Mariners

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From the Editor

Greetings and welcome to another issue of the Mariners Weather Log!

In this issue we have some great articles beginning with a submission from our international colleagues, Martin Kramp and Emanuela Rusciano who work at IOC-WMO Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) Observations Program Support Center (JCOMMOPS) located in France. That article is showcasing yet another successful initiative and collaborative effort gathering VOS observations and deployment of autonomous instruments for NOAA/AOML Global Drifter Program in data sparse regions by utilizing a sailing yacht owned by the German NGO Hamburgischer Verein Seefahrt (HVS). HVS gives training and opportunity introducing offshore sailing to young people who could otherwise not afford it. In addition to training, good seamanship and development of teamwork is instilled. What a great opportunity for all involved. This issue also includes the PMO Corner featuring our Seattle PMO, Matt Thompson. He was kind enough to share some insight to his huge outreach activities. As always, Skip provides us with our ever interesting ship wreck stories showcasing the many life cycles of these ships.

A warm welcome to a long awaited PMO for the Long Beach California locality. We have a new fresh face here at VOS, Tim Harris. Take time to read his biography and you will be impressed with his skill sets. I know he will do a great job and find this position as PMO rewarding.

As you can imagine, creating this MWL takes more than me to accomplish such a fine publication. I would like to introduce my right hand, Stuart Hayes, who does the layout and design for the PDF version of the MWL. I couldn't do this without him and I wanted to acknowledge him in this issue. Creating this on-line magazine, dedicated to the Voluntary Observing Ship Program and its overreaching programs and international colleagues takes time, patience and dedication. So this is my way of thanking Stuart for such a great job.

So now just sit back with a cup O'Joe and enjoy the April issue of the Mariners Weather Log.

- Paula

On the Cover: HASPA HAMBURG watch captain Felix Zahn deploys a NOAA drifter in the Southern Ocean; at the helm: Vincent Weide All photography: HVS

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Sailing and Science: 27 Days to Cape Horn with Surface Drifters and TurboWin

By Martin Kramp and Emanuela Rusciano
(UNESCO-IOC/WMO/JCOMMOPS)

Introducing Ocean Observing Systems: The crew of the HVS yacht BROADER VIEW HAMBURG with skipper Katrin Hilbert (in the middle) visiting the JCOMMOPS office in August 2015

Below the big continental capes, the number of volunteer ships contributing to the Global Ocean Observing System is very small. In April 2014 we reported in the Mariners Weather Log on the Dutch Tall Ship **EUROPA**, which circumnavigated Antarctica and has been contributing to the Voluntary Observing Ship (VOS) scheme for many years, but also hosted underway systems and deployed numerous surface drifters and profiling Argo floats. We have also seen such contributions from yachts participating in round-the-world races in 2015, in particular Barcelona World and Volvo Ocean Race; during the 2015 UN climate conference in Paris, UNESCO's Intergovernmental Oceanographic Commission (IOC) has signed a corresponding long-term agreement with the ocean racing community.

Today we would like to report on another initiative, which allowed the gathering of VOS observations and deployment of autonomous instruments in the data sparse ocean region between New Zealand and Cape Horn from sailing yacht **HASPA HAMBURG** (call sign DGWV2), owned by the German NGO Hamburgischer Verein Seefahrt (HVS). The aim of HVS is introducing offshore sailing to young people who could otherwise not, or not yet, afford this sport. They are trained in good seamanship and develop e.g. teamwork or leadership skills which are useful far beyond sailing.

Our story begins in August 2015, when one of the HVS yachts sailed to Brest in France. The crew was invited to visit the IOC-WMO Joint Technical Commission for Oceanography and Marine

Meteorology (JCOMM) in-situ Observations Programme Support Centre (JCOMMOPS), since 2015 hosted in Brest by the French ocean research institute ***Ifremer***. Already in preparation of the planned Hamburg Süd Southern Ocean Challenge (HSSOC), the HVS crew was introduced to drifters, floats, and compiled first weather reports with the TurboWin software.

Temporarily the smallest ship of the Hamburg Süd fleet: HASPA HAMBURG and crew with skipper Dirk Harenberg (3rd from left) about to leave Auckland

Later on, HVS's flagship **HASPA HAMBURG** was transported by a freighter to Australia and competed in December 2015 in the famous Sydney-Hobart race before sailing to Auckland, where a new crew of nine came onboard for the biggest challenge of the overall project: The Cape Horn voyage. Title sponsor of the HSSOC is Hamburg Süd, a German shipping company operating more than a hundred container vessels around the world. All Hamburg Süd owned ships are recruited by the German weather service DWD for the national VOS program, and the company also supports the deployment of autonomous instruments and other observing operations. With assistance from the local Hamburg Süd office in Auckland and coordinated by JCOMMOPS for NOAA-AOML, it was possible to organize the transport of five surface drifters from Miami to the yacht in New Zealand in only a few days of time.

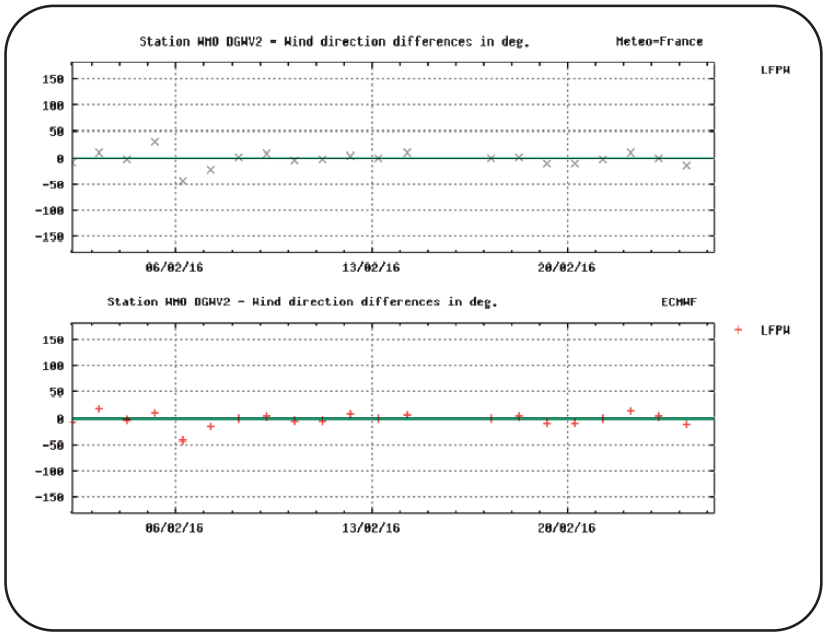
On 30 January **HASPA HAMBURG** left Auckland and started with VOS observations; the ship submitted data like clockwork every day during the four weeks of sailing, most of the time in the harsh conditions of the so-called Furious Fifties and even below 55°S. The buoy deployments were established in accordance with the positions requested by ShaunXDolk, the deployment manager of the Global Drifter Program (GDP) at NOAA-AOML.

Needless to say, contributions from this undersampled ocean area are of high value. It is thereby remarkable that **HASPA HAMBURG** is part of the new VOS "third party support fleet", a class created by the JCOMM Ship Observations Team (SOT) in 2015: the yacht was not recruited or equipped by any national meteorological agency and contributes with its own equipment and means; data quality and timeliness are nevertheless good.

HASPA HAMBURG watch captain Felix Zahn deploys a NOAA drifter in the Southern Ocean; at the helm: Vincent Weide

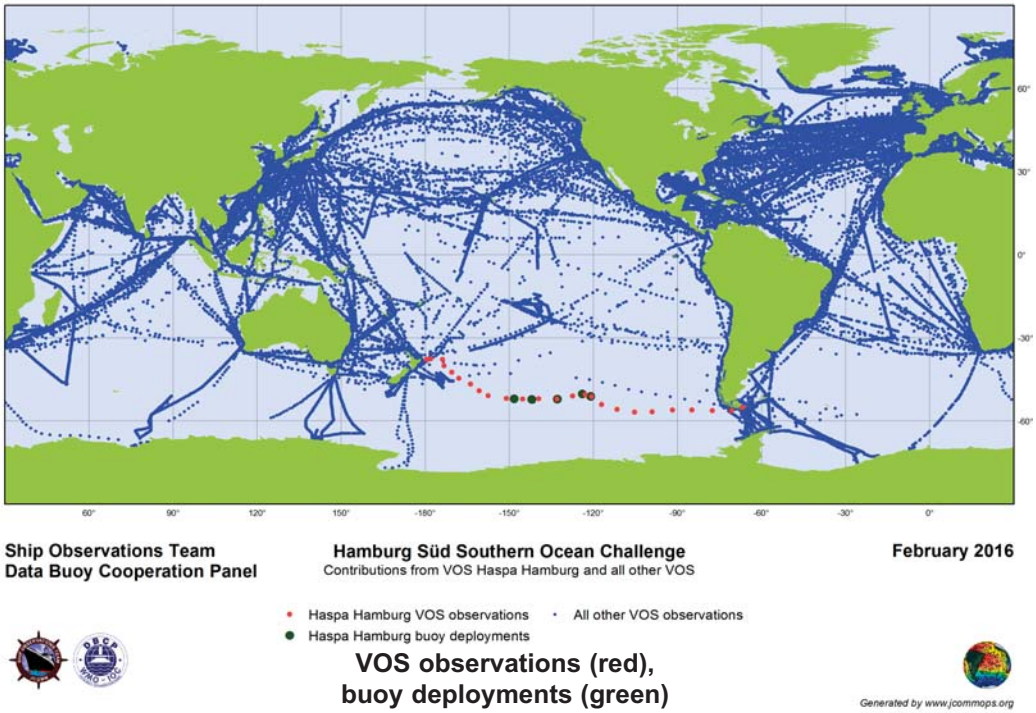
It is also remarkable that the rather small **HASPA HAMBURG** deployed alone as many drifters as the whole Volvo Ocean Race fleet one year ago, but we admit that Haspa Hamburg did not compete in a race this time...

On 24 February, the ship passed the famous Cape Horn. It is now in Ushuaia, waiting for the next crew, and will sail in a few weeks to Brazil to the Olympics, and later head home to Hamburg via the Azores.The follow up crews will continue with VOS observations, and given that this is a training vessel: is there any better way to learn more about marine meteorology than actively participating in the VOS scheme?



Intercomparison with reference models has proven the good quality of the data, here e.g. wind direction. Graphs: Meteo-France / EUMETNET

Working with small, individual ships that can deploy only a few instruments is most often not very efficient. In some cases however, with ships like **HASPA HAMBURG** transiting areas without other regular shipping activity, such vessels can be the only opportunity for a very long time. On behalf of the ocean observing community, we salute all those who made this operation such a big success: Thanks!



VOS observations (red), buoy deployments (green) from HASPA HAMBURG in February, other VOS observations in blue. Map: JCOMMOPS

After 27 days of sailing since Auckland: HASPA HAMBURG at the famous Cape Horn. From left to right: Vincent Weide, Dirk Harenberg, Sinje Haasler, Per Brödermann, Niels Ostmeier, Jens Meyer, David Manherz, Paul Ropohl, Felix Zahn

PMO Corner:
Public Outreach Of A Different Kind

Matthew Thompson,
Port Meteorological Officer - Seattle

As the Seattle PMO and STJG of the US Naval Sea Cadet Corps (USNSCC) I am fortunate to spend a lot of time teaching cadets at the United States Naval Station Everett Division in Everett, Washington.

On October 30th – November 1st 2015, my unit, attended the Region 13 (PNW) Flagship Competition. The event was held at Camp Casey, at the Fort Casey State Park, Whidbey Island, WA. This regional competition brought 7 Sea Cadet Units from around the Pacific Northwest. 99 cadets were in attendance.

10 Cadets, and 4 Officers from the Naval Station Everett Division (132NSE) attended this event. There the cadets competed in core areas that all Sea Cadets train on. The events included: first aid, color guard, knot tying, competition drill, knockout drill, and personnel inspection.

Over the course of the day, a team of 4 cadets participated from each unit for each event. Drill and Knockout personal drill was attended by all cadets. After a great competition, the NSE Division earned team awards: 1st in First Aid, 2nd Knot tying, 2nd Color Guard, 2nd Knockout Drill. Individual awards went to 2 cadets for Knockout Drill – 2nd Place, and in Knot Tying – 3rd Place.

This event is an annual competition that brings these units together builds camaraderie between units, and to test the knowledge of the cadets of the USNSCC. These cadets chose to come to this event, and represent their unit, instead of staying home and celebrating Halloween holiday. All cadets are to be commended for their attendance.

Cadets and staff from participating units for a pre-event briefing for Color Guard competition. Photographs by Ensign Linda Conti PAO

The USNSCC, with its congressional charter, is sponsored by the United States Navy, United States Marine Corps, United States Coast Guard, and the Navy League of the United States. This program is open to young people ages 13-18. The program goal helps further the image of our maritime services by adhering to a standardized training program. These areas are: to develop an interest and ability in seamanship and seagoing skills, instill virtues of good citizenship and strong moral principles in each cadet, demonstrate the value of an alcohol-free, drug-free and gang-free lifestyle, and expose cadets to the prestige of public service and a variety of career paths through hands-on training with our nation's armed services.

Benefits of serving include leadership training, self-confidence, advancement, and exposure to the vast military opportunities that are open to qualified cadets. Each cadet serving honorably in the USNSCC may be eligible for accelerated promotions once they enlist in the USN or USMC.

Far left: LTJG Matt Thompson CO; Far right: Ensign Linda Conti - PAO;
Front Row (left to right): SN Gay, SA Rister-Pedersen, SN Malone, SA Sketchley, SR Padgett;
Back Row PO3 Owens, PO3 Hyatt, SN Reynaud, SA McCartney, SR Hickey.

The USN can accelerate an enlistee up to E-3 upon graduation of boot camp, and the USMC may grant up to E-2, due to experience gained in the USNSCC. Other Cadets who have excelled in their studies, can be recommended to service academies, and ROTC units at universities. In the last survey taken at the US Naval Academy, 10 % of cadets were former USNSCC Cadets. The CNO has stated that the training gained in the USNSCC saves the USN $14,000 in training.

The Naval Station Everett Division has been proud to have help place 5 cadets in service academies over the past few years. These academies include the US Naval Academy, US Military Academy (WestPoint), US Coast Guard Academy, The Merchant Marine Academy, and the California Maritime Institute.

Other cadets have gone on to University ROTC programs, and many others who have enlisted in the US Navy, US Coast Guard, US Marine Corps, and US Army. The Naval Station Everett Division, USNSCC, is just one of the many units that exists with the sponsorship of the Navy League of the United States.

In the end, whether these cadets enter military service or not, the program helps give them confidence, and prepare them for leadership roles they may encounter on their path through life.

note: Mr. Matt Thompson is no longer CO of this unit having been promoted to LCDR Regional Director for 13-2 in January 2016.

Buoy Measurements of Wave Steepness during Hurricane Katrina

Professor S. A. Hsu
Louisiana State University
Email: sahsu@lsu.edu

Abstract: During Hurricane Katrina in 2005 over NDBC buoys 42003 and 42001 located on east and west side, respectively, along its northward track over the Gulf of Mexico, it is demonstrated that on the right side, the seas are dominated by the wind-wave interaction, whereas on the left, by the wind-wave-swell. This strong evidence further supports the long standing notion by the mariners that the left semicircle in a tropical cyclone is a better region for safe navigation due to its lower wave steepness and wind speed.

According to the National Data Buoy Center (www.ndbc.noaa.gov), wave steepness is the ratio of wave height to wave length and an indicator of wave stability. Operationally, here we use the measurements available routinely via NDBC that,

$$\textbf{Wave steepness} = \frac{H_s}{L_p} \quad , \qquad (1)$$

$$\textbf{And, for deep water waves,} \quad L_p = \left(\frac{g T_p^2}{2\pi}\right) \quad , \qquad (2)$$

Here H_s and L_p are significant wave height and peak wavelength for the combined sea and swell spectrum, respectively, g is the acceleration of gravity, and T_p is the peak wave period. All parameters are measured routinely by the NDBC.

In order to minimize the swell effects, we use the criterion for the wave steepness set forth by Drennan et al. (2005) such that, for the wind seas,

$$\frac{H_s}{L_p} \geq 0.020 \quad , \qquad (3)$$

Now, according to Hsu (1988, p. 217), on the right side of the hurricane track, winds, waves, and swells are all traveling nearly the same direction, whereas on the left, they are opposing each other. These phenomena are illustrated in **Figures 1** thru **3**. During Hurricane Katrina in 2005, two buoys, 42003 on the right side of the storm track and 42001 on the left, are employed in this study (see **Fig.1**). On the basis of aforementioned discussions, variations of the wave steepness on both sides of the track are analyzed and presented in **Figures 2** and **3** for the right and the left, respectively. It is clear that on the right, wind seas prevail and on left the seas are mixed with wind seas and swells. This strong evidence further supports the long standing notion by the mariners that the left semicircle in a tropical cyclone is a better region for safe navigation due to its lower wave steepness and wind speed.

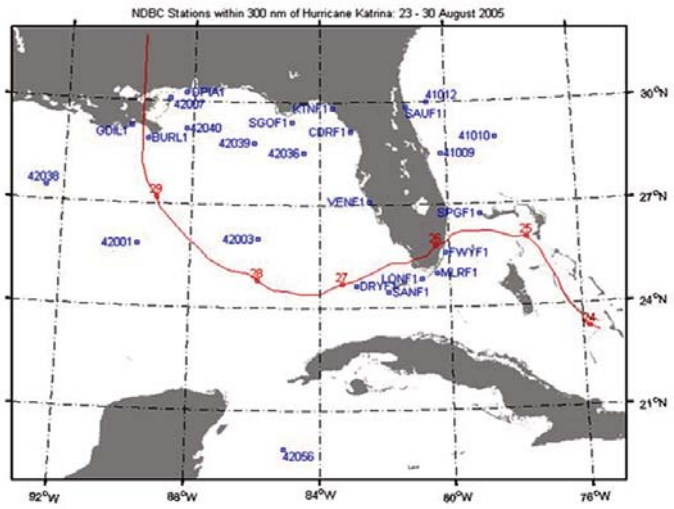


Figure 1. Hurricane Katrina's Track and NDBC Stations. Katrina's track (in red with the start of each day numbered) is from the current positions of the National Hurricane Center's Forecasts/Advisories (Data source: http://www.ndbc.noaa.gov/hurricanes/2005/katrina/).

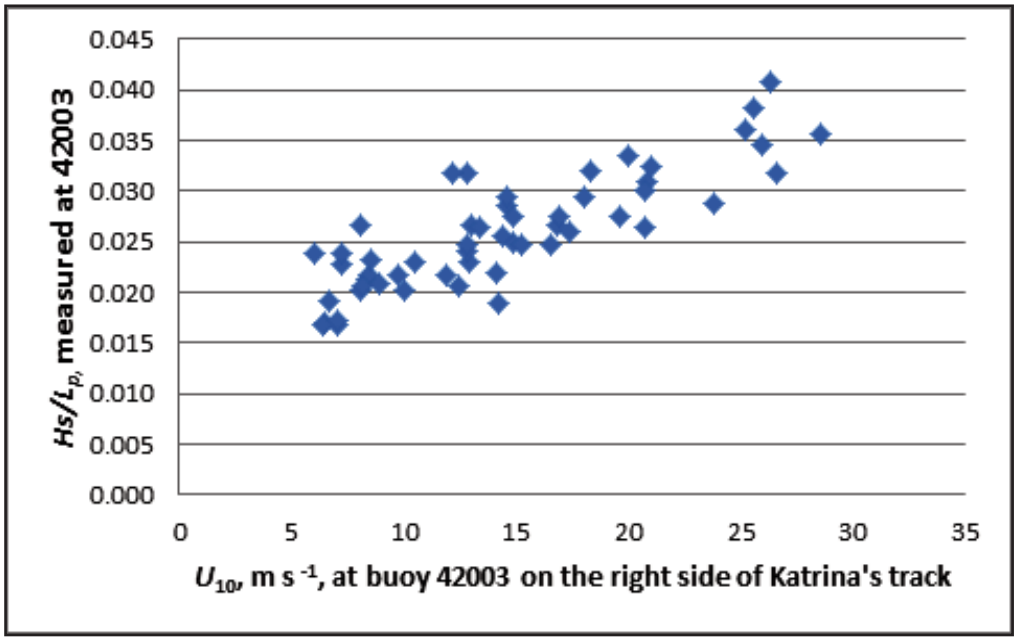


Figure 2. Variation of wave steepness on the wind speed on the right side of Katrina's track.

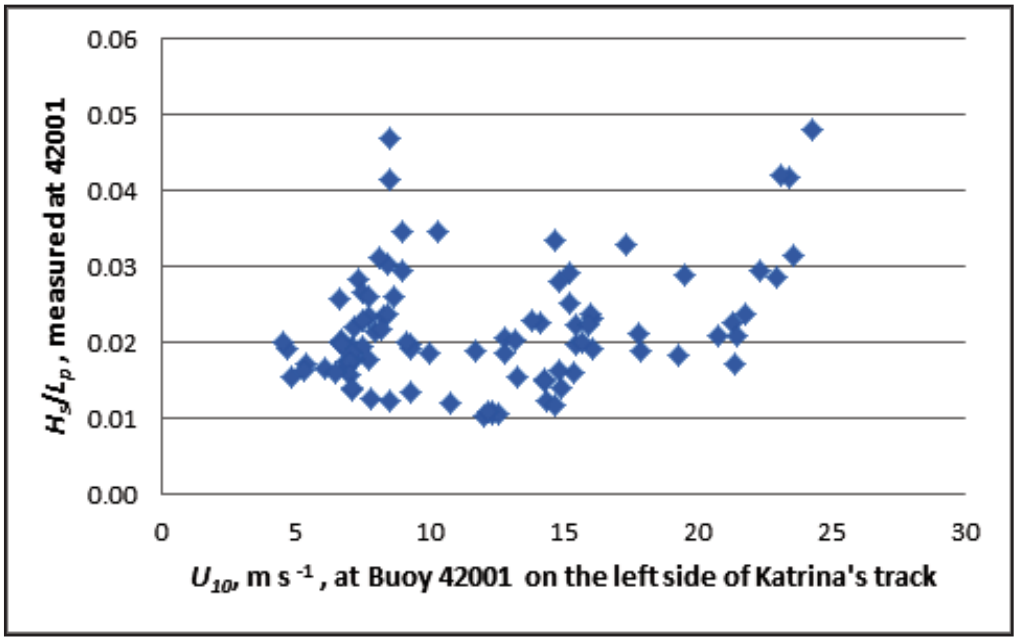


Figure 3. Variation of wave steepness on the wind speed on the left side of Katrina's track.

Acknowledgements: Buoy measurements provided by NDBC are greatly appreciated.

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Drennan, W.M., Taylor, P.K.,Yelland, M.J. 2005. Parameterizing the Sea Surface Roughness, Journal of Physical Oceanography, 35: 835-848.

Hsu, S.A.1988. Coastal Meteorology, Academic Press, San Diego, CA

Shipwreck: IOANNIS DASKALELIS

By Skip Gillham

IOANNIS DASKALELIS
Photo: Skip Gillham Collection, courtesy Steve Hinchliffe

It was in February 1966 that a number of North American newspapers carried three dramatic photos of the sinking of the Liberty ship **ROCKPORT**. Each image showed the aging vessel slipping lower into the water as a valiant effort was made to tow the vessel to a spot where it could be beached. They failed in the attempt to save the ship but all on board were spared.

ROCKPORT was built at Portland, Maine, and launched on March 3, 1945, as the **WILFRED R. BELLEVUE**. It had been constructed as their Hull 3015 and was completed later in March for the United States Maritime Commission. Names chosen for the Liberty ships came from some well-known and many little-known Americans.

Wilfred R. Bellevue as the first assistant engineer aboard the Sinclair Refining tanker **JOSEPH M. CUDAHY**. He lost his life when his ship was torpedoed and sunk off the coast of Florida on May 1, 1942.

The 441 ft, 6 in long by 57 ft wide, the standard for a World War Two Liberty ship, could carry in the range of 10,000 tons of cargo and these general cargo carriers were very useful in carrying supplies to the front lines in the effort to win the war in Europe and the Pacific.

These ships were constructed with interchangeable parts and were steam powered with a 2,500 i.h.p. triple expansion engine. They played a large part in the winning of the war.

With the battles over, there was not the need for so many ships. Allied nations had lost a substantial part of their merchant marine and many Liberties were sold to assist in reconstruction. Others remained under the American flag for a short period before joining their running mates under a foreign flag.

WILFRED R. BELLEVUE was sold to the Edison Steamship Corp. in May 1947 and retained American registry as **EDISON MARINER**. The ship had routine service, often on the Atlantic, but the tail shaft broke and propeller was lost about 540 miles east of Bermuda in March 1950. The ship was on a voyage from Nordenham, West Germany, to New Orleans, Louisiana, but was recovered, taken in tow to Bermuda, and repaired. In 1961, another sale brought the ship under the flag of Greece
as **IOANNIS DASKALELIS**.

The new owners, Geotas Cia de Vapores, sent their vessel to the Great Lakes for a single trip in 1962 and it was believed to have loaded scrap steel at Toronto as part of their Seaway adventure.

In 1964, the final name of **ROCKPORT** was given by Altema Cia Maritima S.A., and it was placed under Liberian registry. The 21-year old Liberty ship had loaded iron ore at Vancouver, B.C. for Japan, when it began to leak in heavy weather on Feb. 1, 1966.

They called for help and **ROCKPORT** was abandoned by the crew and an attempt to tow the vessel to safety failed. The photos shown around the world were likely taken from the towing vessel but, on Feb. 5, 1966, the effort to reach safety fell short about 600 miles from Midway Island in a position recorded as Pos. 30.46 N / 168.23 W.

Welcome Aboard!

New LAX PMO, TIM HARRIS

I would like to introduce all to the newest Port Meteorological Officer for the U.S. VOS program, Tim Harris. Tim will be the PMO for Long Beach California and the surrounding area. We can all look forward to having such a busy port under such qualified, capable and watchful eyes.

Tim was a Meteorological Technician for the National Weather Service at Kotzebue Alaska for the last two and a half years. Tim's vast experience in meteorology comes from 18 years in the U.S. Navy and he is currently in the U.S. Navy Reserves finishing up his Navy career at the Mission Support Center in Coronado, California providing critical support for operations. Some of his previous duty stations include his first duty after training, Mobile Environmental Team Jacksonville, Florida. From there he was stationed at Naval Air Station Fallon, Nevada, supporting air craft carrier Air Wing 3; Ft. Meade, Maryland / National Security Agency, working as a Special Weather Intelligence Analyst providing ArcGIS worldwide Intel support ; Guantanamo Bay, Cuba supporting the Joint Task Force, Coast Guard, Naval Base Gitmo in addition to shipping interests.

Welcome Aboard Tim!

Big Thanks and Introduction to Stuart Hayes, Layout and Design: Mariners Weather Log.

I have known Stuart for quite some time now but only in the last couple years have I really gotten to work with him. Stuart is one of the nicest and most accommodating persons I have ever met. His talent and professionalism makes me grateful each and every issue!

Stuart is an Illustrator by profession and became a contractor to NOAA's National Data Buoy Center in 2002 as the logistical audio visual support. He provides a variety of services for the NDBC such as: covering conferences, special events, on site photographic documentation, and desktop cartography. He supports our mission with printed material from small name tags for visiting high level officials and staff, dial-a-buoy cards, procedures and manuals on various equipment, and large informative graphics for conferences, and presentations using software suites appropreite to the material.

Stuart majored in photography in the late 70's at Memphis College of Art Memphis TN. Some of his former positions, which compels me to note how totally surprised I was when I found this out, was an Operations Manager in the oil and gas service industry and diesel engine repair, parts supply, generator rental Department Manager. His interest while away from the Space Center is working as an independent non-commercial photographer. He also casually follows Formula and LMP Motorsports. Since I don't follow motor sports, he had to spell that out for me; Worldwide Formula One and Le Mans prototype auto racing.

Mean Circulation Highlights and Climate Anomalies

September through December 2015

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

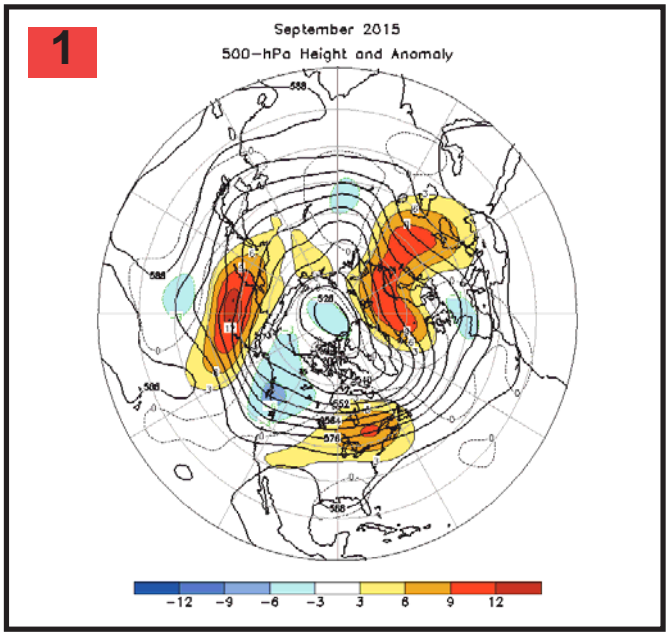
All anomalies reflect departures from the 1981-2010 base period.

