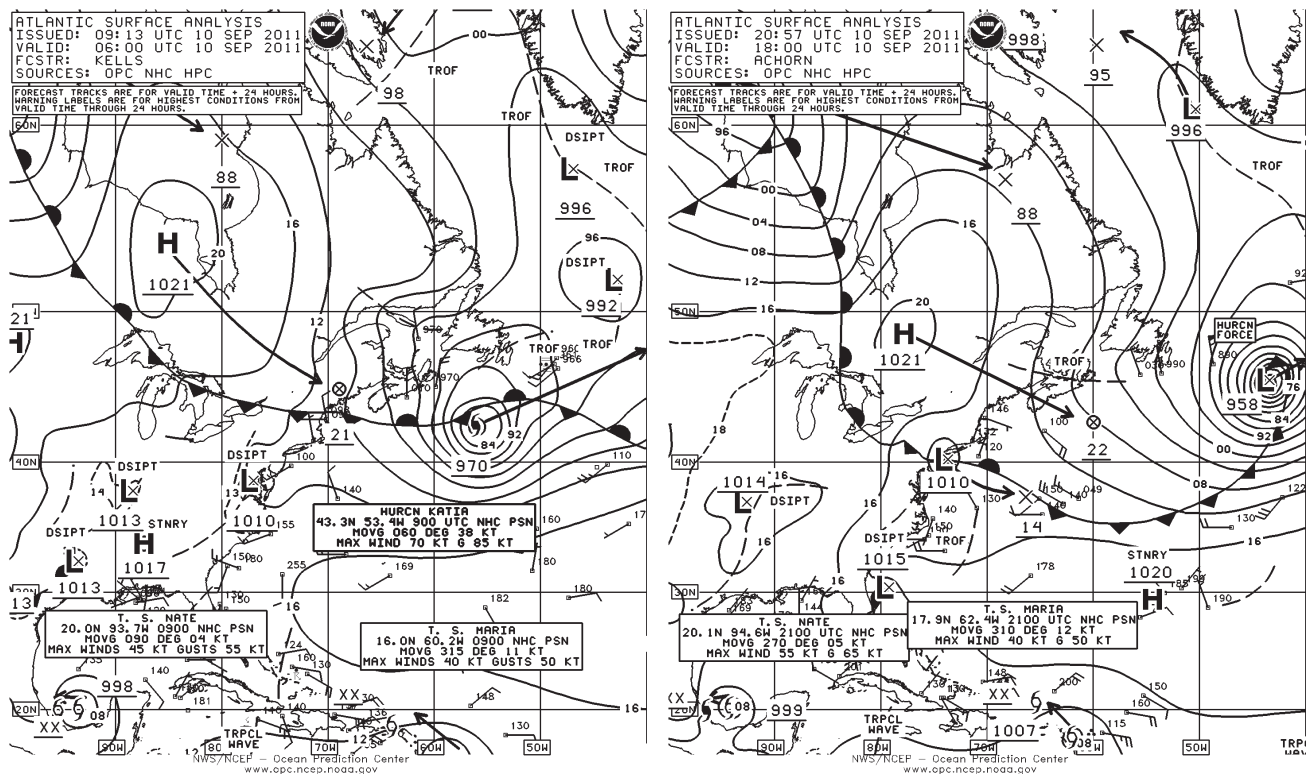


Figure 4. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC and 1800 UTC September 10, 2011.

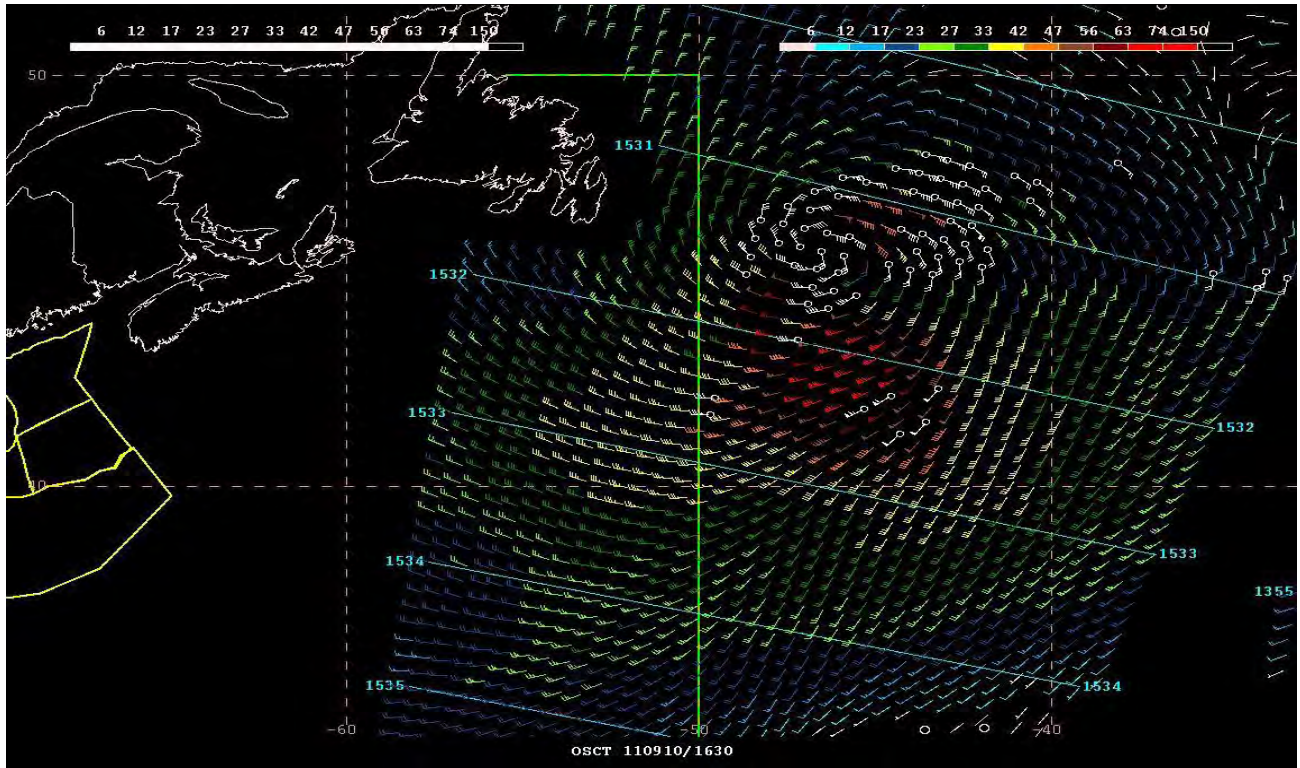


Figure 5. OSCAT (Indian scatterometer) image of satellite-sensed winds around Post-Tropical Katia with 50-km resolution.

The valid time of the image is approximately 1500 UTC September 10, 2011, or three hours prior to the valid time of the second part of Figure 4. Imagery from the Indian scatterometer was recently made available to OPC near-real time. Image includes cross-track time lines of the satellite's descending pass labeled with four-digit UTC times. Imagery is reprocessed by NOAA/NESDIS.

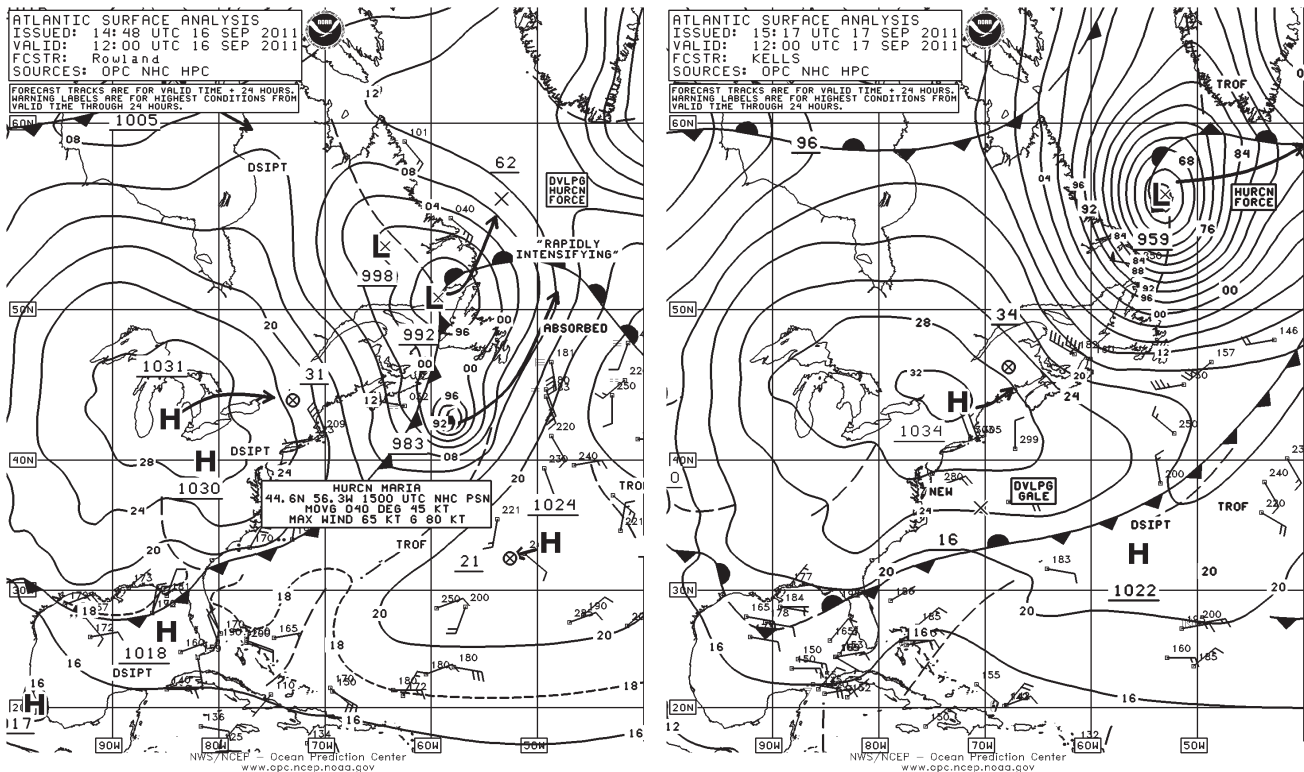


Figure 6. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC September 16 and 17, 2011.

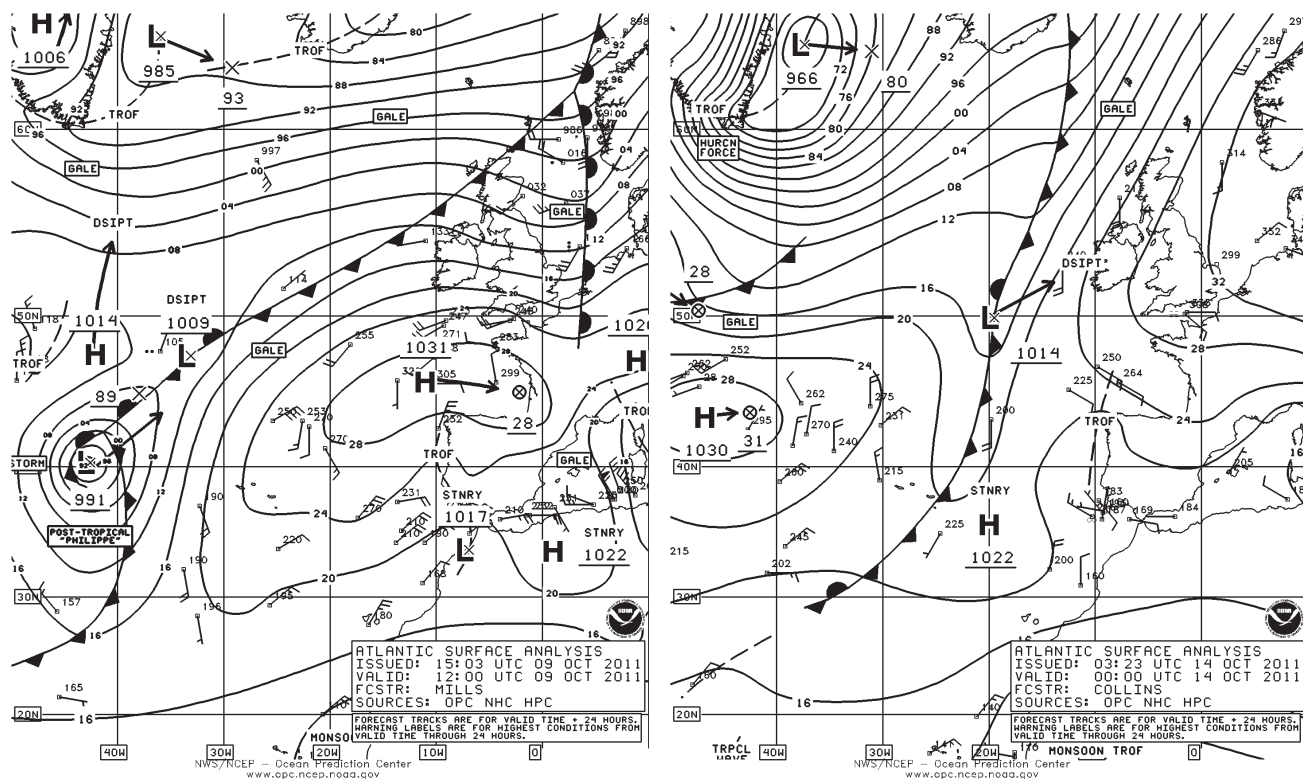


Figure 7. OPC North Atlantic Surface Analysis charts (Part 1 - east) valid 1200 UTC October 9 and 0000 UTC October 14, 2011.

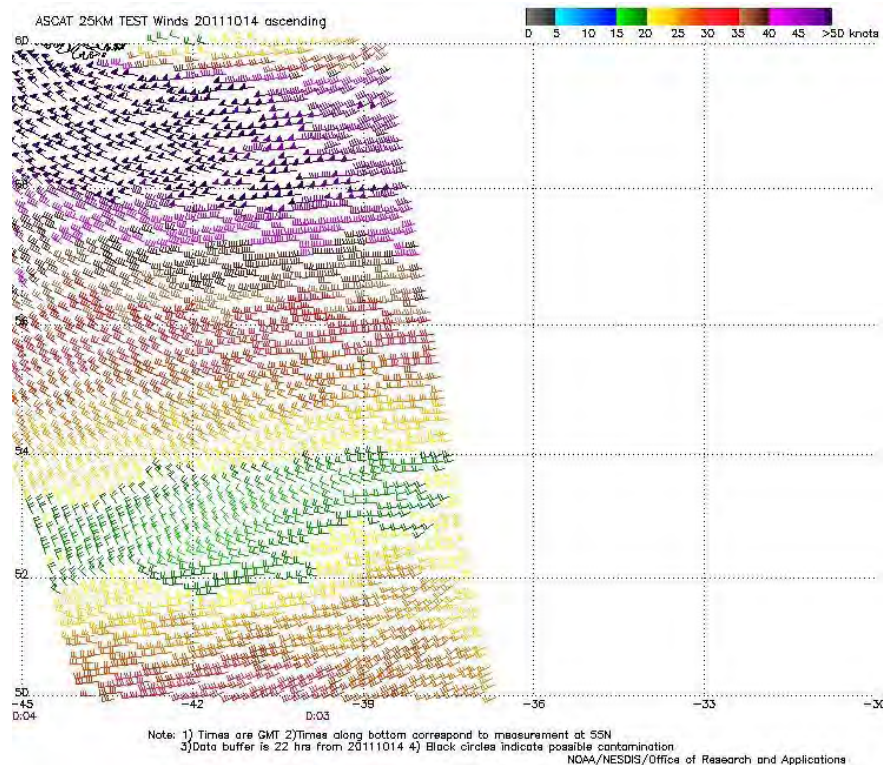


Figure 8. 25-km ASCAT (Advanced Scatterometer) image of satellite-sensed winds on the south side of the cyclone shown in the second part of Figure 7. The valid time of the pass is 0003 UTC October 14, 2011 or close to the valid time of the second part of Figure 7. The southern tip of Greenland is on the upper-left edge of the image. Image is courtesy of NOAA/NESDIS/Center for Satellite Application and Research.

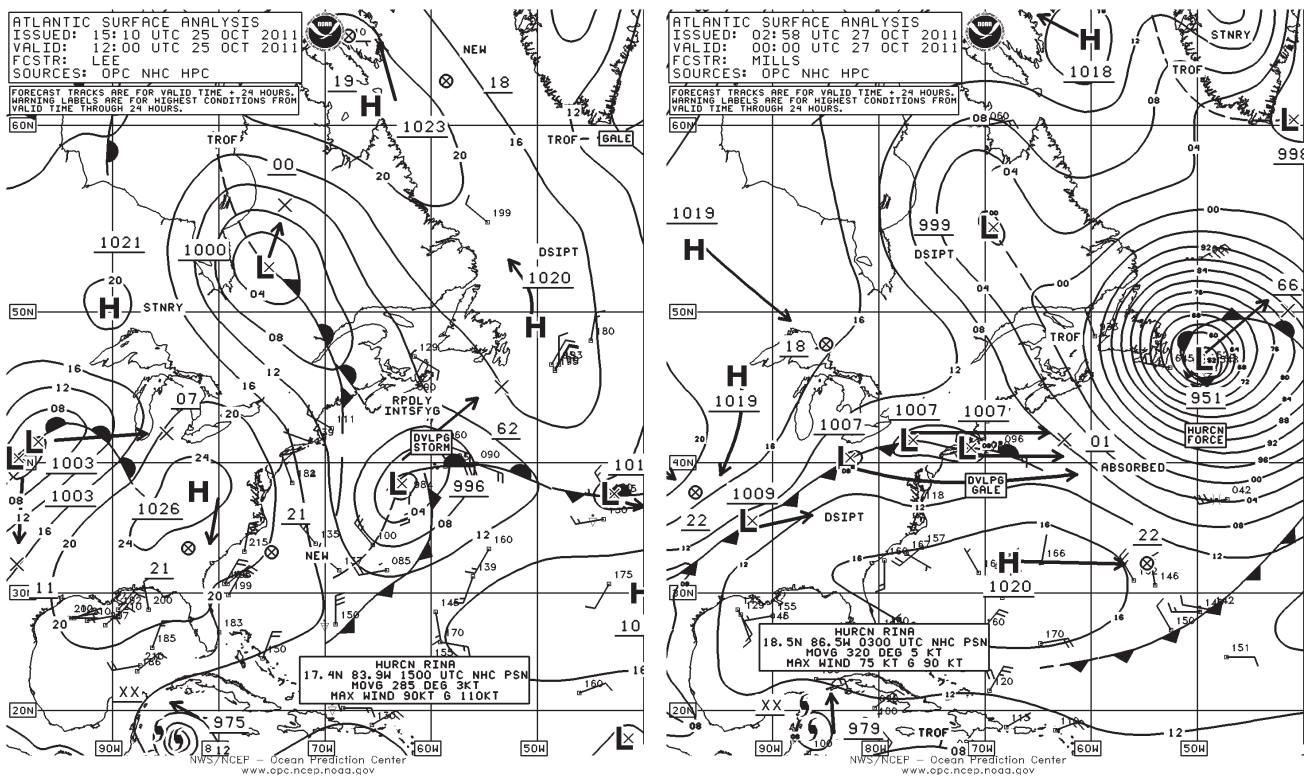


Figure 9. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC October 25 and 0000 UTC October 27, 2011.

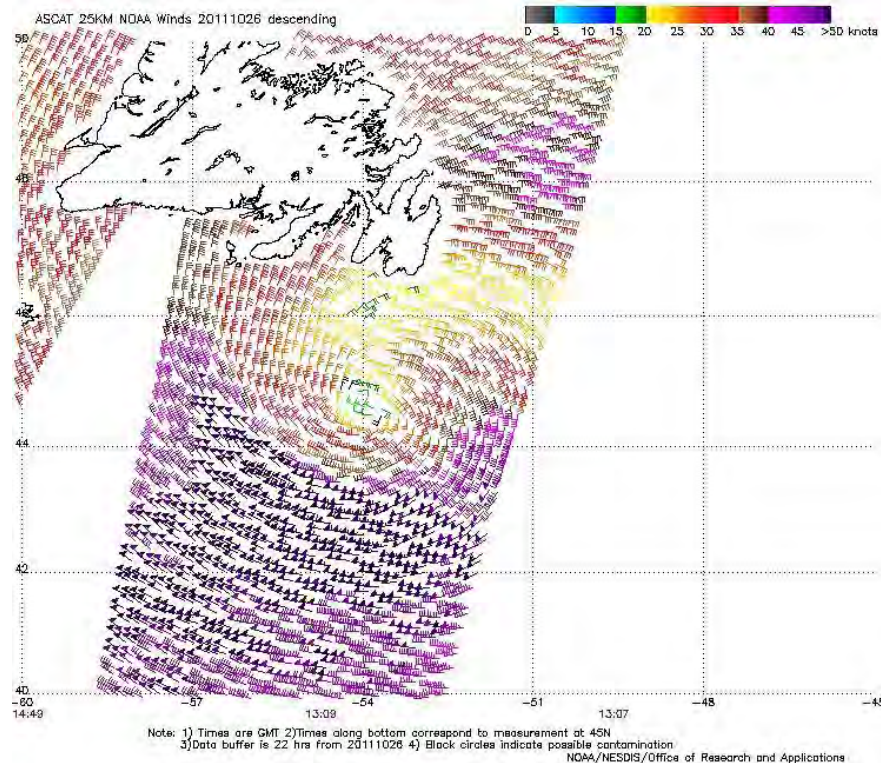


Figure 10. Figure 10. 25-km ASCAT image of satellite-sensed winds around the cyclone shown in the second part of Figure 9. The valid time of the pass is 1309 UTC October 26, 2011 or about eleven hours prior to the valid time of the second part of Figure 9. The center of the cyclone appears near 45N 54W with the island of Newfoundland to the north. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

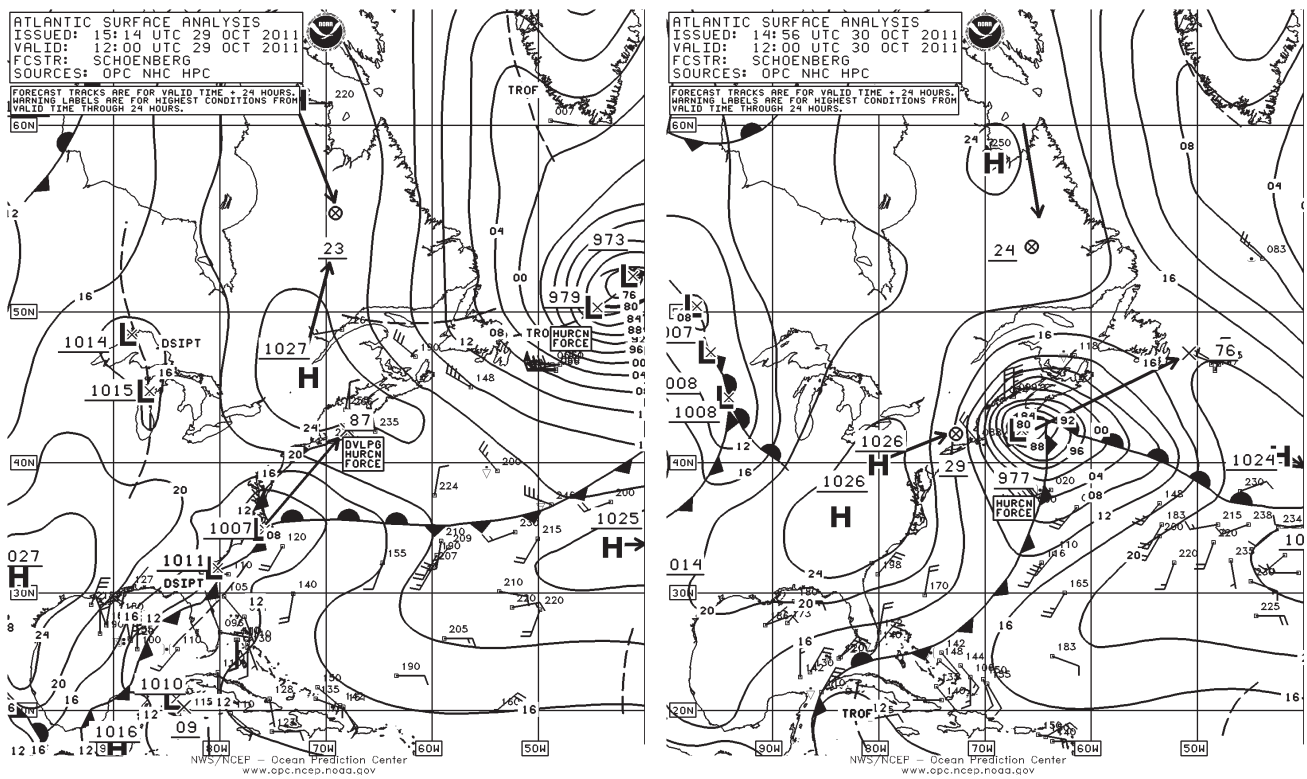


Figure 11. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC October 29 and 30, 2011.

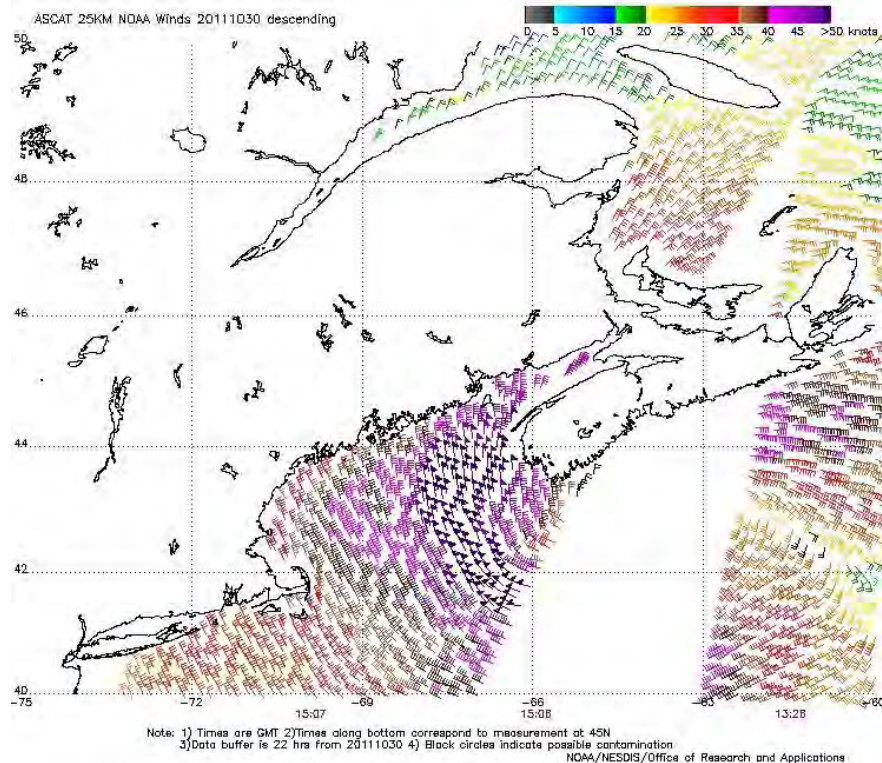


Figure 12. 25-km ASCAT image of satellite-sensed winds around the cyclone shown in the second part of Figure 11. The valid time of the pass is 1506 UTC October 30, 2011, or about three hours later than the valid time of the second part of Figure 11. The center of the storm is south of Nova Scotia in a data-free gap between passes. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

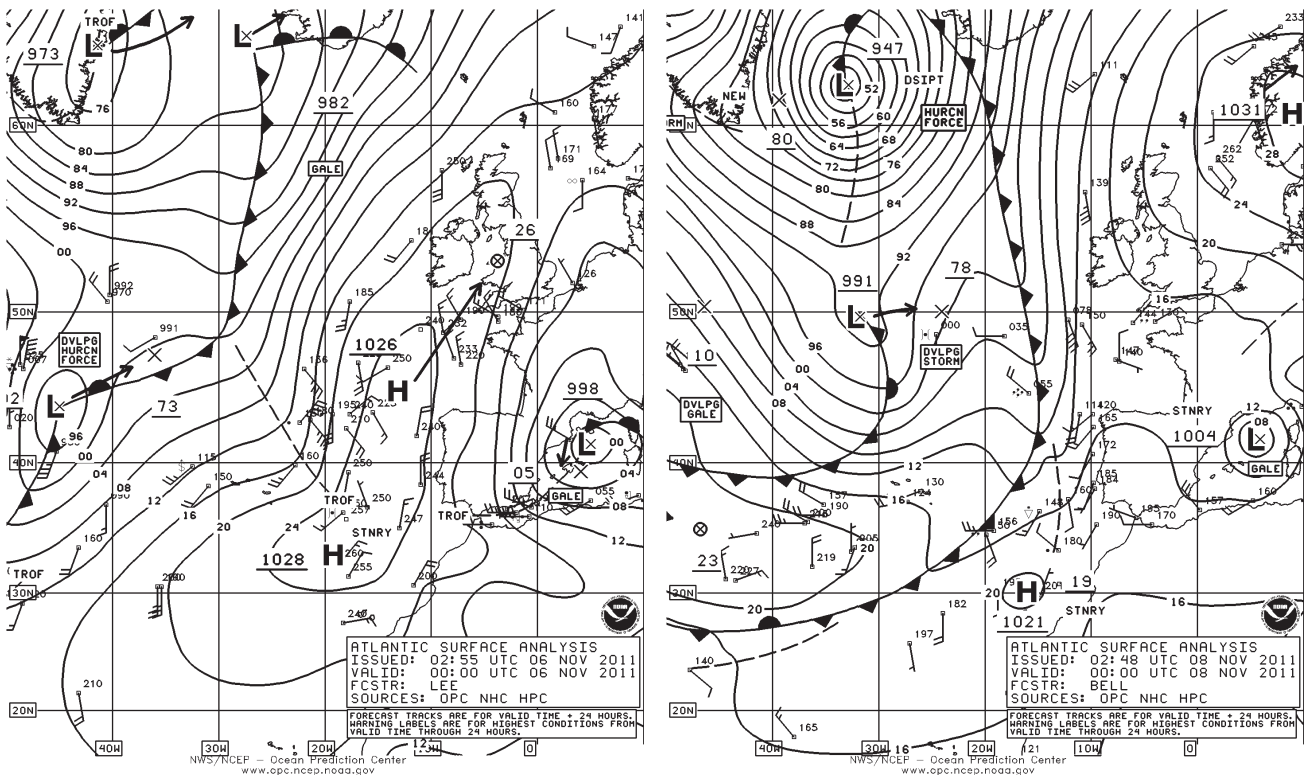


Figure 13. OPC North Atlantic Surface Analysis charts (Part 1) valid 0000 UTC November 6 and 8, 2011.

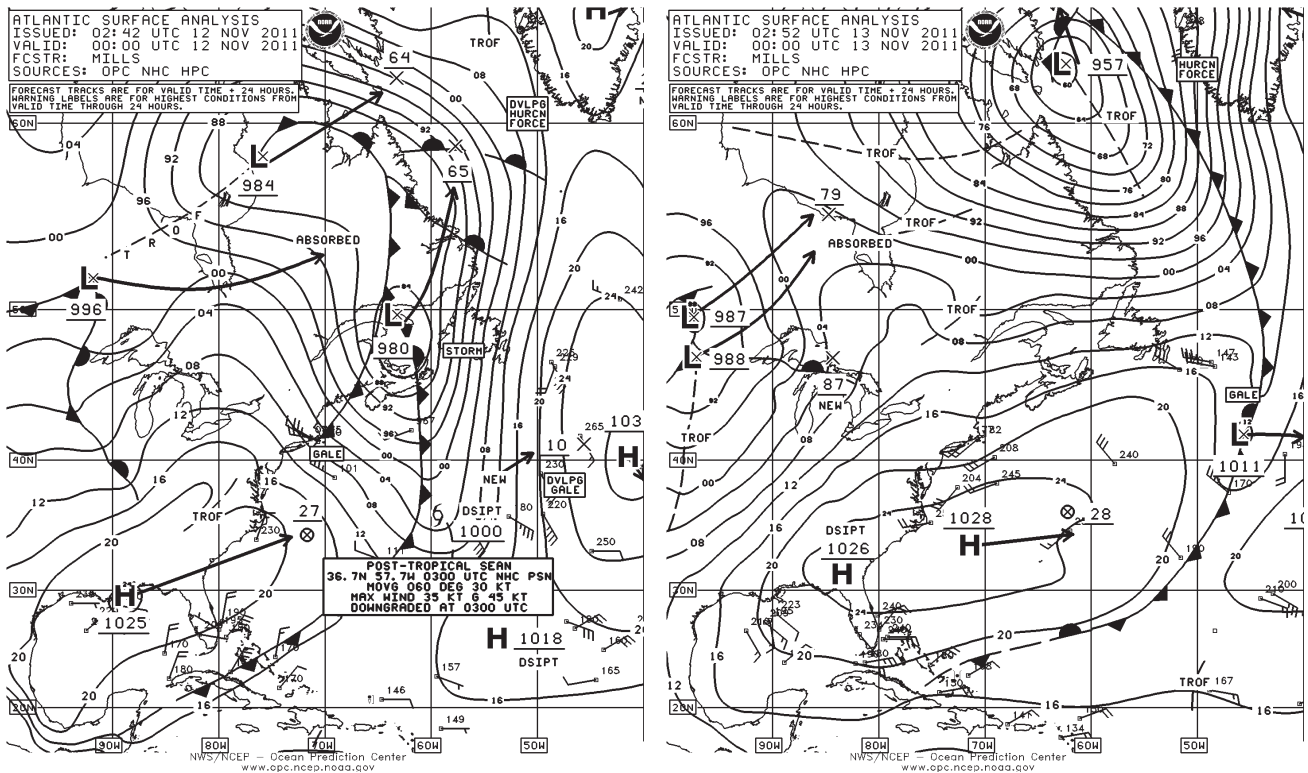


Figure 14. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC November 12 and 13, 2011.

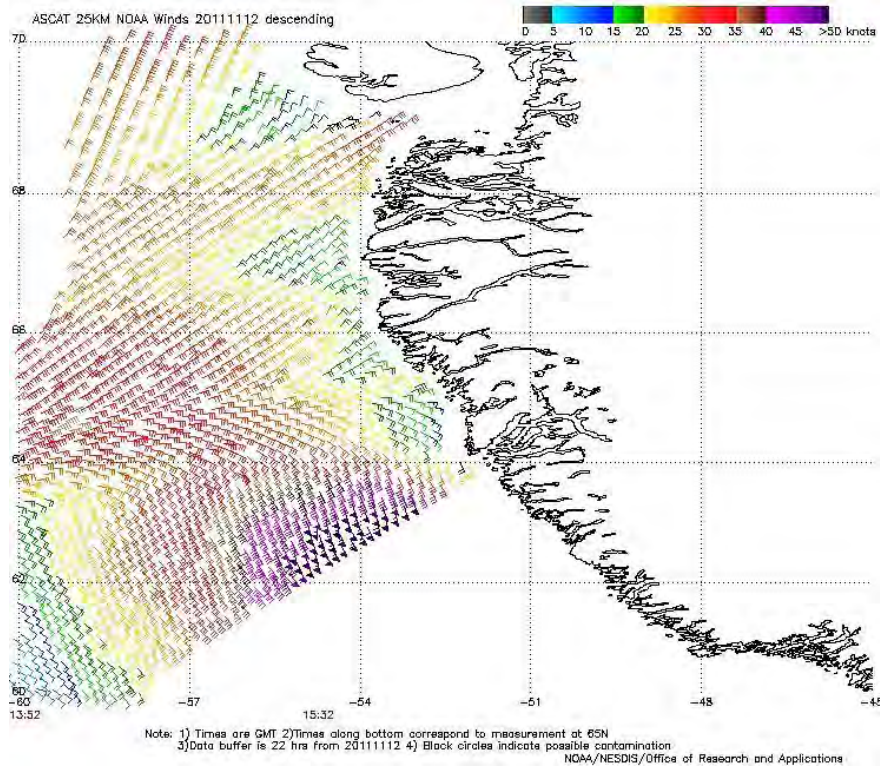


Figure 15. 25-km ASCAT image of satellite-sensed winds with partial coverage around the east side of the hurricane-force low shown in the second part of Figure 14. The valid time of the pass is 1532 UTC November 12, 2011, or about eight and one-half hours prior to the valid time of the second part of Figure 14. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

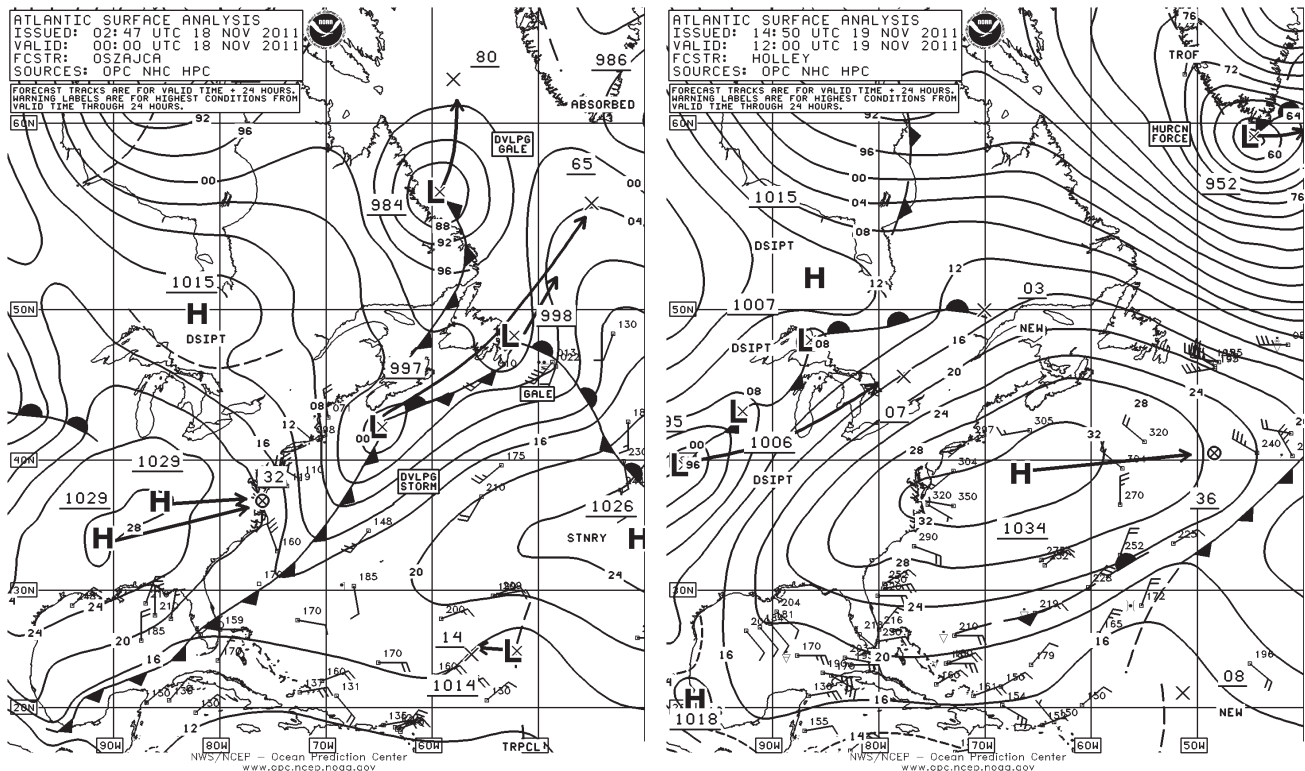


Figure 16. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC November 18 and 1200 UTC November 19, 2011.

