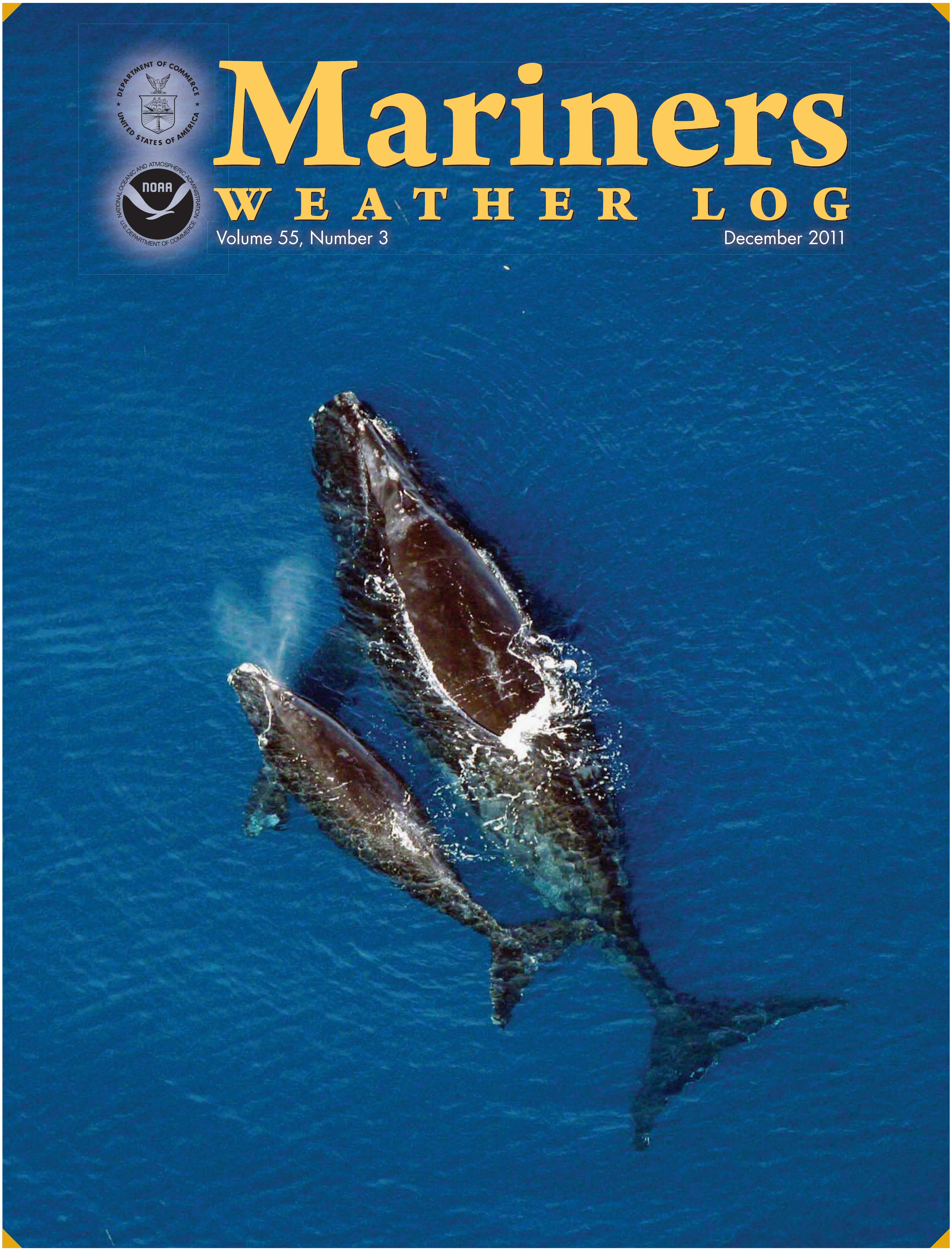
Mariners Weather Log

Volume 55, Number 3
December 2011



Mariners Weather Log
ISSN 0025-3367

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
John L. Wasserman

Layout and Design
Leigh Ellis

Articles, Photographs, and Letters
should be sent to:

Mr. John L Wasserman, 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: john.wasserman@noaa.gov

Some Important Web Page Addresses:

NOAA
http://www.noaa.gov

National Weather Service
http://www.weather.gov

National Data Buoy Center
http://www.ndbc.noaa.gov

AMVER Program
http://www.amver.com

VOS Program
http://www.vos.noaa.gov

SEAS Program
http://seas.amverseas.noaa.gov/seas/seasmain.html

Mariners Weather Log
http://www.vos.noaa.gov/mwl.shtml

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

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

See these Web pages for further links.

From the Editor

John Wasserman

Greetings and farewell shipmates and friends. Thank you once again for picking up this issue of the Mariners Weather Log!

As you may have noticed, my salutation has changed. No, I am not leaving the VOS program, simply turning over the reins of the MWL to the new Operation Manager of the US VOS program. Paula Rychtar (former New Orleans PMO) will be taking over the MWL duties after this issue. (You can read her bio on page 10) I am sure that Paula will do an exceptional job with the magazine as her creativity far exceeds mine! Feel free to contact Paula with any ideas for the magazine that you may have. (vos@noaa.gov)

Well I couldn't have picked a better issue for my final contribution. I am really happy with the articles that have been submitted for this issue and I hope you will enjoy them as much as I have. In addition to all the articles, as promised, this issue is "chock full o' awards" for our top performing ships. We here at the US VOS program love seeing the increased participation!

One item that I wanted to "pass the word" about. We are learning that we did a less than admirable job on letting the ships know about the postage paid envelopes that some of the ships still have on board that were distributed by the PMOs. The issue with the envelopes is the US postal permits have expired and are no longer being honored by the postal service. We ask that you please discontinue using these envelopes and dispose of them, for fear that they are not being delivered properly and ending up in "mail purgatory". Please hold on to any archive materials and they can be picked up from a PMO on your next port visit. The information is used for our archives and for the most part is not "time sensitive"

Well that's about enough of my ramblings and musings, I wish you all Fair Winds and Following Seas. With that I will turn the MWL "conn" over to Paula. Please enjoy this issue of the Mariners Weather Log.

John

Mariners
WEATHER LOG

Page 2

Page 7

Departments:

Marine Weather Review

VOS Program

Right Whale Ship Strike Reduction Rule Helps Protect Endangered Species

By Matt Ellis, NOAA's Office of Law Enforcement

Only man's predation and exploitation of marine resources have ever threatened the survival of Earth's largest living creatures: Whales.

Hunting them for their oil, meat, and other products, humans decimated global whale populations before the 20th century, pushing many whale species to the brink of extinction.

A moratorium on commercial whaling in 1935 and widespread protection offered by the United States' Endangered Species and Marine Mammal Protection Acts in the 1970s allowed most endangered whale populations the opportunity to rebuild and return to healthier numbers.

Yet some, like the North Atlantic right whale, are still struggling to survive.

Ship strikes threaten endangered right whales

Less than 400 individual right whales are estimated to survive in the wild. North Atlantic right whales are endangered, and without proper management of maritime activity now and in the future, human actions could very well lead to their premature extinction.

The scientists and organizations that study and protect these whales are teaming up to guard right whales from endangerment in a number of ways. One of the greatest threats to right whales is accidental collisions between ships and whales, which have contributed largely to protected whale fatalities over the years and a slowed recovery of the population.

In fact, NOAA Fisheries Service reports that collisions with ships are the leading "human-caused source of mortality for the endangered North Atlantic right whale."

The impact of a moving ship can cause hemorrhaging, lacerations, broken bones and other blunt force trauma that can severely debilitate or kill a large whale.

Right whales are deemed more susceptible to such encounters because they feed and breed near the coast and spend extended periods of time close to the surface of the water, and consequently, the dangerous bows and propellers of passing ships.

A 2010 paper by NOAA scientists appearing in the Journal of Experimental Marine Biology and Ecology describes ship strikes as "a significant threat to the recovery of the [right whale] species," and estimates that nearly 40 percent of the 50 documented right whale deaths from 1986 to 2005 occurred due to ship collisions. From 2003 to 2007, at least two right whales were killed each year by ships.

Just one fatality can be devastating to the right whale population, and even more so when the victim is a female whale.

NOAA estimates that a female right whale will need to give birth to four healthy calves over her lifetime to successfully replace herself within the population. Survivorship studies have shown that two of those four calves will likely die before reaching sexual maturity (at around 10 years), and of the remaining two, one will probably be male.

Ship Strike Reduction Rule seeks to slow ships

Although the small Atlantic population is now showing annual growth, increasing by about 2 percent every year, almost a third of all known right whale fatalities are still caused by ship collisions or fishing gear entanglement, motivating scientists and agency officials to put in place a program to reduce these threats, including restrictions on vessel speeds, implemented in December 2008.

This is not the first programdevised to reduce the risk of ship strikes. The Mandatory Ship Reporting System, introduced in 1999, was intended to gather information about ship locations and relay sighting data of local right whales to those ships, so that they may avoid the whales (www.nmfs.noaa.gov/pr/shipstrike/msr/).

State and federal regulations also restrict close contact with whales, mandating that all vessels must stay at least 500 yards away from a sighted whale in U.S. waters. Aerial surveys of whales have been used for years to provide right whale locations to transiting vessels, and recommended routes have been established in various locations to limit the concurrence of whales and ships.

Although helpful, these actions were ineffective in reducing ship strikes to appropriate levels, and the need came for additional methods of protecting right whales.

Effective until December 9, 2013, the NOAA's Ship Strike Reduction Rule mandates that all vessels 65 feet and longer, subject to U.S. jurisdiction or entering/departing a port or place subject to U.S. jurisdiction, must observe a 10 knot speed limit in designated Seasonal Management Areas.

These Seasonal Management Areas are established around Cape Cod Bay, Off Race Point and the Great South Channel in the Northeast, and extend southward down the East Coast, including Block Island Sound and most major Atlantic ports to Jacksonville, Florida. Maps of these areas and a compliance guide are available at www.nmfs.noaa.gov/pr/shipstrike.

From January 1 through May 15, Cape Cod Bay is a designated Seasonal Management Area. Off Race Point becomes a Seasonal Management Area from March 1 to April 30, and the Great South Channel is established as a Seasonal Management Area from April 1 to July 31.

Waters along the southeastern coast of the United States, extending from Brunswick, Georgia, to Port Canaveral, Florida, are the main breeding and nursery grounds of the North Atlantic right whale.

The waters surrounding the ports of Brunswick, Fernandina, and Jacksonville become Seasonal Management Areas between November 15 and April 15, the time when most female and young whales are present. Females then nurse their calves for 10-12 months as they migrate northward, back to New England. Therefore, between November 1 and April 30, Mid-Atlantic Seasonal Management Areas are established around the ports of Charleston, Georgetown, Wilmington, Morehead City, Norfolk and the Delaware Bay to protect migratory routes.

Right whales may occur unexpectedly outside Seasonal Management Areas, so NOAA also establishes temporary zones, called Dynamic Management Areas, which are created when whales are a sighted in a location outside the boundaries of the Seasonal Management Areas. Mariners who voluntarily pass through either management area are requested to observe a 10 knot speed limit or route around the area.

In addition recommended shipping routes have been established in waters around New England and Jacksonville, directing ships to waters historically shown to be less populated by right whales. Working with the International Maritime Organization, NOAA and the U.S. Coast Guard also modified the Boston Traffic Separation Scheme and established an "Area To Be Avoided" in the Great South Channel. These reconfigurations could potentially reduce the risk of right whale ship encounters by 58 percent, according to NOAA scientists' analysis.

If any deviation from the 10 knot speed limit is necessary during transit of a Seasonal or Dynamic Management Area, the ship strike rule dictates that reasons for deviation, speed at which the vessel was operated, latitude and longitude at time of deviation, and time and duration of deviation should all be noted in the vessel's logbook before the master of the vessel can sign and date the entry. Factors such as bad weather and rough seas may be cause for such a deviation.

Since the rule was implemented, there have been no reported right whale fatalities due to ship collisions in Seasonal Management Areas. Despite the apparent effectiveness, slowing the speed of vessels passing through these areas will not prevent all whale deaths. Mariners and fishermen must take advantage of available survey data

and know how to recognize and avoid right whales wherever they are.

How to sight a right whale

To assist mariners, passive acoustic buoys, which receive sound waves rather than emitting them, were installed along incoming and outgoing shipping routes. These buoys detect right whale calls within a 5-mile range and transmit the recorded sound clips to a shore-based detection and analysis center. Once the calls are analyzed, this information is provided online, so mariners know right whales are in the area.

In Woods Hole, Massachusetts, the NOAA Northeast Fisheries Science Center collects ship and aircraft-based data on the whereabouts of right whales around Cape Cod, and elsewhere, and disseminates that information to ships in the area as part of the Sighting Advisory System.

The Northeast Fisheries Science Center also provides more detailed aerial survey data for all protected marine species around the Northeast Seasonal Management Areas, hosted via OBIS-SEAMAP (Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations).

Whales seen from an airplane are not always easily seen from a ship, and even if whales are in the immediate area, they may be underwater. Once notified of a potential encounter, avoidance procedures are then up to the ship's crewmembers. Crews must be vigilant and cautious when travelling through management areas and know the telltale signs of a North Atlantic right whale.

Right whales are positively buoyant, meaning they rise to the surface when at rest, and they feed by skimming close to the surface of the water for zooplankton, thus spending a large amount of time either just below or at the surface of the water. Their dark coloration makes them hard to spot from a distance and they are notoriously slow.

A right whale can grow to 50 feet and weigh up to 80 tons. They are shorter and stockier than most other baleen whale species with a smooth back and no prominent dorsal fin. They can be identified easily from above by their distinctive V-shaped spouts and white, lumpy callosities around their mouths, eyes, and blowholes. Their flukes are deeply notched, and their flippers are broad and flat.

What to do if you spot a right whale

If a whale is spotted, vessels must remain at least 500 yards away. If an entangled, injured, or dead whale is sighted in the area, mariners are advised to keep that precautionary distance while maintaining a line of sight with the whale. Crews should not try to untangle a trapped whale, as it may lead to further injury or death. All injured or dead whale sightings should be reported to NOAA's National Marine Fisheries Service responders. Appropriate procedure and contact information can be at http://www.nero.noaa.gov/prot_res/mmv/Guide%20to%20reporting%20Whale%20Sightings.pdf.

According to the Northeast Fisheries Science Center, when reporting a dead or injured whale, crewmembers should note "date, time and location of the sighting, number of animals sighted, distinctive features and estimated length of the animal, how you can be contacted (i.e. contact information for original report; how an observer can be contacted), signs of injury or entanglement, description of behavior, any injuries and/or entangling gear, and if the whale is dead, the condition of the carcass."

If a whale is sighted and the potential for a collision exists, crews must take appropriate measures to avoid the whale. Depending on the size of the vessel – which may be several football fields in length, extend 50 or more feet into the water, and travel at 20-plus miles per hour – avoiding a 50-foot long, slow-moving whale can be challenging, and crewmembers should be educated in avoidance procedures.

After a whale is located near a ship, the crew must alert the vessel operator who must determine whether to initiate an evasive reaction (e.g., changing course or speed) with adequate time for the vessel to respond to bridge maneuvers.

NOAA's Office of Law Enforcement enforces speed restrictions

Since the introduction of the Ship Strike Reduction Rule in 2008, no one has been penalized for hitting and/or killing a right whale, but that doesn't mean that all incidents have been reported.

Special Agent Stuart Cory, the national program manager for Protected Resources in NOAA's Office of Law Enforcement, explained that any collision with a whale can still be investigated, even if the vessel in question was travelling under the speed limit, and any whale death resulting from a collision can still be penalized and considered an illegal "take" under the Endangered Species and Marine Mammal Protection Acts.

Under the Endangered Species Act, it is illegal to unlawfully "take" - meaning to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect - or to attempt to engage in any such conduct with any endangered species or wildlife listed on the Endangered Species List. Meanwhile, the Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals and defines "take" as "harass, hunt, capture, kill or collect," or the attempt to do so.

Violations can result in a civil penalty up to $11,000 as well as criminal penalties up to $100,000, imprisonment of up to a year or both.

In the rule's first season after implementation, NOAA's Office of Law Enforcement focused on outreach, issuing letters to alleged violators to educate them about the new federal regulation. However, beginning in November 2009 at the start of the rule's second season, the Office of Law Enforcement began enforcing the rule by documenting alleged violations and forwarding them to the attorneys in NOAA's Office of General Counsel for Enforcement and Litigation for possible action, which includes the assessment of civil penalties.

More than 36 cases involving speed violations have been investigated and adjudicated by NOAA since November 2009, and in November 2010, NOAA's attorneys issued their first Notices of Violation and Assessment (NOVAs) under the Ship Strike Reduction Rule.

Nine NOVAs were issued to vessels that allegedly traveled multiple times through Seasonal Management Areas at speeds well in excess of the 10 knots allowed under the regulations. The alleged violations were documented in both the Northeast and Southeast Atlantic, resulting in more than $200,000 in assessed penalties. The NOVAs ranged from $16,500 to $49,500, depending on the frequency of the alleged violations.

Lower speeds mean less deadly collisions

And those fines aren't for nothing. Studies show that speed truly plays a large part in the likelihood and severity of a collision between whale and ship.

Biologists Richard Pace and Greg Silber, who helped develop the Ship Strike Reduction Rule, observed collision data prior to 2008 and tested speed as a predictor of death to determine that the likelihood of a whale fatality due to ship strike increases from around 45 percent to 75 percent when vessel speed increases from 10 to 14 knots. Chance of death at 17 knots was 90 percent (http://www.nmfs.noaa.gov/pr/pdfs/shipstrike/poster_pace-silber.pdf).

Within that same analysis, Pace and Silber found that in the Northeast, "25 percent of entrants were cruising at 13 knots or below and the next 25 percent were between 13 and 14 knots." Ships entering the Southeastern Mandatory Ship Reporting area passed through with a median speed of 15.7 knots, and, in either Mandatory Ship Reporting area, some collisions occurred at speeds upwards of 30 knots.

Asking mariners to voluntarily adhere to vessel speed restrictions or other actions may not always work. Scientists at NOAA and the New England Aquarium determined that 95 percent (38 out of 40) of ships tracked in the Great South Channel did not comply with NMFS-issued speed advisories or route around areas for which right whales sighting locations and speed advisories had been provided.

Scientists and enforcement officials aren't sure whether mariners are disregarding the policies or if they are just unaware they exist, but a 2008 study of commercial whale watching ship speeds, referenced in the 2008 Final Environmental Impact Statement for the Right Whale Ship Strike Reduction Rule issued by NOAA Fisheries Office of Protected Resources, found that "commercial whale watching vessel operators exhibited high non-compliance rates even when they were aware of vessel speed zones around whales. Therefore, even when whale locations are detected and provided, it is not clear how, or if at all, mariners will respond."

Alternative technologies explored

The inability to monitor all whale movement in critical areas has driven scientists and wildlife protection officials to consider alternative technologies that could deter whales from even coming near a ship. Most of these technologies involve devices used to detect whale locations and then, through separate means, pass the information on to mariners.

Among the most cost-effective methods is the use of passive acoustic detections, like the buoy reporting system in the Boston Traffic Separation Scheme, described above, which capture ocean sounds and listen for right whale calls to determine their approximate location. A similar system exists in the Stellwagen

Bank National Marine Sanctuary at the mouth of the Massachusetts Bay and in a number of other locations.

Previous studies of alternative technologies in 1999 and 2002 showed that "no existing or developing technology offered a high probability of eliminating or substantially reducing collisions in the near future," and similar conclusions were made following further assessment of technologies, provided in a 2008 Report of a Workshop to Identify and Assess Technologies to Reduce Ship Strikes of Large Whales.

After testing combinations of aerial and acoustic surveying systems, the report revealed that, for the most part, passive acoustic devices are more adept at picking up whale locations where visual, aerial sighting methods cannot - but visually locating whales is the only way to assure a reduction in ship strikes.

Other researchers have proposed a mass telemetry tagging system to locate and monitor all right whales in the Northeast Atlantic population. Advances in tracking and data transmission technologies have made this option a possibility, but the actual process of locating and tagging hundreds of rare whales would be prohibitively expensive and impractical as a means to reduce ship strikes.

In the 2008 report on Technologies to Reduce Ship Strikes of Large Whales, Shannon Bettridge, David Cottingham and Silber concluded that, "Although telemetry is a highly useful tool for studying whale behavior, natural history and movements, its utility in mitigating ship strikes is severely limited by the logistics, risks, and limited lifespan of the attachments and the cost of getting tags on the animals and keeping them tagged."

Outreach and education are key

For now, education and outreach about right whales are important components of any attempt to prevent future collisions

with whales, in conjunction with the Ship Strike Reduction Rule and other existing ship strike reduction policies. In many communities though, people just aren't aware of the whales or the dangers humans pose.

Surveys of more than 450 festival-goers at the 2010 Right Whale Festival in Jacksonville, Florida, revealed that nearly 40 percent didn't know right whales can occur off the Jacksonville coast. The waters off the Jacksonville coast are the only known calving grounds for the North Atlantic Right whale.

In 2009, Cheryl Bonnes of NOAA's Southeast Fisheries Science Center and Jessica Koelsch of the Sea to Shore Alliance teamed up to organize an annual Right Whale Festival.

In only two years, the festival has proven itself a significant education and outreach event for right whale protection. In 2010, 3,000 people attended the festival, up from 800 a year before at the inaugural event. Bonnes said she expects the festival to grow again this year, with more partners added to help organize and fund the event.

Objectives from last year's Right Whale Festival Final Report included raising awareness "of the importance of [the Southeast] region to right whales, how to recognize and avoid disturbing mother-calf pairs, the close approach rule, the importance of reducing vessel speed when whales are present, and the value of protecting these amazing marine mammals."

Information on right whales and right whale vulnerability to ship strikes can be found in U.S. Coast Pilots and Sailing Directions, and are the subject of USCG Broadcasts to Mariners. NOAA and a number of partners have also developed educational products to assist mariners in whale avoidance training. One of these products, The Prudent Mariner's Guide to Right Whale Protection, is a multimedia CD developed for professional mariners operating along the U.S. East Coast and is available for free upon request. NOAA also developed training modules for mariners attending formal training at seven maritime academies along the East Coast. Additional information on ship strikes can be found at: http://www.nmfs.noaa.gov/pr/shipstrike/.

Compliance with speed limits is on the rise in Seasonal Management Areas, and scientists are monitoring both ship speeds and whale fatalities to assess the success of the ship strike rule. The rule will be reevaluated to determine if it is achieving its intended objectives and, if not, to identify ways to improve it.

"Right whales are a highly endangered and important species," said Special Agent Cory. "It is important to remind those that use and share the same habitat as right whales that this rule was put into place to protect these mammals. Compliance with this rule is one way NOAA is striving to prevent right whales from extinction. The species' recovery is dependent upon the protection of each remaining whale." ⚓

Marine Debris

By Carey Morishige, Pacific Islands regional coordinator, NOAA Marine Debris Program (on contract with I.M. Systems Group, Inc), carey.morishige@noaa.gov

Of all Earth's natural hazards, tsunamis may be among the most infrequent, but they pose a major threat to coastal populations, particularly in the seismically active Pacific Ocean. The tragedy of the March 11, 2011 earthquake and subsequent tsunami in Japan could have far-reaching effects to areas like the U.S. West Coast and Hawai'i. As the tsunami receded from land in northern Japan, it washed much of what was in the inundation zone into the ocean. Heavier materials sank closer to shore while buoyant materials made up debris fields that were seen briefly in satellite imagery and aerial photos of the waters surrounding Japan.

Since the tsunami, there has been a flurry of media attention on the arrival dates of this tsunami debris to Hawai'i and the U.S. West Coast. The original landfall predictions, generated by computer models, were from the International Pacific Research Center (IPRC) at the University of Hawai'i at Mānoa. Both the IPRC model and NOAA's Ocean Surface Current Simulator model agree on the general direction and drift rate of tsunami-generated debris. If the models are correct, debris could pass near or wash ashore in the Northwestern Hawaiian Islands in spring 2012, approach the U.S. West Coast in 2013, and circle back to Hawaii's main Hawaiian Islands in 2014 to 2016.

What we know (and don't)

The debris continues to disperse as it moves with ocean currents and winds, essentially becoming scattered and unlike the expansive "mats" of debris seen initially. Some items may have broken apart into smaller pieces or become water-logged and sunk, and this will likely continue the longer the materials are in the water.

Today, there is much that we don't know about the amounts and types of tsunami-generated marine debris still afloat in the Pacific. A handful of anecdotal sightings of floating marine debris that can be tied to the tsunami have been reported, but without more information and a better understanding of the debris that may be heading to coasts around the Pacific, developing an effective mitigation plan is difficult.

More information is also needed to better predict and thus prepare for the impacts this debris may have in U.S. waters and along shorelines. The most likely impacts include those to navigation safety, pelagic fisheries, recreation and tourism in coastal areas, and marine and coastal species through habitat damage, entanglement, and ingestion.

Understanding Japan tsunami debris

To that end, the NOAA Marine Debris Program (MDP) is leading efforts to gather information to better understand what tsunami-generated debris may be still afloat in the N. Pacific, particularly types and quantities of potential tsunami debris. The MDP is working with the NOAA Office of Marine and Aviation Operation's Pacific fleet of vessels, the NOAA Voluntary Observing Ship Program (VOS), and NOAA Pacific Islands Regional Observer Program and their work with the Hawaii longline fishing industry to gather more information on any significant sightings of marine debris at sea. A tsunami debris workgroup has been formed with partners from governmental, non-governmental and academic sectors to address, coordinate and plan for tsunami-generated marine debris. It is this workgroup's goal that through working together, sharing resources, expertise, and knowledge, any impacts of tsunami-generated marine debris will be mitigated or prevented. The MDP, along with the U.S. Environmental Protection Agency, are key partners in the coordination of efforts and activities to address tsunami debris. Along with collecting information on debris at sea, monitoring of shoreline debris has also begun with the U.S. Fish and Wildlife Service on Tern Island in French Frigate Shoals and Midway Atoll.

We need your help

In a time of limited resources and funding, cooperation and partnerships with partners outside the normal scope of NOAA's focus become increasingly important, especially with those who are on the water often, including commercial vessels and the shipping and fishing industries. **Information on significant marine debris sightings in the North Pacific Ocean is greatly needed and can be reported to MDsightings@gmail.com** (please indicate if the information can be displayed on a public website). Your help in collecting information about still-floating tsunami debris in the North Pacific is greatly appreciated.

For more information please contact Carey.Morishige@noaa.gov. ⚓

The mass of debris stretched for miles off the Honshu Coast soon after the tsunami. Over time and distance, the debris patches dispersed. Photo courtesy of the U.S. Pacific Fleet, Navy.

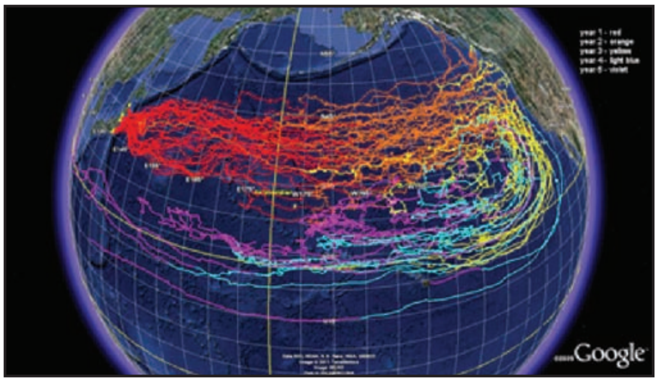
RESOURCES:

Frequently Asked Questions on Japan tsunami marine debris - http://marinedebris.noaa.gov/info/japanfaqs.html

A MARAD advisory (#2011-06) on Japan tsunami-generated marine debris was issued on 23 September 2011 - http://www.marad.dot.gov/news_room_landing_page/maritime_advisories/advisory/advisory2011-06.htm)

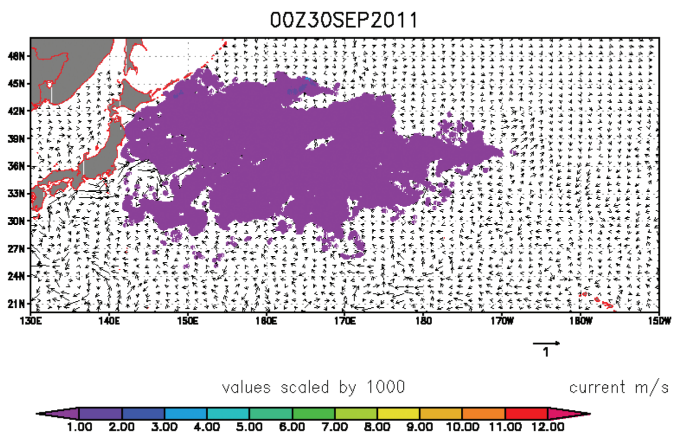
Computer model simulation of debris trajectory in the North Pacific Ocean since 11 March 2011 - http://iprc.soest.hawaii.edu/users/hafner/PUBLIC/TSUNAMI_DEBRIS/tsunami_tracers_top.html

Tsunami-generated debris shown in coastal waters off of Sendai, Japan. Photo courtesy of the U.S. Pacific Fleet, Navy.



NOAA has run a model using OSCURS (Ocean Surface Current Simulator). The results are shown here. Map courtesy of J. Churnside and created through Google.

Year 1 = red
Year 2 = orange
Year 3 = yellow
Year 4 = light blue
Year 5 = violet



Computer model simulation of debris trajectory in the North Pacific Ocean since 11 March 2011 and ending on 30 September 2001. Map courtesy of International Pacific Research Center.

Shipwreck: Anna C Minch

By Skip Gillam
Vinland, Ontario, Canada

Several storms stand out in Great Lakes history for their destruction and loss of life. The "Great Storm" of November 1913 claimed in the range of 250 lives and thirteen ships. Another, in November 1905, wreaked havoc on the upper lakes while "Black Friday" October 20, 1916, sank four ships in Lake Erie. The Armistice Day Storm of November, 11, 1940, displayed its wrath on Lake Michigan where three ships became a total loss.

One that disappeared with all hands on Lake Michigan during the Armistice Day Storm was the **ANNA C. MINCH**. It was en route from Fort William (now Thunder Bay, Ontario) to Chicago with a cargo of screenings. When the storm hit with raging winds and waves, blinding snow and temperatures close to zero, there was no place to hide.

Anna C Minch

The **ANNA C. MINCH** had been built by the American Shipbuilding Company and launched at Cleveland, Ohio, on April 18, 1903. The 400 foot long by 50 foot, 2 inch wide bulk carrier was constructed for Henry Steinbrenner and named for his mother-in-law Anna. She had been the wife of the company founder, the late Philip Minch.

This was one of a number of small, family operated, shipping lines sailing the Great Lakes in the early part of the 20th Century. Minch operations had dated from 1842 and, in the early years, they employed wooden hulled barges and steamers. The construction of the **ANNA C. MINCH** helped move the company forward into the era of steel hulled steamers and, in 1905, corporate reorganization brought the ship under the banner of the newly formed Kinsman Transit Company.

The **ANNA C. MINCH** was used in the ore, grain and coal trades and proved to be a handy carrier for the company. It was sold to Canadian interests for the Western Navigation Company in 1926 and operated for the James Murphy Coal Company. It often loaded grain at the Canadian Lakehead ports of Fort William and Port Arthur for delivery to storage elevators in the east and then returned up the lakes with coal for business, industrial, home and railway use. The vessel is shown at Sault Ste. Marie, in Western Navigation colors, in a photo courtesy of Dick Wicklund.

In 1933, management of the ship was taken over by Capt. R. Scott Misener. This was his first large carrier that he operated in what later became a major Canadian fleet on the inland lakes. Pulpwood was added to the list of popular cargoes and these were delivered to Cleveland or Thorold, Ontario, along the Welland Canal.

Things did not start or end well under Misener operation. The vessel brought 200,000 bushels of grain east and was the first ship of the season into the port of Goderich, Ontario, on April 23, 1933. Three days later, while heading back up the lakes for more, the **ANNA C. MINCH** stranded at Vidal Shoal, above the Soo Locks, but was soon refloated, repaired and underway again.

The final trip trip for Misener ran into the terrible storm that attacked the Lake Michigan region on November 11, 1940. Mountainous waves pounded the eastern shore of the lake and there was no place to seek shelter. The **ANNA C. MINCH** disappeared off Pentwater, Michigan, taking the lives of all 25 sailors on board. Nothing could be done to save them.

The remains of the hull have been located on the bottom. The bow was found in forty feet of water and the pilothouse and forward cabin were gone. Later, the stern section was also located. There was some thought that the ship had been in a collision with the **WILLIAM B. DAVOCK**, another casualty of the storm, but, in May 1972, the latter was discovered intact on the bottom with no evidence of collision damage.

The Kinsman fleet remained active on the Great Lakes until 2004 and then used a contracted ship to complete their cargo commitments. The great-grandson of Henry Steinbrenner, former New York Yankee owner George M. Steinbrenner III, passed away in 2010. ⚓

Voluntary Observing Ship Program Selects New Operations Manager

The US VOS program manager has selected Paula Rychtar as the new Operations Manager.

Paula Rychtar served as the New Orleans, Louisiana Port Meteorological Officer (PMO) for National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service from 2004 until her new appointment as VOS Operations Manager in 2011. Having seven years experience as PMO, her expertise and practical knowledge base will no doubt be an asset to the VOS Program management team. Her career spans more than two decades of dedicated public service.

Paula began her federal career in 1979 proudly serving in the United States Navy. As an Aerographers Mate she was stationed at NOCD Bermuda providing forecasts for military operations, anti-submarine warfare and oceanographic research. In 1982, she transferred to

Lemoore Naval Air Station, California where she became fully accredited as a Meteorologist. After serving in the U.S. Navy, she was employed by the U.S. Department of Defense, Holloman Atmospheric Science Laboratory, White Sands Missile Range, New Mexico supporting rawinsonde observations for NASA's Space Shuttle program, ballistics testing as well as supporting various other research and development projects for the DOD.

Paula joined the National Weather Service in 1986 as a Meteorological Technician. She has been stationed at WSO San Francisco, California, WSMO Volens, Virginia as Network Radar Specialist, NWSFO Blacksburg, Virginia as a Hydrometeorological Technician and NWSFO New Orleans/Baton Rouge as PMO.

Paula has many interests outside of the workplace. Running, swimming and biking are her mainstay, but she loves camping, hiking, fishing, canoeing and has a kayak on her "wish list". Paula is on her sixth consecutive year of participating in the Multiple Sclerosis 150 mile bike ride for the cure. Paula loves to travel, she enjoys painting and drawing, cooking, and sailing on her and her husband's Sunfish. ⚓

Mean Circulation Highlights and Climate Anomalies

May through August 2011

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

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

May-June 2011

The 500 hPa circulation pattern over the Northern Hemisphere during May featured above-average heights over the central North Pacific Ocean, from Newfoundland to central Europe, and across Siberia, and below-average heights over the high latitudes of the North Pacific and North Atlantic, the western contiguous U.S., and the Mediterranean Sea *Figure 1.* The sea level pressure (SLP) pattern resembled the mid-tropospheric pattern, and displayed noticeable asymmetry, with the largest anomalies over the Western Hemisphere *Figure 2.*

The mid-tropospheric circulation pattern during June 2011 featured above-average heights over the Gulf of Alaska, Greenland, the polar region, and western Siberia, and below-average heights over the western conterminous U.S., the British Isles, and south-central and northeastern sections of Russia *Figure 3.* The SLP map again largely mirrored the mid-tropospheric pattern, and displayed the largest departures over Greenland, south-central and northeastern Russia *Figure 4.*

The Tropics

A transition from La Nina to ENSO-neutral conditions occurred during May 2011 as sea surface temperatures (SST) were near-average across much of the equatorial Pacific Ocean. The latest monthly SST indices for the Nino 3.4 region were -0.5C (May) and -0.2C (June). The oceanic thermocline, measured by the depth of the 20C isotherm, was slightly deeper than average across the eastern equatorial Pacific, with sub-surface temperatures reaching 1-2C above average in this region. Atmospheric convection was enhanced over eastern Indonesia, and suppressed across the central equatorial Pacific. Equatorial low-level easterly trade wind anomalies and upper-level westerly wind anomalies remained stronger than average over the central Pacific. Collectively, the atmospheric and oceanic anomalies reflect ENSO-neutral conditions but with weakening La Nina impacts in the atmosphere.

The first named storm of the 2011 Atlantic Hurricane Season was Arlene, which traced back to a tropical wave that moved westward across the Caribbean Sea in late June. After crossing the Yucatan Peninsula and emerging out over the warm waters of the Bay of Campeche, Arlene organized into a tropical storm as it tracked west-northwestward into Mexico, well south of Texas. Peak winds with this storm reached 56 kts.

July-August 2011

The 500 hPa circulation pattern during July 2011 featured an alternating ridge-trough pattern that extended around the hemisphere. Regional aspects of this pattern included above-average heights over the central North Pacific and North Atlantic Ocean, the mid-western U.S., western Russia, and Mongolia, and below-average heights over western North America, central Europe, and central Siberia *Figure 5.* The sea level pressure and anomaly map (*Figure 6*) displays a similar pattern to the 500 hPa circulation pattern.

The month of August was characterized by above average heights over the north polar region, and below average heights in the middle latitudes *Figure 7.* The SLP and anomaly field (*Figure 8*) largely mirrored the mid tropospheric circulation pattern.

Forty one of the lower 48 states (most notably Texas and Oklahoma) reported above-normal, much-above-normal, or record high temperatures during July (*Reference 1*). Severe drought affected the south-central and much of the southeastern U.S., in addition to dozens of large wildfires. In contrast, the Pacific Northwest experienced much below normal temperatures, and above-average precipitation. In August, a drier pattern prevailed across the Northwest, which is more typical for this area, while most of the nation continued to be unseasonably hot and dry.

The Tropics

ENSO-neutral conditions in July gave way to redeveloping La Nina conditions during August. The latest monthly SST indices for the Nino 3.4 region registered -0.2C and -0.6C, respectively. The oceanic thermocline (measured by the depth of the 20C isotherm) was shallower than average across the east-central equatorial Pacific, and sub-surface temperatures were below- average in this region. Deep cloudiness and thunderstorm activity near the equator was enhanced over Indonesia and the far western Pacific, and was suppressed near the Date Line and south of the Equator. Equatorial low-level easterly trade winds remained stronger than average over the central Pacific. Collectively, these atmospheric and oceanic anomalies reflect the return of La Nina conditions.

The most significant tropical cyclone in the Atlantic so far this season was Hurricane Irene, a category 3, Cape Verde-type storm. After traversing Puerto Rico and becoming a minimal hurricane, Irene rapidly intensified to a category 3 hurricane just prior to passing through the Bahamas, with peak winds of 105 kts. Irene made landfall in North Carolina's Outer Banks, New Jersey, and eventually Brooklyn, NY, accompanied by torrential rain, storm surges, and significant river flooding. One of the greatest impacts of this storm was the extensive damage from flood waters in the Northeast U.S.., especially the Catskill Mountains region of upstate New York. ⚓

References

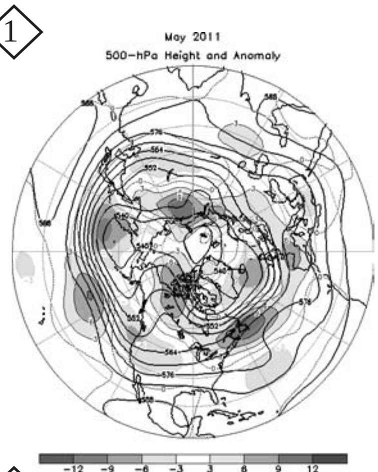
1. http://www.ncdc.noaa.gov/sotc/national/2011/
National Climatic Data Center, Asheville, NC

2. 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)

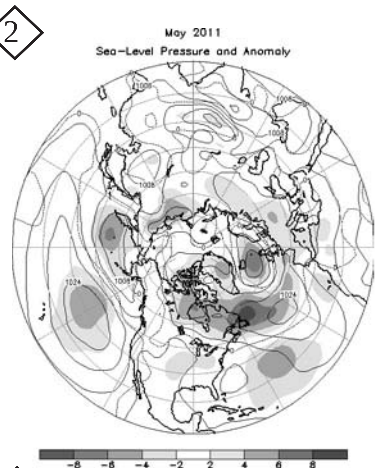
Figures 1,3,5,7
Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981-2010 base period monthly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

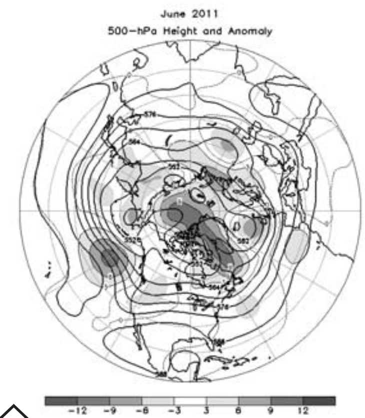
1



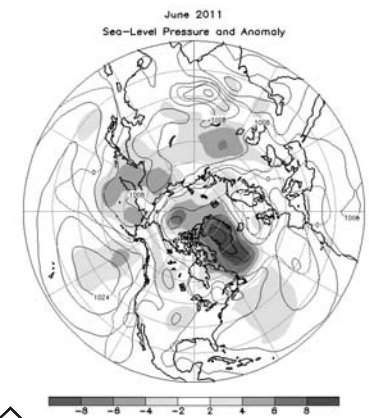
2



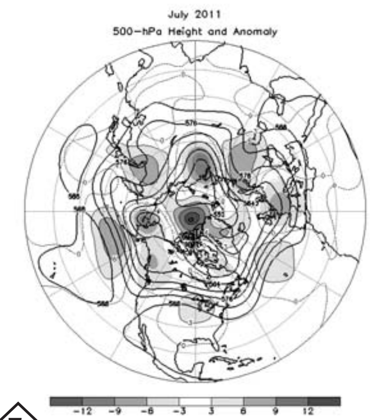
3



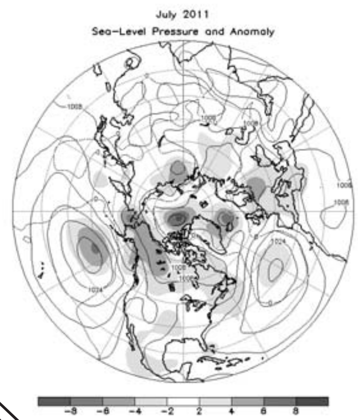
4



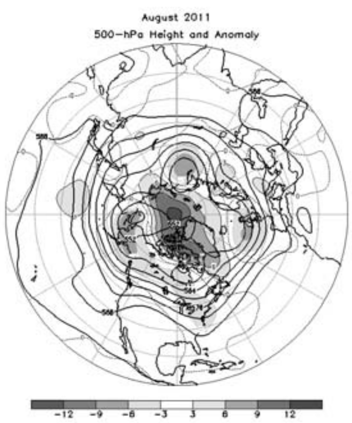
5



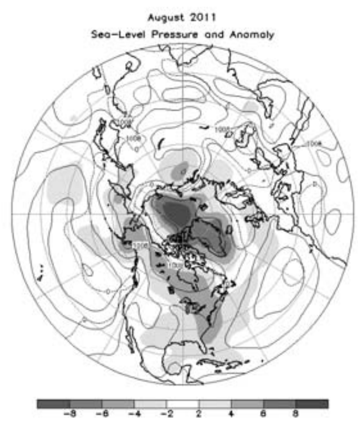
6



7



8



Marine Weather Review – North Atlantic Area
January to June 2011

By George P. Bancroft
Ocean Forecast Branch, Ocean Prediction Center, Camp Springs, MD
NOAA National Center for Environmental Prediction

Introduction

The period of January and February featured increasing activity as an energetic southwest to northeast storm track became established. The numbers of hurricane force lows increased from four in January to a sharp peak of nine in February. Early February was most active, featuring two cyclones with central pressures in the 930s near Greenland. In the past the maximum frequency of hurricane force lows in the North Atlantic has been found to occur earlier, in January (Sienkiewicz and Von Ahn, 2005). The numbers of hurricane force systems then dropped to four in March and to one each in April and May. The strongest systems continued to track northeast in May and June toward or north of Great Britain. There was no tropical activity in OPC's marine area north of 31N.