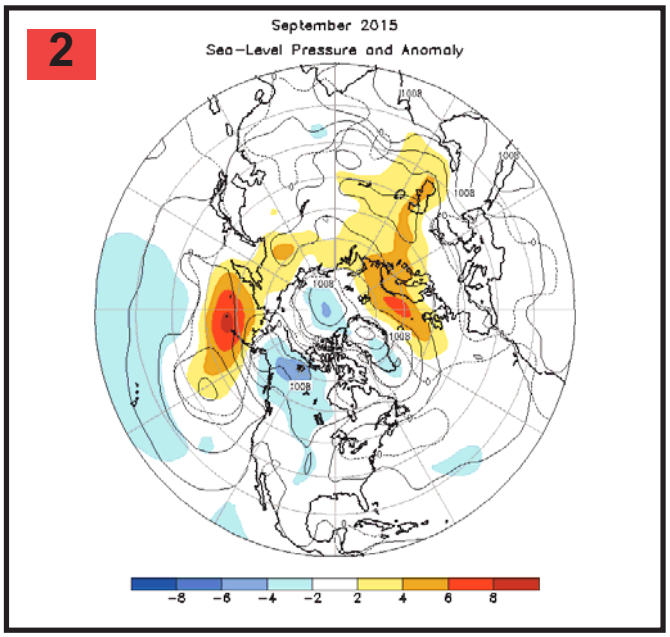
September - October 2015

The mid tropospheric flow pattern during September featured above average 500 hPa heights over the high latitudes of the North Pacific Ocean, the northeastern quadrant of the contiguous U.S., eastern Canada, Scandinavia, and western Russia, and below average heights over western Canada and western Europe **Figure 1**. The sea level pressure (SLP) pattern mirrored the more pronounced features of the circulation pattern **Figure 2**.

The October 500 hPa mean circulation featured above average heights over much of western North America and Scandinavia, and below average heights over the high latitudes of the North Pacific, eastern Canada, the eastern North Atlantic, and west central Russia **Figure 3**. The SLP pattern for October generally mirrored the 500 hPa height anomaly pattern **Figure 4**.

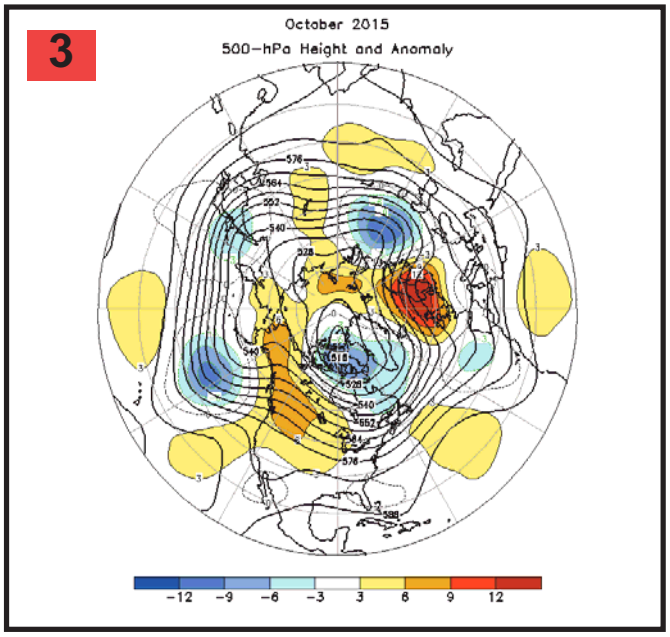
Tropical moisture associated with an upper Low and Hurricane Joaquin brought historic flooding to the Carolinas in early October Reference 1. Localized rainfall totals exceeded 63.5cm in southeast South Carolina. Recent spring tides combined with persistent onshore winds to produce very high tide levels along the South Carolina and Georgia coasts. Such high tides exacerbated the freshwater flooding from the heavy rainfall and led to significant flooding of properties and roads, especially in downtown Charleston. Tide levels peaked at 2.53m Mean Lower Low Water (MLLW) in Charleston Harbor during the early afternoon of October 3 **Reference 2**.

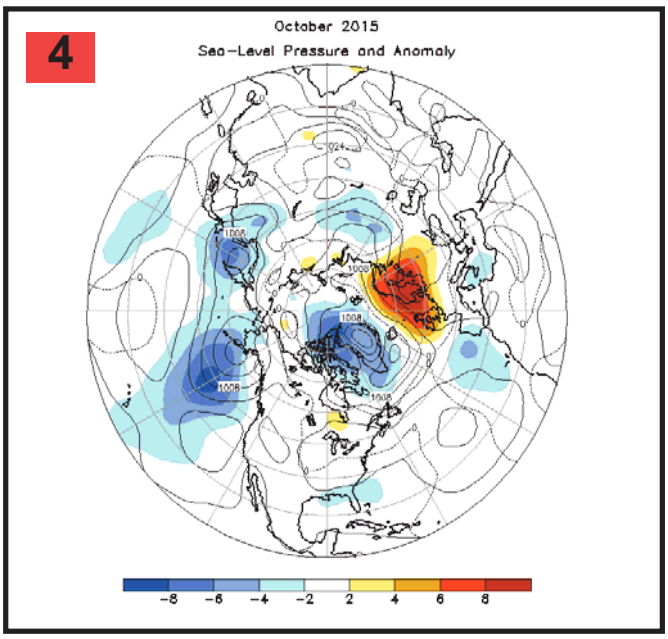




Caption for 500 hPa Heights and Anomalies: Figures 1,3,5,7
Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures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

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





The Tropics

Sea surface temperatures (SSTs) were above average across the equatorial Pacific during both September and October, and the monthly Nino 3.4 index values were +2.3C and +2.5C, respectively. The depth of the 20C isotherm (oceanic thermocline) remained above average across the eastern equatorial Pacific in September and October, with corresponding subsurface temperatures 1-6C above average. The low level westerly wind anomalies remained strong across much of the equatorial Pacific (September and October). Deep, tropical cumuliform clouds and thunderstorm activity was enhanced over the central and eastern equatorial Pacific, and suppressed over Indonesia and the western equatorial Pacific. These oceanic and atmospheric anomalies collectively reflect a continuation of strong El Nino conditions.

November - December 2015

The mean 500 hPa circulation during November was characterized by above average heights over the central North Pacific, eastern North America, southern Europe, and eastern Asia, and below average heights over the western contiguous U.S., the polar region and central Russia **Figure 5**. The sea level pressure and anomaly map (**Figure 6**) generally mirrors the 500 hPa pattern.

During December, the 500 hPa circulation featured a high amplitude pattern,
with above average heights over eastern North America, much of Europe and the Mediterranean region, and China, and below average heights over Greenland and the North Atlantic, western Russia, and from the Bering Sea and Alaska southeastward to the U.S. Pacific Northwest **Figure 7**. As is typically the case, the SLP pattern generally mirrors the mid tropospheric pattern **Figure 8**.

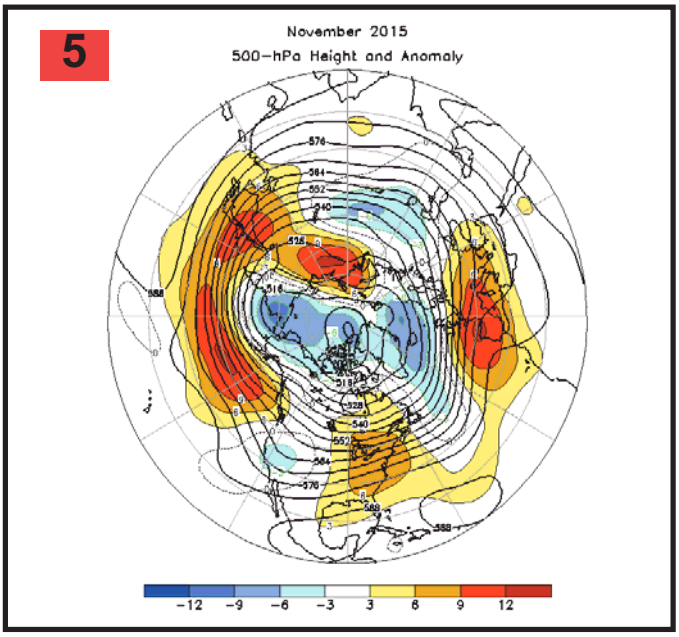
The high amplitude ridge over the eastern contiguous U.S. in December contributed to record warmth in many areas. Kennedy Airport in New York City reported high temperatures at least 5.5 Celsius degrees (10 Fahrenheit degrees) above normal for 19 of the month's 31 days. The largest departure (15.6 Celsius degrees above normal) occurred on Christmas Eve, in advance of a cool front, when the temperature topped out at 20.6 degrees C **Reference 3**.

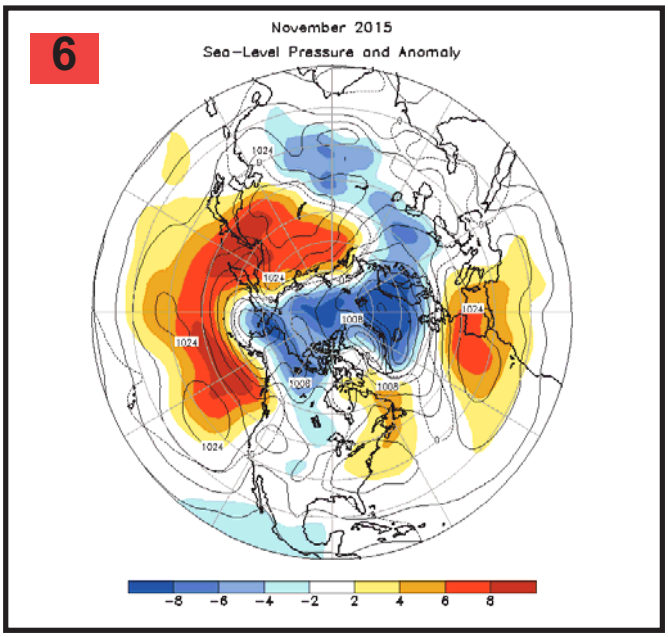
The Tropics

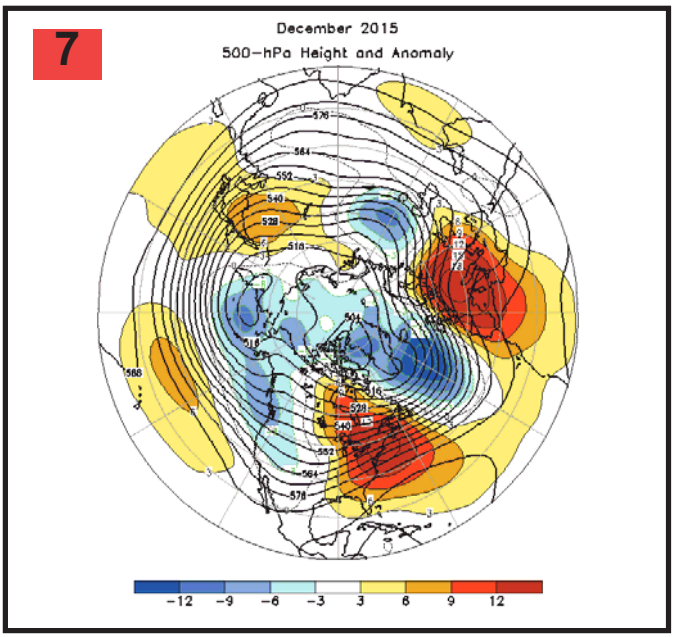
Strong and mature El Nino conditions continued during November and December 2015. Sea surface temperatures (SSTs) were well above average across the central and eastern

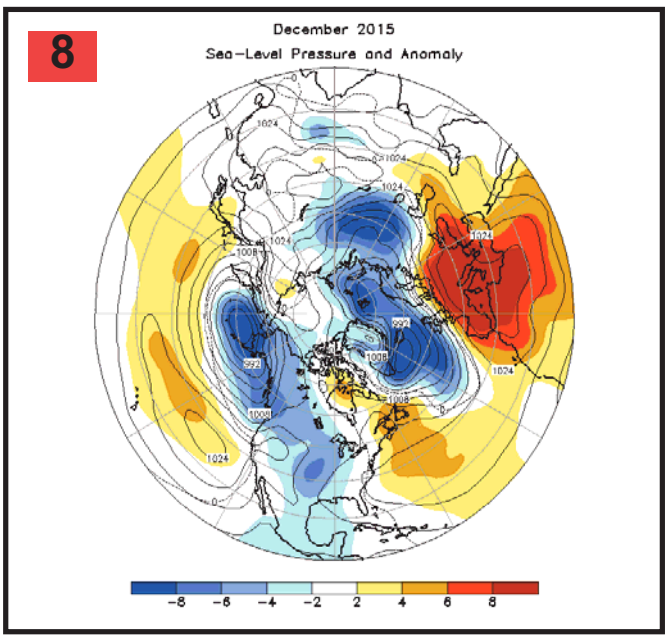
equatorial Pacific. The latest monthly Nino 3.4 indices were +3.0C (Nov) and +2.8 (Dec). The depth of the 20C isotherm (oceanic thermocline) was above average over the eastern equatorial Pacific, and the corresponding subsurface temps ranged from 1-7C above average in that region. Low level westerly wind anomalies and upper level easterly wind anomalies remained strong across the central and eastern equatorial Pacific. Enhanced convection persisted over the central equatorial Pacific, and suppressed convection was observed across Indonesia and the western equatorial Pacific. This anomalous convection pattern is consistent with the current El Nino base state.

However, in mid December, the pattern was temporarily disrupted as convection from the eastern Indian Ocean shifted eastward across the Maritime Continent and northern Australia. This was related to the Madden Julian Oscillation (MJO), which is a mode of sub seasonal variability that operates on a higher frequency time scale than El Nino **Reference 4**. In general, an MJO wave (with alternating regions of rising and sinking motion) makes a complete circuit of the global tropics in 30-60 days. This is a clear example of destructive interference (offsetting) between the lower frequency El Nino and the higher frequency MJO.









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

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

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2. http://www.weather.gov/chs/HistoricFlooding-Oct2015

3. http://w2.weather.gov/climate/index.php?wfo=okx

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Marine Weather Review – North Atlantic Area

March to August 2015

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Introduction

The late winter to early spring period was very active, especially in March when a series of strong cyclones developed off the U.S. East Coast and tracked rapidly northeast toward the area east of Greenland to Iceland or the northeastern Atlantic waters, with 10 developing hurricane force winds. As is usually the case the numbers fell off in April when 4 cyclones developed hurricane force winds. In late April and early May the cyclones moved more erratically with some moving into the Davis Strait or stalling in the northern waters and spawning new development farther east. May was active, producing several cyclones with central pressures down into the 970s and storm force winds, but no hurricane force lows. June and July brought a more summerlike pattern with a weaker cyclonic track shifting north; however each produced one hurricane force low over the southern waters. Such events are rare in those months, with July usually the least active month. August featured cyclones moving mainly north of 50N with a few developing storm force winds. Overall, except for tropical activity, the North Atlantic was more active than the North Pacific throughout this period.

In what would turn out to be a below normal North Atlantic hurricane season, the season got off to an early start with Ana forming initially as a subtropical storm in OPC's far southwestern waters and moving northeast along the coast as a tropical storm before weakening off the Mid-Atlantic coast of the U.S. and lasting only three days as a tropical cyclone. Another tropical storm, Claudette, formed off the North Carolina coast in mid-July but like Ana was short lived. Other tropical activity during the period occurred south of OPC's area of responsibility (**Reference 7**).

Tropical Activity

Subtropical Storm / Tropical Storm Ana:

Ana began as a non-tropical low near the northern Bahamas early on May 6th and moved north, becoming a gale upon passing near 31N 78W on the morning of the 7th. The cyclone became Subtropical Storm Ana, the first named cyclone of 2015, the following evening near 32N 78W with maximum sustained winds of 40 kts with gusts to 50 kts. Ana then drifted north and became a tropical storm early on the 9th near 32.5N 77.6W with sustained winds up to 50 kts. At 0900 UTC on the 8th the **MAERSK MONTANA** (WCDP) near 33N 77W reported northeast winds of 35 kts. At 0600 UTVC on the 10th the **GLEN CANYON BRIDGE** (3EFD9) near 32N 78W reported south winds of 40 kts and the **INDEPENDENCE II** (WGAX) encountered southeast winds of 40 kts at 32N 77W. Buoy 41013 (33.4N 77.7W) reported southeast winds of 41 kts with gusts to 52 kts and 4.5 m seas (15 ft) at 0200 UTC on the 10th, a peak gust of 54 kts two hours prior, and highest seas 5.0 m (17 ft) at 0600 UTC on the 9th. The cyclone then moved over eastern North Carolina where it weakened to a depression on the 10th, before moving along the Mid-Atlantic Coast and becoming a post tropical gale late on the 11th. Post tropical Ana then accelerated northeast and became absorbed by another intensifying low moving east of the Canadian Atlantic provinces on the 13th (See Northeastern Atlantic Storm, May 15-16 below).

Tropical Storm Claudette:

Short lived Tropical Storm Claudette formed off the U.S. Mid-Atlantic Coast near 37N 68W on the afternoon of July 13th with maximum sustained winds of 45 kts and gusts to 55 kts and moved northeast, beginning a weakening trend early the next day.

The cyclone transitioned to a post tropical gale force low on the evening of the 14th south of Newfoundland near 44N 58E. The **VANCOUVER EXPRESS** (9HA3490) near 37N 62W reported southwest winds of 35 kts at 0600 UTC on the 15th. Its winds weakened to below gale force while passing north of the island of Newfoundland late on the 15th. It re-intensified to a gale in the Labrador Sea late on the 16th, where it stalled, before drifting southeast and dissipating east of Newfoundland late on the 18th.

Other Significant Events of the Period

North Atlantic Storm, March 2-5:

Low pressure rapidly intensified while passing northeast across the Canadian Maritime Provinces over a 36 hour period as depicted in **Figure 1**. Its central pressure fell at more than twice the "bomb" rate at 60N (Sanders and Gyakum, 1980) with the central pressure dropping 52 hPa in the 24 hour period ending at 1200 UTC on the 3rd. The cyclone became one of the deepest of the period with a lowest central pressure of 951 hPa (**Figure 1**). The Rapidscat image in Figure 2 shows north winds of 65 kts east of the island of Newfoundland at 1732 UTC on the 3rd as the cyclone was approaching maximum intensity. **Figure 3** is a satellite image revealing a mature fully occluded system with a well defined center near the southern tip of of Greenland. It leaves a swath of higher seas in its wake, with the Jason-2 altimeter pass detecting seas approaching 50 ft (15.2 m).

The **BUDAPEST EXPRESS** (DGWE2) near 40N 62W reported southwest winds of 53 kts at 1800 UTC on the 2nd, while the **CSAV HOUSTON** (LXHL) near 40N 55W encountered southwest winds of 50 kts and 4.5 m seas (15 ft).

The **EAGLE KUANTAN** (9V8376) reported west winds of 40 kts and 9.0 m seas (30 ft) near 45N 55W at 1200 UTC on the 3rd. The buoy 44251 (46.4N 53.4W) reported west winds of 39 kts with gusts to 49 kts and maximum seas 7.0 m (23 ft) at 1300 UTC March 3. The platform **HIBERNIA** (46.7N 48.7W) encountered west winds of 62 kts at an anemometer height of 139 m and 6.5 m seas (21 ft) two hours later. The cyclone's top winds weakened to storm force as it passed east of Greenland on the 4th and then moved through the Denmark Strait the next day.

North Atlantic Storm, March 4-9:

The next major development followed a similar track as shown in **Figure 4**. The cyclone deepened by 34 hPa in the 24 period after it passed northeast of the island of Newfoundland. The second part of **Figure 4** shows the cyclone with a maximum intensity of 939 hPa (27.73 in), making it the most intense cyclone of the six month period in the North Atlantic and much deeper than anything in the North Pacific that did not have a tropical origin. The cyclone did not develop hurricane force winds until it moved into the east Greenland waters on the 6th. The ASCAT-B image in **Figure 5** returned a swath of west winds 50 to 55 kts on the south side of the center, but ASCAT has low bias especially at high wind speeds. The **MAERSK PALERMO** (PDHW) near 44N 44W reported southwest winds of 50 kts at 1200 UTC on the 5th. **HIBERNIA** (46.7N 48.7W) encountered south winds 59 kts at 0000 UTC on the 5th and seas 5.2 m (17 ft) three hours later.

TERRA NOVA FPSO (46.4N 48.4W) reported southwest winds of 48 kts at 0300 UTC on the 5th (anemometer height 53 m). The cyclone subsequently stalled and weakened near the east Greenland coast through the 9th (**Figure 6**) before becoming absorbed by another strong system passing to the east on the 10th.

North Atlantic Storm, March 8-10:

Low pressure originating near 34N 62W early on March 7th and moved rapidly northeast, with its central pressure dropping 29 hPa in the 24 hour period ending at 0000 UTC on the 9th. **Figure 6** shows the cyclone about to pass north of the British Isles. Its central pressure dropped to as low as 966 hPa six hours later as it passed near 57N 14W.The ASCAT-A imagery in **Figure 8** shows a swath of 50 to 60 kts winds on the south side of the center.Low bias in ASCAT was mentioned earlier.

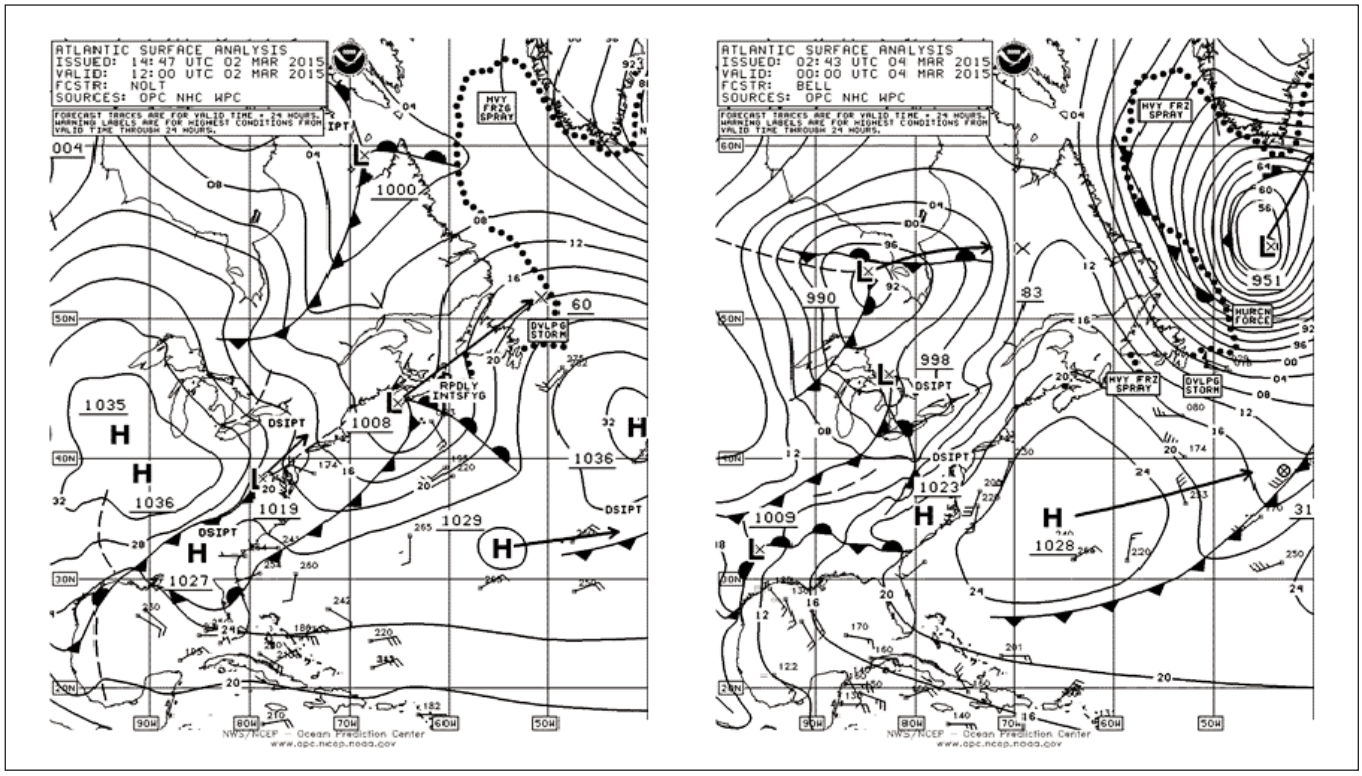

Figure 1. OPC North Atlantic Surface Analysis charts valid 1200 UTC March 2 to 0000 UTC March 4, 2015 (Part 2 – west). Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars except for tropical cyclones at twenty-four hours (tropical symbol at the forecast position).

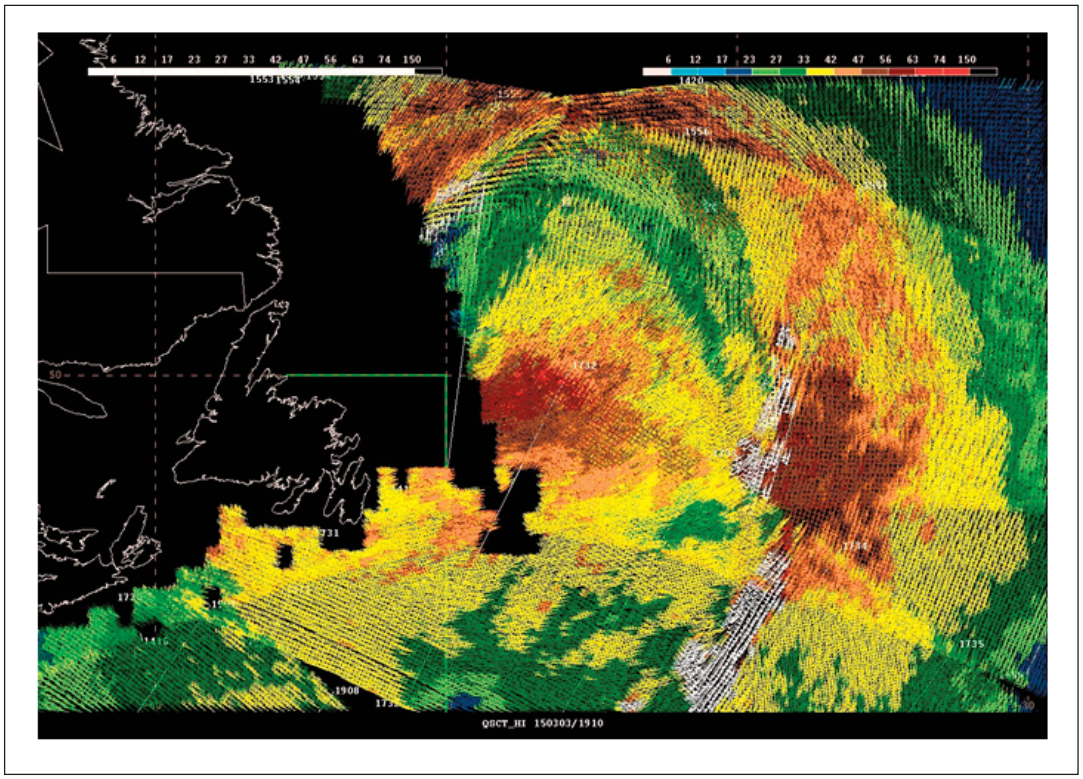

Figure 2. Rapidscat image of remotely-sensed winds from an instrument aboard the International Space Station with resolution of 12.5 km. Wind barbs are colored according to a scale on the upper right side of the image. Diagonal lines are cross-track timelines of the instrument labeled in UTC. The line crossing the center of the image where the highest winds are found is for 1732 UTC March 3, 2015, or six and one-half hours prior to the valid time of the second part of Figure 1. Imagery is courtesy of NOAA/NESDIS/STAR (Center for Satellite Applications and Research).