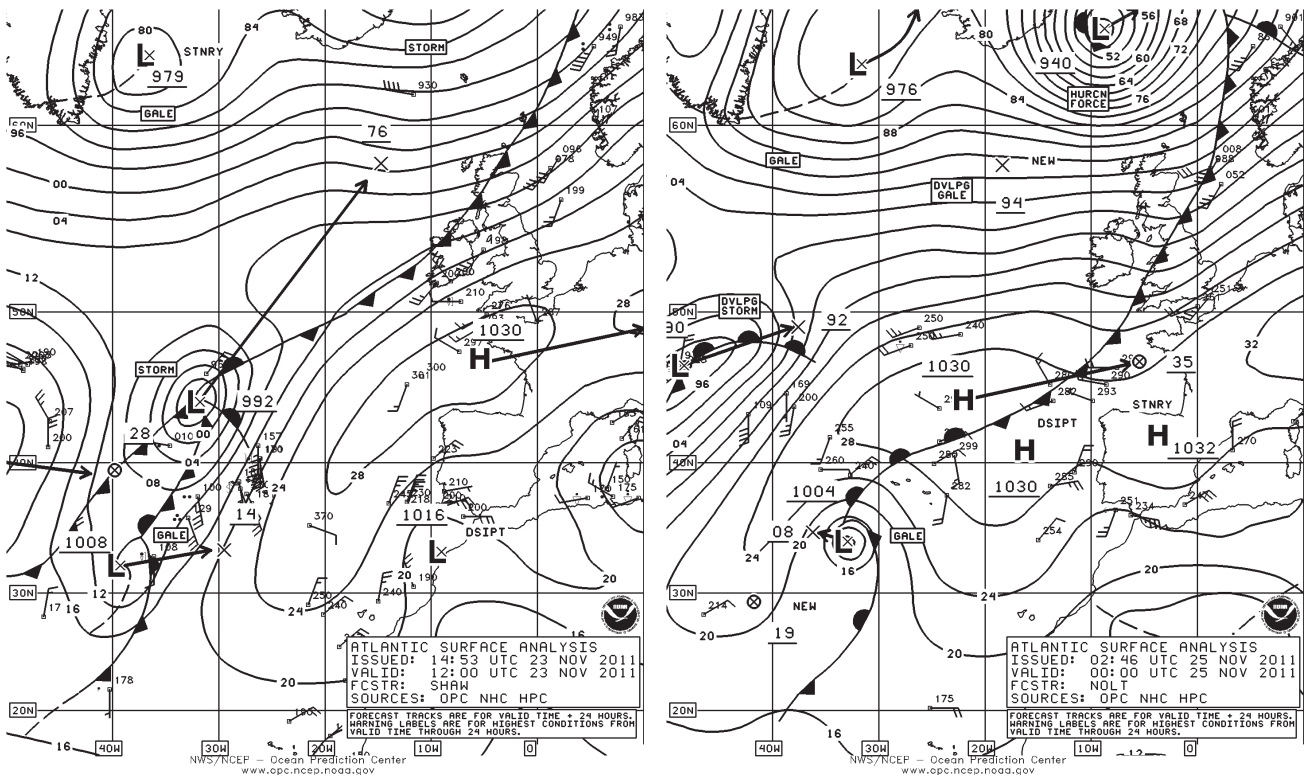


Figure 17. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC November 23 and 0000 UTC November 25, 2011.

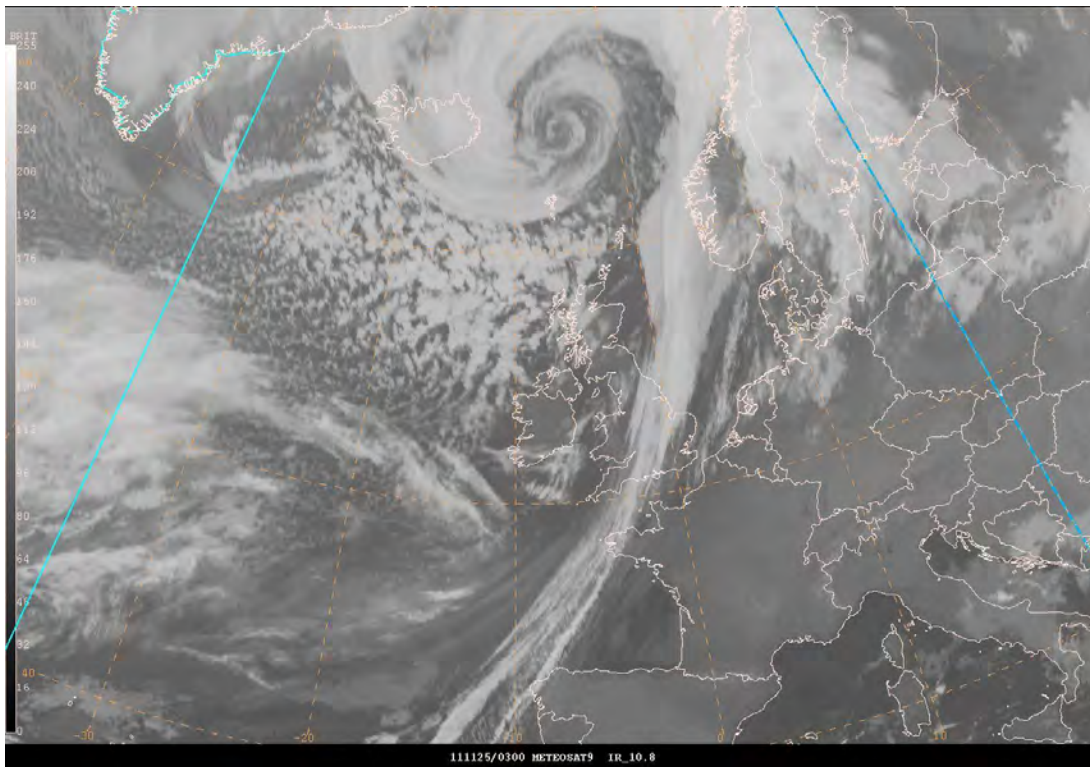


Figure 18. METEOSAT-9 infrared satellite image valid 0300 UTC November 25, 2011. The satellite senses temperature on a scale ranging from black (warm) to white (cold) in this type of imagery. The valid time of the image is three hours later than the valid time of the second part of Figure 17.

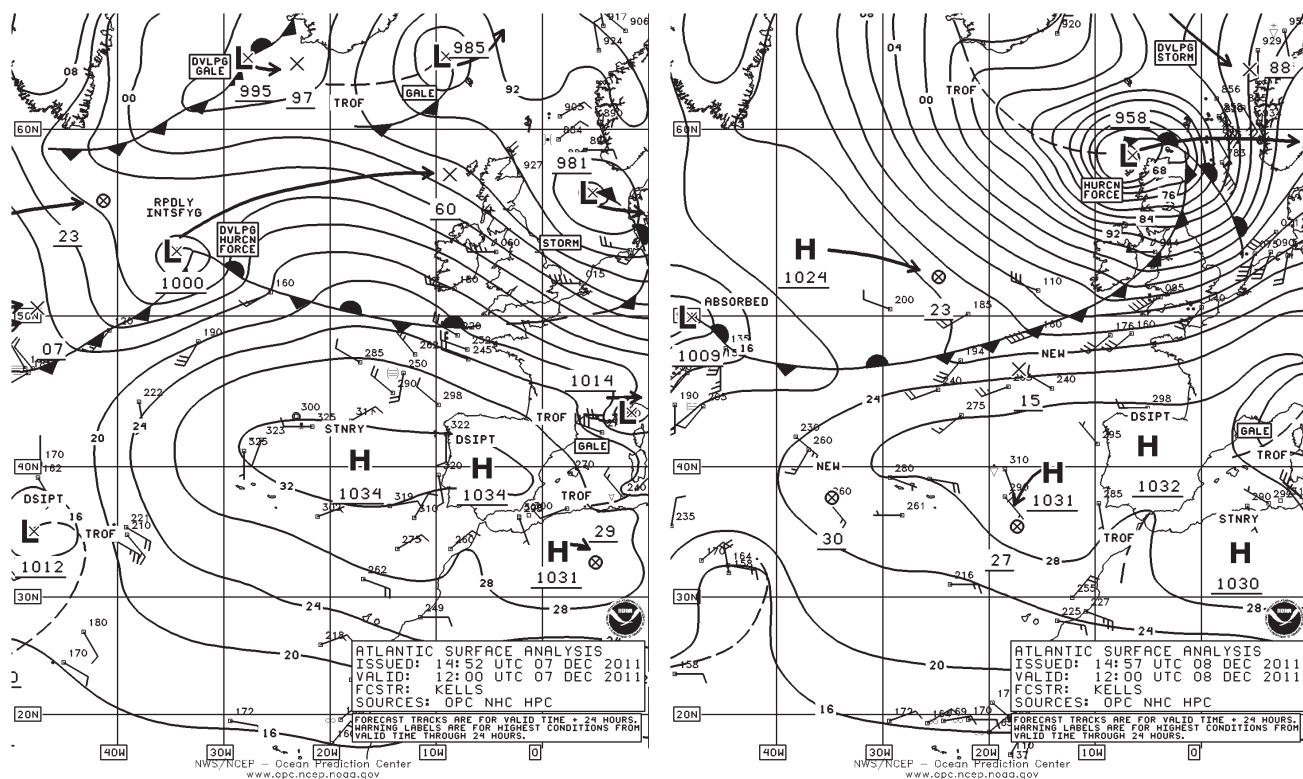


Figure 19. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC December 7 and 8, 2011.

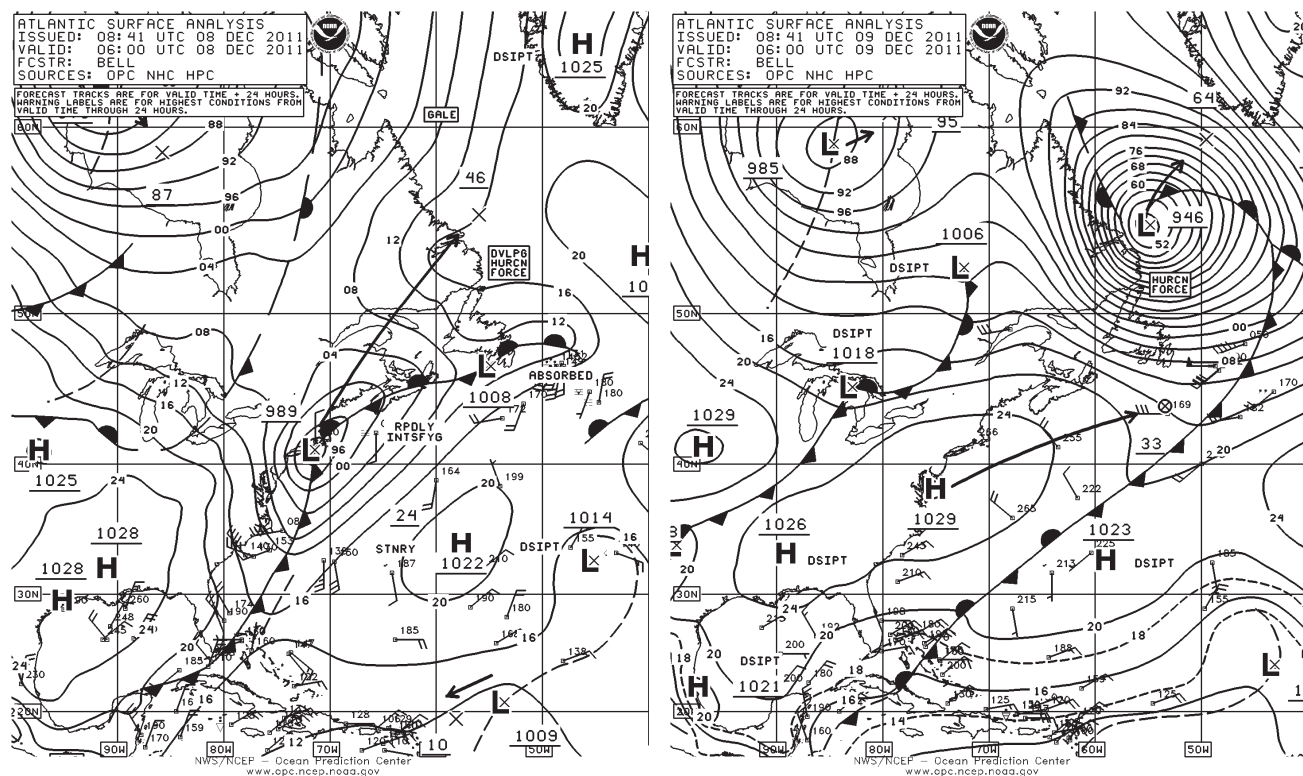


Figure 20. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC December 8 and 9, 2011.

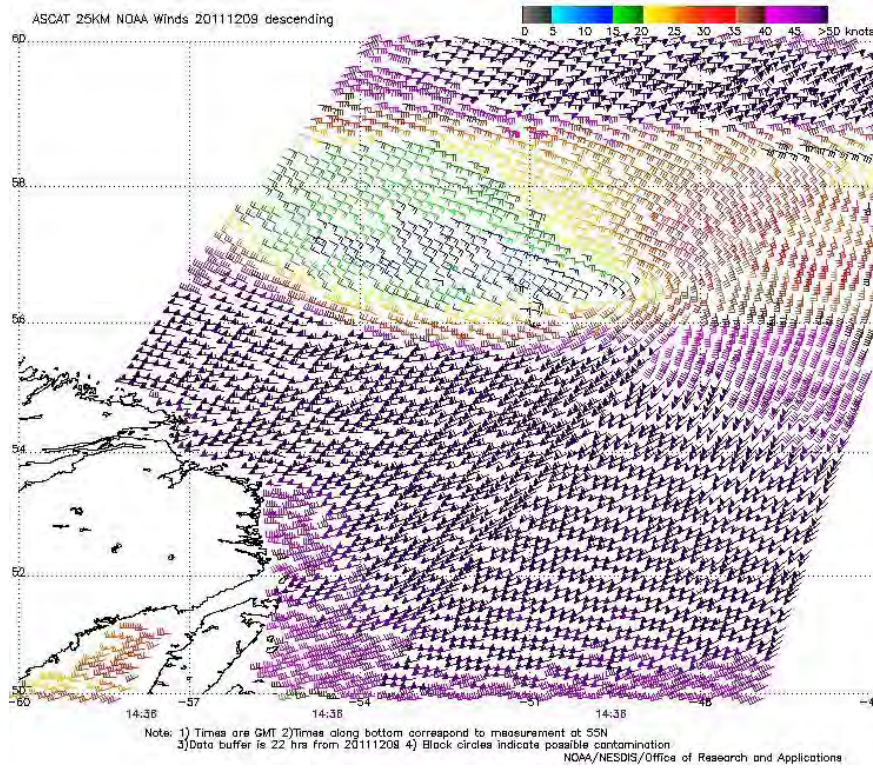


Figure 21. 25-km ASCAT image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 20. The valid time of the pass is 1436 UTC December 9, 2011, or about eight and one-half hours later than the valid time of the second part of Figure 20. The center of the cyclone, not well defined from the wind barbs, is in the area of lighter winds between the stronger winds ahead of the occluded front to the north and the stronger west winds to the south. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

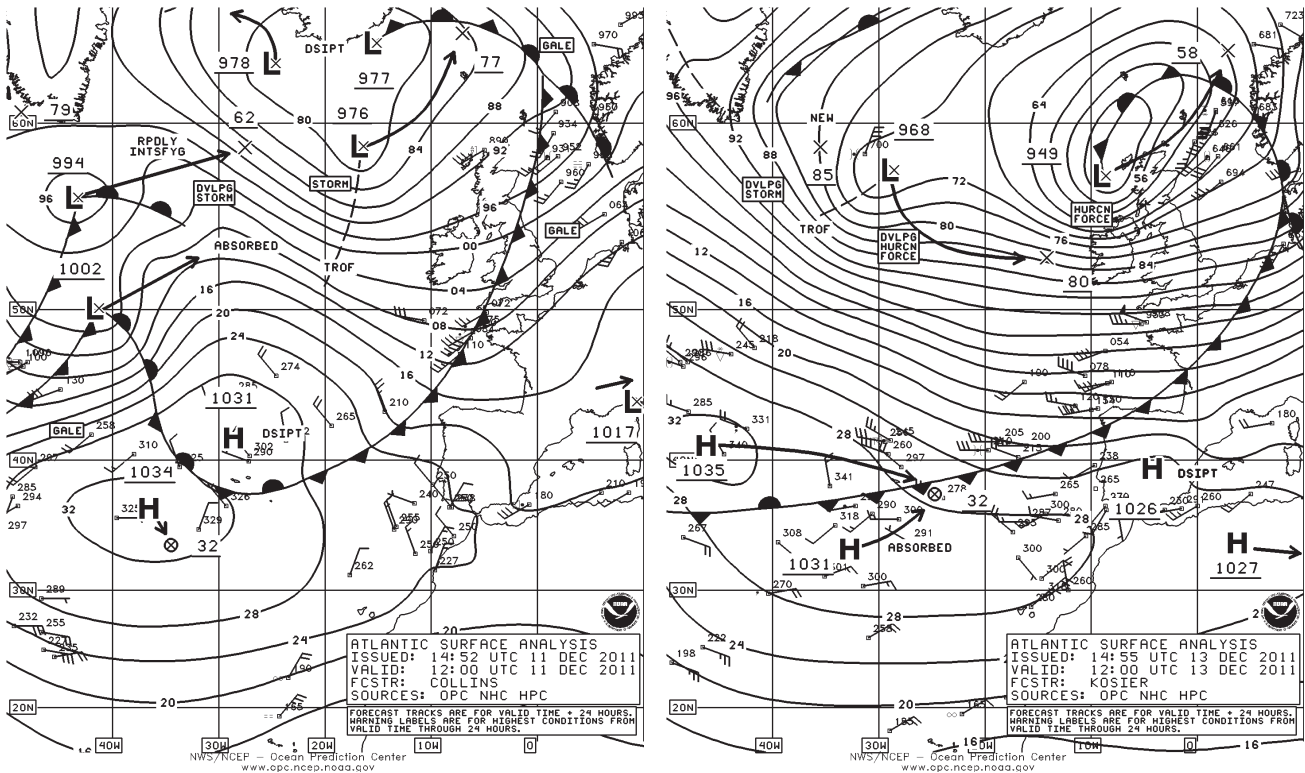


Figure 22. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC December 11 and 13, 2011.

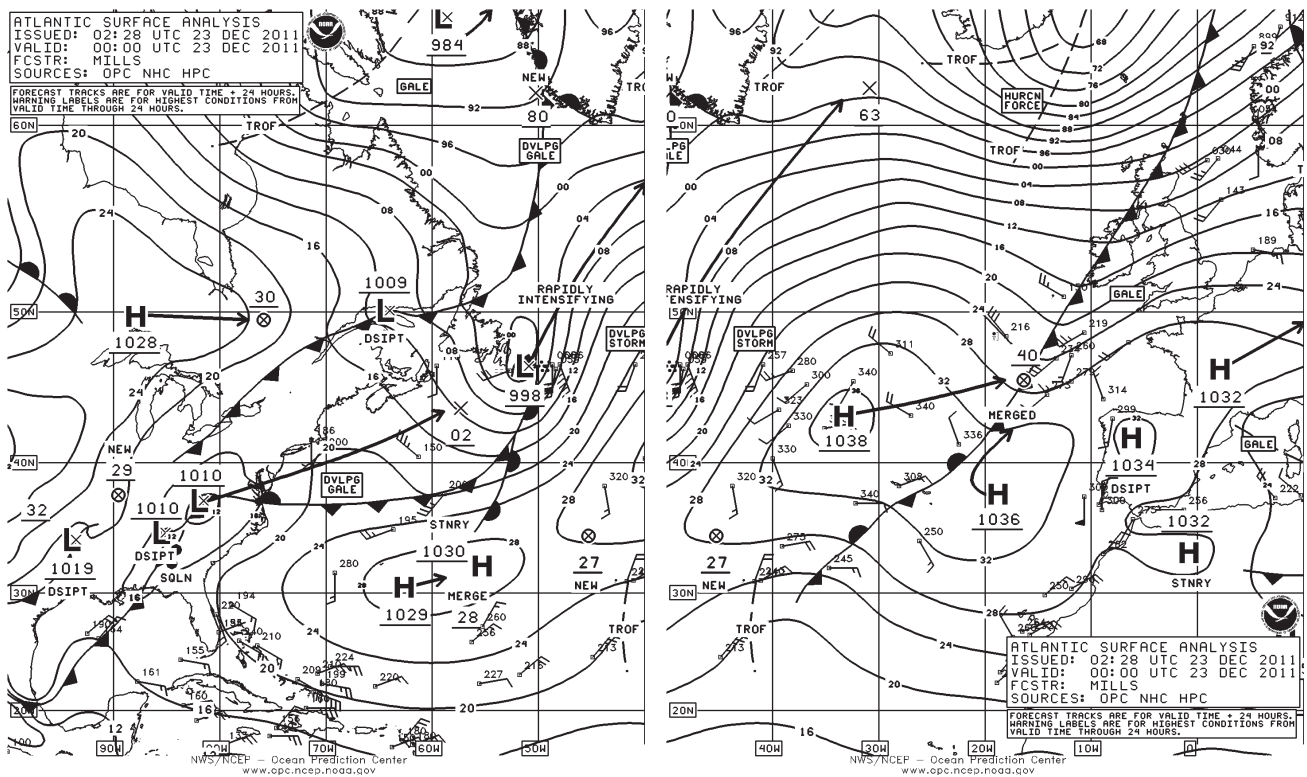


Figure 23. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid 0000 UTC December 23, 2011.

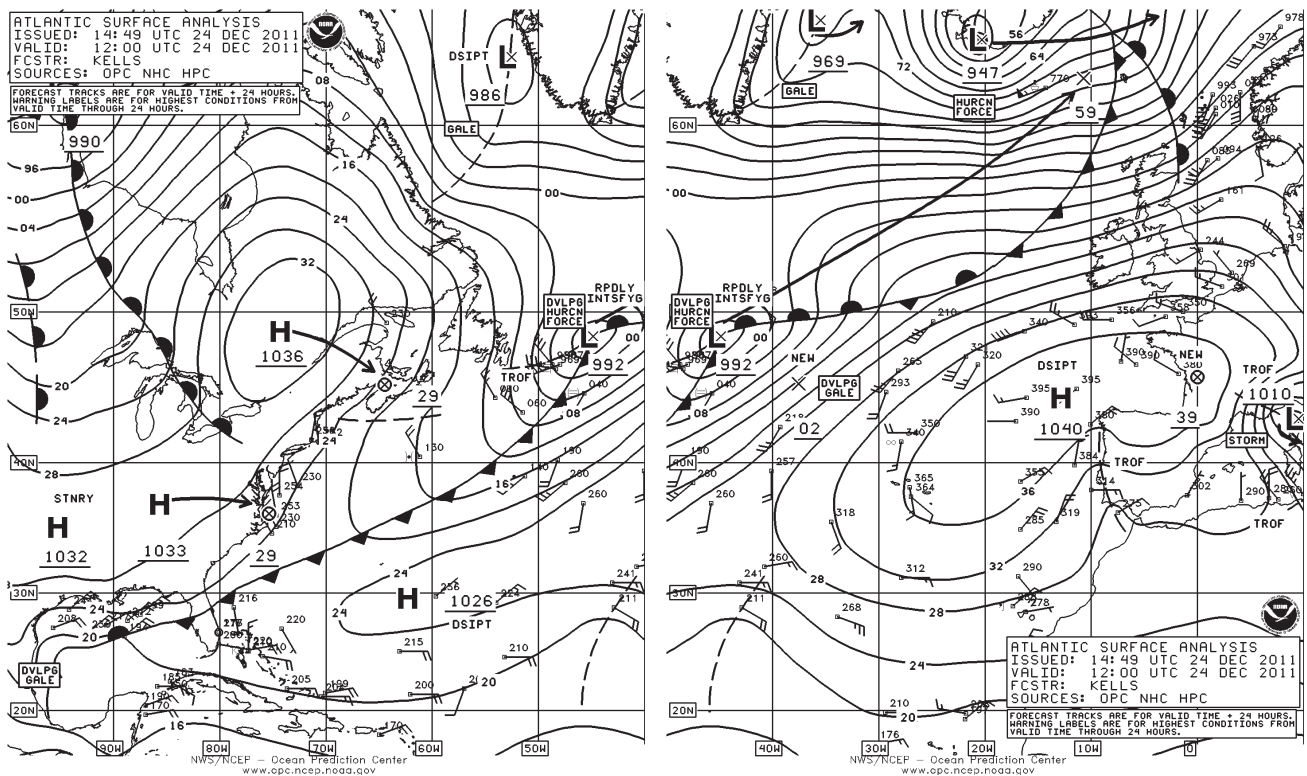


Figure 24. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid 1200 UTC December 24, 2011.

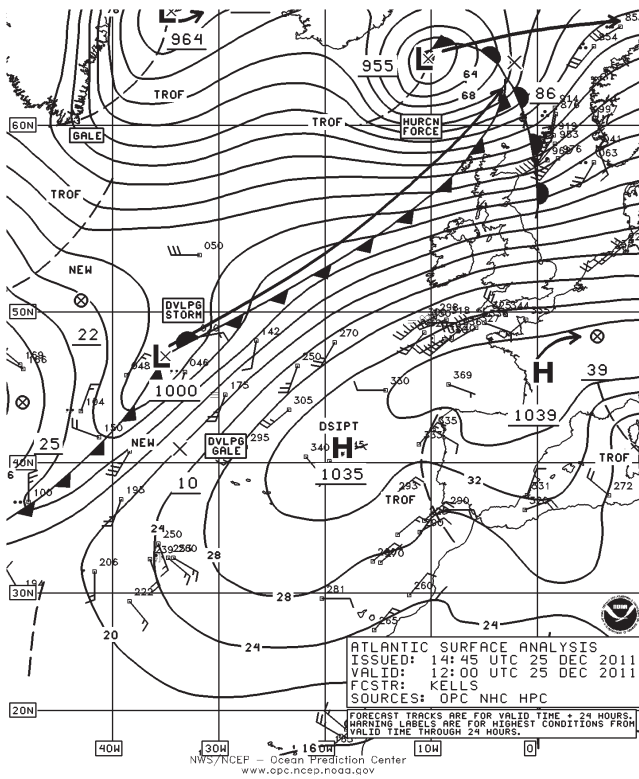


Figure 25. OPC North Atlantic Surface Analysis chart (Part 1) valid 1200 UTC December 25, 2011.

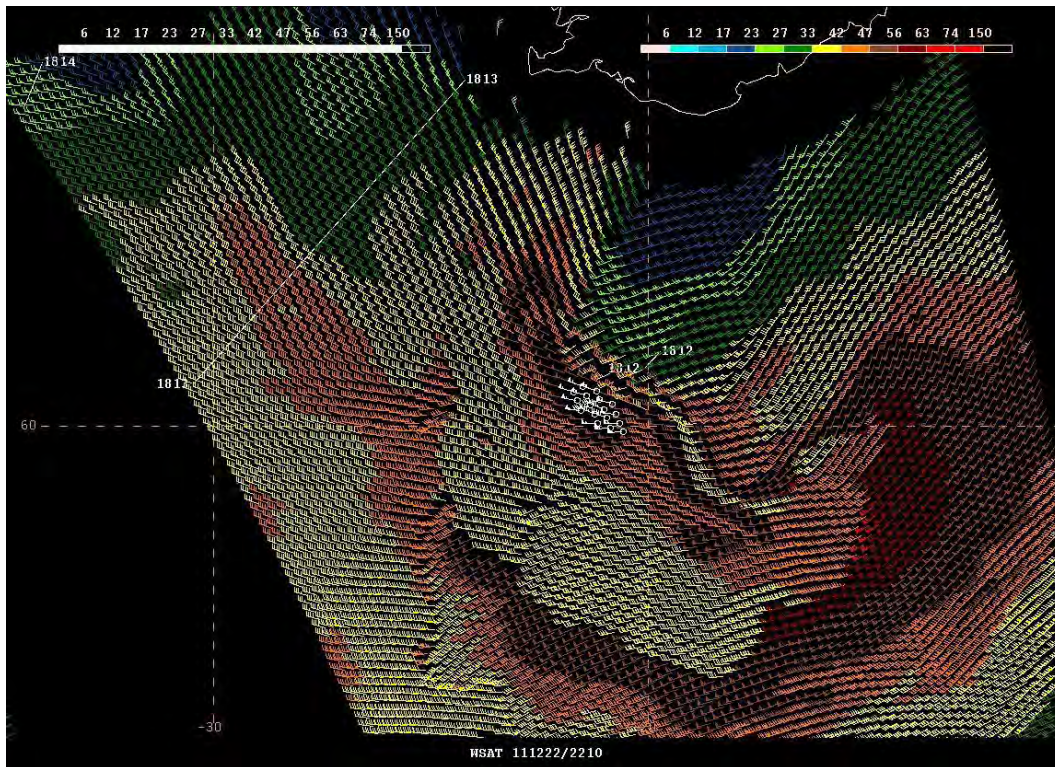


Figure 26. WindSat image of satellite-sensed winds (from passive microwave sensor aboard the U.S. Navy Coriolis satellite) around the south side of the hurricane-force low shown in the second part of Figure 23. The valid time of the pass is approximately 1812 UTC December 22, 2011, or less than six hours prior to the valid time of Figure 23. Iceland appears near the top of the image. Cross-track time lines of the satellite are shown with four-digit labels (UTC) in this version of the imagery adapted to OPC's operational use.

Marine Weather Review – North Pacific Area

July to December 2011

By George P. Bancroft

NOAA National Center for Environmental Prediction/ Ocean Prediction Center

Introduction

The weather pattern over the North Pacific became increasingly active after a relatively tranquil July as mid-summer weather gave way to an active fall pattern, with western Pacific tropical cyclones contributing to some of the developments of cyclones in the eastern North Pacific during September. One measure of the activity is the number of extratropical lows producing hurricane-force winds. There were two in September and three in October of non-tropical origin, followed by eight each in November and December. These trends in seasonal increases are supported by a past study of frequency of hurricane-force lows in the North Pacific (*Reference 3*). The main track of low pressure systems was from the area near Japan northeastward to the Gulf of Alaska with some of the cyclones turning more northward into the Bering Sea, especially in November. There was some high-latitude blocking in mid-November and in mid-December, forcing cyclones entering the Bering Sea to turn west.

Tropical cyclones in the northwestern Pacific were most active from late July through September when ten tropical systems appeared on OPC's oceanic radiofacsimile surface analysis charts, including one super typhoon. Tropical cyclones Sonca and Roke in late September, after initially becoming extratropical near Japan, later re-intensified into intense extratropical lows in the northeastern Pacific.

Tropical Activity

Typhoon Ma-On: Tropical Storm Ma-On developed from a non-tropical low near 19N 155E late on July 11th and intensified while drifting northwest,

becoming a typhoon by 1200 UTC on the 13th near 20N 150E with maximum sustained winds 65 kts. Ma-On reached maximum intensity two days later near 21N 140E when its sustained winds reached 115 kts, or a Category 4 major typhoon on the Saffir-Simpson intensity scale (*Reference 4*). Gradual weakening occurred over the following three days as the cyclone drifted northwest. Ma-On then turned northeastward late on the 18th as the maximum sustained winds lowered to 65 kts. The cyclone weakened to a tropical storm near 34N 137E with maximum sustained winds 55 kts at 0600 UTC on the 20th and to a tropical depression the next day as it turned more toward the southeast. Ma-On became post-tropical (or extratropical) by 0600 UTC on the 22nd near 30N 144E, and re-intensified into the compact storm force low shown in *Figure 1* east of Japan. An ASCAT image of the cyclone (*Figure 2*) offers a partial view of extratropical Ma-On including winds 40 to 50 kts detected on the north side. Some ship observations taken during this event are listed in **Table 1**. The cyclone moved northeast with its winds diminishing to gale force east of northern Japan near 151E on the morning of the 24th and to below gale force by the 26th. Dissipation followed on July 31st in the southwest Bering Sea.

Super-Typhoon Muifa: Tropical Storm Muifa moved into the far southwest waters in OPC's oceanic analysis area well south of Japan near 16N 135E on the afternoon of July 29th then drifted northwest while rapidly intensifying to a super typhoon, reaching a maximum strength of 140 kts for sustained winds with gusts to 170 kts at 1800 UTC the next day. Muifa then began to weaken late on the 30th and on the 31st before stalling near 22N 134E on August 1st and 2nd, and

then resumed a westward movement west of the area late on the 2nd.

Typhoon Merbok: Tropical Storm Merbok formed near 24N 160E from a nontropical low early on August 3rd with maximum sustained winds of 40 kts, then drifted northwest through the 4th with little change in intensity. Merbok then intensified into a 65 kts typhoon near 29N 154E while turning north late on the 5th, and developed a maximum intensity of 80 kts the following day near 31N 154E. Merbok then weakened to a tropical storm by early on the 8th while moving northeast and transitioned to a post-tropical or extratropical storm-force low similar to Ma-On by 0000 UTC August 9 near 40N 161E. The **Alianca Maua** (DCPC2) reported north winds of 35 kts and 4.5 m seas (15 ft) near 39N 158E at 1500 UTC on the 8th. Post-tropical Merbok weakened to a gale force low the next day while continuing to move northeast, and dissipated in the western Bering Sea on the 12th.

Tropical Depression 13W: This was a short lived cyclone developing from a non-tropical low near 24N 137E at 0600 UTC August 10th with maximum sustained winds of 30 kts. The depression drifted northeast and weakened to a remnant low forty-eight hours later near 30N 140E and dissipated late on the 13th.

Tropical Storm Talas: A non-tropical low which became Talas was near 18N 142E with a 999 hPa central pressure at 0600 UTC on August 24th. It was named Tropical Storm Talas near 18N 141E at 0000 UTC on the 25th with 35 kts sustained winds. The cyclone moved north with its maximum sustained winds reaching 55 kts on the morning of the 28th near 24N 140E and

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
SHIP	30N 137E	18/0600	SE 40	13.5/44
SHIP	29N 136E	18/1800	S 40	12.0/39
Northwest Sandpiper (VNVG)	31N 134E	17/0000	NE 50	4.5/15
	29N 131E	16/1200	NE 55	4.0/13
Conti Peridot (A8WR7)	18N 144E	16/0600	S 40	8.5/28
Northwest Snipe (VNVS)	31N 136E	17/0000	SW 50	
Sea-Land Comet (WDB9950)	33N 148E	23/1600	SW 60	9.5/31
Overseas Joyce (V7NV4)	33N 143E	23/1200	NW 40	8.5/28
Horizon Hunter OOCL Japan (VRWB7)	33N 152E	23/1800	S 40	15.8/52
	40N 149E	24/0000	NE 45	8.2/27

Table 1. Ship and buoy observations taken during the passage of Tropical Cyclone Ma-On before and after extratropical transition.

maintained this intensity until moving over western Japan September 3rd where it weakened, and became a post-tropical gale in the Sea of Japan late on the 3rd. There were numerous ship reports with winds 35 to 40 kts around Talas. Stronger reports include southwest 50 kts from the **MSC Firenze** (A8KO3) near 17N 134E at 0600 UTC August 26th and a report from **SHIP** (22N 144E) with southeast winds 45 kts and 12.8 m seas (42 ft) at 2000 UTC that day. The **United Spirit** (ELYB2) reported east winds of 45 kts and 7.5 m seas (25 ft) near 29N 150E at 1800 UTC on the 31st. The extratropical remains of Talas then dissipated in the northern Sea of Japan late on September 6th.