Significant Events of the Period

North Atlantic Storm, January 8-14: The rapid initial development of this hurricane force low is shown in *Figure 1.* Hurricane force winds occurred on the south side of the center early on the 9th when an ASCAT pass (*Figure 2*) revealed a partial view of that area of the storm containing 50 kts wind retrievals. ASCAT winds have a low bias especially at higher wind speeds. Table 1 lists some notable ship and buoy observations taken during the storm. The cyclone then moved out over the North Atlantic on the 10th as a storm force low with central pressures as low as 967 hPa, before weakening into a large complex gale in the northeast Atlantic by the 15th and passing northeast of Iceland on the 16th.

North Atlantic Storm, January 17-19: The developing cyclone, inland over southeast Canada late on January 15, passed near the island of Newfoundland late on the 16th before moving northeast to near 55N 47W with a 969 hPa central pressure late on the 17th, when it briefly developed hurricane force winds near the southern tip of Greenland. The ship (BATEU05) near 59N 44W reported northeast winds of 65 kts at 0300 UTC on the 18th. By 0600 UTC on the 19th the cyclone became a large gale near 62N 36W. The **Sea-Land Mercury** (WKAW) near 48N 23W reported south winds of 45 kts and 10.5 m seas (34 ft) at that time. The system stalled and continued to weaken in the east Greenland waters thereafter, and dissipated late on the 20th.

Western North Atlantic Storm, January 23-26: The development of this hurricane force low over a thirty six hour period is depicted in *Figure 3.* It originated as a frontal wave of low pressure off the southeastern U.S. coast on the 22nd. Much of the initial intensification occurred before passing across the island of Newfoundland early on the 24th when the central pressure fell 33 hPa in the twenty four hour period

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
Charles Island (C6JT)	39N 57W	09/1800	SW 50	
Queen Victoria (GBQV)	45N 57W	11/0700	NW 50	5.0/17
Jaeger Arrow (C6RM7)	47N 50W 47N 44W	11/2300 12/1500	NW 50 W 35	10.0/33 9.8/32
Buoy 44066	38.3N 66.7W	09/0900 09/1300	SW 37 G47 Peak gust 52	5.5/18 8.5/28
Buoy 44137	42.2N 62.0W	09/2000 10/0200 09/2200	NW41 G52 Peak gust 54	7.0/23 Maximum 8.5/28
Buoy 44141	43.0N 58.0W	10/0200		Maximum 9.5/31

Table 1. Selected ship and buoy observations taken during passage of North Atlantic storm, January 8-14, 2011.

ending at 0600 UTC on the 24th. The cyclone is at maximum intensity in the second part of *Figure 3*. At 0600 UTC on the 24th **Hibernia Platform** VEP717 (46.7N 48.7W) with anemometer height 139 m reported southeast winds of 73 kts, while **Terra Nova FPSO** (VCXF) , 46.4N 48.4W with height 53 m, reported southeast winds of 50 kts. Altimetry data from shortly after 0000 UTC on the 25th (*Figure 4*) indicated seas up to 44 ft (13.5 m) off the central Labrador coast, and an ASCAT pass from later on the 25th revealed southeast winds of 50 kts near the southwest Greenland coast. The cyclone subsequently weakened rapidly while passing north through the Davis Strait on the 26th.

North Atlantic Storm, January 30 to February 1: The first in a series of eight hurricane force cyclones to follow in close succession on a southwest to northeast track developed from a low pressure wave south of Newfoundland on January 29, moved northeast of Newfoundland on the 30th and developed hurricane force winds while approaching Iceland with a 963 hPa central pressure by 1800 UTC on the 31st. An ASCAT pass from 1350 UTC on the 31st revealed winds to 45 kts, likely missing the strongest part of the storm. The system then moved northeast of Iceland February 1.

North Atlantic Storm, January 31 to February 2: The cyclone is shown fully developed and near maximum intensity in *Figure 5*. The cyclone originated as a low pressure wave south of Nova Scotia late on the 30th. The central pressure fell 43 hPa in the twenty four hour period ending at 1800 UTC February 1. A high resolution ASCAT pass (*Figure 7*) from 2319 UTC on the 1st revealed an area of 50 to 60 kts west winds south of the center, but there is an 80 kts retrieval in the middle of this area. A NOAA P-3 aircraft investigating this storm measured by dropsonde an 83 kts wind at 1730 UTC February 1 (*Reference 1*). The **London Express** (DPLE, 45N 50W) reported west winds of 50 kts at 0600 UTC on the 1st. The ship **BATEU04** (62N 14W) encountered west winds 56 kts at 0200 UTC on the 3rd. Buoy 64045 (59.1N 11.7W) reported southwest winds of 35 kts and 9.5 m seas (31 ft) at 1100 UTC on the 2nd, followed six hours later by a report of 14.5 m seas (48 ft). The cyclone subsequently passed northeast of Iceland on the 2nd.

North Atlantic Storm, February 2-4: The frontal wave of low pressure south of Nova Scotia in *Figure 5* developed into the hurricane force low northwest of Scotland in *Figure 6*. The central pressure fell 56 hPa in the twenty four hour period ending at 1800 UTC on the 3rd, or more than 2 hPa per hour. The **Tokyo Express** (DGTX) near 45N 41W reported southwest winds of 60 kts at 0000 UTC on the 3rd. One hour later BATEU02 (50N 32W) encountered southwest winds of 55 kts. The buoy 64046 (60.5N 4.8W) reported west winds of 50 kts and 15.8 m seas (52 ft) at 0300 UTC on the 4th. The cyclone then weakened while moving through the Norwegian Sea on the 4th.

North Atlantic Storm, February 6-9: Rapid initial development of this storm occurred as it moved from New Jersey to Newfoundland in the twenty four hour period ending at 0000 UTC on February 7, when the central pressure fell 26 hPa. The cyclone developed hurricane force winds over the northern waters on the 7th and 8th with the center developing a lowest central pressure of 948 hPa near the east Greenland coast, where it stalled late on the 8th. ASCAT imagery on the 7th showed a partial view with west to northwest winds of 50 kts. The **Sea-Land Champion** (WKAU) near 42N 60W reported west winds of 55 kts and 5.8 m seas (19 ft) at 1500 UTC on the 6th. As the cyclone passed northeast of the Grand Banks the platform **Mawddy Tide** (YJQN7, 46.7N 48.4W) reported west winds 65 kts at 1200 UTC on the 7th, and seas 7.9 m (26 ft) three hours later. **Terra Nova FPSO** (VCXF) , 46.4N 48.4W at 1200 UTC on the 7th reported northwest winds of 55 kts. The buoy 44140 (42.9N 51.4W) reported west winds 40 kts and 6.7 m seas (22 ft) at 0300 UTC on the 7th , and 8.5 m seas (28 ft) four hours later. Far to the northeast the **Arnafell** (OZ2048) near 63N 20W reported east winds 50 kts at 1800 UTC on the 8th. The cyclone weakened while stalled off the east Greenland coast on the 9th and dissipated by the 10th.

North Atlantic Storm, February 8-10: Originating near the North Carolina coast late on the 7th, the cyclone developed hurricane force winds as it moved over the Grand Banks at 0600 UTC on the 9th with a 957 hPa central pressure, a drop of 43 hPa over the previous twenty four hours. The **Independence II** (WGAX) near 33N 64W reported southwest winds of 50 kts and 4.0 m seas (13 ft) at 1500 UTC on the 8th. At 0600 UTC on the 9th **Hibernia Platform** (VEP717, 46.7N 48.7) reported southwest winds of 72 kts, and the **Sea Rose FPSO** (VOXS, 46.7N 48.0W) reported west winds 58 kts three hours later. A high resolution ASCAT image from 1228 UTC on the 9th showed 50 to 55 kts west to southwest wind retrievals just east of the Grand Banks. As the cyclone moved farther north over the North Atlantic late on the 9th and early on the 10th its peak winds lowered to storm force (*Figure 8*), as it was about to be absorbed by another deepening system approaching from the south.

North Atlantic Storm, February 9-11: This next developing cyclone followed in the rear of the aforementioned departing system, passing east just south of the island of Newfoundland early on the 9th before turning north by the 10th. *Figure 8* shows the cyclone as the southern 956 hPa center which then deepened into a 935 hPa hurricane force low near the southeast Greenland coast by 1200 UTC on the 11th. The **Saar N** (A8CI8) near 39N 39W reported west winds of 55 kts and 12.2 m seas (40 ft) at 0000 UTC on the 10th. The **Atlantic Concert** (SKOZ) near 43N 28W reported southwest winds of 55 kts and 7.6 m seas (25 ft) at 0600 UTC on the 10th.

Buoy 44140 (42.9N 51.5W) reported southwest winds of 47 kts and 6.7 m seas (22 ft) at 1800 UTC on the 9th, and maximum seas 7.6 m (25 ft) three hours later. This cyclone weakened rapidly late on the 11th as another even stronger low was about to replace it.

North Atlantic Storm, February 10-13: The next event, the most intense of the period, developed from the frontal wave of low pressure off the U.S. mid-Atlantic coast at 1200 UTC on the 10th (*Figure 8*). *Figure 9* shows the cyclone at maximum intensity with a 932 hPa central pressure forty eight hours later. The central pressure fell 58 hPa in the twenty four hour period ending at 1800 UTC on the 11th, when the cyclone was at 52N 35W with a 943 hPa center. The ship DGEF (43N 41W) reported southwest winds of 65 kts and 15.5 m seas (51 ft) at 0600 UTC on the 11th followed twelve hours later by a report of west winds of 65 kts and 19.2 m seas (63 ft) near 44N 42W. The **Saar N** (A8CI8) encountered southwest winds of 55 kts and 8.5 m seas (28 ft) near 42N 28W at 0000 UTC on the 12th. *Figure 11* is a view of the south semicircle of the storm in ASCAT imagery showing widespread 50 to 65 kts winds, impressive given that the winds have a low bias at high wind speeds. The cyclone subsequently stalled in the east Greenland waters by the 13th and weakened, with *Figure 10* showing a remnant gale center at 1200 UTC on the 14th.

North Atlantic Storm, February 12-16: *Figures 9 and 10* follow the progress of the developing hurricane force low off the U.S. mid-Atlantic coast to become the 954 hPa hurricane force system over the central waters. The cyclone developed a lowest central pressure of 950 hPa near 49N 42W at 1800 UTC on the 13th, a drop of 46 hPa over the preceding twenty four hours. ASCAT imagery from 2228 UTC on the 13th (*Figure 12*) gives a partial view of winds 50 to 70 kts on the south side of the cyclone. Altimetry data from 1100 UTC on the 14th (*Figure 13*) reveal seas as high as 66 ft (20.1 m), the highest the author has seen in this type of imagery. At 1500 UTC on the 13th the **Mawddy Tide** (YJQN7, 46.7N 48.4W) reported northwest winds of 75 kts and 5.2 m seas (17 ft) while the **Terra Nova FPSO** (VCXF, 46.4N 48.4W) encountered northwest winds of 60 kts. The ship DGEF (43N 44W) reported west winds of 50 kts and 14.3 m seas (47 ft) at 1200 UTC on the 12th. Twenty four hours later the **Atlantic Concert** (SKOZ) encountered west winds of 60 kts near 41N 46W. The buoy 62442 (49N 16.2W) reported west winds of 35 kts at 0100 UTC on the 15th, with highest seas 12.2 m (40 ft) three hours later. Hurricane force winds with this system lasted from early on the 13th through much of the 14th. The cyclone then made a cyclonic loop early on February 15 and weakened to a gale as it moved through the Bay of Biscay late on the 16th.

North Atlantic Storm, February 15-20: The inland cyclone over southeastern Canada at 1200 UTC on the 14th (*Figure 10*) developed storm force winds as it passed east of the island of Newfoundland late on the 15th, and then became a complex hurricane force system in the north-central Atlantic late on the 16th, where it stalled. Its main center developed a lowest central pressure of 961 hPa near 50N 46W at 0600 UTC on the 17th. The **Mawddy Tide** (YJQN7, 46.7N 48.4W) reported west winds of 78 kts, while **Hibernia Platform** (VEP717, 46.7N 48.7W) reported northwest winds 74 kts, and **GSF Grand Banks** (YJUF7, 46.7N 48.0W) northwest 57 kts, at 0900 UTC on the 17th. Three hours prior, **Terra Nova FPSO** (VCXF, 46.4N 48.4W) encountered northwest winds of 66 kts. The system slowly weakened with the top winds dropping to storm force late on the 17th, but redeveloped toward a new center to the northeast near 55N 35W by the 19th, producing a period of hurricane force winds near the southern tip of Greenland like those in the January 17-19 storm. The center then moved southwest and stalled east of Newfoundland on the 20th as a gale, and became absorbed by a storm passing to the east by the 22nd.

Northwest Atlantic Storm, February 25-28: The last notable event of this active month followed a track from the northeastern U.S. toward Greenland as depicted in *Figure 14*. The second part of *Figure 14* shows the cyclone fully developed, at maximum intensity. ASCAT wind retrievals near that time were similar to those in *Figure 11* for an earlier event. At 2100 UTC February 26 the elevated platform **Mawddy Tide** (YJQN7) reported south winds 77 kts and 6.7 m seas (22 ft) while **Terra Nova FPSO** (VCXF) reported southwest winds of 60 kts and **GSF Grand Banks** (YJUF7) encountered south winds of 50 kts. Three hours later **Terra Nova FPSO** also reported west winds 55 kts and 9.0 m seas. Buoy 44137 (42.2N 62.0W) reported northwest winds 47 kts with gusts to 58 kts and 8.0 m seas (26 ft) at 1100 UTC on the 26th and highest seas 9.0 m (30 ft) three hours later. The cyclone subsequently continued on a northeastward track passing between Greenland and Iceland as a gale by March 1.

Northwest Atlantic Storm, March 4-8: A wave of low pressure over the Gulf of St. Lawrence early on the 3rd moved northeast while intensifying over the next thirty-six hours. Confined by two strong areas of high pressure to the southwest and east, this cyclone briefly developed hurricane force winds at 1800 UTC on the 4th with a central pressure of only 988 hPa as indicated in OPC's six-hourly surface analysis charts. The primary center dissipated shortly thereafter as a new storm center formed between Greenland and Iceland on the 5th and lingered there until moving northeast on the 8th.

North Atlantic Storm, Greenland area, March 13-15: A rapidly intensifying low moved northeast off the central Labrador coast early on March 13 and developed hurricane force winds and a central pressure as low as 952 hPa while reaching the Denmark Strait. The central pressure fell 33 hPa in the twenty-four hour period ending at 1200 UTC on the 14th. High resolution ASCAT from two passes on the morning of the 14th revealed west to northwest winds to 55 kts. The **Atlantic Conveyor** (SCKM, 51N 41W) reported southwest winds of 45 kts and 4.3 m seas (14 ft) at 0000 UTC on the 14th. Later, at 0900 UTC on the 15th the **Helgafell** (OZ2049) encountered south winds of 45 kts near 63N 13W. A weakening trend began later on the 14th and winds diminished to gale force as the cyclone passed north of Iceland late on the 15th.

North Atlantic Storm, March 21-24: A storm force low developed as a frontal wave over the central waters on the 21st and early on the 22nd and moved north, developing hurricane force winds on the 23rd (*Figure 15*). The second part of *Figure 15* shows the cyclone at maximum intensity. *Figure 16* is an ASCAT image revealing an area of east to northeast winds to 55 kts on the north side of the cyclone, north of an apparent frontal boundary. The **Rotterdam Express** (DMRX) near 46N 36W reported southeast winds of 50 kts and 11.9 m seas (39 ft) at 0000 UTC on the 23rd. Six hours later the **Patriot** (WQVY) encountered southwest winds of 50 kts near 45N 40W. The **Terra Nova FPSO** (VCXF, 46.4N 48.4W) encountered northwest winds of 60 kts and 6.7 m seas (22 ft) at 2100 UTC on the 22nd. The cyclone subsequently drifted northwest and weakened on the 24th and dissipated in the Labrador Sea late on the 25th.

North Atlantic Storm, March 24-26: The low pressure complex seen over the U.S. in the second part of *Figure 15* redeveloped off Cape Hatteras later that day and moved northeast, developing a central pressure as low as 966 hPa while approaching the Grand Banks late on the 25th. The cyclone was accompanied by a period of hurricane force winds early on the 25th with 50 kts west winds appearing on a WindSat image south of the center as it was passing south of Newfoundland (*Reference 4*). The **Finnfighter** (SBFC, 46N 50W) reported northeast winds of 50 kts and 4.6 m seas (15 ft) at 1200 UTC on the 25th , while nearby **Hibernia Platform** (VEP717) reported east winds of 60 kts. Buoy 44140 (42.9N 51.5W) reported west winds of 45 kts with gusts to 56 kts and 10.0 m seas (33 ft) two hours later. The cyclone then weakened as it turned northwest toward southern Labrador on the 26th, becoming a gale later that day before becoming absorbed on the 28th.

North Atlantic Storm, April 22-24: Less than a month later a deep low developed over the northern waters near Iceland as depicted in *Figure 17*. It originated near Nova Scotia as a 1008 hPa frontal wave of low pressure early on the 21st and briefly developed hurricane force winds late on the 23rd before passing north of Iceland and weakening on the 24th. ASCAT imagery from near 0000 UTC on the 24th showed winds to 45 kts but missed the area south of the cyclone. The **Maersk Palermo** (PDHW) near 50N 37W reported southwest winds of 50 kts at 0000 UTC on the 23rd. Six hours later the **Maersk Patras** (MYSU5) encountered south winds of 45 kts and 11.3 m seas (37 ft).

Northeastern Atlantic Storm, May 22-24: An unseasonably deep cyclone for late May moved over the far northeastern waters as shown in *Figure 18*. Originating near Newfoundland early on the 21st, it deepened by 27 hPa in the twenty-four hour period ending at 0600 UTC on the 23rd and briefly developed hurricane force winds early on the 23rd before passing north of Scotland. The buoy 64049(54.3N 11.0W) reported southwest winds of 68 kts at 0600 and 0900 UTC on the 23rd and 14.3 m seas (47 ft) at 0900 UTC that day. The ship BATFR04 (56N 13W) encountered west winds 58 kts at that time. The cyclone subsequently weakened to a gale by the 24th and passed north of the area later that day.

North Atlantic Storm, May 23-25: The aforementioned strong system was immediately followed by a second storm, not as intense, developing from the frontal wave of low pressure appearing south of Greenland in the second part of *Figure 18*. It developed a lowest central pressure of 992 hPa near 52N 23W at 1800 UTC on the 24th. The **CSAV Paranagua** (V2NA1) near 50N 39W reported northeast winds of 50 kts and 8.5 m seas (28 ft) at 0500 UTC on the 24th. The **Rotterdam** (PDGS) reported south winds of 45 kts near 47N 27W at 0800 UTC on the 24th. Buoy 64049 (54.3N 11.0W) reported south winds of 50 kts and 9.0 m seas (30 ft) at 0600 UTC May 25. The system subsequently weakened to a gale force low as it passed over Great Britain early on the 26th, then moved into Norway on May 27.

North Atlantic Storm, June 14-15: An unusually deep low for June developed a lowest central pressure of 978 hPa as depicted in *Figure 19*. It developed from a complex low pressure system near Newfoundland early on the 12th. The **Falstaff** (SLCO) reported northwest winds of 55 kts and 6.4 m seas (21 ft) at 1800 UTC on the 14th, while the Bonn Express encountered west winds of 35 kts and 6.0 m seas (20 ft) near 51N 27W. At 1200 UTC the next day the latter ship reported 7.3 m seas (24 ft) at 50N 19W. The cyclone weakened to a gale after 0000 UTC on the 15th, stalled near 57N 20W through the 16th and re-formed east of Great Britain by the 18th. ⚓

References

1. E-mail communication, Sienkiewicz, Joseph, 6/13/2011, OAB Weekly Summary June 6-10, 2011.

2. ASCAT Users Manual, http://www.knmi.nl/scatterometer/publications/pdf/ASCAT_Product_Manual.pdf

3. Von Ahn, Joan. and Sienkiewicz, Joe, Hurricane Force Extratropical Cyclones Observed Using QuikSCAT Near Real Time Winds, *Mariners Weather Log, Vol. 49, No. 1, April 2005.*

4. http://www.nrl.navy.mil/WindSat

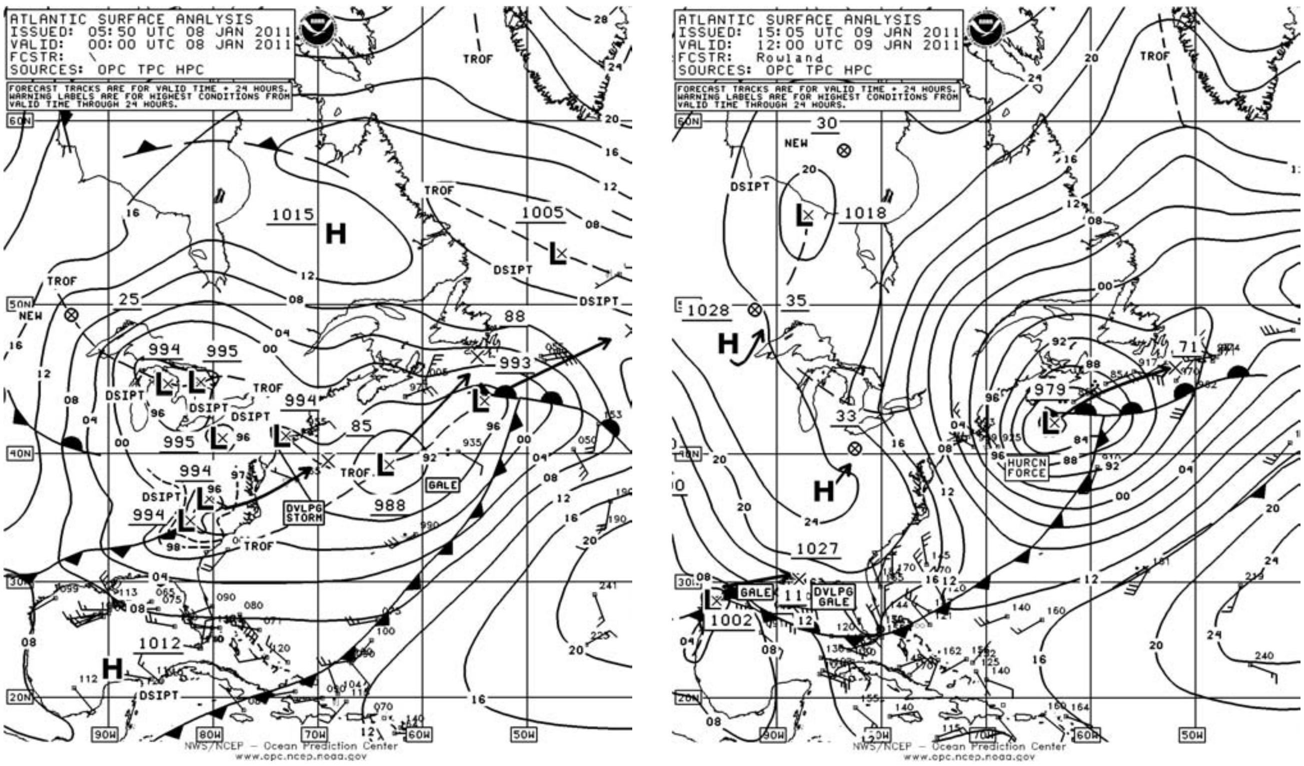


Figure 1. v

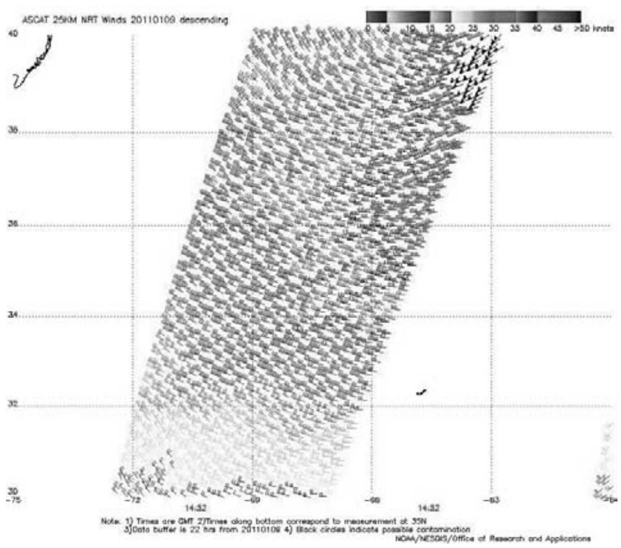


Figure 2. 25 km ASCAT (Advanced Scatterometer) image of satellite-sensed winds around the southwest side of the cyclone shown in Figure 1. The valid time of the pass is 1452 UTC January 9, 2011, or about three hours later than the valid time of the second part of Figure 1. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

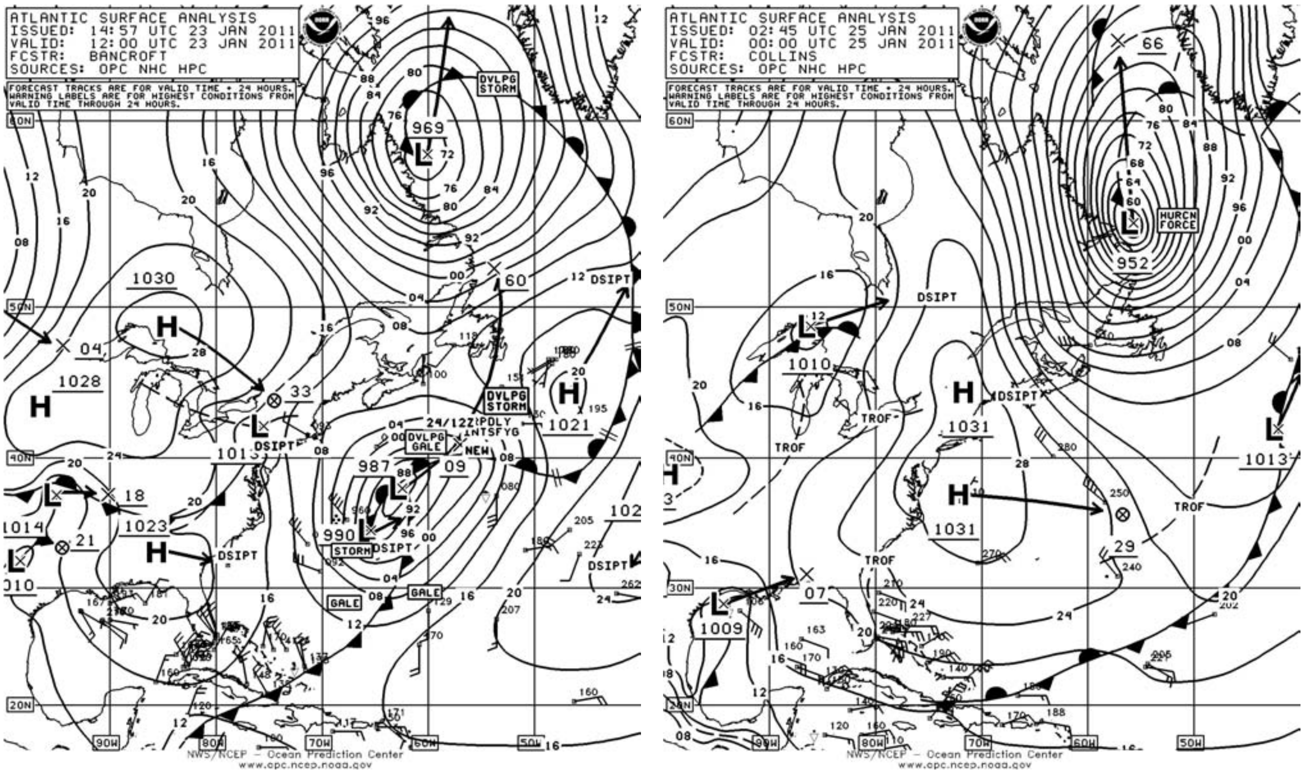


Figure 3. OPC North Atlantic Surface Analysis charts valid 1200 UTC January 23 and 0000 UTC January 25, 2011.

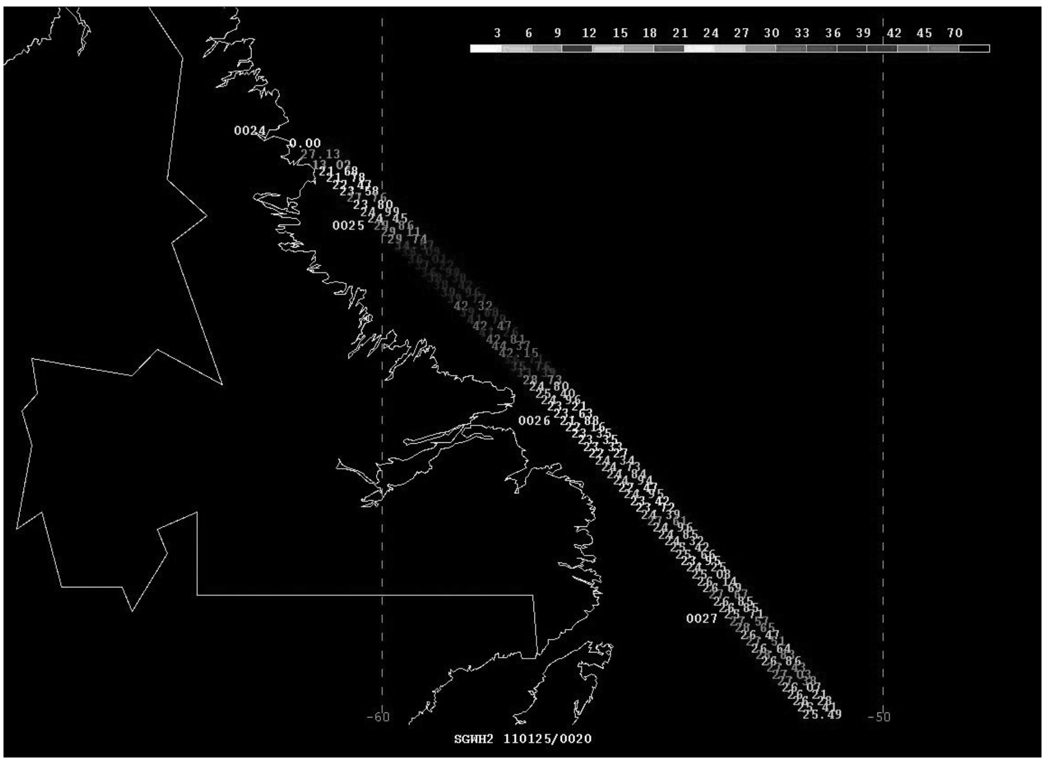


Figure 4. Jason-2 descending altimeter pass valid approximately 0026 UTC January 25, 2011. Remotely-sensed wave heights are given as feet with two decimal places and times (UTC) are shown to the left of the track. The valid time of the pass is close to that of Figure 3.

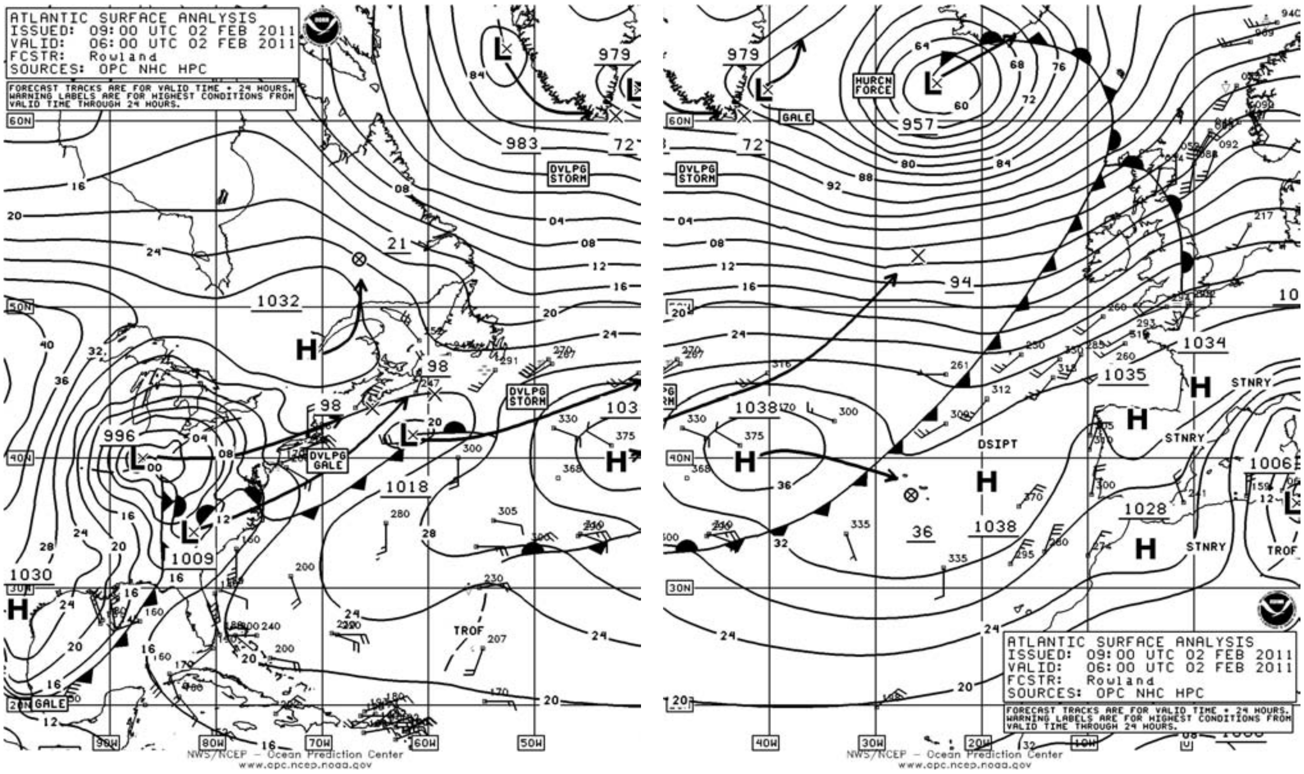


Figure 5. OPC North Atlantic Surface Analysis charts valid 0600 UTC February 2, 2011.

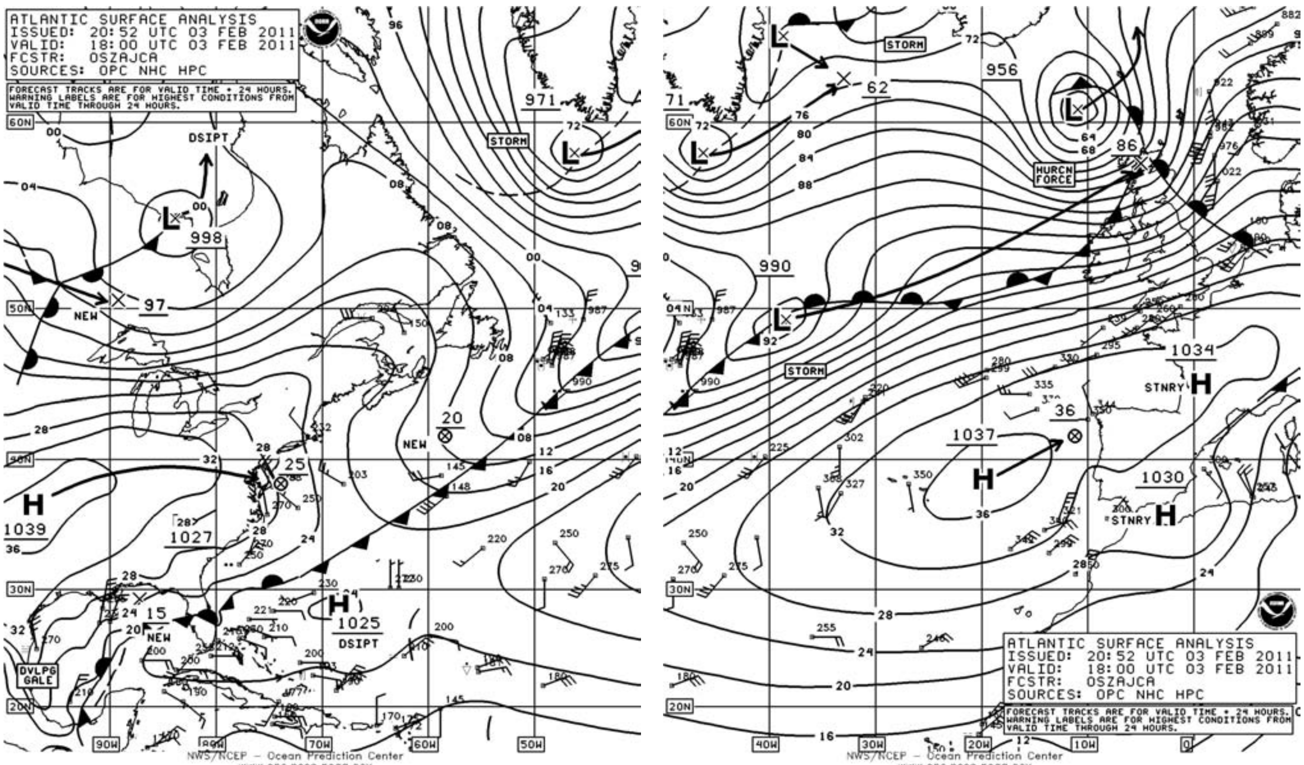


Figure 6. OPC North Atlantic Surface Analysis charts valid 1800 UTC February 3, 2011.

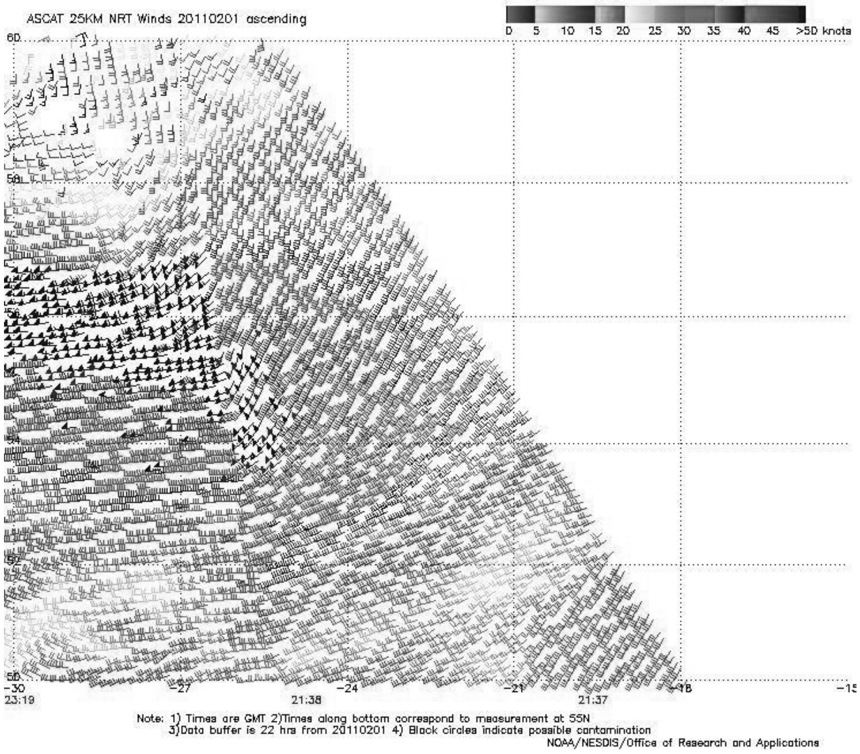


Figure 7. 25-km ASCAT (Advanced Scatterometer) image of satellite-sensed winds around the southeast side of the cyclone shown in Figure 5. The valid time of the pass is 2319 UTC February 1, 2011 or about seven hours prior to the valid time of Figure 5. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

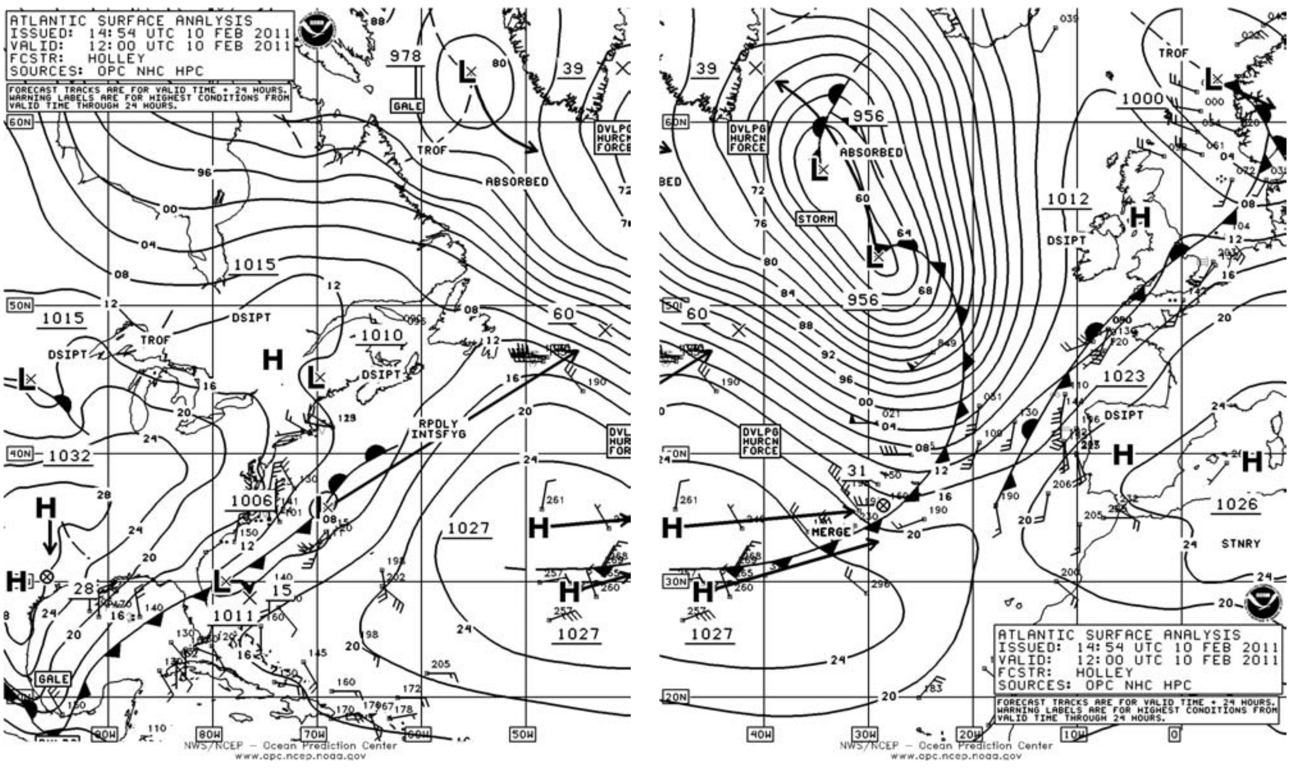


Figure 8. OPC North Atlantic Surface Analysis charts valid 1200 UTC February 10, 2011.