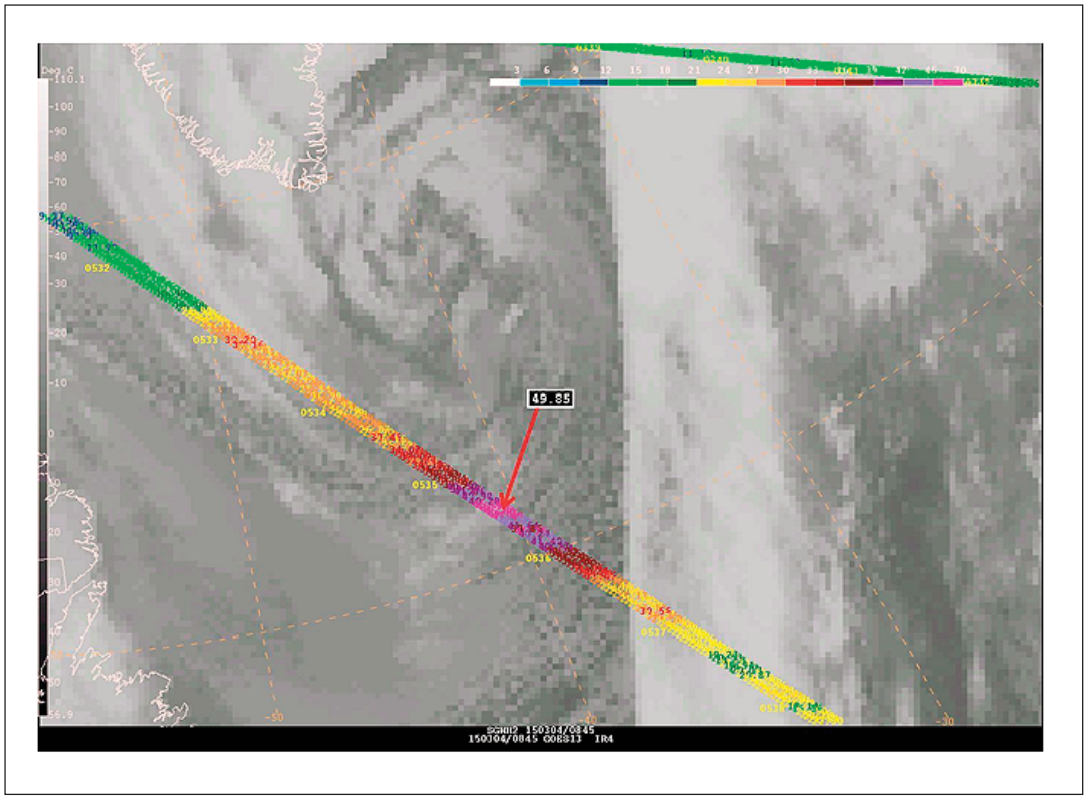

Figure 3. GOES-13 infrared satellite image of the hurricane-force low shown in the second part of Figure 1, with a Jason-2 altimeter pass of remotely-sensed wave heights (in feet with two decimal places). The satellite senses temperature on a scale from black (warm) to white (cold) in infrared imagery. The valid time of the satellite image is 0845 UTC March 4, 2015, or eight and three-quarters hours later than the valid time of the second part of Figure 1. The four-digit labels below the altimeter pass are times in UTC. A label (49.85 feet) points to the maximum significant wave height detected.

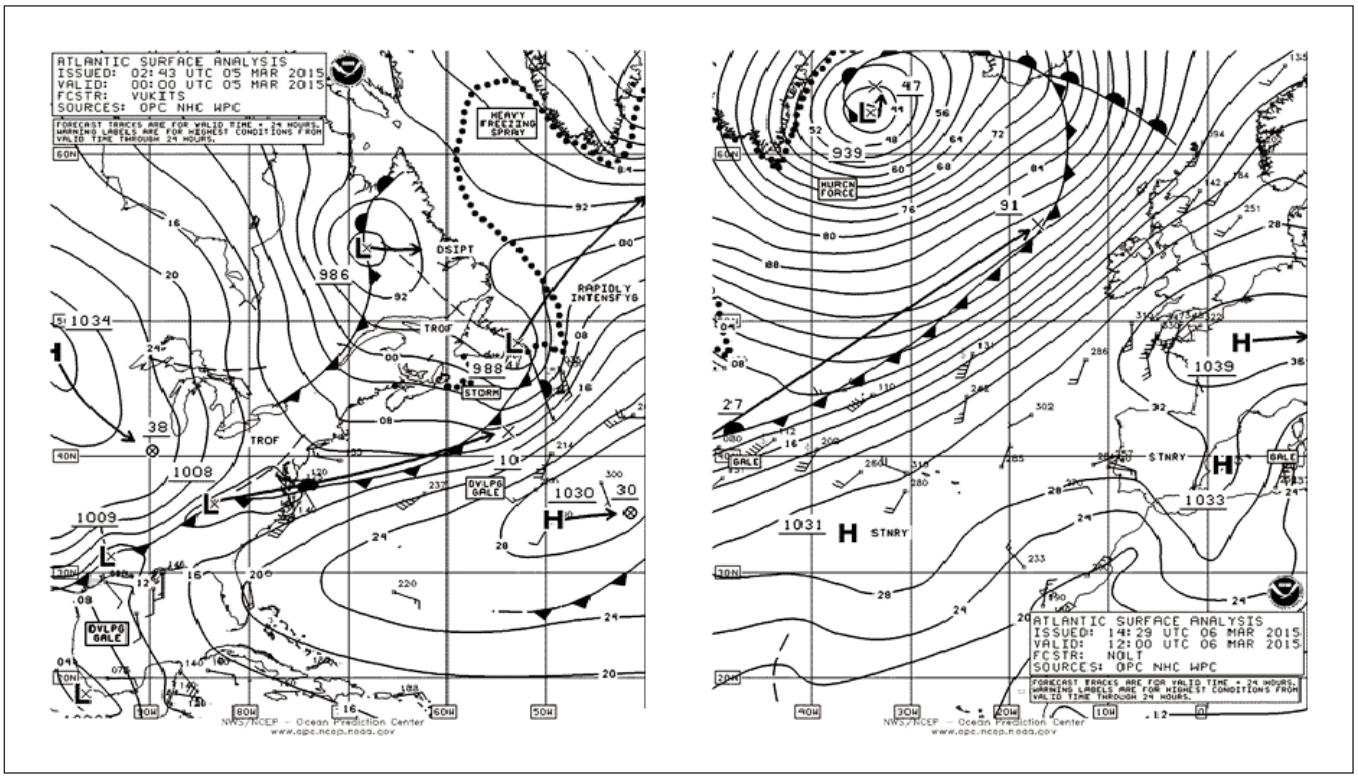

Figure 4. OPC North Atlantic Surface Analysis charts valid 0000 UTC March 5 (Part 2 – west) and 1200 UTC March 6, 2015 (Part 1 – east).

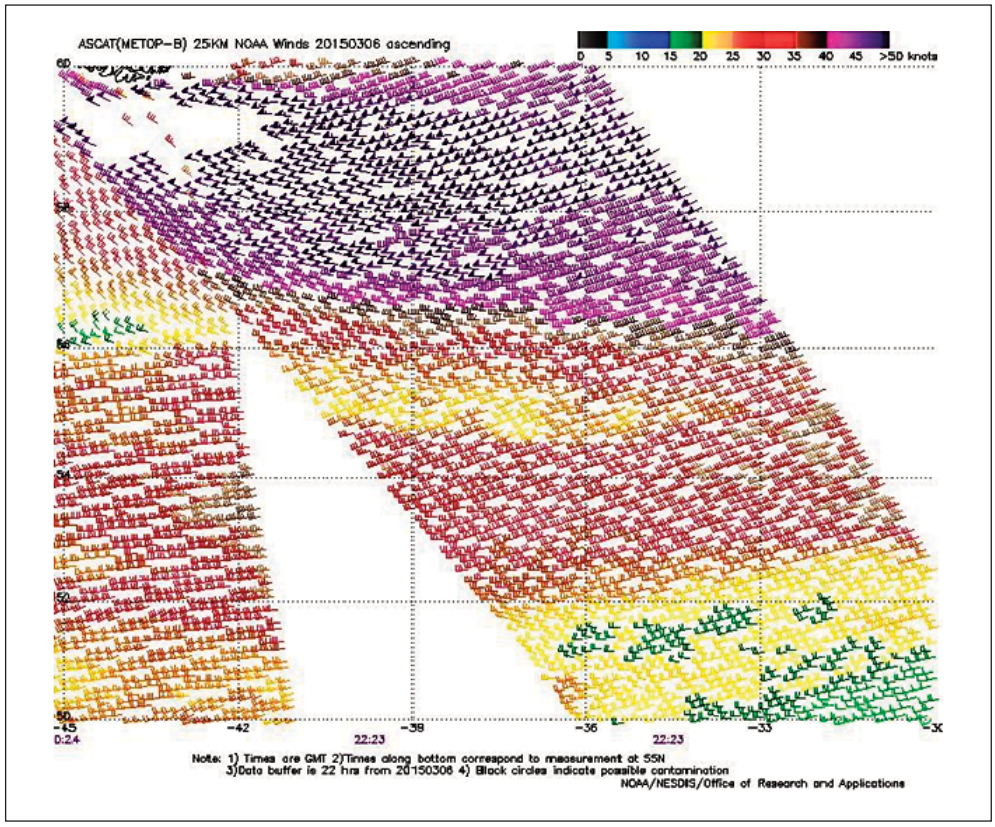

Figure 5. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the south side of the cyclone shown in the second part of Figure 4. The valid time of the pass is 2223 UTC March 6, 2015, or about ten and one-half hours later than the valid time of the second part of Figure 4. The southern tip of Greenland appears on the upper-left edge of the image. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

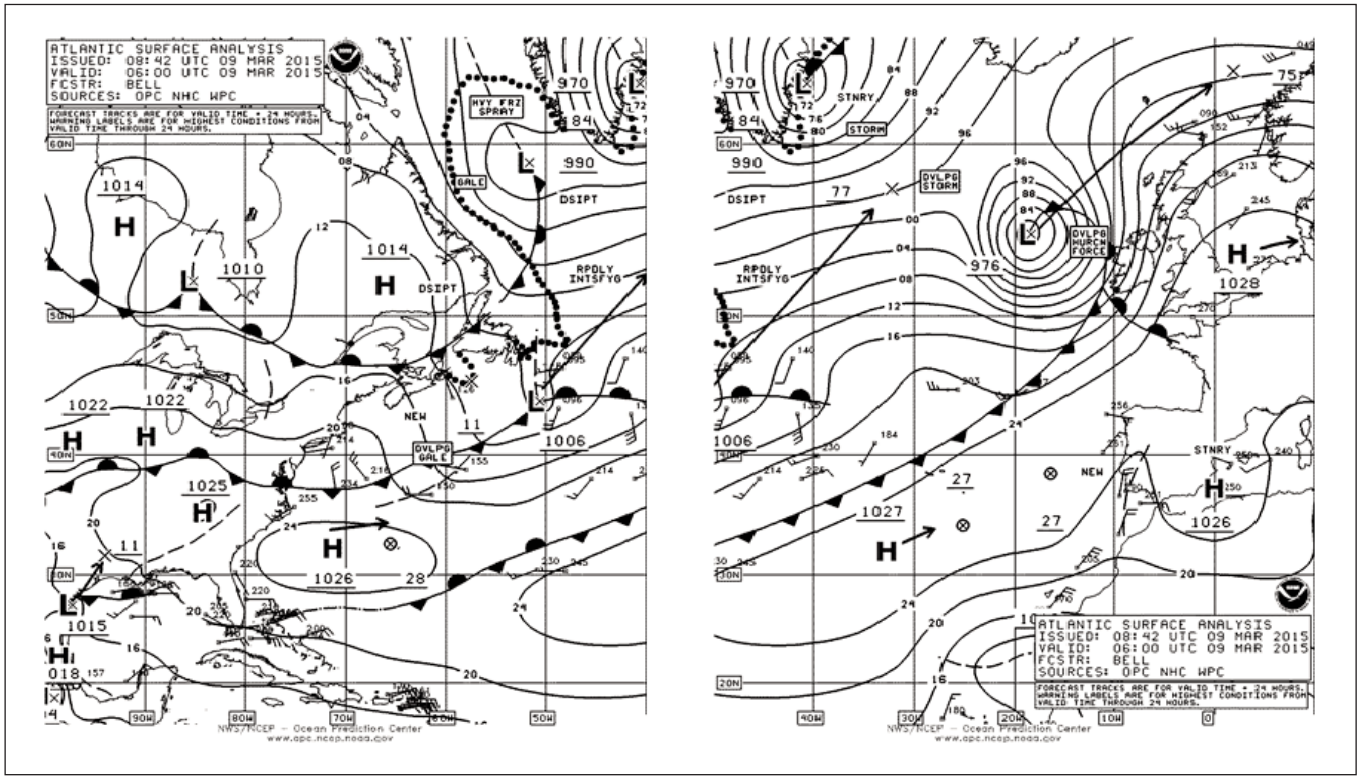

Figure 6. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid 0600 UTC March 9, 2015. The two parts have an overlap area from 40W to 50W.

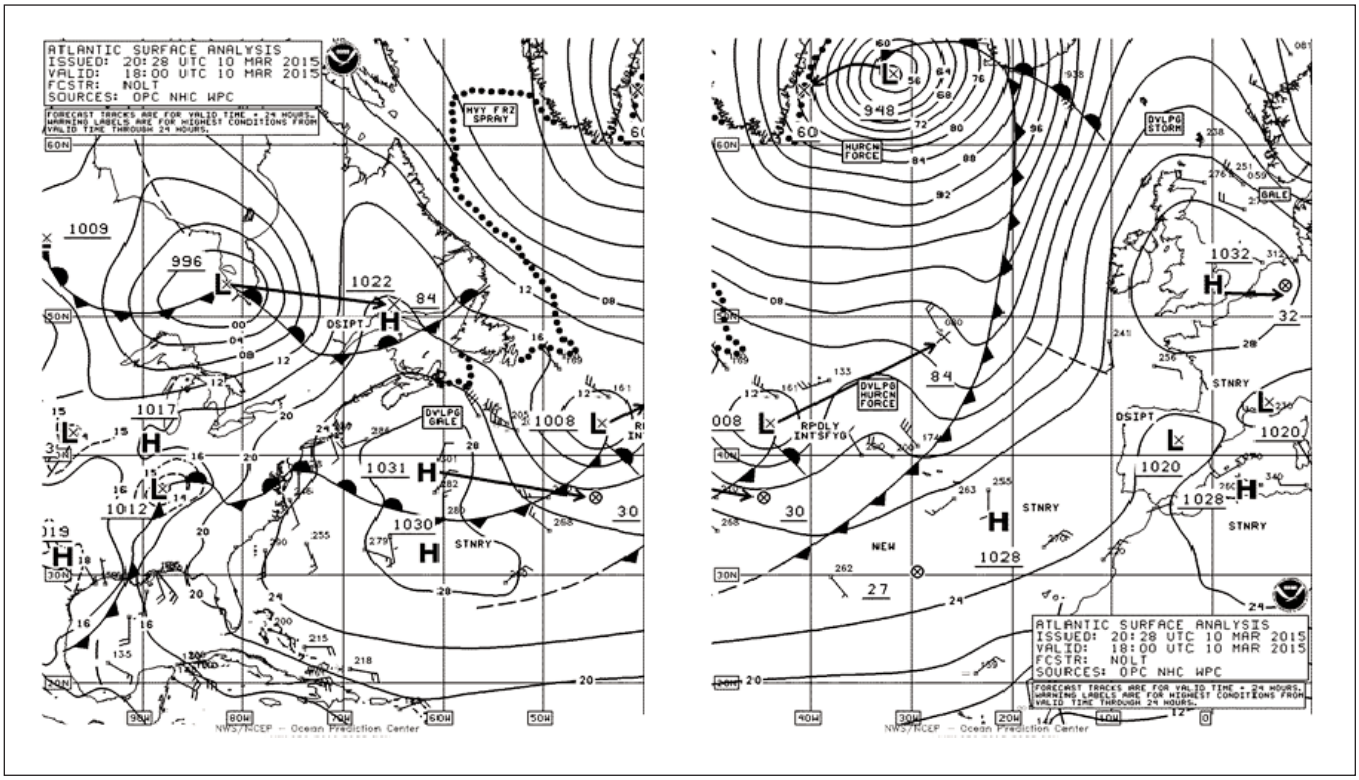

Figure 7. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid 1800 UTC March 10, 2015.

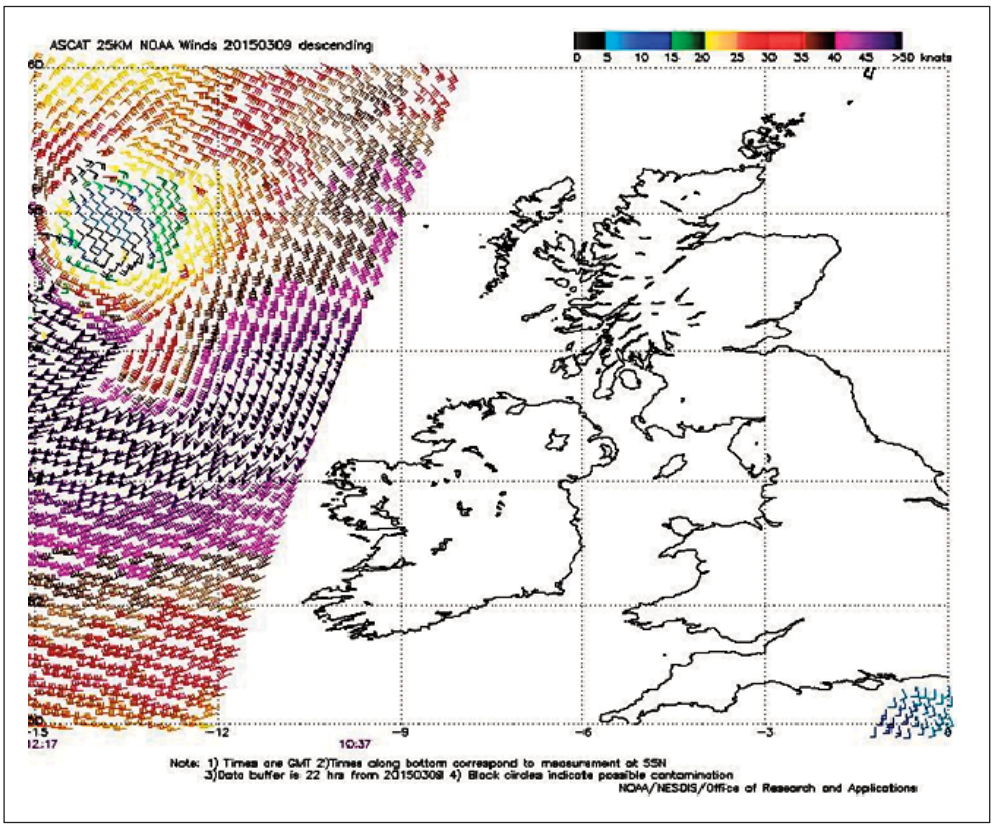

Figure 8. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the storm west of the British Isles shown in Figure 6. The valid times of the passes are 1037 and 1217 UTC March 9, 2015, or about four and one-half and six and one-quarter hours, respectively, later than the valid time of Figure 6. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

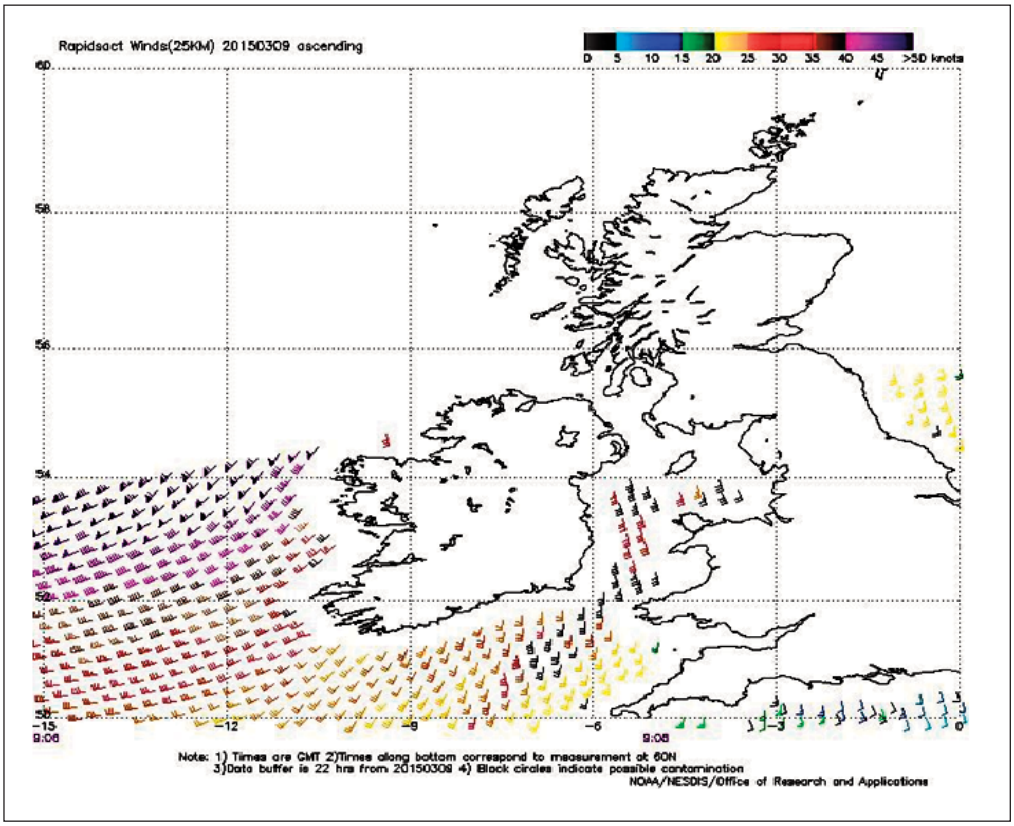

Figure 9. Rapidscat image of remotely-sensed winds from an instrument aboard the International Space Station with resolution of 25 km, for the same cyclone as shown in Figure 6.

The valid time of the image is 0906 UTC March 9, 2015, or about one and one-half to three hours prior to the valid times of the two ASCAT-A passes shown in Figure 8.

Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

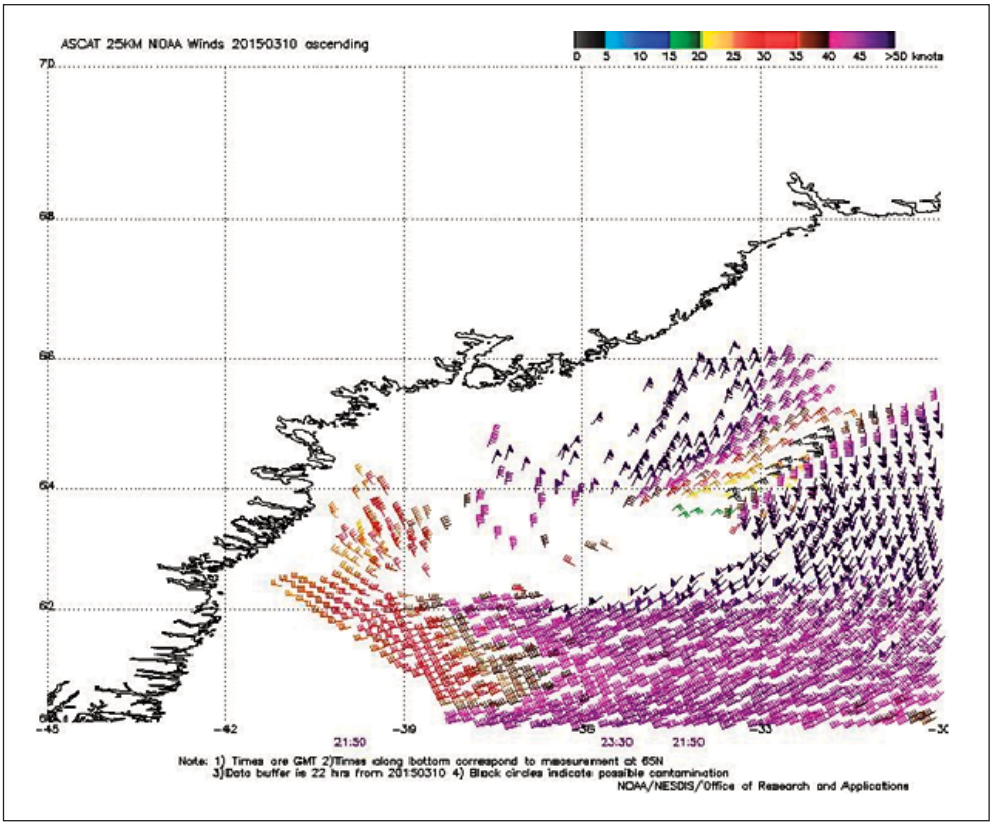

Figure 10. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the hurricane-force low off the east coast of Greenland shown in Figure 7.

Portions of two passes are shown (2150 UTC and 2330 UTC March 10, 2015), with valid times about four to five and one-half hours later than the valid time of Figure 7.

Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

By comparison **Figure 9** shows a Rapidscat pass within a few hours of the ASCAT image with winds to 70 kts on the edge of the pass. The **CL BELGIUM** (VRVQ9) near 45N 28W reported east winds of 76 kts and 7.0 m seas (23 ft) at 1600 UTC on the 8th, but the wind appeared to have a high bias of 12 kts. The platform **HEIMDAL** (LF4H) near 59.6N 2.2E reported south winds of 45 kts and 6.5 m seas (21 ft) at 2300 UTC on the 9th and highest seas 9.5 m (31 ft) eight hours later. The cyclone weakened rapidly in the Norwegian Sea the following night and passed inland over Norway on the 10th (**Figure 7**).

North Atlantic Storm, Greenland area, March 9-12:

Low pressure originating southeast of Newfoundland rapidly intensified over the northern waters and developed a lowest central pressure of 948 hPa east of Greenland by 1800 UTC on the 10th (**Figures 6** and **7**), making it the second deepest central pressure for a cyclone during the period. The central pressure fell 45 hPa in the 24 hour period ending at 1800 UTC on the 10th. The ASCAT-A image in **Figure 10** returned winds to 60 kts on the north and the southeast and east sides of the cyclone center. The cyclone then stalled and weakened near the east Greenland coast over the next two days before becoming absorbed late on the 12th.

North Atlantic Storm, March 10-13:

A weak low dropped southeast across the Canadian Atlantic provinces on March 9th and rapidly intensified after passing southeast of the island of Newfoundland on the 10th (**Figure 7**). Its central pressure dropped 28 hPa during the following 24 hour period and by 0000 UTC on the 12th developed hurricane-force winds with a center near 53N 23W. It was similar in intensity to the March 8-10th event in that area. **Figure 11** shows the cyclone approaching Iceland near maximum intensity. The ASCAT-B pass in **Figure 13** reveals winds of 50 to 65 kts in the southeast semicircle of the cyclone. The ship Arneborg (PHHD) near 45N 37W reported south winds of 55 kts and 7.9 m seas (26 ft). The cyclone then passed northeast of Iceland by the 13th.

North Atlantic Storm, March 11-14:

The next deep system to form in this very active month, like the March 9-12th event, developed a 948 hPa central pressure (**Figure 11**). It originated as the low moving across southern Canada two days prior (**Figure 7**). The center deepened rapidly after moving off the Labrador coast with the central pressure falling 38 hPa in the 24 hour period ending at 1800 UTC on the 12th. The **MSC ILONA** (DARU) near 43N 31W reported southwest winds of 50 kts and 7.9 m seas (26 ft) at 0000 UTC on the 13th. The platform **HIBERNIA** (46.7N 48.7W) reported south winds of 60 kts at 0300 UTC on the 12th, and 9 hours later a west wind of 55 kts and 6.5 m seas (21 ft). The cyclone then stalled and weakened near the east Greenland coast late on the 13th and through the night of the 14th.

North Atlantic Storm, March 12-14:

Another area of low pressure passed southeast from the Atlantic provinces of Canada and then turned northeastward after passing south of the island of Newfoundland (**Figure 11**). It developed hurricane force winds while passing over the north central waters by 0000 UTC on the 14th. An ASCAT-B pass from 2138 UTC on the 13th showed winds 50 to 60 kts on the southeast side of the center, somewhat similar to **Figure 13** for the March 10-13th event. **Figure 12** has the cyclone passing west of Iceland the following night. The central pressure dropped to as low as 957 hPa northwest of Iceland early on the 14th before the system moved inland over Greenland.

North Atlantic Storm, March 15-16:

In a final development in the series, two lows shown over the southern waters in Figure 12 merged late on the 14th to form a rapidly intensifying low over the central waters. The central pressure fell 30 hPa in the 24 hour period ending at 1800 UTC on the 15th, when the cyclone developed a central pressure of 970 hPa and briefly hurricane

force winds near 59N 30W before passing west of Iceland and weakening on the night of the 15th. A station (**TFSRT**, 63.3N 20.4W) on the coast of Iceland reported 9.0 m seas (30 ft) at 1200 UTC on the 16th.

Western North Atlantic Storm, March 21-24:

An area of low pressure moved northeast off the southeast coast of the U.S. and rapidly intensified after passing northeast of 38N 69W at 1200 UTC March 21. The central pressure fell 35 hPa in the 24 hour period ending at 1200 UTC on the 22nd as the cyclone developed a central pressure of 969 hPa and hurricane force winds (**Figure 14**).The Rapidscat image in Figure 15 returned the highest winds on the east side with up to 65 kts. The platform **CFL24** (43.8N 60.6W) reported west winds of 50 kts and 6.0 m seas (20 ft) at 2000 UTC on the 22nd. Buoy 44139 (44.2N 57.1W) reported southwest winds of 37 kts with gusts to 49 kts and 7.5 m seas (25 ft) at 2300 UTC on the 22nd and highest seas 8.5 m (28 ft) one hour later. After weakening over land on the night of the 22nd the cyclone briefly developed hurricane force winds again in the Labrador Sea the next day before stalling and weakening near the east Greenland coast on the 24th.

North Atlantic Storm, April 1-3:

A developing low originating well south of Newfoundland late on March 29th moved northeast and gradually intensified over the next three days, briefly developing hurricane force winds while approaching Greenland with a 987 hPa center late on April 1st before weakening as it passed between Greenland and Iceland on April 2nd and 3rd.