Tropical Storm Noru: Tropical Storm 16W formed near 22N 150E early on September 3rd with maximum sustained winds of 40 kts and initially moved north before turning northwest early on the 4th and acquiring the name Noru, with maximum sustained winds 45 kts. At 1800 UTC on the 4th the **Kota Jati** (VRWJ7) reported south winds of 45 kts near 33N 152E and six hours later a vessel bearing the **SHIP** callsign encountered west winds of 50 kts near 33N 146E. Noru then began to weaken and became a depression near 39N 150E at 0600 UTC on the 6th and then an extratropical gale 44N 150E twelve hours later. Post-tropical Noru then moved into the Sea of Okhotsk where it developed a lowest central pressure of

980 hPa late on the 7th before becoming absorbed by a stronger inland system to the north late on the 10th.

Tropical Storm Kulap: Tropical Storm Kulap formed near 22N 136E at 0700 UTC September 7th and developed a maximum intensity with 45 kts sustained winds early on the 7th while moving northwest, and then weakened to a tropical depression west of the area on the 8th.

Typhoon Roke: Roke began as Tropical Depression 18W near 21N 136E early on September 11th and drifted northeast, becoming Tropical Storm Roke 24N 138E at 1800 UTC on the 13th with maximum sustained winds of 35 kts. Roke then weakened to a depression and moved west of the area on the 14th, only to re-emerge as a typhoon just south of Japan near 33N 136E with 90 kts sustained winds late on September 20th. At 2300 UTC on the 20th a vessel reporting with the **SHIP** callsign reported north winds of 80 kts and 4.0 m seas (13 ft) near 32N 135E, and a northwest wind of 70 kts and 4.5 m seas (14 ft) at 33N 135E one hour later. At 1200 UTC on the 21st the **Sea-Land Comet** (WDB9950) reported south winds of 40 kts and 9.5 m seas (31 ft) near 34N 141E. After moving over Japan's main island Roke transitioned to a post-tropical storm with a 980 hPa central pressure near 40N 143E the following

morning while moving northeast, and then weakened to a gale on the 22nd. Extratropical Roke then passed near the western Aleutian Islands on the 23rd before re-intensifying over the northeastern Pacific as described in **Other Significant Events** below.

Typhoon Sonca: Sonca began as Tropical Depression 19W near 22N 154E at 1800 UTC September 14th and drifted north, becoming Tropical Storm Sonca 23N 155E early on the 15th with maximum sustained winds of 35 kts. Sonca moved northwest and intensified into a typhoon two days later. The cyclone developed a maximum intensity of 85 kts for sustained winds near 33N 143E at 1800 UTC on the 18th before weakening to a tropical storm the next day. Sonca then became an extratropical storm force low with a 996 hPa central pressure at 41N 160E at 0600 UTC September 20th before weakening to a gale while passing over the central North Pacific waters on the 20th and 21st. Subsequent re-intensification into an intense extratropical low is described below.

Typhoon Nalgae: Tropical Storm Nalgae formed near 19N 138E from a non-tropical low-pressure area at 1800 UTC September 27th with maximum sustained winds of 40 kts, and remained nearly stationary over the following day before moving west of the area as a typhoon late on the 28th.

Other Significant Events

Western Pacific Storm, July 20-22:

An unseasonably deep storm force low developed in the western waters during this period with a 980 hPa central pressure and is shown in the first part of *Figure 1*. This was the deepest non-tropical low in the North Pacific until late August. It originated as a wave of low pressure on a stationary front to the northeast of Tropical Storm Ma-On at 0600 UTC on the 20th. The **Star Atlantic** (LAYG5) near 40N 167E reported southwest winds of 45 kts and 4.5 m seas (15 ft) at 0600 UTC on the 21st. The **OOCL Japan** (VRWB7) encountered west winds of 40 kts and 7.3 m seas (24 ft) near 45N 165E at 0000 UTC on the 22nd. A 25 m ASCAT pass from 2323 UTC on the 21st revealed west winds to 45 kts on the south side, which due to the low bias of ASCAT retrievals indicates storm-force. The cyclone then weakened to a gale force low near the western Aleutians early on the 22nd and moved inland over Alaska on the 23rd.

North Pacific Storm, August 24-25:

Figure 3 depicts the rapid development of this cyclone from a frontal wave of low pressure over a thirty-six hour period. The central pressure fell 23 hPa in the twenty-four hour period ending at 0000 UTC on the 25th, and the second part of *Figure 3* shows the storm at maximum intensity. The high resolution ASCAT image in *Figure 4* reveals a compact circulation and a frontal feature. Although the wind barbs cannot be seen the color scale on the upper right side indicates a small area of winds 48 to 56 kts on the south side of the center. The **Horizon Hawk** (WDD6033) reported east winds of 40 kts near 47N 161W at 1200 UTC August 24. The cyclone weakened to a gale-force low late on the 25th as it moved into the Gulf of Alaska, and became absorbed by a larger low to the south on the 27th.

Northeastern Pacific Storm, September 4-6: *Figure 5* shows the rapid development of an eastern

Aleutian's frontal wave as it moved into the Gulf of Alaska. The central pressure fell 31 hPa in the twenty-four hour period ending at 1200 UTC on September 5th. At 0000 UTC on the 6th OPC briefly analyzed this cyclone as a hurricane-force low, the first of the fall season, and it was also the first with central pressures below 960 hPa. At 0200 UTC on the 6th the ship **WDE3542** near 58N 154W reported northeast winds of 70 kts. The **Statendam** (PHSG) near 58N 142W reported southeast winds of 58 kts and 14.0 m seas (46 ft) at 0000 UTC on the 6th. The **Westwood Olympia** (C6UB2) near 57N 144W encountered southeast winds of 50 kts at 1800 UTC on the 5th. The buoy 46076 (59.5N 148.0W) reported east winds of 45 kts with gusts to 58 kt, a peak gust 62 kts and 7.0 m seas (23 ft) at 0200 UTC on the 6th. The highest seas at this buoy occurred one hour before, 8.0 m (26 ft). East Amatuli Station Light (AMAA2) near 58.9N 151.9W at 2200 UTC on the 5th reported northeast winds of 54 kts with gusts to 63 kts and a peak gust 67 kts. The cyclone subsequently weakened to a gale force low by early on the 6th while stalling, and dissipated over the Alaska Peninsula on the 8th.

North Pacific Storm, September 17-20:

The next major event originated near the northern Kurile Islands on the 16th and moved rapidly east along the Aleutian Islands with the central pressure falling 30 hPa in the twenty-four hour period ending at 1200 UTC on the 18th. The cyclone developed hurricane-force winds while passing south of the Alaska Peninsula and Kodiak Island on the 19th and a lowest central pressure of 964 hPa at 0600 UTC on the 20th near 54N 151W. The **Dresden Express** (DHDE) near 53N 164W reported northwest winds of 50 kts and 7.0 m seas (23 ft) at 0000 UTC on the 20th. The buoy 46082 (59.7N 143.4W) at 0400 UTC on the 20th reported east winds of 45 kts with gusts to 60 kts and 8.0 m seas (26 ft) followed by a report of 10.0 m seas (33 ft) three hours later. A 25 km ASCAT pass at 0645 UTC on the 20th showed

east to southeast winds 40 to 50 kts along the Alaska coast east of 147W. The cyclone weakened to a gale on the 20th and like its predecessor dissipated over southwest Alaska the next day.

Eastern North Pacific Storm (Post-tropical Sonca), September 22-23:

The extratropical remains of Tropical Cyclone Sonca in the form of a wave of low pressure passed through the central North Pacific near 40N and rapidly intensified after passing 150W (*Figure 6*). The central pressure fell 28 hPa in the twenty-four hour period ending at 0600 UTC on the 23rd, when the cyclone was at maximum intensity. A WindSat image from 0243 UTC on the 23rd (*Figure 7*) showed the west side of the cyclone's circulation with winds to 70 kts. The **Zuiderdam** (PBIG) on the north side near 55N 131W reported east winds of 65 kts at 0500 UTC on the 23rd while the **Polar Resolution** (WDJK) reported west winds of 60 kts and 8.8 m seas (29 ft) near 53N 136W four hours later. The buoy 46205 (54.2N 134.3W) reported south winds of 45 kts and 12.0 m seas (39 ft) at 0900 UTC on the 23rd. The cyclone then moved inland later that day,

Eastern North Pacific Storm (Post-Tropical Roke), September 25-27:

The extratropical remains of Tropical Cyclone Roke, after initially weakening like Sonca, crossed the Pacific near the Aleutian Islands before re-intensifying as a storm in the eastern Pacific with a lowest pressure of 967 hPa versus 961 hPa for post-tropical Sonca. At 1833 UTC September 26th when the cyclone was near 50N 138W with a 967 hPa central pressure, a 25-km ASCAT pass revealed west winds to 50 kt south of the center. The **YM Hiroshima** (V2OS3) near 51N 151W and the **Hanjin Philadelphia** (A8CN8) near 52N 149W both encountered northwest winds of 50 kts at 0000 UTC on the 26th, and the second ship also reported 9.5 m seas (31 ft). Buoy 46036 (48.5N 133.9W) reported southwest winds of 45 kts and 8.5 m seas (28 ft) at 1900 UTC on the 26th, and 10.5 m (34 ft) four hours later. The cyclone moved onshore

near southern Southeast Alaska the following night and weakened inland.

North Pacific Storm, October 7-10:

A wave of low pressure originating near northern Japan intensified into a hurricane-force low south of the central and western Aleutian Islands as depicted in *Figure 8*. The cyclone is shown near maximum intensity in the second part of *Figure 8*. The ASCAT image in *Figure 9* from late on the 7th reveals a strong circulation with 50 kts wind retrievals even north of the center. The cyclone then slowly weakened as it moved into the eastern Pacific over the next two days. The **Overseas Joyce** (V7NV4) near 55N 149W reported northeast winds of 45 kts and 12.8 m seas (42 ft) at 0600 UTC on the 10th. The top winds with this system weakened to gale force on the 10th before the low center turned northward into the Gulf of Alaska, where it dissipated on the 13th.

Northeastern Pacific Storm, October 24-26:

The development of this cyclone is shown in *Figure 10*, as the low pressure wave which came from the western Pacific rapidly intensified while absorbing the low in the eastern Bering Sea. The central pressure fell 27 hPa in the twenty-four hour period ending at 1200 UTC on the 25th. The 25

km ASCAT image from the night of the 24th (*Figure 11*) reveals remotely sensed winds in the 50 to 60 ktst range on the south side of the cyclone. Selected ship and buoy observations taken in this storm are listed in **Table 2**. The cyclone subsequently weakened rapidly on the night of the 25th and on the 26th and dissipated later that day.

Eastern North Pacific Storm, October 27-28:

The next event originated in the eastern waters as a frontal wave of low pressure near 43N 162W late on the 26th rapidly deepened as it tracked northeast, with the central pressure falling an impressive 36 hPa in the twenty-four hour period ending at 0600 UTC on the 28th. At about that time a 25 km ASCAT pass showed west winds to 50 kts on the south side of the storm, and hurricane-force winds with this system lasted late on the 27th and early on the 28th before the cyclone moved inland on the 28th and weakened. The lowest central pressure was 967 hPa when the center was near 55N 136W early on the 28th. The Canadian buoy 46205 (54.2N 134.3W) reported southwest winds of 43 kts with gusts to 52 kts and 6.5 m seas (21 ft) at 1000 UTC on the 28th, and maximum seas 9.0 m (30 ft) three hours later. The buoy 46185 (52.4N 129.8W) reported southeast winds of 47 kts with gusts to 58 kts and 6.5 m seas (21 ft)

0600 UTC on the 28th, and highest seas 9.0 m (30 ft) two hours later.

Western North Pacific and Bering Sea Storm of October 31-November 3:

By early November the storm track shifted more toward the Bering Sea. An area of low pressure originating southeast of Japan developed hurricane-force winds as it moved toward the Bering Sea (*Figure 12*). Hurricane-force winds lasted from the night of October 31st until the morning of November 2nd, when the central pressure rose to 984 hPa and winds eased to storm force. A 25 km ASCAT image from 1018 UTC on the 2nd contained a swath of north winds 50 kts on the west side. The **Caroline Maersk** (OZWA2) near 54N 170E reported north winds of 50 kts and 7.5 m seas (25 ft) at 1800 UTC on the 2nd. Six hours later the **APL Philippines** (WCX8884) encountered seas of 9.8 m (32 ft) along with south winds of 40 kts near 45N 167W. At 0300 UTC November 4th the ship **WY7636** near 60N 172W reported northwest winds 50 kts and 6.7 m seas (22 ft). Bering Sea buoy 46035 (57.1N 177.8W) reported southeast winds of 39 kts and 10.0 m seas (33 ft) at 1700 UTC on the 2nd, and a gust of 47 kts three hours later. The highest winds with this cyclone came before the lowest central pressure of 970 hPa, which occurred in

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Polar Discovery (WACW)	56N 142W	25/1300	SE 50	4.5/15
	56N 141W	25/1700	SE 55	
Horizon Anchorage (KGTX)	57N 149W	25/1400	S 50	
Star Kilimanjaro (LAIG7)	55N 156W	25/1800	SW 50	8.5/28
	55N 156W	26/0000	W 45	9.0/30
North Star (KIYI)	58N 148W	26/1200	W 55	
Buoy 46001	56.3N 148.0W	26/1300	W 39 G49	9.5/31
		26/0800	Peak gust 51 Maximum	10.5/34
Buoy 46083	58.2N 138.0W	26/0100	SE 41 G54	7.5/25
		27/0200	Peak gust 60 Maximum	8.0/26

Table 2. Ship and buoy observations taken during the passage of the northeastern Pacific storm of October 24-26, 2011.

the Bering Sea near 59N 171W at 1800 UTC on the 3rd. The winds weakened to gale force the following night as the system moved inland over Alaska.

Bering Sea Superstorm, November 7-9: This major storm stood out as being the deepest of the non-tropical cyclones during this six-month period, developing a lowest central pressure of 943 hPa in the northern Bering Sea besides having impacts on land and fuel delivery. It originated near Japan as a wave of low pressure early on November 6th and *Figure 13* depicts the subsequent development over a thirty-six hour period including a twenty-four hour period ending at 1800 UTC on the 8th when the central pressure fell 32 hPa. *Figure 14* is an infrared satellite image of the cyclone near maximum intensity displaying broad cold-topped frontal features which also wrap around a well defined center. ASCAT imagery from 0310 UTC on the 9th showed some 50 to 60 kts of wind retrievals on the edge of a pass and may have missed the strongest winds. The **Horizon Consumer** (WCHF) reported southwest winds of 55 kts and 11.6 m seas (38 ft) near 46N 164E at 0300 UTC on the 8th. The buoy 46035 (57.1N 177.8W) reported southwest winds of 56 kts with gusts to

72 kts and 10.5 m seas (34 ft) at 0000 UTC on the 9th and a peak gust of 74 kts one hour later. Seas at this buoy reached 12.5 m (41 ft) at 2100 UTC on the 8th. Buoy 46070 (55.1N 175.3E) reported west winds of 47 kts with gusts to 58 kts and a peak gust 64 kts and 9.0 m seas (30 ft) at 2100 UTC on the 8th. The seas were as high as 10.0 m (33 ft) three hours later. The land station Savoonga, AK on St. Lawrence Island reported southwest winds of 50 kts with gusts as high as 65 kts on the morning of the 9th. The cyclone subsequently weakened as it passed north of the Bering Strait later that day.

North Pacific and Bering Sea/Gulf of Alaska Storm, November 10-13:

This cyclone originated east of Japan near 165E early on the 9th and moved northeast, developing storm-force winds south of the western Aleutian Islands the next day and hurricane-force winds by the 12th in the Bering Sea. ASCAT imagery showed retrievals of west winds 50 to 60 kts south of the center in the southeast Bering Sea at 0831 UTC on the 12th. *Figure 15* shows the primary hurricane-force low at maximum intensity at 0600 UTC on the 12th, weakening inland in the next twelve hours as redevelopment

occurred in the Gulf of Alaska. The secondary hurricane-force low shown in the second part of *Figure 15* lingered in the northeast Gulf of Alaska on the night of the 12th and on the 13th before dissipating inland on the 15th. Some notable ship and buoy observations taken during this event are listed in **Table 3**.

Northwestern Pacific and Bering Sea Storms, November 15-20:

Three strong cyclones of similar intensity (central pressures in the low 970s) developed in the western North Pacific waters and moved into the Bering Sea during this period. The first one originated east of Japan near 160E early on the 14th and became a hurricane-force low in the western Bering Sea near 56N 165E early on the 16th, with central pressures as low as 970 hPa. Buoy 46070 (55.1N 175.3E) reported east winds of 47 kts with gusts to 60 kts and 9.0 m seas (30 ft) at 0700 UTC November 16, a peak gust of 64 kts one hour later and highest seas 10.5 m (34 ft) at 0900 UTC on the 16th. The cyclone turned west and weakened near the Kamchatka Peninsula on the 17th (first part of *Figure 16*) as the next hurricane-force low approached from the southeast. This second system

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Wren Arrow (C6JD7)	43N 172E	10/1600	N 50	5.5/18
Star Isfjord (LAQX5)	48N 174E	11./1200	NW 60	5.8/19
Healy (AWS) (NWS0003)	54.5N 165W	11/0800	SE 50	
Horizon Tacoma (KGTy)	56N 144W	13/0000	W 55	13.5/44
	55N 142W	12/1800	W 50	15.8/52
	57N 147W	13/1200	NW 55	10.5/34
Midnight Sun (WAHG)	57N 143W	12/1200	W 60	
Alaskan Legend (WDD2074)	54N 141W	12/1200	W 45	11.6/38
Polar Adventure (WAZV)	59N 147W	13/0600	SW 50	11.6/38
	58N 148W	13/1200	W 65	11.6/38
Buoy 46083	58.2N 138.0W	12/1200	SE 35 G41	3.5/11
		12/2300	Peak gust 45	8.0/26
Buoy 46070	55.1N 175.3E	11/2300	NW 41 G51	2.5/8
		12/0500	Maximum	6.5/21

Table 3. Ship and buoy observations taken during the North Pacific and Bering Sea/ Gulf of Alaska redevelopment event of November 10-13, 2011.

originated as a low pressure wave near Japan late on the 14th. The **APL Philippines** (WCX8884) near 54N 171W encountered southeast winds of 45 kts and 10.7 m seas (35 ft) at 1200 UTC on the 17th. Buoy 46035 (57.1N 177.8W) reported east winds of 50 kts and 9.0 m seas (30 ft) at 0800 UTC on the 17th, and highest seas 9.8 m (32 ft) two hours prior. A 25 km ASCAT pass at 2218 UTC November 17th showed 50 kts wind retrievals in the northwest Bering Sea. The cyclone then turned west on the 17th and dissipated west of the Kamchatka Peninsula on the 18th. The second part of *Figure 16* shows a third cyclone that was nearing its maximum intensity as it moved into the Bering Sea on the 18th, after originating near Japan early on the 16th. The A high resolution (25 km) ASCAT pass from 2337 UTC on the 18th revealed west winds 50 to 60 kts on the south side. The **Valiant** (WY7686) near 60N 172W reported northeast winds of 45 kts and 6.0 m seas (20 ft). The cyclone subsequently turned eastward in the Bering Sea with its top winds diminishing to gale force on the 20th, and dissipated the following night.

Eastern North Pacific Storm, November 23-24: After originating east of Japan near 160E on November 21st, the developing cyclone tracked east-northeast with gradual intensification, developing storm force winds late on the 23rd while passing near 49N 139W. It briefly developed hurricane-force winds with a lowest

central pressure of 972 hPa near 51N 131W at 1800 UTC on the 24th, and moved inland the following evening. The **Polar Adventure** (WAZV) encountered southwest winds of 50 kts and 9.5 m seas (31 ft) at 0000 UTC on the 25th. The buoy 46207 (50.9N 129.9W) reported northwest winds of 45 kts and 8.2 m seas (27 ft) at 0000 UTC on the 25th, and 10.0 m seas (33 ft) three hours later.

North Pacific Storm, November 27-30: After originating in the Sea of Japan on November 26th, this developing cyclone tracked east near 46N and developed hurricane-force winds while passing south of the central Aleutians on the 28th. The central pressure fell 34 hPa in the twenty-four hour period ending at 0000 UTC on the 29th. The cyclone turned northeastward and developed a lowest central pressure of 968 hPa near 49N 171W six hours later. The ship **OUI** (41N 177E) reported southwest winds of 50 kts and 5.8 m seas (19 ft) at 1200 UTC on the 28th. Twelve hours later the **Adrian Maersk** (OXLD2) encountered northwest winds of 50 kts and 4.5 m seas (15 ft) near 49N 170E. The system weakened near the Alaska Peninsula on the 29th and 30th before dissipating inland late on the 30th.

Western North Pacific and Bering Sea Storm, December 3-8: A frontal wave of low pressure passed just south of Japan late on December 2nd and tracked northeast while intensifying

into a hurricane-force low near 45N 158E with a 970 hPa central pressure at 1800 UTC on the 4th. The lowest pressure occurred twelve hours later as the cyclone continued to move toward the western Aleutian Islands. A 25 km resolution ASCAT pass from 1034 UTC on the 5th revealed west winds of 50 kts on the south side. The cyclone's top winds lowered to storm force by the 5th. The system redeveloped to the east near the eastern Aleutians on the 6th, with the new center moving north into the Bering Sea while the old center dissipated early on the 7th. The new storm force low in the central Bering Sea at 1800 UTC on the 7th then moved northeast and weakened inland over Alaska by the 9th. Some notable ship and buoy observations taken in this event are listed in **Table 4**.

Northeast Pacific Storm, December 10-12: This event with greatest impact in the northeastern waters originated as a low-pressure wave east of Japan early on December 9th which raced northeast and rapidly intensified south of the eastern Aleutian Islands late on the 10th (*Figure 17*). The central pressure fell 31 hPa in the twenty-four hour period ending at 0000 UTC on the 12th, when the central pressure was 965 hPa. The Ocean Prediction Center analyzed this system as a hurricane-force low by 0000 UTC on the 12th. The ASCAT image in *Figure 18* has wind retrievals in the 50 to 60 kts around the south and west sides of the intensifying low. The **Overseas Nikiski** (WDBH)

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
APL Philippines (WCX8884)	42N 145E	03/2300	NW 40	9.8/32
	46N 152E	04/1800	N 50	
	53N 161E	06/0600	N 40	10.7/35
Star Java (LAJS6)	41N 141E	04/0600	N 50	3.5/11
Grete Maersk (OYCY2)	40N 178W	05/1200	S 50	
	41N 163W	06/0600	S 40	10.0/33
APL Korea (WCX8883)	49N 162E	05/0100	NE 50	7.3/24
Hanjin Baltimore (DDZB2)	46N 161E	06/0000	NW 45	
Buoy 46070	55.1N 175.3E	05/2100	NE 35	5.2/17
		06/0600	Maximum	7.3/24

Table 4. Ship and buoy observations taken during the North Pacific and Bering Sea storm of December 3-8, 2011.

reported southwest winds of 55 kts near 57N 147W at 0600 UTC on the 12th, south of the low center. Six hours later the **Horizon Tacoma** (KGTy) reported southwest winds of 55 kts and 9.8 m seas (32 ft) near 57N 144W, and at 1800 UTC on the 12th encountered seas of 13.7 m (45 ft). Buoy 46001 (56.3N 148.0W) reported southwest winds of 45 kts and 8.2 m seas (27 ft) at 0100 UTC on the 12th, and 10.7 m seas (35 ft) eight hours later. Buoy 46061 (60.2N 146.8W) at 0300 UTC on the 12th reported east winds of 50 kts and 8.2 m seas (27 ft). Buoy 46082 (59.5N 143.5W) at 1100 UTC on the 12th reported seas as high as 10.0 m (33 ft). The cyclone stalled on the south coast of Alaska on the 12th and weakened to a gale, before dissipating the next day.

North Pacific and Bering Sea Storm,

December 11-15: A pair of hurricane-force lows, the second and third most intense of the period in the North Pacific, developed in close succession in the middle of December. The first of these is shown in *Figure 19* at maximum intensity over the central Aleutians. It originated as a new low on a front over Japan early on the 10th which rapidly intensified while passing south of the western Aleutians on the 12th. The central pressure fell 38 hPa in the twenty-four hour period ending at 0000 UTC on the 13th. OPC analyzed this system as a hurricane-force low from 0000 UTC through 1200 UTC on the 13th. ASCAT winds from 0730 and 0930 UTC December 13th passes revealed a wind distribution similar to that of *Figure 21* (for the stronger low that followed) except about 5 kts weaker. The **Cosco Yokohama** (A8EH3) near 54N 176W reported east winds of 50 kts at 0600 UTC on the 13th, while the **Star Atlantic** (LAYG5) encountered northwest winds of 55 kts near 51N 180W. Buoy 46072 (51.7N 172.2W) reported southwest winds of 45 kts with gusts to 54 kts and 11.9 m seas (39 ft) at 1500 UTC on the 13th, and a prak gust 58 kts eight hours later. At 1800 UTC that day this buoy reported maximum seas of 13.4 m (44 ft). The cyclone then turned toward the northwest into the Bering Sea late on the

13th and began to weaken, with its top winds diminishing to gale force by the 15th. Dissipation followed later that day.

North Pacific and Bering Sea Storm,

December 11-15: A second hurricane-force low that followed originated east of Japan early on the 12th and moved east before turning northeast and rapidly intensifying late on the 13th. *Figure 19* shows the developing storm near 41N 172E and *Figure 20* depicts a hurricane-force low at maximum intensity as it turned north into the Bering Sea. The central pressure fell 31 hPa in the twenty-four hour period ending at 1800 UTC on the 14th. The 25 km ASCAT pass in *Figure 21* reveals a swath of west winds 50 to 65 kts south of the eastern Aleutians and winds as high as 50 kts on the north side in the Bering Sea. The **Rotterdam Express** (DMRX) reported northwest winds of 45 kts and 8.5 m seas (28 ft) at 0000 UTC on the 15th. Seven hours later, the **Healy (Aws)** (NWS0003) encountered northeast winds of 50 kts near 57N 166W. The **Horizon Tacoma** (KGTy) near 55N 159W reported south winds of 50 kts and 13.7 m seas (45 ft) at 1800 UTC on the 15th. Buoy 46075 (53.9N 160.8W) reported south winds of 45 kts with gusts to 54 kts and 13.4 m seas (44 ft) at 1200 UTC on the 15th. The cyclone subsequently weakened while moving north in the eastern Bering Sea and then dissipated in the northeast Bering Sea on the 17th.

Eastern North Pacific Storms,

December 20-24: A pair of cyclones tracked east-northeast from the waters east of Japan near 157E, across the North Pacific and developed into 972 hPa hurricane-force lows after passing east of 165W. ASCAT passes from 0821 UTC on the 21st and 1015 UTC on the 22nd, for the two cyclones, were similar in showing 50 kts winds south of the centers. The first one developed a 972 hPa center near 47N 153W at 0000 UTC on the 22nd after deepening by 30 hPa in the twenty-four hour period ending at 1800 UTC on the 21st. Hurricane-force winds occurred south of the center mainly on the 21st. The **Sea-Land Lightning** (WDB9986) reported west

winds of 50 kts and 5.8 m seas (19 ft) near 43N 163W at 1200 UTC on the 21st, and 9.0 m seas (30 ft) near 41N 159W twelve hours later. The **Hanjin Baltimore** (DDZB2) encountered north winds of 50 kts and 9.0 m seas near 52N 153W at 1200 UTC on the 22nd. The cyclone then weakened while turning north toward the Gulf of Alaska on the 22nd, and became absorbed by a new low in the northern Gulf of Alaska late that day. The second cyclone briefly developed hurricane-force winds while attaining its lowest pressure of 972 hPa near 48N 161W at 0000 UTC December 23rd, after it deepened by 28 hPa in the preceding twenty-four hours. The **As Valdivia** (A8XD5) reported west winds of 50 kts and 11.3-meter seas (37 feet) near 42N 160W at 1800 UTC on the 23rd. The **Polar Resolution** (WDJK) encountered southeast winds of 50 kts near 54N 140W at 1200 UTC on the 24th. The cyclone turned northeast that day and weakened to a gale force low later that day before dissipating over Southeast Alaska the next day.

North Pacific Storm, December 23-

27: Low pressure originating 300 nm south of Japan early on December 22nd moved northeast and developed into the hurricane-force low shown in the first part of *Figure 22*. It then weakened during the following thirty-six hours while tracking northeast, before re-intensifying in the Gulf of Alaska late on the 25th. The second part of *Figure 22* shows the cyclone near maximum intensity. The central pressure fell 26 hPa in the twenty-four hour period ending at 1800 UTC on the 26th. A 25 km ASCAT pass from 2029 UTC on the 26th showed west winds of 50 to 55 kts south of the low center. The **Savannah Express** (DNDD) encountered southeast winds of 50 kts and 7.3 m seas (24 ft) near 53N 142W at 0300 UTC on the 26th. The Canadian buoy 46205 (54.2N 134.3W) reported southeast winds of 45 kts with gusts to 52 kts and 7.0 m seas (23 ft) at 1200 UTC on the 26th, and 9.5 m seas (31 ft) three hours later. Buoy 46083 (58.2N 138.0W) reported southeast winds of 50 kts with gusts to 58 kts at 1600 UTC on the 26th, and seas of 9.0 m 1000 UTC

on the 27th. The cyclone subsequently weakened late on the 26th and dissipated inland over Alaska the next day.

North Pacific Storm, December 25-28: The last event of the period followed a track from near Japan early on December 24th east-northeast similar

to those of the December 20th -24th cyclones but developed hurricane-force winds earlier, in the western Pacific, and did not develop its lowest central pressure of 967 hPa until approaching Southeast Alaska early on the 28th when its top winds were weakening. The cyclone passed near 45N 178E as

a hurricane-force low early on the 26th when a 25 km ASCAT pass showed an area of west winds of 50 kts on the south side between 38N and 41N, similar to the December 20th -24th events. The cyclone moved inland over Southeast Alaska as a gale late on the 28th.

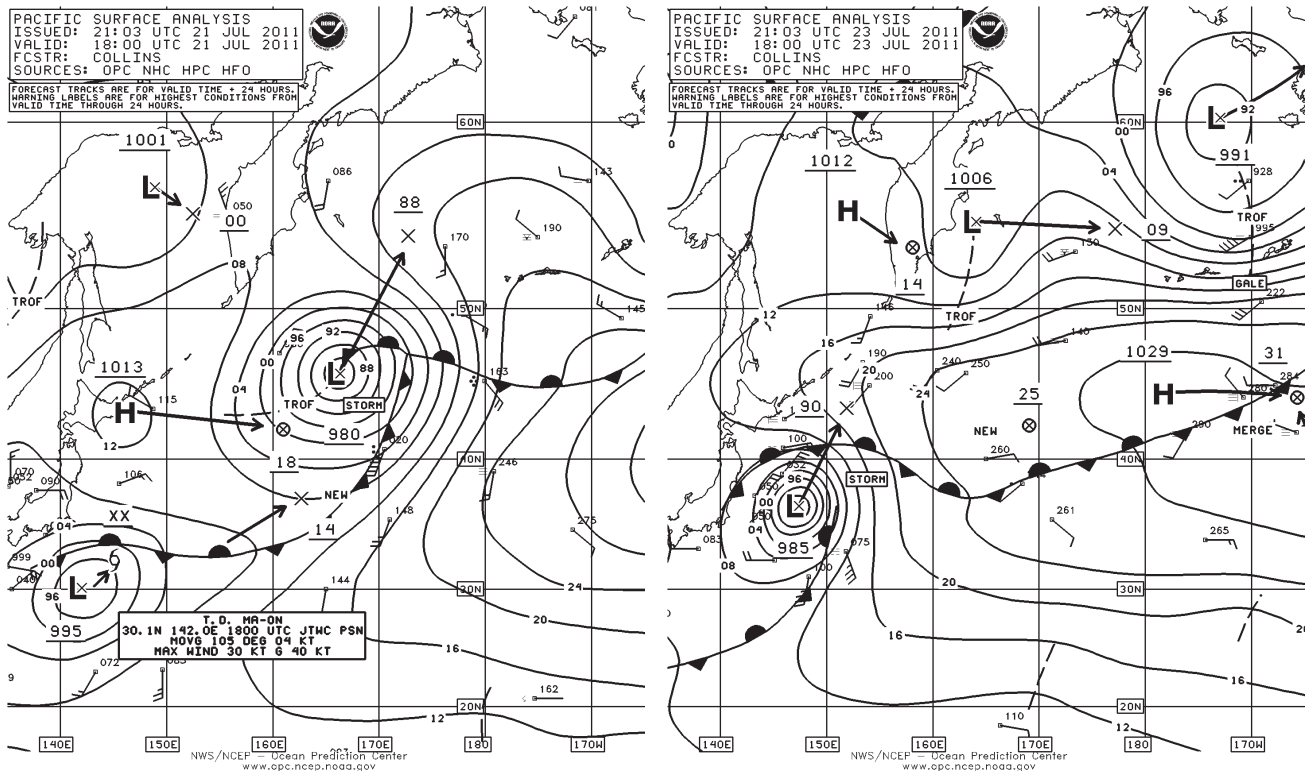


Figure 1. OPC North Pacific Surface Analysis charts (Part 2 - west) valid 1800 UTC July 21 and 23, 2011. Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars, except XX for tropical cyclones. The text box in the first panel contains advisory information on Tropical Depression Ma-On from the Joint Typhoon Warning Center (JTWC).

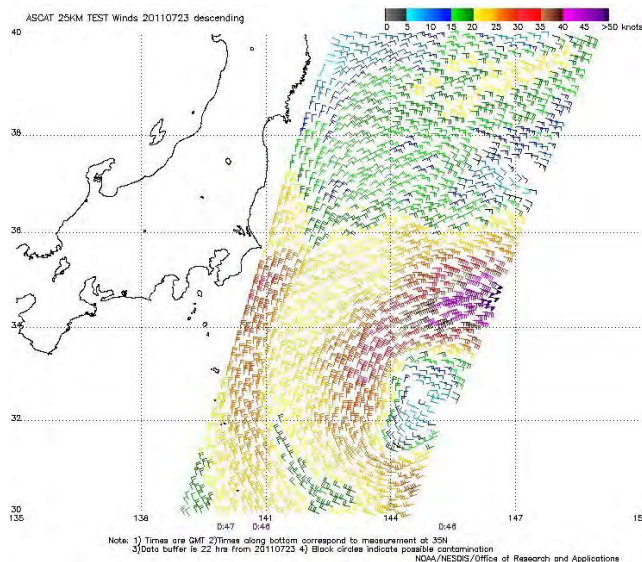


Figure 2. ASCAT (Advanced Scatterometer) image of satellite-sensed winds around the storm shown in the second part of Figure 1 (extratropical or post-tropical Ma-On). The resolution is 25 km in this high-resolution version of the imagery. The valid time of the pass is 0046 UTC July 23, 2011, or about seventeen and one-quarter hours prior to the valid time of the second part of Figure 1. JTWC declared Ma-On extratropical at 0600 UTC July 22. The well-defined storm center appears near the lower-right edge of the pass. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

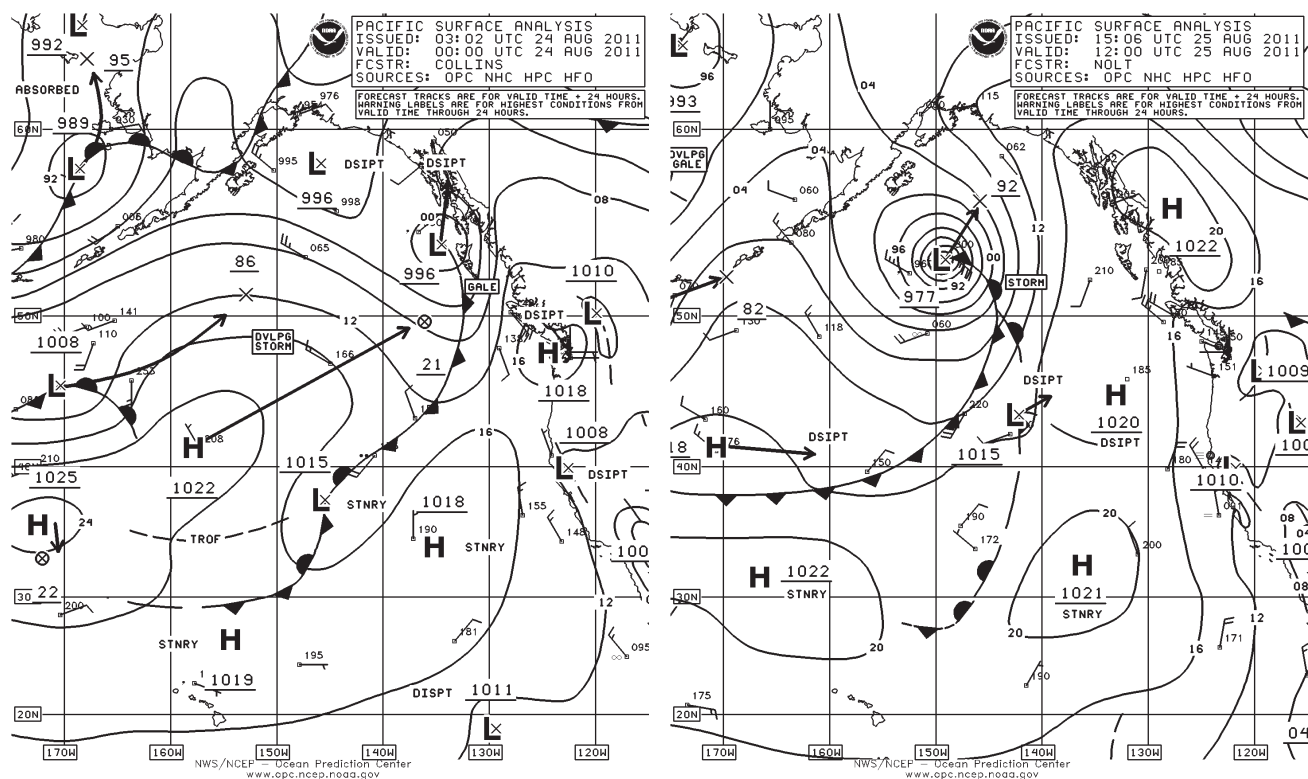


Figure 3. OPC North Pacific Surface Analysis charts (Part 1 - east) valid 0000 UTC August 24 and 1200 UTC August 25, 2011.