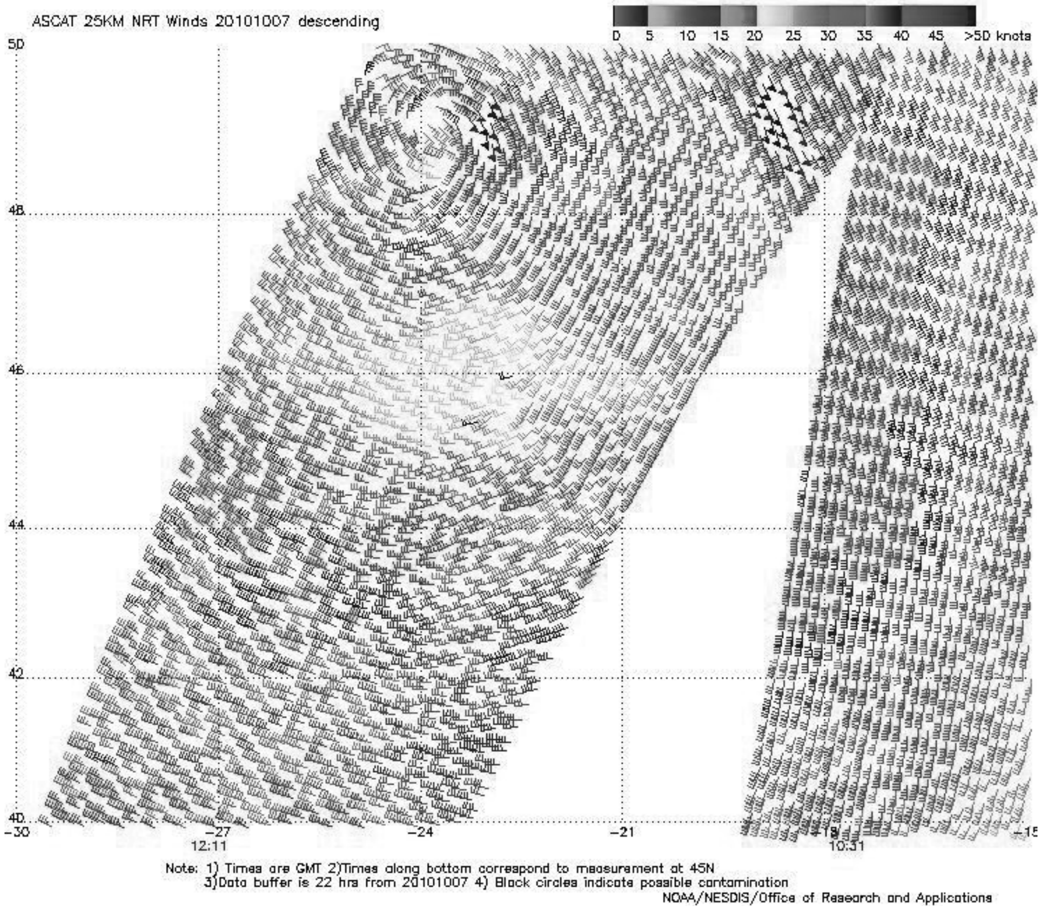


Figure 9. OPC North Atlantic Surface Analysis charts valid 1200 UTC February 12, 2011.

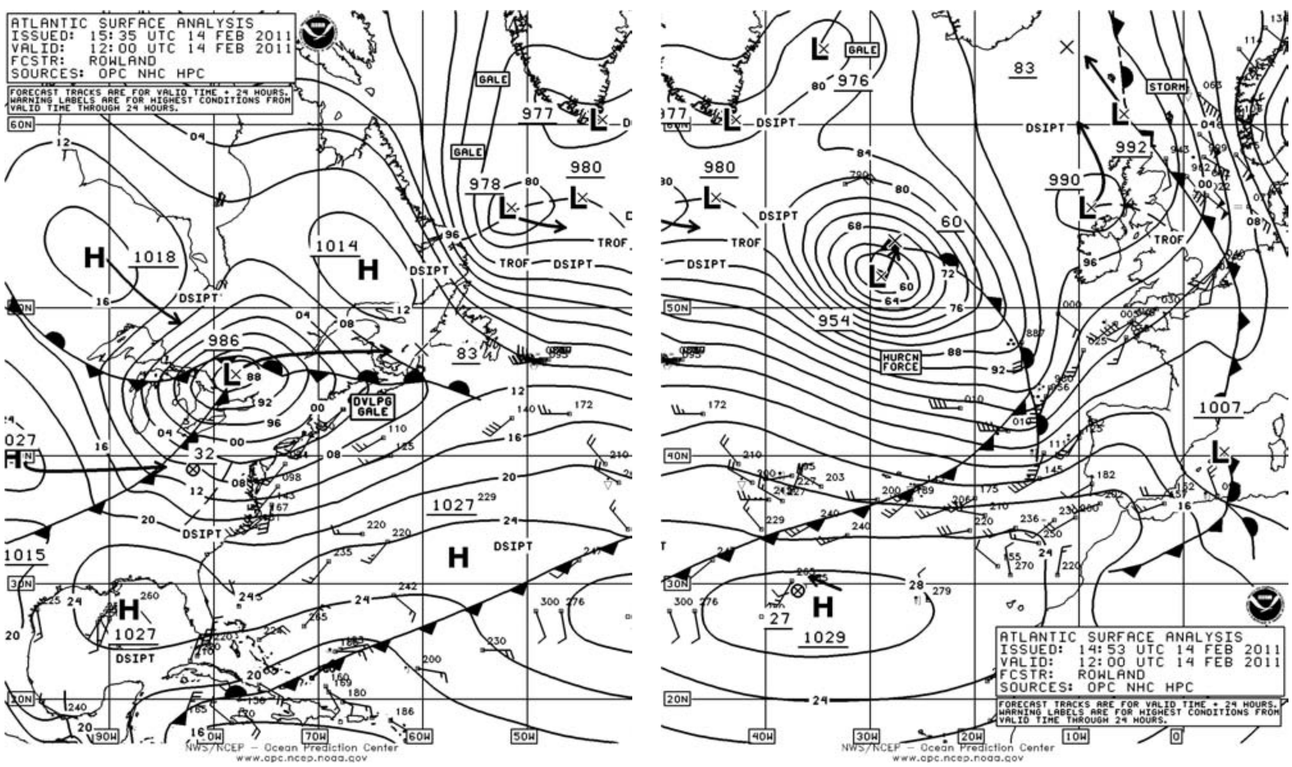


Figure 10. OPC North Atlantic Surface Analysis charts valid 1200 UTC February 14, 2011.

Marine Weather Review — North Atlantic Area

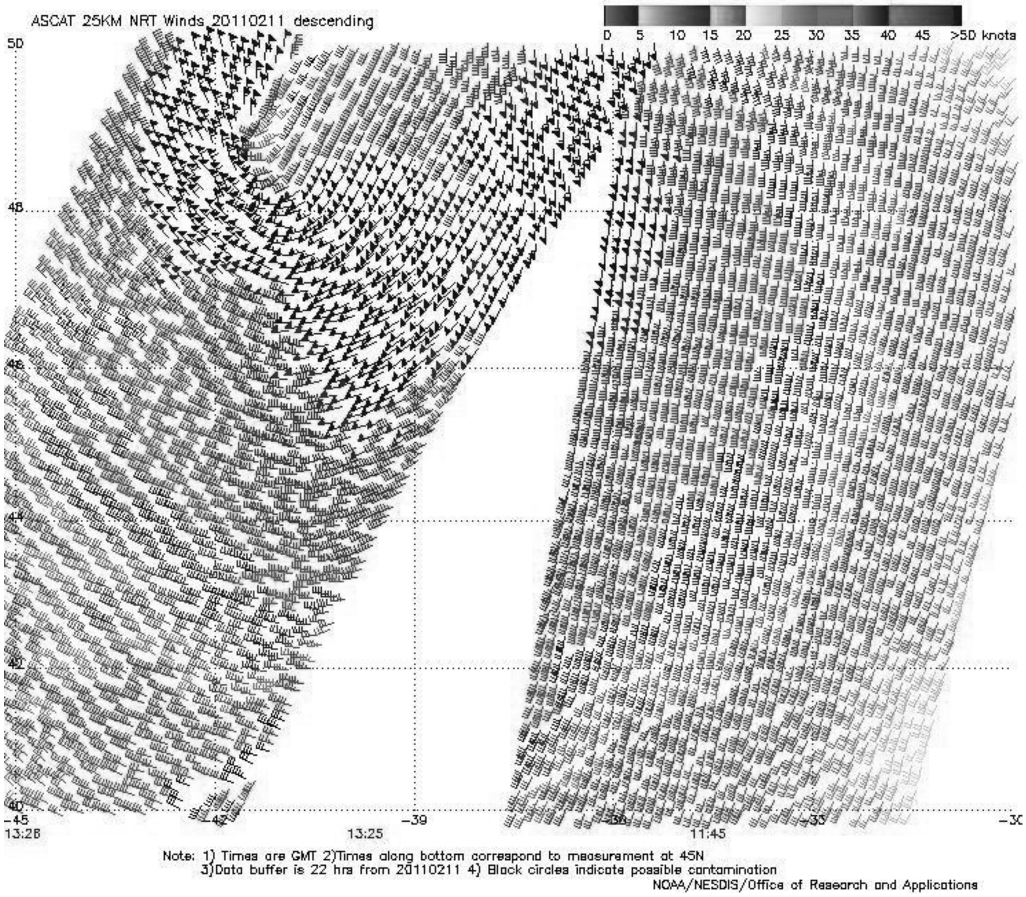


Figure 11. 25-km ASCAT image of satellite-sensed winds around the south side of the hurricane force low shown in Figure 9. The valid time of the pass is 1325 UTC February 11, 2011 or less than twenty-three hours prior to the valid time of Figure 9. The center of the rapidly intensifying cyclone was near 50N 40W at the time of this image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

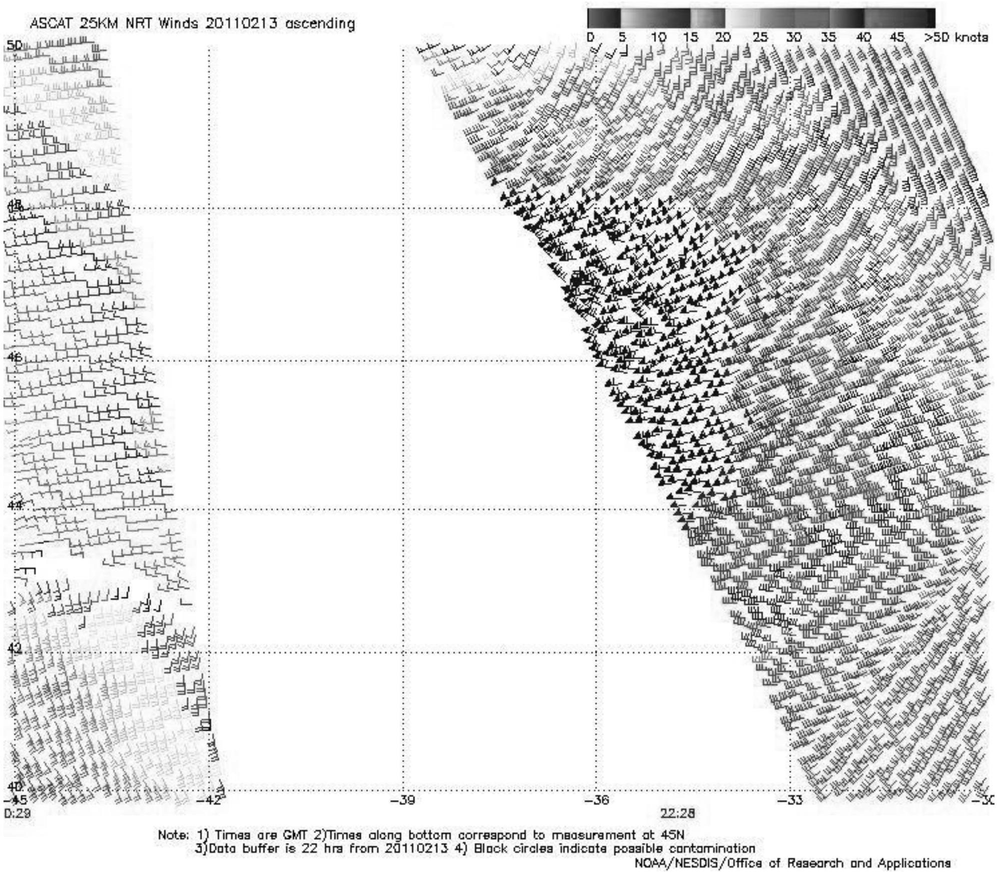


Figure 12. 25-km ASCAT image of satellite-sensed winds providing a partial view of the south side of the hurricane force low shown in Figure 10. The valid time of the pass is 2228 UTC February 13, 2011, or about thirteen and one-half hours prior to the valid time of Figure 10. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

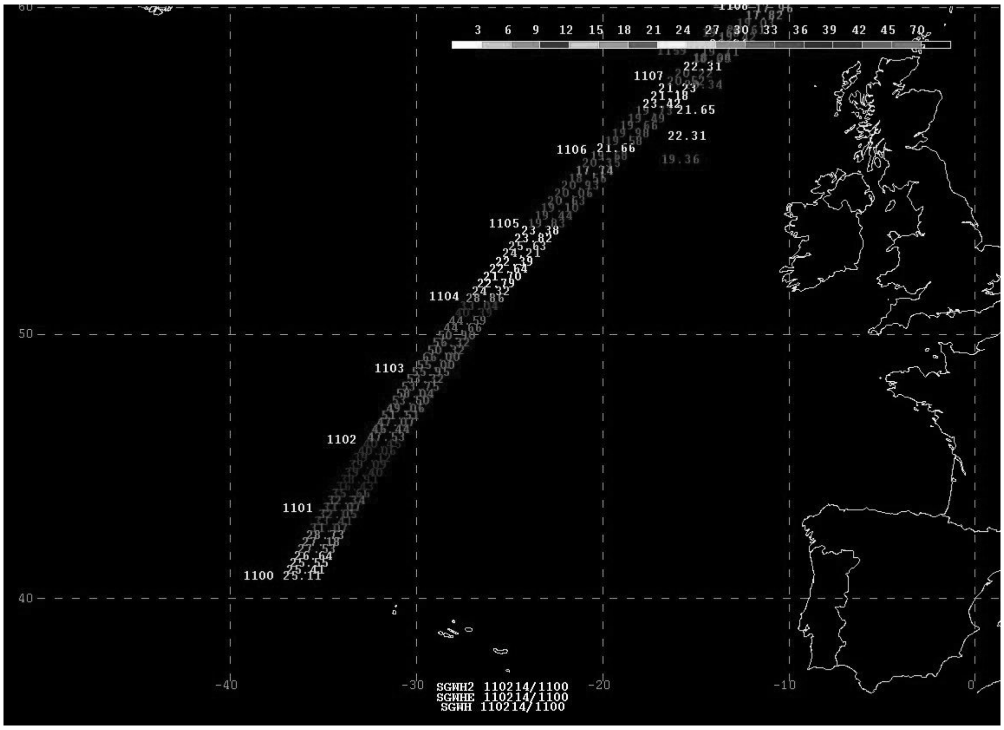


Figure 13. Combined Jason and Envisat altimeter passes valid approximately 1105 UTC February 14, 2011, or about one hour prior to the valid time of Figure 10. Wave heights are given as feet with two decimal places and times (UTC) are shown to the left of the track.

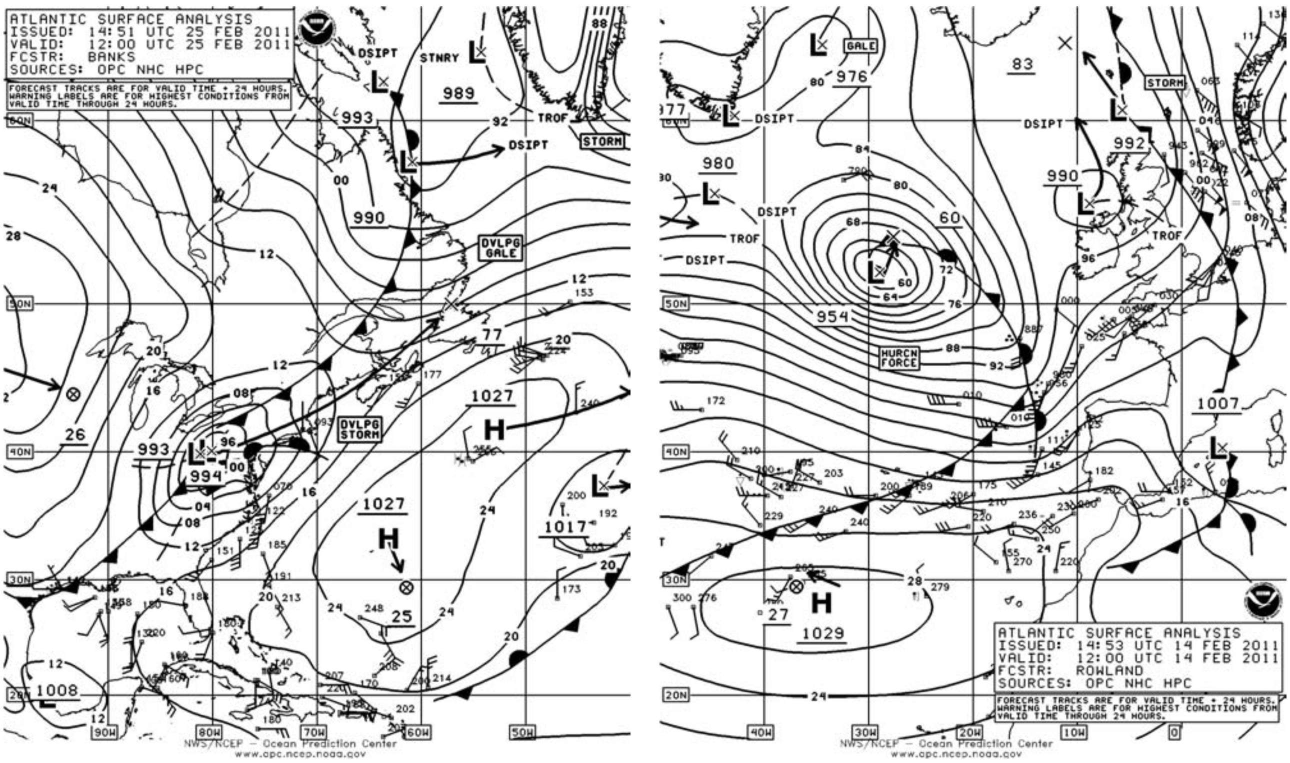


Figure 14. OPC North Atlantic Surface Analysis charts valid 1200 UTC February 25 and 27, 2011.

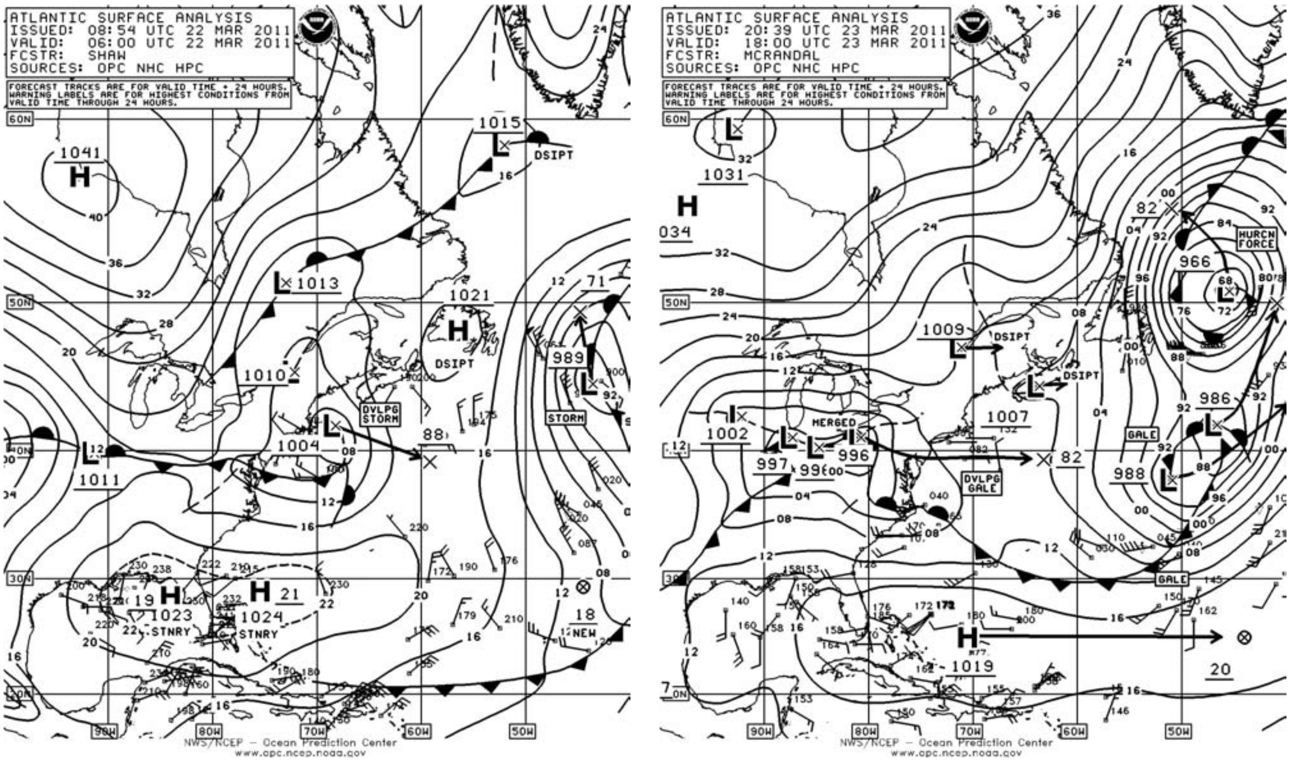
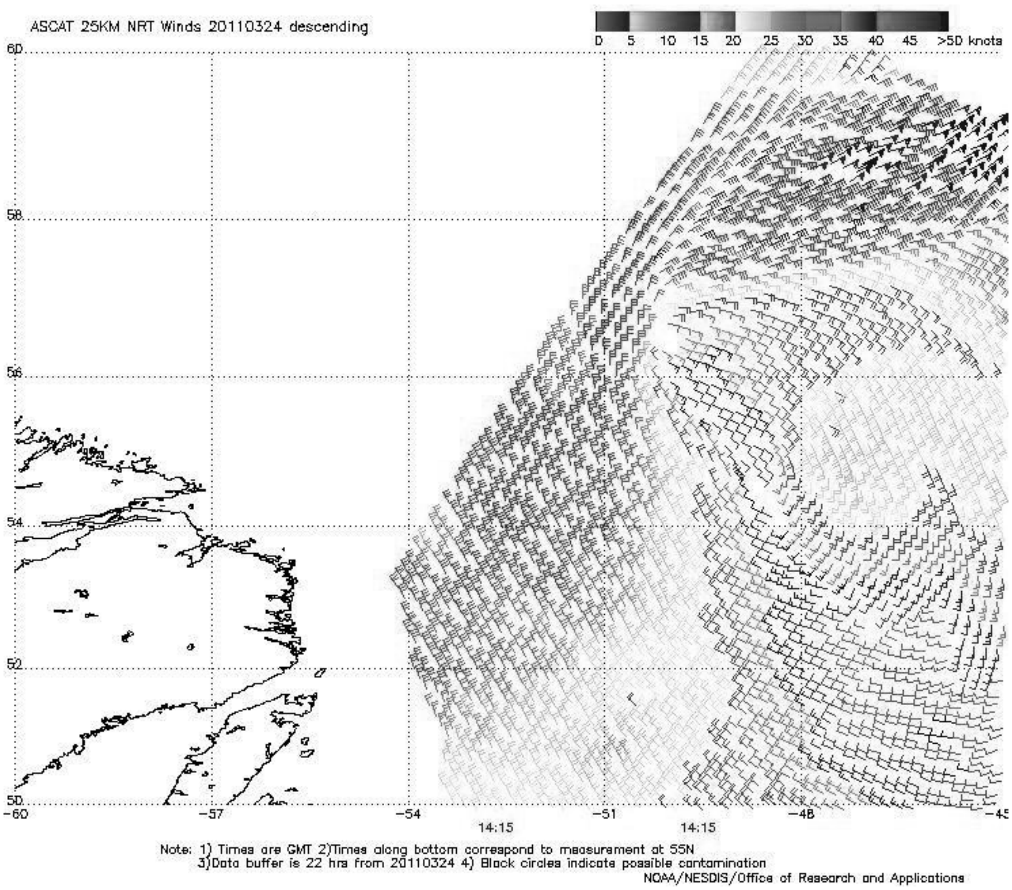


Figure 15. OPC North Atlantic Surface Analysis charts valid 0600 UTC March 22 and 1800 UTC March 23, 2011.

Figure 16. 25 km ASCAT image of satellite-sensed winds around the cyclone shown entering the Labrador Sea in the second part of Figure 15. The valid time of the pass is 1415 UTC March 24, 2011, or about twenty hours later than the valid time of Figure 15. The center of the cyclone is near 56N 49W near the center of the image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.



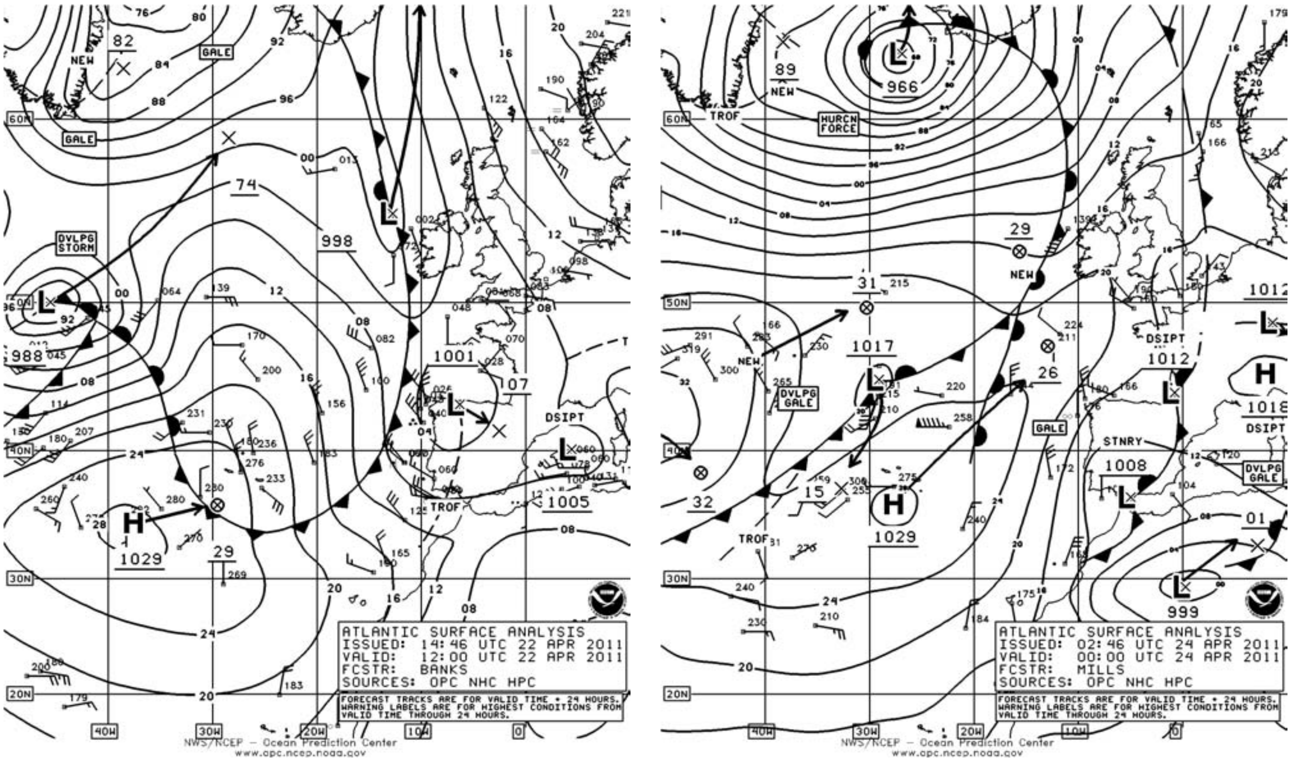


Figure 17. OPC North Atlantic Surface Analysis charts valid 1200 UTC April 22 and 0000 UTC April 24, 2011.

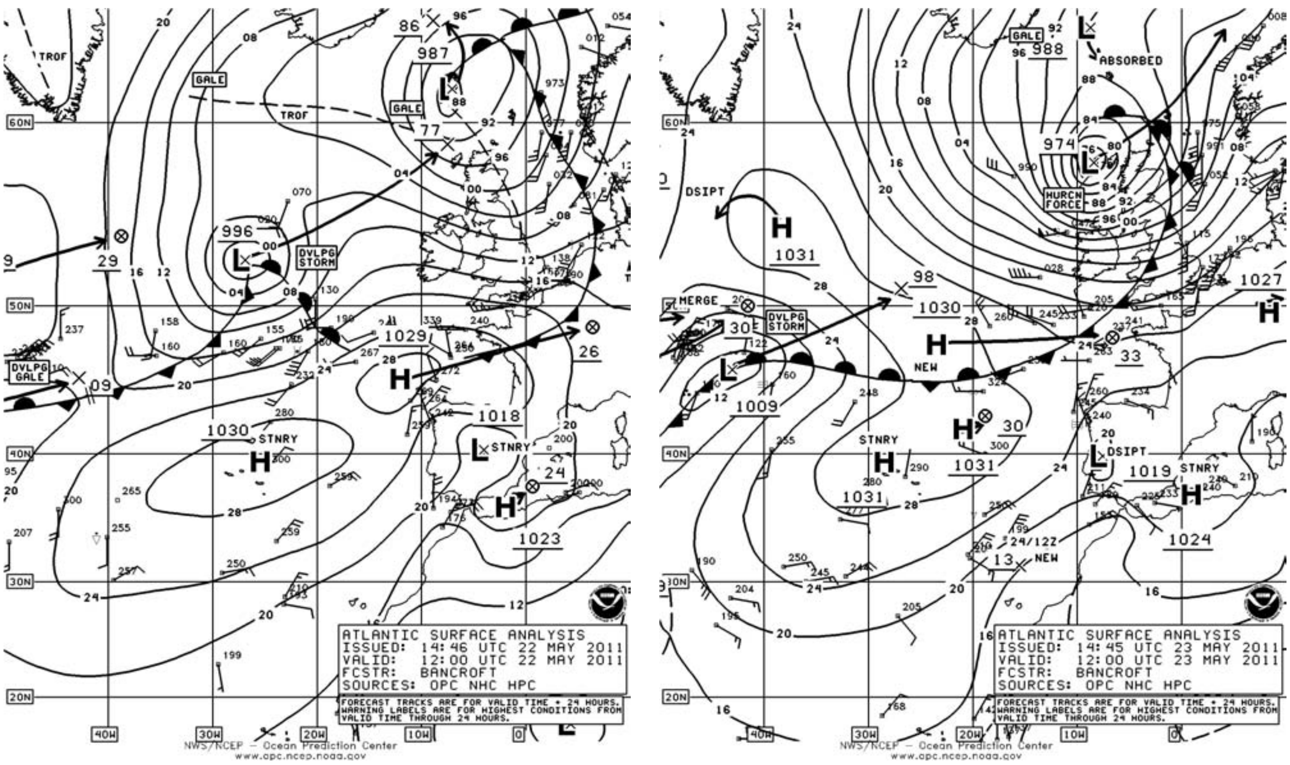


Figure 18. OPC North Atlantic Surface Analysis charts valid 1200 UTC May 22 and 23, 2011.

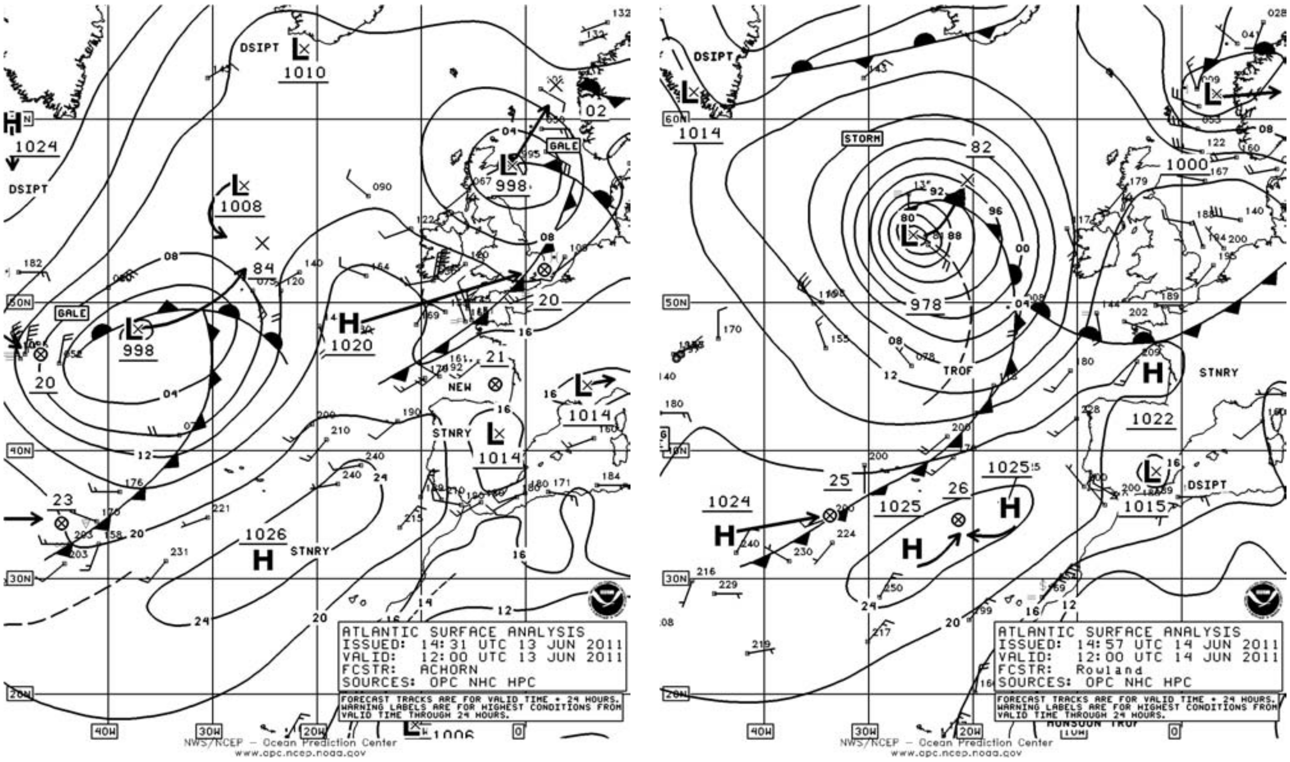


Figure 19. OPC North Atlantic Surface Analysis charts valid 1200 UTC June 13 and 14, 2011.

Marine Weather Review – North Pacific Area

January to June 2011

By George P. Bancroft
NOAA National Center for Environmental Prediction/ Ocean Prediction Center

Introduction

The most active storm track during the period was from near Japan northeastward toward the Bering Sea; occasionally forming secondary cyclones to the east, moving toward the Gulf of Alaska. January and March were most active, with seven and six hurricane force lows, respectively. The most remarkable feature of the period was the occurrence of three cyclones with central pressures in the 930 hPa, with one each in January, March and April. The 933 hPa event in January was the deepest central pressure the author has seen in the North Pacific from a non-tropical system. All were northwestern Pacific and Bering Sea events. There was a notable lack of hurricane force events in the eastern North Pacific from looking at the six hourly OPC surface analysis charts, with the only two occurring off the coasts of the Pacific Northwest and Canada early in March.

Two weak tropical cyclones affected the far southwest waters, with one each in early April and in May. A stronger tropical system, **Songda** late in May, became a significant extra tropical storm which moved out over the North Pacific into early June.

Tropical Activity

Tropical Depression 02W: This cyclone formed near 16N 139E late on April 4th with maximum sustained winds of 30 kts with gusts to 40 kts, and moved northeast over the next day, before becoming extra tropical by 0600 UTC on the 6th, near 18N 149E in *Figure 20.* The cyclone then shifted south on the 7th as high pressure built to the northeast.

Tropical Storm Aere: Tropical Storm **Aere** moved northeast into the area near 31N 136E late on May 11th with maximum sustained winds of 35 kts with gusts to 45 kts and became extra tropical six hours later. Aere then moved northeast toward the western Aleutian Islands over the next three days as a gradually intensifying extra tropical gale, attaining a lowest central pressure of 976 hPa near the central Aleutians early on the 15th before weakening over the Alaska Peninsula by the 17th.

Tropical Storm Songda: Songda, formerly a typhoon west of the area, passed south of Japan as a tropical storm becoming extra tropical early on May 29th as depicted in *Figure 24.* It is shown redeveloping as a storm force low in the second part of *Figure 24.* The reported winds and seas listed in *Table 1* indicate this former tropical system became a significant marine event with the highest seas reported by a ship in the North Pacific during the six month period. The cyclone redeveloped northeast to a new center near 46N 179W early on June 1st which moved into the southeast Bering Sea as a 974 hPa storm on the 2nd before turning northwest and weakening in the northern Bering Sea on the 5th.

OBSERVATION	POSITION	DATE/TIME (UTC)	WIND	SEA(m/f)
APL Thailand (WCX8882)	37N 147E	30/0000	E45	
	38N 148E	30/0600	E55	16.2/53
	40N 151E	30/1800	E50	14.9/49
Pacific Triangle (ELXS8)	36N 141E	30/1200	N50	
	36N 142E	30/1800	N45	10.0/33
Tyco Durable (V7DI8)	36N 142E	30/1200	N45	8.8/29
	36N 142E	31/000	NE45	11.0/36
Horizon Consumer (WCHF)	43N 169E	01/0800	NE50	
APL Arabia (A8CC4)	41N 172E	01/1800	NE50	
APL Singapore (WCX8812)	54N 171W	03/0600	NW45	7.9/26
A8GK7	54N 167W	03/1400	SW50	6.4/21

Table 1. Selected ship observations taken during passage of Tropical Storm Songda after transition into an extra tropical storm.

Other Significant Weather of the Period

North Pacific Storm, January 1-4: The hurricane force low passing south of the central Aleutian Islands in the first part of *Figure 1* was the redevelopment northeastward of a storm system that was near Japan at the end of December 2010. The ship **Hyundai Garnet** (9VVN) near 44N 149E reported northeast winds of 50 kts , and the ship **Hatsu Ethic** (VQFS4) located nearby at 43N 148E encountered 9.4 m seas (31 ft), at 1200 UTC January 1st. At 0000 UTC January 4th the ship **Vienna Express** (DGWF2) reported northwest winds of 50 kts near 54N 166W. A high-resolution ASCAT pass from 0745 UTC on the 4th provided a partial view of the south side of the cyclone, with around 50 kts of southwest wind retrievals near 50N 159W. The cyclone weakened to a gale in the Gulf of Alaska later on the 4th before turning southeast on the 6th and dissipating near the Canadian coast on the 7th.

North Pacific Storm, January 4-6: A weak low south of Japan early on January 3rd moved northeast and intensified over a forty eight hour period, briefly developing hurricane force winds with a 970 hPa center 44N 169E in *Figure 1.* ASCAT winds with this storm south of the center were similar to those in the January 1st-4th event. The cyclone moved across the western Aleutian Islands with a 967 hPa center early on the 6th before weakening in the Bering Sea and then turning north into Russia by the 8th. At 2200 UTC on the 6th the buoy 46073 (55N 172W) reported southeast winds of 43 kts with gusts to 52 kts and 6.5 m seas (21 ft). There was a peak gust of 56 kts at 1500 UTC that day and highest seas were 7.0 m (23 ft) at 0400 UTC on the 7th.

Northwestern Pacific Storm, January 5-8: A complex low pressure system near northern Japan consolidated into single 964 hPa hurricane force low near the central Kurile Islands over a thirty-six hour period as depicted in *Figure 2*. *Figure 3* shows ASCAT winds of up to 50 kts on the west side of the cyclone near the time of the second part of *Figure 2*. The cyclone moved east and weakened to a gale near 47N 162E by 1800 UTC on the 8th before drifting northwest and becoming absorbed on the 11th. At 0000 UTC on the 8th the ship **Igarka** (UIFC) near 57N 152E reported northeast winds of 50 kts and 7.0 m seas (23 ft). Six hours later the ship **Hanjin Philadelphia** (A8CN8) encountered northwest winds of 45 kts and 10.7 m seas (35 ft) near 42N 149E.

North Pacific Storm, January 12-15: With the area north of 50N blocked by high pressure, this storm took a more southern track (*Figure 4*) and remained south of 45N for much of its trek across the North Pacific. Hurricane force winds with this cyclone lasted from the 13th to early on the 14th. ASCAT imagery from 2156 UTC on the 13th contained a 65 kts retrieval south of the center and resembles that of *Figure 15* for the March 12th-13th event. The ship **Maersk Derince** (DDAC2) near 33N 165W reported southwest winds of 50 kts at 0600 UTC on the 15th. The cyclone weakened to a gale force low over the eastern waters on the 15th before moving into southwestern Canada late on the 16th.

North Pacific Storm, January 16-19: The development of this intense system from a low pressure wave off Japan is displayed in *Figure 5*. The central pressure fell 47 hPa in the twenty-four hour period ending at 0000 UTC January 17th, when the cyclone was at 43N 165E with a 936 hPa central pressure. The second part of *Figure 5* shows the cyclone at maximum intensity with a 933 hPa pressure (27.55 inches), almost as deep as one that occurred in February in the North Atlantic. *Figure 6* is an infrared satellite image of the storm near maximum intensity. The intense nature of this system is reflected in extensive cold topped frontal cloud bands indicating considerable vertical development of the cloud pattern. Cold air pouring into the rear of the storm is marked by extensive bands of cumulus type clouds east of Japan. The WindSat passive microwave imagery of remotely sensed winds shown in *figure 7* from near the time of *Figure 5* reveals a well defined storm center and 65 kts wind retrieval southeast of the center. *Table 2* lists some notable ship and buoy observations taken during this event. The cyclone then drifted northeast and slowly weakened over the next two days with its top winds lowering to storm force by the 18th, then turned west and became stationary near 48N 166E on the 20th. The storm then became absorbed by another strong system passing to the east on the 22nd as described below.

North Pacific Storm, January 21-24: A frontal wave of low pressure formed south of the old system described above late on January 20th and moved northeast before turning north on the 22nd and briefly developing hurricane force winds on the 22nd while absorbing the old low to the west. The central pressure fell 28 hPa in the twenty-four hour period ending at 1800 UTC on the 22nd. ASCAT 25 km imagery from 2208 UTC on the 22nd revealed west winds to 50 kts on the south side of the storm center. The cyclone then became a large 953 hPa storm force low near 51N 169W the next day, before drifting west as a weakening gale in the Bering Sea on the 25th and dissipating by the 27th. The highest wind reported by a ship was 55 kts out of the Northeast, from a vessel reporting with the SHIP identifier (52N 170W) at 1000 UTC on the 24th. The ship **Malolo** (WYH6327) near 55N 161W reported northeast winds of 50 kts and 9.0 m (30 ft) at 1100 UTC on the 23rd. The ship **Hanjin Philadelphia** (A8CN8) encountered southwest winds of 40 kts and 12.8 m seas (42 ft) near 51N 154W at 1800 UTC on the 23rd.

North Pacific Storm, January 25-27: The main development of this final significant event of January is depicted in *Figure 8*. Originating near Japan on the 23rd, the cyclone developed hurricane force winds by 1800 UTC on the 26th which lasted into the 27th. The central pressure fell 32 hPa in the twenty-four hour period ending at 1800

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND	SEA(m/f)
Maersk Dartford (MRGU3)	37N 166E	16/1800	SW45	9.0/30
A8UD6	30N 142E	17/0000	NW45	12.2/40
APL China (WDB3161)	52N 168E	17/1500	NE45	10.7/35
	51N 167E	18/1800	NE25	16.2/53
	51N 168E	19/0300	N15	14.0/46
Hanover Express (DFGX2)	53N 176W	18/0000	SE56	
	52N 175W	18/0900	SE54	
Westwood Columbia (C6SI4)	53N 173E	18/0000	NE50	
Nikkei Phoenix (H9UY)	26N 178E	18/0600	S45	9.8/32
DGAF	48N 159E	19/0000	N30	13.1/43
Buoy 46073	55.0N 172.0W	18/1100	E47 G56	7.0/23
		18/1200	Peak gust 60	9.0/30
		19/0100		

Table 2. Selected ship and buoy observations taken during passage of the North Pacific storm of January 16-19, 2011.