Western North Atlantic Storm, April 4-7:

Low pressure intensified as it moved northeast off the southern New England coast over the next 36 hours as depicted in **Figure 16**. The central pressure fell 25 hPa in the 24 hour period ending at 0000 UTC on the 5th, with the cyclone at maximum intensity in the second part of **Figure 16**. The platform **CFL24** (43.8N 60.6W) reported northwest winds of 50 kts and 4.9 m seas (16 ft) at 0400 UTC on the 5th. The buoy 44255 (47.3N 57.3W) reported west winds of 40 kts with gusts to 51 kts and 4.9 m seas (16 ft) at 0900 UTC on the 5th **HIBERNIA** (VEP717, 46.7N 48.7W) encountered west winds of 55 kts and 4.6 m seas (15ft) at 1500 UTC on the 5th and 5.8 m seas (19 ft) six hours later. Hurricane force winds on the night of the 5th weakened over the following two days as the system passed between Greenland and Iceland.

North Atlantic Storm, April 15-18:

Low pressure moving off the Mid-Atlantic Coast of the U.S. intensified rapidly as shown in **Figure 17.** The central pressure dropped 43 hPa in the 24 hour period ending at 1200 UTC April 16th, quite impressive for such low latitude. The lowest central pressure was 962 hPa 12 hours later. The Rapidscat image in **Figure 18** returned winds up to 70 kts west of the center and 65 kts to the south. Areas free of wind barbs are likely due to sea ice. The **HIBERNIA** platform (VEP717, 46.7N 48.7W) reported north winds of 80 kts at a height of 139 m at 0000 UTC on the 17th, and **TERRA NOVA FPSO** (VCXF, 46.4N 48.4W) encountered north winds of 70 kts at a height of 53 m three hours prior. The **BREMEN EXPRESS** (DGZL, 41N 57W) reported northwest winds of 50 kts and 7.3 m seas (24 ft) at 1800 UTC on the 16th. The system then tracked east northeast with a weakening trend on the 17th before turning north and weakening to a gale near Greenland late on the 18th.

North Atlantic Storm, April 19-22:

The development of another hurricane force low that reached maximum intensity in about the same place as its predecessor is depicted in **Figure 19**. Initial development was as a frontal wave that moved southeast from New England late on April 18th then tracked east near 40N before turning northeast and rapidly intensifying. The central pressure fell 33 hPa in the 24 hour period ending at 1200 UTC on the 20th and a lowest pressure of 972 hPa occurred six hours later. A Rapidscat image from 2205 UTC on the 20th was similar to **Figure 18** for the

previous event. The **ATLANTIC COMPANION** (SKPE) near 46N 38W reported southeast winds of 62 kts at 1200 UTC on the 20th. **HIBERNIA** (VEP717, 46.7N 48.7W) reported northeast winds of 66 kts at 0000 UTC on the 21st, and 7.0 m seas (23 ft) six hours later. The cyclone subsequently tracked over the central waters with a weakening trend, stalled and then moved southeast and inland over Spain.

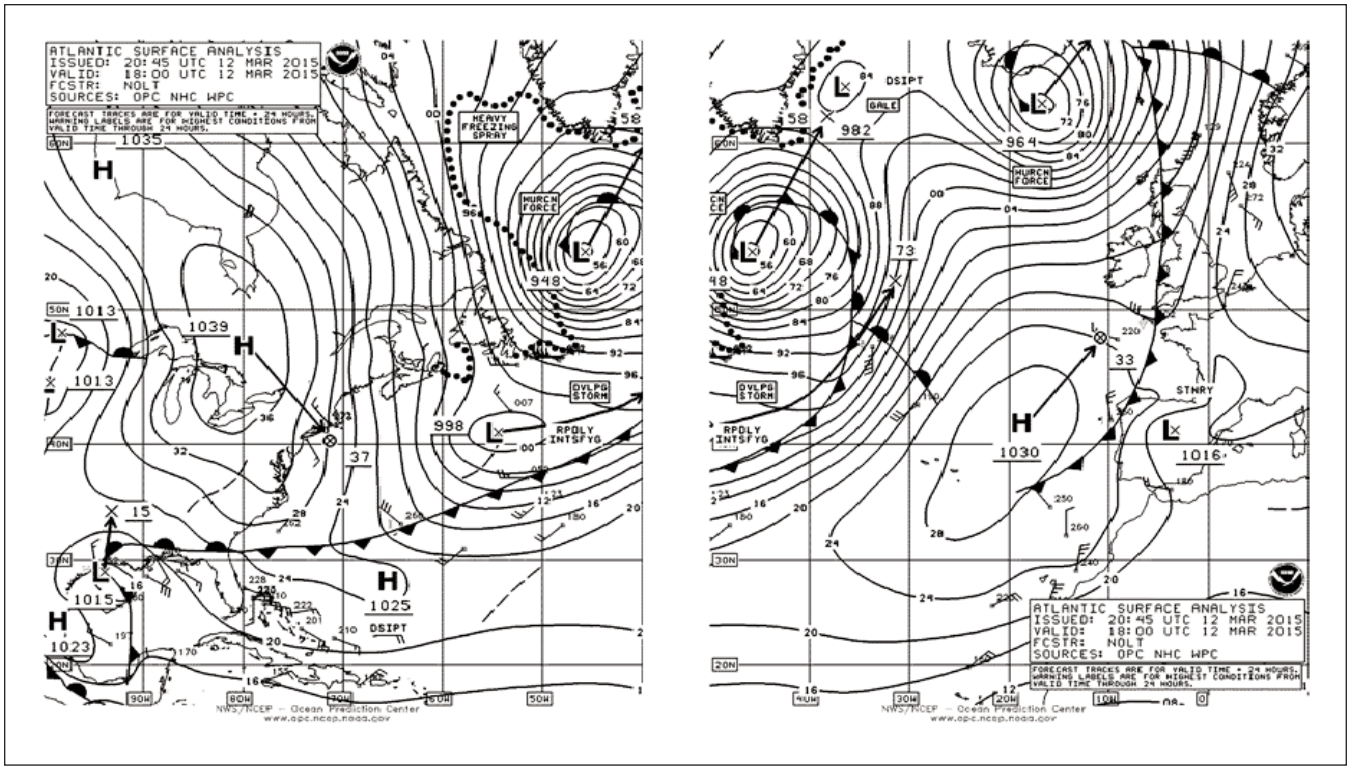

Figure 11. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid 1800 UTC March 12, 2015.

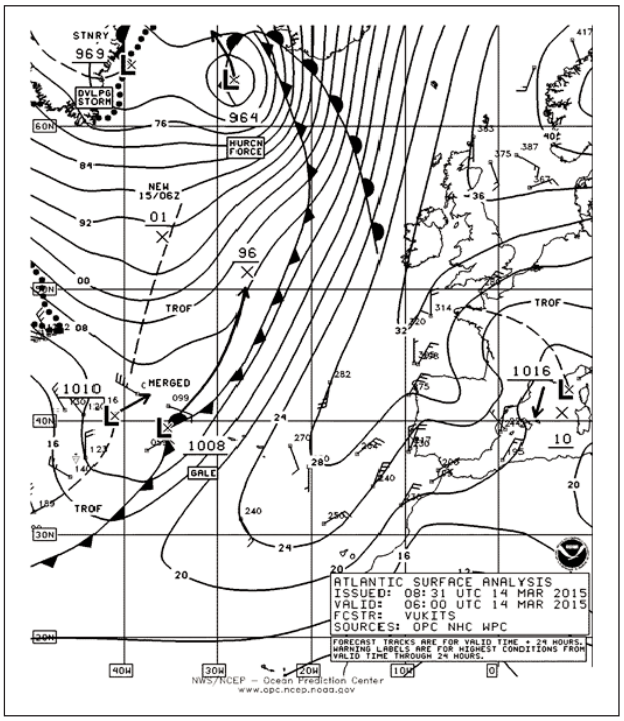

Figure 12. OPC North Atlantic Surface Analysis chart (Part 1) valid 0600 UTC March 14, 2015.

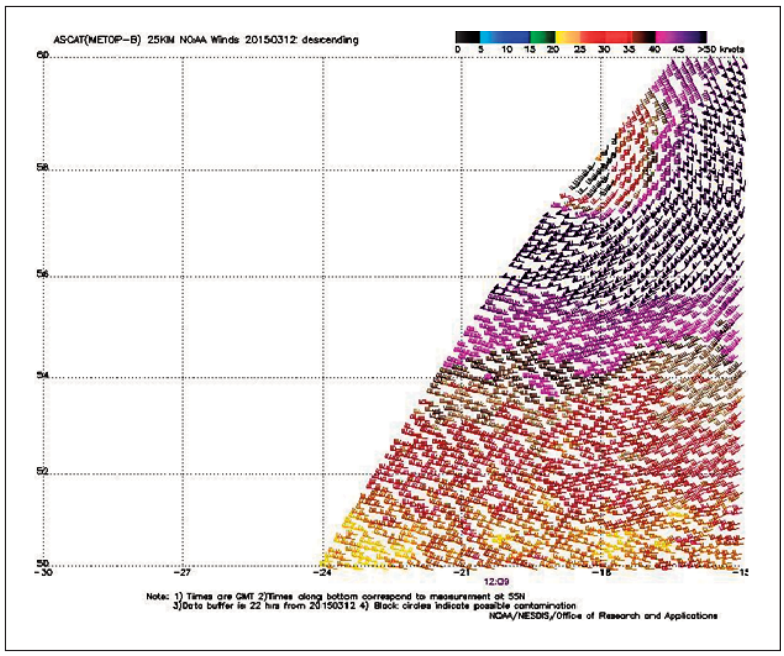

Figure 13. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the southeast semi-circle of the hurricane-force low south of Iceland shown in Figure 11. The valid time of the pass is 1209 UTC March 12, 2015, or about six hours prior to the valid time of Figure 11.

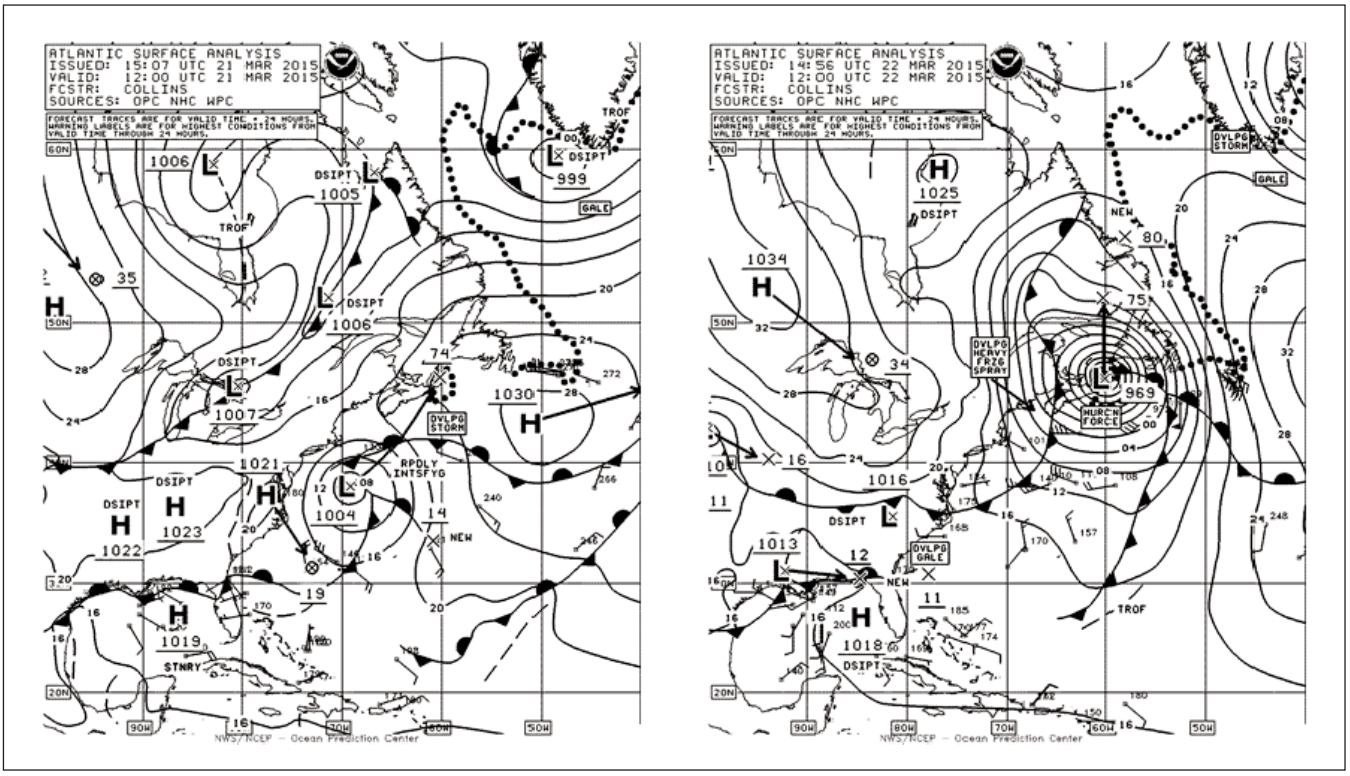

Figure 14. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC March 21 and 22, 2015.

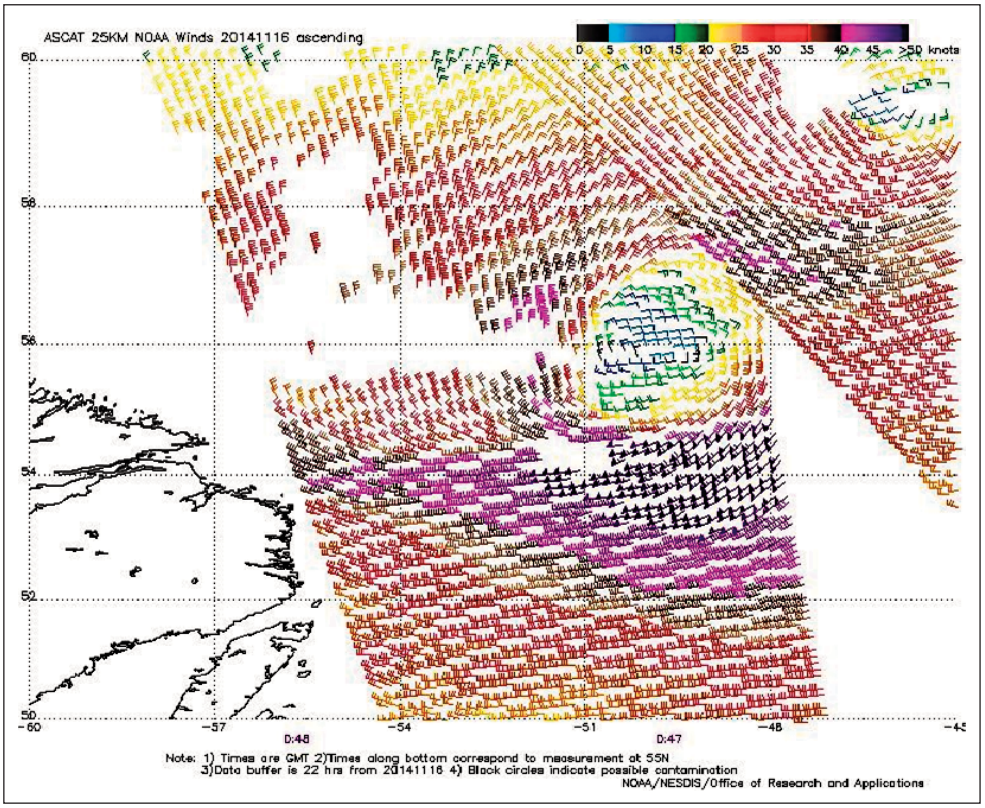

Figure 15. Rapidscat image of remotely-sensed winds from an instrument aboard the International Space Station with resolution of 25 km, showing winds around the east side of the cyclone shown in the second part of Figure 14. The valid time of the pass is 0530 UTC March 22, 2015, or about six and one-half hours prior to the valid time of the second part of Figure 14. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

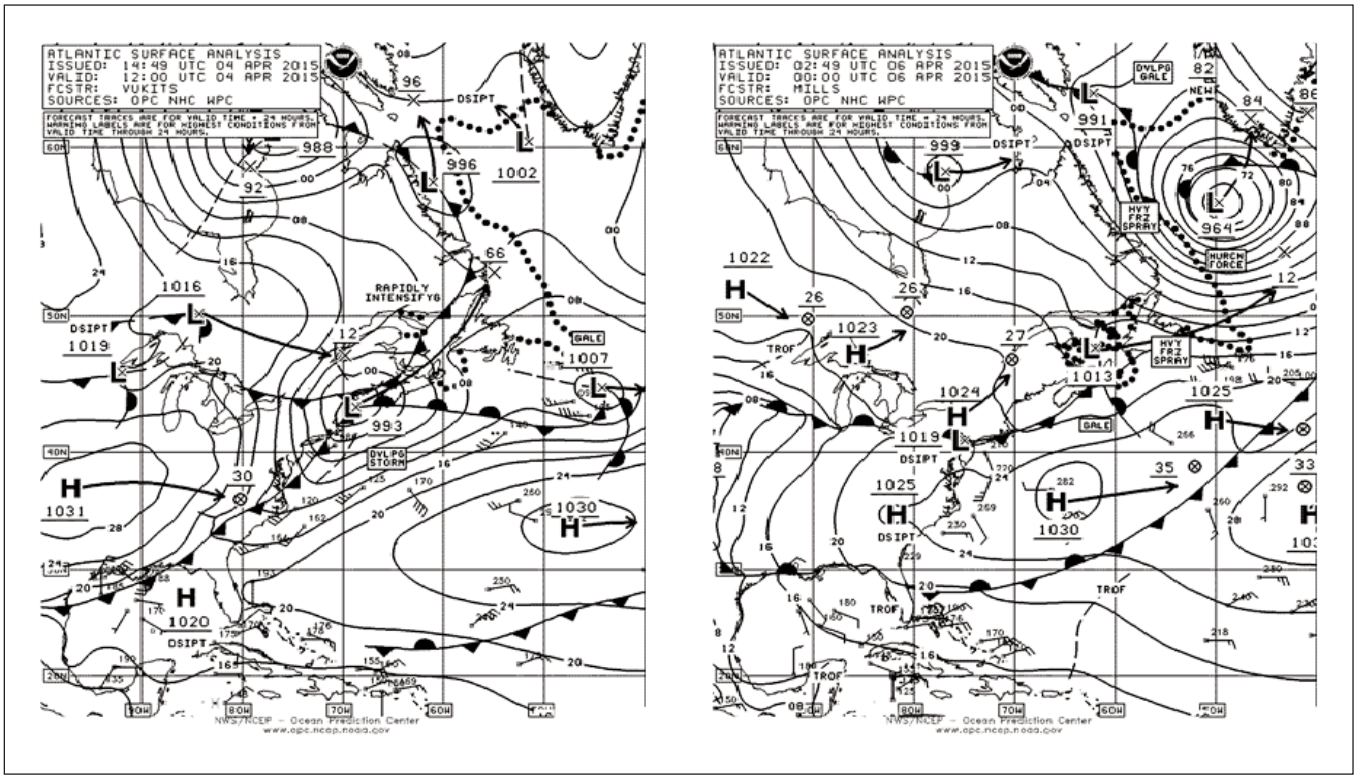

Figure 16. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC April 4 and 0000 UTC April 6, 2015

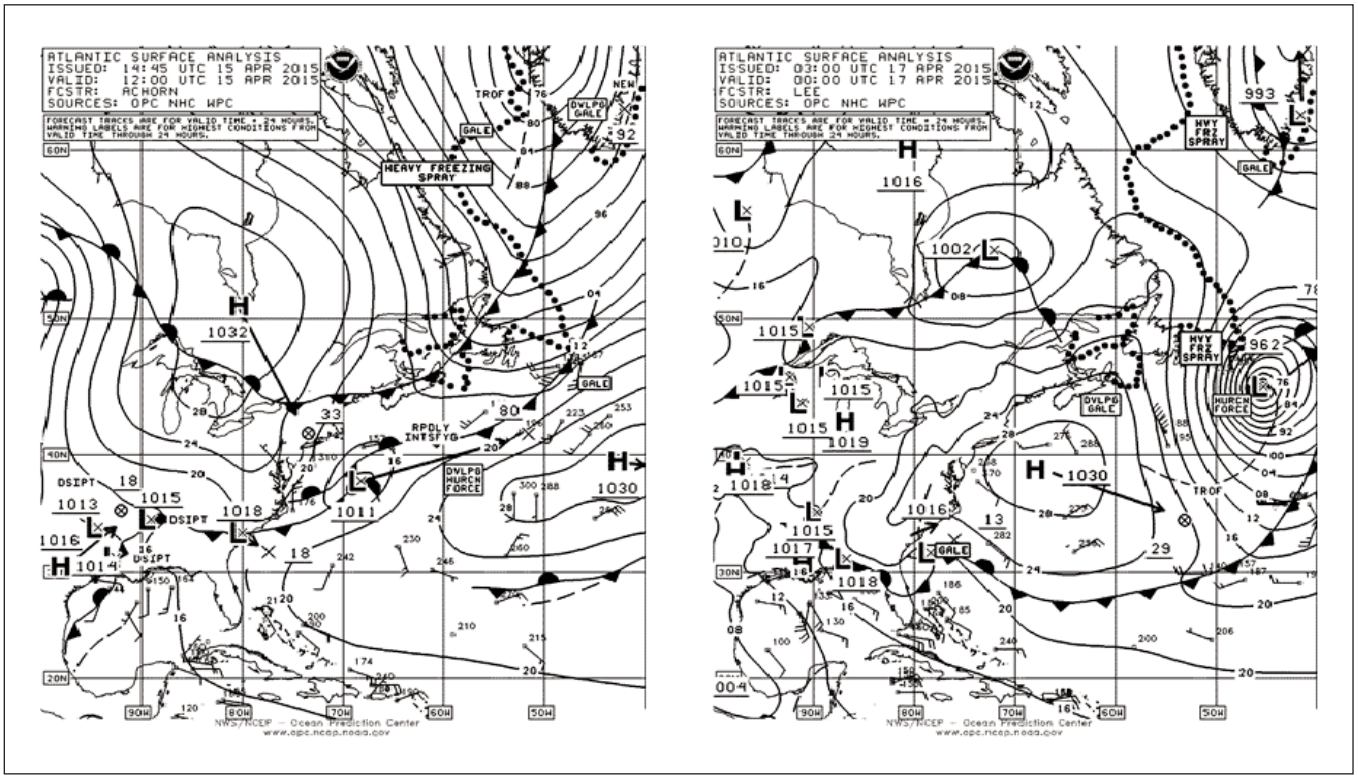

Figure 17. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC April 15 and 0000 UTC April 17, 2015.

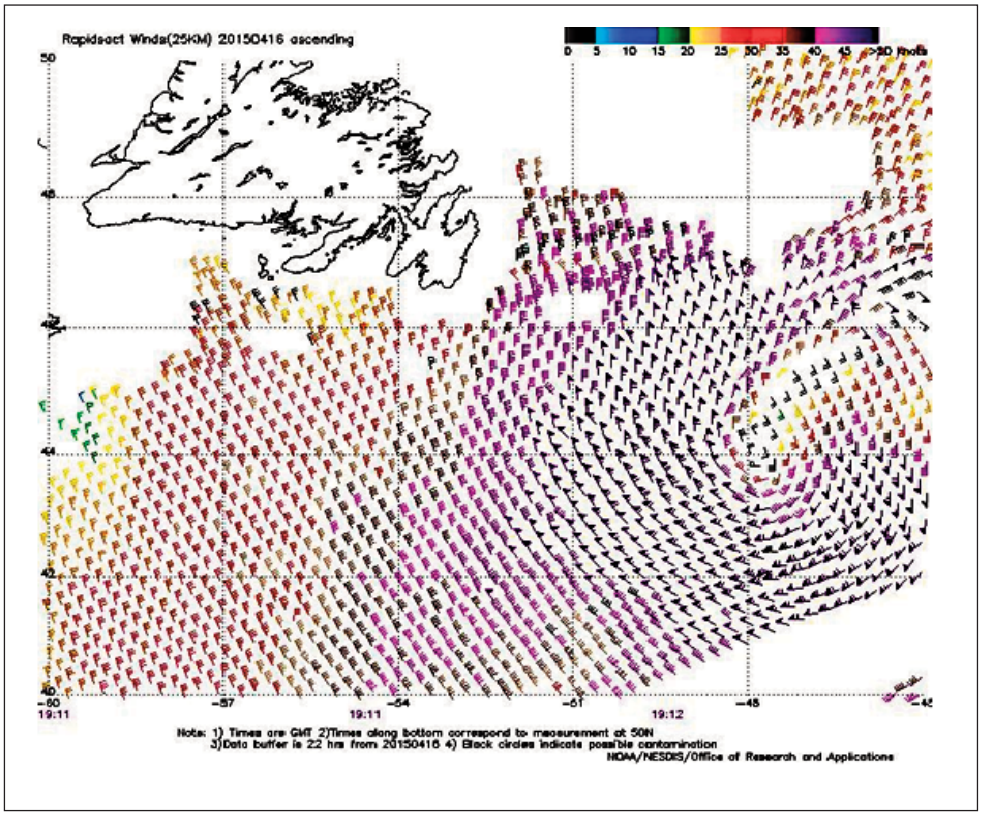

Figure 18. Rapidscat image of remotely-sensed winds from an instrument aboard the International Space Station with resolution of 25 km, showing winds around the cyclone shown in the second part of Figure 17. The valid time of the pass is 1912 UTC April 16, 2015, or about five hours prior to the valid time of the second part of Figure 17. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

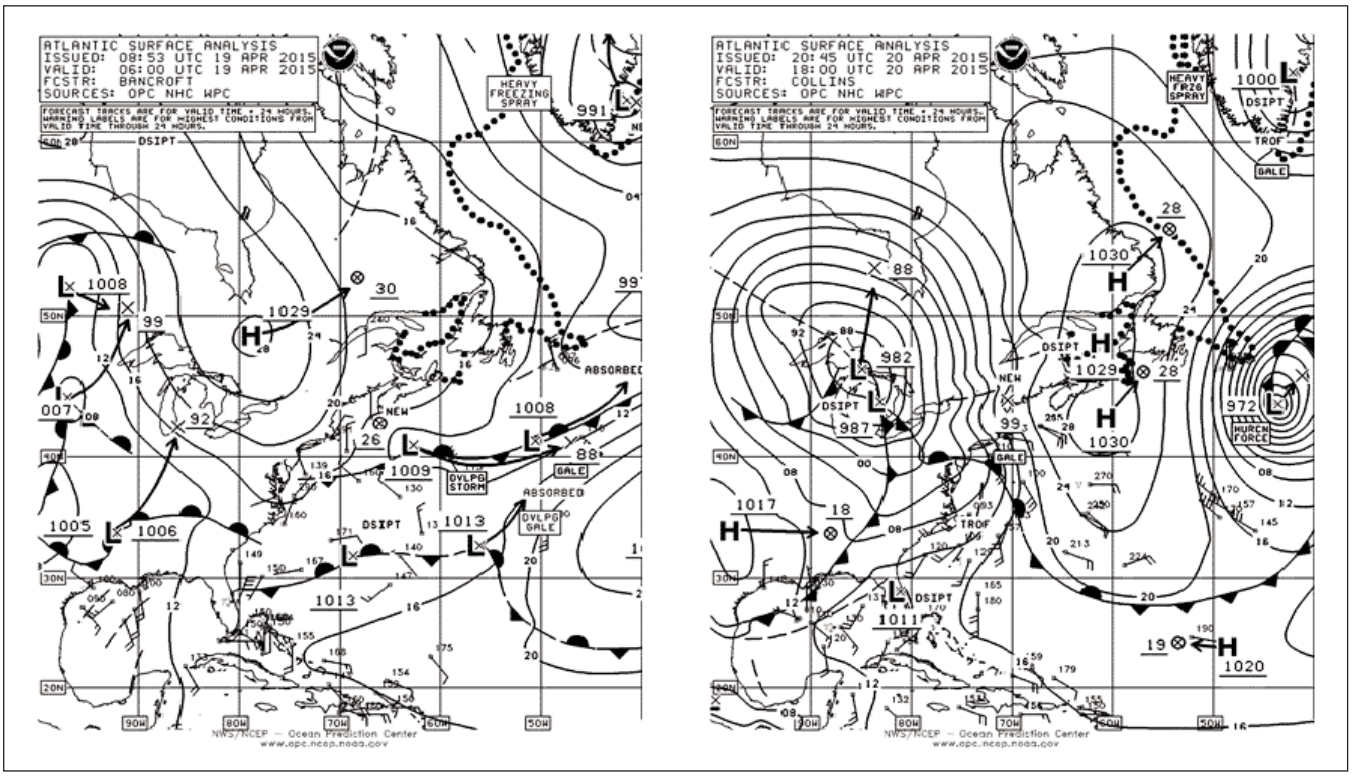

Figure 19. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC April 19 and 1800 UTC April 20, 2015

North Atlantic Storms, May 11-16:

Figures 20 and 21 depict an active pattern over the northern and eastern waters in mid-May. The storm southeast of Greenland formed as a new low early on the 11th in association with a primary low in the Davis Strait. Meanwhile a secondary storm center formed on its front and moved toward Europe. The Rapidscat pass from 0658 UTC on the 14th (Figure 22) depicts the stronger winds of up to 55 kts south of the secondary storm center. At 1800 UTC on the 13th the **HONOR** (WDC925) reported west winds of 45 kts near 50N 19W. Buoy 62029 (48.7N 12.4W) reported west winds of 40 kts with gusts to 50 kts and 8.5 m seas (28 ft) at 0600 UTC on the 14th and highest seas 9.8 m one hour later. Meanwhile the cyclone heading toward Iceland in the second part of Figure 20 came from the Canadian Maritime Provinces late on the 12th and in Figure 21 appears as the storm near Iceland which developed a lowest central pressure of 970 hPa at 1200 UTC on the 15th, making it the most intense cyclone of the May to August period in terms of central pressure. ASCAT-A winds with this cyclone appear in Figure 23, with up to 55 kts south of the center. The storm approaching Europe is dissipated inland in Figure 21 or reformed in the Mediterranean.