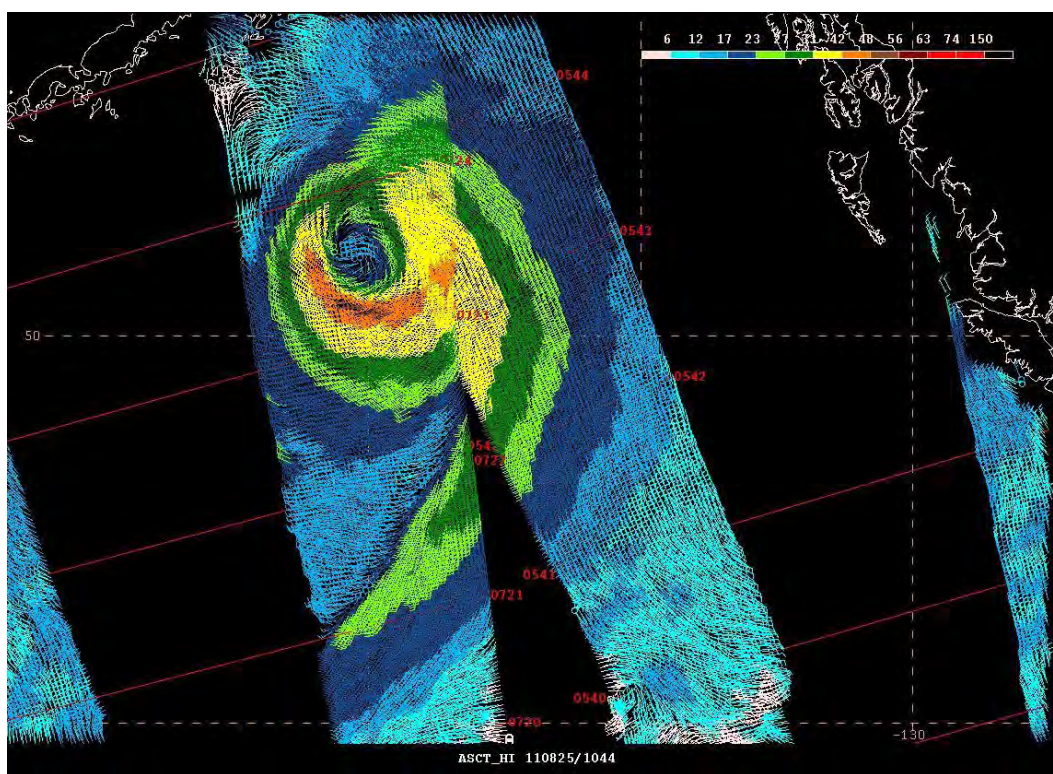


Figure 4. High-resolution ASCAT (25-km resolution) image of satellite-sensed winds around the storm shown in the second part of Figure 3. The valid time of the eastern pass is approximately 0543 UTC and of the western pass, which contains the cyclone center and strongest winds, approximately 0723 UTC August 25, 2011. These times are five to seven hours prior to the valid time of the second part of Figure 3. Portions of Alaska and British Columbia appear in the upper part of the image. This version of imagery, adapted for OPC operational use, includes numbered (UTC) cross-track time lines of the satellite and a color scale for the wind barbs on the upper-right side of the image.

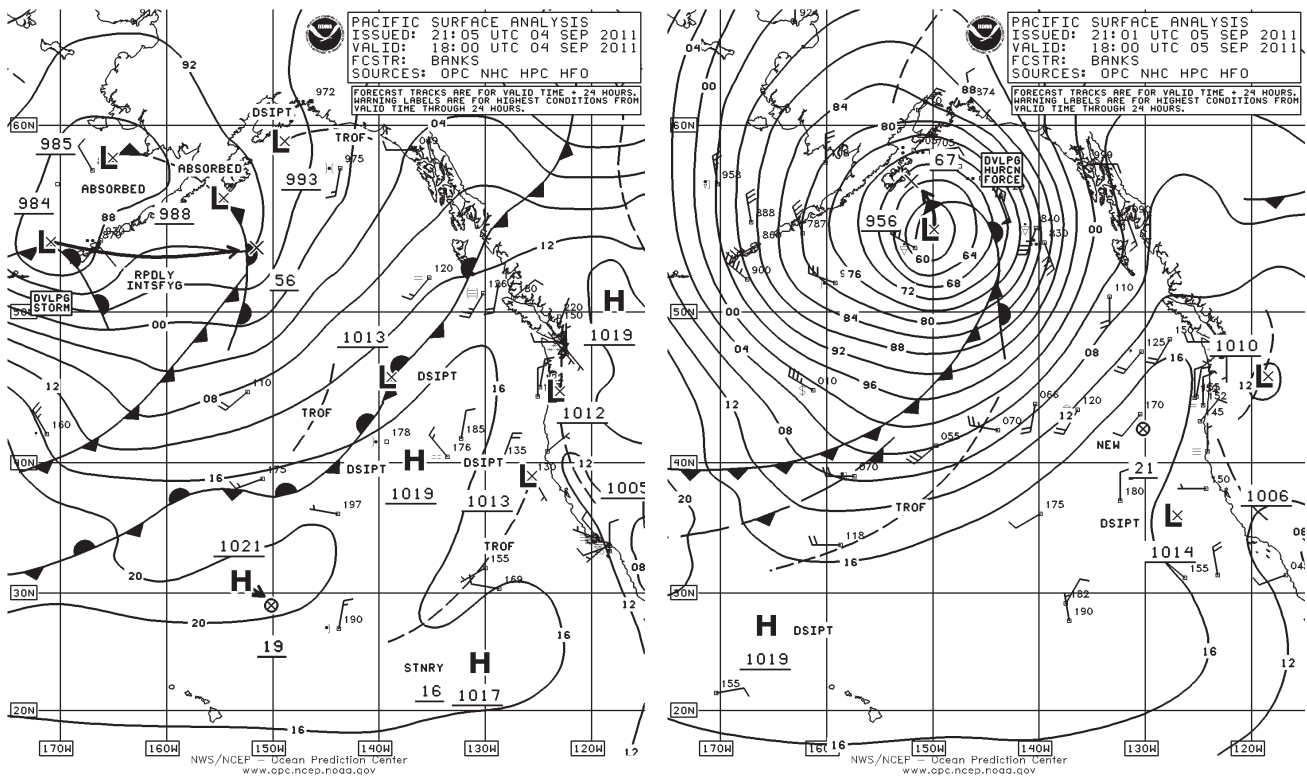


Figure 5. OPC North Pacific Surface Analysis charts (Part 1) valid 1800 UTC September 4 and 5, 2011.

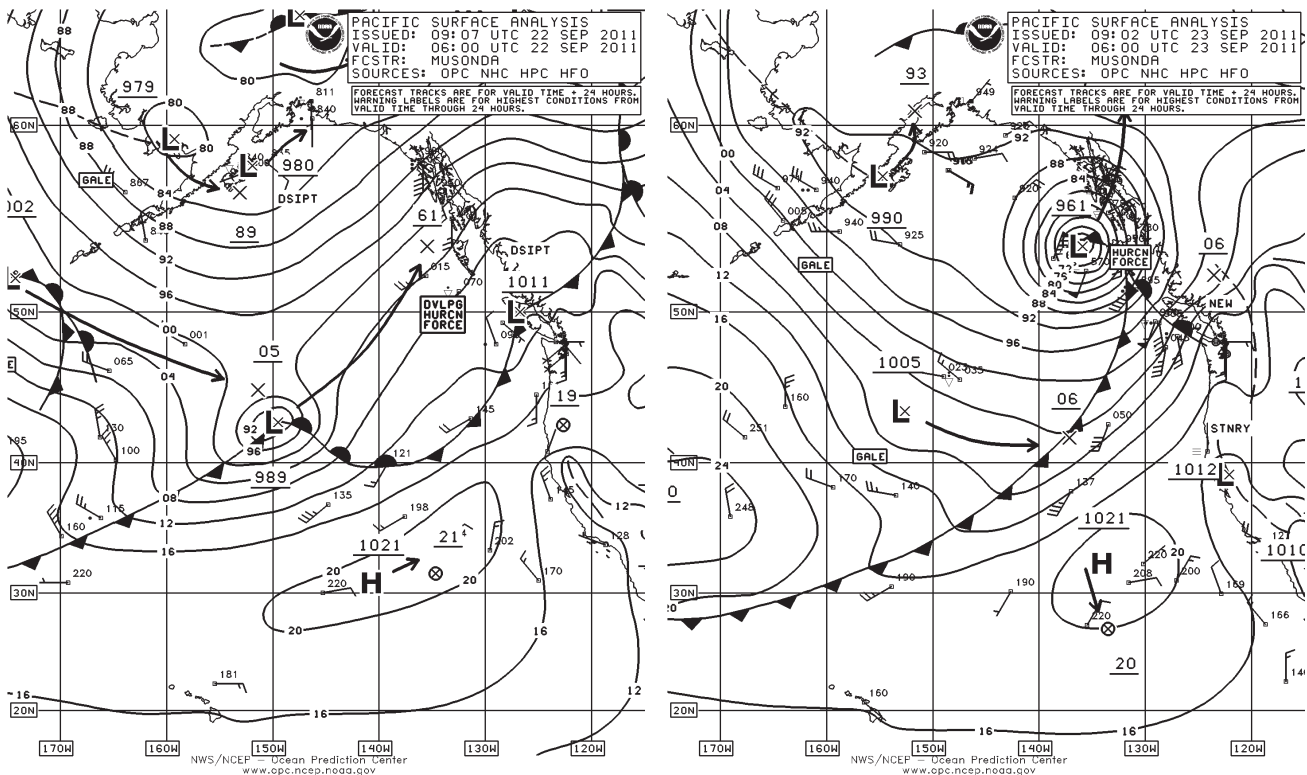


Figure 6. OPC North Pacific Surface Analysis charts (Part 1) valid 0600 UTC September 22 and 23, 2011.

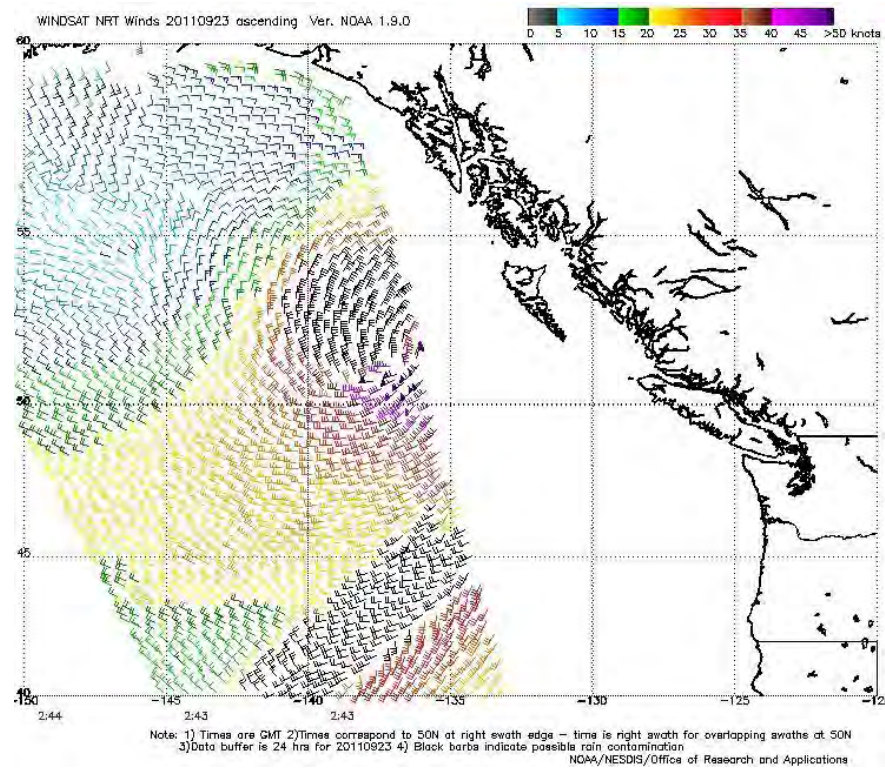


Figure 7. WindSat image of satellite-sensed winds (from passive microwave imager aboard the Coriolis satellite) around the west side of the hurricane-force low shown in the second part of Figure 6. The valid time of the pass is approximately 0243 UTC September 23, 2011, or about three and one-quarter hours prior to the valid time of the second part of Figure 6. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

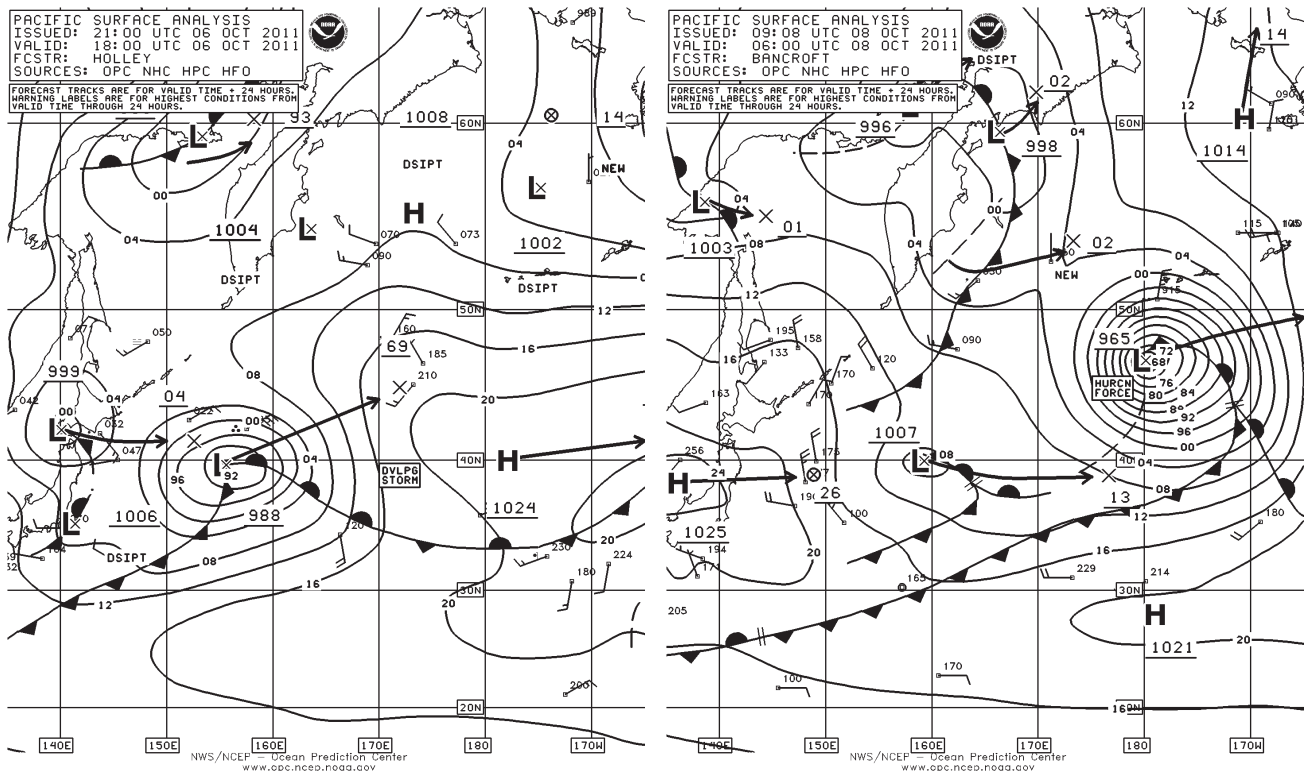


Figure 8. North Pacific Surface Analysis charts (Part 2) valid 1800 UTC October 6 and 0600 UTC October 8, 2011.

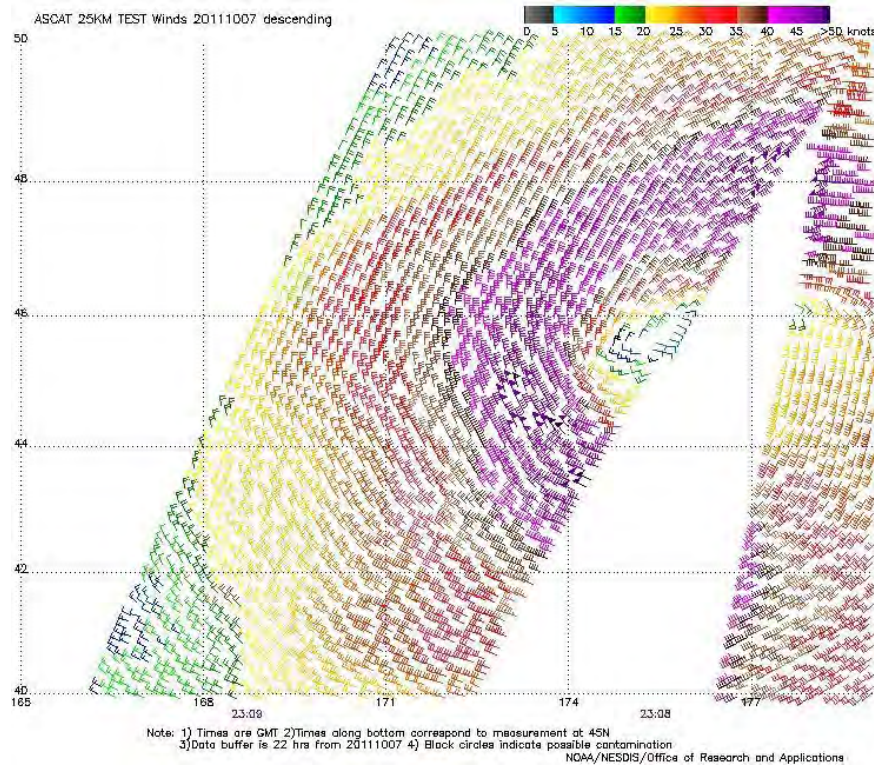


Figure 9. 25-km ASCAT image of satellite-sensed winds around the cyclone shown in the second part of Figure 8. Portions of two adjacent passes are shown, with the left or most recent pass valid 2308 UTC October 7, 2011, or about seven hours prior to the valid time of the second part of Figure 8 and containing the strongest winds. The center of the cyclone is near the right edge of this pass. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

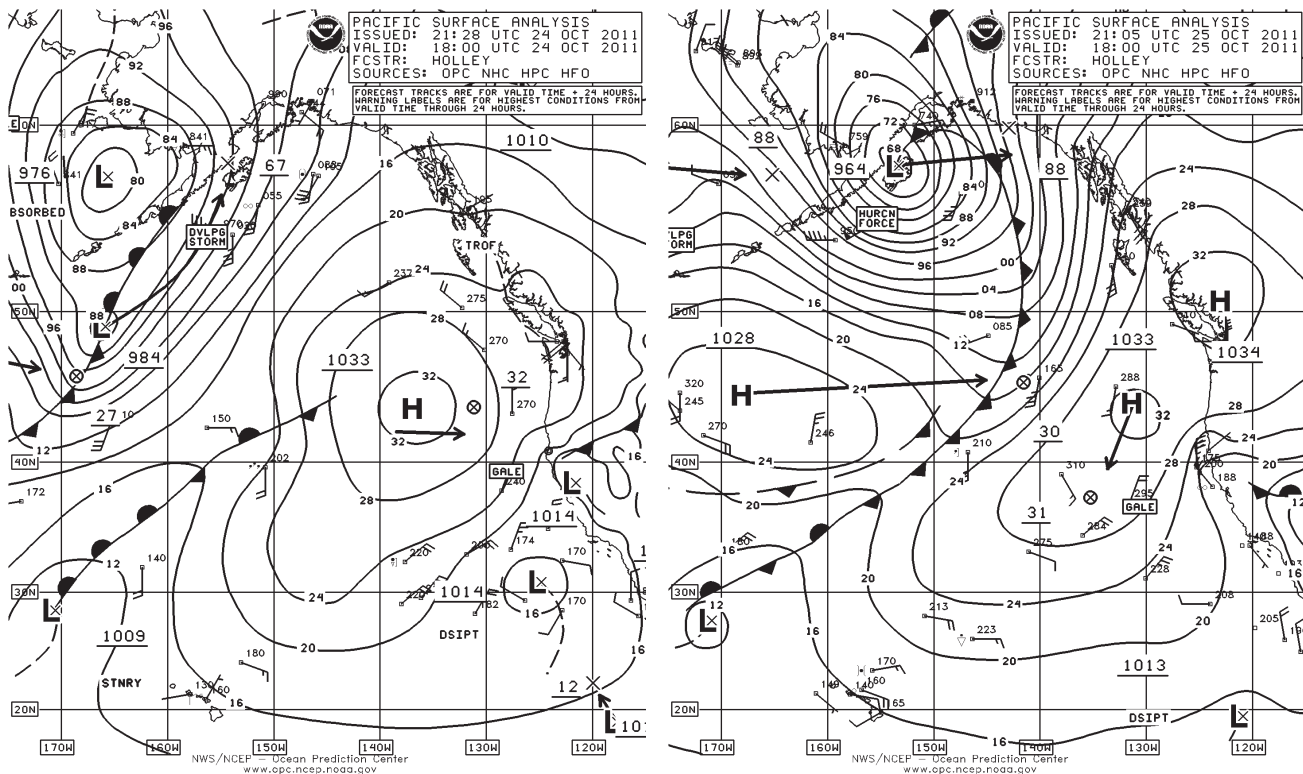


Figure 10. OPC North Pacific Surface Analysis charts (Part 1) valid 1800 UTC October 24 and 25, 2011.

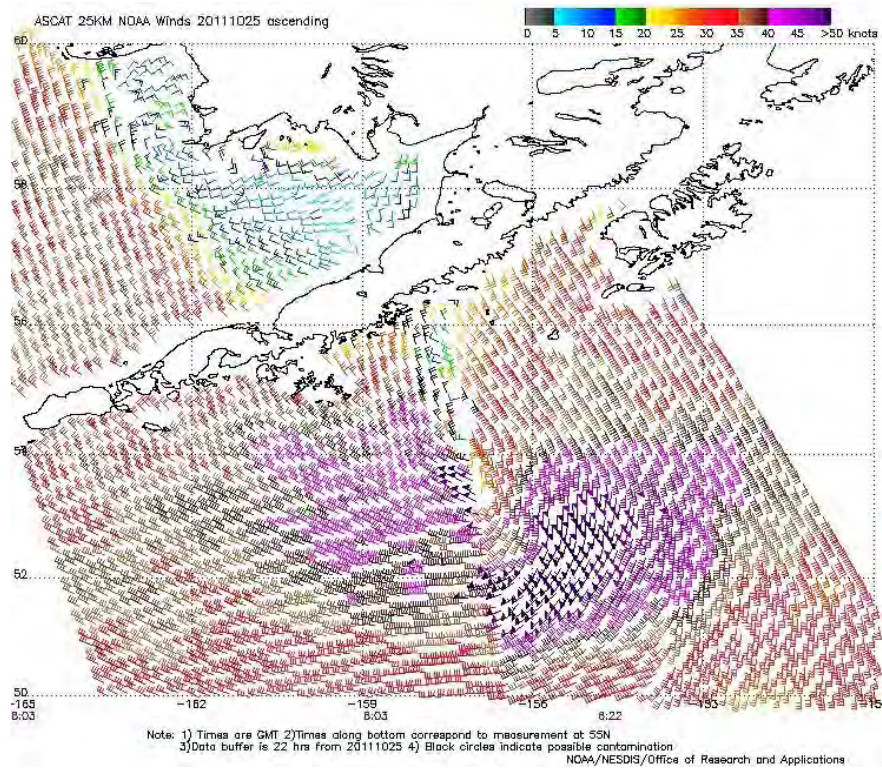


Figure 11. 25-km ASCAT image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 10. The valid time of the eastern pass is 0622 UTC and of the western pass 0803 UTC October 25, 2011, or ten to twelve hours prior to the valid time of the second part of Figure 10. Southwest Alaska and Kodiak Island appear in the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

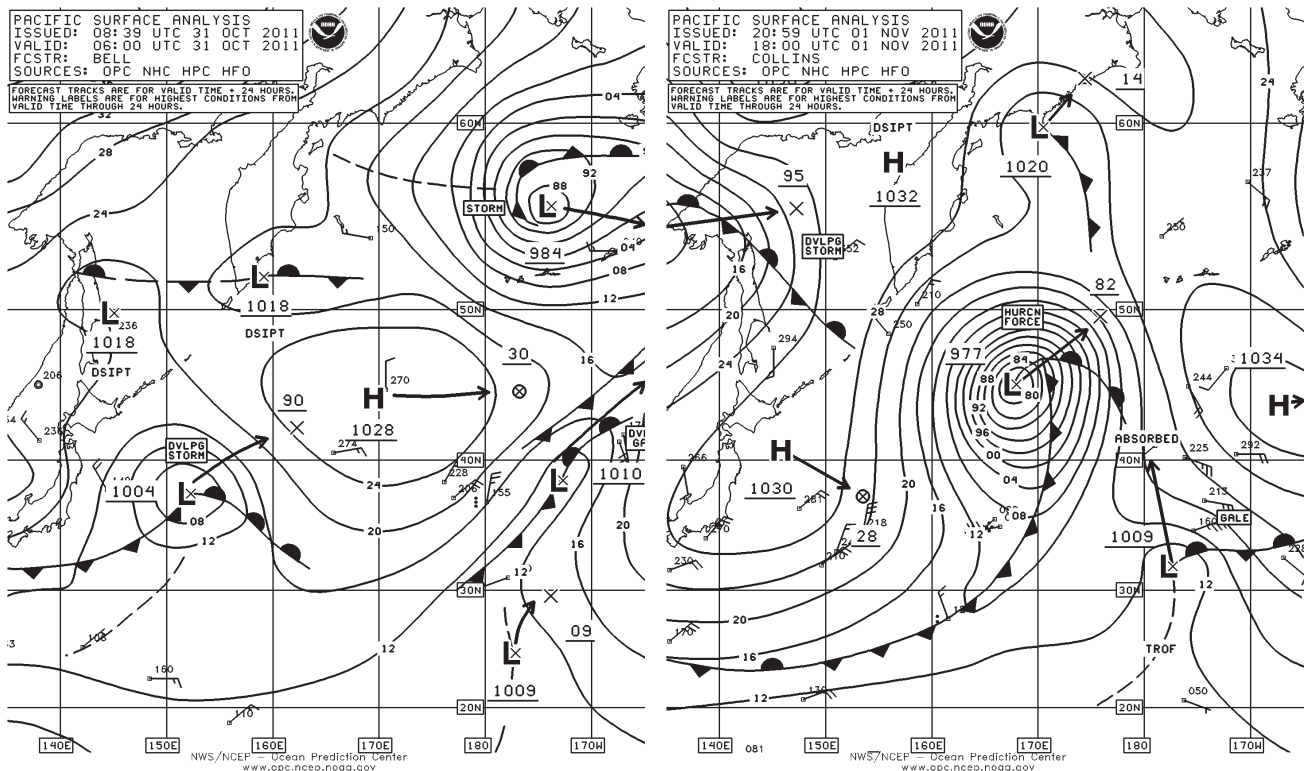


Figure 12. North Pacific Surface Analysis charts (Part 2) valid 0600 UTC October 31 and 1800 UTC November 1, 2011.

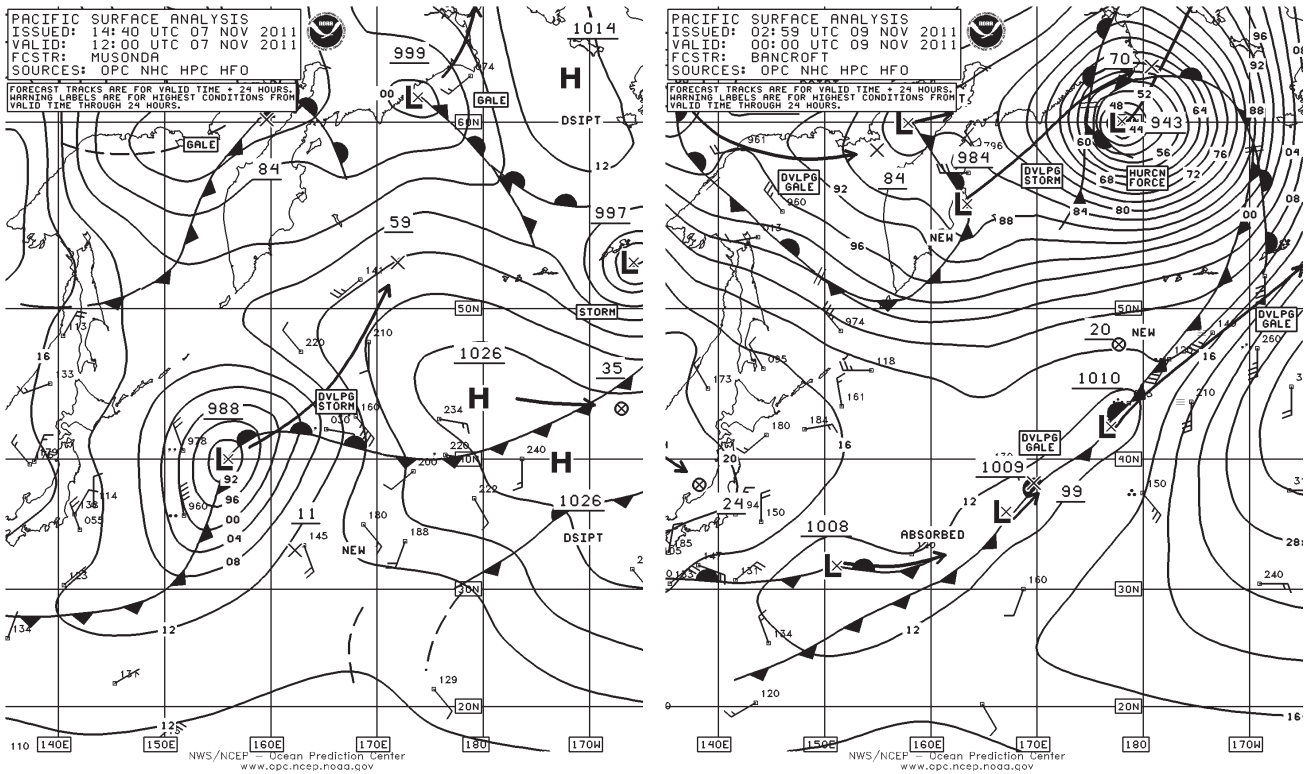


Figure 13. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC November 7 and 0000 UTC November 9, 2011.

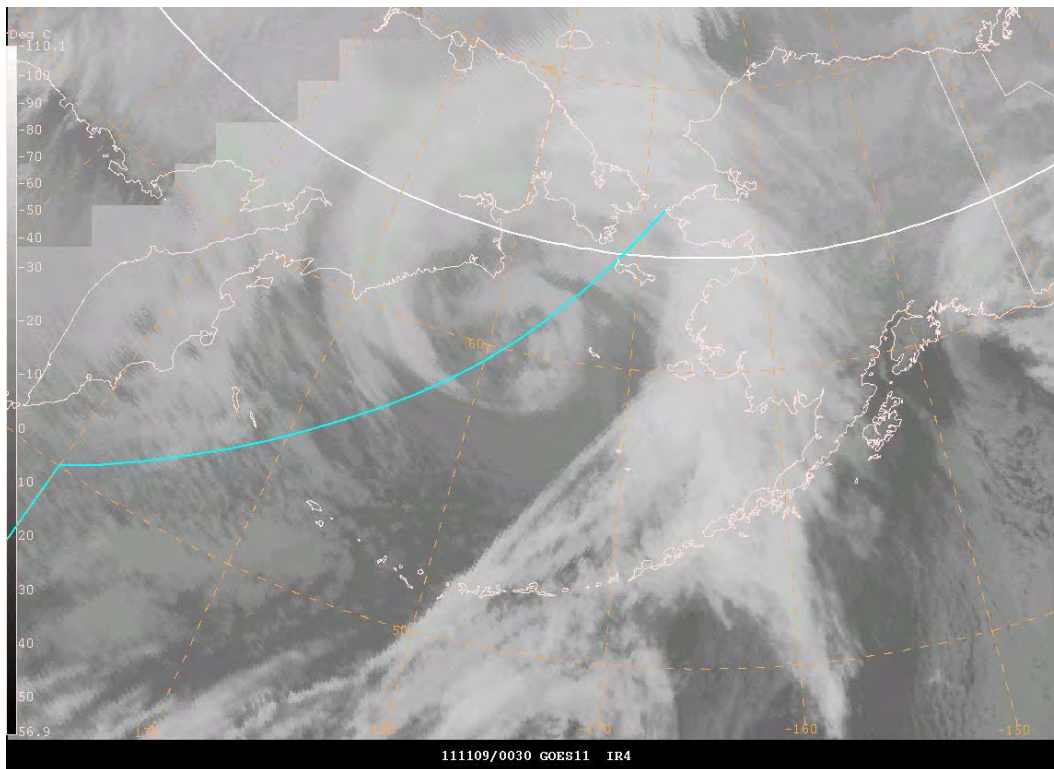


Figure 14. Mosaic of GOES-west, MTS and polar infrared satellite imagery valid 0030 UTC November 9, 2011. Satellites sense temperature on a gray scale from black (warm) to white (cold) in this type of imagery. The valid time of the image is only one half hour later than that of the second part of Figure 13.

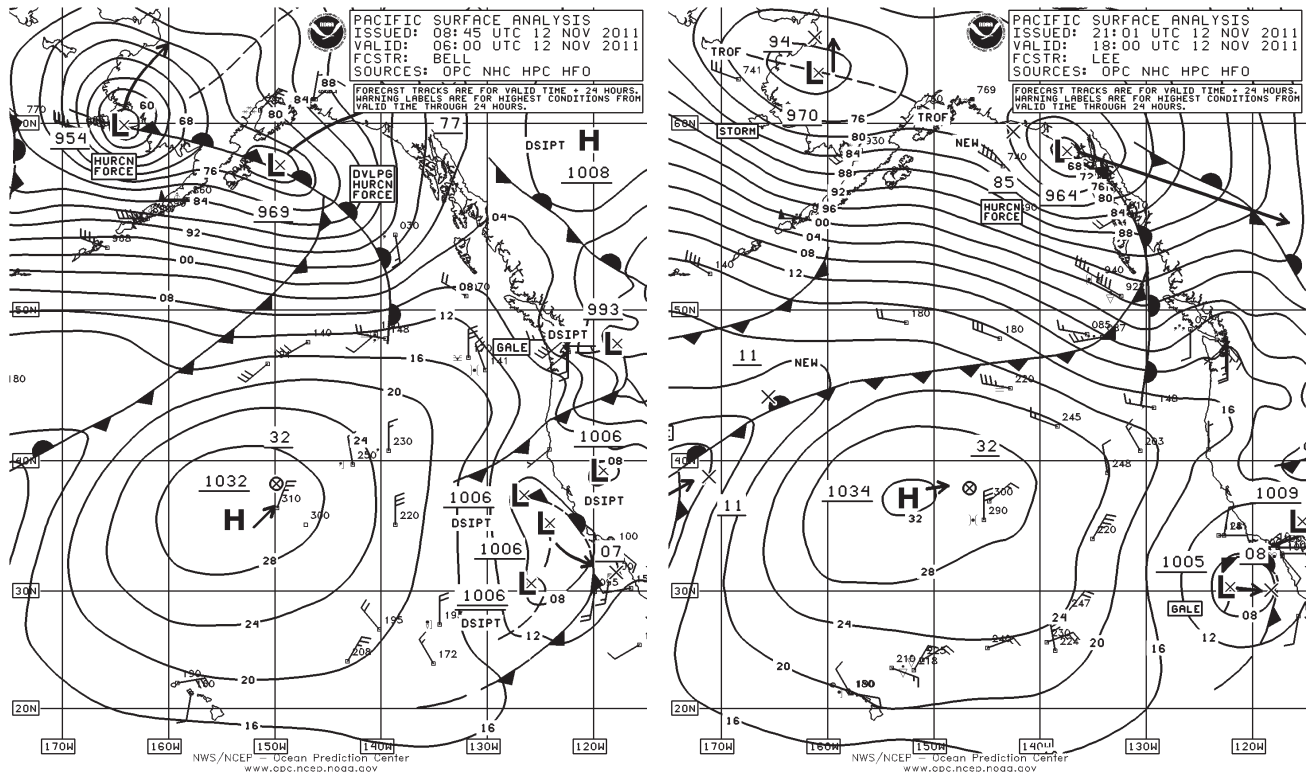


Figure 15. OPC North Pacific Surface Analysis charts (Part 1) valid 0600 UTC and 1800 UTC November 12, 2011.