UTC on the 26th. The high resolution ASCAT wind vectors in *Figure 9* reveal an intense well defined circulation around the center and 50 kts winds south and southwest of the center. The ship **APL Philippines** (WCX8884) near 49N 157W encountered south winds of 60 kts and 13.4 m seas (44 ft) at 1200 UTC on the 27th. The cyclone weakened and turned northwest into the Bering Sea late on the 27th where it became a gale, and moved inland over Russia by the 29th.

North Pacific Storm, February 5-8: Originating in the far southern waters near the dateline early on February 5th, this cyclone developed a compact circulation with hurricane force winds on the 6th near 36N 166W with a 976 hPa central pressure. ASCAT imagery from 2157 UTC on the 6th revealed around 50 kts wind retrievals south of the center near 33N 164W. The cyclone subsequently moved north as a storm force low on the 7th and 8th before moving inland over southwestern Alaska as a gale late on the 8th.

Northwestern Pacific and Bering Sea Storms, February 15-20: Two cyclones of similar intensity developed and moved northeast through the Bering Sea in mid-February. The first of these developed and moved as shown in *Figure 10*. The central pressure fell 28 hPa in the twenty-four hour period ending at 1200 UTC on the 16th. The lowest central pressure was 962 hPa later that day in the northwest Bering Sea. The system then moved well north of the Bering Strait late on the 17th. The ASCAT imagery in *Figure 11* taken when the cyclone was at maximum intensity in the northwest Bering Sea reveals a swath of southwest winds of 50 kts north of the western Aleutians. The ship DDZB2 (48N 166E) reported southeast winds of 50 kts and 5.2 m seas (17 ft) at 0000 UTC on the 16th. The second developing cyclone moved northeast from Japan's main island late on the 17th to near 52N 158E with a 964 hPa pressure and hurricane-force conditions at 0600 UTC on the 19th. The central pressure fell 33 hPa in the twenty-four hour period ending at 0000 UTC on the 19th. Associated ASCAT imagery was similar to *Figure 11*. The ship **Hanjin Philadelphia** (A8CN8) reported south winds of 45 kts and 8.5 m seas (28 ft) near 37N 149E at 0600 UTC on the 8th. The ship **Sofia Express** (DGZT2) near 48N 173E encountered south winds of 50 kts at 0600 UTC on the 19th. The cyclone then weakened in the northwest Bering Sea late on the 19th and passed north of the Bering Strait as a gale on the 20th.

North Pacific and Bering Sea Storm, February 22-24: This event originated well south of the Kamchatka Peninsula near 31N on the 21st and moved northeast to near the western Aleutian Islands as a 968 hPa hurricane force low at 1800 UTC on the 23rd. At 0600 UTC on the 23rd the ship SHIP (name masked) (45N 171E) reported north winds of 55 kts and 5.8 m seas (19 ft). ASCAT imagery with this storm, similar to *Figure 11* on the 23rd, developed 50 kts winds on the northwest side the following night. The cyclone then moved through the Bering Sea where it weakened to a gale late on the 24th before moving north of the area.

Northeastern Pacific Storms, March 1-5: The development of the first and stronger of two hurricane force cyclones that occurred in the eastern Pacific early in March is shown in *Figure 12*. It originated as a frontal wave of low pressure near 30N 148W early on February 28th. The central pressure dropped 25 hPa in the twenty-four hour period ending at 0600 UTC on the 2nd. With a relatively compact appearance the cyclone's ASCAT imagery resembled that of *Figure 9* for the January 25th-27th event. The ship WDE4764 (41N 125W) reported south winds of 55 kts and 10.7 m seas (35 ft) at 1000 UTC on the 2nd. Buoy 46207 (50.9N 129.9W) reported west winds 47 kts with gusts to 58 kts and 6.5 m seas (21 ft) at 2200 UTC on the 2nd, and 7.5 m seas (25 ft) three hours later. Buoy 46089 (45.9N 125.8W) reported maximum seas of 9.5 m (31 ft) at 1500 UTC March 2nd. The cyclone subsequently moved north and dissipated off Southeast Alaska on the 3rd. A second cyclone that followed was the 1005 hPa low seen near 170W in the second part of *Figure 12*. It moved east before turning north near the coast and passing near 52N 137W with a 981 hPa center at 1800 UTC on the 4th. ASCAT imagery as shown in *Figure 13* reveals southeast winds of 50 kts where the northwest end of Vancouver Island tends to focus southerly winds. Buoy 46207 (50.9N 129.9W) reported southeast winds of 43 kts with gusts to 54 kts and 8.5 m seas (28 ft) at 2100 UTC on the 4th. The cyclone then moved into the Gulf of Alaska as a gale by the 5th, where it stalled then dissipated on the 7th.

North Pacific Storm, March 11-15: The final development of this central Pacific system is depicted in *Figure 14*. It originated near Japan on the 10th and dropped 33 hPa in central pressure in the twenty-four hour period ending at 1800 UTC on the 12th. Hurricane force winds with this cyclone, lasting from the 12th into the 13th, are reflected in the impressive ASCAT retrievals of *Figure 15*, including winds of 50 to 60 kts. The cyclone subsequently tracked east through early on March 14th before turning northeast into the Gulf of Alaska, where it dissipated on the 16th. The Canadian buoy 46207 (50.9N 129.9W) reported southeast winds of 35 kts with gusts to 51 kts and 6.5 m seas (21 ft) at 0200 UTC March 15, and maximum seas 7.5 m (25 ft) five hours later.

Northwestern Pacific and Bering Sea Storm, March 15-18: The rapid development of this powerful system, the second of three to develop pressures in the realm of 930 hPa, is shown in *Figure 16*. The central pressure dropped 45 hPa in the twenty-four hour period ending at 1800 UTC March 16. The second part of *Figure 16* shows the cyclone at maximum intensity. In the high resolution ASCAT imagery of Figure *17*, the storm center and frontal boundary are well marked, and 50 kts wind vectors appear both on the southeast and northwest sides of the cyclone. The ship **Caroline Maersk** (OZWA2) near 37N 153E reported west winds of 53 kts at 0600 UTC on the 16th. The ship **Polar Spirit** (C6WL6) encountered north winds 60 kts near 49N 153E at 0300 UTC on the 17th. Nine hours later the ship **Vancouver Express** (A8UE5) reported northeast winds of 60 kts at 53N 163E. The cyclone then moved into the western Bering Sea on the 18th and weakened to a gale (*Figure 18*), and then dissipated over Russia March 20th.

North Pacific and Bering Sea Storm, March 18-20: This developing hurricane force low took a track farther east than that of its predecessor as displayed in *Figure 18*. The central pressure fell 36 hPa in the twenty-four hour period ending at 1800 UTC on the 19th, when the cyclone attained maximum intensity and developed hurricane-force winds. *Figure 19* contains portions of two ASCAT passes over the storm and covers a portion of the stronger retrievals on the south side which actually extend south to 48N. The ship **Horizon Anchorage** (KGTX) reported southeast winds of 60 kts and 8.5 m seas (28 ft) near 54N 166W at 2200 UTC on the 19th. The cyclone then weakened to a gale the next day as it tracked north through the eastern Bering Sea, and then passed north of the Bering Strait on the 21st.

North Pacific Storm, March 25-27: This last significant event of March developed from a frontal wave near 38N 160E early on the 25th and briefly developed into a rather compact hurricane force low with a 986 hPa central pressure near 44N 174E early on the 26th. WindSat imagery showed 50 kts winds around the center near that time but ASCAT passes missed the stronger part of the storm. The system then weakened to a gale early the next day and turned north toward southwestern Alaska on the 28th.

North Pacific and Bering Sea Storm, April 5-8: This major cyclone was nearly a twin of the intense system that occurred a bit farther west in mid-March. It was the third during the January to April period to have central pressures in the 930 hPa. The author has not seen this occur before. It formed from multiple lows along a front along with others to the northwest that consolidated (*Figure 20*). The central pressure dropped at more than a 2 hPa an hour rate, falling 51 hPa in the twenty-four hour period covered by *Figure 20*. The ASCAT wind vector in *Figure 21* is showing east to northeast winds to 55 kts on the north side of an apparent frontal boundary. The ship **Ocean Harvester** (WBO5471) near 51N 177W encountered southwest winds of 65 kts and 6.5 m seas (21 ft) near 51N 177W at 0300 UTC April 7th. The ship **Dominator** (WBZ4106) near 54N 162W reported south winds of 50 kts and similar seas. Buoy 46073 (55.0N 172.0W) reported southwest winds of 51 kts with gusts to 64 kts and 12.5 m seas (41 ft) at 1500 UTC on the 7th, and a peak gust of 72 kts 1300 UTC on the 7th. The system weakened to a gale force low early on the 8th before moving inland over Alaska and then re-forming in the Gulf of Alaska as a gale on the 9th. Dissipation occurred by the 16th near the Alaska coast.

Northwestern Pacific Storm, May 10-12: This cyclone originated as a new gale force low near northern Japan on the 9th which moved northeast and intensified, developing a central pressure as low as 972 hPa near 49N 165E at 0600 UTC on the 11th. It developed storm force winds on the 11th before moving into the western Bering Sea and becoming a stalled gale late on the 12th. The ship **APL Arabia** (A8CC4) near 46N 178E reported south winds of 50 kts at 1200 UTC on the 11th. The ship **Volendam** (PCHM) encountered southeast winds of 51 kts near 54N 179E at 0200 UTC on the 12th. The ship **Westwood Columbia** (C6SI4) reported southeast winds 35 kts and 9.8 m (32 ft) near 55N 178E four hours later.

North Pacific Storm, May 18-19: *Figure 22* depicts the development over a thirty-six hour period of the most intense low of the month in the North Pacific. It originated as a weak frontal wave of low pressure south of Japan on the 16th and is shown at maximum intensity in the second part of *Figure 22*. The ship **APL Singapore** (WCX8812) reported southwest winds of 44 kts and 8.8 m seas (29 ft) near 40N 179E at 1800 UTC on the 18th. The ASCAT imagery in *Figure 23* reveals a tight circulation of winds around the low with a small area of 50 kts retrievals south of the center. The cyclone then tracked northeast and weakened to a gale later on the 19th before dissipating near Kodiak Island by the 22nd.

North Pacific Storm, June 24-26: *Figure 25* displays the development of an unseasonably deep North Pacific low for late June, approaching a time of year when the ocean is normally least active. The central pressure fell 21 hPa in the twenty-four hour period ending at 1800 UTC on the 25th, when the cyclone reached maximum intensity. The ship **Westwood Victoria** (C6SI6) encountered northeast winds of 40 kts near 54N170E at 1300 UTC on the 25th. ASCAT imagery from 0536 UTC on the 26th indicated 35 and 40 kts retrievals around the low, highest south of the center. The cyclone weakened to a gale early on the 26th as it moved northeast, before moving inland over southwest Alaska late on the 27th. ⚓

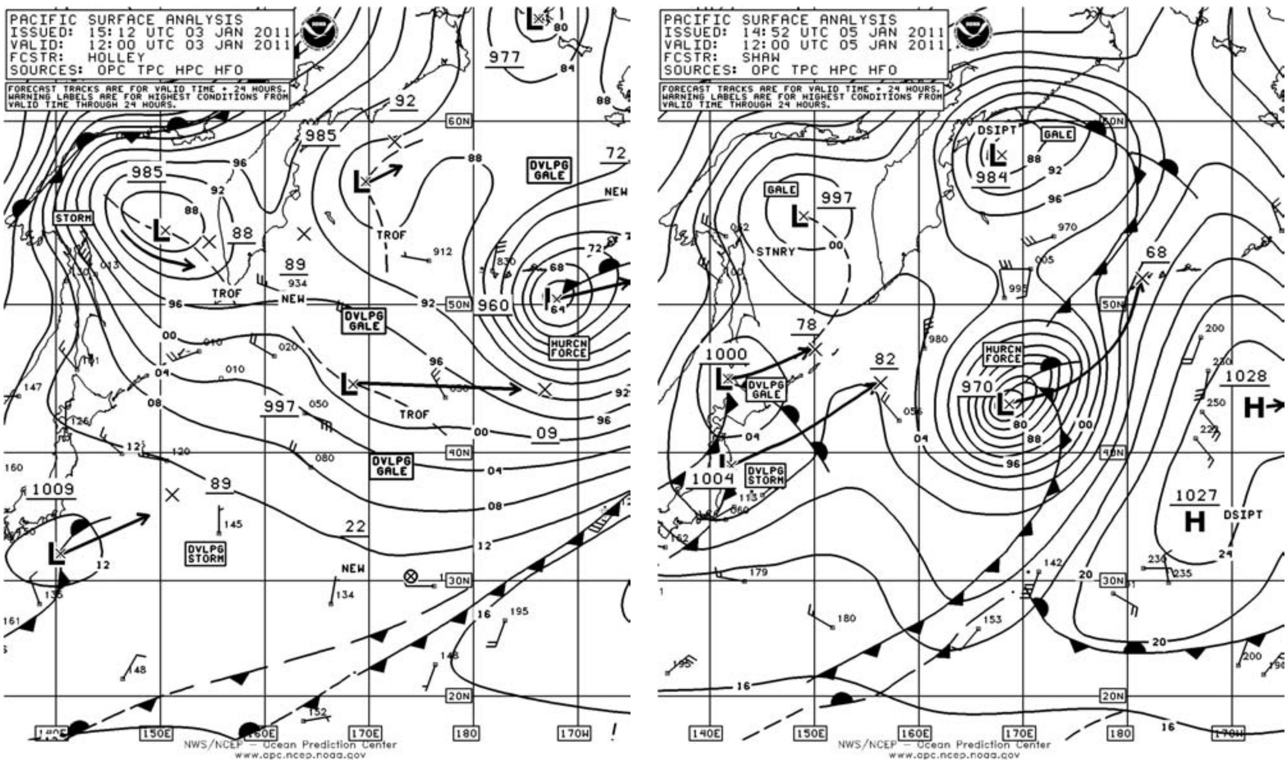


Figure 1. OPC North Pacific Surface Analysis charts valid 1200 UTC January 3rd and 5th, 2011. Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in hPa, except XX for tropical cyclones.

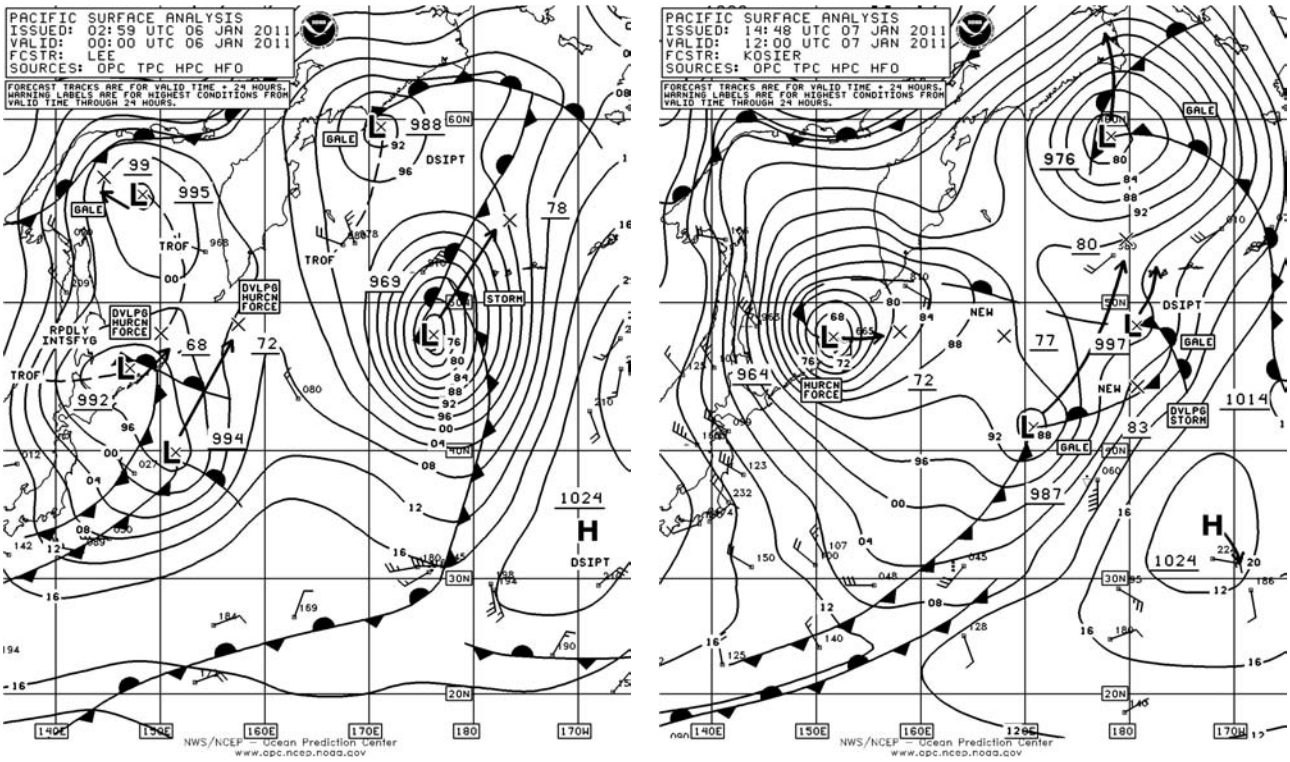


Figure 2. OPC North Pacific Surface Analysis charts valid 0000 UTC January 6th and 1200 UTC January 7th, 2011.

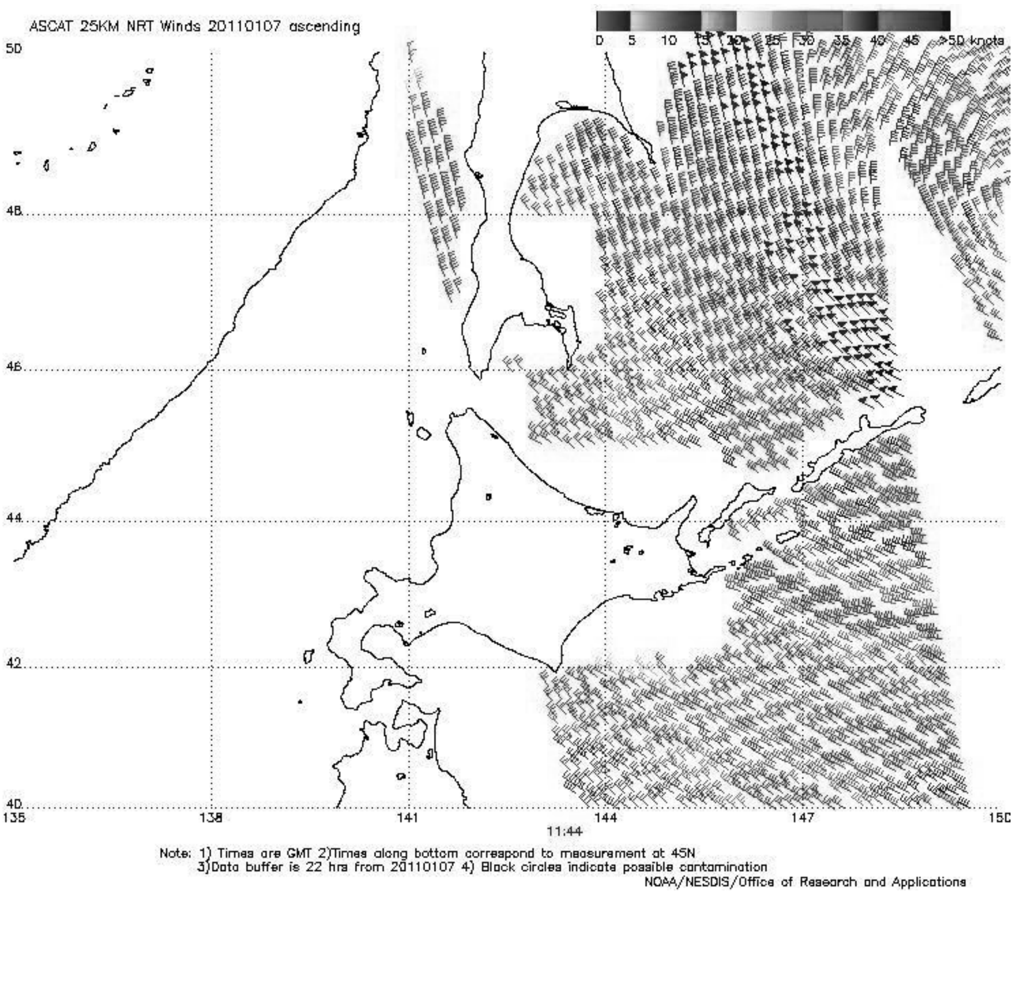


Figure 3. ASCAT (Advanced Scatterometer) image of satellite sensed winds around the west side of the hurricane-force low shown in the second part of Figure 2. The resolution is 25 km in this high resolution version of the imagery. The valid time of the pass is 1144 UTC January 7th, 2011, or approximately the valid time of the second part of Figure 2. Northern Japan and the southern Kurile Islands appear in the lower part of the image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

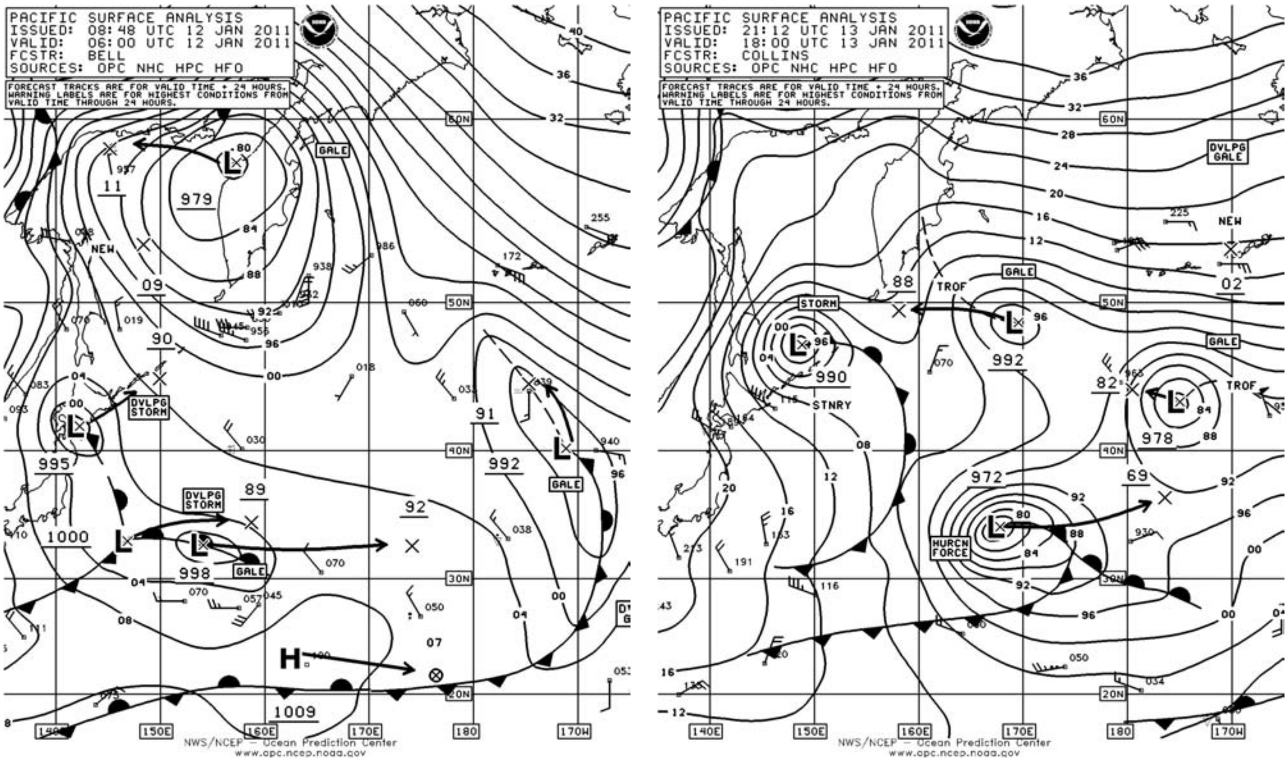


Figure 4. OPC North Pacific Surface Analysis charts valid 0600 UTC January 12th and 1800 UTC January 13th, 2011.

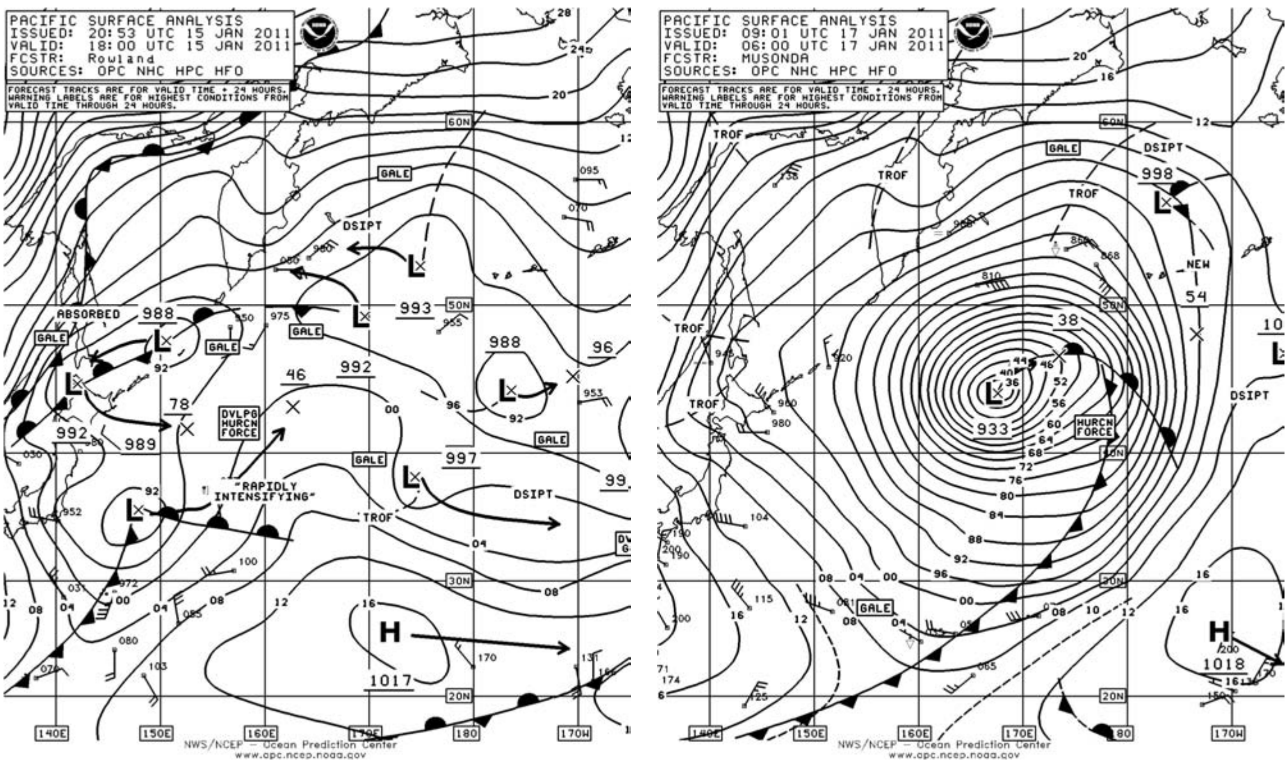


Figure 5. OPC North Pacific Surface Analysis charts valid 1800 UTC January 15th and 0600 UTC January 17th, 2011.

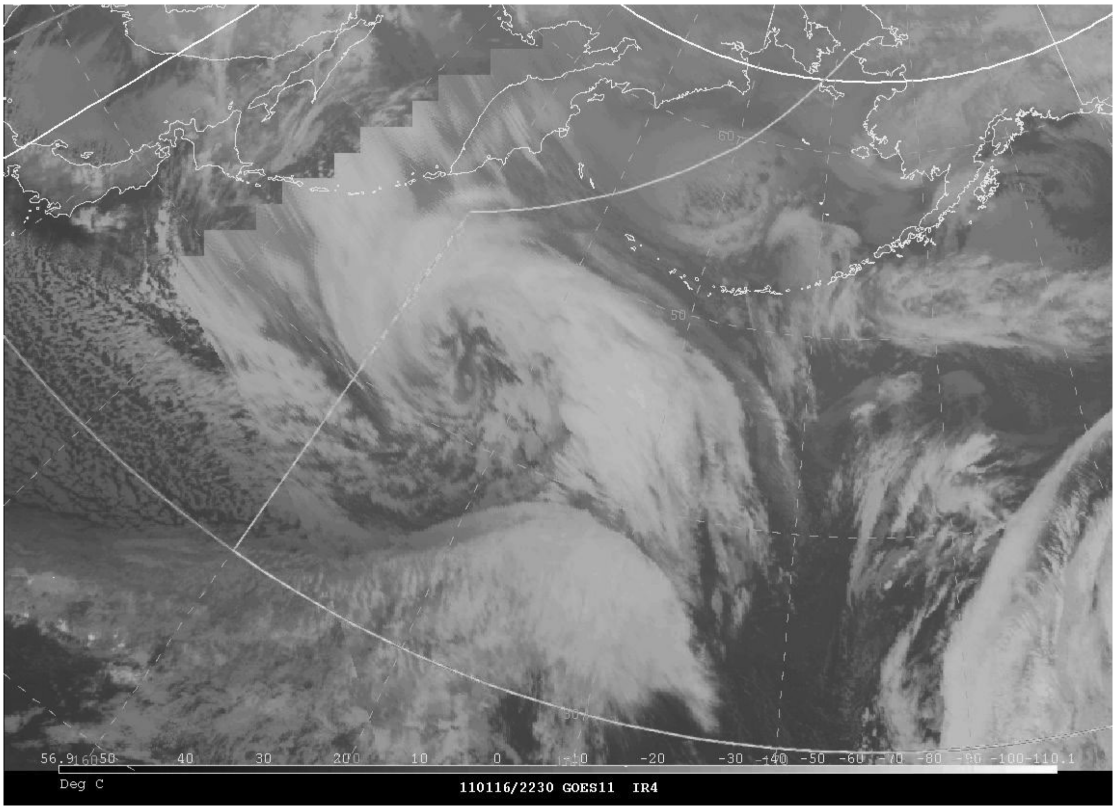
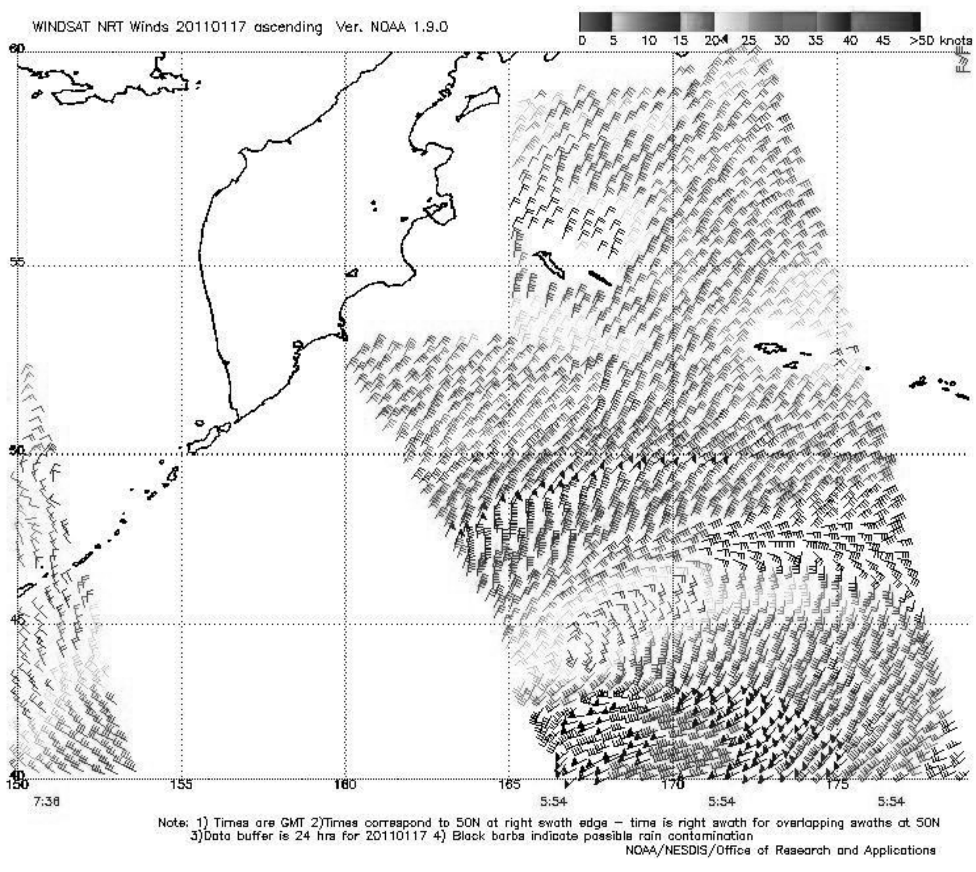


Figure 6. Polar mosaic infrared satellite image valid 2230 UTC January 16th, 2011, or seven and one-half hours prior to the valid time of the second part of Figure 5. Satellite senses temperature on a gray scale from black (warm) to white (cold) in this type of imagery.

Figure 7. WindSat passive microwave image of remotely sensed winds around the hurricane-force low shown in the second part of Figure 5. The time of the pass is 0554 UTC January 17th, 2011 or close to the valid time of the second part of Figure 5. The center of the cyclone appears in the lower center portion of the image. Credit: NRL Remote Sensing Division and Naval Center for Space Technology, and National Polar-orbiting Operational Environmental satellite System Integrated Program Office.



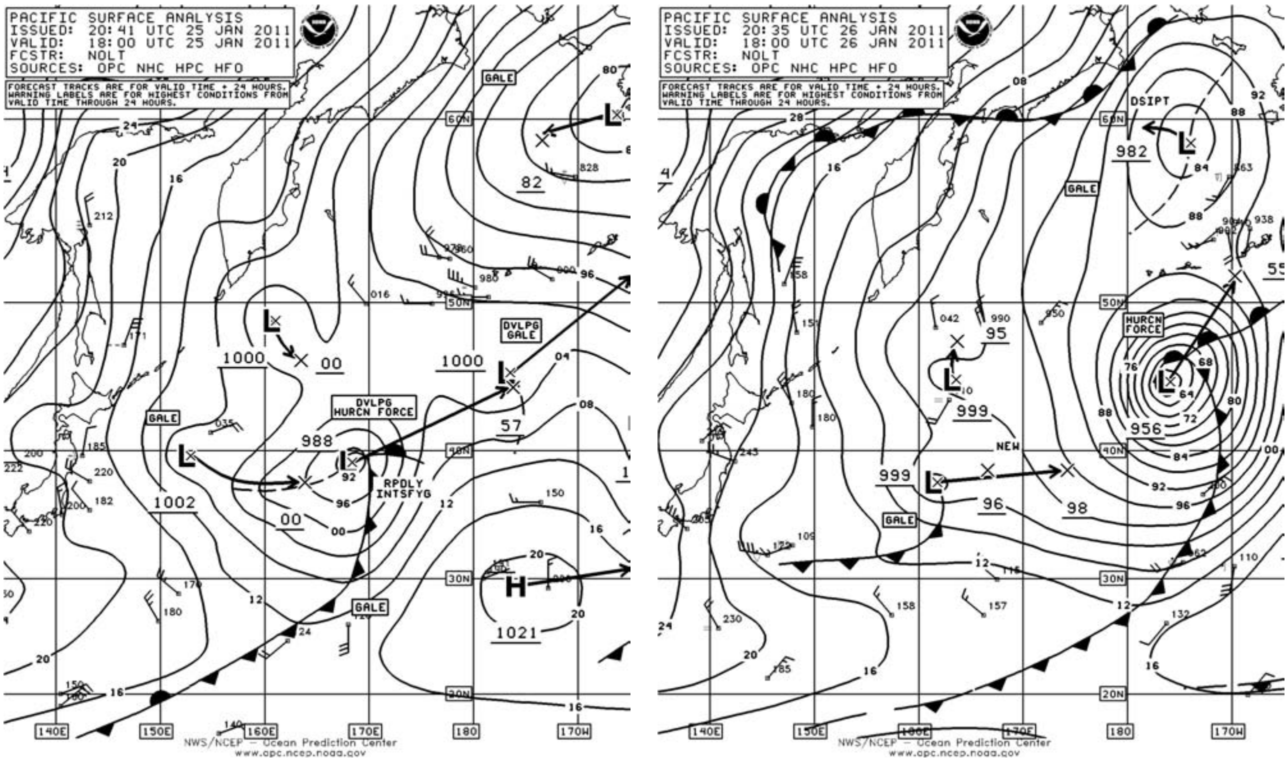


Figure 8. OPC North Pacific Surface Analysis charts valid 1800 UTC January 25th and 26th, 2011.

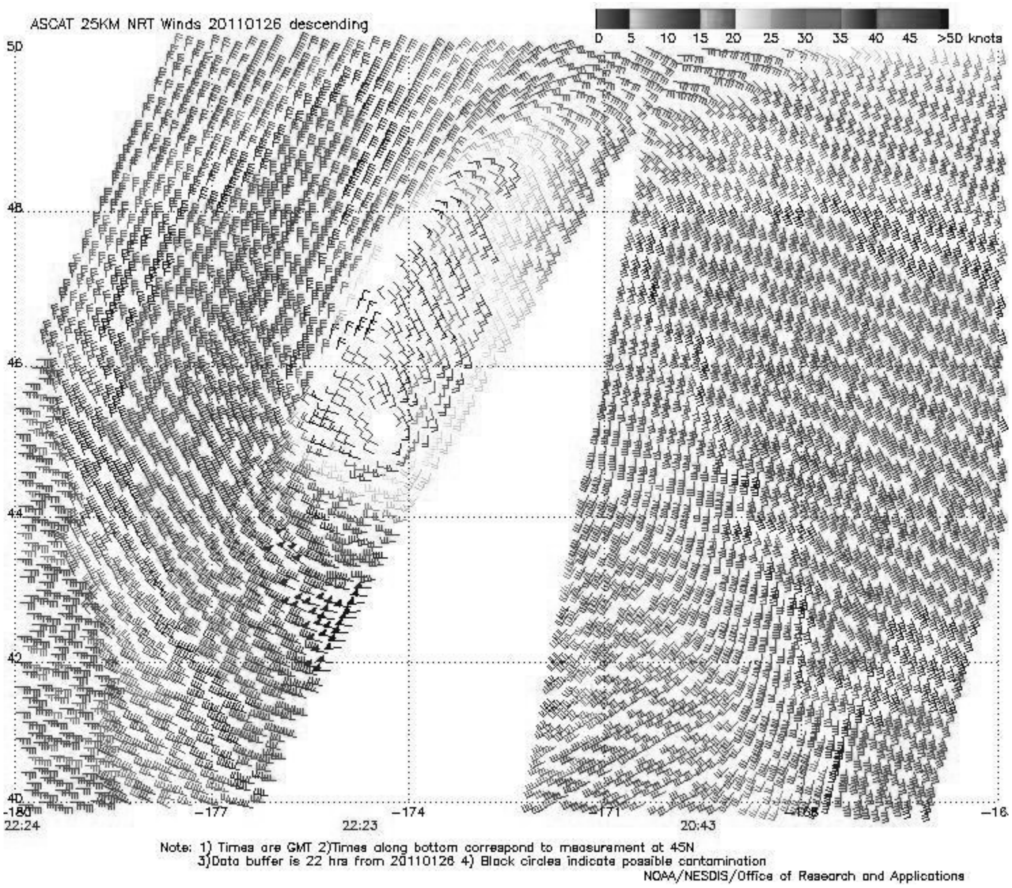


Figure 9. High-resolution ASCAT (25-km resolution) image of satellite-sensed winds around the cyclone shown in the second part of Figure 8. The valid time of the eastern pass is 2043 UTC and of the western pass (which contains the cyclone center and strongest winds) 2223 UTC January 26th, 2011. The valid time of the western pass is about four and one-half hours later than the valid time of the second part of Figure 8. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

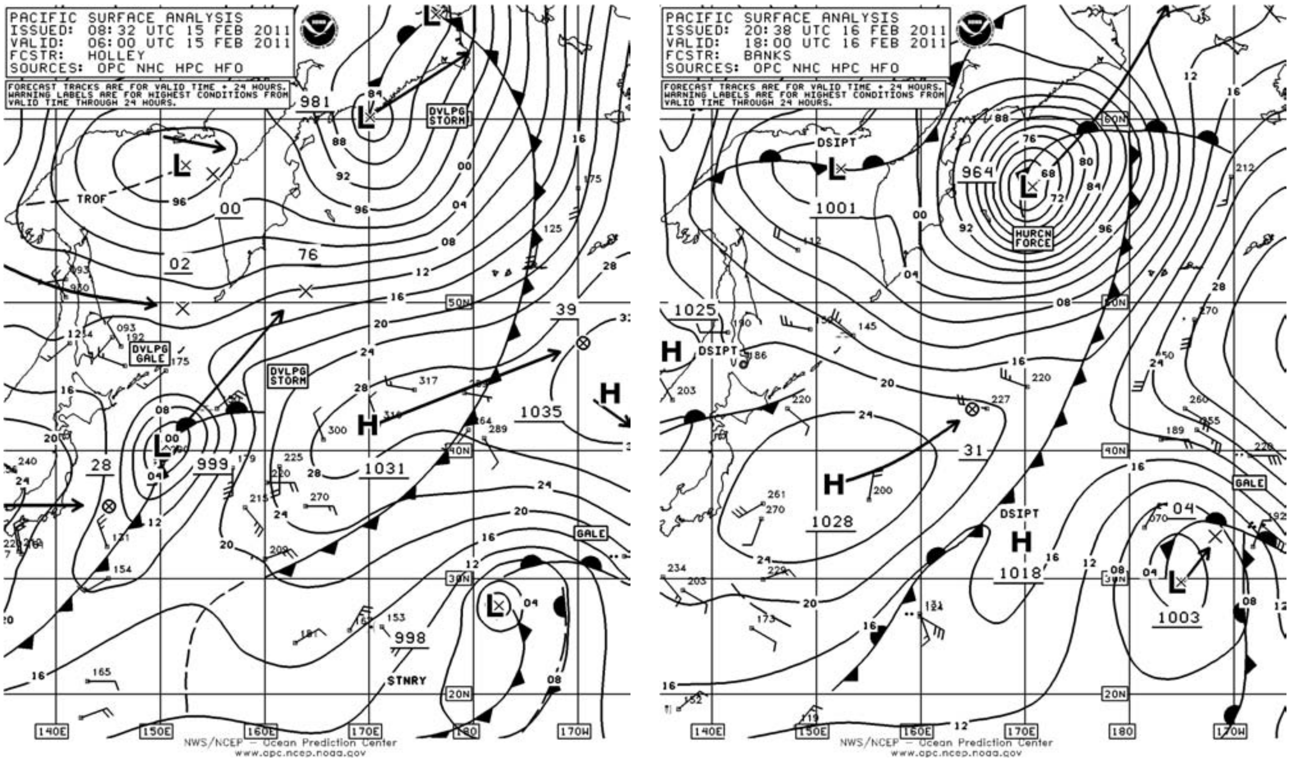


Figure 10. OPC North Pacific Surface Analysis charts valid 0600 UTC February 15th and 1800 UTC February 16th, 2011.