North Atlantic Storms, May 29-31:

The storm with a 976 hPa center (Figure 24) originated as a developing low moving off the north Labrador coast two days prior. An ASCAT-A image from 2232 UTC on the 30th revealed winds up to 50 kts both south of the center and north of the front near the Greenland coast. Figure 24 also depicts a secondary storm center forming on the front while the primary low weakens. Figure 25 is an ASCAT-A image of the secondary cyclone with winds to 45 kts detected south of the center. Both of these systems became absorbed by new development coming off the Labrador coast, described below.

North Atlantic Storms, May 31-June 2:

A complex system moved off the southern Labrador coast along 52N early on the 31st consisting of a primary and a secondary low (Figure 24, second part). Figure 26 shows the primary low becoming a storm in the first part and the secondary low intensifying near the British Isles, with both attaining their lowest central pressures in the second part, 12 hours later. The ASCAT imagery in Figure 27 shows winds of 45 kts with the primary system with even a few 50 kts retrievals. The **SHIP** (BATFR03) (50.4N 1W) reported southwest winds of 50 kts south of the secondary storm at 0000 UTC June 2nd. The **TYCO RESPONDER** (V7CY9) at that time reported west winds of 40 kts and 11.9 m seas (39 ft), with the author uncertain of the accuracy of the reported seas. Both cyclones weakened thereafter.

North Atlantic Storm, June 14-16:

An area of low pressure moved off the New England coast early on June 13th and moved northeast, becoming a gale 12 hours later near Newfoundland and a storm force low over the central waters at 0600 UTC on the 15th with an unusually deep 976 hPa center (Figure 28). An ASCAT-B image from 1244 UTC June 15th (Figure 29) shows a swath of stronger northerly winds to 50 kts to the west and northwest of the cyclone center.

The **TYCO RESPONDER** (V7CY9) encountered southeast winds of 45 kts near 50N 35W at 1200 UTC on the 15th. The cyclone subsequently drifted into the east Greenland waters and weakened during the following two days.

North Atlantic Storm, June 27-29:

This cyclone was one of two summer hurricane force events in 2015, which are rare. It originated as a low pressure wave near the Mid-Atlantic Coast of the U.S. early on June 26th and moved east northeast and rapidly intensified after 0000 UTC on the 28th. The central pressure dropped 14 hPa in only 12 hours after 0600 UTC on the 28th and the lowest central pressure was 982 hPa 46N 34W (Figure 30). With no ships nearby reporting more than 40 kts, an ASCAT-B pass revealed winds to 60 kts (Figure 31), which would support a hurricane force label. A slow weakening trend followed, with winds diminishing to gale force the

next day and then sub-gale as the system stalled over the north central waters by July 2nd.

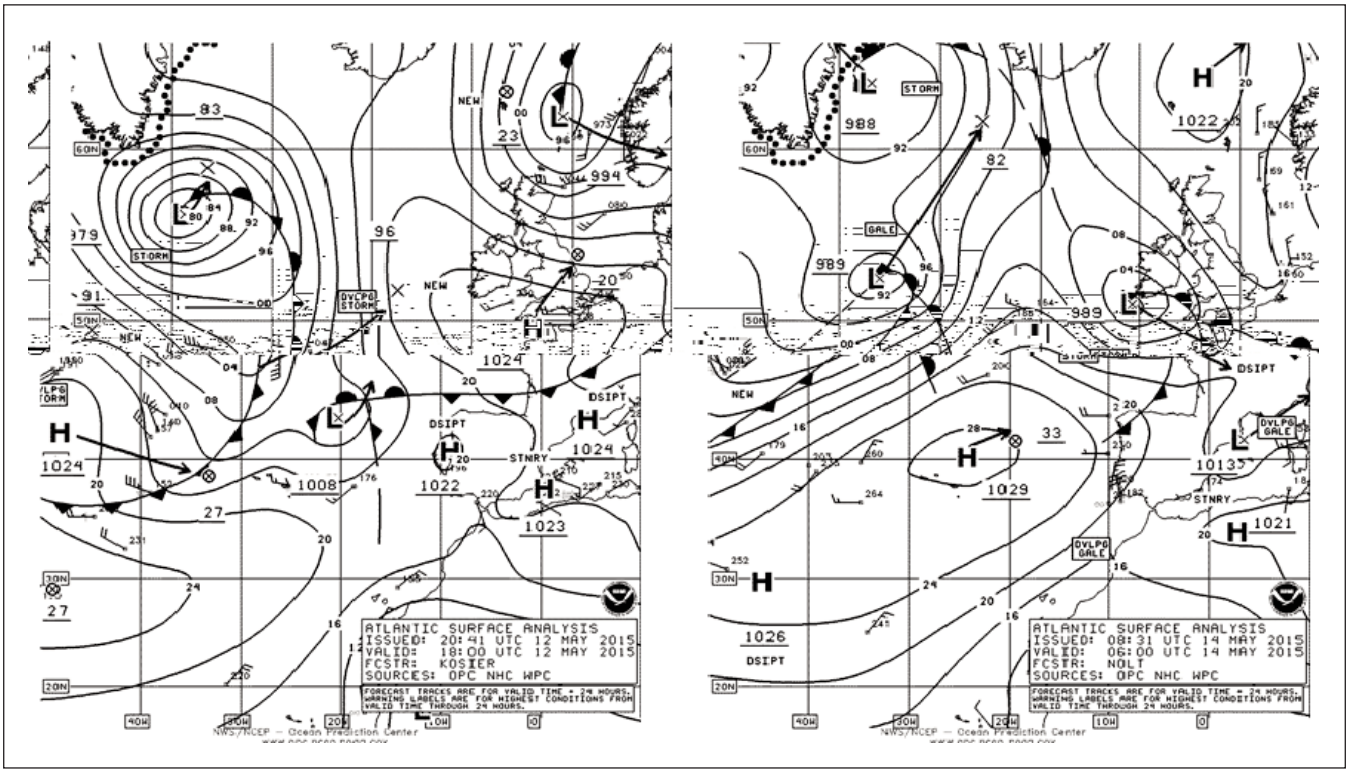

Figure 20. OPC North Atlantic Surface Analysis charts (Part 1) valid 1800 UTC May 12 and 0600 UTC May 14, 2015.

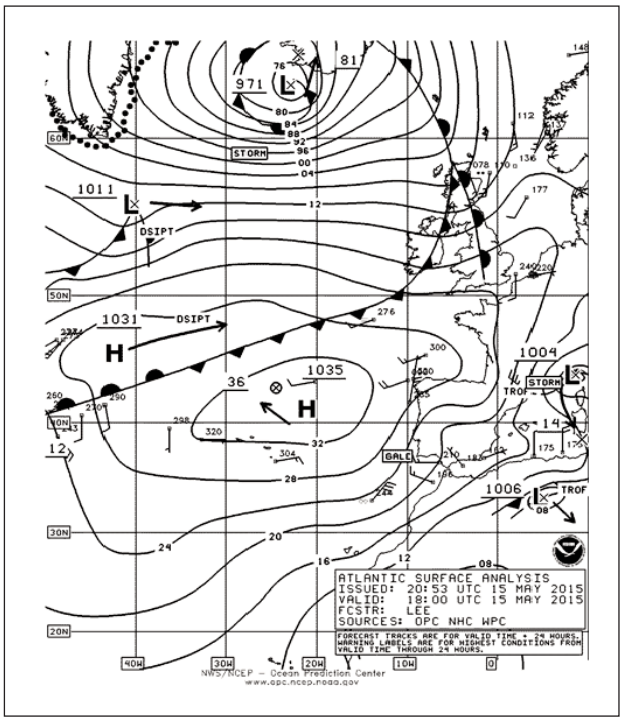

Figure 21. OPC North Atlantic Surface Analysis chart (Part 1) valid 1800 UTC May 15, 2015.

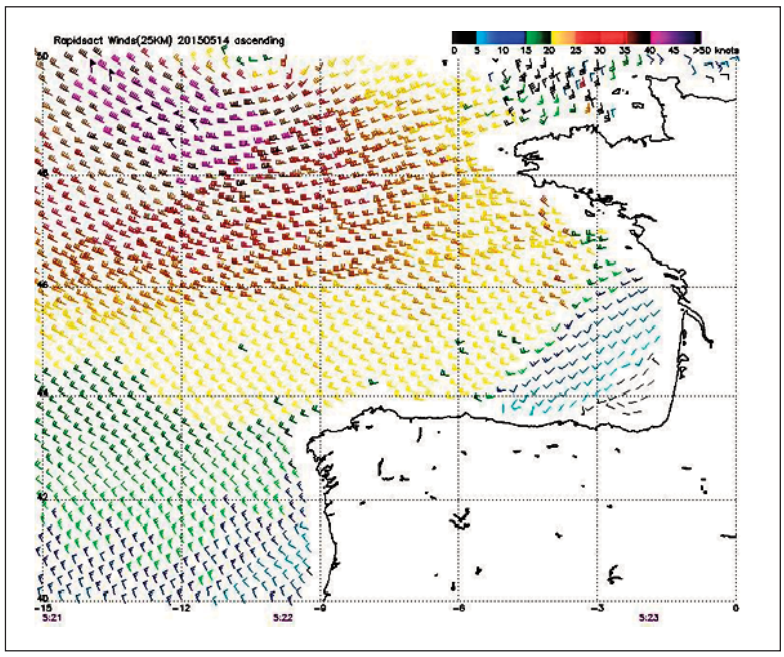

Figure 22. Rapidscat image of remotely-sensed winds from an instrument aboard the International Space Station with resolution of 25 km, showing winds around the south side of the cyclone shown in the second part of Figure 20. The valid time of the pass is 0658 UTC April 14, 2015, or about one hour later than the valid time of the second part of Figure 20. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

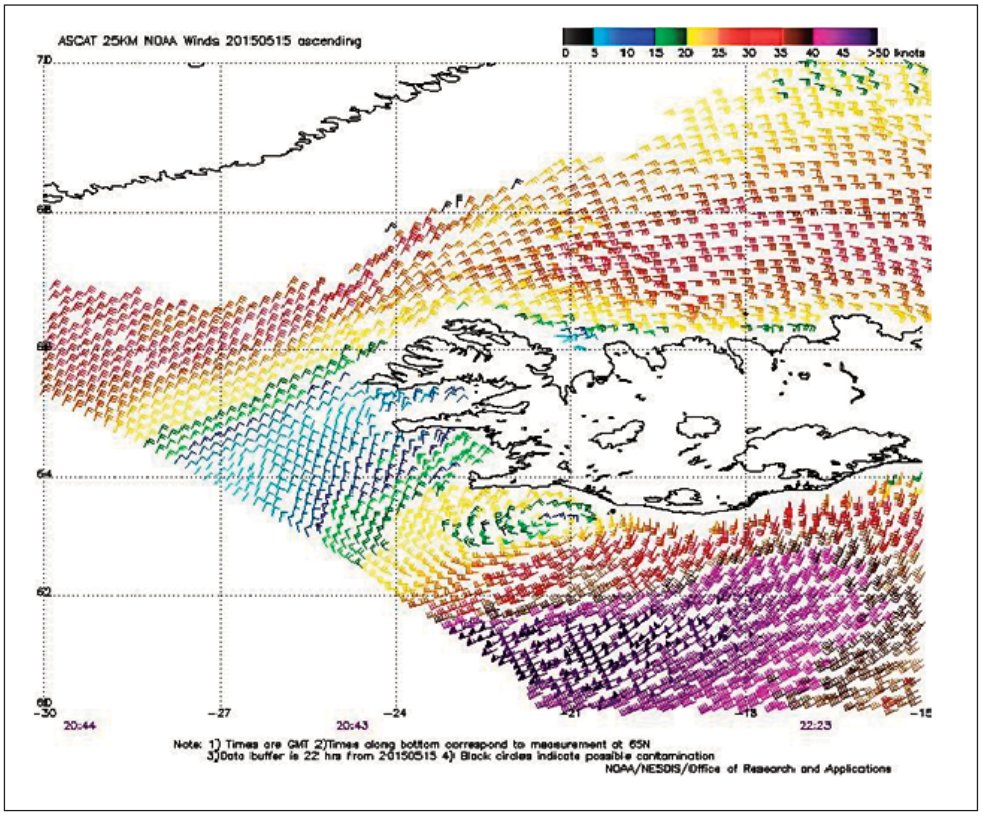

Figure 23. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the storm near Iceland shown in Figure 21. The valid time of the pass containing the strongest winds is 2223 UTC May 15, 2015, or about four and one-half hours later than the valid time of Figure 21. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

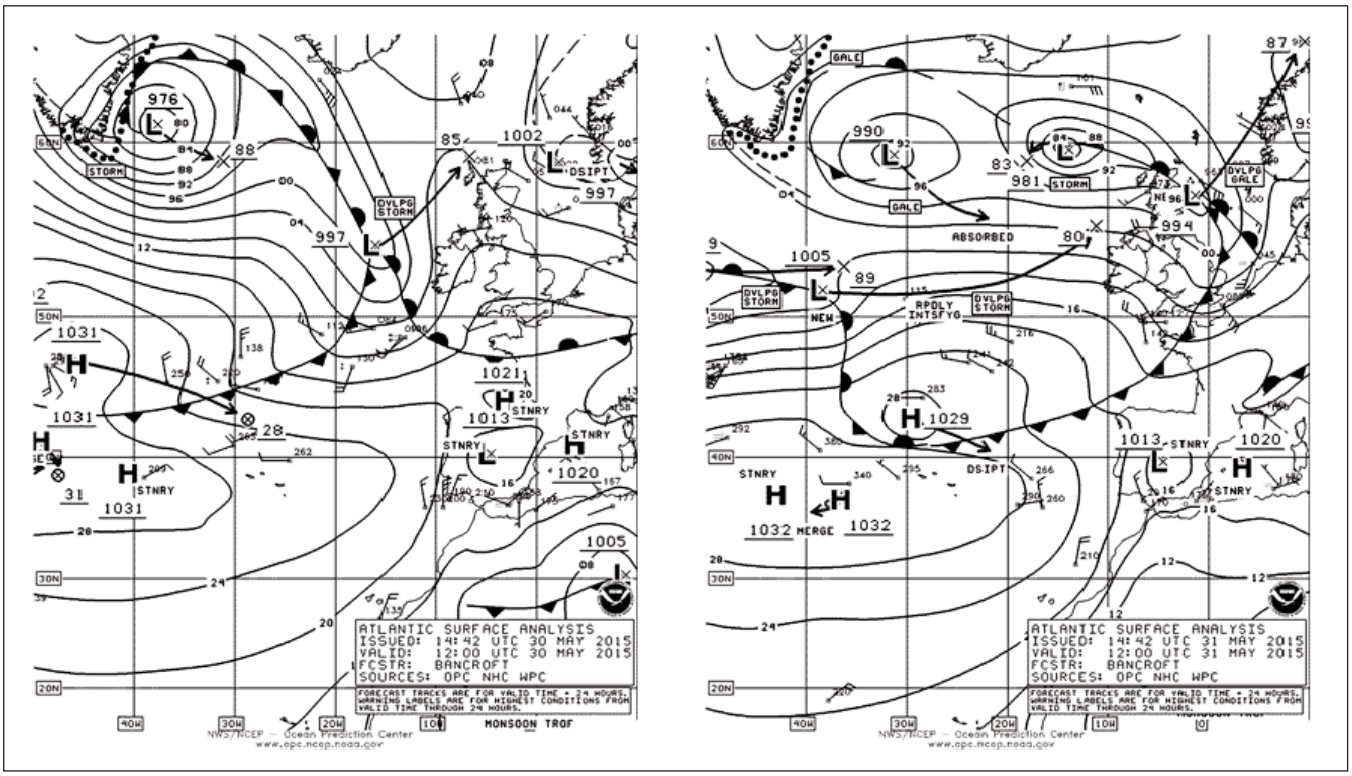

Figure 24. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC May 30 and 31, 2015.

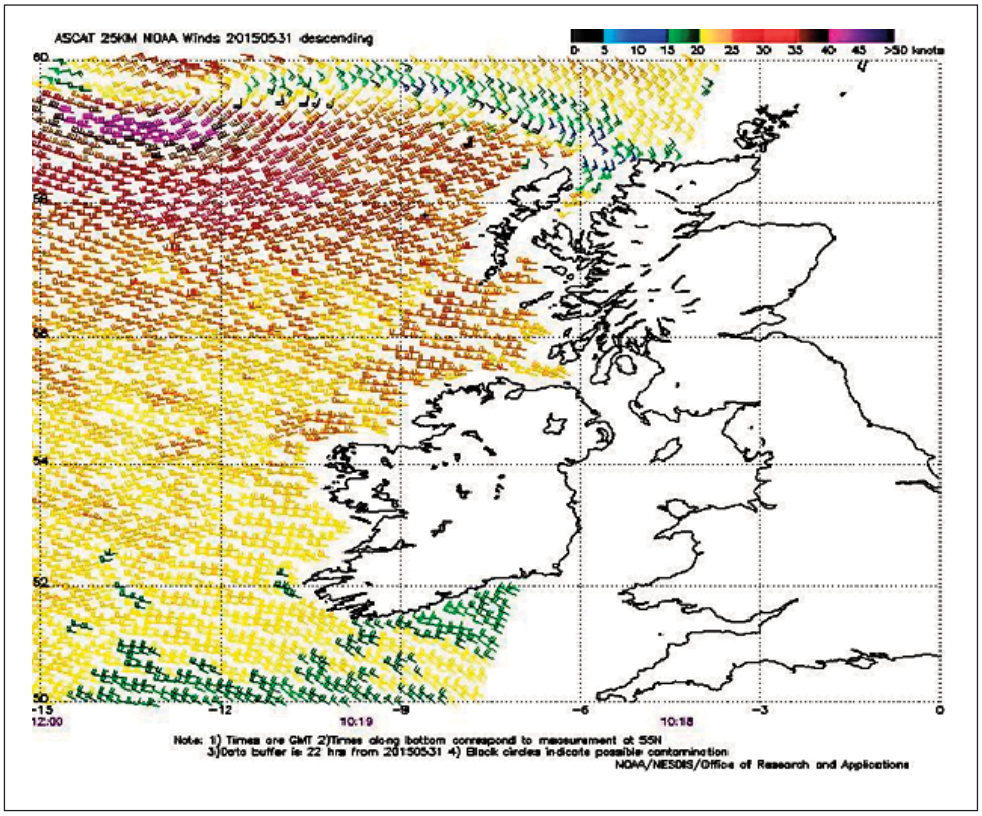

Figure 25. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the storm centered northwest of Scotland shown in the second part of Figure 24. The valid times of the passes are 1019 UTC and 1200 UTC May 31, 2015, or less than two hours prior to the valid time of the second part of Figure 24. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

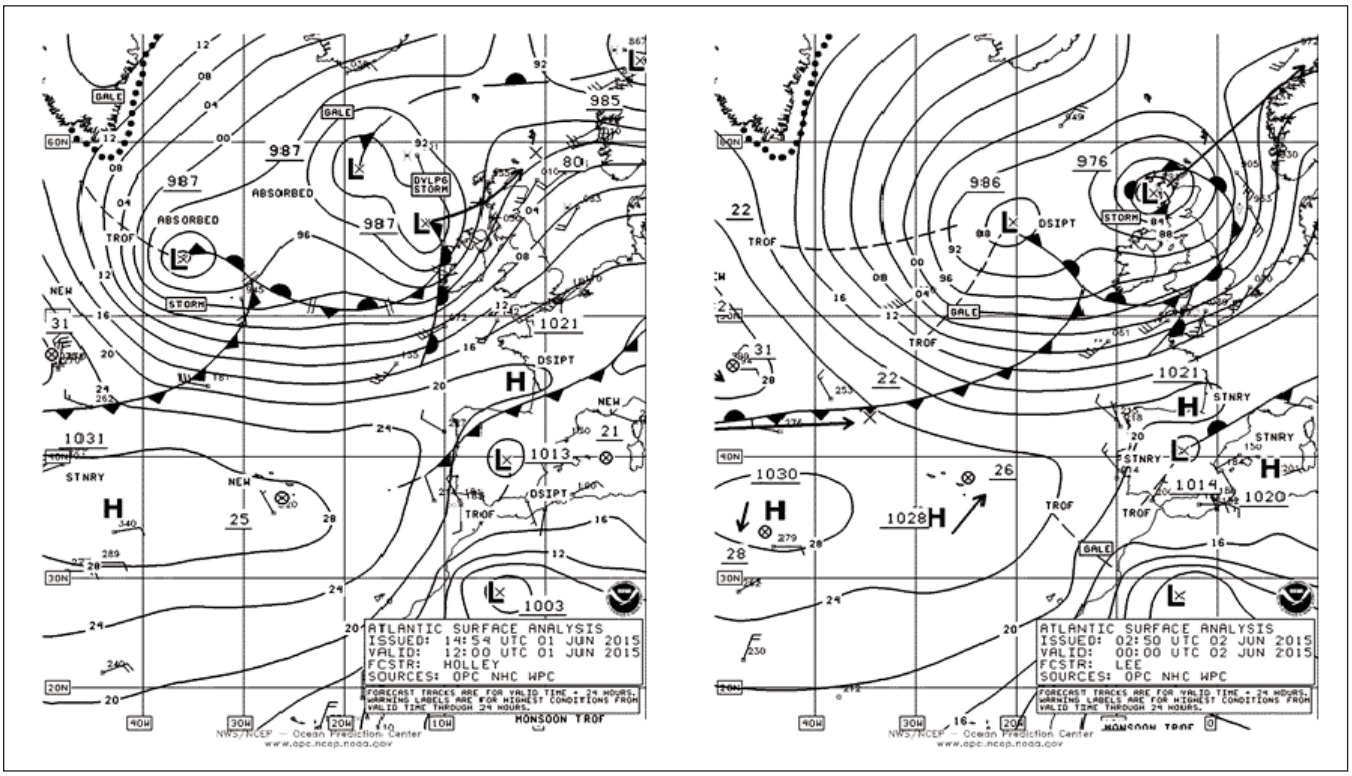

Figure 26. OPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC June 1 and 0000 UTC June 2, 2015.

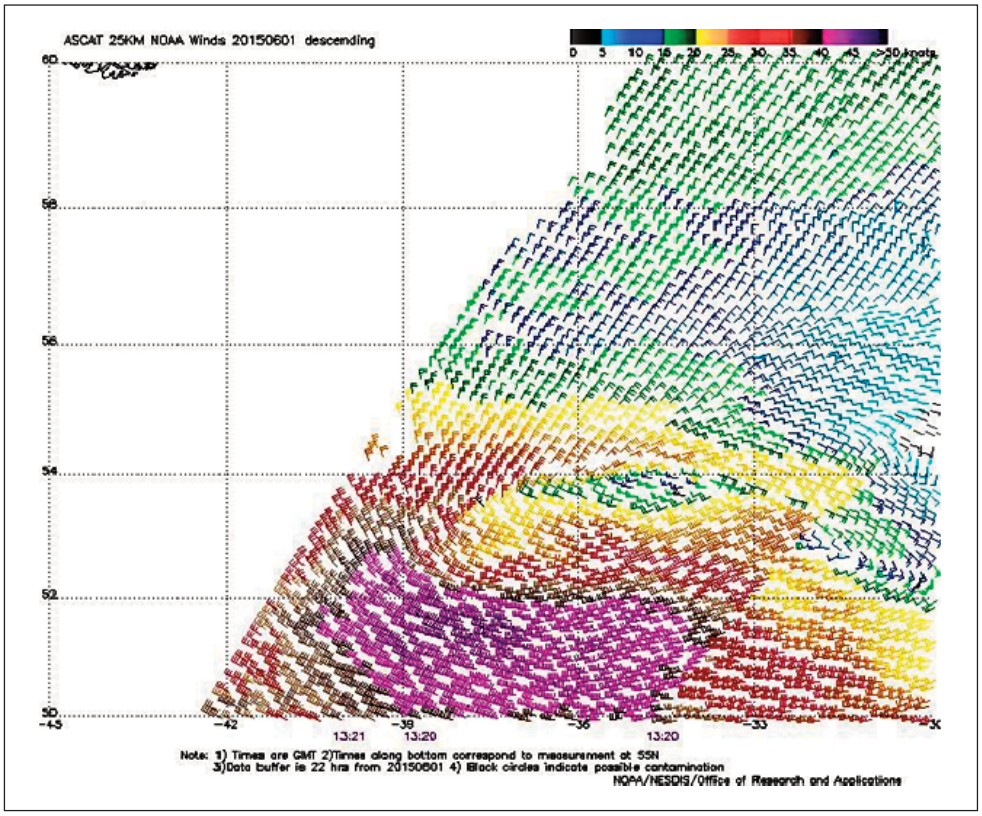

Figure 27. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the storm shown in the first part of Figure 26. The valid time of the pass is 1320 UTC June 1, 2015, or about one and one-quarter hours later than the valid time of the first part of Figure 26. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

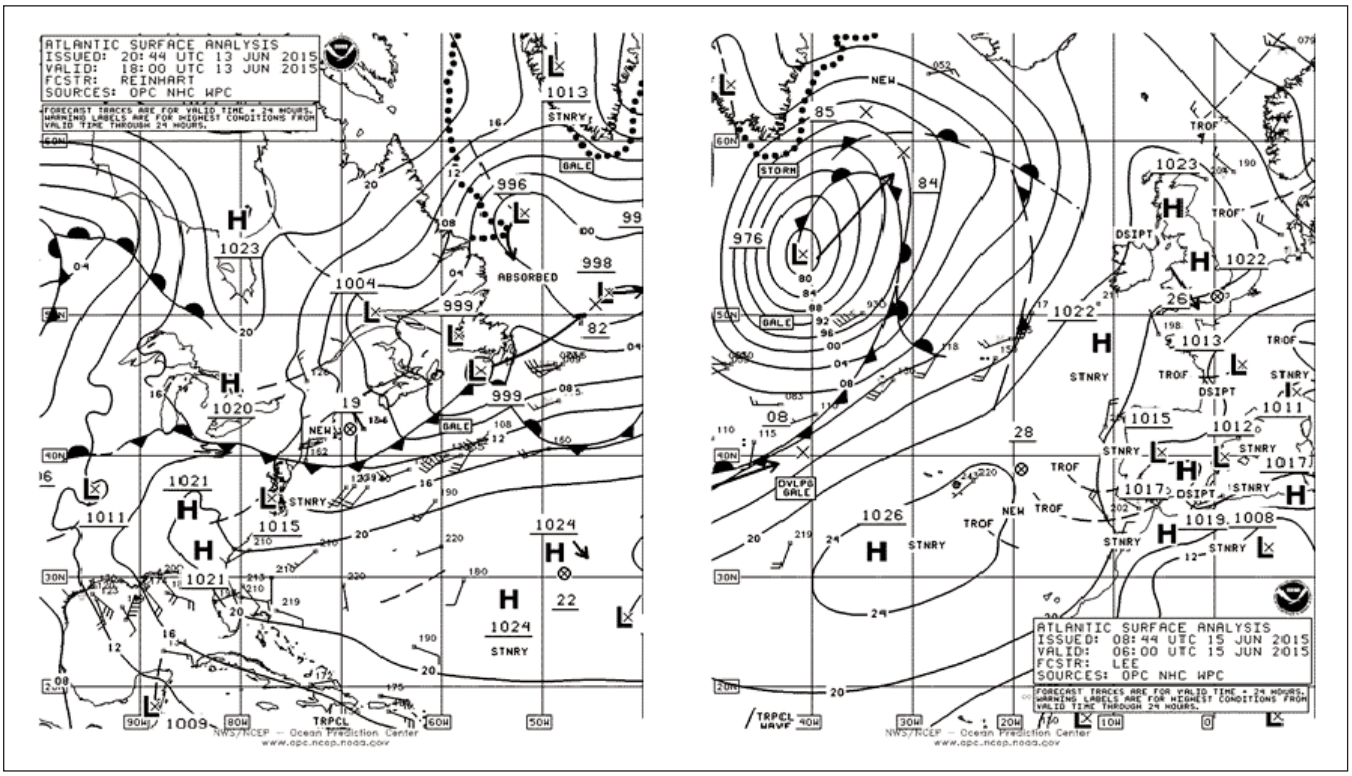

Figure 28. OPC North Atlantic Surface Analysis charts valid 1800 UTC June 13 (Part 2) and 0600 UTC June 15, 2015 (Part 1).