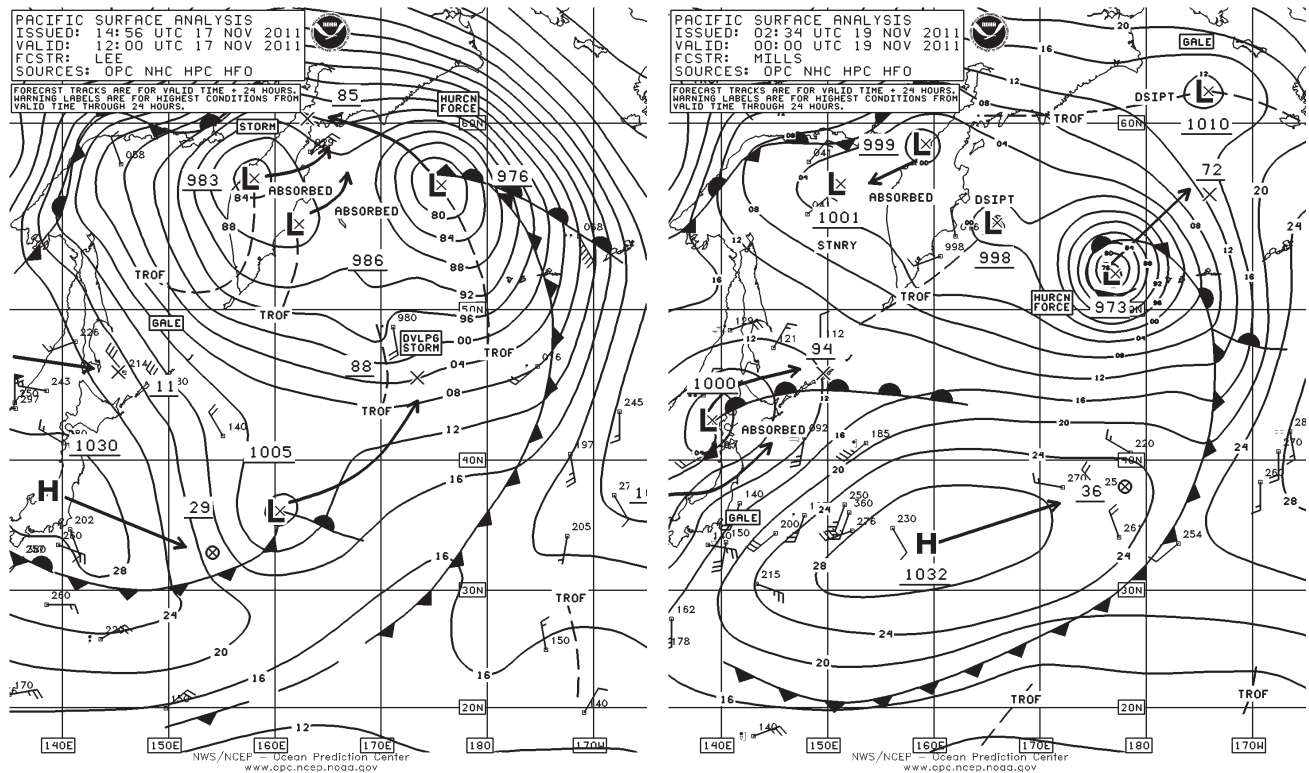


Figure 16. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC November 17 and 0000 UTC November 19, 2011.

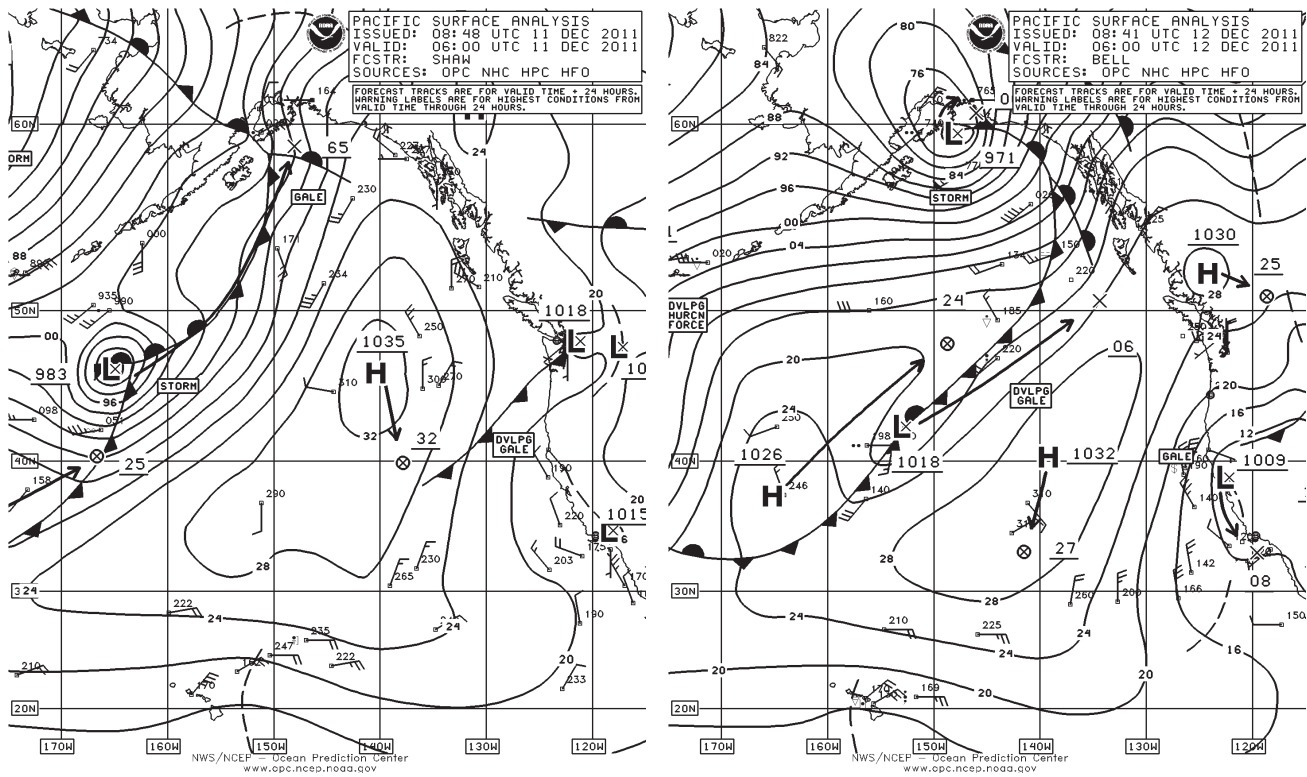


Figure 17. OPC North Pacific Surface Analysis charts (Part 1) valid 0600 UTC December 11 and 12, 2011.

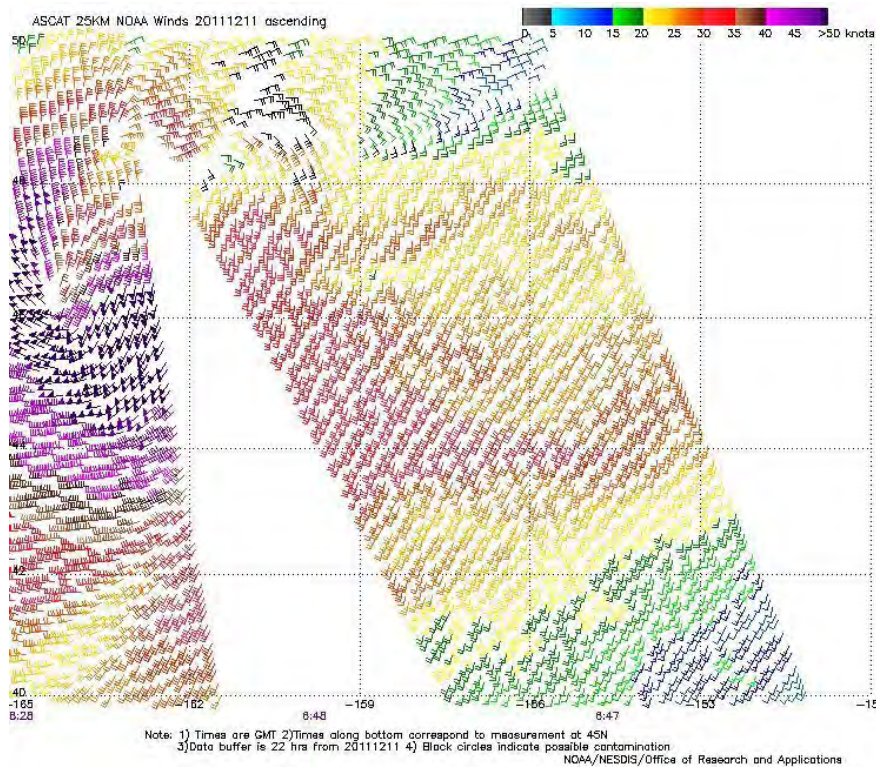


Figure 18. 25-km resolution ASCAT image of satellite-sensed winds around the cyclone shown in Figure 17. Portions of two passes are shown, with the later pass (0828 UTC December 11) containing the strongest winds and valid about two and one-half hours later than the valid time of the first part of Figure 17. The well-defined center is near the left edge of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

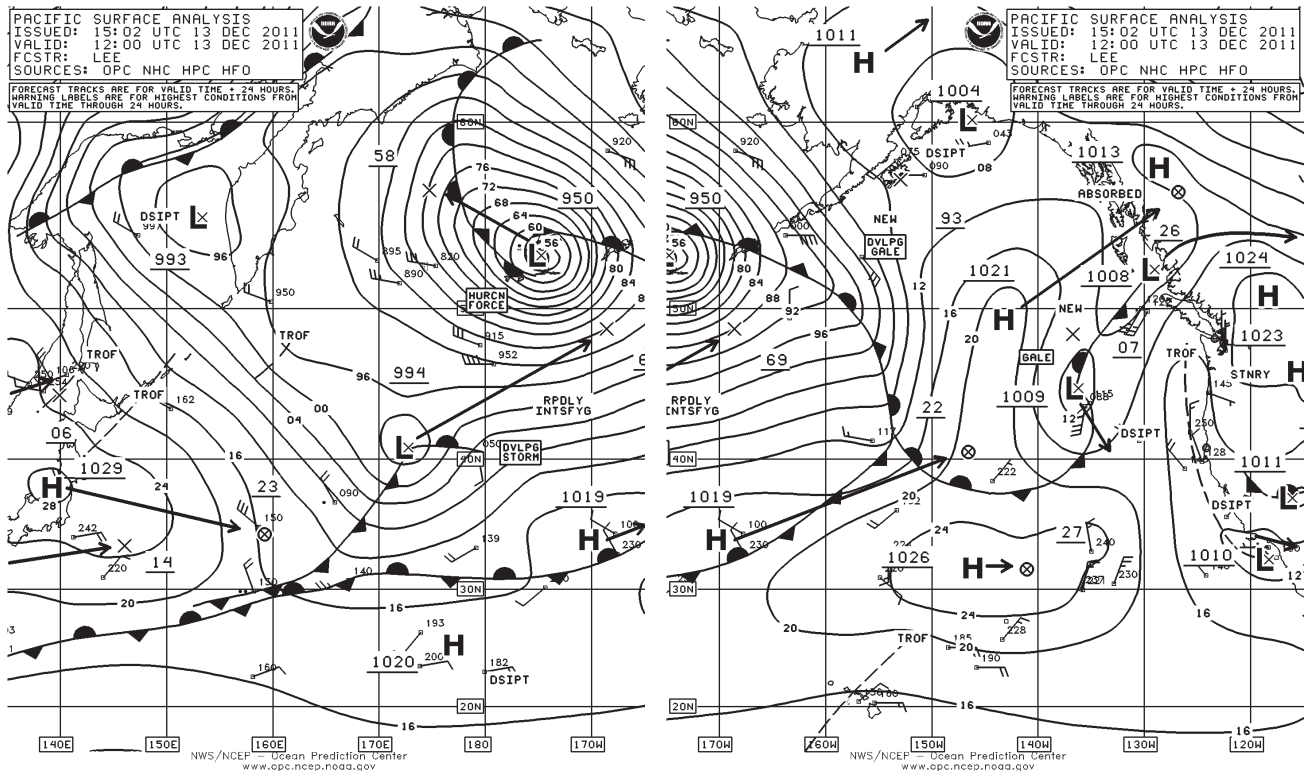


Figure 19. OPC North Pacific Surface Analysis charts (Parts 1 and 2) valid 1200 UTC December 13, 2011.

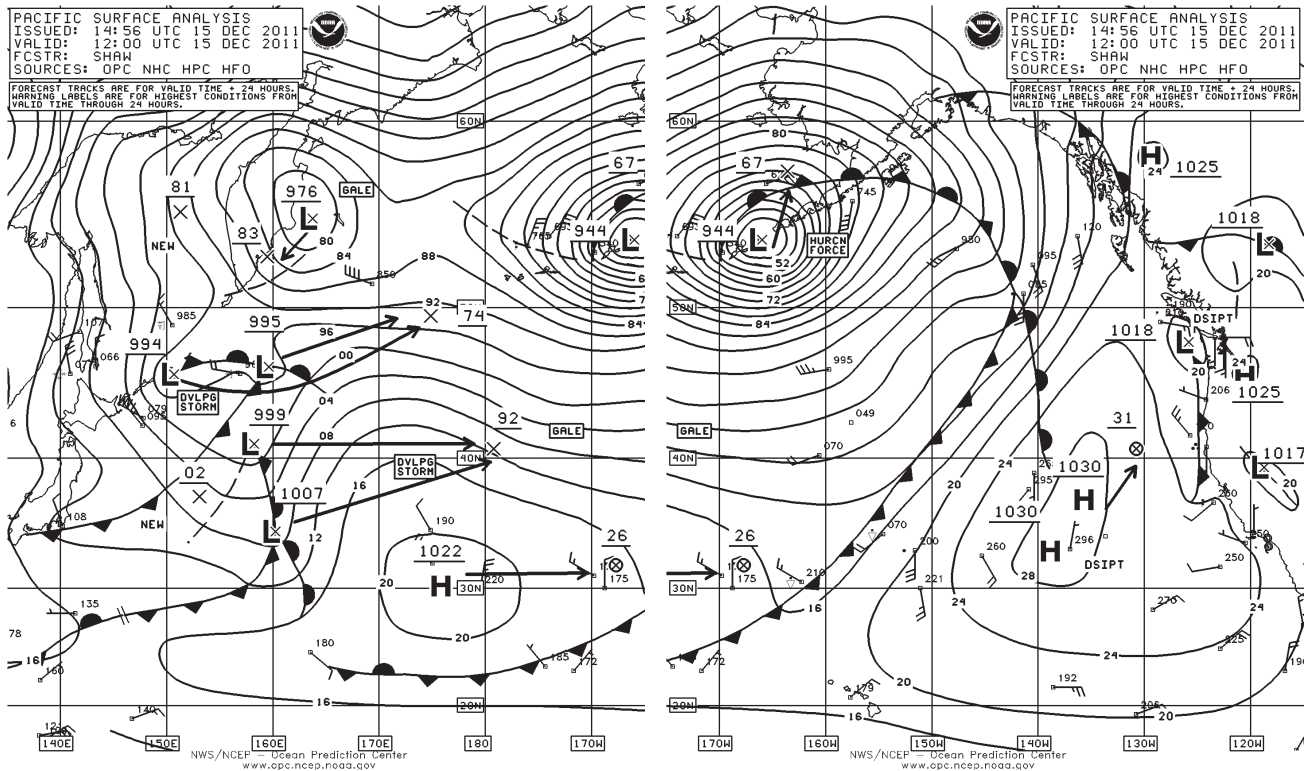


Figure 20. OPC North Pacific Surface Analysis charts (Parts 1 and 2) valid 1200 UTC December 15, 2011.

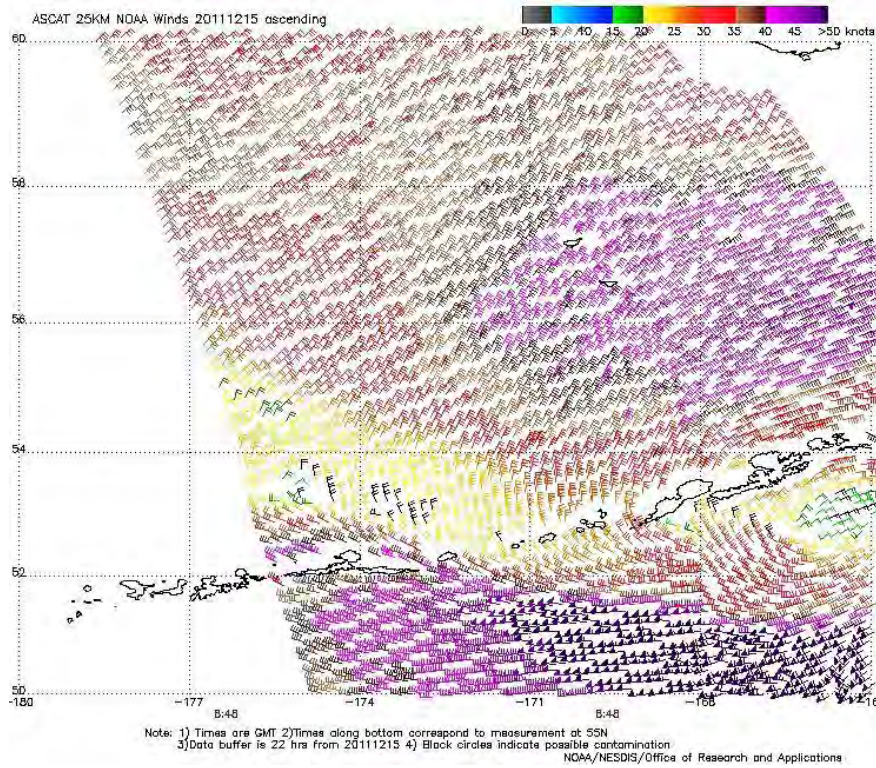


Figure 21. 25-km resolution ASCAT image of satellite-sensed winds around the intense cyclone shown in Figure 20. The valid time of the pass is 0848 UTC December 15, 2011, or about three and one-quarter hours prior to the valid time of Figure 20. The central and eastern Aleutian Islands appear in the image, with the cyclone center near 53N 166W near the lower-right edge of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

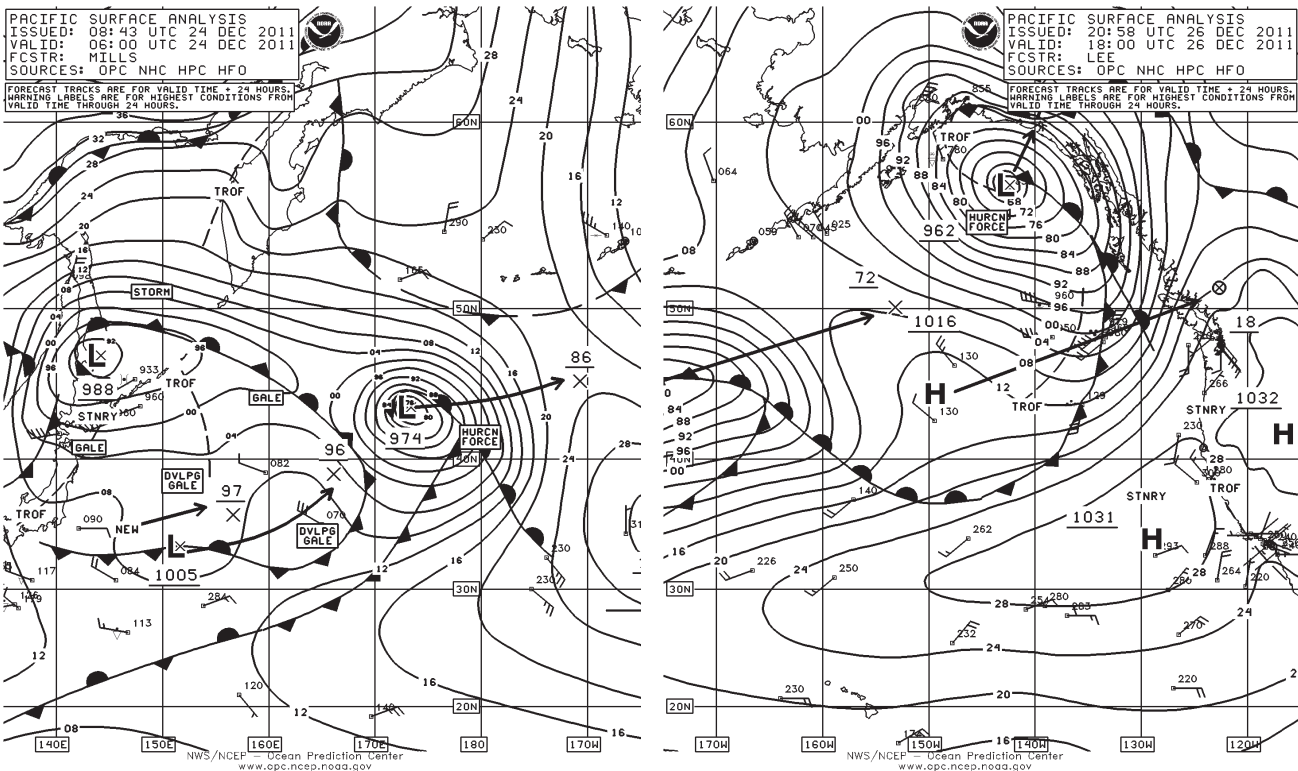
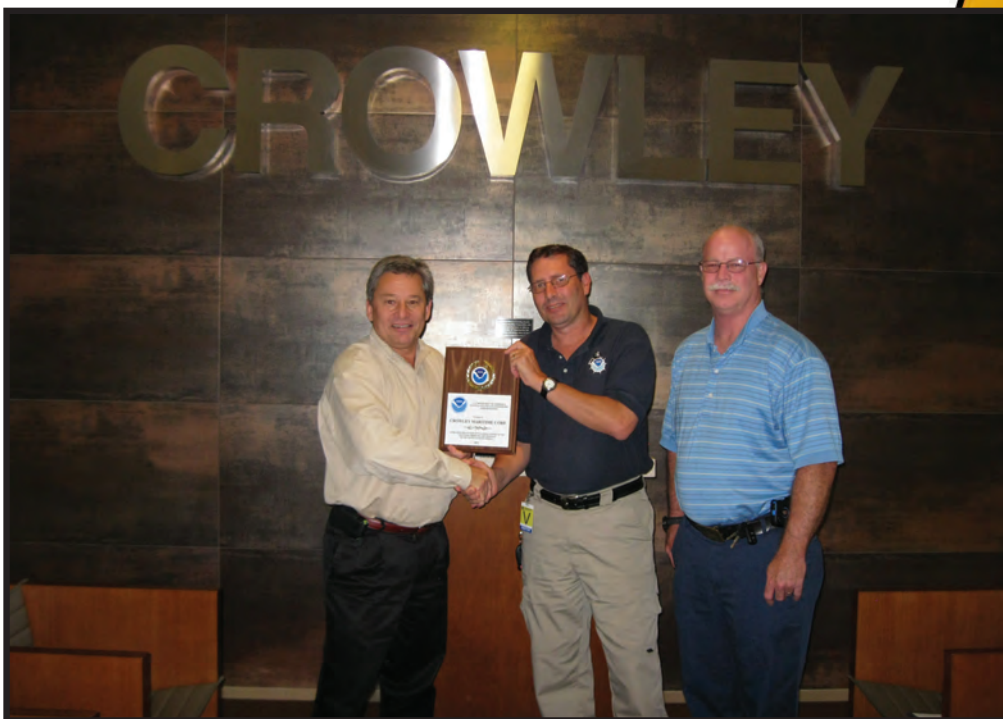


Figure 22. OPC North Pacific Surface Analysis charts valid 0600 UTC December 24 (Part 2) and 1800 UTC December 26, 2011.

VOS Program Awards



Crowley Maritime Corporation has been selected as a 2011 Company Award Winner for the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program. The selection is based on Crowley's 48 active vessels providing a total of 20,430 highly accurate and timely weather observations for the U.S. VOS program in 2011.

Particularly impressive was Crowley's St Louis Express, a cargo vessel whose crew members alone recorded 4,926 observations last year, ranking her the second-highest reporting vessel in the entire United States VOS program.

Pictured Left to Right: Mr. Michael Golonka, General Manager; Robert Niemeyer, PMO, Jacksonville, FL; Ed Burdorf, Senior Port Captain

For the second consecutive year the crew of the Charleston Express has been awarded the annual VOS Award for observing excellence. In 2011 the crew provided over 1500 quality marine observations. Well done and THANKS from NOAA!!!!

Pictured L-R: Capt. John Farmer, C/M Brendan S. Smith, 2/M Brandon M. Teal, 3/M Christopher W. Funke. * or as the Captian said (Old married guy and the young guns) *



VOS Program Awards

For the THIRD consecutive year the Sealand Eagle has been awarded the annual VOS Award. The crew provided over 1647 quality marine observations in 2011. Well done and many THANKS from NOAA!!!!

Pictured L-R: Stephen Sasso Deck Cadet, Brent McClaine 2M, Aaron Moore, 3M, and John Kelly, Chief Mate.



For the THIRD consecutive year the Sealand Racer has been awarded the annual VOS Award. The crew provided over 1400 quality marine observations in 2011. Well done and many THANKS from NOAA!!!!

Left to right, 2M Ken Quinn, CM Karen Reyes, Capt. Don Laverdure, 3M Vitaly Kuznetsoff.

Not pictured but also contributing are CM Steve Watt, Capt Jon Pratt and Capt. J. Jackson.



The Washington Express has won the annual VOS Award in 2011 for the third consecutive year. The crew provided over 1200 marine observations. Well done and thanks!!!

Pictured from left to right: 2/M Ed Hurley, C/M Dan Martin, Cadet Joe Soha and 3/M Jeremy Cunningham.

Contributing observers during 2011: 2/Mates Joe Ward, Andrew Longnecker, Brendan Meyers & Trevor Battles. 3/Mates Ian Falkenberg and Joe Young.



VOS Program Awards



Cruise Ship Amsterdam won a 2011 VOS Award with an outstanding total of 1,224 valuable marine observations! This was a new all time ship's record! The Amsterdam had a worldwide itinerary in 2011.

Pictured: Eversen, Wilhelmus F. — Master
 Teensma, Gerard H.D. — Chief Officer
 Allcock, Simon J. — 2nd Officer
 Koolhaas, Wouter — 2nd Officer
 Harrison, Dominic Ernest — 2nd Officer
 Campbell, Colin — 3rd Officer
 Shearman, Thomas Charles — 3rd Officer
 Shaghaghi, Babak — 4th Officer
 Van Velzen, Vincent — Cadet Officer
 Hubble, Larry — Anchorage Port Meteorological Officer



Cruise Ship Paul Gauguin won their first ever VOS Award in 2011! They had an outstanding total of 1,568 valuable marine observations which was a new ship's record. Their observations were mainly from the South Pacific Ocean.

Photo Left to Right: Lars Vogel, Chris Mounter, Noel Leanillo, Lawrence Roxas, Josh Smith

VOS Program Awards



Tanker Atlantic Grace won a 2011 Voluntary Weather Observing Ship (VOS) Award. This was their first ever award and they had an outstanding total of 1,122 valuable marine observations!

Photo Left to Right:
Cadet Keldeep Mutneja
3rd Officer Rahul Kaushik
Captain Vinay Khosla
Chief Officer Abdul Quader
2nd Officer Vivek

Tanker Axel Spirit won a 2011 Voluntary Weather Observing Ship (VOS) Award. This was their first ever award and they had an excellent total of 784 valuable marine observations! They were the #1 Observing Ship in the Teekay Fleet!

Photo left to right:
Cadet Cvjetovic Tomislav
Chief Officer Zienko Krzysztof
3rd Officer Paksham Kumar
Captain D'souza Damascene
3rd Officer Huynh Nhut Tam
2nd Officer Chandra Vikas



Proudly displaying the Philadelphia Express' SIXTH consecutive annual NOAA VOS AWARD for 2011 are from
Left to right:

Paul "Slick" Sallee C/M, Ryan "Arlo" Guthrie 3/M, Captain Dave Sulin, and seated Brett "Kentucky" Monthie 2/M.

Not pictured but also participating over the 2011 year were Captain Scott Putty, Chuck Rau C/M, Chris Hendrickson C/M, Brendan "Downtown" Smith 2/M, Brandon "Ricky Bobby" Teal 2/M, Al Roland 2/M, Jeremy "Slim" Cunningham 3/M, Brendan Myers 3/M, John Groth 3/M, Cadet Eric "Squarehead" Isaksen, Cadet Peter "Crabcake" Horton, Cadet Craig "Stonewall" Froehlich, Cadet Ian "Hulk" Nisley, and Cadet Zach Bradley.

Well done and many thanks from NOAA!!!!

VOS Program Awards



For the fifth consecutive year, the DISNEY MAGIC is a 2011 Award Winner for the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program. The ship is also a recipient of the 5 Year Pennant for being awarded 5 consecutive annual VOS performance awards. NOAA congratulates the crew for their consistent dedication to the marine observing program over the past 5 years.
A Job Very Well Done!

Pictured left to right are:
Staff Captain Andy Mc Ronald
Safety Officer Michele Moro
1st Officer Antonio Guarino
1st Officer Dean Kanjac
2nd Officer Rikardo Denoble
Safety Office Evgeny Babchenko



Award to the Disney Wonder

Pictured is captain Fabian
Martin Dib

VOS Program Awards



For the fifth consecutive year, the Norwegian Sun is a 2011 Award Winner for the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program. The ship is also a recipient of the 5 Year Pennant for being awarded 5 consecutive annual VOS performance awards. NOAA congratulates the crew for their consistent dedication to the marine observing program over the past 5 years. A Job Very Well Done!

Pictured Left To Right:
Staff Captain Teo Grbic
3rd Officer Alfred Clement
Captain Tommy Stensrud
Chief Officer Kristijan Uhac
Captain Ronny Borg

The El Yunque has been selected as a 2011 Award Winner for the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program. The ship recorded and transmitted nearly 600 quality marine observations. This is the 9th award for the El Yunque since 2001. Well Done!

Pictured Left to Right:
Chief Mate Kwesi Amoo
Captain Michael Richie
2nd Mate Dustin Leserra



VOS Program Awards



Tanker ship George N won a 2011 VOS Award with an excellent total of 935 marine observations from the Atlantic and Pacific Oceans as well as the Norwegian and Mediterranean Seas.

Standing Left to Right:
2nd Officer - Gaurav Kulshreshtha
Captain - Sanjay Sadh
Chief Officer - Gautam Dubey
3rd Officer - Vaibhav Jain

Sitting
Deck Cadet - Naveen Chaturvedi



For the 10 consecutive year, the Horizon Producer has been selected for the as a 2011 National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program award winner. During the year of 2011, the Horizon Producer recorded and transmitted over 1325 quality marine weather observations, a new ship record. The ship is also a recipient of the 10 Year Pennant for being awarded 10 consecutive annual VOS performance awards. During the past 10 years, the ships crew recorded and transmitted over 10,000 marine weather observations. A Job Well Done!

Pictured Left to Right:
3rd Mate Terry Williams
2nd Mate Bob Anderson
Captain Mark Ruppert

Not Pictured:
Captain Bill Boyce
Chief Mate Chris Danilek
Chief Mate John Rawley
Second Mate James McAfee
Third Mate Bernard Scott
Third Mate Bert "Hurricane" Haney



VOS Program Awards



Captain Kevin G. Coulombe accepts the "5 year, Observing Excellence" pennant from NY PMO Jim Luciani, on behalf of all contributing crew aboard MAERSK WYOMING. Congratulations for a job well done!! Keep up the great work!!



The Norwegian Jewel has been selected as a 2011 Award Winner for the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service's "Voluntary Observing Ship" (VOS) program. The ship recorded and transmitted over 525 quality marine observations. Well Done!

Picture Left to Right:
 Staff Captain Niklas Persson
 Captain Lars Bergstrom
 2nd Officer Ernest Torres
 2nd Officer Arturo Abamo
 1st Officer Navigation Ferdinand Aguilar

VOS Program Awards



The Norwegian Gem won its 3rd annual VOS Award. The Ship's crew recorded and transmitted 1040 quality observations during the year of 2011. Thank you for your continued support.

Pictured from left to right:
Staff Captain Zeljko Jurac
Staff Captain Stefan Nording
2nd Officer Luis C. Botacio Underwood



Cruise Ship Norwegian Pearl won a 2011 VOS Award with an outstanding total of 1,661 marine observations! This was a new ship's record and their 2nd ever VOS Award. Their observations were from Alaskan waters, the Eastern Pacific, and the Caribbean.

From right to left (standing):
NWS HMT Geri Swanson
Navigation Officer Vicente Amicone
Staff Captain Mattias Andersson
Quarter Master Aquilino Demecillo
Captain Gunnar Hammerin
Deck Cadet Suzanne Thompson
2nd Officer Jason Habana
2nd Officer Vito Diaz
3rd Officer Teody Eugene Tolentino
NWS Meteorologist Nicole Hannon

From right to left (knee on the ground):
Quarter Master Crisanto Jamandre
Quarter Master Mel Alcantara



Tanker Oriental Queen was selected for a 2011 VOS Award with an excellent total of 669 valuable marine observations! This was their 5th consecutive VOS Award which qualified Oriental Queen for a special 5 Year Award Pennant as well.

Photo Left to Right (standing):
2nd Officer KARTHEEK DEVARAKONDA
Chief Officer GANESH PANIGRAHI
Captain RAJINDER KUMAR
Left to Right (seated):
Cadet DSILVA ACKLISTER DOMSON
3rd Officer SHAILESH K MISHRA

VOS Program Awards



Cruise Ship Norwegian Star won their 2nd consecutive VOS Award in 2011 with an outstanding total of 1,778 valuable marine observations! This was a new all time yearly ship's record.

Photo from left to right:
3rd Officer Tanase Gima
3rd Officer Jay Pastorin
2nd Officer Marko Karabatic



Cruise Ship Oosterdam won a 2011 VOS Award with an excellent total of 842 marine observations from the North Pacific Ocean. This was their first ever VOS Award and a new all time ship's record!

Back row:
chief officer Paul Adams,
3rd officer Jimmy Plug,
2nd officer Gordon Cree
Captain Henk Draper.

Front row:
Guest relations attendant Chren Padilla
international concierge Janique Deuzeman
2nd officer Casper Stravers,



VOS Program Awards

Cargo Ship Posidana won their first ever VOS Award in 2011. They had an outstanding total of 1,571 valuable marine observations! This was a new ship's record and placed them #1 among the Masterbulk Fleet of Observing Ships.

Photo Left to Right:
3rd Officer Yolán S. Velasco
Radio Mate Alvin Eric Barbato
Chief Officer Danilo L. Ramirez
Captain Mauricio H. Ferrariz, Jr.
2nd Officer Aurelio L. Planteras.



Cruise Ship Splendour of the Seas won their 4th consecutive VOS Award in 2011. They had an outstanding total of 2,521 valuable marine observations!

Photo Standing from left to right:
1st Officer Emil Grandev,
Staff Captain Juan Caranti
Quartermaster Burnie
Quartermaster Jay
Captain Carl Graucob
1st Officer Janusz Kalinowski

In front from left to right:
2nd Officer Tomasz Dudzynski
Quartermaster Jupiter
Quartermaster Gomez
Quartermaster Ismail
2nd Officer Juan Blake
1st Officer Randy Salazar



VOS Program Awards



On board the Maersk Georgia:
 Captain Philip Solito, Chief
 Officer Horatiu (back row), 2/m
 Christopher Gillard and 3/m
 Glen Baumgart accept the 2011
 Annual VOS award for observing
 excellence throughout 2011.
 Our thanks to all members
 of the crew who contributed
 to reporting these important
 observations.

Cruise Ship Zuiderdam won a 2011 VOS Award with an outstanding total of 2,075 marine observations from the North Pacific and Caribbean! This was a new ship's record and their 2nd VOS Award!

Pictured:

Andrew McDonald, Genki Kino, Michiel Willems, Jordi van Sikkelerus, Omrine Wilson, Adam Gardner, Captain Chris Turner, Jonathan Edwards, Geri Swanson (NWS), Martijn de Leege, Nicole Hannon (NWS).



VOS Program Awards



Cruise Ship Volendam won a 2011 VOS Award with an outstanding total of 4,856 marine observations from the North and South Pacific Oceans. This was their 4th consecutive VOS Award and the highest total in the Holland America fleet.

Chief Officer: Colm Ryan with NWS Assistant PMO Geri Swanson



Cruise Ship Volendam won a 2011 VOS Award with an outstanding total of 4,856 marine observations from the North and South Pacific Oceans. This was their 4th consecutive VOS Award and the highest total in the Holland America fleet.

Pictured L-R: A/O Kenneth van der Tuin, Deck Cadet Andre Knight, C/O Colm Ryan, 2/O Marienus Hazelman, 3/O Adam Wilson, QM Muhazin, A/O Ruben de Roos, 3/O Aline Sauzé.
Pictured on the inset QM Muhazin and Machdy

VOS Program Awards



Cruise Ship Celebrity Millennium won a 2011 VOS Award with an outstanding total of 2,514 marine observations from the North Pacific Ocean and Caribbean Sea. This was their 4th consecutive VOS Award.