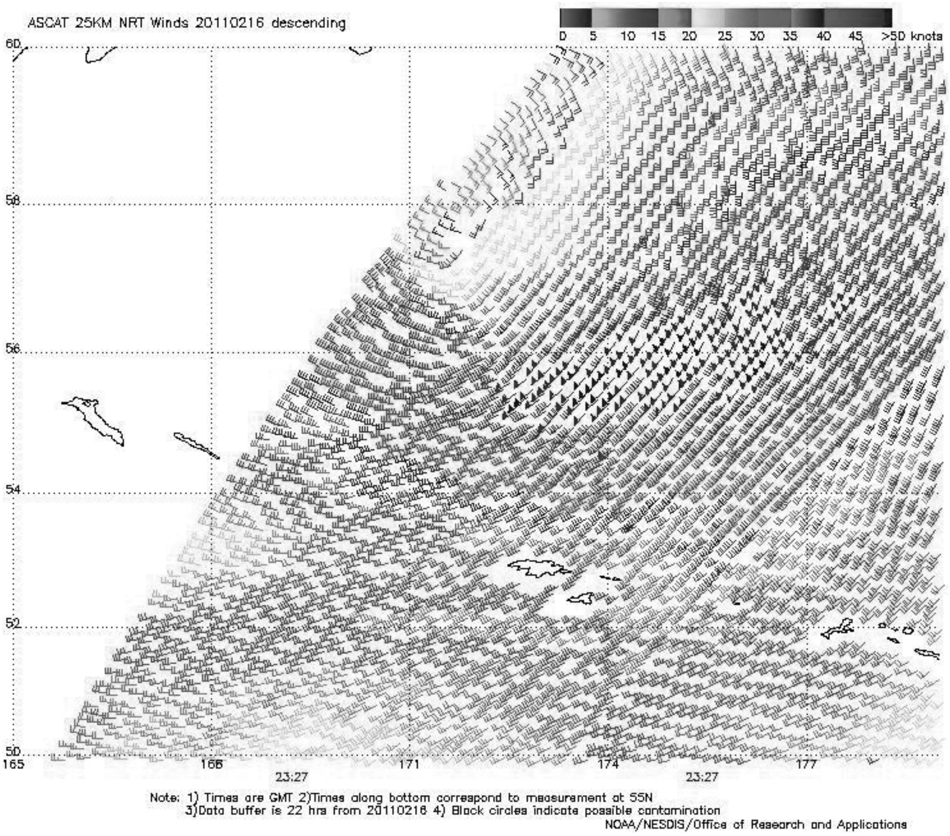


Figure 11. 25-km ASCAT image of satellite sensed winds around the southeast side of the hurricane-force low shown in the second part of Figure 10. The valid time of the pass is 2327 UTC February 16th, 2011, or about five and one-half hours later than the valid time of the second part of Figure 10. The center of the cyclone appears near the edge of the data in the upper portion of the image and the western Aleutian Islands appear in the lower right side of the image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

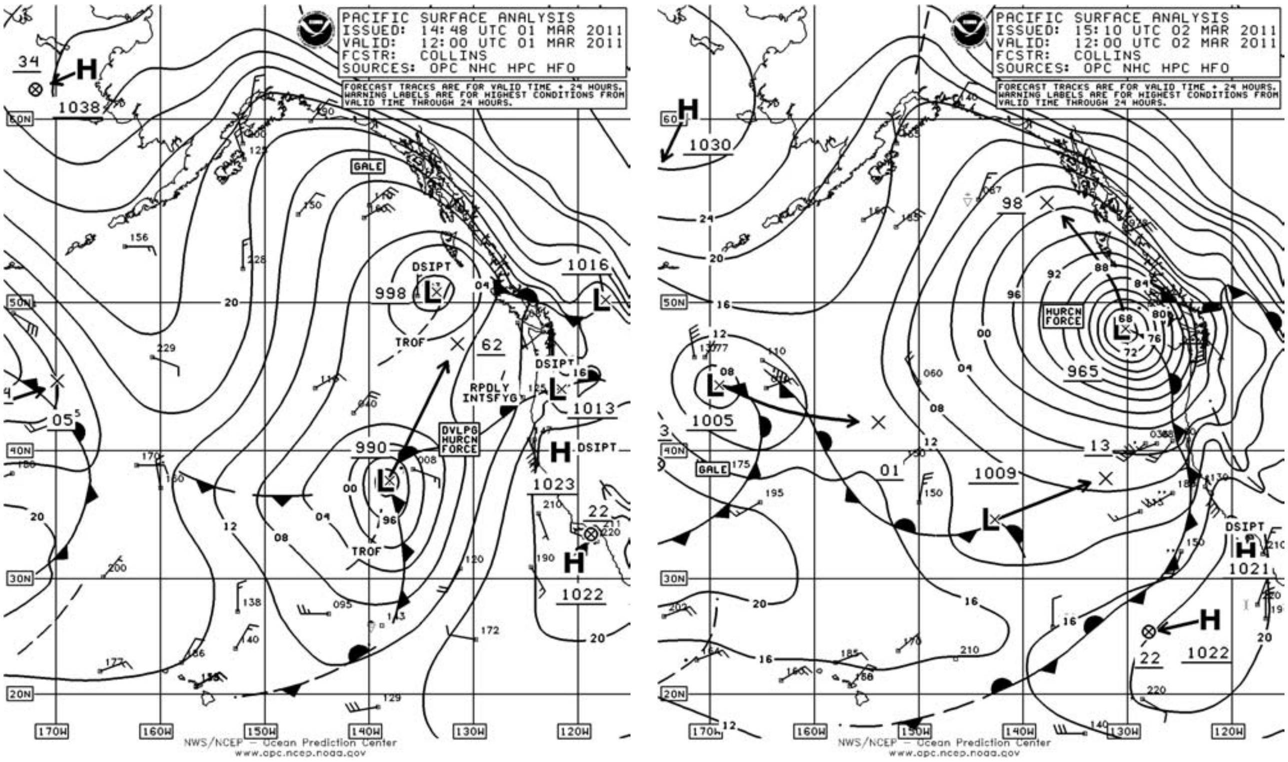


Figure 12. OPC North Pacific Surface Analysis charts valid 1200 UTC March 1st and 2nd, 2011.

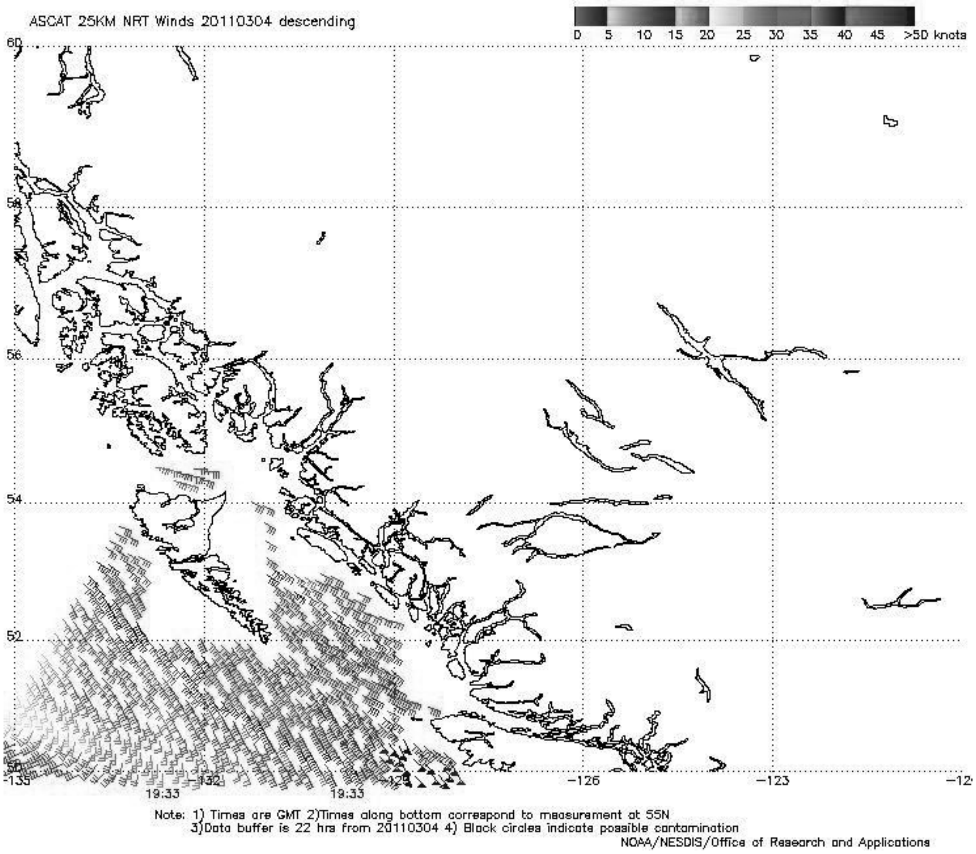


Figure 13. 25-km ASCAT image of satellite sensed winds around the east side of the hurricane-force low which followed the one shown in the second part of Figure 12. The valid time of the pass is 1933 UTC March 4th, 2011. The center of the cyclone is off the left edge of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

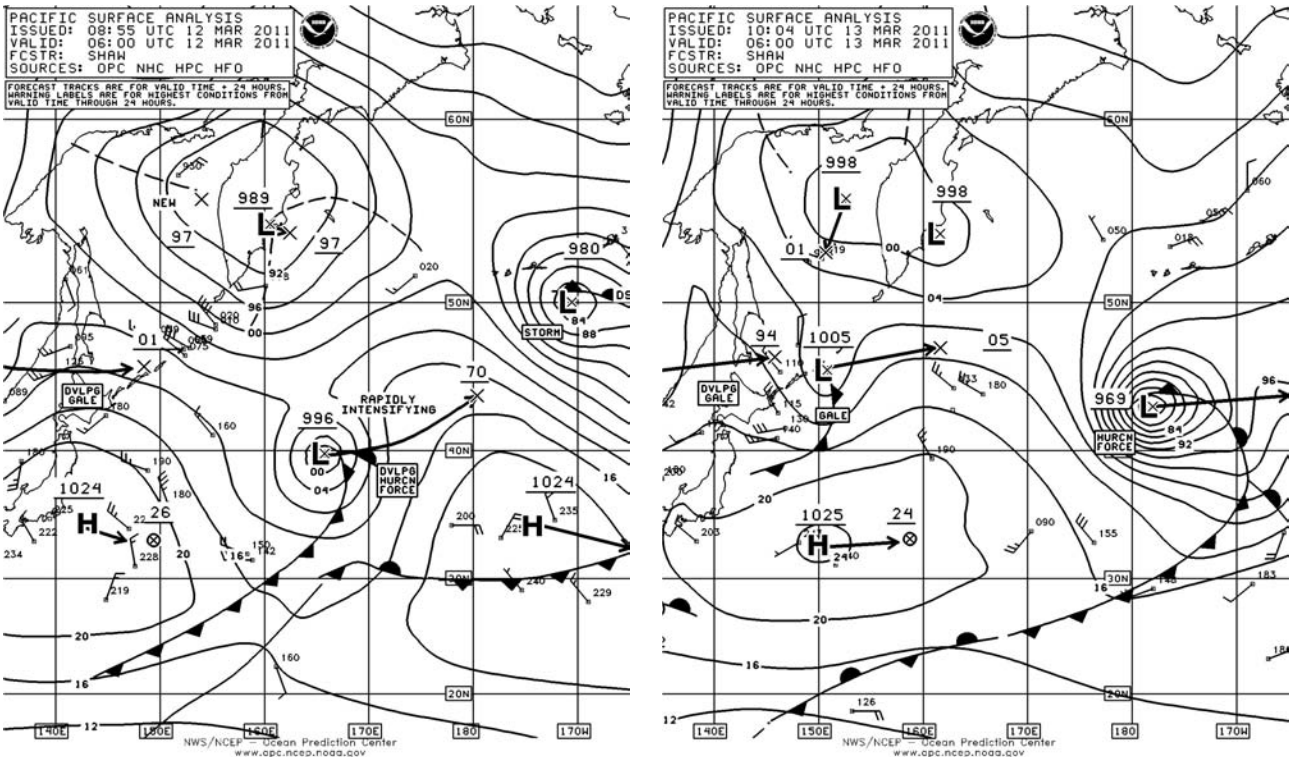
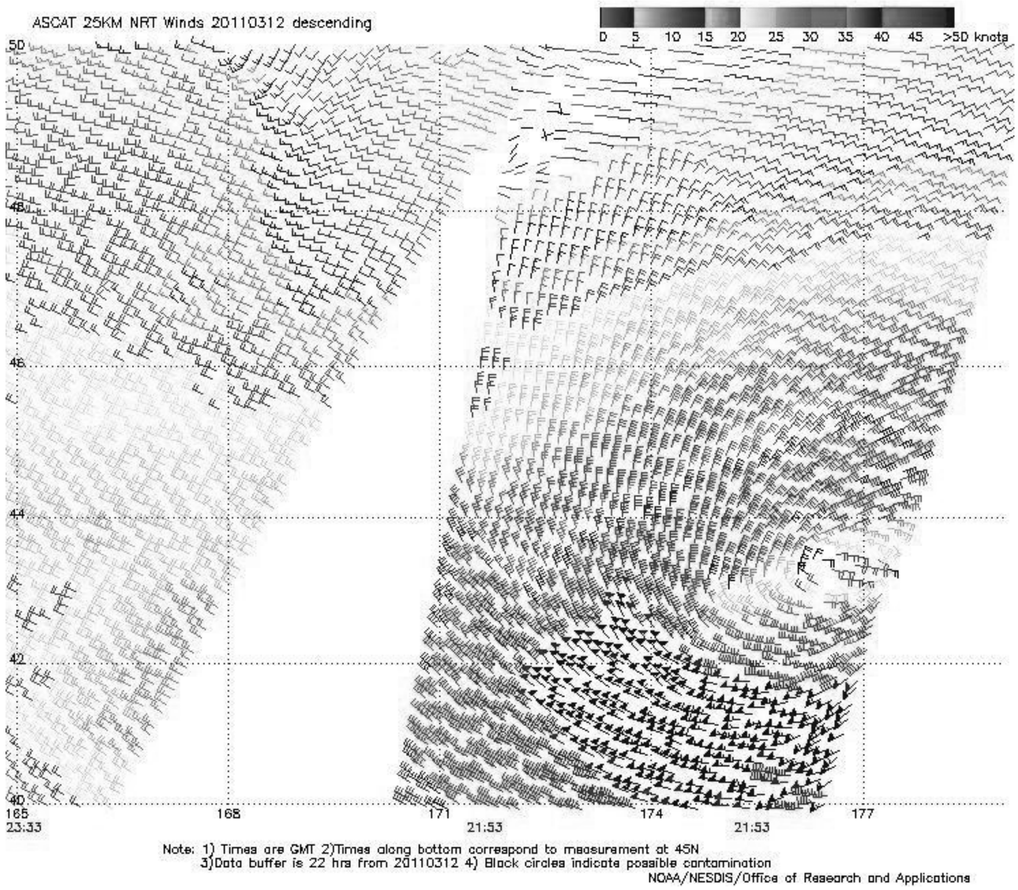


Figure 14. OPC North Pacific Surface Analysis charts valid 0600 UTC March 12th and 13th, 2011.

Figure 15. High resolution ASCAT (25-km) image of satellite sensed winds around the hurricane-force low shown in the second part of Figure 14. The valid time of the pass is 2153 UTC March 12th, 2011, or about eight hours prior to the valid time of the second part of Figure 14. The well defined center of the cyclone is in the lower right side of the image with the strongest winds to the south. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.



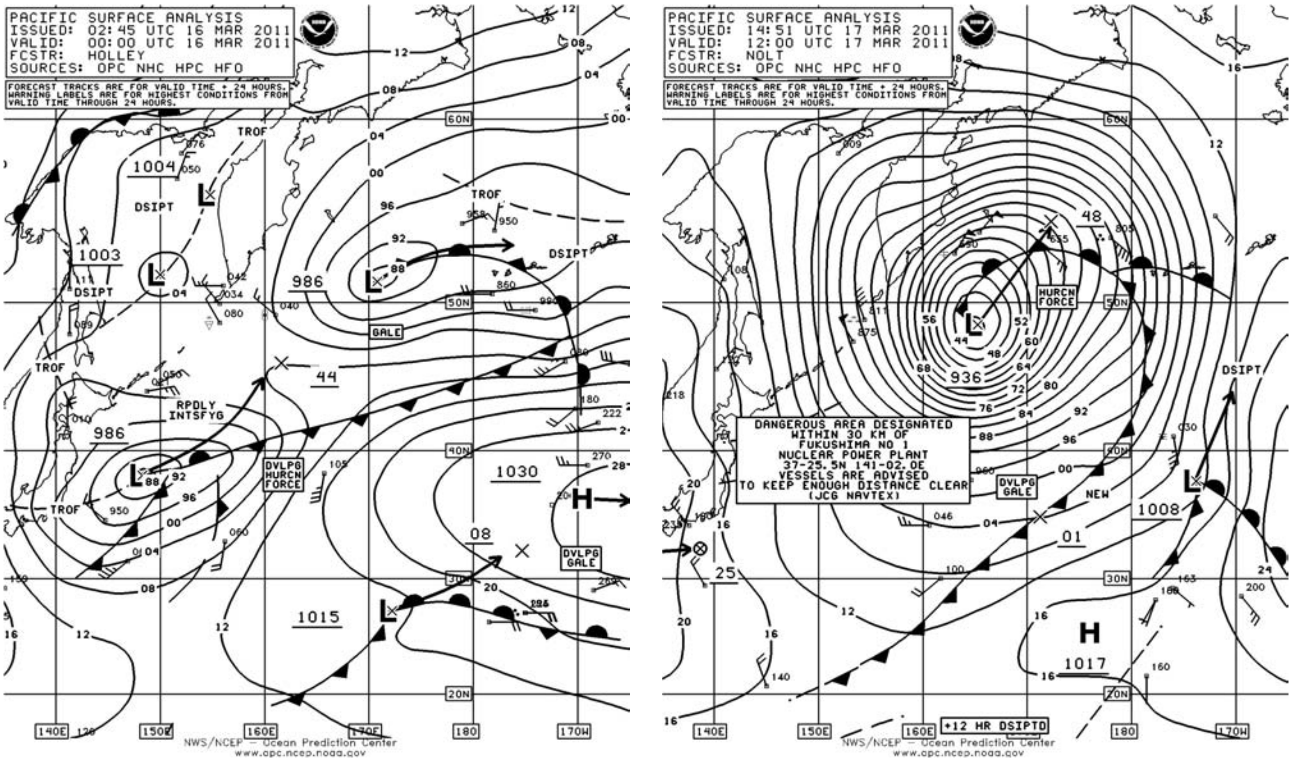


Figure 16. OPC North Pacific Surface Analysis charts valid 0000 UTC March 16th and 1200 UTC March 17th, 2011.

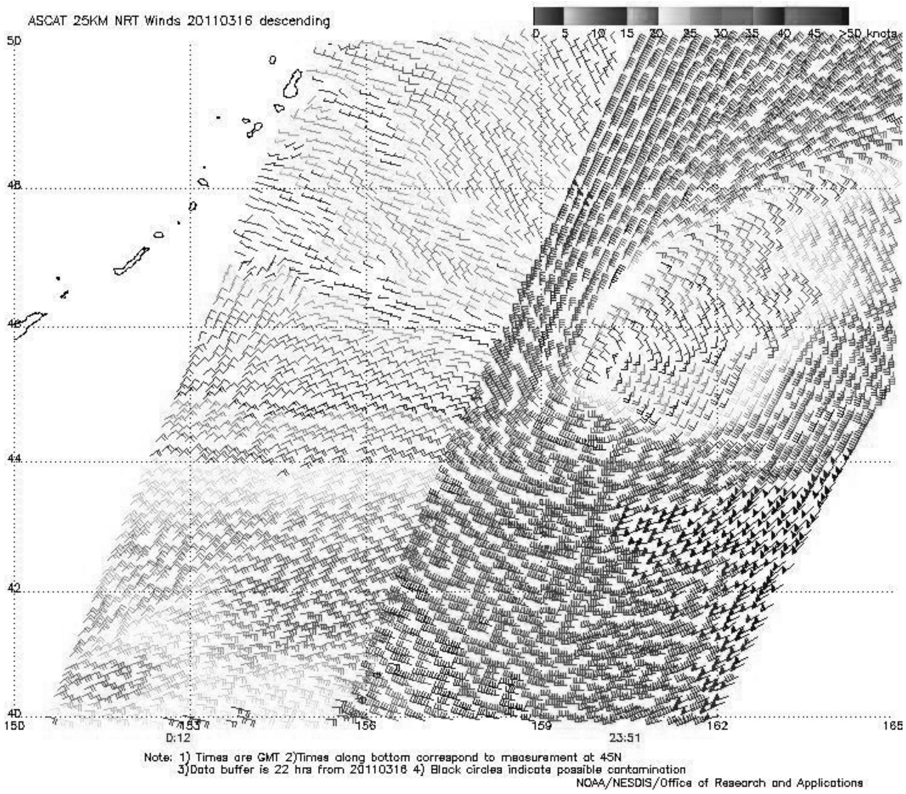


Figure 17. 25-km ASCAT image of satellite-sensed winds around the cyclone shown in the second part of Figure 16. The valid time of the pass is 2351 UTC March 16th, 2011, or about twelve hours prior to the valid time of the second part of Figure 16. The center of the cyclone is near the right center portion of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

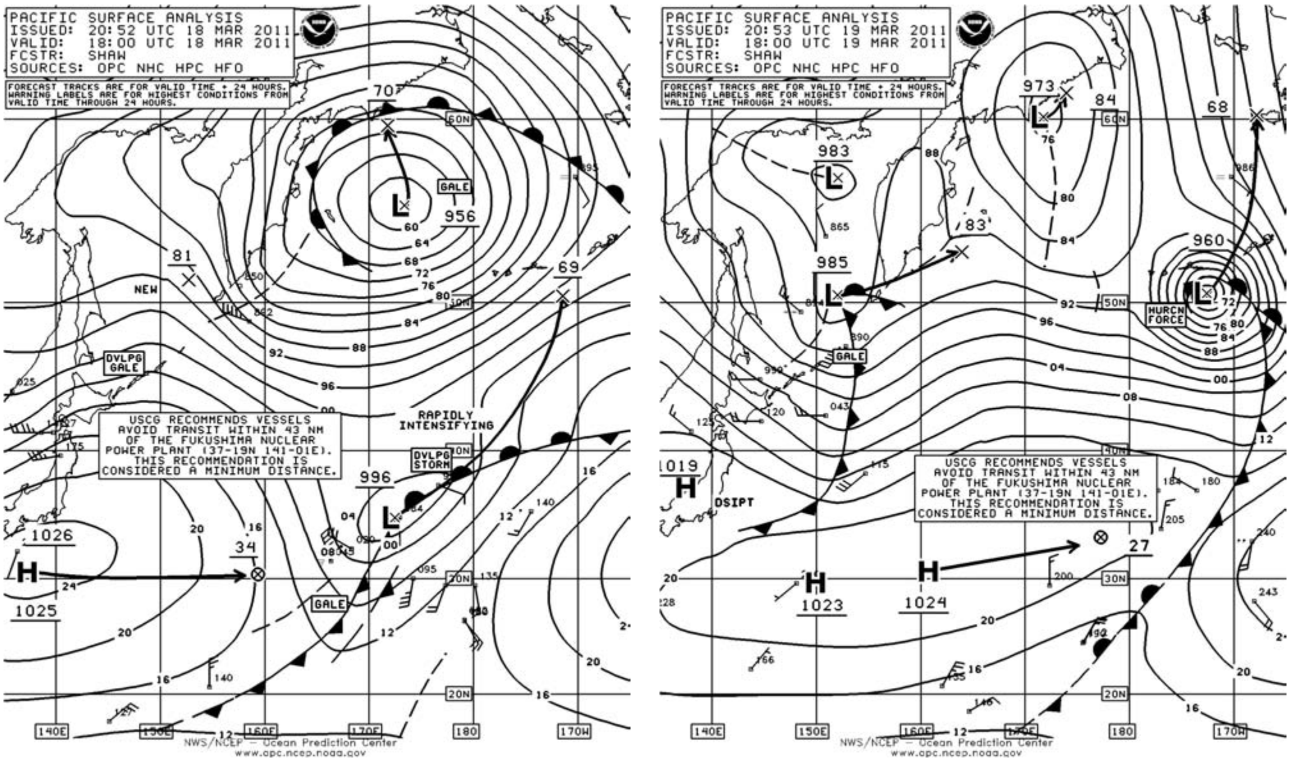


Figure 18. OPC North Pacific Surface Analysis charts valid 1800 UTC March 18th and 19th, 2011.

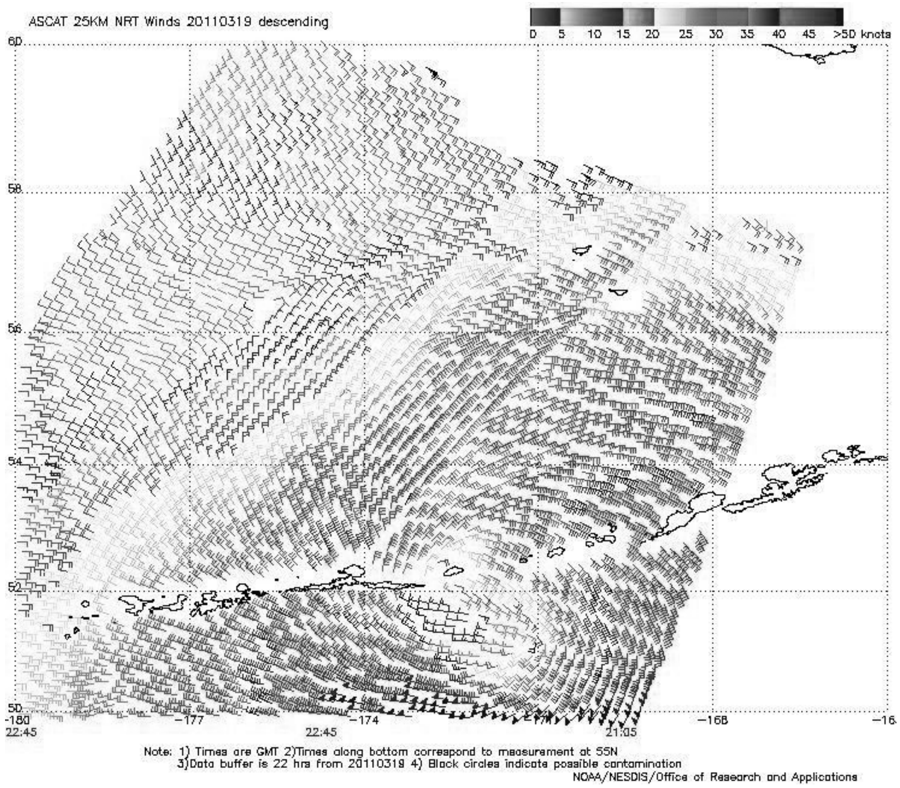


Figure 19. 25-km ASCAT image of satellite sensed winds around the cyclone shown in the second part of Figure 18. The valid time of the eastern pass is 2105 UTC and of the western pass 2245 UTC March 19th, 2011, with the later pass less than five hours later than the valid time of the second part of Figure 18. The center of the cyclone is near 52N 173W in the central Aleutian Islands. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

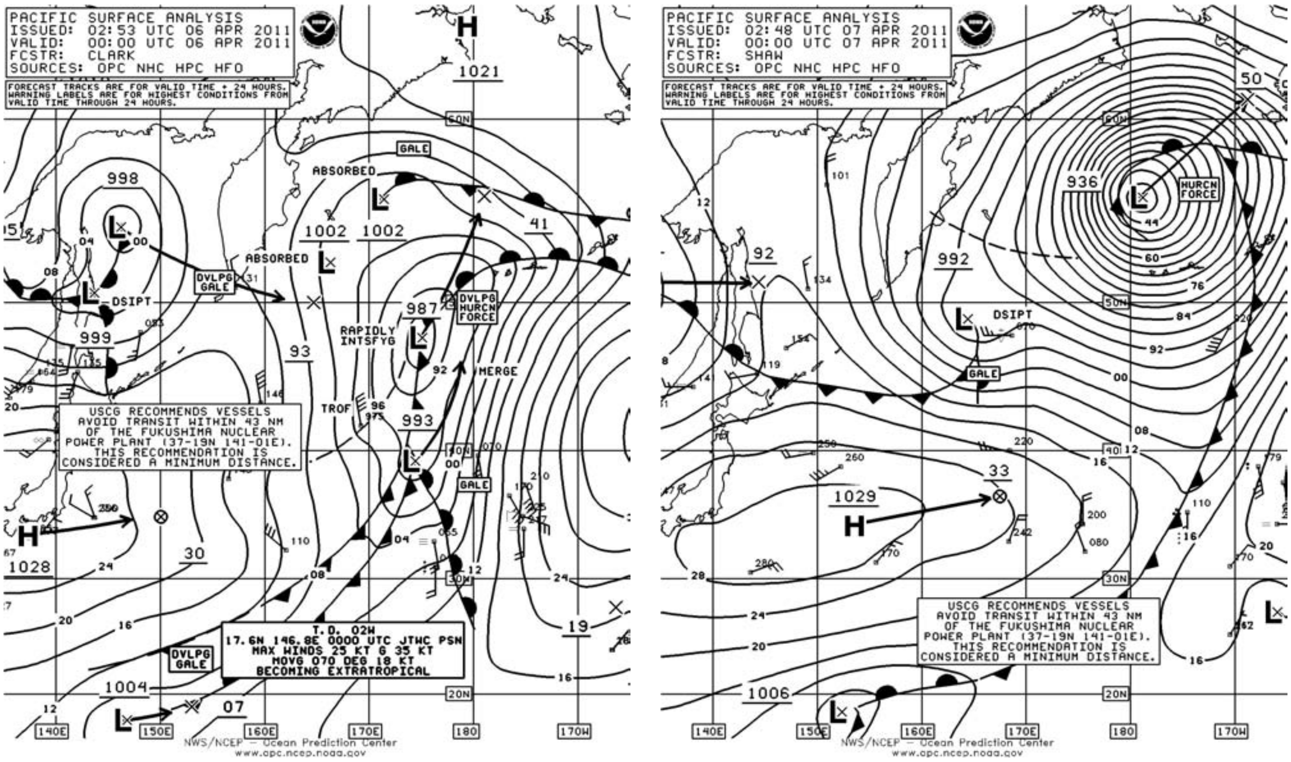


Figure 20. OPC North Pacific Surface Analysis charts valid 0000 UTC April 6th and 7th, 2011.

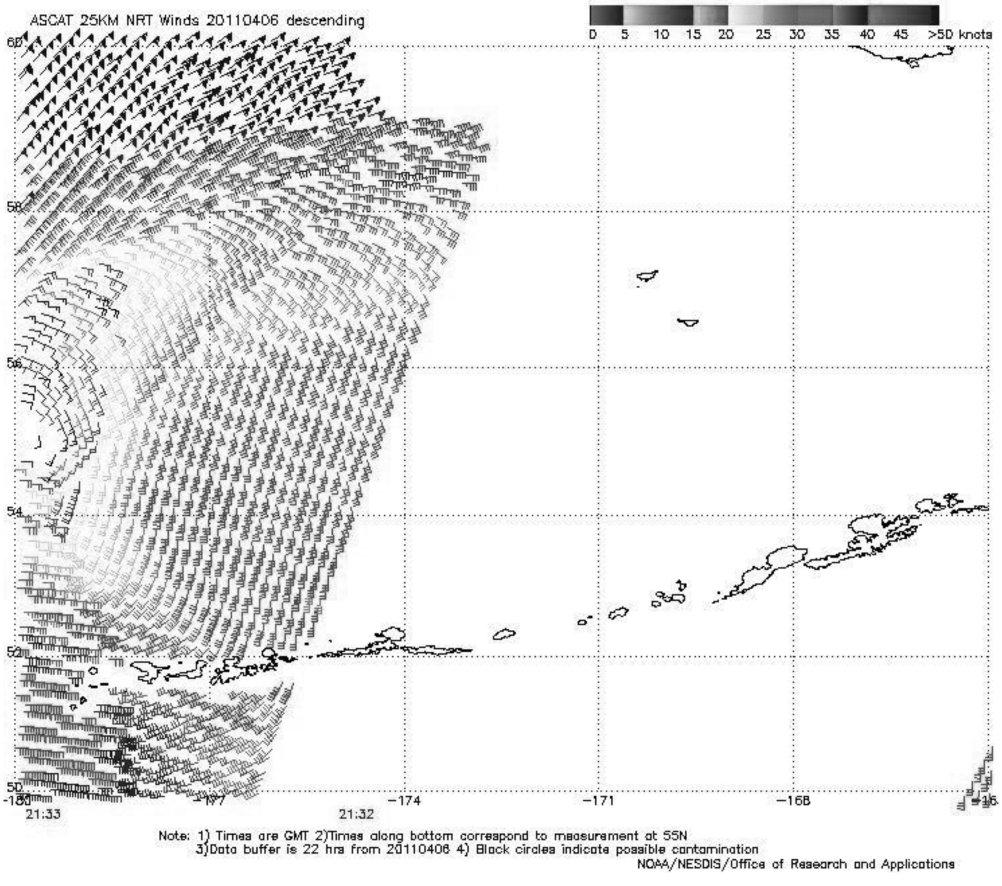


Figure 21. 25-km ASCAT image of satellite sensed winds around the east semicircle of the hurricane-force low shown in the second part of Figure 20. The valid time of the pass is 2133 UTC April 6th, 2011, or about two and one-half hours prior to the valid time of the second part of Figure 20. The center of the cyclone is near the western edge of the image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

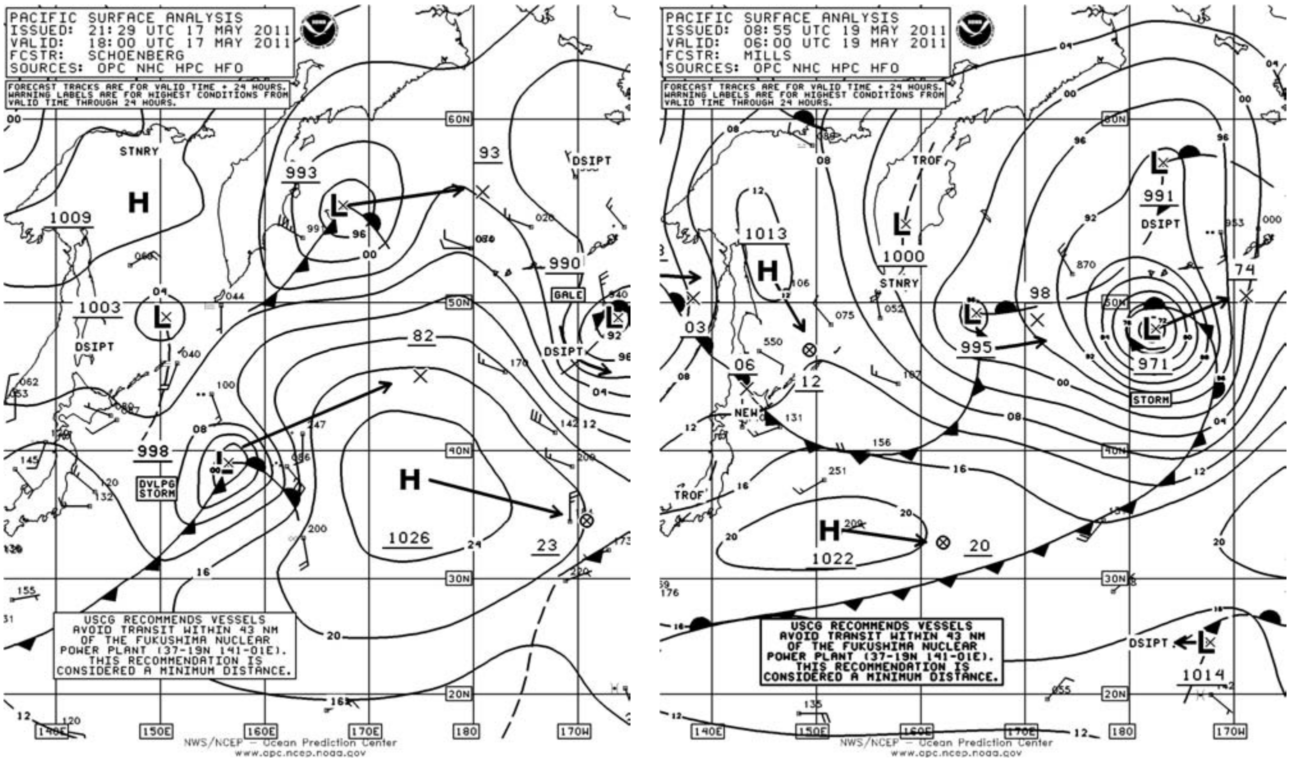
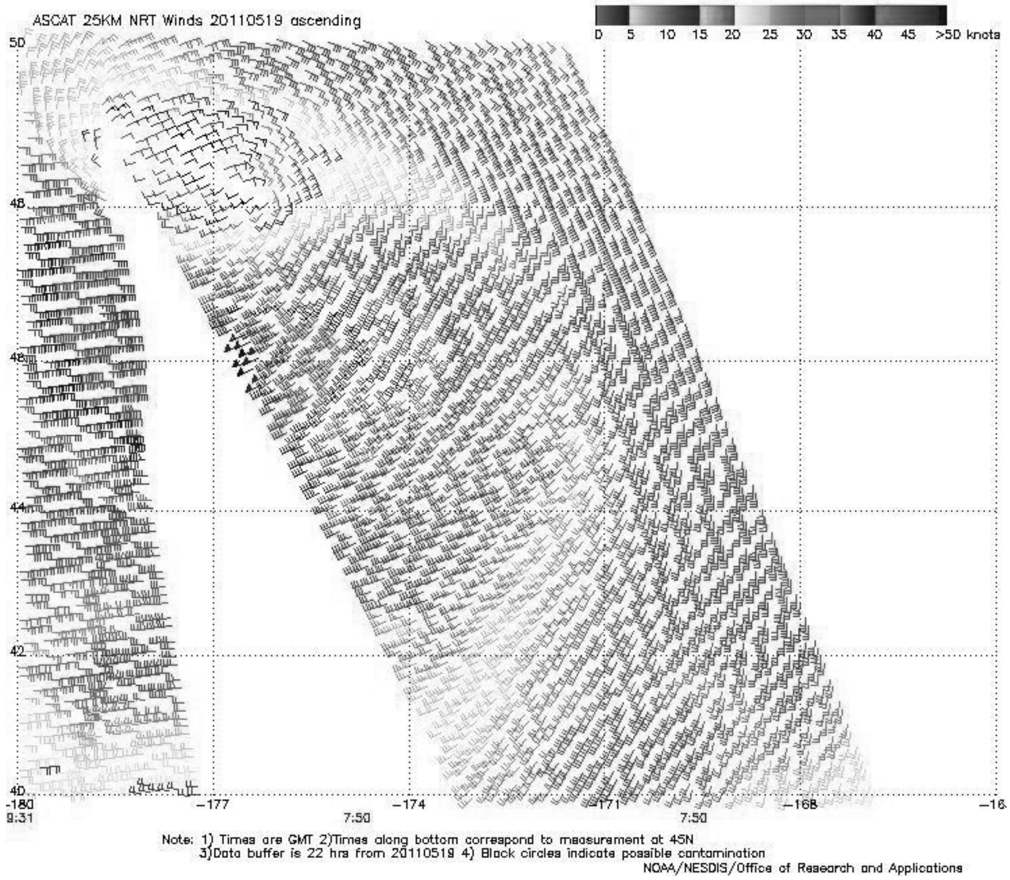


Figure 22. OPC North Pacific Surface Analysis charts valid 1800 UTC May 17th and 0600 UTC May 19th, 2011.

Figure 23. 25-km ASCAT image of satellite sensed winds around the storm shown in the second part of Figure 22. The valid times of the eastern pass is 0750 UTC and of the western pass 0931 UTC May 19th, 2011. The eastern pass is less than two hours later than the valid time of the second part of Figure 22. The center of the cyclone is in the upper left portion of the image.



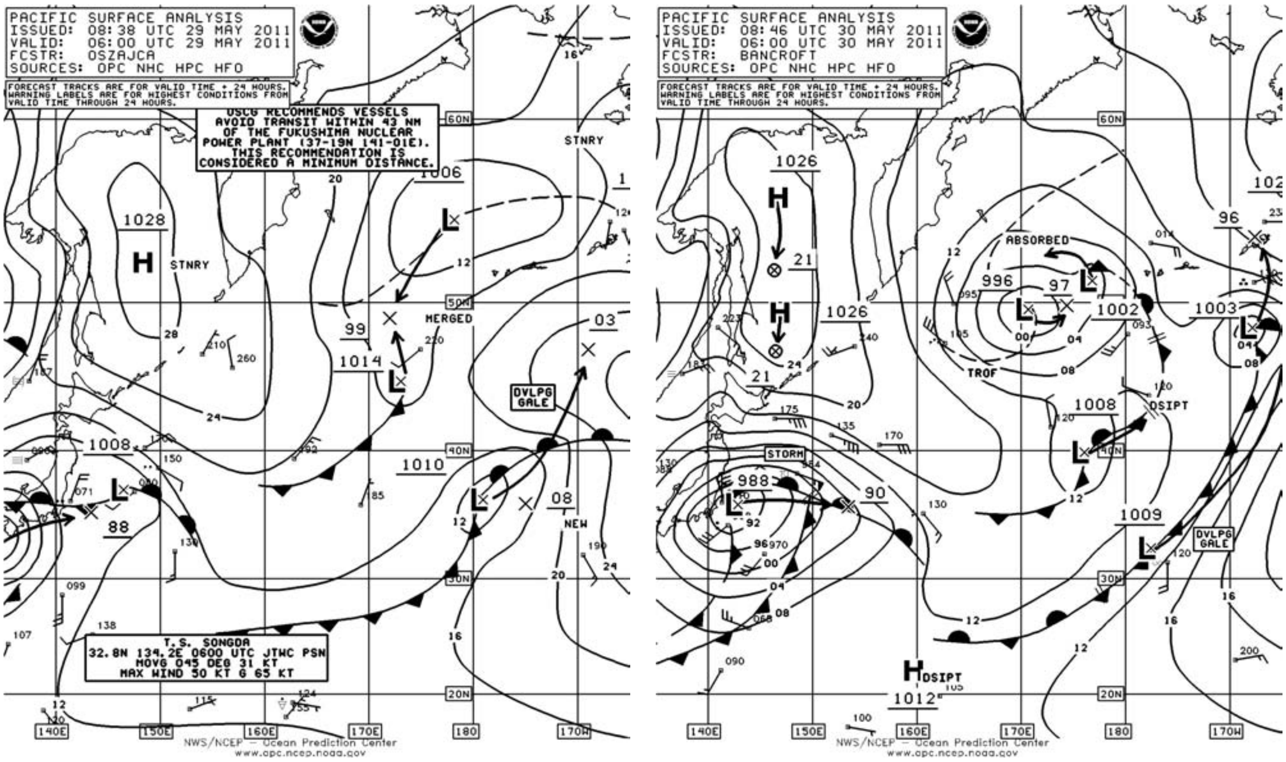


Figure 24. OPC North Pacific Surface Analysis charts valid 0600 UTC May 29th and 30th, 2011.