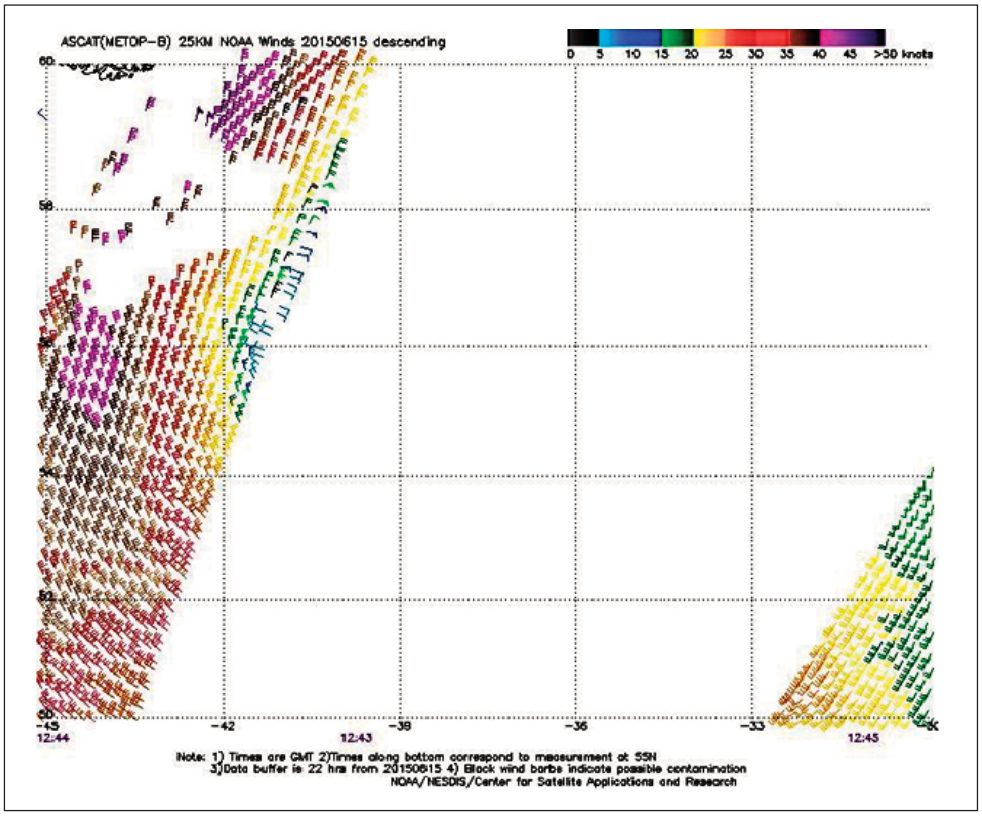

Figure 29. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the west and northwest sides of the storm shown in the second part of Figure 28. The valid time of the pass is 1244 UTC June 15, 2015, or about six and three-quarters hours later than the valid time of the second part of Figure 28. The southern tip of Greenland appears at the upper-left edge of the image. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

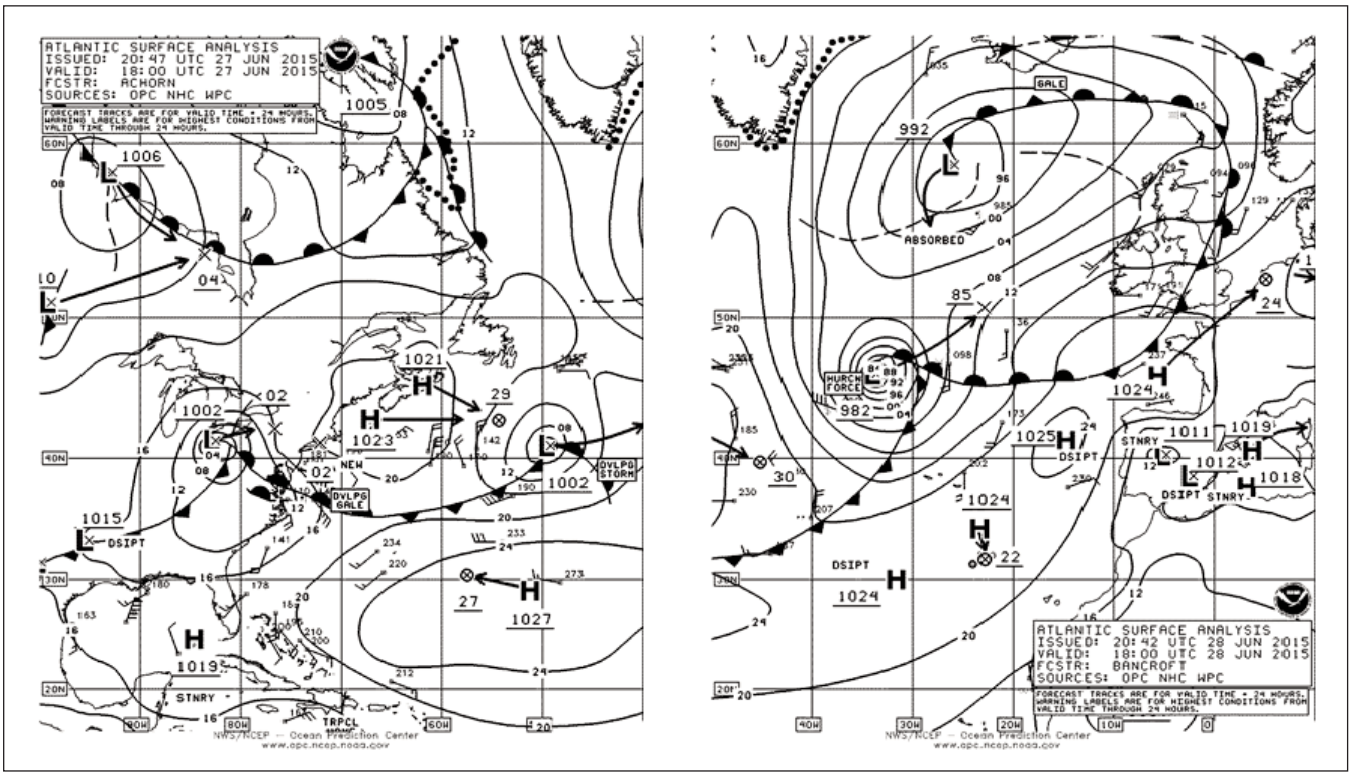

Figure 30. OPC North Atlantic Surface Analysis charts valid 1800 UTC June 27 (Part 2) and 1800 UTC June 28, 2015 (Part 1).

North Atlantic Storm,
July 28-29,
August 2-3:

Low pressure originating off the southeast U.S. coast moved northeast and developed into a gale late on July 28th before rapidly intensifying to hurricane force the next morning (**Figure 32**). The central pressure fell 16 hPa in only 12 hours after 0600 UTC on the 29th. **Figure 33** is a visible satellite image of the cyclone with a ship plotted near the center, the **INDEPENDENCE II** (WGAX) near 40N 58W reporting northwest 65 kts. The ship reported that its pressure had fallen 14.4 hPa in 6 hours. At 1800 UTC, six hours later, on the 29th the **OCEAN GIANT** (WDG4379) reported west winds of 70 kts and 6.7 m seas (22 ft). The satellite image indicates frontal features but ASCAT imagery revealed a compact core of strong winds.After weakening to a gale the next day the cyclone moved into the eastern North Atlantic over the next two days and then reintensified into a storm force low late on August 2nd and early on the 3rd with a central pressure as low as 977 hPa before weakening again and passing east of Iceland on the 6th.

North Atlantic Storm,
August 11-13:

Initial development of this deep low was as a frontal wave moving off the North Carolina coast early on the 7th. The cyclone passed near Sable Island two days later and then after passing the island of Newfoundland began to intensify, developing storm force winds by 1200 UTC on the 11th. **Figure 34** shows the final development over a two day period with the cyclone at maximum strength in the second part. The **SHIP** (BATEU00) near 62N 41W reported northwest winds of 45 kts at 1400 UTC on the 12th. The cyclone subsequently stalled and weakened near Iceland late on the 13th and dissipated by the 16th.

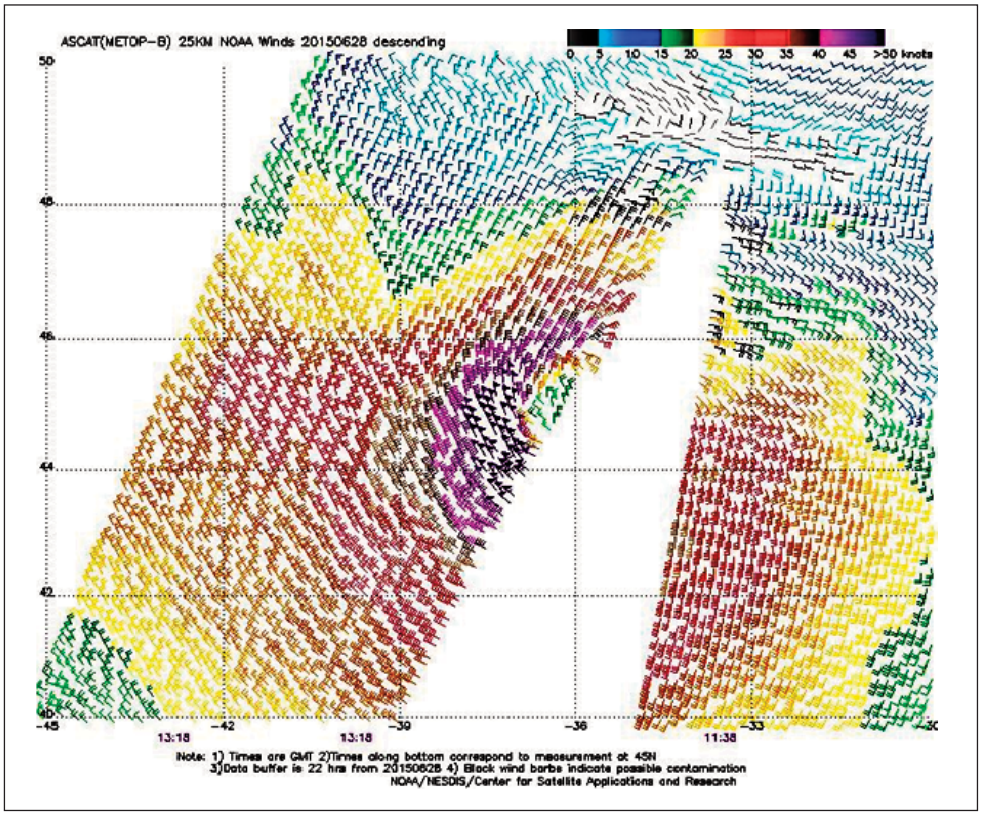

Figure 31. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the hurricane-force low shown in the second part of Figure 30. The valid times of the passes are 1138 UTC and 1318 UTC June 28, 2015, or about six and one-half and four and three-quarters hours prior to the valid time of the second part of Figure 30. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

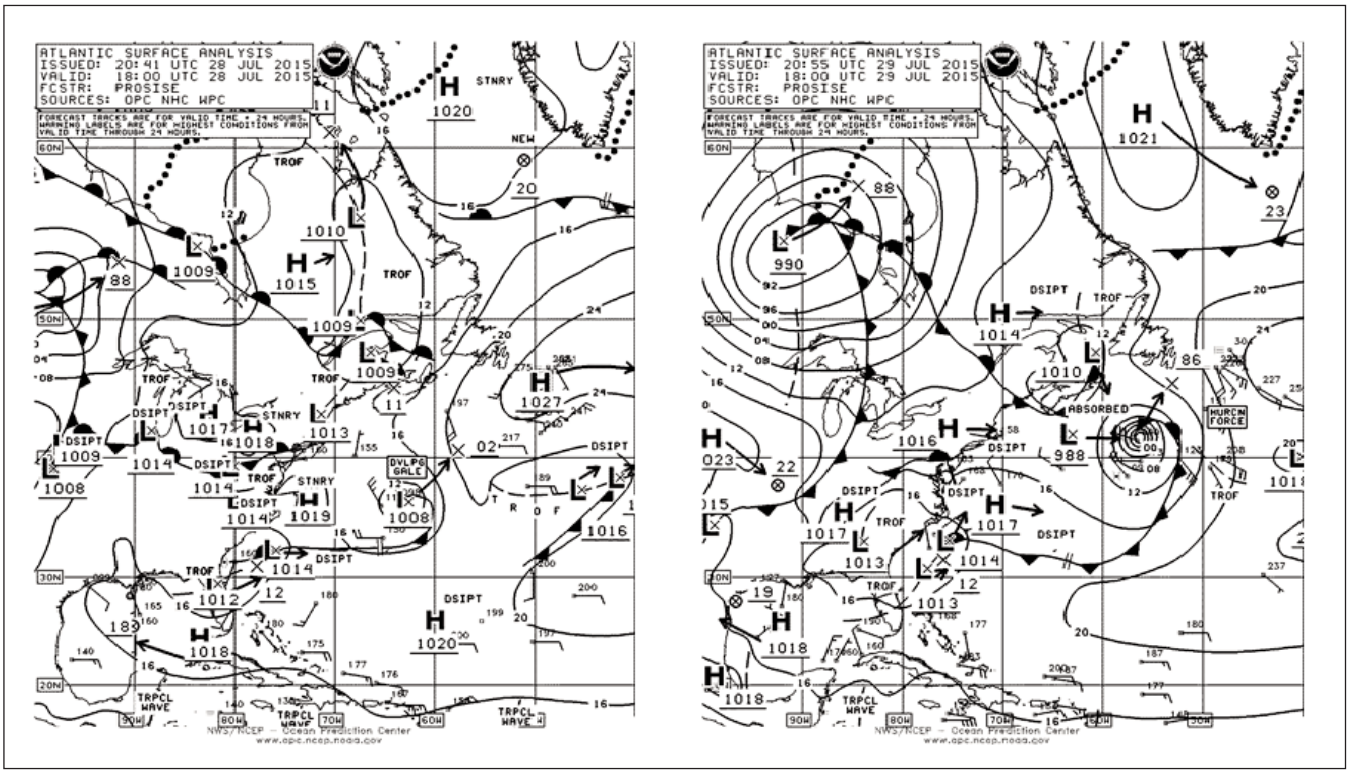

Figure 32. OPC North Atlantic Surface Analysis charts (Part 2) valid 1800 UTC July 28 and 29, 2015.

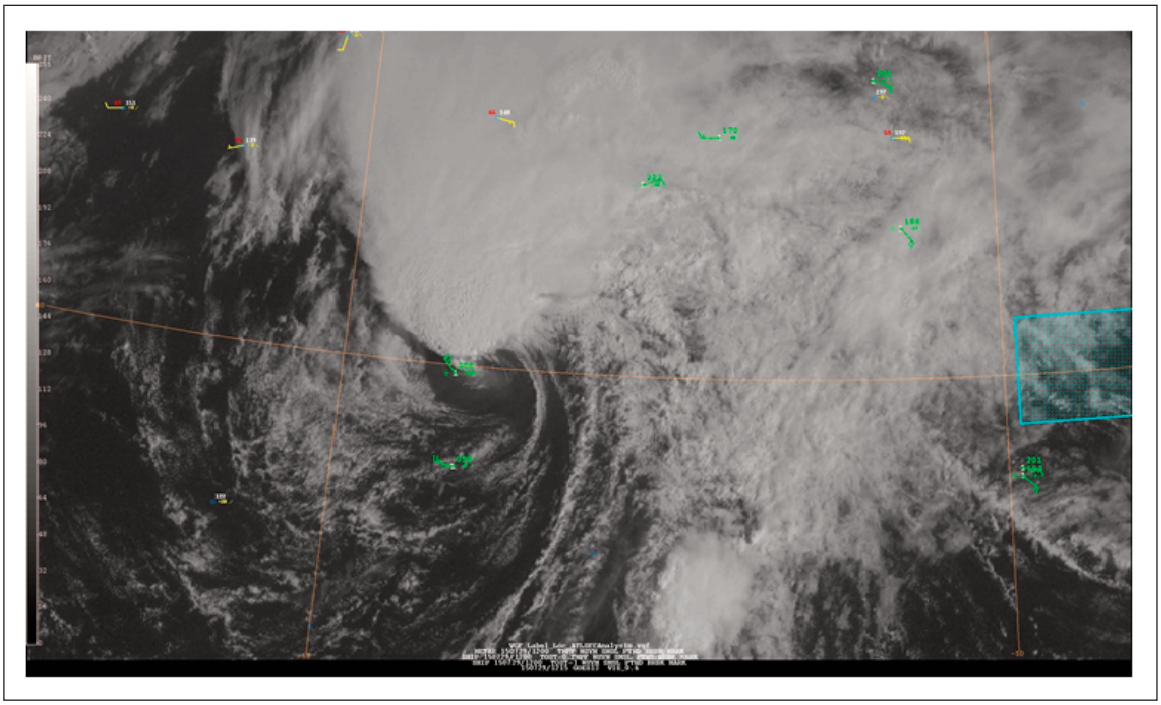

Figure 33. GOES-13 satellite image of the hurricane-force low shown in the second part of Figure 32, with surface observations from 1200 UTC July 29 included. The valid time of the visible satellite image is 1215 UTC July 29, 2015, or five and three-quarters hours prior to the valid time of the second part of Figure 32.

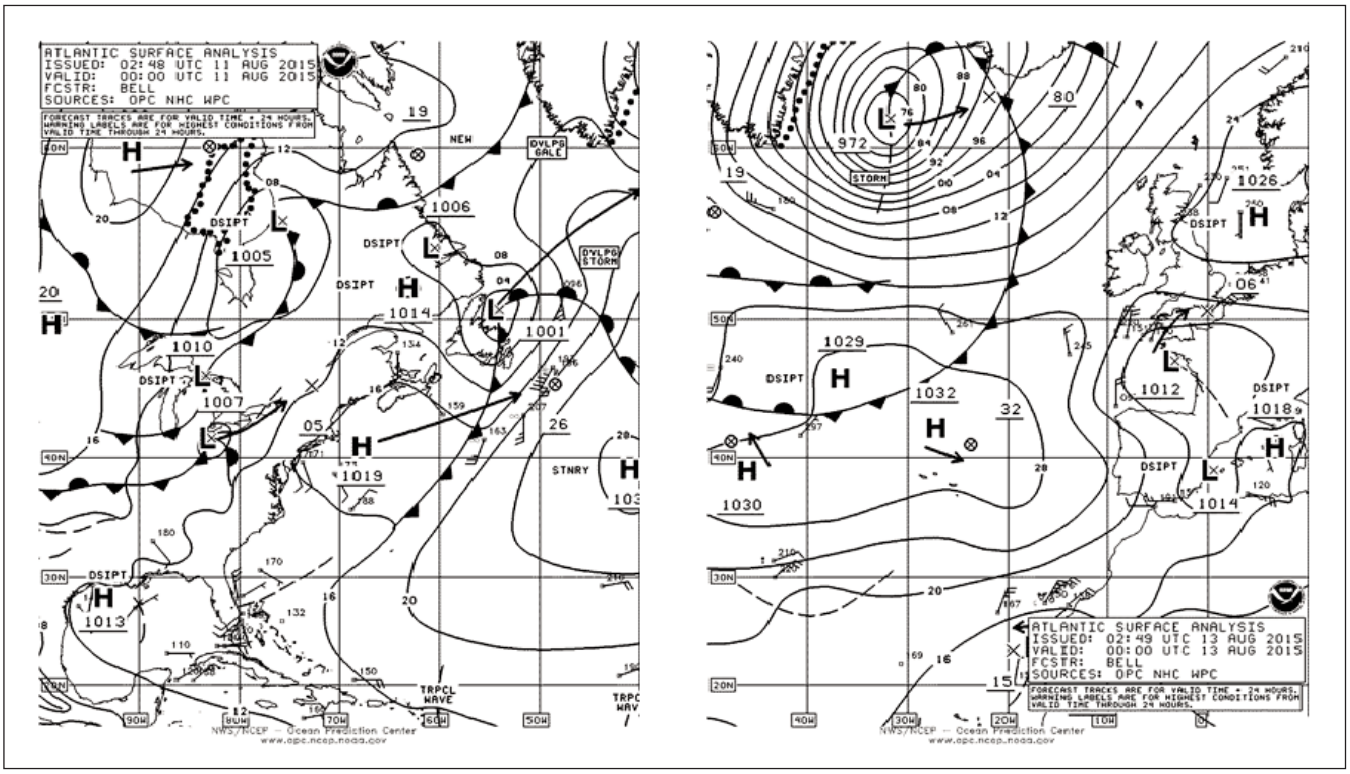

Figure 34. OPC North Atlantic Surface Analysis charts valid 0000 UTC August 11 (Part 2) and 0000 UTC August 13, 2015.

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9. Frequently Asked Questions, http://www.usno.navy.mil/JTWC/

Marine Weather Review – North Pacific Area

March to August 2015

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NOAA National Center for Environmental Prediction

Introduction

The weather pattern over the North Pacific continued to be relatively inactive especially in March which, after February produced no hurricane force events (**Reference 4**), featured only one such event. April also produced just one hurricane force low. In addition there were no really deep cyclones except one with tropical origin, such as Post-Tropical Atsani. There appeared to be a lack of a strong zonal jet stream to provide energy for developing cyclones like the North Pacific has been experiencing in the current winter of 2015-16 which has produced many hurricane force events.

The tropics were relatively active with ten tropical systems including two coming from the Central Pacific. These two systems became strong post-tropical cyclones (Dolphin and Atsani).

Tropical Activity

Typhoon Noul:

Noul was a typhoon west of OPC's radiofacsimile chart area which weakened to a tropical storm before merging with a front south of Japan and becoming post-tropical late on May 11. Post-tropical Noul then then moved out over the North Pacific as a gale which developed a 983 hPa central pressure near the western Aleutians on the 15th before dissipating over the northern Bering Sea on the 18th.

Super-Typhoon Dolphin:

Dolphin moved into OPC's radiofacsimile chart area south of Japan as a super-typhoon (Reference 9) with maximum sustained winds of 140 kts. Dolphin began to weaken on the 17th while drifting north. By the 19th the cyclone weakened to a tropical storm and turned northeast. At 0600 UTC on the 20th Dolphin became a post-tropical storm near 30N 146E. **Figure 1** shows Dolphin as a post-tropical storm about to merge with a front to the north and 36 hours later in the western Bering Sea with its lowest central pressure. **Figure 2** is a Rapidscat image of east side of Post-tropical Dolphin showing winds to 50 kts. The **HANJIN AMI** (VRNF8) reported west winds of 50 kts near 49N 171E at 1000 UTC on May 22. The cyclone then weakened while drifting east and dissipated late on the 24th.

Typhoon Chan-Hom:

Chan-Hom moved northwest into OPC's oceanic chart area crossing 17N near 140E as a tropical storm at 0600 UTC July 6th, became a typhoon six hours later and then passed west of 136E as a typhoon with sustained winds of 80 kts early on the 7th.

Super-Typhoon Nangka:

Nangka was already a major typhoon when moving northwest and crossing 16N 149E early on July 8th with sustained winds of 115 kts or Category 4 on the Saffir-Simpson scale (**Reference 5**). It briefly strengthened to a super typhoon at 1800 UTC on the 9th with sustained winds 135 kts. A weakening trend set in later that day as the cyclone drifted west. The typhoon then drifted north near 136E late on the 13th with a slow weakening trend, before turning northwest and passing west of the area late on the 15th. Its sustained winds were down to 75 kts at that time. Nangka re-emerged in the Sea of Japan as a tropical depression early on the 18th and became a remnant low near northern Japan later that day.

Typhoon Halola:

Halola came from the Central Pacific Hurricane Center warning area, crossing 180W by July 12th and then becoming a typhoon near 18N 167E at 1800 UTC on the 15th with sustained

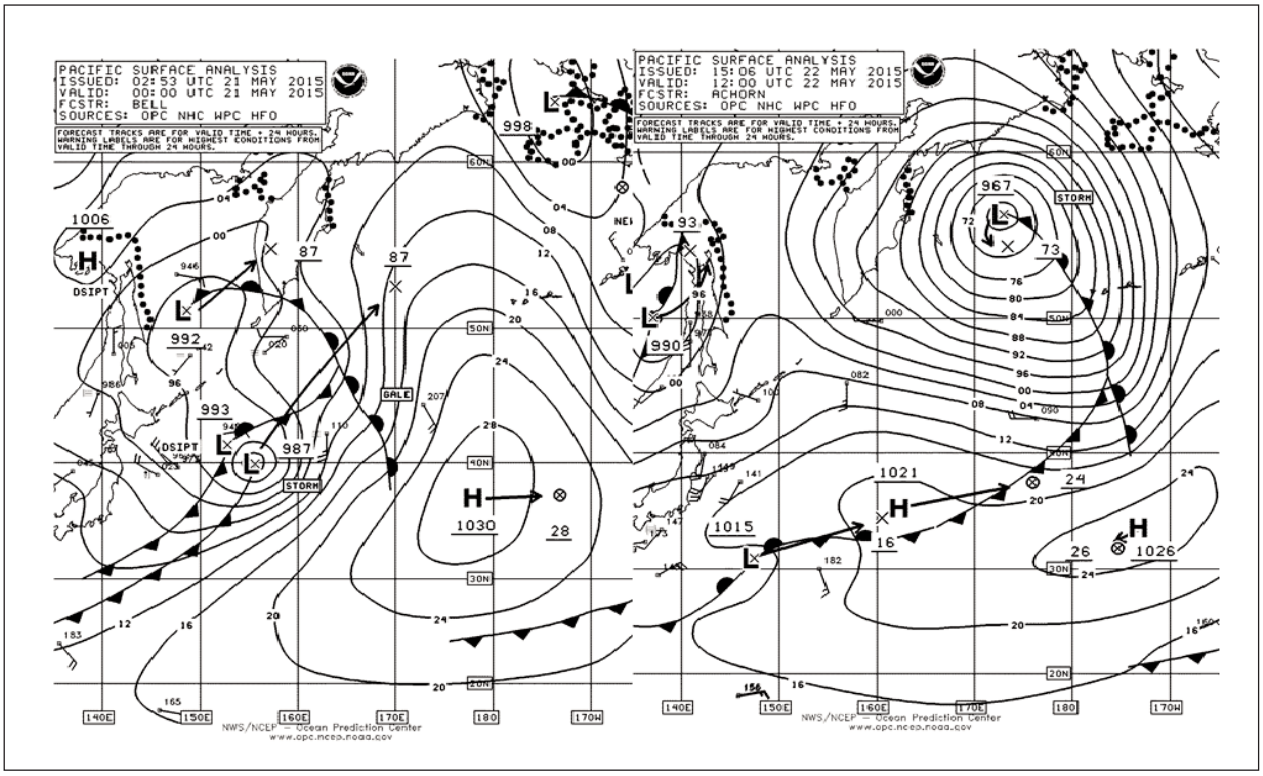

Figure 1. OPC North Pacific Surface Analysis charts (Part 2 - west) valid 0000 UTC May 21 and 1200 UTC May 22, 2015. Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars (hPa), with the exception of tropical cyclones, for which just a tropical symbol is given at the twenty-four hour position (if still a tropical cyclone) . Tropical cyclone information appears in text boxes.

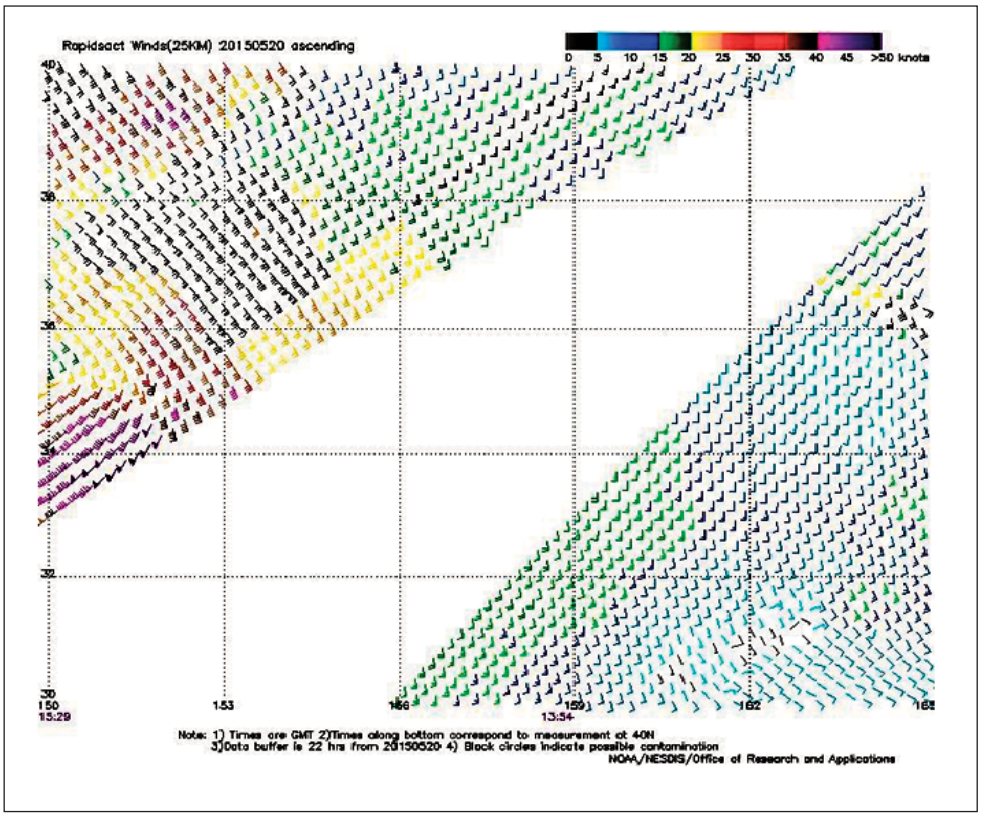

Figure 2. Rapidscat image of satellite-sensed winds (25-km resolution) from an instrument aboard the International Space Station. The stronger retrieved winds around the east side of Post-Tropical Dolphin are shown in the western pass with valid time 1529 UTC May 20, 2015, or about eight and one-half hours prior to the valid time of the first part of Figure 1. Image is courtesy of NOAA/NESDIS

winds of 75 kts. Halola weakened to a 35 kts tropical storm two days later before strengthening again by the 23rd while passing west of the area.