In the photo from left to right:
Apprentice Officer: Costin Iacob
2nd Officer: Panos Vogiatzoglou
Safety Officer: Pantelis Ampotzis
Chief Officer: Kostas Petrakakis



Captain of the Westwood Rainier accepts their award for 2011



2011 VOS award presented to UBC Santa Marta. Pictured is 3rd Mate Roger Tagaca, PMO Dave Jones, Captain Hakon Isaksson, and 2nd Mate Elpidio Tangcalagan

VOS Program Awards



"Captain Allwyn Phillips, Master, M.V. Bernardo Quintana A., accepts the 2011 VOS award on behalf of the crew"



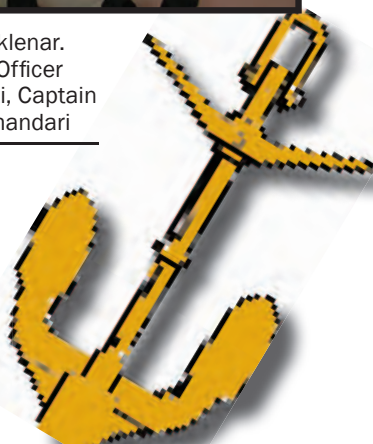
2011 VOS Award presented to H A Sklenar.
Pictured from left to right are: Chief Officer Edmund Brigoli, Third Officer Fawaz Kazi, Captain Pradeep Widge, and Cadet Aneeth Bhandari



Tanker ship Antwerpen won their first ever VOS Award in 2011 with an excellent total of 855 marine observations from the Western Pacific and Indian Ocean. This was a new yearly ship's record for observations.

Pictured from Left to Right:
Standing
Chief Officer : Mathew Riges John
Master : Captain. Gaurab Pal
Second Officer : Jaspal Minhas

Sitting
Third Officer : Mayank Sundriyal
Cadet : Kunal Ashok Nihalani



VOS Program Awards

Cruise Ship Superstar Libra won their 2nd consecutive VOS Award in 2011. They had an outstanding total of 1,349 valuable marine observations which was a new ship's record!

Photo Left to Right:
 2nd Officer Larry Yin Mai La
 3rd Officer Huan Jun Yao
 Safety Manager Niklas Nilsson
 Staff Captain Joakim Vonasek
 Captain Lennart Jegerfalk
 1st Officer Daniel Pantzarfelt
 3rd Officer Jimmy Cerdenola
 2nd Officer Christoffer Sandstrom
 3rd Officer Erick Anonuevo



Cargo Ship Star Fraser won their 2nd consecutive VOS Award in 2011. They had an outstanding total of 1,526 valuable marine observations which was a new ship's record! They were the #1 observing ship in the Star Shipping Fleet!

PHOTO FROM LEFT TO RIGHT:
 3rd Officer Trainee GP Rodan Yarra
 Chief Officer Edwin Llagas
 Captain Jonathan Sison
 2nd Officer John Jimena
 3rd Officer Von Erick Robles

Cruise Ship Zaandam won a 2011 VOS Award with an excellent total of 902 marine observations from the North Pacific Ocean! This was their 2nd VOS Award.

In the photograph:
 Captain André van Schoonhoven
 Chief Officer Peter Cordfunke
 1st Officer Steven Macbeath
 2nd Officer Kevin Jamieson
 3rd Officer Joot Schol
 4th Officer Amy MacDonald
 cadet Fiona Standen
 cadet Kayleigh Fait
 ANC PMO Larry Hubble



VOS Program Awards

Master Vasile Liviu Catalin and 2M Alvin L. Serrano accepting the VOS plaque for entering our VOS program



National Weather Service

VOS Program New Recruits:

March 1 through May 31, 2012

SHIP NAME	CALL SIGN
A. P. Moller	OVYQ2
Algoma Quebecois	CYGR
Algowood	VCTD
Ariso	3FHJ6
Cafer Dede	V7PR8
Caribbean Sea	PHNU
Disney Fantasy	C6ZL6
Expedient	ONFY
Hazel Lorraine	WYR7722
Incentive	WCW9879
Katrina Em	WTK2245
Legend	WDF9316
MAERSK ILLINOIS	WMLI
Maersk Visby	9V8827
Mathilde Maersk Skagen	OUJS2
New Delhi Express	VRBK5
Noble Globetrotter I	A8UD3
NYK Libra	HOJY
NYK Triton	3FUL2
Oar Northwest	WDG3142
Ocean Hope 3	WDF2354
Santa Monica	MGYB8
Seabrooke	WDC4069
Silver Spray	WDC8162
Skagen Maersk	OYOS2
Stormbird	WDA6306

SHIP NAME	CALL SIGN
Taurus	WDF4091
USCGC Stratton	NJIM
Walter J. McCarthy Jr.	WXU3434
Wendy O.	WDF8784
Zim New York	VRGA7
Unique Explorer	VRGT8
USCGC Fir	NAYV
Vietnam Express	VRCZ4
West Sirius	3EMK6
YP676	YP 676
YP696	YP 696
YP686	YP 686
Yuyo Spirits	3FNF4

VOS Cooperative Ship Report:

January through June 30, 2012

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
A. P. Moller	OYVQ2	22	30	28	49	27	52	0	0	0	0	0	0	208
Achievement	WDF2728	152	27	120	44	4	9	0	0	0	0	0	0	356
Adrian Maersk	OXLD2	24	23	9	21	43	0	0	0	0	0	0	0	120
Advantage	WPPO	0	54	5	0	0	0	0	0	0	0	0	0	59
Adventure Of The Seas	C6SA3	81	53	36	53	141	148	0	0	0	0	0	0	512
Adventurer	WBN3015	19	39	23	0	30	4	0	0	0	0	0	0	115
Al Huwaila	C6VG2	25	46	17	17	16	0	0	0	0	0	0	0	121
Al Khuwair	C6VM6	3	0	0	0	9	21	0	0	0	0	0	0	33
Al Marrouna	C6VF5	58	39	47	38	37	44	0	0	0	0	0	0	263
Alaska Mariner	WSM5364	8	46	0	0	0	20	0	0	0	0	0	0	74
Alaska Titan	WDE4789	1	8	4	0	7	0	0	0	0	0	0	0	20
Alaskan Explorer	WDB9918	112	137	96	83	65	44	0	0	0	0	0	0	537
Alaskan Frontier	WDB7815	40	31	14	5	33	16	0	0	0	0	0	0	139
Alaskan Legend	WDD2074	31	13	0	16	34	60	0	0	0	0	0	0	154
Alaskan Navigator	WDC6644	44	34	99	99	53	50	0	0	0	0	0	0	379
Albemarle Island	C6LU3	43	39	42	47	37	20	0	0	0	0	0	0	228
Albert Maersk	OUOW2	0	0	0	0	52	30	0	0	0	0	0	0	82
Alert	WCZ7335	0	30	1	27	3	14	0	0	0	0	0	0	75
Algolake	VCPX	0	0	0	4	29	16	0	0	0	0	0	0	49
Algoma Discovery	CFK9796	0	0	0	0	0	0	0	0	0	0	0	0	0
Algoma Navigator	VG MV	0	0	0	0	0	12	0	0	0	0	0	0	12
Algoma Progress	VDRV	35	0	12	21	34	36	0	0	0	0	0	0	138
Algoma Quebecois	CYGR	0	0	0	0	3	12	0	0	0	0	0	0	15
Algoma Spirit	CFN4309	0	0	0	31	33	18	0	0	0	0	0	0	82
Algoway	VDFP	0	0	0	8	12	6	0	0	0	0	0	0	26
Alkin Kalkan	TCOL6	0	0	0	0	0	0	0	0	0	0	0	0	0
Alliance Beaumont	WKDY	61	31	8	27	38	58	0	0	0	0	0	0	223

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Alliance Charleston	WRAH	17	41	61	65	84	60	0	0	0	0	0	0	328
Alliance Norfolk	WGAH	0	1	16	0	1	18	0	0	0	0	0	0	36
Alliance St Louis	WGAE	24	24	34	9	1	18	0	0	0	0	0	0	110
Allure Of The Seas	C6XS8	25	18	7	0	28	30	0	0	0	0	0	0	108
Alpena	WAV4647	0	0	20	51	0	5	0	0	0	0	0	0	76
Altair Voyager	C6OK	40	62	33	47	1	25	0	0	0	0	0	0	208
American Century	WDD2876	105	0	58	252	340	238	0	0	0	0	0	0	993
American Integrity	WDD2875	14	0	0	23	31	20	0	0	0	0	0	0	88
American Mariner	WQZ7791	0	0	0	1	39	23	0	0	0	0	0	0	63
American Spirit	WCX2417	4	0	0	7	26	26	0	0	0	0	0	0	63
American Tern	WAHF	0	0	1	0	0	0	0	0	0	0	0	0	1
Amsterdam	PBAD	108	116	102	49	143	278	0	0	0	0	0	0	796
Andromeda Voyager	C6FZ6	8	25	34	55	76	45	0	0	0	0	0	0	243
Antonis I. Angelicoussis	C6FP5	8	12	6	0	41	60	0	0	0	0	0	0	127
Antwerpen	VRBK6	137	78	76	130	403	212	0	0	0	0	0	0	1036
APL Agate	WDE8265	32	0	2	25	14	19	0	0	0	0	0	0	92
APL Belgium	9VKQ3	0	0	1	2	6	1	0	0	0	0	0	0	10
APL China	WDB3161	81	67	42	51	55	67	0	0	0	0	0	0	363
APL Coral	WDF6832	18	39	45	37	17	5	0	0	0	0	0	0	161
APL Cyprine	WDE8293	0	0	32	29	0	0	0	0	0	0	0	0	61
APL England	9VDD2	67	12	7	31	25	13	0	0	0	0	0	0	155
APL Garnet	9VVN	7	46	2	0	0	0	0	0	0	0	0	0	55
APL Japan	WDE8288	44	23	28	85	66	32	0	0	0	0	0	0	278
APL Kennedy	9VAY4	36	32	28	5	0	0	0	0	0	0	0	0	101
APL Korea	WCX8883	179	141	33	63	189	191	0	0	0	0	0	0	796
APL Paradise	3ECJ7	5	40	44	0	0	0	0	0	0	0	0	0	89
APL Pearl	WDE8264	61	80	71	51	21	12	0	0	0	0	0	0	296
APL Philippines	WCX8884	31	9	26	31	24	32	0	0	0	0	0	0	153

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
APL Qatar	9VMJ5	0	0	0	0	0	0	0	0	0	0	0	0	0
APL Sardonys	9VVU	19	12	0	0	0	0	0	0	0	0	0	0	31
APL Scotland	9VDD3	2	21	12	16	17	31	0	0	0	0	0	0	99
APL Singapore	WCX8812	51	1	11	20	26	30	0	0	0	0	0	0	139
APL Tennessee	9HA2064	49	48	3	0	0	0	0	0	0	0	0	0	100
APL Texas	VRFH2	88	25	79	40	15	10	0	0	0	0	0	0	257
APL Thailand	WCX8882	72	52	52	42	56	45	0	0	0	0	0	0	319
APL Tourmoline	9VVP	36	0	1	21	18	38	0	0	0	0	0	0	114
APL Washington	VRFD6	21	13	33	49	43	73	0	0	0	0	0	0	232
Aquarius Voyager	C6UC3	25	57	51	52	57	51	0	0	0	0	0	0	293
Aquavictory	A8VA2	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Bear	WBP3396	0	0	7	11	3	9	0	0	0	0	0	0	30
Arctic Ocean	C6T2062	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctic Titan	WDG2803	0	0	0	0	0	3	0	0	0	0	0	0	3
Arcturus Voyager	C6YA7	41	71	91	92	44	42	0	0	0	0	0	0	381
Aries Voyager	C6UK7	63	61	62	57	38	91	0	0	0	0	0	0	372
Ariso	3FHJ6	0	18	0	0	27	0	0	0	0	0	0	0	45
Arnold Maersk	OXES2	19	26	39	12	1	76	0	0	0	0	0	0	173
Arthur M. Anderson	WE4805	98	0	12	65	110	24	0	0	0	0	0	0	309
Arthur Maersk	OXJH2	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic Breeze	VRDC6	0	6	8	11	18	9	0	0	0	0	0	0	52
Atlantic Cartier	SCKB	28	50	40	31	30	17	0	0	0	0	0	0	196
Atlantic Explorer (AWS)	NWS0021	138	0	0	0	0	0	0	0	0	0	0	0	138
Atlantic Explorer (AWS)	WDC9417	92	211	411	268	424	235	0	0	0	0	0	0	1641
Atlantic Frontier	VRDJ7	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic Gemini	VRDO9	2	0	0	0	0	0	0	0	0	0	0	0	2
Atlantic Grace	VRDT7	0	2	35	142	236	326	0	0	0	0	0	0	741
Atlantic Lily	VREF6	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic Rose	VREF7	20	0	1	0	0	0	0	0	0	0	0	0	21

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Atlantis	KAQP	290	516	591	718	507	679	0	0	0	0	0	0	3301
Atlantis (AWS)	NWS0020	454	0	0	0	0	0	0	0	0	0	0	0	454
Attentive	WCZ7337	1	11	8	1	3	14	0	0	0	0	0	0	38
Aurora	WYM9567	0	0	30	425	570	563	0	0	0	0	0	0	1588
Aware	WCZ7336	10	10	14	2	4	2	0	0	0	0	0	0	42
Axel Spirit	C6FY5	87	18	11	47	36	39	0	0	0	0	0	0	238
Azamara Journey	9HOB8	4	37	21	22	9	19	0	0	0	0	0	0	112
Azamara Quest	9HOM8	7	52	73	38	80	38	0	0	0	0	0	0	288
Badger	WBD4889	0	0	0	0	1	83	0	0	0	0	0	0	84
Baltic Bear	V7QN4	14	23	21	26	24	23	0	0	0	0	0	0	131
Baltic Cove	A8VG9	3	14	7	16	5	12	0	0	0	0	0	0	57
Baltic Wind	A8SU8	3	6	6	4	1	0	0	0	0	0	0	0	20
Baltic Wolf	V7QX8	0	0	0	0	0	0	0	0	0	0	0	0	0
Barbara Andrie	WTC9407	20	0	0	22	51	20	0	0	0	0	0	0	113
Barbara Foss	WYL4318	13	14	8	2	0	0	0	0	0	0	0	0	37
Barrington Island	C6QK	22	26	19	12	11	32	0	0	0	0	0	0	122
Bebedouro	ELFN7	0	34	55	24	29	0	0	0	0	0	0	0	142
Bell M. Shimada	WTED	0	2	23	153	2	300	0	0	0	0	0	0	480
Bell M. Shimada (AWS)	NWS0025	0	0	0	0	0	0	0	0	0	0	0	0	0
Berge Nantong	VRBU6	48	0	16	6	29	22	0	0	0	0	0	0	121
Berge Ningbo	VRBQ2	0	0	0	0	0	0	0	0	0	0	0	0	0
Berlian Ekuator	HPYK	1	0	0	0	0	0	0	0	0	0	0	0	1
Bernardo Quintana A.	C6KJ5	59	49	46	45	28	16	0	0	0	0	0	0	243
Berra K	TCTH9	0	0	0	0	0	0	0	0	0	0	0	0	0
Bluefin	WDC7379	0	0	0	0	0	45	0	0	0	0	0	0	45
Bonn Express	ZCEG4	20	0	16	15	0	0	0	0	0	0	0	0	51
Brilliance Of The Seas	C6SJ5	0	0	0	0	0	0	0	0	0	0	0	0	0
Brottonne Bridge	VRHO2	51	26	0	0	0	0	0	0	0	0	0	0	77

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Buccaneer	WYW5588	0	0	0	0	3	0	0	0	0	0	0	0	3
Bulk Mexico	A8VL8	92	76	81	8	0	0	0	0	0	0	0	0	257
Bulwark	WBN4113	19	8	8	5	24	34	0	0	0	0	0	0	98
Burns Harbor	WDC6027	13	0	0	13	31	36	0	0	0	0	0	0	93
Cafer Dede	V7PR8	0	0	0	0	0	0	0	0	0	0	0	0	0
California Voyager	WDE5381	12	30	32	18	7	6	0	0	0	0	0	0	105
Calumet	WDE3568	32	2	0	0	3	20	0	0	0	0	0	0	57
Camai	KF003	0	0	0	0	0	0	0	0	0	0	0	0	0
Capricorn Voyager	C6UZ5	2	4	33	10	54	67	0	0	0	0	0	0	170
Capt. Henry Jackman	VCTV	0	62	50	20	7	12	0	0	0	0	0	0	151
Caribbean Sea	PHNU	0	0	0	0	0	0	0	0	0	0	0	0	0
Carnival Conquest	3FPQ9	13	25	49	29	7	27	0	0	0	0	0	0	150
Carnival Destiny	C6FN4	148	33	51	35	20	16	0	0	0	0	0	0	303
Carnival Dream	3ETA7	1	56	37	26	1	66	0	0	0	0	0	0	187
Carnival Ecstasy	H3GR	8	5	6	8	5	5	0	0	0	0	0	0	37
Carnival Elation	3FOC5	9	13	0	16	27	29	0	0	0	0	0	0	94
Carnival Fantasy	H3GS	54	28	11	17	16	29	0	0	0	0	0	0	155
Carnival Fascination	C6FM9	15	8	28	7	44	39	0	0	0	0	0	0	141
Carnival Freedom	3EBL5	27	18	17	17	23	1	0	0	0	0	0	0	103
Carnival Glory	3FPS9	29	33	43	26	19	20	0	0	0	0	0	0	170
Carnival Imagination	C6FN2	49	42	39	0	41	44	0	0	0	0	0	0	215
Carnival Inspiration	C6FM5	28	4	15	42	34	15	0	0	0	0	0	0	138
Carnival Legend	H3VT	10	3	22	32	13	14	0	0	0	0	0	0	94
Carnival Liberty	HPYE	96	5	11	32	22	99	0	0	0	0	0	0	265
Carnival Magic	3ETA8	56	11	26	96	96	75	0	0	0	0	0	0	360
Carnival Miracle	H3VS	17	21	17	14	15	41	0	0	0	0	0	0	125
Carnival Paradise	3FOB5	0	4	3	39	37	19	0	0	0	0	0	0	102
Carnival Pride	H3VU	23	34	25	23	89	58	0	0	0	0	0	0	252
Carnival Sensation	C6FM8	31	21	14	20	34	37	0	0	0	0	0	0	157

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Carnival Spirit	3FPR9	26	50	41	35	27	24	0	0	0	0	0	0	203
Carnival Splendor	3EUS	37	27	21	96	142	45	0	0	0	0	0	0	368
Carnival Triumph	C6FN5	9	20	2	6	39	87	0	0	0	0	0	0	163
Carnival Valor	H3VR	25	40	55	16	25	11	0	0	0	0	0	0	172
Carnival Victory	3FLL8	17	0	11	29	6	4	0	0	0	0	0	0	67
Caroline Maersk	OZWA2	9	32	0	15	40	1	0	0	0	0	0	0	97
Cason J. Callaway	WE4879	35	0	1	83	98	27	0	0	0	0	0	0	244
Castor Voyager	C6UZ6	4	23	41	10	23	39	0	0	0	0	0	0	140
Celebrity Century	9HJ19	116	31	0	0	57	115	0	0	0	0	0	0	319
Celebrity Constellation	9HJB9	245	159	352	481	446	365	0	0	0	0	0	0	2048
Celebrity Eclipse	9HXC9	585	520	587	587	507	399	0	0	0	0	0	0	3185
Celebrity Equinox	9HXD9	409	462	485	342	259	162	0	0	0	0	0	0	2119
Celebrity Infinity	9HJD9	68	334	323	308	172	192	0	0	0	0	0	0	1397
Celebrity Mercury	9HJG9	0	0	0	0	0	0	0	0	0	0	0	0	0
Celebrity Millennium	9HJF9	148	160	107	8	76	109	0	0	0	0	0	0	608
Celebrity Silhouette	9HA2583	311	165	136	197	131	180	0	0	0	0	0	0	1120
Celebrity Solstice	9HRJ9	270	384	413	415	289	180	0	0	0	0	0	0	1951
Celebrity Summit	9HJC9	37	88	90	77	74	71	0	0	0	0	0	0	437
Centurion	WBN3022	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamai	WDF9872	0	0	0	1	4	0	0	0	0	0	0	0	5
Charles Island	C6JT	15	2	13	12	27	26	0	0	0	0	0	0	95
Charleston Express	WDD6126	119	16	91	113	126	136	0	0	0	0	0	0	601
Chemical Pioneer	KAFO	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenega	WDC3997	0	0	0	1	0	0	0	0	0	0	0	0	1
Clementine Maersk	OUQK2	0	0	0	0	0	0	0	0	0	0	0	0	0
CMB Biwa	ONED	0	0	0	0	0	0	0	0	0	0	0	0	0
Commitment	WDE3894	0	0	0	0	0	0	0	0	0	0	0	0	0
Copenhagen Express	ZCDP2	0	0	0	0	0	0	0	0	0	0	0	0	0

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Corwith Cramer	WTF3319	0	0	0	0	4	9	0	0	0	0	0	0	13
Costa Allegra	ICRA	197	151	1	0	0	0	0	0	0	0	0	0	349
Costa Atlantica	IBLQ	0	0	10	48	0	0	0	0	0	0	0	0	58
Costa Fortuna	IBNY	0	0	0	0	0	0	0	0	0	0	0	0	0
Costa Luminosa	ICGU	547	397	372	148	172	61	0	0	0	0	0	0	1697
Costa Marina	IBNC	0	0	0	0	0	0	0	0	0	0	0	0	0
Costa Mediterranea	IBCF	0	0	0	23	26	62	0	0	0	0	0	0	111
Costa Neoromantica	IBCR	0	0	0	0	0	0	0	0	0	0	0	0	0
Courage	WDC6907	16	3	0	9	2	3	0	0	0	0	0	0	33
Courage	WDE3893	0	0	0	0	0	0	0	0	0	0	0	0	0
Crystal Marine	9VIC4	0	13	0	0	1	0	0	0	0	0	0	0	14
Darya Shanthi	VRXB2	0	0	0	7	5	62	0	0	0	0	0	0	74
Deepwater Millennium	V7HD2	34	10	5	0	0	7	0	0	0	0	0	0	56
Defender	WBN3016	26	24	29	30	15	20	0	0	0	0	0	0	144
Delaware II	KNBD	79	138	69	22	130	4	0	0	0	0	0	0	442
Delaware II (AWS)	NWS0012	0	327	357	0	221	120	0	0	0	0	0	0	1025
Deliverance	WDE2632	3	3	0	2	6	3	0	0	0	0	0	0	17
Dependable	V7DI6	0	0	51	0	1	0	0	0	0	0	0	0	52
Diane H	WUR7250	0	0	0	0	0	32	0	0	0	0	0	0	32
Discoverer Clear Leader	V7MO2	101	94	80	79	67	59	0	0	0	0	0	0	480
Discoverer Deep Seas	V7HC6	46	128	153	132	118	134	0	0	0	0	0	0	711
Discoverer Enterprise	V7HD3	0	20	15	21	14	12	0	0	0	0	0	0	82
Discoverer Inspiration	V7MO3	11	6	2	0	13	13	0	0	0	0	0	0	45
Discoverer Spirit	V7HC8	0	20	12	58	53	68	0	0	0	0	0	0	211
Disney Dream	C6YR6	0	46	36	4	2	1	0	0	0	0	0	0	89
Disney Fantasy	C6ZL6	0	0	0	27	45	12	0	0	0	0	0	0	84
Disney Magic	C6PT7	0	16	11	39	26	3	0	0	0	0	0	0	95
Disney Wonder	C6QM8	18	101	119	16	10	64	0	0	0	0	0	0	328
Dominator	WBZ4106	0	25	32	0	0	0	0	0	0	0	0	0	57

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Drew Foss	WYL5718	0	1	8	0	0	0	0	0	0	0	0	0	9
Duncan Island	C6JS	65	55	38	60	54	52	0	0	0	0	0	0	324
Eagle Tacoma	S6NK2	0	0	4	7	2	1	0	0	0	0	0	0	14
Eagle Toledo	S6NK3	0	0	0	0	0	0	0	0	0	0	0	0	0
Eagle Trenton	S6NK4	0	0	0	45	96	48	0	0	0	0	0	0	189
Ecem Kalkavan	V7JT6	0	0	0	0	0	0	0	0	0	0	0	0	0
Edgar B. Speer	WQZ9670	23	0	26	105	58	70	0	0	0	0	0	0	282
Edwin H. Goff	WXQ4511	3	0	1	18	93	85	0	0	0	0	0	0	200
El Morro	KCGH	38	29	18	15	25	8	0	0	0	0	0	0	133
El Yunque	WGJT	30	21	21	70	78	51	0	0	0	0	0	0	271
Elversele	ONCT	34	42	35	33	0	0	0	0	0	0	0	0	144
Empire State	KKFW	0	0	0	0	116	125	0	0	0	0	0	0	241
Enchantment Of The Seas	C6FZ7	12	23	15	1	18	15	0	0	0	0	0	0	84
Endeavor (AWS)	WCE5063	685	690	720	708	744	718	0	0	0	0	0	0	4265
Endurance	WDE9586	73	69	51	51	10	1	0	0	0	0	0	0	255
Endurance	WDF7523	18	10	14	5	28	43	0	0	0	0	0	0	118
Ensign	WBN3012	1	15	12	28	0	0	0	0	0	0	0	0	56
Eot Spar	WDE9193	54	39	29	26	18	24	0	0	0	0	0	0	190
Erkan K	V7ND9	0	1	0	0	0	0	0	0	0	0	0	0	1
Ernest N	A8PG6	14	0	5	13	42	37	0	0	0	0	0	0	111
Eships Dana	ZDJT6	0	0	0	0	0	0	0	0	0	0	0	0	0
Eskden	DYLD	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurodam	PHOS	201	263	322	258	150	60	0	0	0	0	0	0	1254
Eurus Lima	A8MH9	0	0	0	12	16	3	0	0	0	0	0	0	31
Eurus Lisbon	A8MI2	0	0	0	5	17	15	0	0	0	0	0	0	37
Eurus London	A8MH7	10	8	11	50	17	23	0	0	0	0	0	0	119
Ever Dainty	9V7951	11	3	3	3	14	17	0	0	0	0	0	0	51
Ever Decent	9V7952	0	0	1	19	16	4	0	0	0	0	0	0	40

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Ever Develop	3FLF8	0	0	0	0	0	0	0	0	0	0	0	0	0
Ever Devote	9V7954	0	0	8	3	7	4	0	0	0	0	0	0	22
Ever Diadem	9V7955	27	13	20	51	68	31	0	0	0	0	0	0	210
Ever Diamond	3FQS8	93	85	127	283	510	268	0	0	0	0	0	0	1366
Ever Divine	9V7956	0	0	0	0	32	28	0	0	0	0	0	0	60
Ever Ethic	VQFS4	0	11	8	13	19	11	0	0	0	0	0	0	62
Ever Excel	VSVV3	0	0	0	42	46	26	0	0	0	0	0	0	114
Ever Radiant	3FFR4	8	4	6	1	6	0	0	0	0	0	0	0	25
Ever Reach	3FQO4	5	6	15	5	12	5	0	0	0	0	0	0	48
Ever Refine	3FSB4	67	6	17	0	16	0	0	0	0	0	0	0	106
Ever Result	3FSA4	5	0	4	0	0	0	0	0	0	0	0	0	9
Ever Reward	3FYB3	53	154	168	391	587	582	0	0	0	0	0	0	1935
Ever Safety	3EMQ4	15	38	24	26	0	0	0	0	0	0	0	0	103
Ever Salute	3ENU5	0	0	0	0	0	0	0	0	0	0	0	0	0
Ever Shine	MUKZ4	39	33	30	0	44	4	0	0	0	0	0	0	150
Ever Steady	3EHT6	0	0	0	0	0	0	0	0	0	0	0	0	0
Ever Summit	3EKU3	5	3	0	0	0	25	0	0	0	0	0	0	33
Ever Ulysses	9V7962	3	0	0	0	0	0	0	0	0	0	0	0	3
Ever Unific	9V7961	0	0	0	0	0	0	0	0	0	0	0	0	0
Ever Uranus	3FCA9	10	0	0	0	12	0	0	0	0	0	0	0	22
Ever Urban	3FXN9	0	0	9	0	0	0	0	0	0	0	0	0	9
Ever Useful	3FCC9	30	8	0	0	0	0	0	0	0	0	0	0	38
Everest Spirit	C6FY8	85	44	95	72	45	49	0	0	0	0	0	0	390
Evergreen State	WDE4430	1	0	4	18	0	1	0	0	0	0	0	0	24
Excalibur	ONCE	39	69	63	44	75	62	0	0	0	0	0	0	352
Excel	ONAI	85	51	84	46	75	102	0	0	0	0	0	0	443
Excelerate	ONDY	66	51	38	0	56	63	0	0	0	0	0	0	274
Expedient	ONFY	0	0	0	0	1	41	0	0	0	0	0	0	42
Explorer	ONFE	97	89	72	58	75	54	0	0	0	0	0	0	445

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Explorer	WBN7618	0	0	3	1	1	18	0	0	0	0	0	0	23
Explorer Of The Seas	C6SE4	13	0	0	1	13	15	0	0	0	0	0	0	42
Fairchem Bronco	V7MC8	77	57	62	31	0	0	0	0	0	0	0	0	227
Fairchem Friesian	V7PU7	0	0	0	1	0	0	0	0	0	0	0	0	1
Fairchem Mustang	HPOW	8	0	0	0	0	0	0	0	0	0	0	0	8
Fairchem Stallion	H3WD	59	26	21	0	0	0	0	0	0	0	0	0	106
Fairweather	WDB5604	0	0	0	0	4	17	0	0	0	0	0	0	21
Fairweather (AWS)	WTEB	0	0	0	346	0	190	0	0	0	0	0	0	536
Federal Asahi	VRWG3	40	0	0	0	0	0	0	0	0	0	0	0	40
Federal Mackinac	V7RI8	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Saguenay	8PNQ	30	0	0	0	0	0	0	0	0	0	0	0	30
Federal Schelde	8POF	0	0	0	0	0	9	0	0	0	0	0	0	9
Federal Venture	VRXL7	64	28	10	14	9	9	0	0	0	0	0	0	134
Florida Voyager	WDF4764	20	10	22	15	18	8	0	0	0	0	0	0	93
Freedom	WDB5483	35	39	13	14	18	47	0	0	0	0	0	0	166
Freedom Of The Seas	C6UZ7	82	31	17	1	10	19	0	0	0	0	0	0	160
Freja Dania	A8LC2	16	3	14	10	43	18	0	0	0	0	0	0	104
Fritzi N	A8PQ4	0	0	0	1	0	0	0	0	0	0	0	0	1
Front Kathrine	V7GX2	0	0	0	0	0	0	0	0	0	0	0	0	0
Furth	V7MP5	0	0	0	0	0	0	0	0	0	0	0	0	0
G. L. Ostrander	WCV7620	0	1	1	30	41	94	0	0	0	0	0	0	167
Garden City River	S6AJ8	19	18	9	8	0	16	0	0	0	0	0	0	70
Gauntlet	WBN6511	0	0	0	0	0	1	0	0	0	0	0	0	1
Gemini Voyager	C6FE5	43	31	34	54	33	28	0	0	0	0	0	0	223
Genco Augustus	VRDD2	0	0	0	0	0	0	0	0	0	0	0	0	0
Genco Claudius	V7SY6	62	85	85	62	57	46	0	0	0	0	0	0	397
Genco Constantine	VRDR8	0	8	45	59	43	48	0	0	0	0	0	0	203
Genco Hadrian	V7QN8	42	40	29	14	15	12	0	0	0	0	0	0	152

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Genco Raptor	V7NB8	0	0	0	0	0	0	0	0	0	0	0	0	0
Genco Thunder	V7LZ4	29	24	29	17	17	5	0	0	0	0	0	0	121
Genco Tiberius	VRDD3	0	0	0	0	0	0	0	0	0	0	0	0	0
Genco Titus	VRDI7	34	4	0	0	0	0	0	0	0	0	0	0	38
General Rudder	WTAU	0	0	0	0	14	12	0	0	0	0	0	0	26
Genoa Express	ZCDJ7	0	0	0	27	30	19	0	0	0	0	0	0	76
George N	A8PQ5	2	3	2	10	30	14	0	0	0	0	0	0	61
Geysir	WCZ5528	0	0	0	0	0	0	0	0	0	0	0	0	0
Glen Canyon Bridge	3EFD9	0	0	0	0	0	15	0	0	0	0	0	0	15
Global Spirit	ELTL3	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Bear	NMRY	0	0	0	0	52	55	0	0	0	0	0	0	107
Golden State	WHDV	3	10	17	6	6	0	0	0	0	0	0	0	42
Gordon Gunter (Aws)	NWS0014	0	0	0	0	0	0	0	0	0	0	0	0	0
Gordon Gunter (Aws)	WTEO	0	0	141	582	582	407	0	0	0	0	0	0	1712
Grandeur Of The Seas	C6SE3	54	43	68	31	0	16	0	0	0	0	0	0	212
Great Republic	WDF7994	107	0	19	64	46	14	0	0	0	0	0	0	250
Green Bay	WDD9433	23	34	62	17	10	5	0	0	0	0	0	0	151
Green Dale	WCZ5238	31	11	47	14	23	17	0	0	0	0	0	0	143
Green Lake	WDDI	0	61	44	0	0	5	0	0	0	0	0	0	110
Green Ridge	WZZF	15	12	23	20	25	18	0	0	0	0	0	0	113
Gretchen H	WDC9138	4	10	24	35	41	14	0	0	0	0	0	0	128
Gsf Development Driller I	YJSW5	12	21	0	1	0	0	0	0	0	0	0	0	34
Gsf Grand Banks	YJUF7	0	55	188	218	209	177	0	0	0	0	0	0	847
Guardian	WBO2511	21	17	12	27	2	0	0	0	0	0	0	0	79
Gulf Reliance	WDD2703	0	0	0	0	0	0	0	0	0	0	0	0	0
Gulf Titan	WDA5598	11	4	11	1	8	3	0	0	0	0	0	0	38
H A Sklenar	C6CL6	25	110	16	156	66	99	0	0	0	0	0	0	472
H. Lee White	WZD2465	13	0	0	4	27	17	0	0	0	0	0	0	61
Hazel Lorraine	WYR7722	0	0	3	0	0	0	0	0	0	0	0	0	3

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Henry B. Bigelow (AWS)	WTDF	0	0	0	7	99	498	0	0	0	0	0	0	604
Henry Goodrich	YJQN7	0	0	0	8	97	183	0	0	0	0	0	0	288
Herbert C. Jackson	WL3972	18	0	11	35	24	15	0	0	0	0	0	0	103
Hi'ilakai (AWS)	WTEY	0	3	445	658	437	159	0	0	0	0	0	0	1702
Hon. James L. Oberstar	WL3108	53	0	29	156	52	56	0	0	0	0	0	0	346
Honor	WDC6923	43	19	15	17	28	29	0	0	0	0	0	0	151
Hood Island	C6LU4	36	47	55	32	0	0	0	0	0	0	0	0	170
Horizon Anchorage	KGTX	106	116	97	62	149	140	0	0	0	0	0	0	670
Horizon Challenger	WZJC	110	40	50	79	77	66	0	0	0	0	0	0	422
Horizon Consumer	WCHF	0	13	53	15	0	0	0	0	0	0	0	0	81
Horizon Discovery	WZJD	16	29	9	50	69	43	0	0	0	0	0	0	216
Horizon Eagle	WDD6039	0	0	0	0	0	0	0	0	0	0	0	0	0
Horizon Enterprise	KRGB	58	32	37	39	34	35	0	0	0	0	0	0	235
Horizon Falcon	WDD6040	0	0	0	0	0	0	0	0	0	0	0	0	0
Horizon Hawk	WDD6033	0	0	0	0	0	0	0	0	0	0	0	0	0
Horizon Hunter	WDD6038	0	0	0	0	0	0	0	0	0	0	0	0	0
Horizon Kodiak	KGIZ	27	29	56	46	48	42	0	0	0	0	0	0	248
Horizon Navigator	WPGK	150	154	143	138	115	203	0	0	0	0	0	0	903
Horizon Pacific	WSRL	71	62	18	11	48	45	0	0	0	0	0	0	255
Horizon Producer	WBJ	158	0	0	196	174	191	0	0	0	0	0	0	719
Horizon Reliance	WFLH	80	79	70	61	73	81	0	0	0	0	0	0	444
Horizon Spirit	WFLG	82	84	79	79	81	68	0	0	0	0	0	0	473
Horizon Tacoma	KGTY	33	26	30	23	39	37	0	0	0	0	0	0	188
Horizon Tiger	WDD6042	0	0	0	0	0	0	0	0	0	0	0	0	0
Horizon Trader	KIRH	80	54	64	53	32	0	0	0	0	0	0	0	283
Hosanger	9VAW8	100	137	114	115	87	25	0	0	0	0	0	0	578
Houston	KCDK	7	9	2	11	17	35	0	0	0	0	0	0	81
Hugo N	A8TD2	0	0	0	0	0	0	0	0	0	0	0	0	0