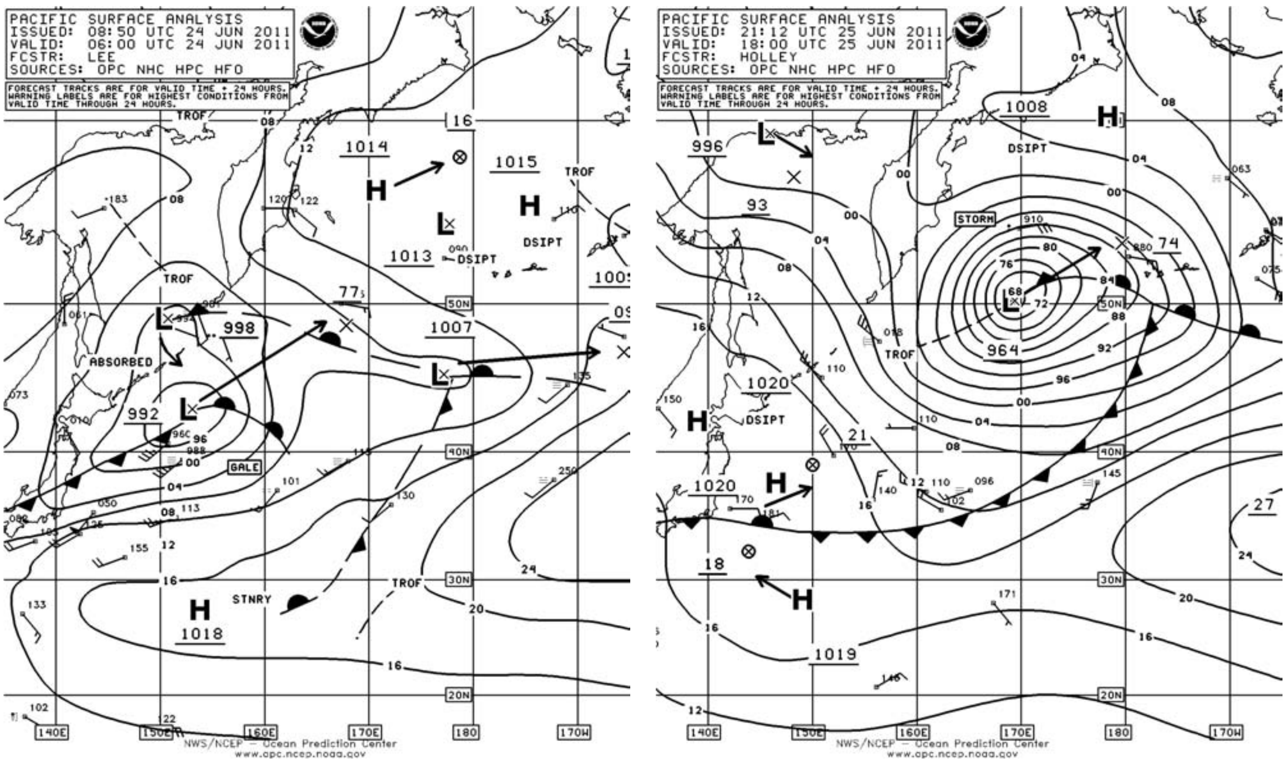


Figure 25. OPC North Pacific Surface Analysis charts (Part 2) valid 0600 UTC June 24th and 1800 UTC June 25th, 2011

Tropical Atlantic and Tropical East Pacific Areas

May through August 2011

Dan Mundell / Jorge Aguirre / Jessica Schauer / Hugh Cobb
Tropical Analysis and Forecast Branch,
National Hurricane Center, Miami, Florida
NOAA National Center for Environmental Prediction

Atlantic Ocean including the Caribbean Sea and the Gulf of Mexico

There were no non-tropical cyclone gale events that occurred between 1 May and 31 August 2011 in the area of high seas forecast responsibility (7°N to 31°N, west of 35°W including the Caribbean Sea and Gulf of Mexico) of the National Hurricane Center's (NHC) Tropical Analysis and Forecast Branch (TAFB). Practically all significant weather occurrences during this period were tied to tropical cyclones. However, a smoke event during the month of May had adverse implications for mariners in the western Gulf of Mexico.

Gulf of Mexico May 2011 Smoke Event

A rather persistent episode of dense smoke was observed over much of the western Gulf of Mexico and portions of the central Gulf during the month of May beginning around the 21st and lasting through the 31st. The smoke was most noticeable in satellite imagery and observations from May 21 through late on the evening of May 25. The synoptic pattern during this time featured an east to west ridge just inland of the northern Gulf coast and low pressure over the southern Plains states and northern Mexico. *Figure 1.*

The resulting pressure gradient that had set up between the ridge and the low pressure over the southern Plains was strong enough to induce broad southeasterly flow of 15-20 kts throughout the majority of the western Gulf of Mexico and across southeastern Mexico. The ship **Discoverer Deep Seas** (V7HC6) stationary over the west central Gulf reported steady southeast winds of 20 kts with some occasions of 25 kts during the period of May 21 into May 25.

This happened to be the time of year when wildfires can be quite prevalent across sections of southeastern Mexico and Central America. The ongoing wildfires at the time were quite widespread over

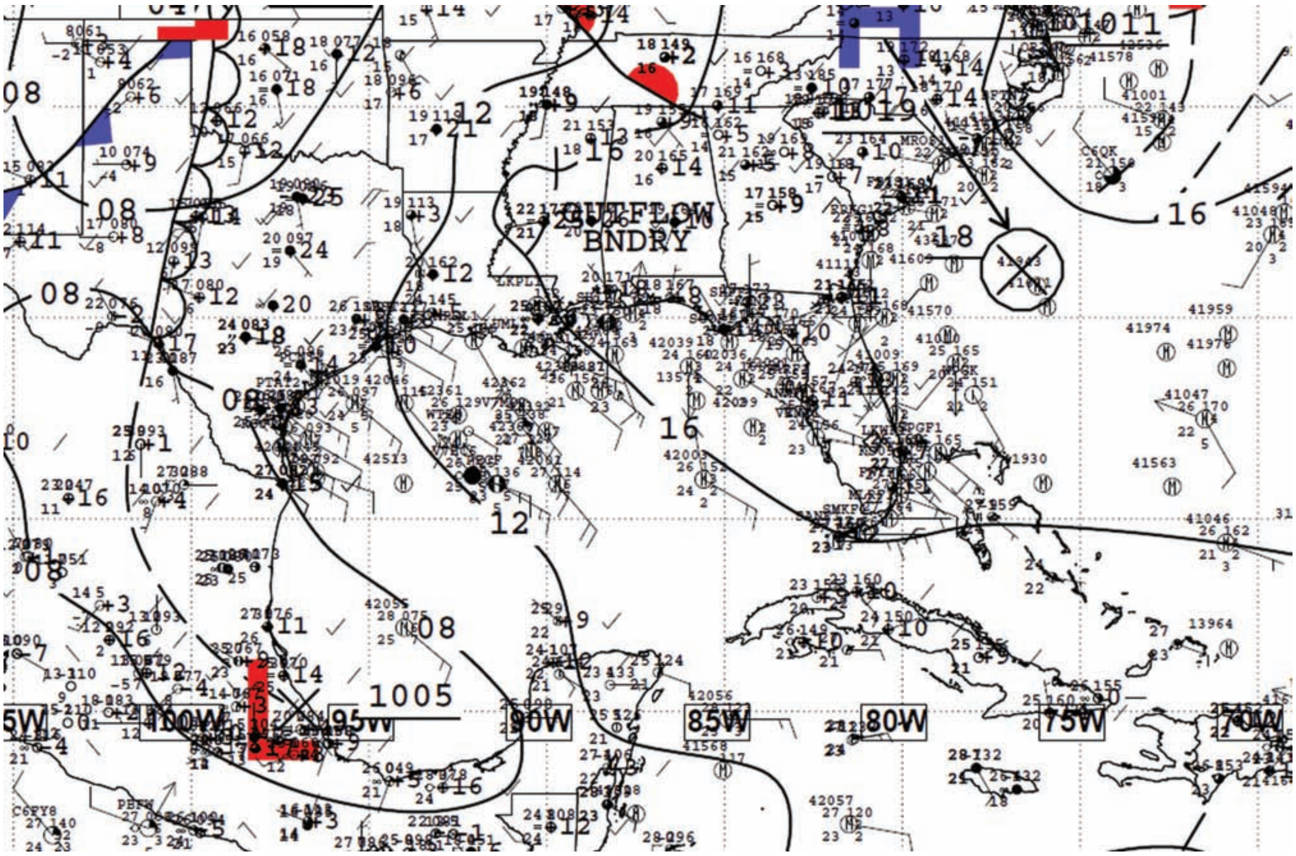


Figure 1. National Weather Service Unified Surface Analysis from 1200 UTC 21 May 2011.

those regions, as well as in Belize. A 1200 UTC observation on the 21st from ship **Iver Experience** (PECF) near 26N92W reported overcast sky cover suggesting that dense smoke was already in place over the western Gulf. Mention of the smoke and its impact on visibilities was introduced into the TAFB marine interpretation message (MIM) that was issued at 205 am EDT on May 21 to highlight the event as noted below.

```
AGXX40 KNHC 210657 AAA
MIMATS

MARINE WEATHER DISCUSSION...UPDATED
NWS NATIONAL HURRICANE CENTER MIAMI FL
300 AM EDT SAT MAY 21 2011

UPDATED GULF OF MEXICO

MARINE WEATHER DISCUSSION FOR THE GULF OF
MEXICO...CARIBBEAN SEA
AND TROPICAL N ATLC...AND SOUTHWEST NORTH ATLC S OF 31N W
OF 55W.

GULF OF MEXICO...

A LARGE AREA OF SMOKE CONTINUES TO STREAM NW TOWARD NE
MEXICO AND SE TEXAS FROM WILDFIRES BURNING IN THE YUCATAN
PENINSULA AND BELIZE. THIS SMOKE WILL OCCASIONALLY REDUCE
VISIBILITIES OVER THE W GULF WATERS.....ESPECIALLY DURING THE
NIGHTTIME AND EARLY MORNING HOURS.
```

Similar statements with regards to smoke and reduced visibilities were also incorporated into the Atlantic High Seas Forecasts and Gulf of Mexico Offshore Waters forecasts at 1800 UTC on May 24.

```
HIGH SEAS FORECAST
NWS NATIONAL HURRICANE CENTER MIAMI FL
2230 UTC TUE MAY 24 2011

SUPERSEDED BY NEXT ISSUANCE IN 6 HOURS

SEAS GIVEN AS SIGNIFICANT WAVE HEIGHT...WHICH IS THE AVERAGE
HEIGHT OF THE HIGHEST 1/3 OF THE WAVES. INDIVIDUAL WAVES MAY
BE
MORE THAN TWICE THE SIGNIFICANT WAVE HEIGHT.

SECURITE

ATLANTIC FROM 07N TO 31N W OF 35W INCLUDING CARIBBEAN SEA
AND
GULF OF MEXICO

SYNOPSIS VALID 1800 UTC TUE MAY 24.
24 HOUR FORECAST VALID 1800 UTC WED MAY 25.
48 HOUR FORECAST VALID 1800 UTC THU MAY 26.

.WARNINGS.

.NONE.

.SYNOPSIS AND FORECAST.
........
GULF OF MEXICO FROM 22N TO 26N BETWEEN 92W AND 96W SE
WINDS 20 KT. SEAS LESS THAN 8 FT. WIDESPREAD AREAS OF VISIBIL-
ITY BELOW 5 NM IN SMOKE W OF 91W.
```

The induced smoke plume became entrained into the southeasterly wind flow around the southwest periphery of the ridge, and became visible as early as 12 UTC on May 21. (*Figure 2*)

Gulf of Mexico oil rig platforms from **Mustang Island A31B Merit Energy**, KMIU, (27.3N 96.7W) to **East Breaks 165 (Sand Ridge Energy,** KEMK, (27.8N 94.3W) to **South Marsh 268A (Apache Corp,** KSCF, (29.1N 91.9W) revealed the persistent light to moderate southeasterly winds. The majority of these observations, as seen in *Figure 2,* showed near full cloud cover indicating the likelihood that dense smoke was very close to the sea surface. Subsequent satellite imagery continued to show the dense smoke plume advecting northwestward over the western Gulf. *Figure 3* showed that oil platforms were still reporting almost full cloud cover at 2200 UTC on May 24.

Of particular interest to mariners was that visibilities were sharply reduced (3-5 nmi) during the duration of the event. By 1800 UTC May 26, a cold front associated with the area of low pressure over the U.S. southern Great Plains moved into the coastal plains of the northwestern Gulf of Mexico. It became stationary, causing the east to west ridge to weaken. *Figure 4.* As a result, the wind flow across the southwest portion of the Gulf started to weaken as it transitioned to a more southwest flow in the northwest Gulf ahead of the front. These changes in the winds were enough to curtail the further advection of smoke into the Gulf of Mexico from the wildfire sources. However, even through the end of May 31, lingering smoke still covered much of the western Gulf as it slowly dissipated.

Ship observations can also be very purposeful in pointing out the possibility that reported sky cloud cover may be attributed to smoke in the conditions in the atmospheric environment, a situation

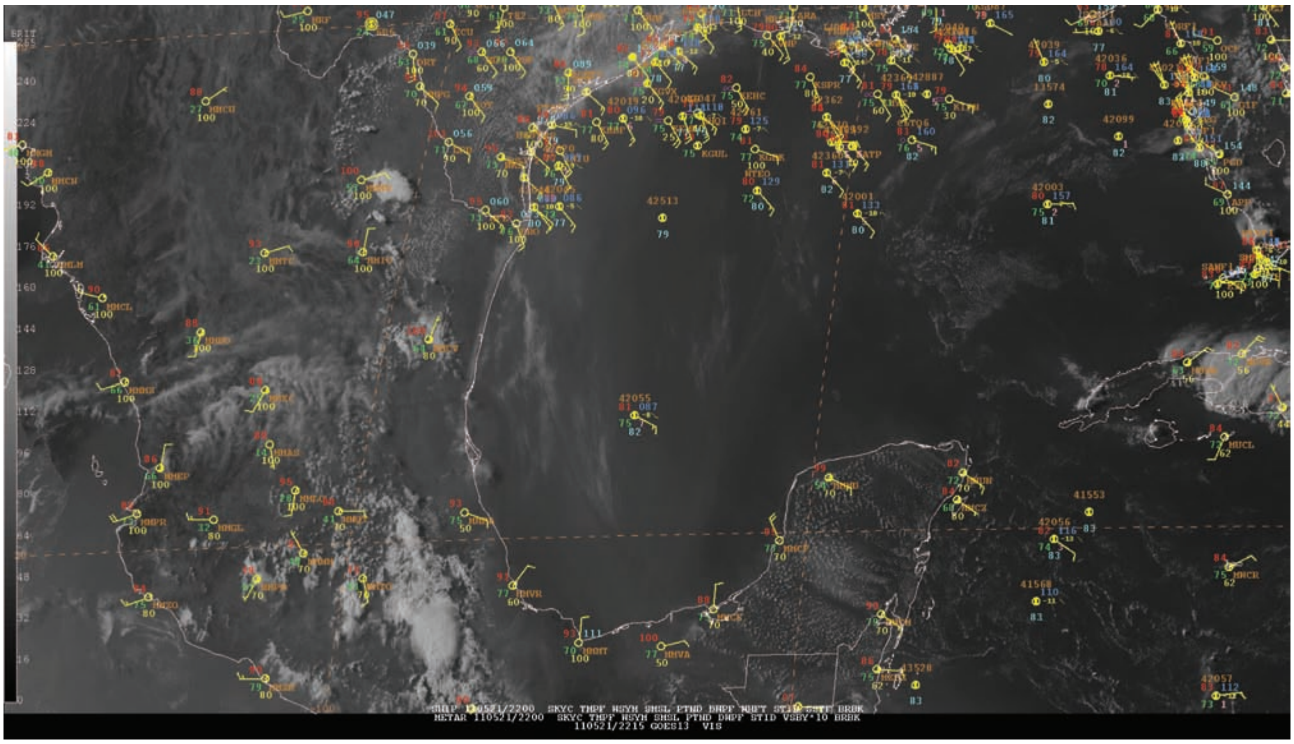


Figure 2. Similar statements with regards to smoke and reduced visibilities were also incorporated into the Atlantic High Seas Forecasts and Gulf of Mexico Offshore Waters forecasts at 1800 UTC on May 24.

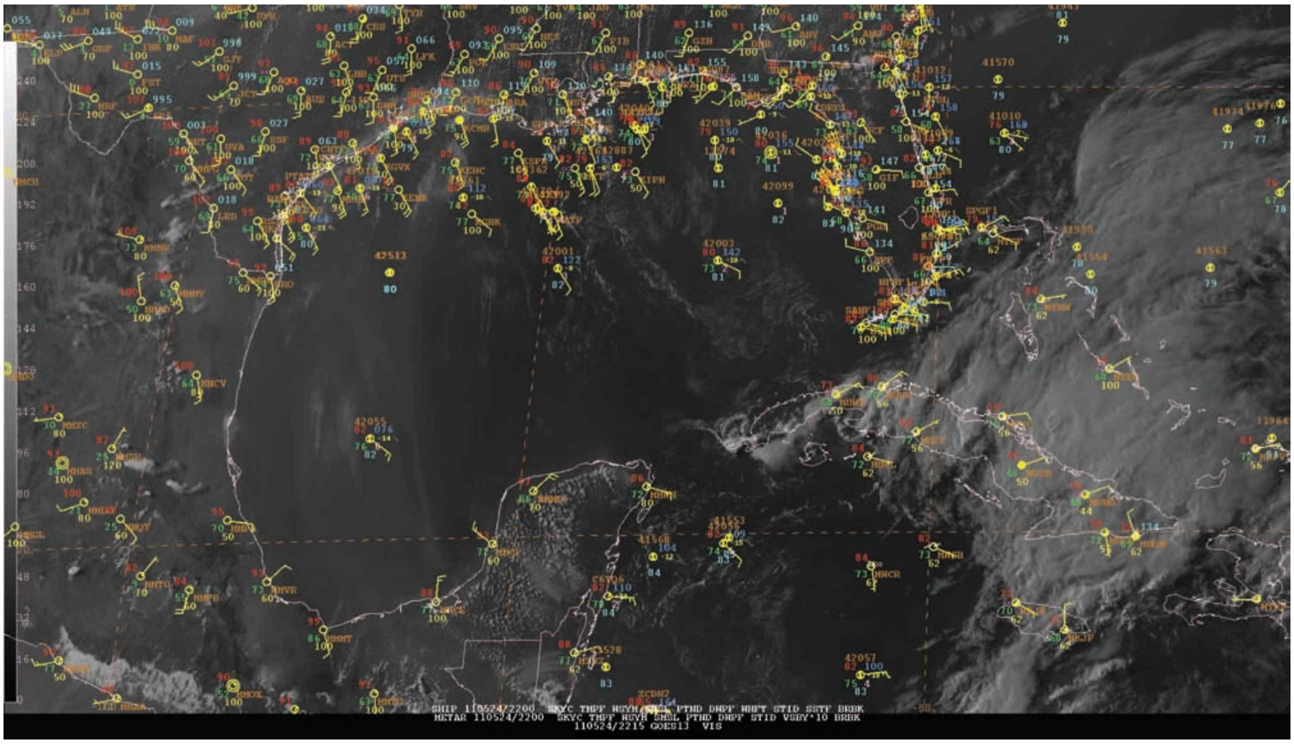


Figure 3. GOES visible satellite imagery, oil rig platform and buoy observations from approximately 2200 UTC 21 May.

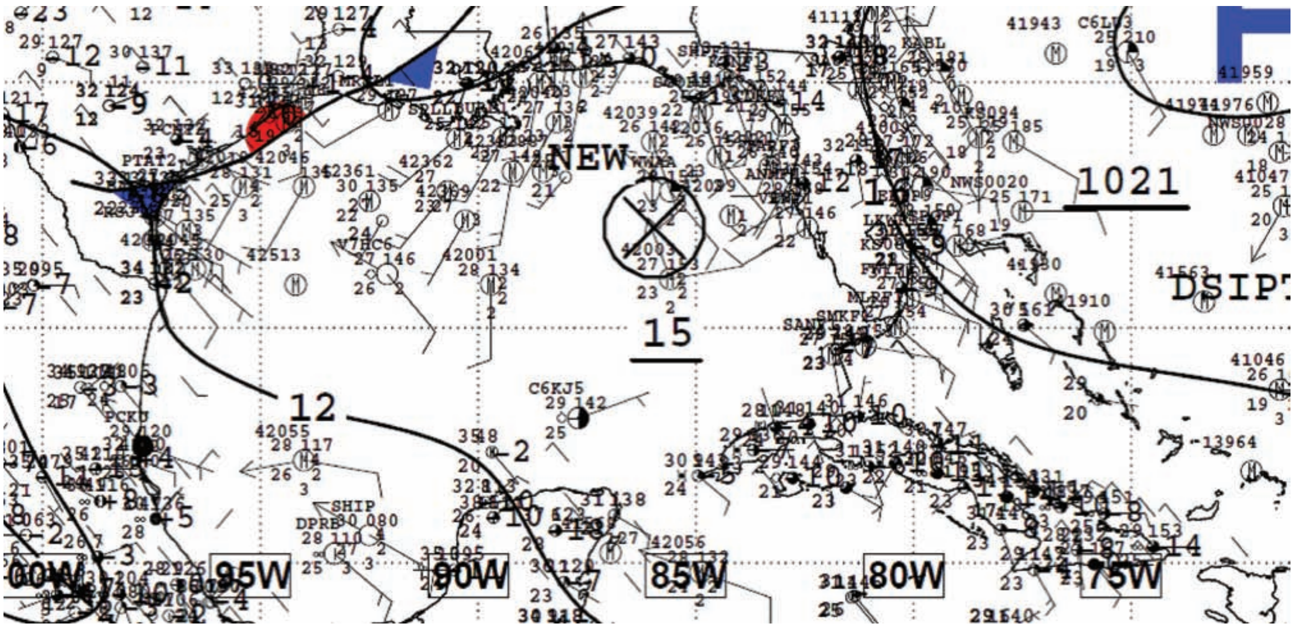


Figure 4. National Weather Service Unified Surface Analysis map from 1800 UTC 26 May 2011.

not too often encountered by mariners at sea.

Eastern Pacific Ocean North to 30N and East of 140W

Gales and significant wave events are almost exclusively attributed to tropical cyclones across the tropical northeast Pacific during the summer months. A single significant non-tropical cyclone marine event was documented May through August 2011. *Table 1* provides details on this event.

Late Season Gulf of Tehuantepec Gale

Gulf of Tehuantepec cold season wind events typically end by the first week of April. However, in early May 2011, there was a very strong late season gale event that lasted more than 48 hours.

Table 1. Non-tropical cyclone warnings issued for the subtropical and tropical eastern North Pacific (between the equator and 30°N from the west coast of Mexico and Central America to 140°W) between 1 May and 31 August 2011.

Onset	Region	Peak Wind Speed	Gale Duration	Weather Forcing
1500 UTC 3 May	Gulf of Tehuantepec	50 kt	54 hr	Pressure Gradient

Typical cold season Gulf of Tehuantepec wind events are initiated by strong northerly winds across the western Gulf of Mexico. This strong flow, which advects cold air southward, is supported by a steep pressure gradient between strong high pressure over Mexico or southern Texas and lower pressure over the Pacific Ocean. Funneling of the wind from the Gulf of Mexico into the eastern Pacific Ocean is due to gaps in the high terrain over southern Mexico, and is most pronounced across the Isthmus of Tehuantepec.

The final gale event of the season commenced around 1500 UTC 3 May. An unusually strong cold front plunged rapidly southward from the Texas coast into the western Gulf of Mexico the evening of May 2nd, and as it approached the Chivela Pass in the early morning hours of May 3rd, winds increased to 20 kts at Salina Cruz. 1025 hPa high pressure located near Tampico, Mexico in addition to a 1006hPa surface low located near Costa Rica strengthened the pressure gradient across the Isthmus of Tehuantepec (*Figure 5*). After the cold front reached the Chivela Pass, strong northerly winds began to surge into the Gulf of Tehuantepec.

A comparison of consecutive Advanced Scatterometer (ASCAT) passes on May 3rd demonstrated the sudden increase in winds during this period, as nearly calm winds in the Gulf of Tehuantepec were followed 12 hours later by the onset of gale force winds *(Figure 6).* These two images vividly demonstrate the potential hazards for marine vessels during wind events in the Gulf of Tehuantepec due to its unique terrain effects. Conditions can suddenly increase from calm winds and light chop to gale or storm force winds with steep waves within a few hours in a narrow swath extending less than 100 nm from the coast of Mexico.

For several days prior to the event, numerical model forecast winds indicated peak winds would occur on May 4th, with model winds at 1200 and 1800 UTC exceeding 50 kts near the coast. Due to the unusual late season nature of this event, TAFB forecasters were reluctant to issue a warning for storm force winds in the Gulf of Tehuantepec, and instead indicated that winds would peak at around 45 kt on the 4th in their forecast discussions. There were no ship reports or scatterometer passes over the Gulf of Tehuantepec on May 4th, and the only indication that winds approached 50 kts that day was a synoptic report of 35 kts from Ixtepec Mexico (WMO ID 76830) at 1800 UTC, which was the highest wind reported by a surface station while the gale warning was in effect. An altimetry satellite pass at 04/2130 UTC (*Figure 8*) indicated 16 ft seas about 270 nmi south of the Tehuantepec coast near 11.9N 95.3W.

However, on May 5th the passenger cruise ship **Sea Princess** (ZCBU3) transited the Gulf of Tehuantepec, and reported 48 kts sustained winds at 1000 UTC. A high-resolution ASCAT satellite passing over the same area a few hours earlier showed 35 to 40 kts near the coast of Mexico (*Figure 9*). Because strong gale force winds were occurring nearly 24 hours

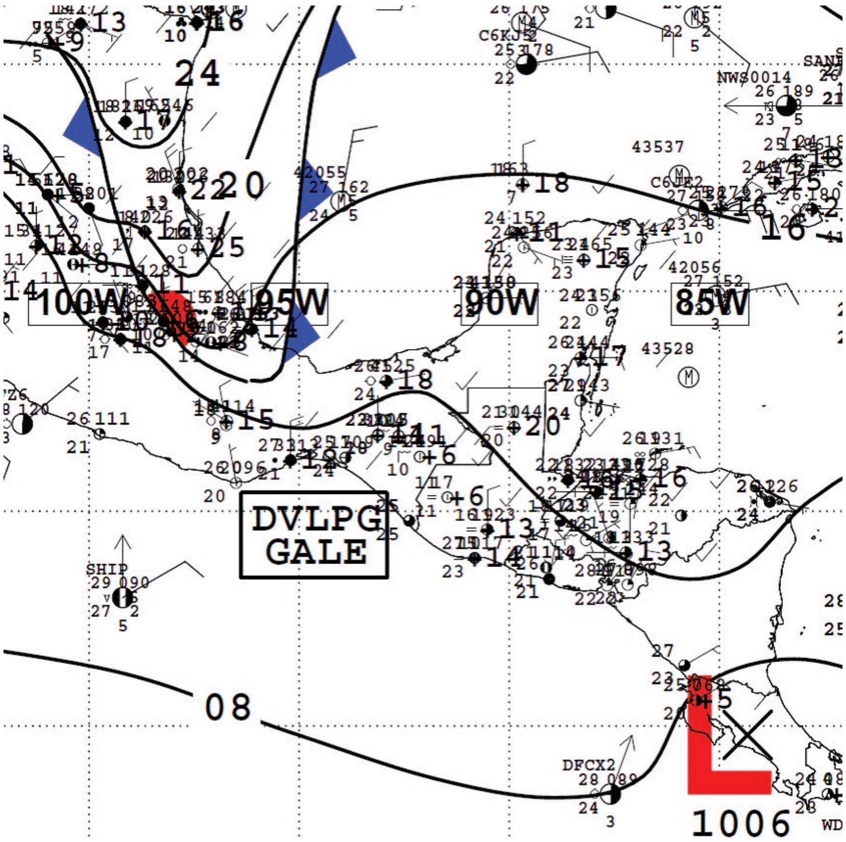
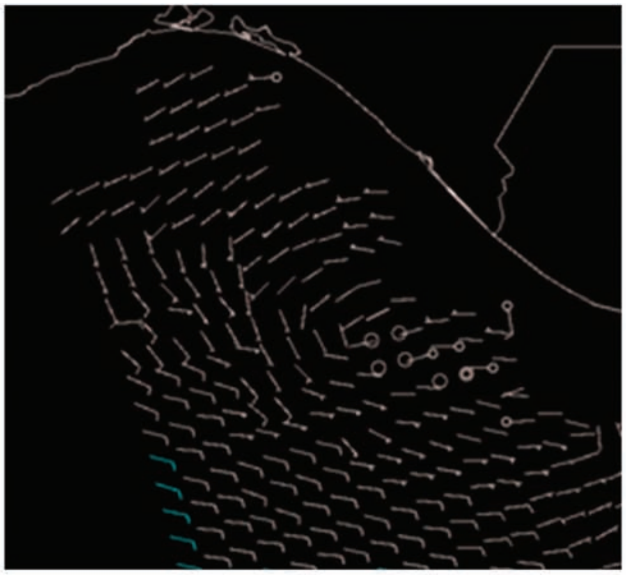


Figure 5. National Weather Service unified surface analysis chart from 1200 UTC 3 May 2011, centered on southern Mexico and Central America. Unusually strong high pressure from a late-season cold front is pushing into southern Mexico, toward the Isthmus of Tehuantepec.



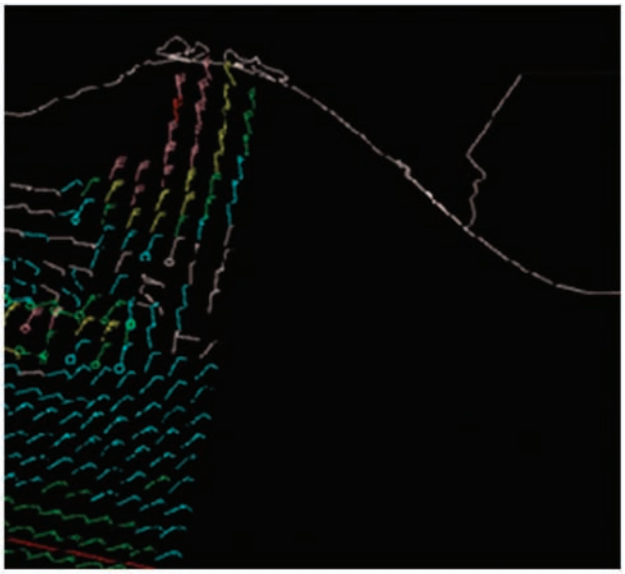


Figure 6 and 7. Advanced scatterometer (ASCAT) wind retrievals from 3 May 2011 over the Gulf of Tehuantepec. Figure 6 at 0309 UTC showed light variable winds over the entire swath. Figure 7 just over 12 hours later at 1541 UTC shows the onset of near-gale force winds over the same area. The red barb indicates winds of 30-33 kt.

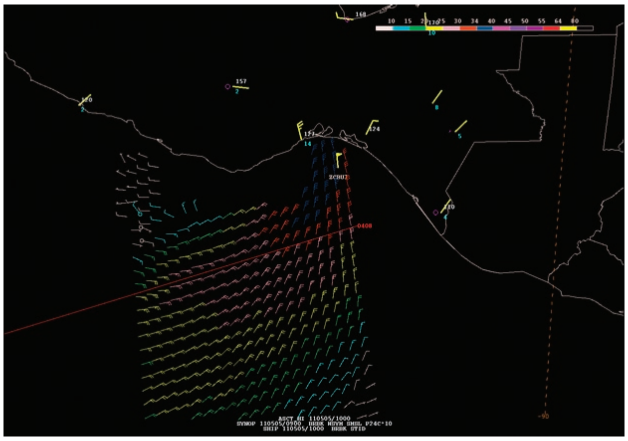


Figure 8. Satellite-derived sea height measurements (ft) from the Poseidon 3 altimeter on board the Jason-2 spacecraft at 2130 UTC 4 May 2011. The altimeter indicated sea heights up to 16.4 ft (in green) along the swath.

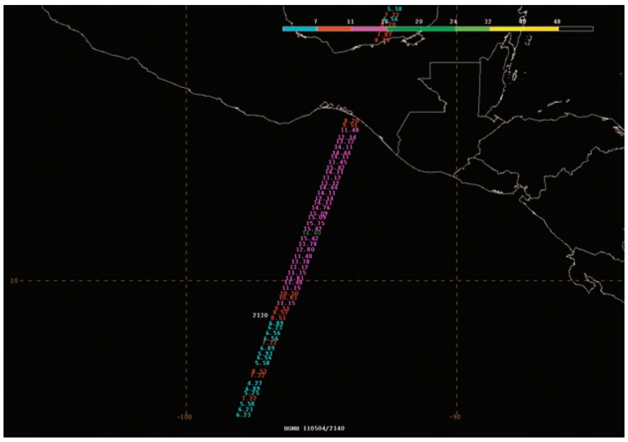


Figure 9. Composite image of surface and ship observations at 1200 UTC 5 May with Advanced scatterometer (ASCAT) wind retrievals six hours earlier at 0408 UTC.

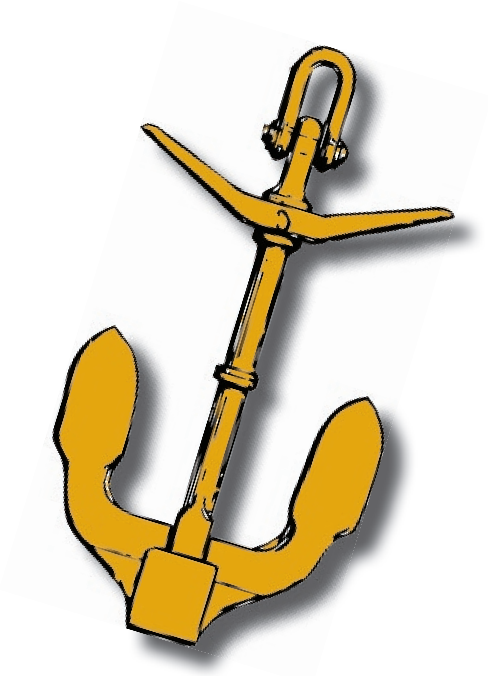
after the forecasted peak winds, it is considered highly likely that storm-force winds were present for several hours in the Gulf of Tehuantepec during this event. If so, it would be the only time in recent history that winds have reached 50 kts there during the month of May.

High pressure began to weaken and shift eastward in the southern Gulf of Mexico the evening of May 5th, which caused the surface pressure gradient across the Isthmus of Tehuantepec to gradually relax. By 2100 UTC wind observations from Salina Cruz and Ixtepec on the coast of Mexico, along with additional ship reports from the **Sea Princess** (ZCBU3) as it moved north away from the Gulf of Tehuantepec, indicated that winds had already dropped below 34 kts, and the gale warning was discontinued. ⚓

ACKNOWLEDGMENTS

The authors would like to extend their sincere thanks for the outstanding graphical and editing support provided by NHC Scientific Illustrator, Joan David.

VOS Program Awards



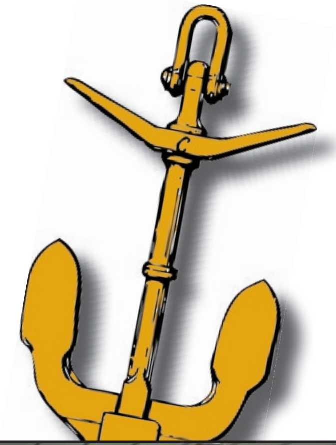
Pictured is the crew of the OVERSEAS JOYCE receiving the VOS AWARD for 2010. The OVERSEAS JOYCE has been in the U.S. VOS Project since 1988 but have become very active in their participation just recently with the enthusiasm instilled in them by their PMO Rob Niemeyer. Since 2008, the crew has more than doubled the amount of observations that they provided VOS and with a total of 914 observation for 2010, the OVERSEAS JOYCE has achieved their first annual VOS award. They are now a true and dedicated member of the U.S. VOS Project, Congratulations!

Pictured from left to right: Captain Gil B. Sanchez, 1M Dennis C. Clarin, 2M Eugene Fortich, 3M Severiano R. Guileng Jr., and 4M Danilo D. Depito Jr.

Star Fraser won a 2010 VOS Award with a total of 1,146 marine observations. This was an all time new ship's record!

From left to right: 2/O Joseph Cahiles, 3/O Joseph Calinao, C/O Felix Omega, 3/O-Trainee Von Erick Robles, and Capt. Edilberto Cruz

VOS Program Awards



Norwegian Star was presented their 2010 VOS Award in Juneau Alaska on September 13, 2011. They had an outstanding total of 1,492 marine observations which was an all time new ship's record and good for #1 in the NCL Fleet!

Left to Right: Alan Vera, Aldin de Juan, Peter Engwall, Carl Hammerin, Richard Desalesa, Mikko Kovalainen, Alvin Del Rosario

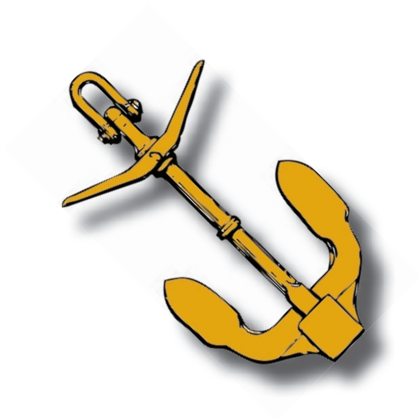
Noordam won a 2010 VOS Award with a total of 1,692 marine observations.

From the left to right: Captain John Scott; Cadet David Beckett; 1st Officer Leon van der Knaap; 4th Officer Mei van der Have; 3rd Officer Simon Morgan; Chief Officer Jethro Beck – holding plaque; 2nd Officer Wouter Koolhaas; Cadet Andrew Ribbons; 4th Officer Michael Hassan; Cadet Benjamin Dirksen. Not in picture, 3rd Officer Benito Graanoogst

Madrid Spirit won a 2010 VOS Award with a total of 894 marine observations. This was a new all time ship's record! Madrid Spirit was the #1 Manual Weather Observing ship for all of Teekay Shipping.

From left to right: Second Mate - Alvaro Vidal; Chief Officer Jr - Fernando Ezquerro; Third Officer - Manuel Herrera; Third Off. Training - Dario Gonzalez; Deck Cadet - Oriol Perez; Master - Ruben Fernandez Barro; Chief Officer - Talal Mansour

VOS Program Awards



Fritzi N was presented a 2010 VOS Award. They had an outstanding total of 3,291 marine observations! This was an all time new ship's record! Fritzi N was the number 1 observing ship for Anglo Eastern for 2010!

Standing (left to right), Capt Ronny Saldanha, 2/off Snigdhajyoti Kar, C/off Jasvinder Singh. Kneeling (left to right), 3/off Shray Khanduri & Cadet Amit Rawat.

Zuiderdam was presented with their 2010 VOS award in Juneau Alaska on September 12, 2011. They had a total of 1,815 marine observations which was an all time new ship's record.

From Left to Right: Andy Glendinning, Joshua Banyard, Henry Jones

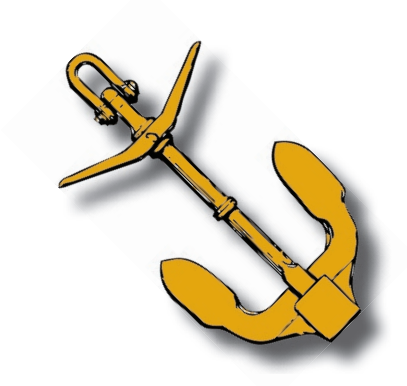
Holland America Cruise Ship Volendam won a 2010 VOS Award with an outstanding total of 6,190 marine observations! This was an all time new ship's record! Volendam was the number 1 manual observing ship for the USA VOS Program for 2010! The crew also transmitted around 100 marine mammal and phenomena reports. The award was presented in Juneau Alaska on AUG 19, 2011.

Back row (Left to Right): Captain Peter Bos, Colm Ryan, Harry Hobma, George Hale, Marienus Hazelman, Adam Wilson, Folkert Visser, John Prins, Maarten Janse, Kayleigh Tait. Front row (Left to Right): Radhityo Nugroho, Jefri Sipahuta, Alhudori, Muhazin, Sapei, Mochamad Achyat

VOS Program Awards

Celebrity Millennium won a 2010 VOS Award with an outstanding total of 2,523 valuable marine observations! This was an all time new ship's record!

Left to right: A.D.O. Tampouratzi Ourania; Deck Officer: Roman Kutsenko; A.D.O. Kircchoff Melanie; Master: Taramas Zisis; 1/O: Olteanu Cristina; Master: Alevropoulos Emmanouil; S/C: Kasimatis Ioannis; 2/O: Lemnaru Dragos; Navigation Officer: Varotsos Panagiotis



Splendour of the Seas won a VOS Award with a total of 1,312 valuable marine observations.

From left to right standing: 2nd off.A Mediano, 1st off E.Grandev, Chief Off. T.Potter, Quartermaster J.Lacera, Capt Iv Vidos, Quartermaster A.Gomez, Staff Capt. J. Caranti, 2nd Off L.Jimenez. From left to right in front: AB N.Ismael, Deck Cadet D.Bennie, Quartermaster B. Burgos, OS F.Cayetano, 1st off R.Salazar

Horizon Anchorage was presented with a 2010 VOS Award with an outstanding total of 1,361 marine observations! Since this was their 10th consecutive VOS Award, they were also presented with a 10 Year Award Pennant.

Pictured from left to right: Tamara Becker - 3rd Mate; Warren Bragg - 2nd Mate; Shawn Farrell - 3rd Mate; not pictured: Captain Robert Cooper

VOS Program Awards

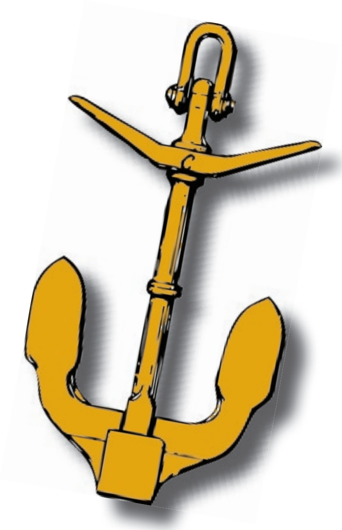
Sitting in the front row: 2nd Officer Collen Engada, 1st Officer Yasendy Santamaria Ku. Standing from Lelft to right: 2nd officer Edler C. Bongo, Captain Kenneth Harstom, 3rd Officer Paulino; Sanchez and Nav. Officer Arvin Empialets.

The Norwegian Spirit continues to stay on top of their game by providing an abundance of timely as well as quality marine weather observations. This will be their second consecutive VOS award and I am sure this trend will continue. Congratulations to the wonderful officers who are dedicated to our mission here at VOS.

Superstar Libra had 924 marine observations in 2010! This was a new all time ship's record! In this photo, from left to right: Third Officer Dino Rebote; Third Officer Jimmy Cerdenola; Captain Lennart Jegerfalk; Staff Captain Thomas Larsen; First Officer Kalle Ek; Second Officer Michael Qun Shang Dong; Second Officer Henry Xu Xi Min; Third Officer Erich Anonuevo

Pictured from lright to left: 3rd Officer Sandeep Kumar, Captain Pradeep Widge, 2nd Officer Gaurau Singh and Chief Officer Glen D'souza. Pictured are the officers and Captain of the ship H.A. Sklenar being presented with the VOS annual award for outstanding service in 2010...Bravo Zulu !

VOS Program Awards

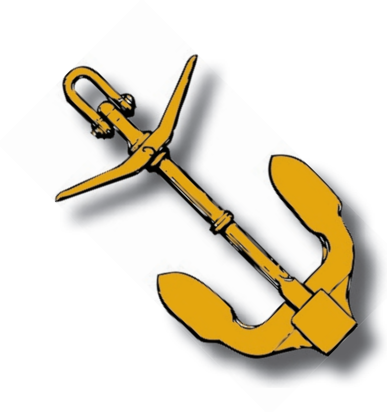


Crew from the Midnight Sun receiving their performance reward. From left to right: 2nd mate Aaron Nystrom; Chief Mate Russ Horton; 3rd Mate Tony Milam; Deck Cadet Nathan Sherr; 2nd Mate Alecc Clark. Presented on 27 July 2011

2010 VOS winner YM Busan. Pictured are Captain Tarun Rishi, and C/O Debartha Bhattacharjee. Not pictured: Captain Hanoz Buhariwalla, C/O Christopher Miranda, 2/O; Alister Randolph Joseph, 2/O Stephen D'Souza, 3/O Derrick D'Souza and 3/O Ajit Yadav

Left To Right - Captain, Mark Ruppert Second Mate, Bob Anderson. Not Shown: Captain Bill Boyce; Chief Mate Chris Danilek; Chief Mate John Rawley; Second Mate James Mcafee; Third Mate Terry Williams

VOS Program Awards



This is the 2010 VOS Observation award winner the M/V Edgar B. Speer. Pictured on the left is 1st Mate James Stengel and to his right is 2nd Mate Richard Jenulis.

Crew of the UBC Saiki receiving their 2010 VOS award

Congratulations once again to the crew of the Transocean Drill Ship DISCOVERER CLEAR LEADER. The CLEAR LEADER continues to be one of the best ships among the Transocean League of observing ships. Once again, Bravo Zulu to you all!