Super-Typhoon Soudelor:

Soudelor was a strengthening typhoon while tracking northwest and crossing near 16N 144E at 0000 UTC August 3rd with sustained winds of 115 kts. It became a super-typhoon 12 hours later and after another six hours reached maximum intensity with sustained winds of 155 kts. At 1200 UTC on the 4th Soudelor was a super typhoon near 19N 137E with sustained winds 140 kts. **Figure 3** is a close up infrared satellite view of Soudelor and it is just a coincidence that we have a Jason-2 altimeter pass through the eye wall of Soudelor. Note the highest significant wave height of 90.55 ft in the northwest eye wall. This is the highest satellite detected wave height that the author is aware of. Later on the 4th Soudelor passed west of the area with a weakening trend.

Tropical Storm Molave:

Tropical depression 15W formed near 21N 148E at 0000 UTC August 7th and moved northwest, briefly becoming tropical storm Molave early on the 8th and then becoming downgraded to a post-tropical gale on the 9th. Molave was reclassified as a tropical storm 0600 UTC on the 11th with sustained winds of 45 kts, near 32N 144E. The cyclone passed near 35N 154E with sustained winds of 50 kts at 0000 UTC on the 13th before weakening. **Figure 4** depicts Molave becoming post-tropical while developing frontal structure. The **FRANKFURT EXPRESS** (DGZS2) reported southwest winds of 40 kts near 33N 160E at 1800 UTC on the 12th. The ASCAT-B image in **Figure 5** shows winds around Molave about at post-tropical transition. The cyclone then tracked east and then northeast into the Gulf of Alaska on the 21st.

Super-Typhoon Atsani:

Typhoon Atsani moved northwest into OPC's radiofacsimile chart area at 17N 156E at 0600 UTC August 18th with sustained winds of 115 kts. Atsani became

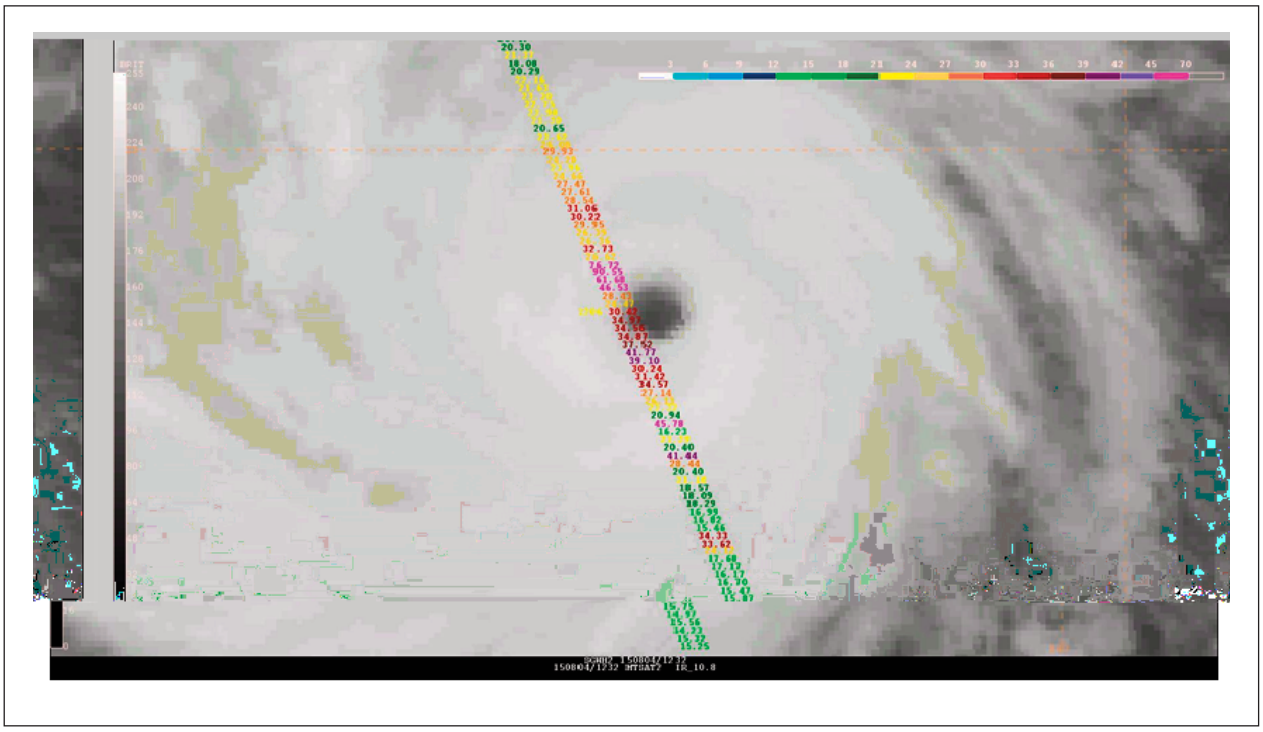

Figure 3. A zoomed-in MTSAT2 infrared satellite image of Super-Typhoon Soudelor valid 1232 UTC August 4, 2015. The satellite senses temperature on a scale from black (warm) to white (cold) in this type of imagery. Soudelor was centered near 19N 137E at this time with maximum sustained winds of 140 kt with gusts to 170 kt (from a Joint Typhoon Warning Center advisory). A Jason-2 altimeter pass appears as a swath of significant wave heights given in feet to two decimal places cutting across the central core of Soudelor with times (UTC) given to the left.

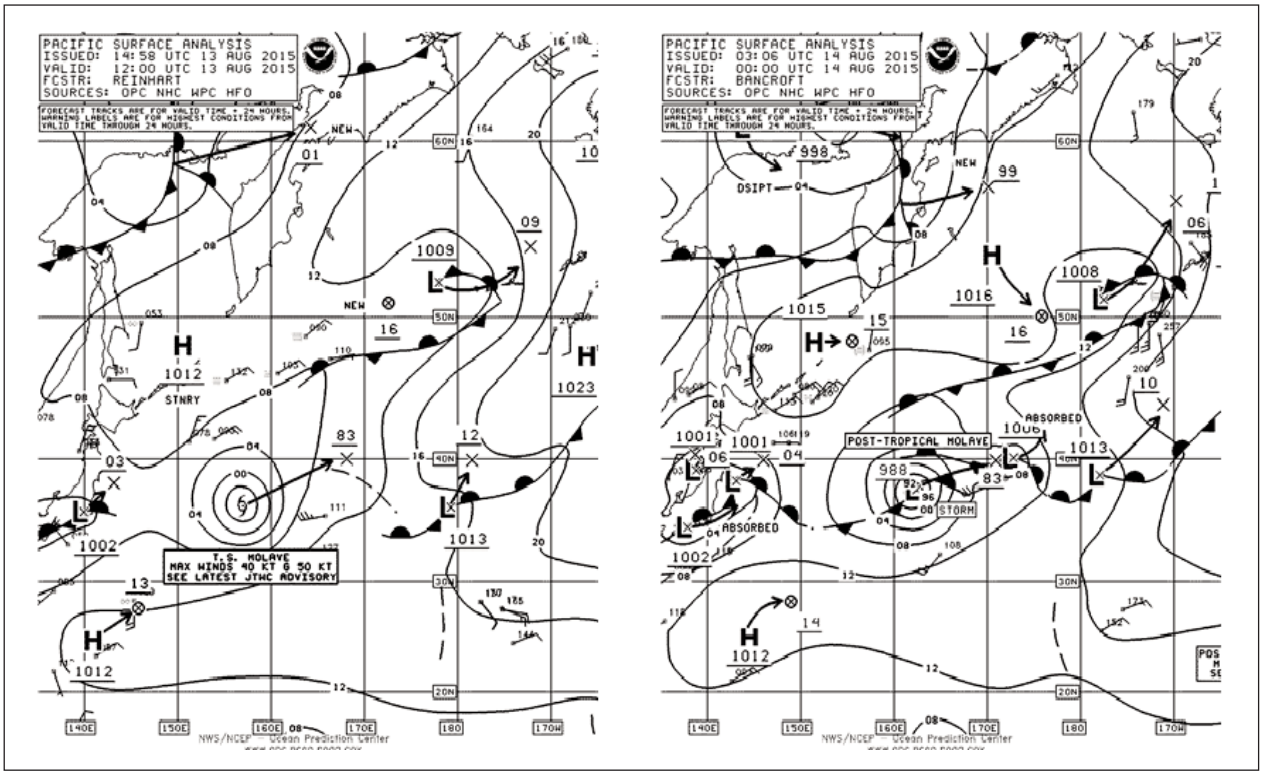

Figure 4. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC August 13 and 0000 UTC August 14, 2015.

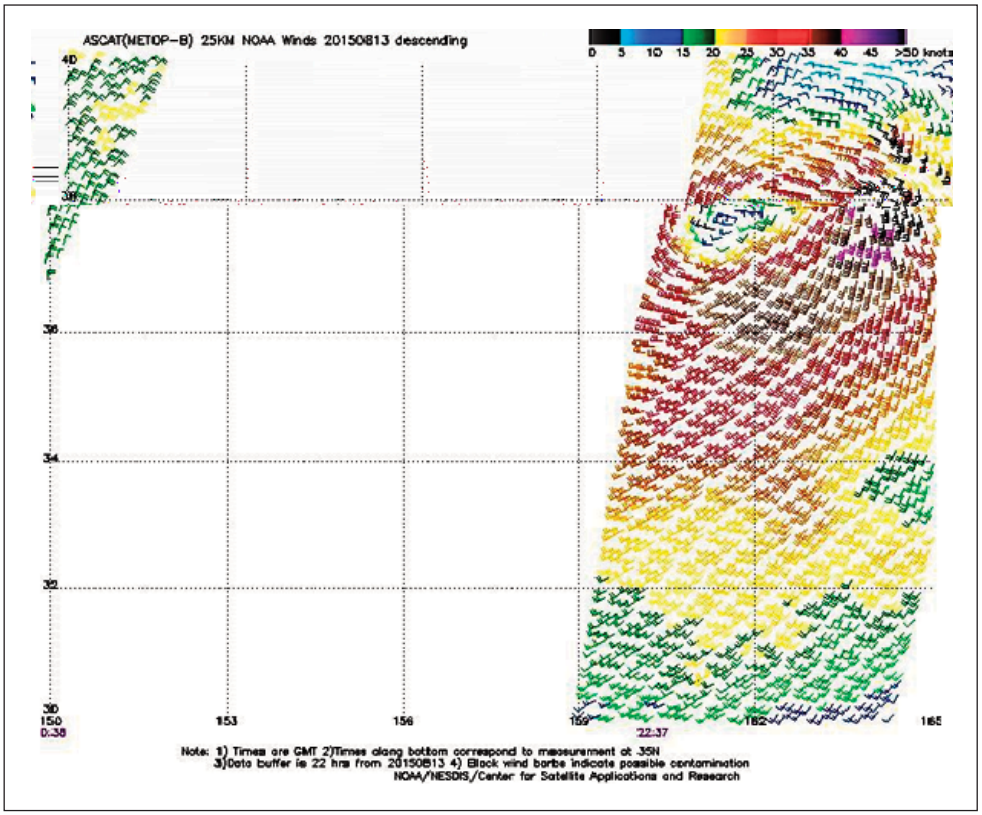

Figure 5. ASCAT (METOP-A) (Advanced Scatterometer) image of satellite-sensed winds (25-km resolution) around Post-Tropical Molave shown in the second part of Figure 4. The valid time of the pass is 2237 UTC August 13, 2015, or about one and one-half hours prior to the valid time of the second part of Figure 4. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

a super typhoon 24 hours later with sustained winds of 130 kts. Peak intensity came 6 hours later when sustained winds were 140 kts, near 20N 151E. Atsani then began to weaken and beginning on the 21st turned northward and then late on the 23rd northeast. The cyclone became a strong tropical storm early on the 24th just before extratropical transition near 33N 151E with sustained winds of 60 kts. **Figure 6** depicts Atsani making a rapid post-tropical transition and re-intensification as an intense hurricane force low within 12 hours. The ASCAT-B image in **Figure 7** includes some 65 kts winds. The **EXCEL** (ONAI) near 45N 159E reported northeast winds of 60 kts and 12.8 m seas (42 ft) at 0600 UTC on the 27th. The cyclone maintained hurricane force winds until 0000 UTC on the 26th. The cyclone stalled and weakened near 40N 165E until the 28th when it moved north and became absorbed on the 29th.

Typhoon Goni:

Goni formed south of the area and moved northwest, passing near 17N 140E 0600 UTC on August 17th as an intensifying typhoon. The peak intensity was 115 kts for sustained winds 1800 UTC on the 17th. Goni passed west of 136E shortly thereafter.

Hurricane Loke:

Another Central Pacific system, Loke was a tropical storm near 19N 179W at 0600 UTC August 23rd and moving north northeast. It became a hurricane before moving into OPC's high seas area north of 30N (**Figure 6**). As Loke reached 31N 174W at 1800 UTC on the 25th it had weakened to a tropical storm with sustained winds of 60 kts. Loke moved northwest and became post-tropical late on the 26th near 39N 180W and became absorbed by Post-Tropical Atsani by the 27th.

Other Significant Events of the Period

Western North Pacific Storm, March 9-11:

A wave of low pressure rapidly intensified while moving north from south of Japan (**Figure 8**) and became the only hurricane force low in March. The central pressure fell 31 hPa in the 24 hour period ending at 0600 UTC on the 10th. The Rapidscat image in **Figure 9** reveals winds as high as 70 kts near northern Japan. The cyclone developed a lowest central pressure of 969 hPa near 45N 141E at 1800 UTC on the 10th. The **SHIP** VRHM2 (50N 165E) reported southeast winds of 48 kts and 5.8 m seas (19 ft). The cyclone subsequently dissipated near the Kamchatka by the 14th.

North Pacific Storm, April 11-15:

Originating south of Japan early on the 10th, this cyclone developed into a hurricane force low as depicted in **Figures 10** and **11**. The central pressure fell 33 hPa in the 24 hour period ending at 1800 UTC on the 12th. The infrared satellite image in **Figure 12** is impressive revealing a fully mature cyclone and a well-defined center. The Rapidscat image in **Figure 13** shows numerous winds in the 50 to 70 kts range south of the cyclone's center. In the absence of ship reports, altimeter passes showing remotely sensed wave heights reveal seas to 40 ft (12.2 m) near the center of the image. The **CMA CGM VELA** (DFUM) near 50N 165W encountered southeast winds of 50 kts and 6.0 m seas (20 ft). The cyclone then moved northeast and weakened on the 14th and 15th and then moved into southern Alaska on the 16th.

Eastern Pacific Storm, April 12-13:

This cyclone developed from a central Pacific wave as shown in **Figures 10** and **11**. The central pressure fell 26 hPa in the 24 hour period ending at 1200 UTC on the 13th. The satellite image is impressive (**Figure 12**) with well defined fronts with cold tops. The buoy 46185 (52.4N 129.8W) reported southeast winds of 43 kts with gusts to 58 kts and 6.5 m seas (21 ft) at 1400 UTC on the 13th and highest seas 9.0 m (30 ft). The cyclone moved inland late on the 13th. The second part of **Figure 11** shows the cyclone at maximum intensity. An ASCAT (METOP-A) pass from 1053 UTC on the 19th revealed winds to 50 kts southeast of the center of a compact circulation. The **BUDAPEST EXPRESS** (DGWE2) reported south winds of 45 kts near 42N 162E at 2100 UTC on the 18th.

The **EVER SAFETY** (3EMQ4) encountered west winds of 35 kts and 9.0 m seas (30 ft) near 46N 162E at 0600 UTC on the 20th. The system subsequently weakened as it moved into the western Bering Sea, where it stalled and dissipated on the 23rd.

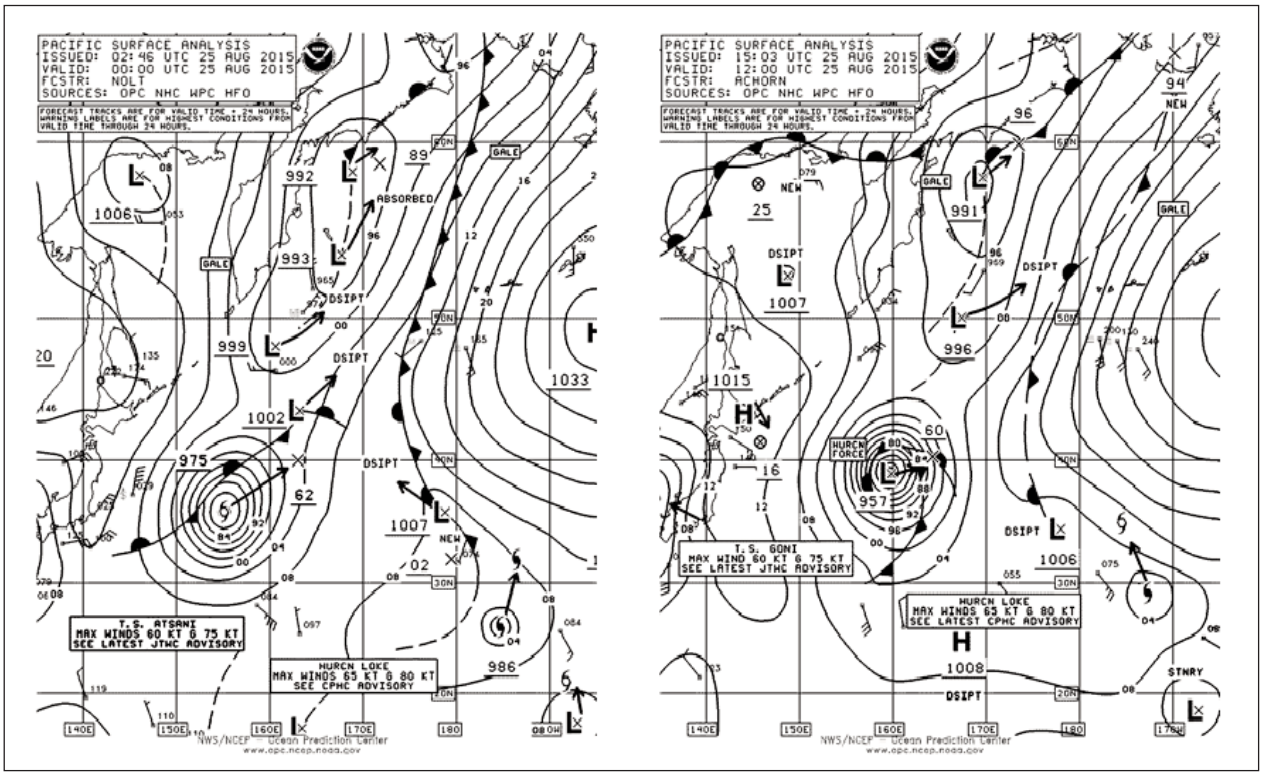

Figure 6. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC and 1200 UTC August 25, 2015.

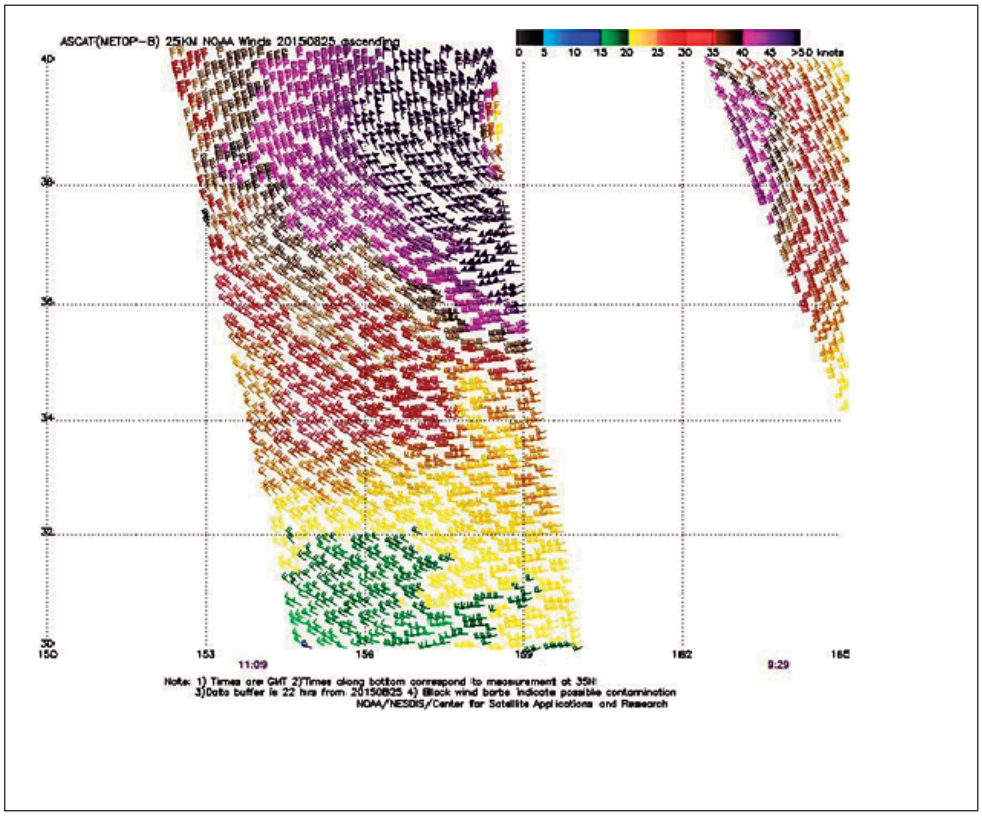

Figure 7. ASCAT (METOP-B) image of satellite-sensed winds (25-km resolution) around the hurricane-force low (Post-Tropical Atsani) shown in the second part of Figure 6. The valid time of the pass is 1109 UTC August 25, 2015, or about one hour prior to the valid time of the second part of Figure 6.

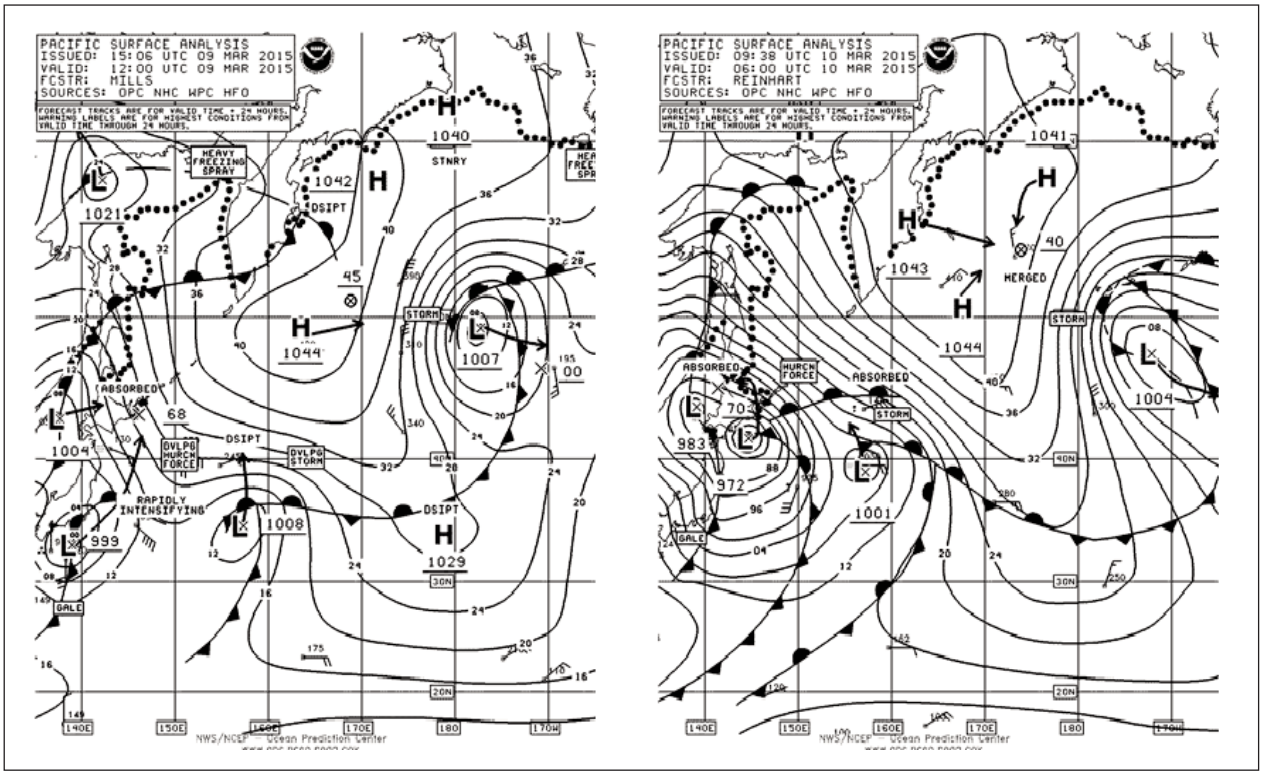

Figure 8. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC March 9 and 0600 UTC March 10, 2015.

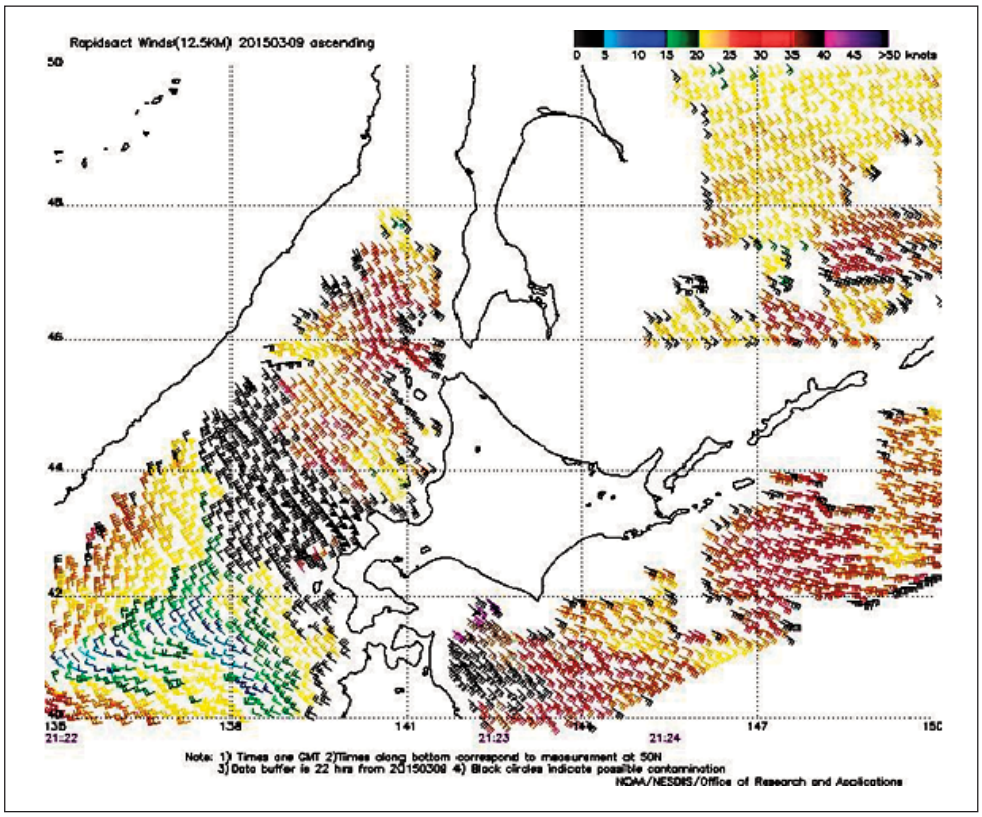

Figure 9. Rapidscat image of satellite-sensed winds (12.5-km resolution) from an instrument aboard the International Space Station. The valid time of the pass is 2123 UTC March 9, 2015, or about eight and one-half hours prior to the valid time of the second part of Figure 8. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

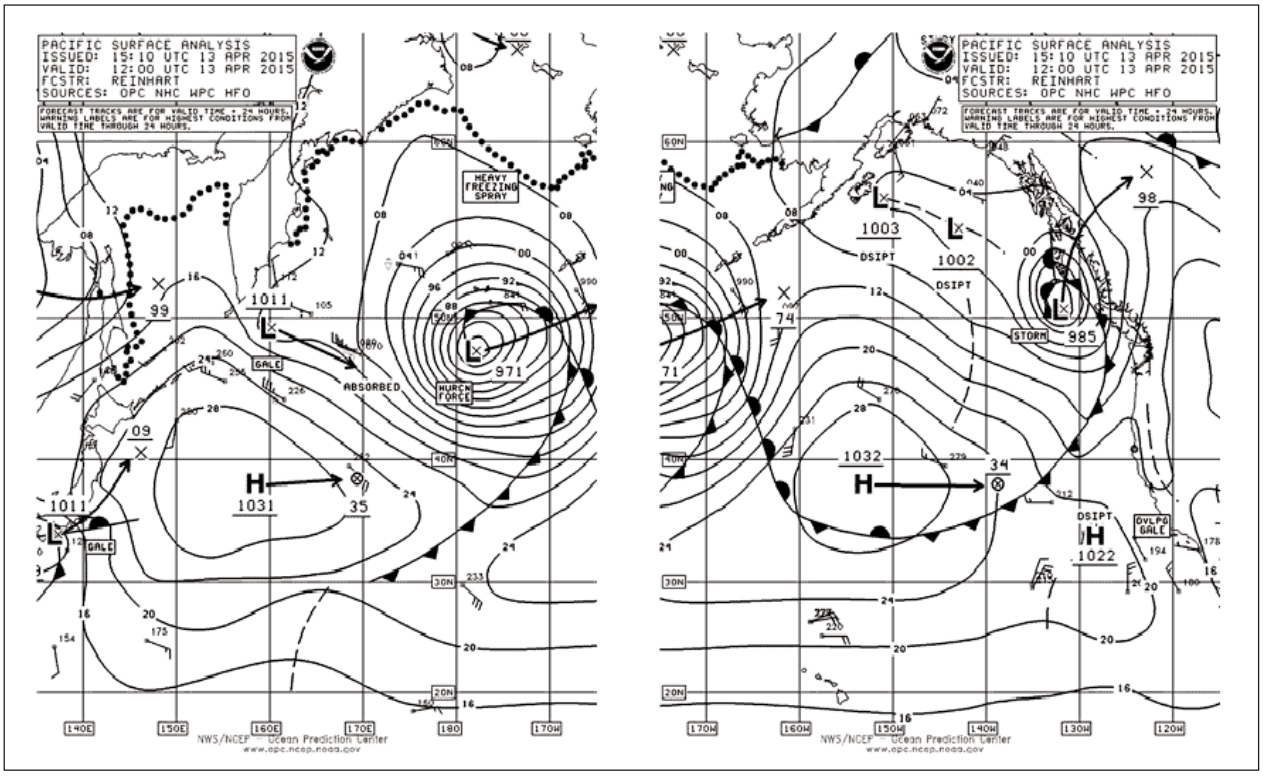

Figure 11. OPC North Pacific Surface Analysis charts (Parts 1 and 2) valid 1200 UTC April 13, 2015.