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Hunter	WBN3744	0	0	0	16	38	75	0	0	0	0	0	0	129
Incentive	WCW9879	13	4	4	1	0	0	0	0	0	0	0	0	22
Independence II	WGAX	72	122	105	88	57	51	0	0	0	0	0	0	495
Independence Of The Seas	C6WW4	24	26	28	14	7	9	0	0	0	0	0	0	108
Indian Ocean	C6T2063	0	0	0	0	0	0	0	0	0	0	0	0	0
Indiana Harbor	WXN3191	13	0	0	0	0	30	0	0	0	0	0	0	43
Integrity	WDC6925	28	57	46	11	27	47	0	0	0	0	0	0	216
Integrity	WDD7905	0	0	0	0	80	74	0	0	0	0	0	0	154
Invader	WBO3337	5	11	0	0	0	0	0	0	0	0	0	0	16
Island Champion	WCZ7046	0	0	11	6	0	0	0	0	0	0	0	0	17
Island Scout	WDC6588	0	12	0	0	12	14	0	0	0	0	0	0	38
James L. Kuber	WDF7020	170	0	13	215	19	91	0	0	0	0	0	0	508
James R. Barker	WYP8657	40	0	18	81	250	271	0	0	0	0	0	0	660
Jean Anne	WDC3786	27	59	95	104	31	16	0	0	0	0	0	0	332
Jenny N	A8PQ7	8	11	12	13	39	23	0	0	0	0	0	0	106
Jewel Of The Seas	C6FW9	0	0	0	0	0	0	0	0	0	0	0	0	0
John G. Munson	WE3806	43	0	2	95	119	148	0	0	0	0	0	0	407
John J. Boland	WZE4539	0	0	0	11	16	1	0	0	0	0	0	0	28
Joides Resolution	D5BC	0	0	0	0	0	0	0	0	0	0	0	0	0
Joseph L. Block	WXY6216	238	0	121	342	0	672	0	0	0	0	0	0	1373
Justine Foss	WYL4978	0	0	0	0	0	0	0	0	0	0	0	0	0
Ka'imimoana (Aws)	WTEU	146	641	509	501	512	386	0	0	0	0	0	0	2695
Karen Andrie	WBS5272	37	0	40	134	103	320	0	0	0	0	0	0	634
Karoline N	A8PQ8	0	3	0	2	0	0	0	0	0	0	0	0	5
Kasif Kalkavan	V7IX7	0	15	0	0	0	0	0	0	0	0	0	0	15
Katrina Em	WTK2245	0	4	26	4	5	9	0	0	0	0	0	0	48
Kaveri Spirit	C6WK2	18	21	25	16	26	24	0	0	0	0	0	0	130
Kaye E. Barker	WCF3012	66	0	0	0	0	0	0	0	0	0	0	0	66
Kennicott	WCY2920	25	5	0	41	25	23	0	0	0	0	0	0	119

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Keswick	C6XE5	3	0	0	0	0	0	0	0	0	0	0	0	3
Kilo Moana	WDA7827	11	1	35	67	70	18	0	0	0	0	0	0	202
Kiyi	KAO107	0	0	0	0	0	18	0	0	0	0	0	0	18
Knorr	KCEJ	0	132	742	684	732	719	0	0	0	0	0	0	3009
Knorr (AWS)	NWS0029	558	303	0	0	0	0	0	0	0	0	0	0	861
Kodiak	KQXZ	0	2	18	9	12	18	0	0	0	0	0	0	59
Kota Halus	9V8258	0	0	0	0	0	0	0	0	0	0	0	0	0
Kota Harum	9VFF8	0	0	0	0	0	0	0	0	0	0	0	0	0
Kota Jati	VRWJ7	55	85	70	30	52	58	0	0	0	0	0	0	350
Kota Jaya	VRWM2	10	14	20	12	2	0	0	0	0	0	0	0	58
Lahore Express	VRBY8	0	0	0	0	0	0	0	0	0	0	0	0	0
Lauren Foss	WDB3834	0	1	39	78	83	0	0	0	0	0	0	0	201
Laurence M. Gould (AWS)	WCX7445	651	621	648	647	674	598	0	0	0	0	0	0	3839
Lavender Passage	3FIY6	0	0	0	0	0	5	0	0	0	0	0	0	5
Lee A. Tregurtha	WUR8857	0	0	5	17	12	3	0	0	0	0	0	0	37
Legacy	WDF7311	0	0	0	0	0	0	0	0	0	0	0	0	0
Legend	WDF9316	0	0	0	60	21	0	0	0	0	0	0	0	81
Leslie Lee	WYC7933	4	1	3	0	0	0	0	0	0	0	0	0	8
Liberty Eagle	WHIA	56	46	10	7	31	68	0	0	0	0	0	0	218
Liberty Glory	WADP	6	4	22	0	0	28	0	0	0	0	0	0	60
Liberty Grace	WADN	4	11	0	40	63	23	0	0	0	0	0	0	141
Liberty Of The Seas	C6VG8	4	2	2	16	0	0	0	0	0	0	0	0	24
Liberty Pride	KRAU	11	59	52	28	40	34	0	0	0	0	0	0	224
Liberty Spirit	WCPU	13	21	4	0	0	0	0	0	0	0	0	0	38
Liberty Sun	WCOB	14	20	13	84	0	31	0	0	0	0	0	0	162
Lion City River	9VJC5	0	0	0	0	0	0	0	0	0	0	0	0	0
Livorno Express	ZCDV9	13	63	45	38	19	22	0	0	0	0	0	0	200
ING Abuja	C6W2032	27	49	71	120	4	0	0	0	0	0	0	0	271

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Lng Edo	C6W2033	0	0	0	0	0	0	0	0	0	0	0	0	0
Lng Gemini	V7BW9	56	52	83	45	44	54	0	0	0	0	0	0	334
Lng Jupiter	C6XQ5	0	68	11	2	12	14	0	0	0	0	0	0	107
Lng Leo	V7BX2	0	27	43	66	12	14	0	0	0	0	0	0	162
Lois H	WTD4576	0	0	0	2	5	0	0	0	0	0	0	0	7
Lowlands Brilliance	9HA3015	17	0	0	0	0	0	0	0	0	0	0	0	17
Lowlands Orchid	ONFP	31	10	23	36	39	54	0	0	0	0	0	0	193
Lyla	V7QK3	28	12	18	30	113	100	0	0	0	0	0	0	301
Maasdam	PYRO	204	237	283	212	176	206	0	0	0	0	0	0	1318
Madrid Spirit	ECFM	16	0	0	0	0	0	0	0	0	0	0	0	16
Maersk Carolina	WBDS	35	16	12	3	3	20	0	0	0	0	0	0	89
Maersk Drummond	A8JF3	5	0	26	0	0	0	0	0	0	0	0	0	31
Maersk Georgia	WAHP	45	34	14	78	75	35	0	0	0	0	0	0	281
Maersk Idaho	WKPM	5	53	25	32	22	60	0	0	0	0	0	0	197
Maersk Illinois	WMLI	0	0	13	4	2	0	0	0	0	0	0	0	19
Maersk Iowa	KABL	57	73	49	57	70	59	0	0	0	0	0	0	365
Maersk Jaun	HBDD	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Jurong	3ERO6	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Kentucky	WKPY	46	30	26	45	32	60	0	0	0	0	0	0	239
Maersk Merritt	VRCH6	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Missouri	WAHV	86	65	15	19	14	13	0	0	0	0	0	0	212
Maersk Montana	WCDP	63	54	63	24	33	9	0	0	0	0	0	0	246
Maersk Ohio	KABP	99	82	58	65	103	53	0	0	0	0	0	0	460
Maersk Peary	WHKM	68	70	43	27	36	44	0	0	0	0	0	0	288
Maersk Tangier	A8NH3	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Tennessee	WMFW	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Texas	KRPW	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Utah	WKAB	83	77	94	85	45	68	0	0	0	0	0	0	452
Maersk Virginia	WAHK	0	6	59	71	13	24	0	0	0	0	0	0	173

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Maersk Visby	9V8827	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Wakayama	3FCC4	0	19	17	10	12	5	0	0	0	0	0	0	63
Maersk Westport	VRFO4	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Wind	S6TY	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Winnipeg	VRG17	0	0	0	0	0	0	0	0	0	0	0	0	0
Maersk Wisconsin	WKPN	53	18	24	13	22	50	0	0	0	0	0	0	180
Maersk Wyoming	WKPF	48	20	38	50	132	77	0	0	0	0	0	0	365
Mahimahi	WHRN	28	20	44	14	20	13	0	0	0	0	0	0	139
Maia H	WYX2079	0	0	0	55	23	2	0	0	0	0	0	0	80
Majesty Of The Seas	C6FZ8	0	0	14	31	26	23	0	0	0	0	0	0	94
Major Bernard F. Fisher	KBGK	0	0	0	0	20	56	0	0	0	0	0	0	76
Malolo	WYH6327	0	0	0	0	0	0	0	0	0	0	0	0	0
Manfred Nystrom	WCN3590	0	0	0	0	0	0	0	0	0	0	0	0	0
Manistee	WDB6831	41	0	0	44	22	25	0	0	0	0	0	0	132
Manitowoc	WDE3569	109	0	0	232	80	86	0	0	0	0	0	0	507
Manoa	KDBG	0	0	6	27	25	18	0	0	0	0	0	0	76
Manukai	WRGD	53	54	39	16	9	16	0	0	0	0	0	0	187
Manulani	WECH	40	27	23	31	17	14	0	0	0	0	0	0	152
Maple 2	C6TF8	2	49	63	54	68	39	0	0	0	0	0	0	275
Marchen Maersk	OUIY2	1	0	33	6	0	42	0	0	0	0	0	0	82
Marcus G. Langseth (AWS)	WDC6698	274	560	659	670	743	718	0	0	0	0	0	0	3624
Maren Maersk	OUIJ2	0	0	14	6	0	27	0	0	0	0	0	0	47
Margrethe Maersk	OZBY2	33	0	0	13	0	0	0	0	0	0	0	0	46
Maria A. Angelicoussis	C6FP2	0	0	0	0	0	0	0	0	0	0	0	0	0
Marine Express	3FHX2	10	18	12	8	19	12	0	0	0	0	0	0	79
Mariner Of The Seas	C6FV9	22	16	5	7	0	0	0	0	0	0	0	0	50
Marit Maersk	OUIJ2	54	25	0	8	39	0	0	0	0	0	0	0	126
Mary Ann Hudson	KSDF	80	7	28	33	56	75	0	0	0	0	0	0	279

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Matanuska	WN4201	0	0	0	0	0	2	0	0	0	0	0	0	2
Mathilde Maersk Skagen	OJJS2	42	0	0	0	28	0	0	0	0	0	0	0	70
Maui	WSLH	48	51	47	47	50	42	0	0	0	0	0	0	285
Maunalei	KFMV	34	4	19	20	27	54	0	0	0	0	0	0	158
Maunawili	WGBE	38	15	9	3	47	24	0	0	0	0	0	0	136
Mein Schiff	9HJH9	0	0	0	0	0	0	0	0	0	0	0	0	0
Melville	WECB	368	665	743	705	652	581	0	0	0	0	0	0	3714
Mesabi Miner	WYQ4356	33	0	22	38	49	47	0	0	0	0	0	0	189
Messologi	3EIM6	0	0	0	0	0	0	0	0	0	0	0	0	0
Midnight Sun	WAHG	64	37	31	67	29	9	0	0	0	0	0	0	237
Mike O'leary	WDC3665	0	0	0	1	0	0	0	0	0	0	0	0	1
Mill House	9VAK9	7	9	17	0	0	0	0	0	0	0	0	0	33
Mill Reef	9VAK8	41	21	0	0	0	0	0	0	0	0	0	0	62
Mindanao	S6SR	52	24	84	54	0	0	0	0	0	0	0	0	214
Mineral Beijing	ONAR	15	12	13	31	53	15	0	0	0	0	0	0	139
Mineral Belgium	VRKF5	11	1	35	37	19	9	0	0	0	0	0	0	112
Mineral Dalian	ONFW	54	48	53	41	15	30	0	0	0	0	0	0	241
Mineral Dragon	ONFN	8	21	0	0	0	0	0	0	0	0	0	0	29
Mineral Ningbo	ONGA	6	59	47	11	2	0	0	0	0	0	0	0	125
Mineral Noble	ONAN	11	33	11	18	42	25	0	0	0	0	0	0	140
Mineral Tianjin	ONBF	4	0	0	2	5	2	0	0	0	0	0	0	13
Miss Roxanne	WCX4992	0	0	0	0	1	0	0	0	0	0	0	0	1
Mokihana	WNRD	0	18	34	41	49	52	0	0	0	0	0	0	194
Mol Experience	3ELI7	0	0	0	0	0	0	0	0	0	0	0	0	0
Monarch Of The Seas	C6FZ9	24	38	83	68	43	27	0	0	0	0	0	0	283
Monitor	WCX9104	2	0	0	28	8	14	0	0	0	0	0	0	52
Montrealais	VDWC	0	0	0	19	28	9	0	0	0	0	0	0	56
Morning Glory Viii	A8AT8	1	0	0	0	27	106	0	0	0	0	0	0	134
Morning Haruka	A8GK7	2	0	0	0	0	0	0	0	0	0	0	0	2

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Msc Poesia	3EPL4	0	0	0	0	0	0	0	0	0	0	0	0	0
Murat K	V7NE2	0	0	0	0	0	0	0	0	0	0	0	0	0
Mustafa Dayi	TCZF2	0	4	25	23	19	6	0	0	0	0	0	0	77
Mv Ocean Giant	WDG4379	0	0	0	0	0	0	0	0	0	0	0	0	0
Nachik	WDE7904	0	0	0	0	0	1	0	0	0	0	0	0	1
Nancy Foster (AWS)	NWS0008	0	0	0	0	0	0	0	0	0	0	0	0	0
Nancy Foster (AWS)	WTER	0	0	118	552	375	299	0	0	0	0	0	0	1344
Nanuq	WCY8498	0	0	0	1	0	0	0	0	0	0	0	0	1
Nathaniel B. Palmer (AWS)	WBP3210	298	199	237	326	170	328	0	0	0	0	0	0	1558
Naval Academy Yp 676	YP 676	0	0	0	0	0	0	0	0	0	0	0	0	0
Naval Academy Yp 686	YP686	0	0	0	0	0	0	0	0	0	0	0	0	0
Naval Academy Yp 696	YP 696	0	0	0	0	0	0	0	0	0	0	0	0	0
Navigator	WBO3345	19	0	4	0	0	0	0	0	0	0	0	0	23
Navigator Of The Seas	C6FU4	46	6	8	1	19	1	0	0	0	0	0	0	81
Neptune Voyager	C6FU7	0	1	7	1	0	34	0	0	0	0	0	0	43
New Delhi Express	VRBK5	0	0	0	0	0	9	0	0	0	0	0	0	9
New Horizon	WKWB	0	0	0	0	172	93	0	0	0	0	0	0	265
Nieuw Amsterdam	PBWQ	60	93	115	90	67	40	0	0	0	0	0	0	465
Noble Ace	2ELO7	0	0	0	0	0	0	0	0	0	0	0	0	0
Noble Globeletter I	A8UD3	0	0	0	7	38	17	0	0	0	0	0	0	62
Noble Star	KRPP	55	49	48	8	11	19	0	0	0	0	0	0	190
Noordam	PHET	199	136	58	151	285	81	0	0	0	0	0	0	910
North Star	KIYI	72	82	57	45	55	135	0	0	0	0	0	0	446
Northern Jupiter	A8TA5	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Victor	WCZ6534	1	0	0	0	0	0	0	0	0	0	0	0	1
Northwest Swan	ZCDJ9	67	39	58	51	30	18	0	0	0	0	0	0	263
Norwegian Dawn	C6FT7	123	226	201	332	551	438	0	0	0	0	0	0	1871
Norwegian Epic	C6XP7	33	17	42	34	13	27	0	0	0	0	0	0	166

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Norwegian Gem	C6VG8	291	133	88	96	108	69	0	0	0	0	0	0	785
Norwegian Jade	C6WK7	216	211	240	213	269	234	0	0	0	0	0	0	1383
Norwegian Jewel	C6TX6	16	232	331	92	85	58	0	0	0	0	0	0	814
Norwegian Pearl	C6VG7	527	478	593	632	560	521	0	0	0	0	0	0	3311
Norwegian Sky	C6PZ8	163	233	254	235	159	134	0	0	0	0	0	0	1178
Norwegian Spirit	C6TQ6	215	274	231	204	104	37	0	0	0	0	0	0	1065
Norwegian Star	C6FR3	29	30	19	57	103	91	0	0	0	0	0	0	329
Norwegian Sun	C6RN3	53	6	53	138	33	7	0	0	0	0	0	0	290
Nyk Delphinus	3ENU7	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyk Demeter	3ENV5	12	13	10	20	25	11	0	0	0	0	0	0	91
Nyk Diana	3EOS4	63	22	53	52	25	34	0	0	0	0	0	0	249
Nyk Futago	9V8739	15	5	40	32	40	0	0	0	0	0	0	0	132
Nyk Libra	HOJY	0	0	0	0	4	31	0	0	0	0	0	0	35
Nyk Rosa	3FJM9	0	0	0	0	0	7	0	0	0	0	0	0	7
Nyk Rumina	9V7645	66	47	27	0	9	28	0	0	0	0	0	0	177
Nyk Triton	3FUL2	22	4	0	1	31	62	0	0	0	0	0	0	120
Oasis Of The Seas	C6XS7	0	53	61	55	68	62	0	0	0	0	0	0	299
Ocean Atlas	WDHL	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocean Clipper	V7DZ8	0	0	38	8	58	36	0	0	0	0	0	0	140
Ocean Crescent	WDF4929	0	11	0	17	17	0	0	0	0	0	0	0	45
Ocean Freedom	WDF9323	66	47	45	84	47	37	0	0	0	0	0	0	326
Ocean Harvester	WBO5471	0	0	0	1	6	1	0	0	0	0	0	0	8
Ocean Hope 3	WDF2354	14	0	20	5	0	0	0	0	0	0	0	0	39
Ocean Mariner	WCF3990	0	0	0	0	33	33	0	0	0	0	0	0	66
Ocean President	VRAD4	1	0	2	0	0	0	0	0	0	0	0	0	3
Ocean Reliance	WADY	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocean Titan	WDB9647	15	1	3	0	0	0	0	0	0	0	0	0	19
Okeanos Explorer (Aws)	NWS0016	0	0	0	0	0	0	0	0	0	0	0	0	0
Okeanos Explorer (Aws)	WTDH	0	268	531	531	495	306	0	0	0	0	0	0	2131

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Oleander	V7SX3	2	10	27	24	28	0	0	0	0	0	0	0	91
Olive L. Moore	WDF7019	42	0	0	29	137	146	0	0	0	0	0	0	354
OOCL America	VRWE8	63	0	0	37	58	54	0	0	0	0	0	0	212
OOCL Busan	VRDN3	12	6	8	0	0	10	0	0	0	0	0	0	36
OOCL Nagoya	VRFX8	1	17	11	9	7	53	0	0	0	0	0	0	98
OOCL Norfolk	VREX4	17	25	6	0	0	0	0	0	0	0	0	0	48
Oosterdam	PBKH	3	40	61	54	68	30	0	0	0	0	0	0	256
Optimiana	9VAR2	53	190	2	7	112	126	0	0	0	0	0	0	490
Orange Sky	ELZU2	0	4	18	8	0	0	0	0	0	0	0	0	30
Orange Star	A8WP6	5	11	5	0	0	0	0	0	0	0	0	0	21
Orange Sun	A8HY8	17	0	25	6	1	7	0	0	0	0	0	0	56
Oregon II (AWS)	WTD0	73	414	100	0	88	465	0	0	0	0	0	0	1140
Oregon Voyager	WDF2960	29	2	10	10	5	2	0	0	0	0	0	0	58
Oriental Queen	VRAC9	13	18	34	30	14	15	0	0	0	0	0	0	124
Orion Voyager	C6MC5	26	15	6	19	35	106	0	0	0	0	0	0	207
Oscar Dyson	WTEP	5	121	118	15	703	610	0	0	0	0	0	0	1572
Oscar Dyson (AWS)	NWS0001	74	541	736	523	39	0	0	0	0	0	0	0	1913
Oscar Elton Sette (AWS)	WTEE	0	0	123	101	57	57	0	0	0	0	0	0	338
Oscar Elton Sette (AWS)	NWS0015	0	0	192	453	306	245	0	0	0	0	0	0	1196
Ouro Do Brasil	ELPP9	23	11	1	0	2	7	0	0	0	0	0	0	44
Overseas Alcesmar	V7HP2	0	0	0	0	0	7	0	0	0	0	0	0	7
Overseas Anacortes	KCHV	34	24	14	52	15	22	0	0	0	0	0	0	161
Overseas Andromar	V7HP4	10	17	1	26	6	36	0	0	0	0	0	0	96
Overseas Ariadmar	V7HP6	10	6	7	7	9	0	0	0	0	0	0	0	39
Overseas Boston	WJBU	58	90	73	43	65	70	0	0	0	0	0	0	399
Overseas Cascade	WOAG	0	0	0	0	0	12	0	0	0	0	0	0	12
Overseas Houston	WWAA	7	0	0	1	4	7	0	0	0	0	0	0	19
Overseas Joyce	V7NV4	79	3	9	23	98	94	0	0	0	0	0	0	306

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Overseas Long Beach	WAAT	41	33	23	29	29	15	0	0	0	0	0	0	170
Overseas Los Angeles	WABS	224	163	101	138	151	174	0	0	0	0	0	0	951
Overseas Luxmar	WDC7070	17	3	2	0	21	19	0	0	0	0	0	0	62
Overseas Maremar	WDC6975	11	5	4	43	39	48	0	0	0	0	0	0	150
Overseas Martinez	WPAJ	0	0	36	7	3	0	0	0	0	0	0	0	46
Overseas Nikiski	WDBH	22	11	8	5	5	5	0	0	0	0	0	0	56
Overseas Rimar	V7HQ3	0	0	0	0	0	0	0	0	0	0	0	0	0
Overseas Tampa	WOTA	4	24	7	10	3	0	0	0	0	0	0	0	48
Overseas Texas City	WHED	0	0	0	0	14	6	0	0	0	0	0	0	20
Pacific Celebes	VRZN9	27	13	7	5	0	0	0	0	0	0	0	0	52
Pacific Flores	VRZN8	64	18	14	0	0	0	0	0	0	0	0	0	96
Pacific Freedom	WDD9283	0	0	0	0	3	6	0	0	0	0	0	0	9
Pacific Java	VRZN7	28	18	13	19	13	0	0	0	0	0	0	0	91
Pacific Makassar	VRZO2	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Mistral	A8WI2	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Santa Ana	A8WI3	33	46	94	65	0	0	0	0	0	0	0	0	238
Pacific Star	WCW7740	3	0	0	1	2	0	0	0	0	0	0	0	6
Pacific Star	WDD3686	0	3	1	0	0	0	0	0	0	0	0	0	4
Pacific Wolf	WDD9286	0	0	1	0	0	0	0	0	0	0	0	0	1
Pandalus	WAV7611	0	0	0	0	0	0	0	0	0	0	0	0	0
Paragon	WDD9285	0	0	0	1	3	2	0	0	0	0	0	0	6
Patriarch	WBN3014	13	9	9	5	0	4	0	0	0	0	0	0	40
Patriot	WQVY	8	0	16	48	32	10	0	0	0	0	0	0	114
Paul Gauguin	C6TH9	39	135	104	118	105	237	0	0	0	0	0	0	738
Paul R. Tregurtha	WYR4481	32	0	24	103	91	68	0	0	0	0	0	0	318
Peace Voyage	VRHO5	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelican State	WDE4433	0	2	0	0	2	0	0	0	0	0	0	0	4
Perseverance	WDE5328	11	10	0	18	0	0	0	0	0	0	0	0	39
Philadelphia Express	WDC6736	326	266	131	127	94	179	0	0	0	0	0	0	1123

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Philip R. Clarke	WE3592	107	0	0	5	41	104	53	0	0	0	0	0	310
Phoenix Alpha	VRZT8	10	0	0	0	0	0	0	0	0	0	0	0	10
Phoenix Beta	VRZT9	68	44	28	2	1	0	0	0	0	0	0	0	143
Phoenix Light	HPHV	15	0	3	0	0	0	0	0	0	0	0	0	18
Phoenix Voyager	C6QE3	8	17	73	58	17	33	0	0	0	0	0	0	206
Phyllis Dunlap	WDA6552	0	0	3	0	0	0	0	0	0	0	0	0	3
Pilot	WBN3011	1	0	0	0	0	0	0	0	0	0	0	0	1
Pisces (Aws)	WTDL	0	0	28	352	244	531	0	0	0	0	0	0	1155
Polar Adventure	WAZV	47	32	42	27	39	13	0	0	0	0	0	0	200
Polar Cloud	WDF5296	0	0	1	0	13	32	0	0	0	0	0	0	46
Polar Discovery	WACW	38	65	79	24	46	79	0	0	0	0	0	0	331
Polar Endeavour	WCAJ	69	19	0	0	0	0	0	0	0	0	0	0	88
Polar Endurance	WDG2085	0	0	0	12	20	12	0	0	0	0	0	0	44
Polar Enterprise	WRTF	107	113	29	68	76	33	0	0	0	0	0	0	426
Polar Ranger	WDC8652	0	0	0	2	0	1	0	0	0	0	0	0	3
Polar Resolution	WDJK	231	361	253	270	252	241	0	0	0	0	0	0	1608
Polar Spirit	C6W16	0	0	0	0	0	0	0	0	0	0	0	0	0
Polar Storm	WDE8347	0	0	0	0	0	0	0	0	0	0	0	0	0
Polar Viking	WDD6494	3	0	0	0	0	0	0	0	0	0	0	0	3
Polar Wind	WDE6058	0	0	0	0	0	0	0	0	0	0	0	0	0
Posidana	9VBM6	201	226	247	162	2	0	0	0	0	0	0	0	838
Premium Do Brasil	A8BL4	0	0	0	0	0	0	0	0	0	0	0	0	0
President Adams	WRYW	30	29	26	43	35	55	0	0	0	0	0	0	218
President Jackson	WRYC	69	68	67	61	65	56	0	0	0	0	0	0	386
President Polk	WRYD	25	33	41	26	27	46	0	0	0	0	0	0	198
President Truman	WNDP	44	45	33	6	46	30	0	0	0	0	0	0	204
Presque Isle	WZE4928	12	0	1	33	23	10	0	0	0	0	0	0	79
Prestige New York	KDUE	1	9	0	11	3	0	0	0	0	0	0	0	24

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Pride Of America	WNBE	22	27	15	34	74	32	0	0	0	0	0	0	204
Pride Of Baltimore II	WUW2120	0	0	0	2	34	3	0	0	0	0	0	0	39
Prinsendam	PBGH	59	45	48	14	142	10	0	0	0	0	0	0	318
Progress Ace	HPQI	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosperous	VR1A3	0	0	1	0	0	0	0	0	0	0	0	0	1
Pt. Barrow	WBM5088	0	0	0	0	0	0	0	0	0	0	0	0	0
Pt. Thompson	WBM5092	0	0	0	0	35	8	0	0	0	0	0	0	43
R. J. Pfeiffer	WRJP	0	0	0	0	37	52	0	0	0	0	0	0	89
R. M. Thorlenson	KGCJ	24	15	22	21	6	3	0	0	0	0	0	0	91
Radiance Of The Seas	C6SE7	63	59	99	57	14	55	0	0	0	0	0	0	347
Rainier	WTEF	0	0	0	0	5	120	0	0	0	0	0	0	125
Rainier (Aws)	NWS0011	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranger	WBN5979	0	0	1	0	10	22	0	0	0	0	0	0	33
Rebecca Lynn	WCW7977	2	0	5	14	13	29	0	0	0	0	0	0	63
Redoubt	WDD2451	0	27	0	9	15	5	0	0	0	0	0	0	56
Regulus Voyager	C6FE6	56	27	53	51	17	44	0	0	0	0	0	0	248
Resolve	WCZ5535	7	26	22	20	27	45	0	0	0	0	0	0	147
Rhapsody Of The Seas	C6UA2	62	51	2	6	20	58	0	0	0	0	0	0	199
Robert C. Seamans	WDA4486	0	0	0	0	0	1	0	0	0	0	0	0	1
Robert Gordon Sproul (Aws)	WSQ2674	0	0	0	247	273	272	0	0	0	0	0	0	792
Robert S. Pierson	CFN4934	1	0	0	0	0	9	0	0	0	0	0	0	10
Roger Blough	WZP8164	146	0	42	315	202	156	0	0	0	0	0	0	861
Roger Revelle	KAOU	743	695	716	708	664	687	0	0	0	0	0	0	4213
Ronald H. Brown (Aws)	NWS0018	0	0	0	0	0	0	0	0	0	0	0	0	0
Ronald H. Brown (Aws)	WTEC	0	0	0	0	0	0	0	0	0	0	0	0	0
Ronald N	A8PQ3	0	12	2	5	14	2	0	0	0	0	0	0	35
Ryndam	PHFV	47	47	19	88	92	44	0	0	0	0	0	0	337
S/R American Progress	KAWM	11	12	19	4	34	35	0	0	0	0	0	0	115
Safmarine Makutu	MRWF2	35	19	17	16	19	25	0	0	0	0	0	0	131
Safmarine Ngami	ONFC	0	0	0	0	0	0	0	0	0	0	0	0	0

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Saga Adventure	VRBL4	0	0	0	0	0	0	0	0	0	0	0	0	0
Saga Andorinha	MYNJ6	0	0	0	0	0	0	0	0	0	0	0	0	0
Saga Monal	VRZQ9	16	7	5	5	27	22	0	0	0	0	0	0	82
Saga Navigator	VRDA4	0	0	0	17	4	1	0	0	0	0	0	0	22
Saga Viking	VRXO6	9	16	26	17	8	24	0	0	0	0	0	0	100
Saipem 7000	C6NO5	0	0	0	0	9	57	0	0	0	0	0	0	66
Sam Laud	WZC7602	0	0	0	0	16	29	0	0	0	0	0	0	45
Samuel De Champlain	WDC8307	10	0	9	20	12	14	0	0	0	0	0	0	65
Sandra Foss	WYL4908	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Monica	MGYB8	17	79	58	74	83	56	0	0	0	0	0	0	367
Saudi Abha	HZRX	65	20	16	0	36	4	0	0	0	0	0	0	141
Saudi Diriyah	HZZB	6	45	6	0	32	31	0	0	0	0	0	0	120
Saudi Hofuf	HZZC	4	4	0	11	19	0	0	0	0	0	0	0	38
Saudi Tabuk	HZZD	0	0	45	46	0	43	0	0	0	0	0	0	134
Sea Breeze	WBN3019	0	0	0	0	0	0	0	0	0	0	0	0	0
Sea Hawk	WDD9287	0	0	2	0	0	0	0	0	0	0	0	0	2
Sea Horse	WBN4382	0	0	1	0	0	0	0	0	0	0	0	0	1
Sea Prince	WYT8569	15	8	0	0	9	10	0	0	0	0	0	0	42
Sea Victory	WCY6777	0	0	0	0	0	0	0	0	0	0	0	0	0
Sea Voyager	WCX9106	38	6	42	23	48	56	0	0	0	0	0	0	213
Sea-Land Champion	WKAU	51	49	8	19	16	20	0	0	0	0	0	0	163
Sea-Land Charger	WDB9948	25	0	11	27	0	43	0	0	0	0	0	0	106
Sea-Land Comet	WDB9950	51	45	16	5	24	50	0	0	0	0	0	0	191
Sea-Land Eagle	WKAE	146	79	127	122	88	44	0	0	0	0	0	0	606
Sea-Land Intrepid	WDB9949	61	27	39	48	48	33	0	0	0	0	0	0	256
Sea-Land Lightning	WDB9986	51	23	40	45	53	53	0	0	0	0	0	0	265
Sea-Land Mercury	WKAW	67	84	89	89	70	57	0	0	0	0	0	0	456
Sea-Land Meteor	WDB9951	4	27	55	26	18	50	0	0	0	0	0	0	180

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Sea-Land Racer	WKAP	87	96	76	43	51	63	0	0	0	0	0	0	416
Seabourn Spirit	C6FR4	37	25	41	31	35	0	0	0	0	0	0	0	169
Seabrooke	WDC4069	0	0	1	0	0	0	0	0	0	0	0	0	1
Seabulk Arctic	WCY7054	23	8	30	32	13	15	0	0	0	0	0	0	121
Seabulk Trader	KNJK	43	15	22	31	38	39	0	0	0	0	0	0	188
Sedef Kalkavan	V7LU5	0	0	0	0	0	0	0	0	0	0	0	0	0
Sena Kalkavan	V7JH2	0	0	0	0	0	0	0	0	0	0	0	0	0
Senang Spirit	C6ME8	0	0	0	0	0	0	0	0	0	0	0	0	0
Seneca	WBN8469	0	0	0	0	0	0	0	0	0	0	0	0	0
Sentinel	WBN6510	24	1	0	0	0	0	0	0	0	0	0	0	25
Sentry	WBN3013	34	18	0	7	35	18	0	0	0	0	0	0	112
Serenade Of The Seas	C6FV8	10	2	5	5	0	0	0	0	0	0	0	0	22
Serenata	3EEE2	7	0	0	0	0	0	0	0	0	0	0	0	7
Sesok	WDE7899	0	0	0	0	0	0	0	0	0	0	0	0	0
Seven Seas Mariner	C6VV8	53	47	26	51	39	44	0	0	0	0	0	0	260
Seven Seas Navigator	ZCDT7	0	14	16	9	10	0	0	0	0	0	0	0	49
Seven Seas Voyager	C6SW3	11	13	16	24	17	4	0	0	0	0	0	0	85
Sheila Mcdevitt	WDE2542	8	15	28	27	0	40	0	0	0	0	0	0	118
Sidney Foss	WYL5445	0	1	1	0	0	0	0	0	0	0	0	0	2
Sierra	WSNB	11	5	2	30	17	10	0	0	0	0	0	0	75
Siku	WCQ6174	0	0	0	0	10	14	0	0	0	0	0	0	24
Silver Lining	HOWS	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver Spray	WDC8162	7	6	5	7	10	0	0	0	0	0	0	0	35
Sinuk	WCQ8110	0	0	0	0	0	0	0	0	0	0	0	0	0
Siranger	9VAH	20	12	22	24	15	50	0	0	0	0	0	0	143
Skagen Maersk	OYOS2	0	0	17	44	27	27	0	0	0	0	0	0	115
Skodsborg	3FXP	0	0	0	0	0	0	0	0	0	0	0	0	0
Sol Do Brasil	ELQQ4	43	23	27	7	9	16	0	0	0	0	0	0	125
Splendour Of The Seas	C6TZ9	288	227	185	202	227	217	0	0	0	0	0	0	1346
St Louis Express	WDD3825	377	290	413	422	335	351	0	0	0	0	0	0	2188

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
St Nicholas	WDB8066	7	4	8	0	1	0	0	0	0	0	0	0	20
St. Clair	WZA4027	0	0	0	0	23	5	0	0	0	0	0	0	28
Stacey Foss	WYL4909	0	0	0	0	0	10	0	0	0	0	0	0	10
Stalwart	WBN6512	0	0	0	0	0	0	0	0	0	0	0	0	0
Star Alabama	LAVU4	0	0	0	0	0	0	0	0	0	0	0	0	0
Star America	LAVV4	0	27	11	0	24	14	0	0	0	0	0	0	76
Star Atlantic	LAYG5	25	14	32	27	29	19	0	0	0	0	0	0	146
Star Derby	LAXS2	3	5	0	0	0	0	0	0	0	0	0	0	8
Star Dieppe	LEQZ3	23	31	26	10	9	0	0	0	0	0	0	0	99
Star Eagle	LAWO2	24	24	17	37	24	33	0	0	0	0	0	0	159
Star Evviva	LAHE2	7	11	12	8	0	13	0	0	0	0	0	0	51
Star Florida	LAVW4	30	15	25	25	17	37	0	0	0	0	0	0	149
Star Fraser	LAVY4	0	0	0	0	0	12	0	0	0	0	0	0	12
Star Fuji	LAVX4	21	6	34	10	23	18	0	0	0	0	0	0	112
Star Gran	LADR4	19	26	0	0	82	27	0	0	0	0	0	0	154
Star Grip	LADQ4	26	14	5	0	0	0	0	0	0	0	0	0	45
Star Hansa	LAXP4	3	15	23	4	22	32	0	0	0	0	0	0	99
Star Harmonia	LAGB5	24	32	33	0	9	0	0	0	0	0	0	0	98
Star Herdla	LAVD4	19	5	10	0	8	2	0	0	0	0	0	0	44
Star Hidra	LAVN4	3	21	0	26	1	47	0	0	0	0	0	0	98
Star Isfjord	LAOX5	46	7	60	18	22	21	0	0	0	0	0	0	174
Star Ismene	LANT5	2	20	0	25	18	15	0	0	0	0	0	0	80
Star Isind	LAMP5	44	21	30	36	11	5	0	0	0	0	0	0	147
Star Japan	LAVZ5	0	73	0	56	0	0	0	0	0	0	0	0	129
Star Java	LAYS6	21	11	63	15	53	34	0	0	0	0	0	0	197
Star Juventas	LAZU5	46	32	0	9	19	26	0	0	0	0	0	0	132
Star Kilimanjaro	LAIG7	31	0	0	0	1	0	0	0	0	0	0	0	32
Star Kinn	LAJF7	31	0	45	10	5	0	0	0	0	0	0	0	91