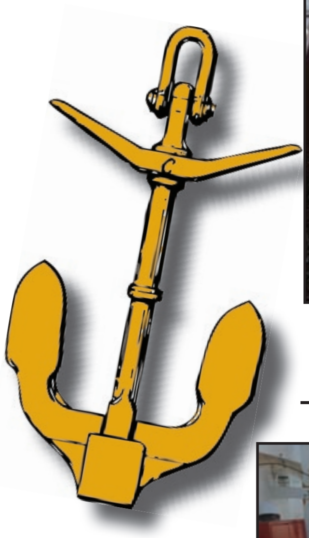
From left to right; Sr DPO Greg Stanfield, Chief Mate Aubrey Gabriel,DPO Mike Dirnbeck, DPO Brian Belanger, Captain Doug Banfield

VOS Program Awards

Pictured is the NOAA SHIP GORDON GUNTER crew receiving their 10 year pennant for exemplary participation in the VOS program. Not only has the NOAA SHIP GORDON GUNTER been an active and consistently high caliber observing ship for the National Weather Service and VOS; the GORDON GUNTER provided a platform for extensive R & D in the automation of marine weather observations for the NOAA Fleet as well as software development and enhancement. The ships high standards of calibrated instrumentation in conjunction with the dedicated crew members was in intricate part to the successful launching of the SEAS AutoIMET. Thanks go to all of you for your patience, dedication and your all around excellence!

Pictured from Left to Right: ENS Jennifer Wegener, OPS Lt Kent Stein, Safety Officer LTJG Tim Sinquefield, CO LCDR Jeff Taylor, XO Lt Stephen Berry and ET Anthony VanCampen. Not Pictured: ENS Van Helker

Pictured are the officers of the NOAA Ship OREGON II receiving their 5 year pennant signifying 5 consistent years of outstanding performance and dedication in the U.S. VOS Program. Bravo Zulu! Left to Right, Lt. Sarah Harris, LCDR Jason Appler, Captain Dave Nelson, ENS Larry Thomas and ENS Brian Adornato



Scientists aboard the Oregon II getting ready to Shove Off for the Shark long-line Survey!

The NOAA Ship OREGON II is supported not only by their team of officers, but the extraordinary efforts of the electronics team, engineering systems team as well as the multitasking, multifaceted skilled fishermen and let's not forget the very important Stewards. Pictured: left to right Electronics Technician Brian Thompson, Skilled Fisherman Chuck Godwin and Ships Electronic/ Engineering Representative Tim Burrell

National Weather Service VOS Program New Recruits:

July 1 through October 31, 2011

SHIP NAME	CALL SIGN
Algoma Mariner	CFN5517
Algosteel	VDJB
Alkin Kalkavan	TCOL6
Aquavictory	A8VA2
Baltic Wind	A8SU8
Besire Kalkavan	V7OQ7
Bulk Mexico	A8VL8
Camellia	VRCP9
Celebrity Silhouette	9HA2583
Genco Hadrian	V7QN8
Hugo N	A8TD2
James L. Kuber	WDF7020
LNG Jupiter	C6XQ5
Lyla	V7QK3
Maersk Jurong	3ER06
Maersk Wakayama	3FCC4
Maersk Walvis Bay	3FWS9
Maersk Willemstadt	3FTJ8
Maersk Wolfsburg	VRGP3
Noble Ace	2EL07
Northern Jupiter	A8TA5
NYK Daedalus	3EMS
NYK Futago	9V8739
NYK Rumina	9V7645
Ocean Freedom	WDF9323
Pacific Mistral	A8WI2

SHIP NAME	CALL SIGN
Prosperous	VRIA3
Stikine	WDC8583
Tarang	ELSR7
Tiawan Express	C4XC2
Tonsberg	9HA2066
Unique Explorer	VRGT8
USCGC Fir	NAYV
Vietnam Express	VRCZ4
West Sirius	3EMK6
YP676	YP 676
YP696	YP 696
YP686	YP 686
Yuyo Spirits	3FNF4

39 NEW RECRUITS! WAY TO GO!!!

VOS Cooperative Ship Report:
January through October 2011

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Achievement	WDF2728	0	0	0	0	47	29	56	67	112	20	0	0	331
Adam E. Cornelius	WCY9870	0	0	0	0	0	0	2	1	0	0	0	0	3
Adrian Maersk	OXLD2	0	0	0	0	0	0	0	0	0	19	0	0	19
Advantage	WPPO	4	0	9	13	8	37	13	9	1	1	0	0	95
Adventure Of The Seas	C6SA3	156	244	380	334	396	290	324	299	370	350	0	0	3143
Adventurer	WBN3015	1	20	2	16	3	19	8	10	0	0	0	0	79
Al Huwaila	C6VG2	24	17	11	5	1	0	0	0	9	0	0	0	67
Al Khuwair	C6VM6	0	20	37	12	16	6	0	24	8	0	0	0	123
Al Marrouna	C6VF5	53	60	46	52	52	38	74	79	1	0	0	0	455
Alaska Mariner	WSM5364	9	33	7	34	25	85	117	153	69	93	0	0	625
Alaska Titan	WDE4789	12	0	0	0	0	0	0	0	0	11	0	0	23
Alaskan Explorer	WDB9918	87	77	32	26	88	124	136	86	212	126	0	0	994
Alaskan Frontier	WDB7815	40	17	34	45	0	68	65	48	38	47	0	0	402
Alaskan Legend	WDD2074	23	60	116	101	0	36	0	0	25	12	0	0	373
Alaskan Navigator	WDC6644	13	40	55	49	7	0	64	163	135	6	0	0	532
Albemarle Island	C6LU3	50	32	34	33	50	35	37	24	52	57	0	0	404
Alert	WCZ7335	2	24	20	42	21	4	4	3	3	4	0	0	127
Algolake	VCPX	0	0	0	0	3	0	1	0	0	0	0	0	4
Algoma Discovery	CFK9796	0	0	0	0	0	13	28	3	21	26	0	0	91
Algoma Guardian	CFK9698	0	0	0	7	11	9	39	22	3	14	0	0	105
Algoma Navigator	VGMV	0	0	0	0	0	0	6	3	0	13	0	0	22
Algoma Progress	VDRV	17	0	1	34	28	10	5	23	31	20	0	0	169
Algoma Spirit	CFN4309	0	8	50	8	5	15	6	14	14	5	0	0	125
Algoma Transport	VCLX	0	0	0	0	0	0	0	6	0	0	0	0	6
Algomarine	VGJV	0	0	0	0	0	0	0	0	10	0	0	0	10
Algorail	VYNG	0	0	0	0	1	108	19	59	0	0	0	0	187
Algosoo	VGJD	0	0	0	0	0	0	16	21	0	0	0	0	37

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Algosteel	VDJB	0	0	0	0	0	2	3	2	0	0	0	0	7
Algoway	VDFP	0	0	0	1	38	38	11	46	46	5	0	0	185
Algowood	VCTD	0	0	0	3	3	1	2	0	0	0	0	0	9
Alkin Kalkavan	TCOL6	0	0	0	0	0	0	1	0	0	0	0	0	1
Alliance Beaumont	WKDY	30	25	0	0	27	59	51	31	36	47	0	0	306
Alliance Charleston	WRAH	29	24	29	55	62	33	60	44	35	50	0	0	421
Alliance St Louis	WGAE	12	21	5	27	19	39	10	25	36	19	0	0	213
Allure Of The Seas	C6XS8	7	15	1	2	0	0	2	6	33	21	0	0	87
Alpena	WAV4647	0	0	3	11	2	10	16	12	2	0	0	0	56
Altair Voyager	C6OK	3	0	2	18	41	5	48	5	6	22	0	0	150
American Century	WDD2876	55	0	78	299	306	309	352	296	265	435	0	0	2395
American Courage	WDD2879	0	0	0	0	5	7	0	0	0	0	0	0	12
American Integrity	WDD2875	42	0	13	79	57	25	10	16	22	10	0	0	274
American Mariner	WQZ7791	0	0	6	38	25	22	31	24	20	16	0	0	182
American Spirit	WCX2417	16	0	7	39	56	76	46	23	57	53	0	0	373
American Tern	WAHF	4	18	13	27	45	16	6	0	0	10	0	0	139
Amsterdam	PBAD	55	34	42	31	81	165	129	108	84	147	0	0	876
Andromeda Voyager	C6FZ6	9	45	20	59	25	10	45	36	14	53	0	0	316
Antonis I. Angelicoussis	C6FP5	72	74	26	23	65	72	40	84	54	3	0	0	513
Antwerpen	VRBK6	64	53	111	67	69	74	64	88	136	55	0	0	781
APL Agate	WDE8265	55	41	41	43	28	48	59	54	4	51	0	0	424
APL Belgium	9VKQ3	73	23	8	53	25	14	17	4	0	0	0	0	217
APL Cairo	S6HU3	0	0	0	0	0	9	0	0	0	0	0	0	9
APL China	WDB3161	70	90	65	61	48	31	46	60	50	60	0	0	581
APL Coral	WDF6832	6	5	0	3	16	7	0	51	26	64	0	0	178
APL Cyprine	WDE8293	1	14	3	13	9	16	29	18	0	0	0	0	103
APL England	9VDD2	76	8	23	28	57	51	82	81	57	95	0	0	558
APL Garnet	9VVN	6	11	15	11	23	0	15	18	34	8	0	0	141

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
APL Japan	WDE8288	45	41	24	30	34	50	70	51	74	49	0	0	468
APL Kennedy	9VAY4	40	20	29	3	0	0	37	49	55	43	0	0	276
APL Korea	WCX8883	30	145	217	279	37	28	260	335	216	110	0	0	1657
APL Paradise	3ECJ7	0	0	0	0	0	0	0	0	0	54	0	0	54
APL Pearl	WDE8264	200	58	67	90	117	79	28	110	91	65	0	0	905
APL Philippines	WCX8884	34	19	44	39	18	22	46	56	33	35	0	0	346
APL Scotland	9VDD3	30	41	2	25	31	50	42	45	77	38	0	0	381
APL Singapore	WCX8812	38	44	35	21	25	16	42	40	42	69	0	0	372
APL Spinel	9VVK	4	32	46	2	5	3	16	0	24	1	0	0	133
APL Tennessee	9HA2064	40	30	27	27	0	0	0	0	38	22	0	0	184
APL Texas	VRFH2	0	11	54	14	42	5	13	18	4	2	0	0	163
APL Thailand	WCX8882	49	48	34	39	12	42	72	62	33	23	0	0	414
APL Tourmoline	9VVP	0	0	0	0	0	21	24	25	18	29	0	0	117
APL Turquoise	9VVY	29	0	0	0	0	0	0	0	0	0	0	0	29
APL Washington	VRFD6	0	0	0	0	0	13	20	12	4	0	0	0	49
Aquarius Voyager	C6UC3	4	18	8	47	8	10	3	44	50	1	0	0	193
Aquavictory	A8VA2	0	0	0	0	0	19	10	2	3	0	0	0	34
Arctic Bear	WBP3396	0	0	0	10	2	1	0	0	1	5	0	0	19
Arctic Ocean	C6T2062	3	41	23	51	42	32	46	46	34	0	0	0	318
Arcturus Voyager	C6YA7	1	0	26	11	93	64	60	58	57	31	0	0	401
Aries Voyager	C6UK7	57	76	69	51	33	12	50	2	4	17	0	0	371
Arthur M. Anderson	WE4805	156	0	32	200	147	84	295	276	247	220	0	0	1657
Atlantic Breeze	VRDC6	20	32	16	24	15	14	21	1	0	0	0	0	143
Atlantic Cartier	SCKB	38	22	28	18	15	24	14	8	24	24	0	0	215
Atlantic Explorer	WDC9417	0	0	0	0	1	0	0	0	0	0	0	0	1
Atlantic Explorer (AWS)	NWS0021	0	116	388	194	181	410	404	237	153	620	0	0	2703
Atlantic Frontier	VRDJ7	0	0	0	6	1	0	184	186	186	178	0	0	741
Atlantic Gemini	VRDO9	0	219	36	0	0	0	0	0	0	0	0	0	255
Atlantic Grace	VRDT7	17	47	463	363	136	44	23	28	1	0	0	0	1122

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Atlantic Lily	VREF6	0	0	10	22	37	38	9	25	13	2	0	0	156
Atlantic Ocean	C6T2064	20	0	31	31	20	21	16	32	27	39	0	0	237
Atlantic Rose	VREF7	0	0	0	0	0	0	0	0	35	17	0	0	52
Atlantis (AWS)	NWS0020	0	0	262	153	733	710	740	740	717	703	0	0	4758
Attentive	WCZ7337	0	9	18	74	0	0	15	1	14	6	0	0	137
Aurora	WYM9567	160	286	273	314	340	635	302	680	370	0	0	0	3360
Aware	WCZ7336	0	0	33	0	0	0	1	0	0	4	0	0	38
Axel Spirit	C6FY5	57	80	86	80	86	76	72	58	14	34	0	0	643
Azamara Journey	9HOB8	39	142	83	44	4	3	1	106	54	24	0	0	500
Azamara Quest	9HOM8	36	37	51	24	51	31	7	29	29	1	0	0	296
Badger	WBD4889	0	0	0	0	0	13	13	19	1	2	0	0	48
Baltic Bear	V7QN4	0	0	0	0	52	45	40	11	0	0	0	0	148
Baltic Cove	A8VG9	0	0	1	11	6	1	0	0	4	11	0	0	34
Baltic Wind	A8SU8	0	1	0	0	0	6	13	8	3	0	0	0	31
Baltic Wolf	V7QX8	0	0	64	11	0	20	62	70	29	115	0	0	371
Barbara Andrie	WTC9407	1	0	2	10	5	21	31	36	31	22	0	0	159
Barbara Foss	WYL4318	7	0	14	8	2	0	0	0	0	3	0	0	34
Barrington Island	C6QK	38	52	51	35	50	59	29	50	26	40	0	0	430
Bell M. Shimada	WTED	0	0	0	0	0	0	83	280	36	0	0	0	399
Bell M. Shimada (AWS)	NWS0025	0	0	227	331	185	240	250	0	0	0	0	0	1233
Berge Nantong	VRBU6	182	493	156	105	60	47	23	11	6	48	0	0	1131
Berge Ningbo	VRBQ2	2	0	1	0	41	79	76	2	0	52	0	0	253
Berlian Ekuator	HPYK	30	5	23	17	0	0	0	0	0	0	0	0	75
Bernardo Quintana A.	C6KJ5	67	61	68	72	54	62	57	45	44	56	0	0	586
Berra K	TCTH9	0	0	0	0	0	0	15	15	9	7	0	0	46
Bismarck Sea	WDE5016	1	0	0	0	0	1	0	0	0	0	0	0	2
Bluefin	WDC7379	0	0	0	0	2	58	64	63	42	0	0	0	229
Brilliance Of The Seas	C6SJ5	0	0	0	1	0	0	0	0	1	0	0	0	2

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Buccaneer	WYW5588	0	0	1	5	11	0	0	0	0	2	0	0	19
Buffalo	WXS6134	12	0	0	0	0	0	1	0	0	17	0	0	30
Bulk Mexico	A8VL8	0	0	0	0	0	0	18	53	57	53	0	0	181
Bulwark	WBN4113	16	4	20	18	60	59	19	16	16	45	0	0	273
Burns Harbor	WDC6027	28	0	0	36	49	47	57	7	8	56	0	0	288
California Voyager	WDE5381	42	2	6	31	55	13	23	38	2	37	0	0	249
Calumet	WDE3568	0	0	0	0	2	8	0	0	4	3	0	0	17
Camai	KF003	0	0	0	0	6	0	2	7	1	1	0	0	17
Camellia	VRCP9	0	0	0	0	0	0	0	0	22	0	0	0	22
Capelin	KF006	0	0	0	0	0	1	0	0	0	0	0	0	1
Capricorn Voyager	C6UZ5	29	9	15	11	1	15	25	37	34	41	0	0	217
Capt. Henry Jackman	VCTV	0	0	0	5	4	2	0	0	1	0	0	0	12
Carnival Conquest	3FPQ9	23	14	13	11	9	59	63	55	44	15	0	0	306
Carnival Destiny	C6FN4	38	29	23	53	57	125	137	73	13	53	0	0	601
Carnival Dream	3ETA7	30	49	35	8	7	30	32	33	11	27	0	0	262
Carnival Ecstasy	H3GR	15	5	0	12	24	18	0	8	1	4	0	0	87
Carnival Elation	3FOC5	0	9	13	15	9	1	45	7	0	0	0	0	99
Carnival Fantasy	H3GS	11	6	12	12	3	30	86	66	55	24	0	0	305
Carnival Fascination	C6FM9	2	0	3	6	83	39	61	37	8	16	0	0	255
Carnival Freedom	3EBL5	23	5	7	16	67	46	18	21	56	6	0	0	265
Carnival Glory	3FPS9	49	40	39	48	8	8	9	28	7	0	0	0	236
Carnival Imagination	C6FN2	33	43	40	49	3	34	14	1	3	9	0	0	229
Carnival Inspiration	C6FM5	74	46	15	3	26	16	67	53	30	34	0	0	364
Carnival Legend	H3VT	0	0	0	0	5	3	0	22	8	0	0	0	38
Carnival Liberty	HPYE	26	21	46	51	35	53	84	42	26	8	0	0	392
Carnival Miracle	H3VS	4	57	49	52	48	42	23	0	6	41	0	0	322
Carnival Paradise	3FOB5	11	6	26	28	31	36	27	1	0	0	0	0	166
Carnival Pride	H3VU	0	0	0	4	23	22	19	21	0	0	0	0	89
Carnival Sensation	C6FM8	25	43	10	1	0	0	7	0	33	37	0	0	156

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Carnival Spirit	3FPR9	51	41	23	5	11	9	30	28	25	10	0	0	233
Carnival Splendor	3EUS	0	9	35	41	35	42	36	9	15	188	0	0	410
Carnival Triumph	C6FN5	0	19	31	17	19	18	21	31	72	22	0	0	250
Carnival Valor	H3VR	41	4	43	13	6	4	4	14	92	83	0	0	304
Carnival Victory	3FFL8	22	24	18	8	19	59	55	28	27	16	0	0	276
Caroline Maersk	OZWA2	0	0	37	42	39	41	51	12	14	11	0	0	247
Cason J. Callaway	WE4879	3	0	32	56	21	22	6	7	26	18	0	0	191
Castor Voyager	C6UZ6	0	66	20	62	64	23	36	55	30	84	0	0	440
Celebrity Century	9HJI9	142	93	54	115	30	152	225	198	126	46	0	0	1181
Celebrity Constellation	9HJB9	417	530	351	319	312	305	269	297	299	274	0	0	3373
Celebrity Eclipse	9HXC9	649	636	692	629	659	628	534	384	467	496	0	0	5774
Celebrity Equinox	9HXD9	319	267	573	580	536	466	341	343	394	454	0	0	4273
Celebrity Infinity	9HJD9	27	45	147	75	85	84	39	128	95	71	0	0	796
Celebrity Mercury	9HJG9	0	388	0	0	0	0	0	0	0	0	0	0	388
Celebrity Millennium	9HJF9	194	296	287	186	227	246	225	236	195	151	0	0	2243
Celebrity Silhouette	9HA2583	0	0	0	0	0	0	189	501	503	409	0	0	1602
Celebrity Solstice	9HRJ9	546	526	353	427	388	296	170	254	134	194	0	0	3288
Celebrity Summit	9HJC9	85	90	235	192	264	242	155	107	107	137	0	0	1614
Centurion	WBN3022	9	11	6	0	3	0	13	29	12	0	0	0	83
Chaconia	ONCA	23	25	30	33	2	0	0	0	0	0	0	0	113
Chamai	WDD5880	0	0	0	0	0	0	10	2	0	0	0	0	12
Charles Island	C6JT	48	16	14	21	19	4	31	22	15	28	0	0	218
Charleston Express	WDD6126	91	96	119	131	101	96	121	135	115	192	0	0	1197
Chemical Pioneer	KAFO	0	44	25	22	11	13	33	14	2	7	0	0	171
Chenega	WDC3997	0	0	0	0	0	0	0	0	7	2	0	0	9
Chukchi Sea	WED2281	0	0	0	3	0	0	0	0	0	0	0	0	3
CMB Biwa	ONED	6	3	0	0	0	0	0	0	0	0	0	0	9
Commitment	WDE3894	8	14	0	5	46	26	29	0	9	10	0	0	147

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Cornelius Maersk	OYTN2	0	0	0	0	1	5	0	0	0	0	0	0	6
Corwith Cramer	WTF3319	0	7	25	0	17	21	1	0	0	0	0	0	71
Costa Allegra	ICRA	17	8	4	0	0	0	0	0	0	0	0	0	29
Costa Atlantica	IBLQ	1	3	14	0	0	0	0	0	0	0	0	0	18
Costa Concordia	IBHD	0	120	197	213	425	363	430	236	46	0	0	0	2030
Costa Fortuna	IBNY	111	172	134	21	0	0	0	0	0	0	0	0	438
Costa Luminosa	ICGU	0	3	1	0	0	0	0	0	0	0	0	0	4
Costa Magica	IBQQ	0	3	1	0	0	0	0	0	0	0	0	0	4
Costa Marina	IBNC	0	15	90	40	53	157	151	143	137	120	0	0	906
Costa Mediterranea	IBCF	0	3	22	53	1	0	0	0	0	0	0	0	79
Costa Romantica	IBCR	0	39	61	55	30	3	0	0	0	0	0	0	188
Costa Serena	ICAZ	0	3	1	0	0	0	0	0	0	0	0	0	4
Courage	WDC6907	4	1	22	16	4	0	3	2	0	1	0	0	53
Courage	WDE3893	11	2	5	7	15	1	11	0	0	0	0	0	52
Cross Point	WCW8728	0	0	0	0	1	0	0	0	3	0	0	0	4
Cross Point	WDA3423	0	0	0	0	1	0	0	0	0	0	0	0	1
Crowned Eagle	V7QP4	1	1	1	9	0	2	0	0	0	0	0	0	14
Crystal Marine	9VIC4	11	6	0	4	15	20	19	14	0	0	0	0	89
Csl Assiniboine	VCKQ	0	0	0	0	11	0	0	0	0	3	0	0	14
Csl Niagara	VCGJ	0	0	0	11	1	0	3	0	0	0	0	0	15
Darya Shanthi	VRXB2	2	57	66	114	19	18	1	0	0	0	0	0	277
Darya Shree	VRZZ2	0	0	0	0	0	0	3	0	0	0	0	0	3
Darya Tara	VRWS5	16	0	0	0	0	0	0	0	0	0	0	0	16
Deepwater Millennium	V7HD2	29	23	33	39	27	28	35	29	43	17	0	0	303
Defender	WBN3016	1	0	0	40	11	29	65	23	2	0	0	0	171
Delaware II	KNBD	156	370	0	0	204	389	229	212	222	116	0	0	1898
Delaware II (AWS)	NWS0012	195	408	0	0	465	0	382	285	0	0	0	0	1735
Deliverance	WDE2632	1	0	0	7	37	26	44	9	2	1	0	0	127
Diane H	WUR7250	0	0	0	4	7	8	12	1	11	15	0	0	58

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Discoverer Clear Leader	V7MO2	103	93	76	67	86	67	69	61	78	54	0	0	754
Discoverer Deep Seas	V7HC6	200	150	148	179	179	200	185	203	174	137	0	0	1755
Discoverer Inspiration	V7MO3	0	0	0	0	0	0	0	0	1	0	0	0	1
Discoverer Spirit	V7HC8	78	48	28	17	13	0	16	0	0	40	0	0	240
Disney Dream	C6YR6	0	0	0	32	48	2	0	0	0	0	0	0	82
Disney Magic	C6PT7	19	31	58	52	1	46	49	10	0	6	0	0	272
Disney Wonder	C6QM8	54	58	92	31	165	133	176	89	74	21	0	0	893
Dominator	WBZ4106	0	18	31	4	0	15	22	23	6	1	0	0	120
Drew Foss	WYL5718	12	7	8	15	4	0	0	0	0	0	0	0	46
Duncan Island	C6JS	50	44	50	32	53	43	48	38	61	56	0	0	475
Dynamic Energy	C6FT3	25	14	21	11	12	0	0	0	0	0	0	0	83
Eagle Albany	S6TD	0	0	145	216	127	155	49	0	0	0	0	0	692
Eagle Anaheim	S6TF	55	19	4	0	0	0	0	0	0	0	0	0	78
Eagle Phoenix	9VKH2	0	2	0	0	0	0	0	0	0	0	0	0	2
Eagle Stavanger	3FNZ5	0	7	4	0	0	0	0	21	9	0	0	0	41
Eagle Toledo	S6NK3	24	21	17	9	26	34	27	5	0	0	0	0	163
Eagle Torrance	9VMG5	17	19	19	5	4	0	0	5	10	0	0	0	79
Ecem Kalkavan	V7JT6	0	0	0	0	0	9	8	1	0	0	0	0	18
Edgar B. Speer	WQZ9670	0	0	12	103	75	44	42	16	36	13	0	0	341
Edwin H. Gott	WXQ4511	0	0	0	4	38	46	110	14	38	58	0	0	308
El Faro	WFJK	0	16	19	8	3	32	16	0	0	0	0	0	94
El Morro	KCGH	6	9	18	36	31	33	24	43	33	30	0	0	263
El Yunque	WGJT	51	47	39	9	63	72	68	47	55	72	0	0	523
Elversele	ONCT	0	0	0	0	57	77	33	1	0	0	0	0	168
Empire State	KKFW	0	0	0	0	105	136	134	30	0	0	0	0	405
Enchantment Of The Seas	C6FZ7	0	33	27	17	5	1	0	0	0	0	0	0	83
Endeavor (AWS)	NWS0022	617	671	715	692	598	720	741	741	716	742	0	0	6953
Endurance	WDE9586	62	31	125	51	61	10	28	158	87	62	0	0	675

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Endurance	WDF7523	42	14	14	9	44	40	70	40	22	10	0	0	305
Ensign	WBN3012	4	0	0	9	17	20	14	20	0	0	0	0	84
Eot Spar	WDE9193	41	34	44	34	45	45	56	18	18	35	0	0	370
Erkan K	V7ND9	0	0	6	34	20	5	0	0	10	3	0	0	78
Ernest N	A8PQ6	14	0	0	46	23	14	6	0	17	18	0	0	138
Eships Dana	ZDJT6	0	0	10	24	47	61	36	26	16	7	0	0	227
Eships Nahyan	ZDIY2	1	0	0	0	0	0	0	0	0	0	0	0	1
Eskden	DYLD	0	0	0	8	27	46	45	47	0	0	0	0	173
Eurodam	PHOS	11	10	23	51	29	15	11	3	26	90	0	0	269
Eurus Lima	A8MH9	0	0	0	18	27	13	6	2	0	0	0	0	66
Eurus Lisbon	A8MI2	4	7	15	12	7	11	10	16	13	15	0	0	110
Ever Dainty	9V7951	23	8	18	12	17	11	2	1	0	1	0	0	93
Ever Decent	9V7952	0	0	0	0	0	0	0	8	0	0	0	0	8
Ever Delight	3FCB8	91	85	88	55	0	10	5	7	0	5	0	0	346
Ever Deluxe	9V7953	20	5	3	6	1	0	0	0	0	0	0	0	35
Ever Develop	3FLF8	0	26	22	17	0	12	6	14	12	2	0	0	111
Ever Devote	9V7954	0	0	0	0	0	0	0	21	0	2	0	0	23
Ever Diadem	9V7955	13	1	12	0	4	25	0	0	0	0	0	0	55
Ever Diamond	3FQS8	0	0	0	0	0	33	51	50	59	64	0	0	257
Ever Excel	VSXV3	15	53	38	61	56	58	48	61	56	62	0	0	508
Ever Radiant	3FFR4	11	12	9	7	1	0	0	0	0	2	0	0	42
Ever Reach	3FQO4	5	1	22	5	5	0	12	13	0	0	0	0	63
Ever Refine	3FSB4	62	69	31	66	12	9	18	40	92	86	0	0	485
Ever Result	3FSA4	2	1	0	0	2	6	21	17	20	21	0	0	90
Ever Reward	3FYB3	3	0	2	24	5	0	0	0	0	20	0	0	54
Ever Salute	3ENU5	33	10	8	7	0	0	0	0	0	0	0	0	58
Ever Steady	3EHT6	157	37	0	0	5	22	0	0	0	0	0	0	221
Ever Summit	3EKU3	0	0	0	0	0	7	3	0	0	0	0	0	10
Ever Uberty	9V7960	0	0	0	0	0	57	0	0	0	0	0	0	57

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Ever Ulysses	9V7962	0	0	0	3	0	1	3	0	0	14	0	0	21
Ever Unific	9V7961	0	0	0	0	69	11	0	9	21	0	0	0	110
Ever Union	3FFG7	0	17	0	0	8	1	0	4	3	0	0	0	33
Ever Unique	9V7959	2	0	0	0	0	4	4	12	0	0	0	0	22
Ever United	9V7957	0	16	11	3	7	28	6	6	0	0	0	0	77
Ever Urban	3FXN9	22	0	0	22	12	2	5	6	5	9	0	0	83
Ever Useful	3FCC9	0	0	0	0	0	28	14	0	8	17	0	0	67
Everest Spirit	C6FY8	40	97	102	45	43	38	90	72	47	2	0	0	576
Evergreen State	WDE4430	29	22	15	12	6	7	16	5	12	12	0	0	136
Excalibur	ONCE	52	82	108	90	67	63	96	79	73	82	0	0	792
Excel	ONAI	0	0	0	90	86	90	81	4	64	78	0	0	493
Excelerate	ONDY	0	0	0	52	31	61	66	101	90	80	0	0	481
Explorer	ONFE	92	73	86	74	76	67	3	0	0	57	0	0	528
Explorer	WBN7618	1	0	0	0	0	0	0	4	0	0	0	0	5
Explorer Of The Seas	C6SE4	30	32	56	28	27	23	33	34	16	28	0	0	307
Fairchem Friesian	V7PU7	0	14	9	14	33	0	0	0	0	0	0	0	70
Fairchem Mustang	HPOW	9	18	5	7	10	0	1	1	33	30	0	0	114
Fairchem Stallion	H3WD	0	0	0	0	0	0	33	20	1	30	0	0	84
Fairchem Steed	3EBR5	0	9	9	3	0	0	0	0	0	0	0	0	21
Fairweather	WDB5604	1	0	0	0	2	14	28	4	18	0	0	0	67
Fairweather (AWS)	WTEB	0	0	0	0	0	578	643	742	556	328	0	0	2847
Fairweather	NWS0004	0	0	0	0	169	121	0	0	0	0	0	0	290
Federal Asahi	VRWG3	10	18	0	0	0	0	0	0	0	45	0	0	73
Federal Maas	8POB	0	0	0	0	0	15	4	0	0	0	0	0	19
Federal Mackinac	V7RI8	32	1	2	6	3	1	0	0	0	0	0	0	45
Federal Saguenay	8PNQ	0	0	0	30	236	23	57	149	113	3	0	0	611
Federal Schelde	8POF	0	0	0	0	0	0	0	0	0	6	0	0	6
Federal Venture	VRXL7	17	7	10	33	17	38	66	25	42	40	0	0	295

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Flanders Loyalty	ONEV	26	20	13	1	44	43	32	2	0	0	0	0	181
Florida Voyager	WDF4764	0	1	5	20	28	43	28	58	42	39	0	0	264
Fmg Cloudbreak	ONFW	36	45	54	39	15	22	17	17	21	41	0	0	307
Fmg Matilda	ONFN	0	0	0	0	21	28	46	44	20	22	0	0	181
Freedom	WDB5483	12	3	2	1	17	0	0	0	0	0	0	0	35
Freedom Of The Seas	C6UZ7	0	0	15	0	0	0	0	0	0	0	0	0	15
Freja Dania	A8LC2	0	0	2	22	28	29	15	23	12	7	0	0	138
Fritzi N	A8PQ4	0	13	65	6	0	13	26	44	79	83	0	0	329
Front Kathrine	V7QX2	17	61	55	42	36	5	48	112	112	112	0	0	600
Front Tina	A8HH5	12	0	0	0	0	0	0	0	0	0	0	0	12
Furth	V7MP5	1	14	31	40	18	12	1	13	5	24	0	0	159
G. L. Ostrander	WCV7620	0	0	0	19	27	20	18	51	40	55	0	0	230
Ganges Spirit	C6WG3	0	0	0	0	0	0	4	0	0	0	0	0	4
Garden City River	S6AJ8	0	0	0	0	0	0	0	0	0	7	0	0	7
Gauntlet	WBN6511	43	21	26	8	11	28	24	0	0	0	0	0	161
Gemini Voyager	C6FE5	25	0	0	0	0	0	0	22	24	11	0	0	82
Genco Augustus	VRDD2	61	69	87	82	114	64	0	0	0	0	0	0	477
Genco Claudius	V7SY6	25	21	17	14	1	14	49	85	38	8	0	0	272
Genco Constantine	VRDR8	90	27	67	64	63	25	70	43	67	4	0	0	520
Genco Hadrian	V7QN8	0	0	0	0	0	0	4	64	92	86	0	0	246
Genco Raptor	V7NB8	0	0	0	0	0	20	2	16	1	7	0	0	46
Genco Thunder	V7LZ4	30	14	4	0	0	0	0	0	0	0	0	0	48
Genco Tiberius	VRDD3	0	0	0	4	21	23	21	13	22	16	0	0	120
Genco Titus	VRDI7	45	64	68	2	0	10	4	3	10	17	0	0	223
George N	A8PQ5	0	144	184	401	0	27	60	51	18	3	0	0	888
Geysir	WCZ5528	6	31	75	70	26	0	0	0	0	0	0	0	208
Gladiator	WBN5982	0	0	0	0	0	0	0	0	1	0	0	0	1
Global Sentinel	V7KR4	0	0	0	0	0	0	0	4	4	18	0	0	26
Glory Express	3EFV2	19	9	8	2	0	0	0	0	0	0	0	0	38

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Golden Bear	NMRY	0	0	0	0	16	64	62	54	0	0	0	0	196
Golden Eagle	V7TF7	0	0	0	7	0	0	0	0	0	0	0	0	7
Golden State	WHDV	7	5	6	1	0	0	6	10	3	10	0	0	48
Gordon C. Leitch	VCKM	0	0	0	0	0	17	9	15	7	1	0	0	49
Gordon Gunter (AWS)	WTEO	0	0	0	0	278	319	446	212	580	521	0	0	2356
Gordon Gunter (AWS)	NWS0014	0	0	217	569	212	0	0	0	0	0	0	0	998
Grandeur Of The Seas	C6SE3	87	98	111	52	53	57	68	38	44	47	0	0	655
Great Republic	WDF7994	0	0	0	0	0	60	81	40	73	83	0	0	337
Green Bay	WDD9433	29	10	0	0	94	40	57	55	23	5	0	0	313
Green Dale	WCZ5238	59	46	40	47	66	55	24	26	7	0	0	0	370
Green Ridge	WZZF	83	59	11	34	37	26	54	9	21	0	0	0	334
Gretchen H	WDC9138	0	0	27	19	25	21	24	39	40	1	0	0	196
GSF C.R. Luigs	YJUF5	9	7	0	0	0	0	0	0	0	0	0	0	16
GSF Development Driller I	YJSW5	62	70	66	63	45	31	27	27	15	31	0	0	437
GSF Grand Banks	YJUF7	131	124	128	111	118	109	113	113	108	110	0	0	1165
Guardian	WBO2511	14	9	36	16	14	30	7	45	24	0	0	0	195
Guardsman	WBN5978	0	0	0	0	0	0	1	2	7	0	0	0	10
Gulf Reliance	WDD2703	10	34	5	14	0	0	0	0	0	0	0	0	63
Gulf Titan	WDA5598	8	17	9	1	8	4	4	3	4	8	0	0	66
H A Sklenar	C6CL6	99	63	84	64	71	61	62	35	79	35	0	0	653
H. Lee White	WZD2465	3	0	0	3	40	40	36	9	11	35	0	0	177
Harmonious	VRCL9	21	0	44	56	76	0	0	0	0	0	0	0	197
Harriette	WRFJ	1	0	33	21	0	0	0	0	0	0	0	0	55
Healy	NEPP	0	0	0	0	0	87	89	77	140	95	0	0	488
HEALY (AWS)	NWS0003	0	0	0	0	11	708	742	717	714	740	0	0	3632
Helenka B	WAH5520	0	4	0	0	6	1	2	0	2	0	0	0	15
Henry B. Bigelow (AWS)	WTDF	0	6	262	299	196	444	356	12	216	452	0	0	2243
Henry B. Bigelow (AWS)	NWS0017	0	57	0	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
Henry Goodrich	YJQN7	125	127	127	110	114	111	111	114	103	106	0	0	1148
Herbert C. Jackson	WL3972	11	0	1	25	51	58	34	22	41	20	0	0	263
Hi'ialakai	WTEY	0	0	68	66	14	0	0	0	0	0	0	0	148
Hi'ialakai (AWS)	NWS0010	0	0	402	489	543	0	373	313	0	0	0	0	2120
Hoegh Oslo	LAEK7	7	0	11	32	14	0	0	0	52	0	0	0	116
Hon. James L. Oberstar	WL3108	0	0	1	25	12	5	32	24	49	53	0	0	201
Honor	WDC6923	69	37	15	33	13	1	10	29	14	44	0	0	265
Hood Island	C6LU4	64	60	76	71	60	30	24	43	38	21	0	0	487
Horizon Anchorage	KGTX	146	185	189	169	136	179	199	176	202	161	0	0	1742
Horizon Challenger	WZJC	83	56	67	84	81	48	54	137	89	103	0	0	802
Horizon Consumer	WCHF	38	39	40	46	14	81	7	0	0	0	0	0	265
Horizon Eagle	WDD6039	7	95	121	72	78	76	73	83	77	85	0	0	767
Horizon Enterprise	KRGB	69	64	71	75	66	53	37	69	39	21	0	0	564
Horizon Falcon	WDD6040	80	74	77	77	69	61	67	94	87	61	0	0	747
Horizon Hawk	WDD6033	32	31	42	90	57	54	54	73	59	56	0	0	548
Horizon Hunter	WDD6038	44	54	67	49	57	53	82	73	70	77	0	0	626
Horizon Kodiak	KGTZ	58	52	47	46	44	41	34	51	45	45	0	0	463
Horizon Navigator	WPGK	71	121	150	156	171	171	158	160	105	152	0	0	1415
Horizon Pacific	WSRL	72	62	39	17	47	35	40	29	22	46	0	0	409
Horizon Producer	WJBJ	107	87	132	147	172	234	184	246	160	199	0	0	1668
Horizon Reliance	WFLH	48	32	69	63	76	68	42	71	78	82	0	0	629
Horizon Spirit	WFLG	88	80	83	83	82	72	76	84	80	79	0	0	807
Horizon Tacoma	KGTY	32	3	49	48	46	52	50	46	57	61	0	0	444
Horizon Tiger	WDD6042	93	62	45	76	41	2	25	150	52	52	0	0	598
Horizon Trader	KIRH	62	62	85	85	88	89	86	86	94	82	0	0	819
Houston	KCDK	25	21	8	2	30	20	9	10	0	2	0	0	127
Hugo N	A8TD2	0	0	0	0	0	0	51	54	18	0	0	0	123
Hyundai No. 203	3FRY8	21	21	2	0	0	0	0	0	0	0	0	0	44
Independence II	WGAX	120	124	71	121	108	135	55	58	105	115	0	0	1012

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Independence Of The Seas	C6WW4	0	32	34	39	33	33	32	45	41	13	0	0	302
Indian Ocean	C6T2063	30	31	32	27	30	31	42	54	26	27	0	0	330
Indiana Harbor	WXN3191	28	0	0	75	75	71	73	30	29	43	0	0	424
Inland Seas	WCJ6214	0	0	0	1	0	1	3	1	1	0	0	0	7
Integrity	WDD7905	0	0	0	0	3	6	2	3	0	0	0	0	14
Invader	WBO3337	2	25	5	6	17	50	119	46	31	86	0	0	387
Island Scout	WDC6588	0	1	0	0	0	0	0	0	0	0	0	0	1
Iver Foss	WYE6442	0	0	0	0	0	4	0	0	0	9	0	0	13
James L. Kuber	WDF7020	0	0	0	0	0	0	0	0	0	113	0	0	113
James R. Barker	WYP8657	9	0	37	124	76	114	99	91	82	89	0	0	721
Jean Anne	WDC3786	122	63	35	59	91	81	76	31	58	93	0	0	709
Jenny N	A8PQ7	0	0	0	0	0	0	0	0	7	123	0	0	130
Jeppesen Maersk	OWTW2	25	17	37	2	9	0	0	0	0	0	0	0	90
Jewel Of The Seas	C6FW9	0	36	44	14	6	4	0	0	0	0	0	0	104
John B. Aird	VCYP	0	0	0	1	24	17	5	9	10	15	0	0	81
John D. Leitch	VGWM	0	0	0	0	0	0	2	0	0	1	0	0	3
John G. Munson	WE3806	20	0	0	70	80	16	18	25	27	15	0	0	271
John J. Boland	WZE4539	0	0	0	0	0	0	5	0	0	3	0	0	8
Joides Resolution	D5BC	6	1	0	0	0	0	0	0	0	0	0	0	7
Joseph L. Block	WDA2768	64	0	485	715	580	42	572	677	618	742	0	0	4495
Justine Foss	WYL4978	0	0	0	0	0	0	1	6	0	0	0	0	7
Ka'imimoana	WTEU	35	67	73	58	27	0	26	67	13	3	0	0	369
Ka'imimoana (AWS)	NWS0009	317	533	593	479	254	0	264	619	234	722	0	0	4015
Karen Andrie	WBS5272	193	15	15	241	231	183	111	272	103	95	0	0	1459
Karoline N	A8PQ8	1	160	50	60	54	0	0	4	0	64	0	0	393
Kasif Kalkavan	V7IX7	33	63	92	47	52	0	0	0	0	0	0	0	287
Kauai	WSRH	14	3	0	0	0	0	0	0	0	0	0	0	17
Kaveri Spirit	C6WK2	0	0	0	0	0	0	0	13	24	22	0	0	59

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Kaye E. Barker	WCF3012	7	0	9	38	43	59	52	75	44	44	0	0	371
Kennicott	WCY2920	8	0	0	4	0	2	21	43	24	1	0	0	103
Keswick	C6XE5	10	1	0	6	11	9	14	3	7	2	0	0	63
Kilo Moana	WDA7827	14	27	37	20	58	49	26	42	50	69	0	0	392
Kiyi	KAO107	0	0	0	0	26	20	5	2	3	1	0	0	57
Knorr (AWS)	NWS0029	117	173	744	720	734	720	723	741	240	738	0	0	5650
Kodiak	KQXZ	0	0	1	28	54	0	5	8	0	10	0	0	106
Kodiak King	WCE8949	0	0	0	1	0	0	0	0	0	0	0	0	1
Kota Halus	9V8258	32	26	0	0	0	0	0	0	0	0	0	0	58
Kota Harum	9VFF8	0	0	0	0	40	55	63	0	0	0	0	0	158
Kota Jati	VRWJ7	41	44	22	26	33	5	15	37	18	1	0	0	242
Kota Jaya	VRWM2	19	33	27	33	24	14	6	12	12	15	0	0	195
Laurence M. Gould (AWS)	WCX7445	593	536	700	669	497	710	266	468	329	704	0	0	5472
Lavender Passage	3FJY6	0	7	22	10	0	0	0	0	0	0	0	0	39
Lee A. Tregurtha	WUR8857	0	0	1	2	14	33	16	7	12	1	0	0	86
Legacy	WDF7311	0	0	0	0	0	0	38	12	0	0	0	0	50
Leslie Lee	WYC7933	1	0	0	0	0	0	0	0	0	0	0	0	1
Liberty Eagle	WHIA	32	32	3	46	30	74	32	27	0	47	0	0	323
Liberty Glory	WADP	26	17	22	20	41	3	34	2	2	22	0	0	189
Liberty Grace	WADN	62	50	11	43	0	46	61	2	0	2	0	0	277
Liberty Of The Seas	C6VQ8	2	37	15	4	0	9	18	16	5	0	0	0	106
Liberty Spirit	WCPU	26	22	16	54	61	85	45	27	0	23	0	0	359
Liberty Sun	WCOB	57	18	20	110	16	4	43	68	4	35	0	0	375
Limerick Spirit	C6VF3	7	10	5	0	0	1	0	0	0	0	0	0	23
Lion City River	9VJC5	0	0	0	0	0	0	21	19	1	3	0	0	44
Livorno Express	ZCDV9	0	0	0	0	0	0	20	42	15	15	0	0	92
LNG Abuja	C6W2032	0	0	0	0	0	0	1	0	0	6	0	0	7
LNG Edo	C6W2033	7	19	25	31	3	2	10	10	0	0	0	0	107
LNG Gemini	V7BW9	21	0	11	35	53	70	53	125	121	7	0	0	496