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Star Kirkenes	LAHR7	18	11	14	0	21	23	0	0	0	0	0	0	87
Star Kvarven	LAJ7	26	36	17	24	51	10	0	0	0	0	0	0	164
State Of Maine	WCAH	0	0	0	0	58	48	0	0	0	0	0	0	106
Statendam	PHSG	90	47	32	52	14	32	0	0	0	0	0	0	267
Stellar Voyager	C6FV4	3	34	0	0	23	24	0	0	0	0	0	0	84
Stewart J. Cort	WDC6055	0	0	5	36	70	18	0	0	0	0	0	0	129
Stikine	WDC8583	9	11	0	0	0	5	0	0	0	0	0	0	25
Stimson	WDG2051	14	11	0	1	37	38	0	0	0	0	0	0	101
Stormbird	WDA6306	0	0	1	0	0	0	0	0	0	0	0	0	1
Sunshine Ace	C6XN6	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunshine State	WDE4432	6	8	20	11	3	7	0	0	0	0	0	0	55
Superstar Aquarius	C6LG6	0	0	0	0	0	0	0	0	0	0	0	0	0
Superstar Libra	C6DM2	105	110	122	115	117	101	0	0	0	0	0	0	670
Sylvie	VRCQ2	5	4	3	17	24	2	0	0	0	0	0	0	55
Talisman	LAOW5	11	23	34	50	13	10	0	0	0	0	0	0	141
Tamesis	LAOL5	0	0	20	3	7	0	0	0	0	0	0	0	30
Tan'erliq	WCY8497	0	0	0	0	0	0	0	0	0	0	0	0	0
Tangguh Hiri	C6XC2	102	75	81	96	98	89	0	0	0	0	0	0	541
Tarang	ELSR7	0	8	0	0	0	0	0	0	0	0	0	0	8
Taurus	WDF4091	0	2	31	6	1	0	0	0	0	0	0	0	40
Thailand Express	3EIZ7	14	20	19	0	6	0	0	0	0	0	0	0	59
Thomas G. Thompson	KTDQ	28	72	6	5	5	13	0	0	0	0	0	0	129
Thomas Jefferson	WTEA	0	0	0	0	1	375	0	0	0	0	0	0	376
Thomas Jefferson (Aws)	NWS0019	0	0	0	0	0	0	0	0	0	0	0	0	0
Thrasher	V7TE3	0	0	0	0	0	0	0	0	0	0	0	0	0
Tim S. Dool	VGPy	0	0	9	23	33	52	0	0	0	0	0	0	117
Time Bandit	WCX2255	1	0	3	16	2	1	0	0	0	0	0	0	23
Tina Litrico	KCKB	0	0	0	0	0	0	0	0	0	0	0	0	0
Tonsberg	9HA2066	16	0	2	33	11	0	0	0	0	0	0	0	62
Trailblazer	WDE6541	24	8	0	0	5	0	0	0	0	0	0	0	37

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Tridonawati	ELNY2	25	0	0	0	0	0	0	0	0	0	0	0	25
Triumph	WDC9555	0	0	0	0	1	1	0	0	0	0	0	0	2
Tropic Carib	J8PE3	0	4	26	17	1	24	0	0	0	0	0	0	72
Tropic Dawn	J8PR3	23	7	5	5	3	1	0	0	0	0	0	0	44
Tropic Express	HO7723	24	20	17	17	16	21	0	0	0	0	0	0	115
Tropic Jade	J8NY	18	21	19	17	17	15	0	0	0	0	0	0	107
Tropic Lure	J8PD	26	22	21	23	28	25	0	0	0	0	0	0	145
Tropic Night	J8NX	19	27	17	18	21	23	0	0	0	0	0	0	125
Tropic Opal	J8NW	28	36	40	44	43	42	0	0	0	0	0	0	233
Tropic Palm	J8PB	14	6	0	0	8	24	0	0	0	0	0	0	52
Tropic Sun	J8AZ2	11	9	10	13	14	12	0	0	0	0	0	0	69
Tropic Tide	J8AZ3	20	31	58	22	0	0	0	0	0	0	0	0	131
Tropic Unity	J8PE4	44	46	46	38	42	29	0	0	0	0	0	0	245
Ts Kennedy	KVMU	79	54	0	0	0	0	0	0	0	0	0	0	133
Tug Dorothy Ann	WDE8761	1	0	3	69	54	81	0	0	0	0	0	0	208
Tug Spartan	WDF5483	0	14	12	165	210	198	0	0	0	0	0	0	599
Tustumena	WNGW	4	37	84	186	254	222	0	0	0	0	0	0	787
Tyco Decisive	V7DI7	5	66	0	0	31	90	0	0	0	0	0	0	192
Tyco Durable	V7DI8	7	16	1	0	0	11	0	0	0	0	0	0	35
Tyco Responder	V7CY9	23	105	35	0	0	0	0	0	0	0	0	0	163
Tycom Reliance	V7CZ2	0	0	4	35	0	0	0	0	0	0	0	0	39
Ubc Saiki	P3GY9	55	1	42	52	74	33	0	0	0	0	0	0	257
Ubc Santa Marta	5BDK2	68	40	25	12	0	1	0	0	0	0	0	0	146
Umag	A8PF6	20	45	28	27	13	0	0	0	0	0	0	0	133
Unique Brilliance	VRXK4	1	0	0	0	0	0	0	0	0	0	0	0	1
Unique Carrier	VRCV5	0	0	0	0	32	56	0	0	0	0	0	0	88
Unique Explorer	VRGT8	1	0	6	33	9	11	0	0	0	0	0	0	60
Unique Sunshine	VRWV4	21	9	1	0	0	13	0	0	0	0	0	0	44
United Spirit	ELYB2	0	0	0	0	51	1	0	0	0	0	0	0	52

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Uscgc Healy	NEPP	159	23	0	0	0	0	0	0	0	0	0	0	182
Uscgc Healy (Aws)	NWS0003	733	213	0	0	0	0	0	0	0	0	0	0	946
Uscgc Stratton	NJIM	0	0	0	0	0	0	0	0	0	0	0	0	0
Valdez Star	WCO7674	0	0	0	0	0	0	0	0	0	0	0	0	0
Veendam	PHEO	149	142	45	189	119	51	0	0	0	0	0	0	695
Vega Voyager	C6FV3	11	5	37	49	25	49	0	0	0	0	0	0	176
Veracruz Express	ZCDJ2	0	0	0	0	0	16	0	0	0	0	0	0	16
Vietnam Express	VRCZ4	0	0	0	0	0	0	0	0	0	0	0	0	0
Vigilant	WDE2719	42	67	57	60	82	37	0	0	0	0	0	0	345
Viking Star	WDE6434	20	1	0	0	0	0	0	0	0	0	0	0	21
Virginian	KSPH	74	26	68	94	58	66	0	0	0	0	0	0	386
Vision Of The Seas	C6SE8	29	33	46	36	4	7	0	0	0	0	0	0	155
Volendam	PCHM	383	489	414	285	100	284	0	0	0	0	0	0	1955
Voyager Of The Seas	C6SE5	84	22	18	24	9	1	0	0	0	0	0	0	158
Walter J. McCarthy Jr.	WXU3434	0	0	0	0	32	69	0	0	0	0	0	0	101
Warrior	WBN4383	0	4	10	14	0	0	0	0	0	0	0	0	28
Washington Express	WDD3826	58	91	127	124	52	90	0	0	0	0	0	0	542
Wendy O.	WDF8784	0	0	0	1	0	24	0	0	0	0	0	0	25
West Sirius	3EMK6	28	18	19	3	6	6	0	0	0	0	0	0	80
Westerdam	PINX	73	7	98	32	39	49	0	0	0	0	0	0	298
Western Ranger	WBN3008	0	0	0	0	0	0	0	0	0	0	0	0	0
Westwood Columbia	C6SI4	20	26	41	28	49	32	0	0	0	0	0	0	196
Westwood Olympia	C6UB2	21	40	23	51	44	41	0	0	0	0	0	0	220
Wilfred Sykes	WC5932	640	0	99	701	734	687	0	0	0	0	0	0	2861
Wolstad	WCY2270	5	18	0	11	4	4	0	0	0	0	0	0	42
World Spirit	ELWG7	16	3	3	3	2	50	0	0	0	0	0	0	77
Xpedition	HC2083	0	10	5	0	0	0	0	0	0	0	0	0	15
Ym Antwerp	VRET5	41	2	0	0	0	26	0	0	0	0	0	0	69
Ym Busan	VREX8	22	15	32	17	6	2	0	0	0	0	0	0	94
Yorktown Express	WDD6127	50	26	23	19	44	29	0	0	0	0	0	0	191

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Yuhsan	H9TE	0	0	113	261	386	334	0	0	0	0	0	0	1094
Yuyo Spirits	3FNF4	61	53	4	0	0	0	0	0	0	0	0	0	118
Zaandam	PDAN	22	11	24	97	68	92	0	0	0	0	0	0	314
Zim Los Angeles	A8S13	26	24	47	15	39	18	0	0	0	0	0	0	169
Zim New York	VRGA7	0	0	0	0	0	0	0	0	0	0	0	0	0
Zim Ningbo	A8S15	12	20	22	50	8	35	0	0	0	0	0	0	147
Zim Shanghai	VRGA6	18	14	24	21	19	6	0	0	0	0	0	0	102
Zim Shenzhen	VQUQ4	0	0	0	0	0	0	0	0	0	0	0	0	0
Zuiderdam	PBIG	254	228	267	319	277	134	0	0	0	0	0	0	1479

Points of Contact

U.S. Port Meteorological Officers

HEADQUARTERS

John Wasserman

Voluntary Observing Ship Program
Manager
National Data Buoy Center
Building 3203
Stennis Space Center, MS 39529-6000
Tel: 228-688-1818
Fax: 228-688-3923
E-mail: john.wasserman@noaa.gov

Paula Rychtar

Voluntary Observing Ship Operations
Manager
National Data Buoy Center
Building 3203
Stennis Space Center, MS 39529-6000
Tel: 228-688-1457
Fax: 228-688-3923
E-mail: paula.rychtar@noaa.gov

ATLANTIC PORTS

David Dellinger, PMO

National Weather Service, NOAA
2550 Eisenhower Blvd, Suite 312
P.O. Box 350067
Port Everglades, FL 33335
Tel: 954-463-4271
Fax: 954-462-8963
E-mail: david.dellinger@noaa.gov

Robert Niemeyer, PMO

National Weather Service, NOAA
13701 Fang Road
Jacksonville, FL 32218-7933
Tel: 904-741-5186 Ext. 117
Fax: 904-741-0078
E-mail: rob.niemeyer@noaa.gov

Tim Kenefick, PMO

NOAA Coastal Services Center
2234 South Hobson Avenue
Charleston, SC 29405-2413
Tel: 843-709-0102
Fax: 843-740-1289
E-mail: timothy.kenefick@noaa.gov

Peter Gibino, PMO

National Weather Service, NOAA
4034-B Geo. Wash. Mem. Hwy.
Yorktown, VA 23692-2724
Tel: 757-617-0897
Fax: 757-877-9561
E-mail: peter.gibino@noaa.gov

Lori Evans, PMO

National Weather Service, NOAA
Maritime Center I, Suite 287
2200 Broening Highway
Baltimore, MD 21224-6623
Tel: 443-642-0760
Fax: 410-633-4713
E-mail: lori.evans@noaa.gov

Jim Luciani, PMO

New York/New Jersey
National Weather Service, NOAA
110 Main Street, Suite 201
South Amboy, NJ 08879-1367
Tel: 908-217-3477
Fax: 732-316-7643
E-mail: james.luciani@noaa.gov

GREAT LAKES PORTS

Ron Williams, PMO

National Weather Service, NOAA
5027 Miller Trunk Highway
Duluth, MN 55811-1442
Tel 218-729-0651
Fax 218-729-0690
E-mail: ronald.williams@noaa.gov

GULF OF MEXICO PORTS

David Jones, PMO

PMO New Orleans
62300 Airport Rd.
Slidell, LA 70460-5243
Tel:
Fax: 504 649-2907
E-mail:

Chris Fakes, PMO

National Weather Service, NOAA
1353 FM646
Suite 202
Dickinson, TX 77539
Tel: 281-534-2640 Ext. 277
Fax: 281-534-4308
E-mail: chris.fakes@noaa.gov

PACIFIC PORTS

Derek LeeLoy, PMO

Ocean Services Program Coordinator
National Weather Service Pacific Region HQ
Grosvenor Center, Mauka Tower
737 Bishop Street, Suite 2200
Honolulu, HI 96813-3201
Tel: 808-532-6439
Fax: 808-532-5569
E-mail: derek.leeloy@noaa.gov

Brian Holmes, PMO

National Weather Service, NOAA
501 West Ocean Blvd., Room 4480
Long Beach, CA 90802-4213
Tel: 562-980-4090
Fax: 562-436-1550
E-mail: brian.holmes@noaa.gov

VACANT

National Weather Service, NOAA
1301 Clay Street, Suite 1190N
Oakland, CA 94612-5217
Tel: 510-637-2960
Fax: 510-637-2961
E-mail:

Matt Thompson, PMO

National Weather Service, NOAA
7600 Sand Point Way, N.E.,
BIN C15700
Seattle, WA 98115-6349
Tel: 206-526-6100
Fax: 206-526-6904
E-mail: matthew.thompson@noaa.gov

Richard Courtney, PMO

National Weather Service, NOAA
600 Sandy Hook Street, Suite 1
Kodiak, AK 99615-6814
Tel: 907-487-2102
Fax: 907-487-9730
E-mail: richard.courtney@noaa.gov

Peggy Perales, PMO

National Weather Service, NOAA,
Box 427
Valdez, AK 99686-0427
Tel: 907-835-4505
Fax: 907-835-4598
E-mail: peggy.perales@noaa.gov

Larry Hubble, PMO

National Weather Service Alaska Region
222 West 7th Avenue #23
Anchorage, AK 99513-7575
Tel: 907-271-5135
Fax: 907-271-3711
E-mail: larry.hubble@noaa.gov

U.S. Coast Guard AMVER Center

Ben Strong

AMVER Maritime Relations Officer, United States Coast Guard
Battery Park Building
New York, NY 10004
Tel: 212-668-7762
Fax: 212-668-7684
E-mail: bmstrong@battery.ny.uscg.mil

SEAS Field Representatives

AOML SEAS PROGRAM MANAGER

Dr. Gustavo Goni

AOML
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4339
Fax: 305-361-4412
E-mail: gustavo.goni@noaa.gov

DRIFTER PROGRAM MANAGER

Dr. Rick Lumpkin

AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4513
Fax: 305-361-4412
E-mail: rick.lumpkin@noaa.gov

ARGO PROGRAM MANAGER

Dr. Claudia Schmid
AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4313
Fax: 305-361-4412
E-mail: claudia.schmid@noaa.gov

GLOBAL DRIFTER PROGRAM

Shaun Dolk

AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4446
Fax: 305-361-4366
E-mail: shaun.dolk@noaa.gov

NORTHEAST ATLANTIC SEAS REP.

Jim Farrington

SEAS Logistics/AMC
439 West York Street
Norfolk, VA 23510
Tel: 757-441-3062
Fax: 757-441-6495
E-mail: james.w.farrington@noaa.gov

SOUTHWEST PACIFIC SEAS REP.

Carrie Wolfe

Southern California Marine Institute
820 S. Seaside Avenue
San Pedro, Ca 90731-7330
Tel: 310-519-3181
Fax: 310-519-1054
E-mail: cwolfe@csulb.edu

SOUTHEAST ATLANTIC SEAS REP.

Francis Bringas

AOML/GOOS Center
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4332
Fax: 305-361-4412
E-mail: francis.bringas@noaa.gov

PACIFIC NORTHWEST SEAS REP.

Steve Noah

SEAS Logistics/PMC
Olympic Computer Services, Inc.
Tel: 360-385-2400
Cell: 425-238-6501
E-mail: snoah@olycomp.com or karsteno@aol.com

Other Port Meteorological Officers

ARGENTINA

Mario J. Garcia

Jefe del Dto. Redes
Servicio Meteorológico Nacional
25 de Mayo 658 (C1002ABN)
Buenos Aires
Argentina
Tel: +54-11 4514 1525
Fax: +54-11 5167 6709
E-mail: garcia@meteofa.mil.ar

AUSTRALIA

Head Office

Graeme Ball, Mgr.

Marine Observations Group
Bureau of Meteorology
GPO Box 1289K
Melbourne, VIC 3001
Australia
Tel: +61-3 9669 4203
Fax: +61-3 9669 4168
E-mail: smmo@bom.gov.au
Group E-mail: marine_obs@bom.gov.au

Fremantle

Malcolm (Mal) Young, PMA

c/o Bureau of Meteorology
PO Box 1370
West Perth WA 6872
Australia
Tel: +61-8 9474 1974
Fax: +61 8 9474 2173
E-mail: pma.fremantle@bom.gov.au

Melbourne

Albert Dolman, PMA

c/o Bureau of Meteorology
GPO Box 1636M
Melbourne, Vic. 3001
Australia
Tel: +61-4 3858 7341
Fax: +61-3 5229 5432
E-mail: pma.melbourne@bom.gov.au

Sydney**Matt Dunn, PMA**

c/o Bureau of Meteorology
GPO Box 413
Darlinghurst NSW 1300
Australia
Tel: +61-2 9296 1547
Fax: +61-2 9296 1648
E-mail: pma.sydney@bom.gov.au

CANADA**Canadian Headquarters****Gerie Lynn Lavigne, Life Cycle Manager**

Marine Networks, Environment Canada
Surface Weather, Climate and Marine
Networks
4905 Dufferin Street
Toronto, Ontario
Canada M3H 5T4
Tel: +1-416 739 4561
Fax: +1-416 739 4261
E-mail: gerielynn.lavigne@ec.gc.ca

British Columbia**Bruce Lohnes, Monitoring Manager**

Environment Canada
Meteorological Service of Canada
140-13160 Vanier Place
Richmond, British Columbia V6V 2J2
Canada
Tel: +1-604-664-9188
Fax: +1-604-664-4094
E-mail: _bruce.lohnes@ec.gc.ca

Newfoundland**Andrew Dwyer, PMO**

Environment Canada
6 Bruce Street
St John's, Newfoundland A1N 4T3
Canada
Tel: +1-709-772-4798
Fax: +1-709-772-5097
E-mail: andre.dwyer@ec.gc.ca

Nova Scotia**Randy Sheppard, PMO**

Meteorological Service of Canada
16th Floor, 45 Aldernay Drive
Dartmouth, Nova Scotia B2Y 2N6
Canada
Tel: +1-902-426-6616
E-mail: randy.sheppard@ec.gc.ca

Ontario**Tony Hilton, Supervisor PMO;****Rick Shukster, PMO &****Roland Kleer, PMO**

Environment Canada
Meteorological Service of Canada
100 East Port Blvd.
Hamilton, Ontario L8H 7S4 Canada
Tel: +1-905 312 0900
Fax: +1-905 312 0730
E-mail: tony.hilton@ec.gc.ca
roland.kleer@ec.gc.ca
rick.shukster@ec.gc.ca

Quebec**Erich Gola, PMO**

Meteorological Service of Canada
Quebec Region
Service météorologique du Canada
Environnement Canada
800 rue de la Gauchetière Ouest, bureau
7810
Montréal (Québec) H5A 1L9 Canada
Tel: +1-514 283-1644
Cel: +1-514 386-8269
Fax: +1-514 496-1867
E-mail: erich.gola@ec.gc.ca

CHINA**YU Zhaoguo**

Shanghai Meteorological Bureau
166 Puxi Road
Shanghai, China

CROATIA**Port of Split****Captain Zeljko Sore**

Marine Meteorological Office-Split
P.O. Box 370
Glagoljaska 11
HR-21000 Split
Croatia
Tel: +385-21 589 378
Fax: +385-21 591 033 (24 hours)
E-mail: sore@cirus.dhz.hr

Port of Rijeka**Smiljan Viskovic**

Marine Meteorological Office-Rijeka
Riva 20
HR-51000 Rijeka
Croatia
Tel: +385-51 215 548
Fax: +385-51 215 574

DENMARK**Cmdr Roi Jespersen, PMO &
Cmdr Harald R. Joensen, PMO**

Danish Meteorological Inst., Observation
Dept
Surface and Upper Air Observations
Division
Lyngbyvej 100
DK-2100 Copenhagen
Denmark
Tel: +45 3915 7337
Fax: +45 3915 7390
E-mail: rj@dm.dk
hrj@dm.dk

FALKLANDS**Captain R. Gorbitt, Marine Officer**

Fishery Protection Office
Port Stanley
Falklands
Tel: +500 27260
Fax: +500 27265
Telex: 2426 FISHDIR FK

FRANCE**Headquarters****André Péries, PMO Supervisor**

Météo-France DSO/RESO/PMO
42, Avenue Gustave Coriolis
31057 Toulouse Cédex
France
Tel: +33-5 61 07 98 54
Fax: +33-5 61 07 98 69
E-mail: andre.peries@meteo.fr

Boulogne-sur-mer**Gérard Doligez**

Météo-France DDM62
17, boulevard Sainte-Beuve
62200 Boulogne-sur-mer
France
Tel: +33-3 21 10 85 10
Fax: +33-2 21 33 33 12
E-mail: gerard.doligez@meteo.fr

Brest**Louis Stéphan, Station Météorologique**

16, quai de la douane 29200 Brest
France
Tel: +33-2 98 44 60 21
Fax: +33-2 98 44 60 21

La Réunion**Yves Morville, Station Météorologique**

Port Réunion
France
Fax: +262 262 921 147
Telex: 916797RE
E-mail: dirre@meteo.fr
meteo.france.leport@wanadoo.fr

Le Havre**Andre Devatine, Station Météorologique**

Nouveau Sémaphore
Quai des Abeilles
76600 Le Havre
France
Tel: +33-2 32 74 03 65
Fax: +33 2 32 74 03 61
E-mail: andre.devatine@meteo.fr

Marseille**Michel Perini, PMO**

Météo-France / CDM 13
2A BD du Château-Double
13098 Aix en Provence Cédex 02
France
Tel: +00 33 (0)4 42 95 25 42
Fax: +00 33 (0)4 42 95 25 49
E-mail: michel.perini@meteo.fr

Montoir de Bretagne**Jean Beaujard, Station Météorologique**

Aérodrome de Saint-Nazaire-Montoir
44550 Montoir de Bretagne
France
Tel: +33-2 40 17 13 17
Fax: +33-2 40 90 39 37

New Caledonia**Henri Lévêque, Station Météorologique**

BP 151
98845 Noumea Port
New Caledonia
France
Tel: +687 27 30 04
Fax: +687 27 42 95

GERMANY**Headquarters****Volker Weidner, PMO Advisor**

Deutscher Wetterdienst
Bernhard-Nocht-Strasse 76
D-20359 Hamburg
Germany
Tel: +49-40 6690 1410
Fax: +49-40 6690 1496
E-mail: pmo@dwd.de

Bremerhaven**Henning Hesse, PMO**

Deutscher Wetterdienst
An der Neuen Schleuse 10b
D-27570 Bremerhaven
Germany
Tel: +49-471 70040-18
Fax: +49-471 70040-17
E-mail: pmo@dwd.de

Hamburg**Horst von Barga, PMO****Matthias Hoigt****Susanne Ripke**

Deutscher Wetterdienst
Met. Hafendienst
Bernhard-Nocht-Str. 76
D - 20359 Hamburg
Tel: +49 40 6690 1412/1411/1421
Fax: +49 40 6690 1496
E-mail: pmo@dwd.de

Rostock**Christel Heidner, PMO**

Deutscher Wetterdienst
Seestr. 15a
D - 18119 Rostock
Tel: +49 381 5438830
Fax: +49 381 5438863
E-mail: pmo@dwd.de

Gibraltar**Principal Meteorological Officer**

Meteorological Office
RAF Gibraltar BFPO 52
Gibraltar
Tel: +350 53419
Fax: +350 53474

GREECE**Michael Myrsilidis**

Marine Meteorology Section
Hellenic National Meteorological Service
(HNMS)
El, Venizelou 14
16777 Hellinikon
Athens
Greece
Tel: +30-10 9699013
Fax: +30-10 9628952, 9649646
E-mail: mmirsi@hnms.gr

HONG KONG, CHINA**Wing Tak Wong, Senior Scientific Officer**

Hong Kong Observatory
134A Nathan Road
Kowloon
Hong Kong, China
Tel: +852 2926 8430
Fax: +852 2311 9448
E-mail: wtwong@hko.gov.hk

ICELAND**Hreinn Hjartarson, Icelandic Met. Office**

Bústadavegur 9
IS-150 Reykjavik
Iceland
Tel: +354 522 6000
Fax: +354 522 6001
E-mail: hreinn@vedur.is

INDIA**Calcutta****Port Meteorological Office**

Alibnagar, Malkhana Building
N.S. Dock Gate No. 3
Calcutta 700 043
India
Tel: +91-33 4793167

Chennai**Port Meteorological Office**

10th Floor, Centenary Building
Chennai Port Trust, Rajaji Road
Chennai 600 001
India
Tel: +91-44 560187

Fort Mumbai**Port Meteorological Office**

3rd Floor, New Labour Hamallage Building
Yellow Gate, Indira Doct
Fort Mumbai 400 001
India
Tel: +91-2613733

Goa**PMO, Port Meteorological Liaison Office**

Sada, P.O., Head Land Sada
Goa 403 804
India
Tel: +91-832 520012

Kochi**Port Meteorological Office**

Cochin Harbour, North End, Wellington
Island
Kochi 682 009
India
Tel: +91-484 667042

Visakhapatnam**Port Meteorological Office**

c/o The Director, Cyclone Warning Centre
Chinna Waltair
Visakhapatnam 530 017. Andhra Pradesh
India
Tel: +91-891 746506

INDONESIA**Belawan****Stasiun Meteorologi Maritim Belawan**

Jl. Raya Pelabuhan III
Belawan - 20414
Indonesia
Tel: +62-21 6941851
Fax: +62-21 6941851

Bitung**Stasiun Meteorologi Maritim Bitung**

Jl. Kartini No. 1
Bitung - 95524
Indonesia
Tel: +62-438 30989
Fax: +62-438 21710

Jakarta**Mochamad Rifangi**

Meteorological and Geophysical Agency
Jl. Angkasa I No. 2 Kemayoran
Jakarta - 10720
Indonesia
Tel: +62-21 4246321
Fax: +62-21 4246703

Stasiun Meteorologi Maritim Tanjung Priok

Jl. Padamarang Pelabuhan
Tanjung Priok
Jakarta - 14310
Indonesia
Tel: +62-21 4351366
Fax: +62-21 490339

Makassar**Stasiun Meteorologi Maritim Makassar**

Jl. Sabutung I No. 20 Paotere
Makassar
Indonesia
Tel: +62-411 319242
Fax: +62-411 328235

Semarang**Stasiun Meteorologi Maritim Semarang**

Jl. Deli Pelabuhan
Semarang - 50174
Indonesia
Tel: +62-24 3549050
Fax: +62-24 3559194

Surabaya**Stasiun Meteorologi Maritim Surabaya**

Jl. Kalimas baru No. 97B
Surabaya - 60165
Indonesia
Tel: +62-31 3291439
Fax: +62-31 3291439

IRELAND**Cork****Brian Doyle, PMO**

Met Eireann
Cork Airport
Cork
Ireland
Tel: +353-21 4917753
Fax: +353-21 4317405

Donegal**Paddy Delaney, Station Manager**

Met Eireann
Cork Airport
MalinHead
Lifford
Co. Donegal
Ireland

Dublin**Columba Creamer, Marine Unit**

Met Eireann
Glasnevin Hill
Dublin 9
Ireland

Mayo**Andy Clohessy, Station Manager**

Connaught International Airport
Charleston
Co. Mayo

IRELAND**Wexford****Dennis O. Mahoney, Station Manager**

Met Eireann
Rossiari Harbour
Wexford
Ireland
Tel: +353-53 33113
Fax: +353-53 33105
E-mail: met.rossiari@eircom.net

ISRAEL**Ashdod****Aharon Ofir, PMO**

Marine Department
Ashdod Port
Tel: 972 8 8524956

Haifa**Hani Arbel, PMO**

Haifa Port
Tel: 972 4 8664427

JAPAN**Headquarters****Dr. Kazuhiko Hayashi, Scientific Officer**

Marine Div., Climate and Marine Dept.
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo, 100-8122
Japan
Tel: +81-3 3212 8341 ext. 5144
Fax: +81-3 3211 6908
Email: hayashik@met.kishou.go.jp
VOS@climar.kishou.go.jp

Kobe**Port Meteorological Officer**

Kobe Marine Observatory
1-4-3, Wakinohamakaigan-dori, Chuo-ku
Kobe 651-0073
Japan
Tel: +81-78 222 8918
Fax: +81-78 222 8946

Nagoya**Port Meteorological Officer**

Nagoya Local Meteorological Observatory
2-18, Hiyori-ho, Chigusa-ku
Nagoya, 464-0039
Japan
Tel: +81-52 752 6364
Fax: +81-52 762-1242

Yokohama**Port Meteorological Officer**

Yokohama Local Meteorological
Observatory
99 Yamate-cho, Naka-ku
Yokohama, 231-0862
Japan
Tel: +81-45 621 1991
Fax: +81-45 622 3520
Telex: 2222163

KENYA**Ali Juma Mafimbo, PMO**

PO Box 98512
Mombasa
Kenya
Tel: +254-11 225687 / 433689
Fax: +254-11 433689
E-mail: mafimbo@lion.meteo.go.ke

MALASYA**Port Bintulu****Paul Chong Ah Poh, PMO**

Bintulu Meteorological Station
P.O. Box 285
97007 Bintulu
Sarawak
Malaysia
Fax: +60-86 314 386

Port Klang**Mohd Shah Ani, PMO**

Malaysian Meteorological Service
Jalan Sultan
46667 Petaling Jaya
Selangor
Malaysia
Fax: +60-3 7957 8046

Port Kinabalu**Mohd Sha Ebung, PMO**

Malaysian Meteorological Service
7th Floor, Wisma Dang Bandang
P.O. Box 54
88995 Kota Kinabalu
Sabah
Malaysia
Fax: +60-88 211 019

MAURITIUS**Port Louis****Meteorological Services**

St. Paul Road
Vacoas
Mauritius
Tel: +230 686 1031/32
Fax: +230 686 1033
E-mail: meteo@intnet.mu

NETHERLANDS**Bert de Vries, PMO &
René Rozeboom, PMO**

KNMI, PMO-Office
Wilhelminalaan 10
Postbus 201
3730 Ae de Bilt
Netherlands
Tel: +31-30 2206391
Fax: +31-30 2210849
E-mail: pmo-office@knmi.nl

NEW ZEALAND**Julie Fletcher, MMO**

Meteorological Service New Zealand Ltd.
P.O. Box 722
Wellington
New Zealand
Tel: +64-4 4700 789
Fax: +64-4 4700 772

NORWAY**Tor Inge Mathiesen, PMO**

Norwegian Meteorological Institute
Allégaten 70
N-5007 Bergen, Norway
Tel: +47-55 236600
Fax: +47-55 236703
Telex: 40427/42239

PAKISTAN**Hazrat Mir, Senior Meteorologist**

Pakistan Meteorological Department
Meteorological Office
Jinnah International Airport
Karachi, Pakistan
Tel: +92-21 45791300, 45791322
Fax: +92-21 9248282
E-mail: pmdmocar@khi.paknet.com.pk

PHILIPINES**Cagayan de Oro City****Leo Rodriguez**

Pagasa Complex Station
Cagayan de Oro City 9000, Misamis
Occidental
Philippines
Tel: +63-8822 722 760

Davao City**Edwin Flores**

Pagasa Complex Station, Bangoy Airport
Davao City 8000
Philippines
Tel: +63-82 234 08 90

Dumaguete City**Edsin Culi**

Pagasa Complex Station
Dumaguete City Airport
Dumaguete City, Negros Oriental 6200
Philippines
Tel: +63-35 225 28 04

Legaspi City**Orthello Estareja**

Pagasa Complex Station
Legaspi City, 4500
Philippines
Tel: +63-5221 245 5241

Iloilo City**Constancio Arpon, Jr.**

Pagasa Complex Station
Iloilo City 5000
Philippines
Tel: +63-33 321 07 78

Mactan City**Roberto Entrada**

Pagasa Complex Station, Mactan Airport
Mactan City, CEBU 6016
Philippines
Tel: +63-32 495 48 44

Manila**Dr. Juan D. Cordeta & Benjamin Tado, Jr**

Pagasa Port Meteorological Office
PPATC Building, Gate 4
South Harbor
Manila 1018
Philippines 1100
Tel: +63-22 527 03 16

POLAND**Józef Kowalewski, PMO**

Gdynia and Gdansk Institute of
Meteorology and Water Management
Waszyngton 42
PL-81-342 Gdynia
Poland
Tel: +48-58 6204572
Fax: +48-58 6207101
Telex: 054216
E-mail: kowalews@stratus.imgw.gdynia.pl

REPUBLIC OF KOREA**Inchon****Inchon Meteorological Station**

25 Chon-dong, Chung-gu
Inchon
Republic of Korea
Tel: +82-32 7610365
Fax: +82-32 7630365

Pusan**Pusan Meteorological Station**

1-9 Taecheon-dong, Chung-gu
Pusan
Republic of Korea
Tel: +82-51 4697008
Fax: +82-51 4697012

RUSSIAN FEDERATION**Ravil S. Fakhрутdinov**

Roshydromet
12, Novovagan'kovsky Street
Moscow 123242
Russian Federation
Tel: +7-095 255 23 88
Fax: +7-095 255 20 90
Telex: 411117 RUMS RF
E-mail: marine@mcc.mecom.ru fakhrutdinov@rhmc.mecom.ru

SAUDI ARABIA**Mahmoud M. Rajkhan, PMO**

Meteorology and Environmental
Protection Administration (MEPA)
P.O. Box 1358
Jeddah 21431
Saudi Arabia
Tel: +966-2 6512312 Ext. 2252 or 2564

SINGAPORE**Amran bin Osman, PMS**

Meteorological Service
PO Box 8
Singapore Changi Airport
Singapore 9181
Tel: 5457198
Fax: +65 5457192
Telex: RS50345 METSIN

SOUTH AFRICA**Headquarters****Johan Stander**

Regional Manager: Western Cape
Antarctica and Islands
South African Weather Service
P O Box 21 Cape Town International Airport
7525
South Africa
Tel: +27 (0) 21 934 0450
Fax: +27 (0) 21 934 4590
Cell: +27 (0) 82 281 0993
Weatherline: 082 162
E-mail: johan.stander@weathersa.co.za

Cape Town**C. Sydney Marais, PMO**

Cape Town Regional Weather Office
Cape Town International Airport
Cape Town 7525
South Africa
Tel: +27-21 934 0836
Fax: +27-21 934 3296
E-mail: maritime@weathersa.co.za

Durban**Gus McKay, PMO**

Durban Regional Weather Office
Durban International Airport
Durban 4029
South Africa
Tel: +27-31 408 1446
Fax: +27-31 408 1445
E-mail: mckay@weathersa.co.za

SWEDEN**Johan Svalmark**

SMHI
SE-601 75 NORRKÖPING
Sweden
Tel: + 46 11 4958000
E-mail: johan.svalmark@smhi.se

TANZANIA, UNITED REPUBLIC OF**H. Charles Mwakitosi, PMO**

P.O. Box 3056
Dar es Salaam
United Republic of Tanzania

THAILAND**Kesrin Hanprasert, Meteorologist**

Marine and Upper Air Observation Section
Meteorological Observation Division
Thai Meteorological Department
4353 Sukhumvit Road, Bangna
Bangkok 10260
Thailand
Tel: +66-2 399 4561
Fax: +66-2 398 9838
E-mail: wattana@fc.nrct.go.th

UNITED KINGDOM**Headquarters****Sarah C. North, Marine Networks
Manager Met Office**

Observations Supply - Marine Networks
FitzRoy Road
Exeter
Devon
EX1 3PB
United Kingdom
Tel: +44-1392 855 617
Fax: +44-870 900 5050
E-mail: sarah.north@metoffice.gov.uk
Group E-mail: obsmar@metoffice.gov.uk

North England

Vacant

South England – PMO London**Joe Maguire**

Port Meteorological Officer
Met Office
Trident House
21 Berth Tilbury Dock
Tilbury, Essex RM18 7HL
United Kingdom
Telephone: +44-1375 859 970
Telefax: +44- (0)870 900 5050
E-mail: pmolondon@metoffice.gov.uk

PMO Southampton**Lalinda Namalarachchi, PMO**

Met Office
c/o Room 231/19
National Oceanography Centre,
Southampton
University of Southampton,
Waterfront Campus
European Way
Southampton SO14 3ZH
United Kingdom
Telephone: +44 -2380638339
Telefax: +44-870 900 5050
E-mail: pmosouthampton@metoffice.gov.uk

SCOTLAND**Tony Eastham, PMO**

Met Office
 Saughton House, Broomhouse Drive
 Edinburgh EH11 3XQ
 United Kingdom
 Tel: +44-131 528 7305
 Fax: +44-131 528 7345
 E-mail: pmoedinburgh@metoffice.gov.uk

Ian J. Hendry, Offshore Adviser

Met Office
 Davidson House Campus 1
 Aberdeen Science & Technology Park
 Bridge of Don
 Aberdeen AB22 8GT
 United Kingdom
 Tel: +44-1224 407 557
 Fax: +44-1224 407 568
 E-mail: ihendry@metoffice.gov.uk

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.



Mariners

WEATHER LOG



U.S. Department of Commerce
 National Oceanic and Atmospheric Administration
 National Data Buoy Center
 Stennis Space Center
 1007 Balch Blvd
 Bay St Louis, MS 39520-9903