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
LNG Leo	V7BX2	32	0	0	0	0	0	17	0	0	47	0	0	96
Lois H	WTD4576	0	0	0	4	0	0	6	0	0	0	0	0	10
Lowlands Brilliance	ONDC	0	0	0	0	0	21	42	39	29	29	0	0	160
Lowlands Orchid	ONFP	55	46	21	12	66	45	26	35	29	25	0	0	360
Lyla	V7QK3	0	0	0	0	0	0	27	15	29	24	0	0	95
M/V Integrity	WDC6925	59	40	30	50	61	51	56	58	52	70	0	0	527
Maasdam	PFRO	184	110	44	32	129	204	249	204	148	238	0	0	1542
Mackinaw	NBGB	3	2	3	0	0	0	0	0	0	0	0	0	8
Madrid Spirit	ECFM	2	14	54	18	0	0	0	17	13	0	0	0	118
Maersk Carolina	WBDS	39	32	39	36	35	41	40	30	35	31	0	0	358
Maersk Constellation	WRYJ	16	11	2	0	0	0	0	0	0	0	0	0	29
Maersk Danang	A8PS5	0	0	47	45	31	47	30	34	16	15	0	0	265
Maersk Drummond	A8JF3	3	0	36	7	26	28	0	50	10	20	0	0	180
Maersk Georgia	WAHP	94	60	34	24	74	68	59	26	41	73	0	0	553
MAERSK IDAHO	WKPM	22	30	15	50	66	24	57	38	28	42	0	0	372
Maersk Iowa	KABL	49	16	65	65	54	41	36	29	43	77	0	0	475
Maersk Karlskrona	A8PW8	3	7	6	7	2	0	0	0	0	0	0	0	25
Maersk Kentucky	WKPY	33	18	31	9	23	29	39	4	4	34	0	0	224
Maersk Merritt	VRCH6	11	7	1	0	0	0	0	0	0	0	0	0	19
Maersk Missouri	WAHV	66	18	42	68	54	30	45	60	61	40	0	0	484
Maersk Montana	WCDP	40	52	57	55	17	52	50	30	31	43	0	0	427
Maersk Ohio	KABP	98	92	30	83	87	81	65	43	124	100	0	0	803
Maersk Peary	WHKM	0	0	0	0	0	0	0	0	0	55	0	0	55
Maersk Tangier	A8NH3	9	4	0	0	0	0	0	0	0	0	0	0	13
Maersk Utah	WKAB	73	66	86	26	69	78	84	84	71	102	0	0	739
Maersk Virginia	WAHK	0	38	48	31	14	43	35	46	4	50	0	0	309
Maersk Wakayama	3FCC4	0	0	0	0	0	0	0	0	0	2	0	0	2
Maersk Westport	VRFO4	0	0	0	1	1	0	4	21	2	0	0	0	29

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Maersk Willemstadt	3FTJ8	0	0	0	0	0	0	0	0	0	1	0	0	1
Maersk Wind	S6TY	0	0	0	0	0	8	9	0	0	0	0	0	17
Maersk Winnipeg	VRGI7	0	0	0	4	0	4	7	52	15	25	0	0	107
Maersk Wisconsin	WKPN	39	31	20	21	36	39	57	66	27	46	0	0	382
Maersk Wyoming	WKPF	50	90	64	72	75	51	64	55	59	57	0	0	637
Mahimahi	WHRN	32	19	12	22	18	19	32	38	30	13	0	0	235
Maia H	WYX2079	0	0	18	5	0	0	42	14	6	0	0	0	85
Majesty Of The Seas	C6FZ8	0	5	6	14	0	0	0	0	0	0	0	0	25
Malolo	WYH6327	3	3	0	0	30	67	25	16	0	0	0	0	144
Manfred Nystrom	WCN3590	0	0	0	0	0	0	52	2	0	0	0	0	54
Manistee	WDB6831	5	0	0	5	3	44	18	34	25	29	0	0	163
Manitowoc	WDE3569	113	0	21	145	123	129	161	72	113	170	0	0	1047
Manoa	KDBG	61	42	47	46	32	33	20	11	30	42	0	0	364
Manukai	WRGD	12	25	13	14	20	30	35	42	35	43	0	0	269
Manulani	WECH	56	62	20	38	59	33	47	28	1	53	0	0	397
Maple 2	C6TF8	19	11	19	1	0	6	19	12	5	7	0	0	99
Marchen Maersk	OUIY2	22	66	0	0	70	1	0	36	1	0	0	0	196
Marcus G. Langseth	WDC6698	0	0	13	37	40	33	350	712	714	700	0	0	2599
Maren Maersk	OUJI2	0	1	0	0	0	0	0	29	29	0	0	0	59
Margrethe Maersk	OZBY2	0	0	0	0	0	34	7	0	37	31	0	0	109
Marilyn	WFQB	13	33	46	0	0	0	0	0	0	0	0	0	92
Marine Express	3FHX2	3	11	5	4	1	7	1	0	0	2	0	0	34
Mariner Of The Seas	C6FV9	26	34	23	0	3	24	2	11	9	2	0	0	134
Marit Maersk	OUJN2	60	0	0	64	1	0	22	10	0	27	0	0	184
Mary Ann Hudson	KSDF	35	54	28	1	0	0	0	56	53	42	0	0	269
Matanuska	WN4201	6	1	0	0	0	0	0	0	0	0	0	0	7
Maui	WSLH	0	39	42	35	37	42	48	19	25	38	0	0	325
Maunalei	KFMV	22	36	0	20	21	14	47	32	26	42	0	0	260
Maunawili	WGEB	59	52	51	65	61	40	71	63	68	54	0	0	584

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Mcarthur II	NWS0006	0	0	289	280	163	0	244	244	21	0	0	0	1241
Mcarthur II (AWS)	WTEJ	0	0	78	49	89	102	132	80	206	463	0	0	1199
Medeia	WDE6486	0	1	0	0	0	0	0	0	0	0	0	0	1
Mein Schiff	9HJH9	34	29	50	30	12	4	0	0	0	0	0	0	159
Melville	WECB	66	61	87	74	81	332	433	224	33	62	0	0	1453
Mermaid Express	H9PV	9	0	0	0	0	0	0	0	0	0	0	0	9
Mesabi Miner	WYQ4356	3	0	13	42	37	54	56	64	61	69	0	0	399
Midnight Sun	WAHG	44	24	58	122	48	70	135	50	39	48	0	0	638
Mike O'leary	WDC3665	0	0	0	0	0	41	0	0	0	0	0	0	41
Miletus	V7UI6	13	8	0	0	0	0	0	0	0	0	0	0	21
Mill House	9VAK9	0	0	0	5	26	45	45	31	4	0	0	0	156
Mill Reef	9VAK8	21	0	1	0	21	27	26	20	1	0	0	0	117
Mindanao	S6SR	0	47	73	72	53	28	0	0	0	0	0	0	273
Mineral Beijing	ONAR	56	22	37	14	10	11	13	12	12	9	0	0	196
Mineral Belgium	ONCF	18	0	51	34	15	29	50	12	16	21	0	0	246
Mineral Ningbo	ONGA	0	0	0	3	19	39	6	0	0	0	0	0	67
Mineral Noble	ONAN	19	41	34	7	5	18	9	29	25	43	0	0	230
Mineral Tianjin	ONBF	22	12	0	0	0	3	11	8	4	0	0	0	60
Miss Roxanne	WCX4992	0	0	0	0	1	6	0	0	2	0	0	0	9
Mississippi Voyager	WDD7294	28	40	3	21	8	4	0	2	0	0	0	0	106
Mokihana	WNRD	30	49	60	37	43	40	36	41	13	3	0	0	352
Moku Pahu	WBWK	0	0	9	0	0	0	39	0	7	10	0	0	65
Monarch Of The Seas	C6FZ9	33	22	8	8	23	43	30	23	42	152	0	0	384
Monitor	WCX9104	4	0	18	16	21	8	14	46	24	0	0	0	151
Montrealais	VDWC	0	0	0	0	0	2	2	1	0	0	0	0	5
Morning Glory VIII	A8AT8	0	0	0	0	0	0	0	0	0	46	0	0	46
Morning Haruka	A8GK7	0	0	0	0	68	122	48	29	19	28	0	0	314
Murat K	V7NE2	0	0	0	0	0	0	0	17	36	0	0	0	53

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Nachik	WDE7904	0	0	0	0	2	8	9	0	2	5	0	0	26
Nakolo	WDD9308	0	0	0	0	0	0	0	0	0	6	0	0	6
Nancy Foster (AWS)	WTER	0	0	205	603	474	257	189	561	532	181	0	0	3002
Nanuq	WCY8498	2	1	0	0	0	0	0	0	0	0	0	0	3
Nathaniel B. Palmer (AWS)	WBP3210	404	522	699	663	616	720	727	517	447	737	0	0	6052
National Glory	WDD4207	12	0	0	0	0	0	0	0	0	0	0	0	12
Navigator Of The Seas	C6FU4	36	9	7	12	20	2	8	23	3	38	0	0	158
Neptune Voyager	C6FU7	23	6	19	3	4	21	25	7	0	0	0	0	108
New Horizon	WKWB	21	10	0	0	17	53	51	21	13	9	0	0	195
Nieuw Amsterdam	PBWQ	61	148	84	29	2	144	103	90	144	163	0	0	968
Noble Star	KRPP	31	74	49	42	5	0	59	50	5	0	0	0	315
Noordam	PHET	116	173	156	102	45	64	136	94	163	125	0	0	1174
Norma H.	WYL6686	0	0	0	0	0	0	0	0	4	0	0	0	4
North Star	KIYI	27	21	36	55	28	28	15	20	44	63	0	0	337
Northern Jupiter	A8TA5	0	0	0	0	0	0	0	0	8	0	0	0	8
Northwest Swan	ZCDJ9	63	42	63	57	54	0	58	96	83	53	0	0	569
Norwegian Dawn	C6FT7	81	32	99	23	33	198	37	21	25	133	0	0	682
Norwegian Epic	C6XP7	33	29	22	43	66	16	8	14	27	39	0	0	297
Norwegian Gem	C6VG8	45	44	1	167	138	162	102	52	18	33	0	0	762
Norwegian Jade	C6WK7	50	37	146	162	155	97	113	166	164	161	0	0	1251
Norwegian Jewel	C6TX6	62	36	45	57	34	56	77	61	56	33	0	0	517
Norwegian Pearl	C6VG7	34	49	68	87	7	50	20	0	57	110	0	0	482
Norwegian Sky	C6PZ8	16	9	5	52	21	10	40	59	97	63	0	0	372
Norwegian Spirit	C6TQ6	68	37	117	175	204	155	240	235	168	129	0	0	1528
Norwegian Star	C6FR3	184	157	174	100	61	98	45	135	304	225	0	0	1483
Norwegian Sun	C6RN3	90	120	212	116	44	31	13	18	42	97	0	0	783
Nunaniq	WRC2049	0	0	0	0	4	0	0	0	0	0	0	0	4
NYK Delphinus	3ENU7	0	25	45	0	0	0	0	0	0	0	0	0	70
NYK Demeter	3ENV5	11	6	22	18	27	9	50	23	27	21	0	0	214

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
NYK Futago	9V8739	0	0	0	0	0	0	36	32	13	7	0	0	88
NYK Rumina	9V7645	0	0	0	0	0	0	0	0	0	45	0	0	45
Oasis Of The Seas	C6XS7	20	17	26	19	29	8	1	0	0	1	0	0	121
Ocean Charger	WDE9698	52	9	0	0	6	5	2	1	0	0	0	0	75
Ocean Crescent	WDF4929	1	0	19	49	56	41	17	31	37	45	0	0	296
Ocean Freedom	WDF9323	0	0	0	0	0	0	0	0	0	13	0	0	13
Ocean Harvester	WBO5471	11	5	6	12	2	0	0	0	5	1	0	0	42
Ocean Mariner	WCF3990	0	0	0	29	19	1	0	20	26	99	0	0	194
Ocean President	VRAD4	3	11	21	0	0	0	0	0	2	0	0	0	37
Ocean Reliance	WADY	0	0	0	0	0	2	109	73	1	1	0	0	186
Ocean Titan	WDB9647	0	0	3	3	0	2	6	0	0	2	0	0	16
Oceanus (AWS)	NWS0028	744	670	740	670	632	720	740	740	656	743	0	0	7055
Okeanos Explorer (AWS)	WTDH	0	0	54	30	0	455	444	583	544	0	0	0	2110
Okeanos Explorer	NWS0016	0	0	362	217	0	0	0	0	0	0	0	0	579
Oleander	V7SX3	19	0	0	17	19	15	18	14	2	0	0	0	104
Olive L. Moore	WDF7019	0	0	0	58	56	57	121	74	62	105	0	0	533
OOCL America	VRWE8	2	3	5	1	6	0	0	0	1	4	0	0	22
OOCL Busan	VRDN3	25	7	26	13	22	16	16	18	21	3	0	0	167
OOCL Nagoya	VRFX8	24	11	9	23	41	39	59	59	46	47	0	0	358
OOCL Norfolk	VREX4	1	1	13	23	41	44	37	30	28	23	0	0	241
Oosterdam	PBKH	73	55	96	87	73	64	49	30	44	67	0	0	638
Optimana	9VAR2	73	51	146	175	152	43	39	78	48	0	0	0	805
Orange Sky	ELZU2	0	0	0	0	0	19	13	32	31	18	0	0	113
Orange Star	A8WP6	0	0	0	0	10	6	4	13	27	8	0	0	68
Orange Sun	A8HY8	9	7	22	7	16	38	49	53	42	46	0	0	289
Orange Wave	ELPX7	11	0	4	0	0	16	51	2	0	0	0	0	84
Oregon II (AWS)	WTDO	0	0	0	0	0	224	471	476	452	410	0	0	2033
Oregon Voyager	WDF2960	35	12	12	23	17	0	0	0	45	38	0	0	182

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Oriental Queen	VRAC9	191	42	26	29	40	73	92	73	37	18	0	0	621
Orion Voyager	C6MC5	24	21	35	51	0	46	0	16	0	5	0	0	198
Oscar Dyson	WTEP	0	0	0	0	150	170	130	73	120	178	0	0	821
Oscar Dyson (AWS)	NWS0001	0	0	0	0	516	612	648	714	690	678	0	0	3858
Oscar Elton Sette	WTEE	0	15	139	125	0	2	69	142	87	55	0	0	634
Oscar Elton Sette (AWS)	NWS0015	0	102	592	455	0	0	152	270	0	150	0	0	1721
Ouro Do Brasil	ELPP9	20	37	16	30	38	28	26	25	18	14	0	0	252
Overseas Alcesmar	V7HP2	35	3	53	67	114	47	67	9	0	0	0	0	395
Overseas Alcmar	V7HP3	9	3	0	0	0	0	0	0	0	0	0	0	12
Overseas Anacortes	KCHV	26	13	11	20	14	8	26	18	11	6	0	0	153
Overseas Andromar	V7HP4	7	2	4	4	0	14	56	55	31	27	0	0	200
Overseas Ariadmar	V7HP6	6	6	14	20	20	19	19	16	14	14	0	0	148
Overseas Boston	WJBU	82	107	141	132	70	85	65	65	70	93	0	0	910
Overseas Cascade	WOAG	0	6	8	0	0	0	0	0	0	0	0	0	14
Overseas Houston	WWAA	4	1	3	0	13	8	19	16	10	6	0	0	80
Overseas Joyce	V7NV4	40	25	65	35	94	46	47	36	41	50	0	0	479
Overseas Long Beach	WAAT	72	183	257	59	27	59	94	87	52	36	0	0	926
Overseas Los Angeles	WABS	227	191	58	148	125	237	285	150	91	88	0	0	1600
Overseas Luxmar	WDC7070	14	0	32	18	11	10	3	17	11	7	0	0	123
Overseas Maremar	WDC6975	0	21	11	5	19	16	1	13	21	15	0	0	122
Overseas Martinez	WPAJ	0	23	2	18	6	21	32	23	5	11	0	0	141
Overseas Nikiski	WDBH	13	16	20	29	35	22	17	6	6	3	0	0	167
Overseas Rimar	V7HQ3	21	16	15	13	20	22	0	0	0	0	0	0	107
Overseas Tampa	WOTA	0	0	0	0	5	6	0	5	16	27	0	0	59
Overseas Texas City	WHED	0	6	2	5	0	12	10	0	0	0	0	0	35
Pacific Celebes	VRZN9	1	9	25	13	40	37	20	54	22	26	0	0	247
Pacific Flores	VRZN8	0	18	18	25	0	0	0	0	0	0	0	0	61
Pacific Freedom	WDD9283	0	0	0	0	14	0	0	10	0	0	0	0	24
Pacific Java	VRZN7	42	31	16	49	31	53	64	37	25	30	0	0	378

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Pacific Makassar	VRZO2	37	57	73	31	83	47	56	94	24	47	0	0	549
Pacific Mistral	A8WI2	0	0	0	0	0	30	15	59	0	0	0	0	104
Pacific Reliance	WDC9368	1	0	0	0	0	0	0	0	0	0	0	0	1
Pacific Star	WCW7740	0	0	0	0	1	0	0	0	0	0	0	0	1
Pacific Wolf	WDD9286	2	0	0	1	0	4	1	1	1	0	0	0	10
Pandalus	WAV7611	0	0	0	0	0	12	21	4	9	0	0	0	46
Patriarch	WBN3014	16	4	43	26	0	0	34	1	0	1	0	0	125
Patriot	WQVY	41	37	39	27	35	57	36	30	60	68	0	0	430
Paul Gauguin	C6TH9	93	63	41	59	80	126	150	294	55	52	0	0	1013
Paul R. Tregurtha	WYR4481	26	0	17	76	89	87	46	77	104	54	0	0	576
Peace Voyage	VRHO5	0	0	2	21	25	20	4	14	0	0	0	0	86
Pelican State	WDE4433	10	18	10	11	9	7	9	3	5	9	0	0	91
Perseverance	WDE5328	0	0	0	0	0	0	7	10	9	17	0	0	43
Philadelphia Express	WDC6736	71	142	120	131	93	122	107	111	149	149	0	0	1195
Philip R. Clarke	WE3592	42	0	18	36	5	20	53	17	31	72	0	0	294
Phoenix Alpha	VRZT8	11	1	0	0	12	1	0	0	2	15	0	0	42
Phoenix Beta	VRZT9	0	27	49	8	2	7	28	28	42	77	0	0	268
Phoenix Light	HPHV	0	0	1	0	20	36	66	68	59	7	0	0	257
Phoenix Voyager	C6QE3	3	21	33	32	2	13	17	8	4	3	0	0	136
Pilot	WBN3011	0	0	0	5	2	0	0	3	14	0	0	0	24
Pisces (AWS)	WTDL	0	0	41	35	399	459	300	411	516	397	0	0	2558
Polar Adventure	WAZV	72	35	20	51	41	39	50	46	61	33	0	0	448
Polar Cloud	WDF5296	20	0	44	0	0	0	0	0	0	0	0	0	64
Polar Discovery	WACW	116	82	0	0	0	0	67	41	28	40	0	0	374
Polar Endeavour	WCAJ	21	20	70	78	84	29	50	97	83	66	0	0	598
Polar Enterprise	WRTF	24	22	21	17	76	72	5	0	0	0	0	0	237
Polar Ranger	WDC8652	0	0	0	0	2	0	3	0	2	0	0	0	7
Polar Resolution	WDJK	139	100	210	209	88	180	290	213	214	313	0	0	1956

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Polar Spirit	C6WL6	27	46	23	4	2	28	12	11	0	0	0	0	153
Polar Storm	WDE8347	0	0	0	0	7	0	0	1	8	0	0	0	16
Polar Viking	WDD6494	0	7	16	0	2	1	0	0	0	0	0	0	26
Polar Wind	WDE6058	0	0	0	0	0	0	4	0	0	0	0	0	4
Posidana	9VBM6	30	109	183	370	254	69	194	200	104	6	0	0	1519
Poul Spirit	C6FJ8	11	1	0	0	0	0	0	0	0	0	0	0	12
Premium Do Brasil	A8BL4	28	32	34	15	33	16	21	0	0	0	0	0	179
President Adams	WRYW	36	35	21	12	41	43	66	34	47	37	0	0	372
President Jackson	WRYC	63	25	39	33	0	0	0	0	68	81	0	0	309
President Polk	WRYD	13	19	17	13	31	0	31	58	52	74	0	0	308
President Truman	WNDP	45	24	30	45	28	25	2	11	49	40	0	0	299
Presque Isle	WZE4928	0	0	10	110	84	20	51	38	63	38	0	0	414
Prestige New York	KDUE	37	32	36	30	48	9	30	33	39	72	0	0	366
Pride Of America	WNBE	42	19	19	5	14	12	51	18	18	106	0	0	304
Pride Of Baltimore II	WUW2120	0	0	0	5	22	41	26	35	28	7	0	0	164
Prinsendam	PBGH	0	33	39	37	91	5	9	17	19	35	0	0	285
Prosperous	VRIA3	0	0	0	0	0	8	59	0	0	1	0	0	68
Pt. Barrow	WBM5088	0	0	0	0	0	0	0	0	9	0	0	0	9
Pt. Thompson	WBM5092	0	0	0	0	0	0	0	0	15	0	0	0	15
Quebecois	CYGR	0	0	0	5	30	23	32	25	1	3	0	0	119
R. J. Pfeiffer	WRJP	0	3	2	0	0	0	0	0	0	0	0	0	5
R. M. Thorstenson	KGCJ	1	0	3	3	0	0	1	0	0	0	0	0	8
Radiance Of The Seas	C6SE7	20	99	93	95	62	20	74	50	25	5	0	0	543
Rainier	WTEF	0	0	0	0	0	0	71	99	131	142	0	0	443
Rebecca Lynn	WCW7977	0	0	3	22	18	12	8	8	11	2	0	0	84
Redoubt	WDD2451	0	0	0	10	28	0	19	52	28	14	0	0	151
Regulus Voyager	C6FE6	23	8	31	21	0	0	0	0	0	0	0	0	83
Resolve	WCZ5535	25	29	12	17	24	34	13	48	37	4	0	0	243
Rhapsody Of The Seas	C6UA2	11	31	33	7	0	32	52	15	46	31	0	0	258
Robert C. Seamans	WDA4486	0	0	9	23	26	28	23	0	0	0	0	0	109

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Robert S. Pierson	CFN4934	0	0	0	0	7	15	4	0	10	1	0	0	37
Roger Blough	WZP8164	1	0	36	177	313	173	32	146	260	355	0	0	1493
Roger Revelle	KAOU	0	2	11	33	67	595	736	724	717	743	0	0	3628
Ronald H. Brown (AWS)	WTEC	0	0	0	0	0	22	218	163	0	37	0	0	440
Ronald N	A8PQ3	10	3	8	23	8	234	160	174	9	36	0	0	665
Ryndam	PHFV	14	45	31	95	56	33	40	14	23	34	0	0	385
S/R American Progress	KAWM	80	80	54	51	51	72	43	30	0	0	0	0	461
Safmarine Makutu	MRWF2	0	0	0	37	45	27	30	15	25	20	0	0	199
Saga Adventure	VRBL4	0	0	0	0	0	29	81	90	69	102	0	0	371
Saga Andorinha	MYNJ6	4	0	0	0	0	0	0	0	22	71	0	0	97
Saga Frontier	VRCP2	5	0	0	0	0	0	0	3	0	0	0	0	8
Saga Monal	VRZQ9	0	0	53	63	39	86	33	116	0	0	0	0	390
Saga Navigator	VRDA4	3	9	20	86	142	124	5	201	416	482	0	0	1488
Saga Viking	VRXO6	4	12	0	0	0	4	22	13	17	17	0	0	89
Saipem 7000	C6NO5	0	0	0	0	19	82	17	7	0	0	0	0	125
Salvia Ace	ZCXR	33	4	0	0	0	0	0	0	0	0	0	0	37
Sam Laud	WZC7602	0	0	0	0	0	0	6	2	0	0	0	0	8
Samson Mariner	WCN3586	0	1	0	1	0	0	1	0	1	1	0	0	5
Samuel De Champlain	WDC8307	44	0	12	37	29	6	5	23	19	27	0	0	202
Sandra Foss	WYL4908	0	0	3	0	0	16	0	0	0	22	0	0	41
Saudi Abha	HZRX	0	3	17	0	3	0	0	83	52	33	0	0	191
Saudi Diriyah	HZZB	20	0	45	17	11	0	33	20	0	34	0	0	180
Saudi Hofuf	HZZC	1	8	7	0	0	5	4	0	7	7	0	0	39
Saudi Tabuk	HZZD	57	64	0	35	30	5	6	43	18	0	0	0	258
Sea Breeze	WBN3019	58	0	0	0	7	0	1	0	0	0	0	0	66
Sea Hawk	WDD9287	0	0	0	0	0	1	25	0	6	1	0	0	33
Sea Horse	WBN4382	10	10	2	6	0	0	0	0	0	0	0	0	28
Sea Prince	WYT8569	3	48	38	26	5	0	0	3	2	1	0	0	126

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Sea Victory	WCY6777	0	0	0	0	0	0	0	0	1	0	0	0	1
Sea Voyager	WCX9106	399	94	0	43	93	120	132	202	69	106	0	0	1258
Seabulk Arctic	WCY7054	34	24	16	19	38	21	27	9	24	28	0	0	240
Seabulk Trader	KNJK	37	48	38	15	25	20	44	48	27	20	0	0	322
Sea-Land Champion	WKAU	11	31	44	47	37	62	58	47	46	54	0	0	437
Sea-Land Charger	WDB9948	33	38	52	30	25	40	43	24	13	5	0	0	303
Sea-Land Comet	WDB9950	112	59	24	39	36	54	61	35	48	30	0	0	498
Sea-Land Eagle	WKAE	152	193	166	103	86	143	153	94	109	111	0	0	1310
Sea-Land Intrepid	WDB9949	55	9	17	23	30	21	13	16	33	47	0	0	264
Sea-Land Lightning	WDB9986	73	65	36	23	35	6	0	6	12	7	0	0	263
Sea-Land Mercury	WKAW	75	18	57	70	117	94	119	130	114	137	0	0	931
Sea-Land Meteor	WDB9951	29	3	47	24	6	29	34	63	51	48	0	0	334
Sea-Land Racer	WKAP	175	107	112	128	96	118	139	110	134	174	0	0	1293
Sedef Kalkavan	V7LU5	0	0	5	15	0	0	0	0	0	0	0	0	20
Senang Spirit	C6ME8	9	3	9	113	8	0	0	0	0	0	0	0	142
Seneca	WBN8469	0	0	0	0	36	13	11	64	28	0	0	0	152
Sentinel	WBN6510	0	0	15	25	8	0	8	33	12	0	0	0	101
Sentry	WBN3013	0	26	0	0	6	47	6	4	0	0	0	0	89
Serenade Of The Seas	C6FV8	26	13	23	25	3	17	43	15	10	14	0	0	189
Serenata	3EEE2	26	5	18	23	28	7	31	21	9	4	0	0	172
Sesok	WDE7899	0	0	0	0	0	0	3	0	0	0	0	0	3
Seven Seas Mariner	C6VV8	37	24	1	9	24	16	9	23	13	0	0	0	156
Seven Seas Navigator	ZCDT7	19	24	19	11	9	6	0	34	18	3	0	0	143
Seven Seas Voyager	C6SW3	24	22	0	18	72	8	18	2	7	5	0	0	176
Sheila Mcdevitt	WDE2542	29	72	14	57	53	1	0	0	0	1	0	0	227
Sidney Foss	WYL5445	0	22	11	0	0	9	0	0	0	7	0	0	49
Sierra	WSNB	11	26	23	13	4	23	17	7	0	14	0	0	138
Sigas Silvia	S6ES6	0	0	0	0	0	0	3	0	0	0	0	0	3
Siku	WCQ6174	0	0	0	1	2	20	24	0	2	15	0	0	64
Sinuk	WCQ8110	0	0	0	45	135	114	21	97	59	0	0	0	471

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Siranger	9VAH	0	0	0	0	0	18	25	20	10	17	0	0	90
Snopac Innovator	WUU9229	0	0	0	3	1	2	0	0	0	0	0	0	6
Soga	3FDR8	18	16	21	19	17	15	2	11	5	2	0	0	126
Sol Do Brasil	ELQQ4	16	37	27	58	57	21	44	15	9	12	0	0	296
Splendour Of The Seas	C6TZ9	99	108	205	202	129	141	261	498	438	222	0	0	2303
St Louis Express	WDD3825	405	340	371	447	235	444	461	490	459	479	0	0	4131
St Nicholas	WDB8066	0	0	0	0	0	0	0	8	0	0	0	0	8
St. Clair	WZA4027	46	0	0	0	0	0	0	0	0	40	0	0	86
Stacey Foss	WYL4909	9	0	0	0	0	0	7	0	1	4	0	0	21
Stadt Berlin	V2OH8	12	10	16	13	8	7	14	0	0	0	0	0	80
Stalwart	WBN6512	36	50	55	42	27	64	68	1	40	26	0	0	409
Star Alabama	LAVU4	31	23	45	11	0	19	4	35	15	14	0	0	197
Star America	LAVV4	6	6	31	17	30	10	10	0	11	0	0	0	121
Star Atlantic	LAYG5	43	23	13	0	9	9	27	20	32	43	0	0	219
Star Derby	LAXS2	48	13	50	42	32	36	35	29	47	25	0	0	357
Star Dieppe	LEQZ3	9	27	16	19	18	24	24	29	5	30	0	0	201
Star Eagle	LAWO2	20	25	36	39	42	62	111	56	32	0	0	0	423
Star Evviva	LAHE2	2	14	0	10	0	6	20	47	10	30	0	0	139
Star Florida	LAVW4	18	31	29	44	22	28	23	21	0	0	0	0	216
Star Fraser	LAVY4	325	139	367	244	261	69	18	8	46	25	0	0	1502
Star Fuji	LAVX4	13	18	20	8	9	8	24	25	26	22	0	0	173
Star Gran	LADR4	30	22	4	22	0	0	0	34	31	0	0	0	143
Star Grip	LADQ4	36	15	53	4	63	51	47	70	28	38	0	0	405
Star Hansa	LAXP4	0	1	0	25	5	1	0	0	0	31	0	0	63
Star Harmonia	LAGB5	11	2	0	0	0	0	2	2	0	0	0	0	17
Star Herdla	LAVD4	77	8	69	7	17	29	22	0	0	15	0	0	244
Star Hidra	LAVN4	22	27	5	35	33	0	4	3	7	0	0	0	136
Star Isfjord	LAOX5	1	36	17	8	41	46	29	0	44	21	0	0	243

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Star Ismene	LANT5	8	2	2	37	8	68	9	16	10	0	0	0	160
Star Istind	LAMP5	0	0	0	0	0	0	0	55	41	34	0	0	130
Star Japan	LAZV5	19	15	14	18	0	29	34	4	0	45	0	0	178
Star Java	LAJS6	54	48	38	42	15	20	1	18	20	34	0	0	290
Star Juventas	LAZU5	0	18	15	2	1	0	20	31	40	0	0	0	127
Star Kilimanjaro	LAIG7	38	33	62	10	23	31	42	21	28	45	0	0	333
Star Kinn	LAJF7	1	0	0	18	0	3	28	13	27	0	0	0	90
Star Kvarven	LAJK7	6	9	16	28	46	10	1	39	31	4	0	0	190
State Of Maine	WCAH	0	0	0	0	53	40	0	0	0	0	0	0	93
Statendam	PHSG	31	18	12	65	69	92	66	17	38	27	0	0	435
Stellar Eagle	V7RJ6	0	0	0	14	0	0	0	0	0	0	0	0	14
Stellar Voyager	C6FV4	3	0	0	30	54	76	9	5	18	1	0	0	196
Stewart J. Cort	WDC6055	6	0	7	43	46	38	55	13	41	45	0	0	294
Stikine	WDC8583	0	0	0	0	0	11	26	19	17	15	0	0	88
Stimson	KF002	15	1	6	0	3	2	2	0	0	14	0	0	43
Sumida	3FMX7	64	32	0	0	0	0	0	0	0	0	0	0	96
Sunshine State	WDE4432	10	0	1	1	15	12	8	0	2	11	0	0	60
Superstar Aquarius	C6LG6	29	19	0	0	0	0	0	0	0	0	0	0	48
Superstar Libra	C6DM2	106	97	118	119	116	116	106	121	120	120	0	0	1139
Sylvie	VRCQ2	0	0	0	0	0	0	0	0	20	38	0	0	58
Talisman	LAOW5	0	17	23	0	0	32	25	0	6	23	0	0	126
Tamesis	LAOL5	0	27	0	14	10	23	14	4	11	28	0	0	131
Tan'erliq	WCY8497	0	0	0	0	3	0	0	0	0	1	0	0	4
Tangguh Hiri	C6XC2	0	0	0	9	31	16	37	77	72	43	0	0	285
Tarang	ELSR7	0	0	8	0	19	7	45	51	15	0	0	0	145
Taurus	WYH6499	0	0	0	1	4	1	0	0	0	0	0	0	6
Thomas G. Thompson	KTDQ	0	0	0	1	22	0	27	14	26	0	0	0	90
Thomas Jefferson	WTEA	0	0	0	331	439	305	0	0	0	0	0	0	1075
Thrasher	V7TE3	2	4	0	0	0	0	60	16	1	0	0	0	83
Tiglax	WZ3423	0	0	0	0	2	0	0	0	4	0	0	0	6

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Tim S. Dool	VGPY	0	0	0	5	6	8	4	7	11	5	0	0	46
Tina Litrico	KCKB	22	5	0	15	0	20	2	0	0	0	0	0	64
Titan	WAW9232	0	0	0	0	0	0	0	0	1	0	0	0	1
Tonsberg	9HA2066	0	0	0	0	0	0	0	0	19	28	0	0	
Tordenskjold	WDC4922	0	0	0	0	0	1	2	3	0	0	0	0	6
Torm Esbjerg	VREQ5	11	6	4	0	0	0	0	0	0	0	0	0	21
Tridonawati	ELNY2	0	0	0	0	0	70	98	63	34	2	0	0	267
Triumph	WDC9555	0	0	0	0	0	0	0	0	1	2	0	0	3
Tropic Carib	J8PE3	10	10	22	24	11	0	0	36	28	20	0	0	161
Tropic Dawn	J8PR3	9	4	13	11	7	1	1	8	29	14	0	0	97
Tropic Jade	J8NY	33	32	36	40	36	29	8	11	17	13	0	0	255
Tropic Lure	J8PD	24	21	23	19	22	19	26	9	47	23	0	0	233
Tropic Night	J8NX	1	4	0	0	0	46	45	42	11	14	0	0	163
Tropic Opal	J8NW	36	33	23	61	43	43	44	15	35	39	0	0	372
Tropic Palm	J8PB	8	9	13	11	11	13	15	14	9	8	0	0	111
Tropic Sun	J8AZ2	0	24	25	22	8	10	12	12	6	0	0	0	119
Tropic Tide	J8AZ3	28	0	31	39	38	63	90	31	34	35	0	0	389
Tropic Unity	J8PE4	0	0	0	11	61	64	66	69	59	47	0	0	377
TS Kennedy	KVMU	102	66	0	0	0	0	0	0	0	0	0	0	168
Tug Dorothy Ann	WDE8761	1	0	0	0	0	95	48	31	65	62	0	0	302
Tug Spartan	WDF5483	0	0	0	0	1	20	124	288	267	311	0	0	1011
Tustumena	WNGW	94	128	247	160	158	198	179	187	221	137	0	0	1709
Tyco Decisive	V7DI7	19	51	44	55	0	0	0	0	0	0	0	0	169
Tyco Dependable	V7DI6	0	0	0	0	4	60	114	77	36	0	0	0	291
Tyco Durable	V7DI8	2	1	43	61	56	75	0	0	0	54	0	0	292
Tyco Responder	V7CY9	67	2	0	0	0	0	0	0	0	0	0	0	69
Tycom Reliance	V7CZ2	8	5	42	0	1	0	0	0	0	0	0	0	56
UBC Saiki	P3GY9	66	45	10	59	34	29	70	18	32	51	0	0	414

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
UBC Santa Marta	5BDK2	107	46	76	75	123	103	138	55	114	50	0	0	887
Umang	A8PF6	34	18	1	2	0	1	2	0	0	0	0	0	58
Unique Brilliance	VRXK4	0	0	0	0	59	26	33	17	20	0	0	0	155
Unique Carrier	VRCV5	12	77	2	3	2	0	0	1	0	0	0	0	97
Unique Explorer	VRGT8	0	0	13	0	0	5	24	14	20	17	0	0	93
Unique Sunshine	VRWV4	0	0	0	0	0	14	25	2	34	10	0	0	85
United Spirit	ELYB2	121	88	116	78	137	41	100	63	74	9	0	0	827
US Epa Bold	WAA2245	0	0	4	0	4	1	0	0	0	0	0	0	9
USCG Alder	NGML	0	0	1	3	0	0	1	0	0	0	0	0	5
Valdez Star	WCO7674	74	80	30	0	0	20	13	0	0	0	0	0	217
Veendam	PHEO	42	53	66	37	81	16	24	85	54	200	0	0	658
Vega Voyager	C6FV3	51	33	16	14	38	40	20	20	13	13	0	0	258
Vigilant	WDE2719	40	62	47	49	34	28	41	55	39	55	0	0	450
Viking Star	WDE6434	4	0	0	0	3	0	0	0	1	0	0	0	8
Virginian	KSPH	58	63	76	90	80	60	85	95	67	77	0	0	751
Vision Of The Seas	C6SE8	27	11	9	17	2	7	8	4	19	22	0	0	126
Volendam	PCHM	480	502	385	248	405	518	495	380	368	219	0	0	4000
Voyager Of The Seas	C6SE5	83	56	27	16	7	55	30	42	32	26	0	0	374
Washington Express	WDD3826	79	108	56	66	73	128	101	49	61	144	0	0	865
West Sirius	3EMK6	0	0	0	0	0	0	21	52	48	17	0	0	138
Westerdam	PINX	93	39	42	74	29	0	31	28	13	43	0	0	392
Western Ranger	WBN3008	0	0	0	0	0	0	0	15	0	0	0	0	15
Westwood Columbia	C6SI4	46	35	32	34	40	45	20	46	27	29	0	0	354
Westwood Olympia	C6UB2	56	19	38	22	35	28	26	29	37	28	0	0	318
Westwood Rainier	C6SI3	44	37	34	45	42	30	65	39	28	43	0	0	407
Wilfred Sykes	WC5932	578	0	102	718	738	718	743	656	666	732	0	0	5651
Woldstad	KF001	5	0	14	16	17	25	25	6	0	0	0	0	108
World Spirit	ELWG7	0	28	17	47	23	37	18	35	22	10	0	0	237
Xpedition	HC2083	19	0	27	40	0	6	33	39	39	43	0	0	246

Ship Name	Call	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
YM Antwerp	VRET5	31	27	16	17	39	38	31	1	77	101	0	0	378
YM Busan	VREX8	42	77	48	57	48	24	23	51	36	11	0	0	417
Yorktown Express	WDD6127	17	42	30	45	34	20	24	19	19	28	0	0	278
Yp686	YP686	0	0	0	0	0	0	0	10	0	0	0	0	10
Yuhsan	H9TE	4	9	7	16	12	0	0	0	0	0	0	0	48
Yuyo Spirits	3FNF4	0	0	0	0	0	19	28	17	4	24	0	0	92
Zaandam	PDAN	106	120	56	41	7	119	116	175	61	3	0	0	804
Zenith	WBV3237	0	1	0	0	0	0	0	0	0	0	0	0	1
Zim Djibouti	A8SI4	18	0	0	0	2	47	43	60	0	0	0	0	170
Zim Los Angeles	A8SI3	31	27	29	46	24	32	44	17	43	8	0	0	301
Zim Ningbo	A8SI5	17	24	37	12	28	1	0	0	4	11	0	0	134
Zim Shanghai	VRGA6	14	8	4	0	6	5	0	0	16	10	0	0	63
Zim Shenzhen	VQUQ4	79	71	44	40	48	47	37	17	0	0	0	0	383
Zuiderdam	PBIG	53	70	35	222	165	176	198	89	199	329	0	0	1536
Total Ships Reporting: 842	Totals:	26200	26166	32194	35524	35631	38322	42076	42356	36762	38607	0	0	353838

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

(vacant)
PMO New Orleans
62300 Airport Rd.
Slidell, LA 70460-5243
Tel: 985-645-0565
Fax:
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

Daniel Curtis, PMO
National Weather Service, NOAA
1301 Clay Street, Suite 1190N
Oakland, CA 94612-5217
Tel: 510-637-2960
Fax: 510-637-2961
E-mail: daniel.curtis@noaa.gov

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@batteryny.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 Meteorlógico 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

Capt. Einion E. (Taffy) Rowlands, 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: +1604-664-4094
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@dmi.dk
hrj@dmi.dk

FALKLANDS

Captain R. Gorbutt, 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 douane29200 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
Aérodome 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 Lévèque, 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 Bargen, 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

Gilbraltar

Principal Meteorological Officer
Meteorological Office
RAF Gilbraltar BFPO 52
Gilbraltar
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.Andra 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
Rossiare Harbour
Wexford
Ireland
Tel: +353-53 33113
Fax: +353-53 33105
E-mail: met.rossiarre@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

MAURITUIS

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: pmdmokar@khi.paknet.com.pk

PHILIPINES

Cagayan de Oro City

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

Davao City

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

Dumaguete City

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

Legaspi City

Orthello Estareja
Pagasa Complex Station
Legaspi City, 4500
Philipines
Tel: +63-5221 245 5241

Iloilo City

Constancio Arpon, Jr.
Pagasa Complex Station
Iloilo City 5000
Philipines
Tel: +63-33 321 07 78

Mactan City

Roberto Entrada
Pagasa Complex Station, Mactan Airport
Mactan City, CEBU 6016
Philipines
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
Philipines 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 Taechong-dong, Chung-gu
Pusan
Republic of Korea
Tel: +82-51 4697008
Fax: +82-51 4697012

RUSSIAN FEDERATION

Ravil S. Fakhrutdinov
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 Airpot
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.go

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.

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.

United States Government Information

Credit card orders are welcome!

Ordering Process Code: *5862

☐ Yes, please send_subscriptions to: Mariners Weather Log (MWL) at $19.00 ($26.00 foriegn) per year (3 issues)

Fax your orders: (202) 512-2250
Phone your orders: (202) 512-1800

The total cost of my order is $
Price includes regular shipping & handing and is subject to change.

Name or title (Please type or print)

Company Name Room, floor, street

Street Address

City State Zip Code + 4

Daytime phone, including area code

Purchase order number (optional)

For privacy protection, check box below:

☐ **Do not make my name available to other mailers**

Check method of payment:

☐ Check payable to: Superintendent of Documents

☐ GPO Deposit Account ☐☐☐☐☐☐☐ – ☐

☐ Visa ☐ MasterCard ☐ Discover

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

☐☐☐☐

expiration date Authorizing Signature 11/03

Mail to: Superintendent of Documents PO Box 371954, Pittsburgh PA 15250-7954

Important: Please include this completed order form with your remittance. Thank you for your order.

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

Address Correction Requested
Official Business

First Class
U.S. Postage
PAID
DOC / NOAA
Permit No. 348

Mariners
WEATHER LOG