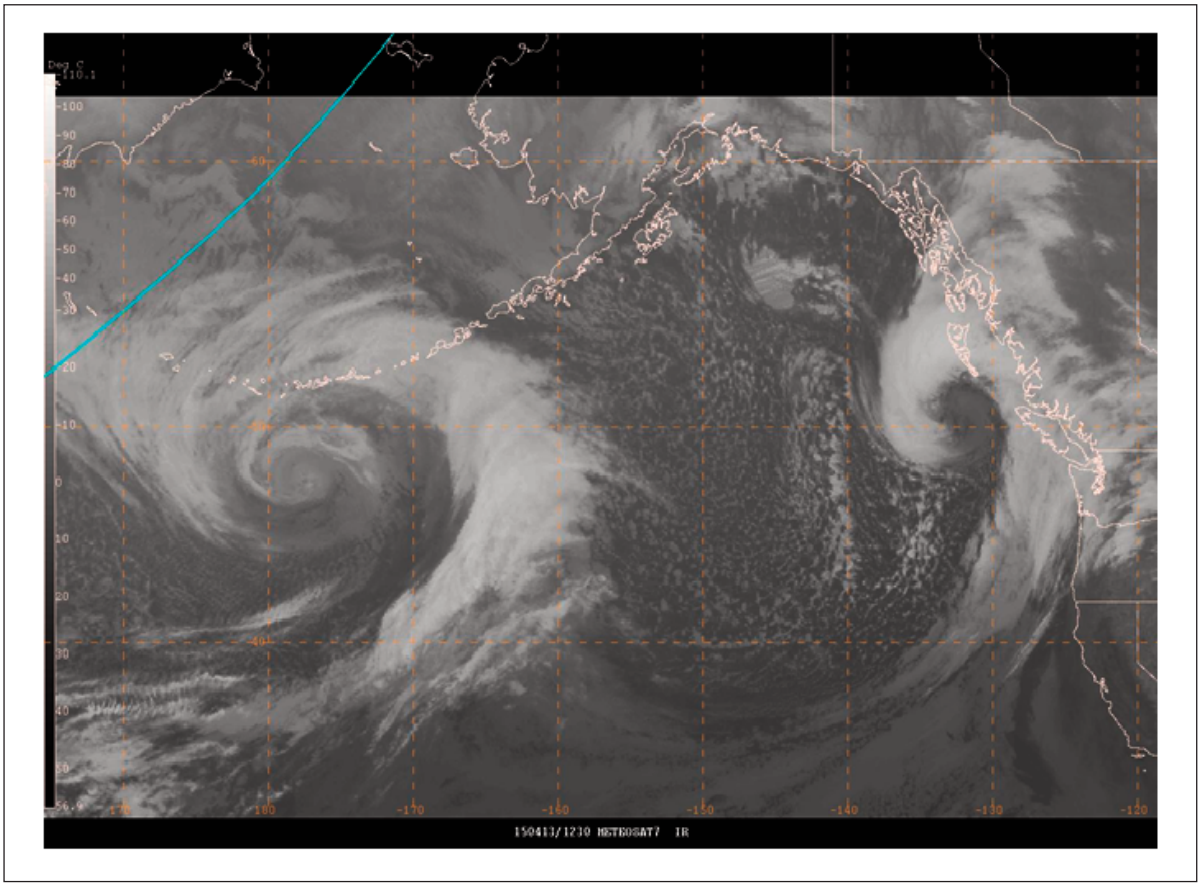

Figure 12. A global mosaic infrared satellite image of a large part of the North Pacific valid 1230 UTC April 13, 2015. The valid time of the image is only one-half hour later than the valid time of Figure 11.

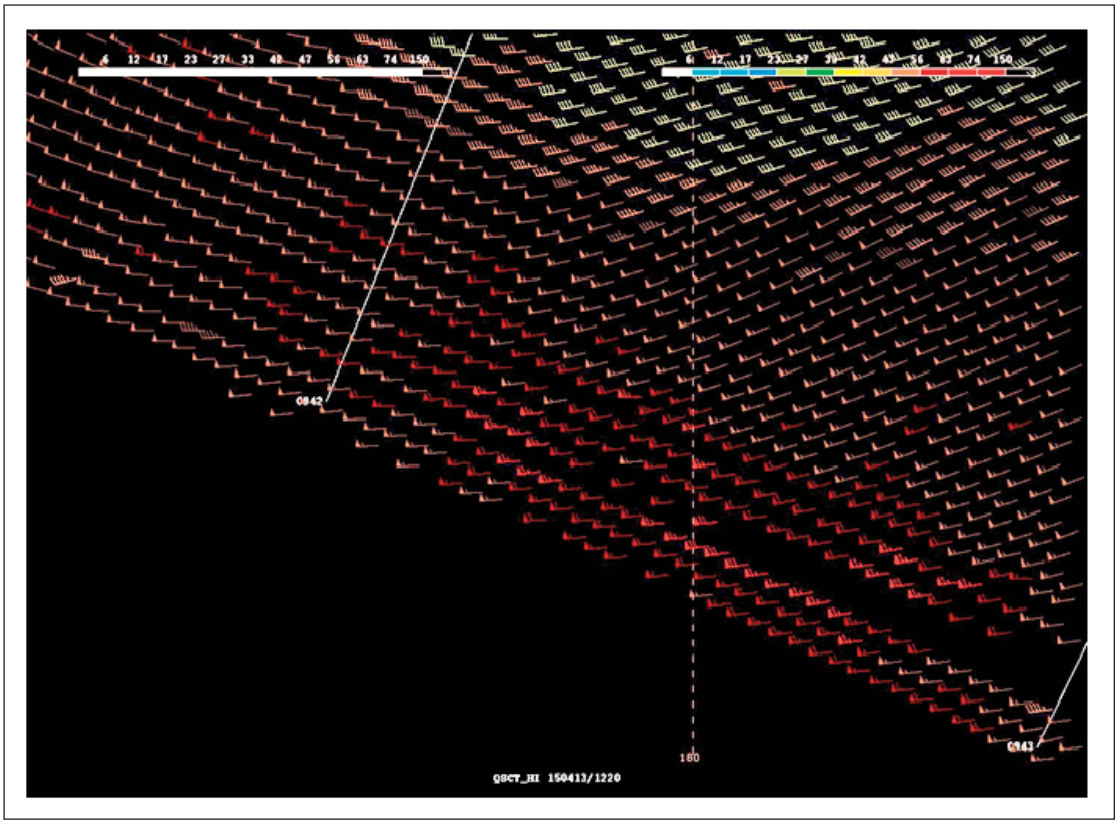

Figure 13. Rapidscat image of satellite-sensed winds (12.5-km resolution) around the south side of the hurricane-force cyclone shown in Figure 11. Cross-track time lines of the pass from 0942 UTC and 0943 UTC April 13, 2015 are shown. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

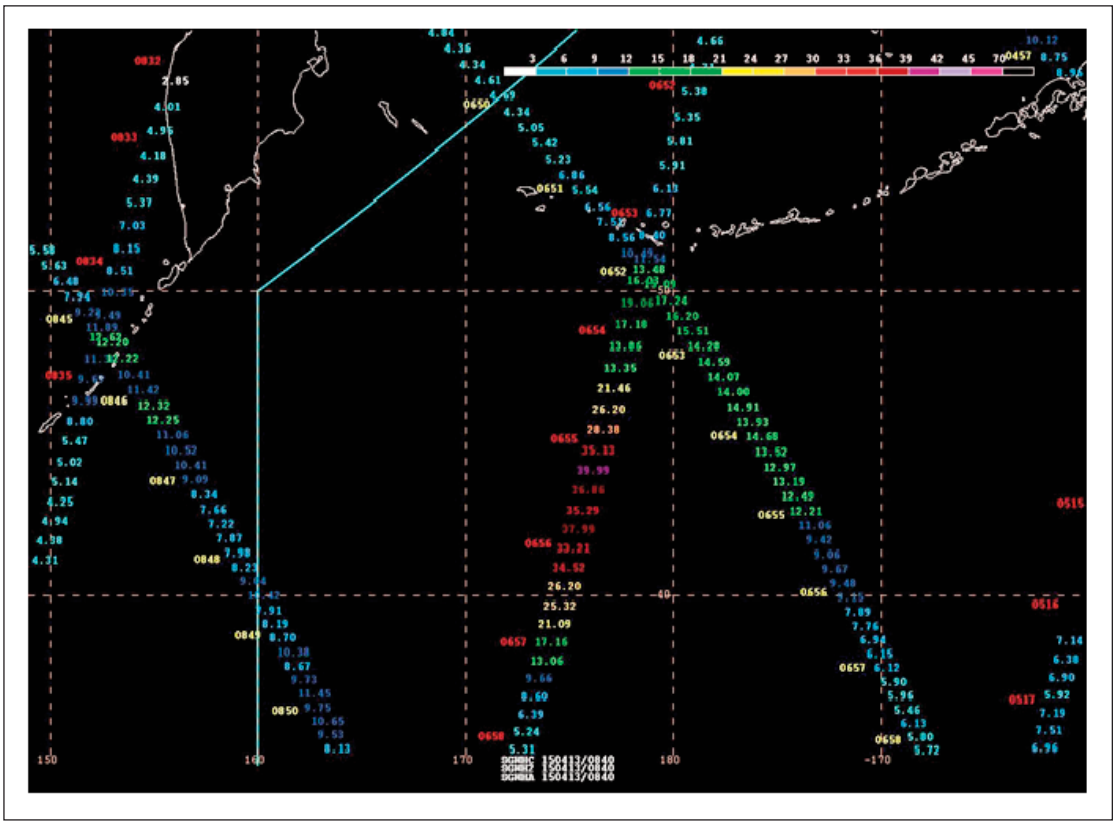

Figure 14. Altimeter passes showing swaths of significant wave height in feet to two decimal places from the Cryosat, Jason-2 and AltiKa satellites. Overpass times appear to the left of the satellite tracks (four-digit UTC). The times of the central passes are about five hours prior to the valid time of Figure 11.

North Pacific Storms, May 2-4:

The development of the stronger central Aleutians low is depicted in **Figures 15** and **16**. The central Aleutians storm in **Figure 16** formed from the merging of the developing storm to the south and the gale near the western Aleutians. The central pressure of the combined low dropped to as low as 981 hPa at 0600 UTC on the 4th. The ASCAT-B image (**Figure 17**) for the western storm reveals some 45 kts wind retrievals near the central Aleutians. The eastern cyclone, near maximum intensity in **Figure 15**, originated near 36N 170E early on April 29th. The **APL CHINA** (WDB3161) near 49N 159W reported northwest winds of 45 kts and 8.5 m seas (28 ft). The western system drifted east late on the 4th with a weakening trend, while the eastern cyclone dissipated.

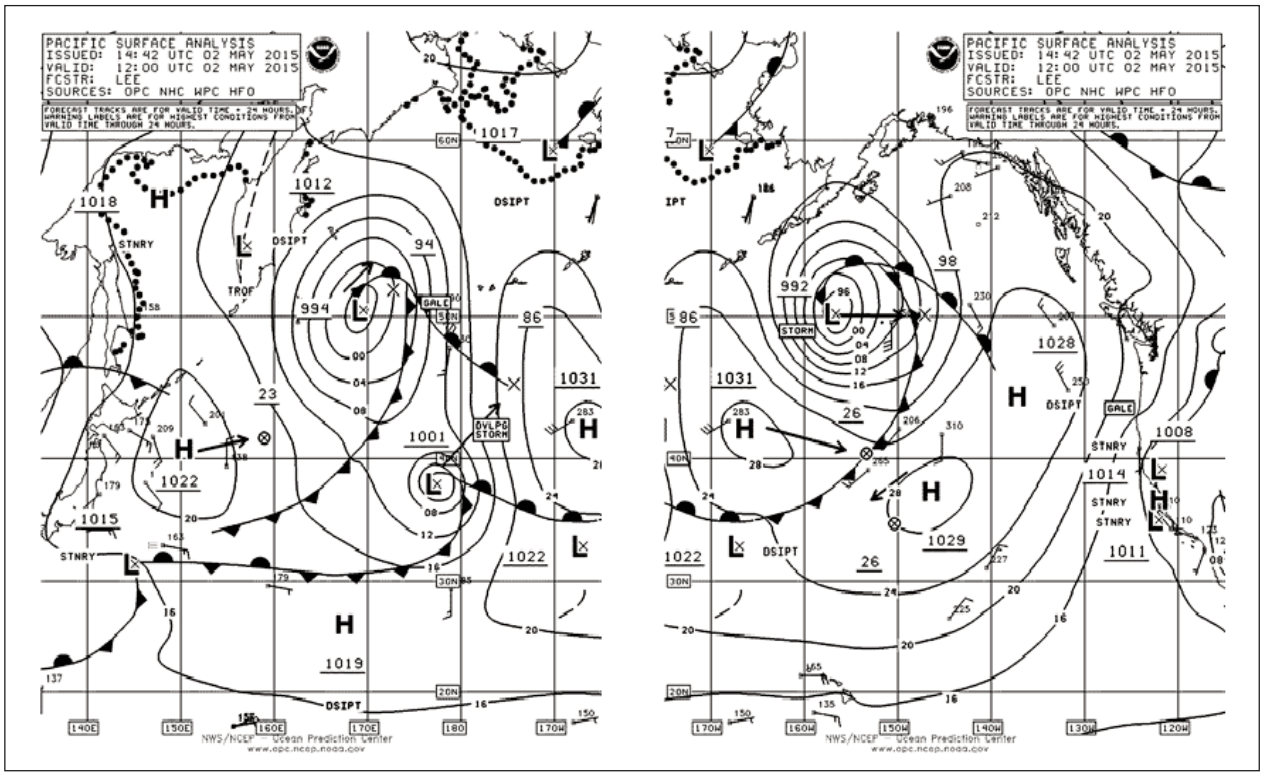

Figure 15. OPC North Pacific Surface Analysis charts (Parts 1 and 2) valid 1200 UTC May 2, 2015.

Northwestern Pacific Storm, May 30-June 1:

Low pressure originating south of Japan May 28th moved northeast and developed storm force winds near the Kurile Islands late on the 31st (**Figure 18**). The lowest central pressure was 971 hPa on May 18th, making it one of the deepest lows of the period without tropical origin.The ASCAT-B image in **Figure 19** returned some 45 kts winds, but the second part of **Figure 18** does show a plotted 50 kts ship report. The cyclone subsequently turned east along 49N on the 2nd and then southeast and dissipated by the 6th.

Eastern North Pacific Storm, August 28-29:

A short lived storm in late August affected mainly coastal waters of the Pacific Northwest (**Figure 20**). Destruction Island C/MAN 47.7N 124.4W reported southeast winds of 69 kts with gusts to 76 kts with a peak gust 78 kts at 1800 UTC on the 29th. Buoy 46041 near 47.4N 124.7W at 1700 UTC on the 29th reported south winds of 43 kts with gusts to 54 kts with peak gusts 56 kts and maximum seas 6.0 m (20 ft) one hour later. The next significant event was a stronger development originating over southern Japan late on December 3rd and moving northeast. **Figure 20** depicts the final 24 hours of

development leading to a lowest central pressure of 956 hPa. The pressure fell 42 hPa in the twenty-four hour period ending at 1200 UTC on the 5th. **Figure 20** shows a large area of ASCAT winds of 50 to 60 kts with good support for classifying this as a hurricane force low. The **EVER DIAMOND** (3FQS8) near 35N 157E reported southwest winds of 40 kts and 8.5 m seas (28 ft). The cyclone then moved east with some weakening but maintaining storm force winds until becoming absorbed by a new development to the east on the 7th.

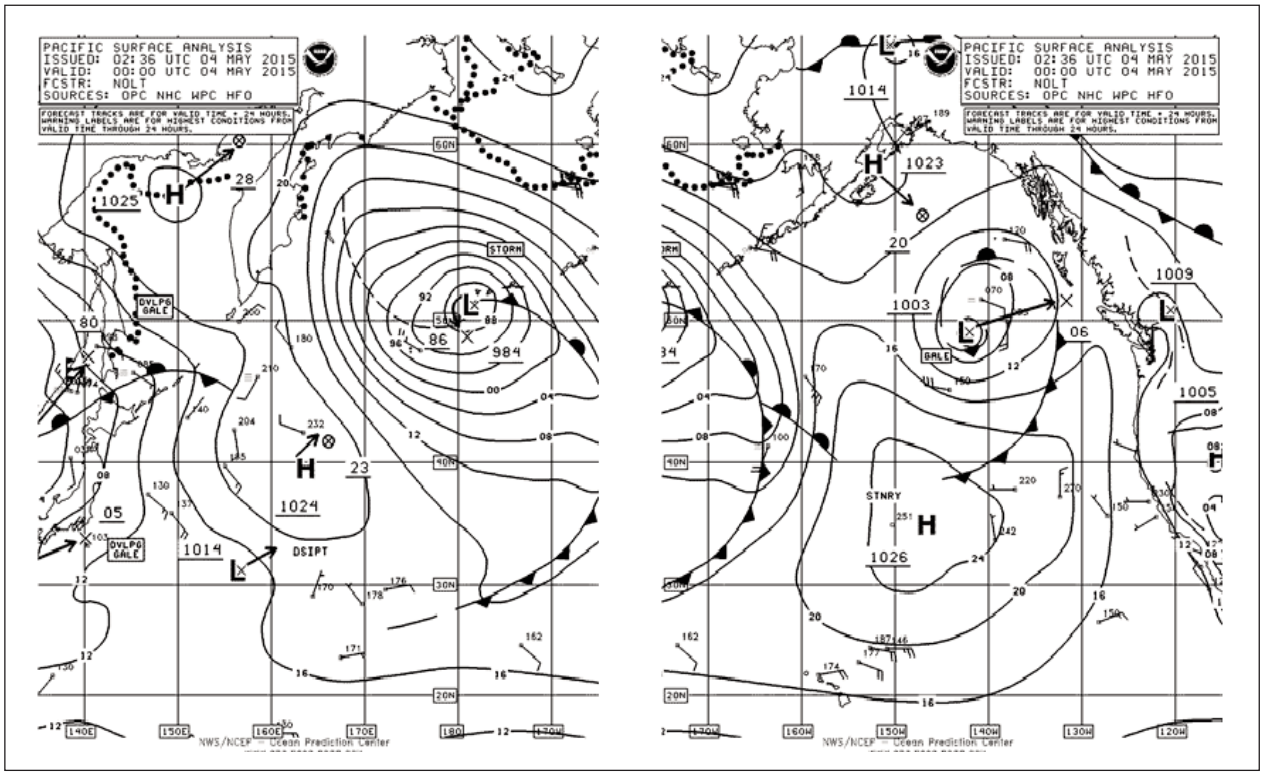

Figure 16. OPC North Pacific Surface Analysis charts (Parts 1 and 2) valid 0000 UTC May 4, 2015.

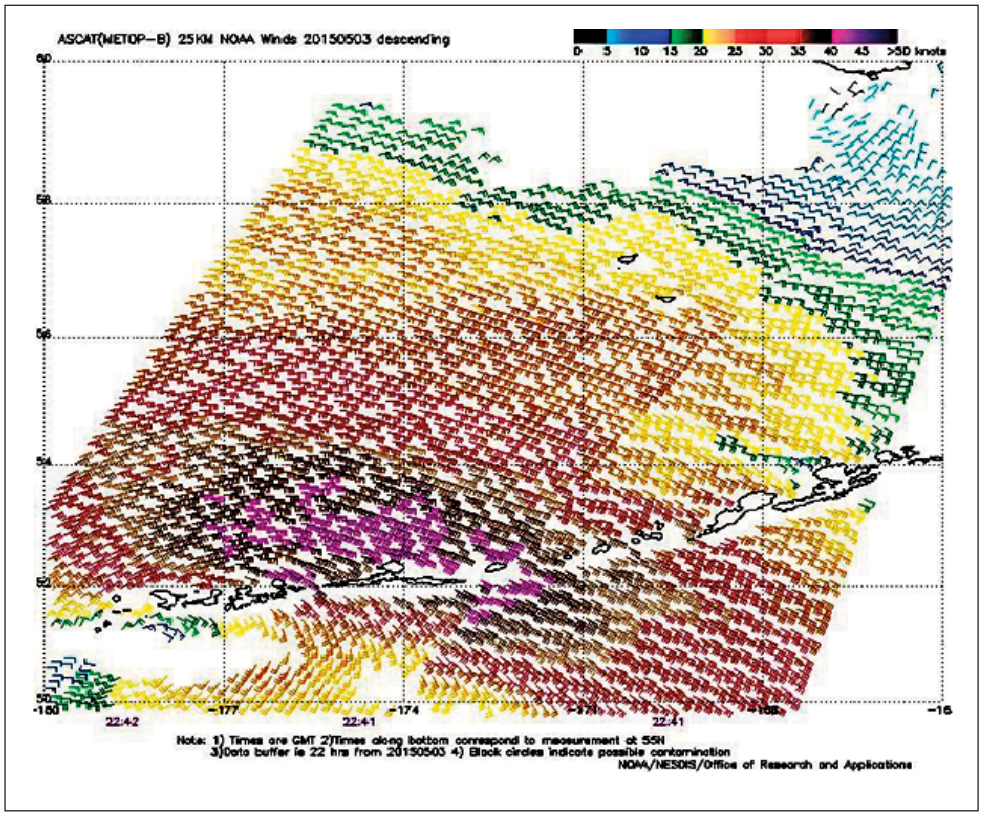

Figure 17. ASCAT (METOP-B) image of satellite-sensed winds (25-km resolution) around the north and east sides of the storm shown in Figure 16. The valid time of the pass is 2241 UTC May 3, 2015, or about one and three-quarters hours prior to the valid time of Figure 16. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research..

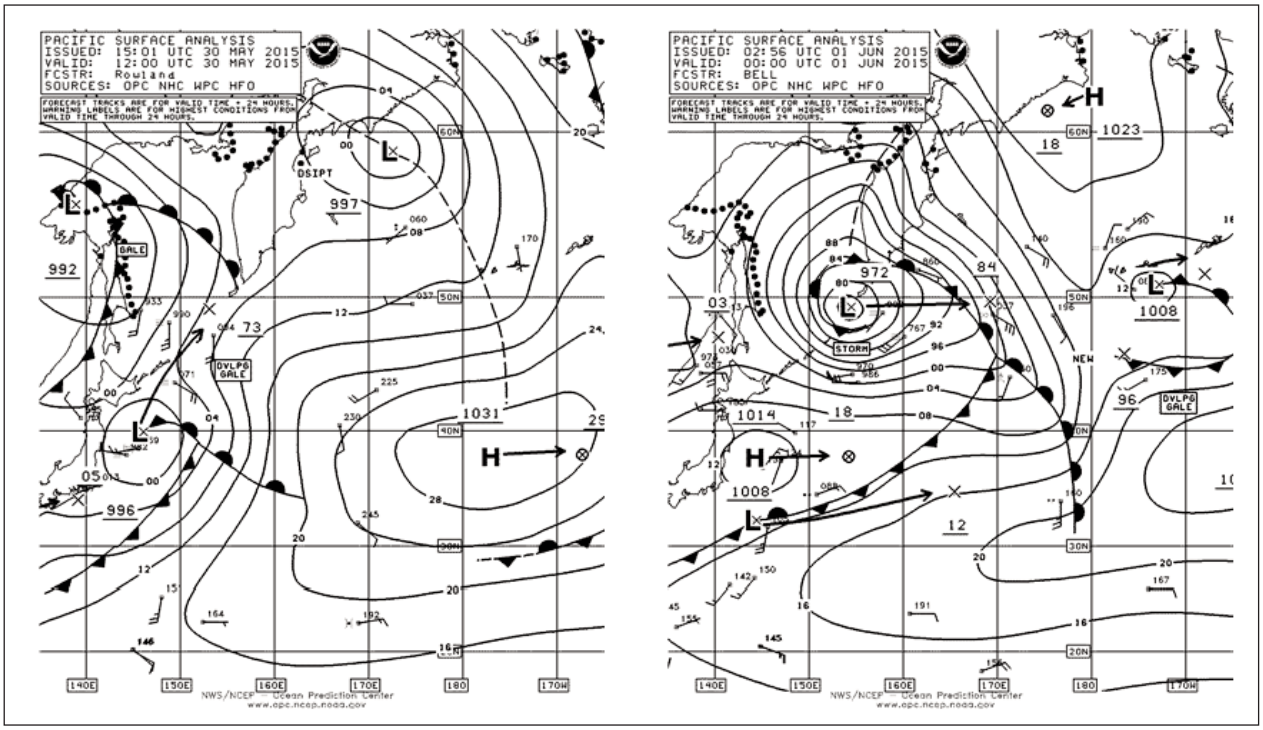

Figure 18. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC may 30 and 0000 UTC June 1, 2015.

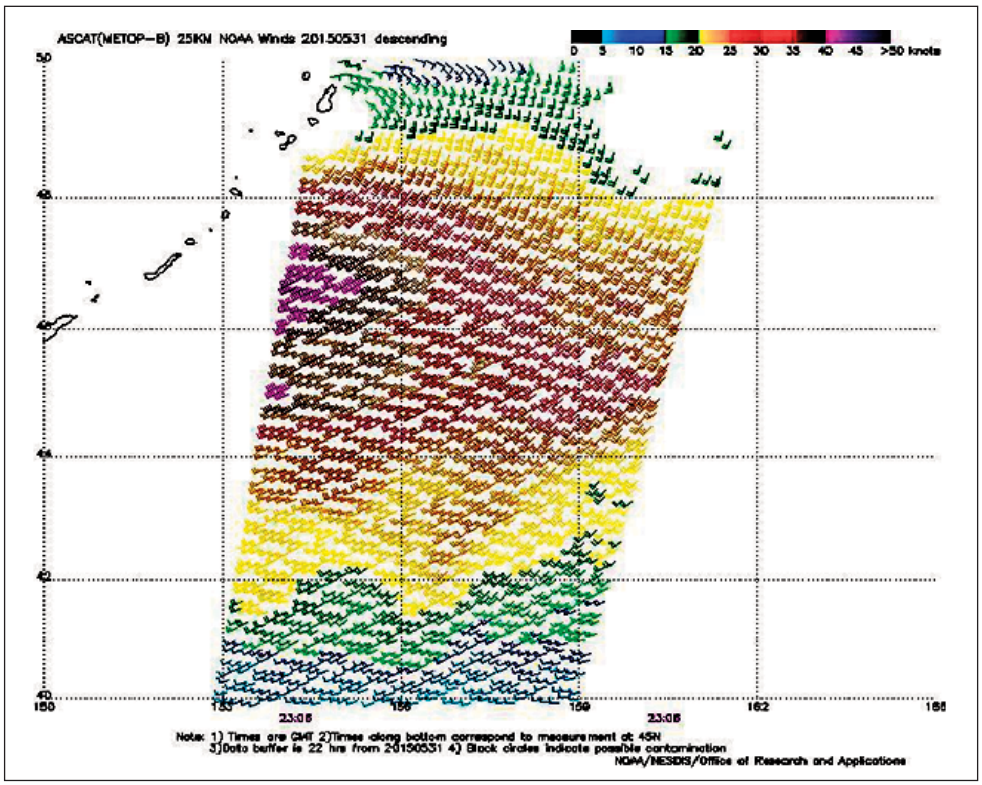

Figure 19. ASCAT (METOP-B) image of satellite-sensed winds (25-km resolution) around the east and southeast sides of the storm shown in the second part of Figure 18. The valid time of the pass is 2308 UTC May 31, 2015 or about one hour prior to the valid time of the second part of Figure 18. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

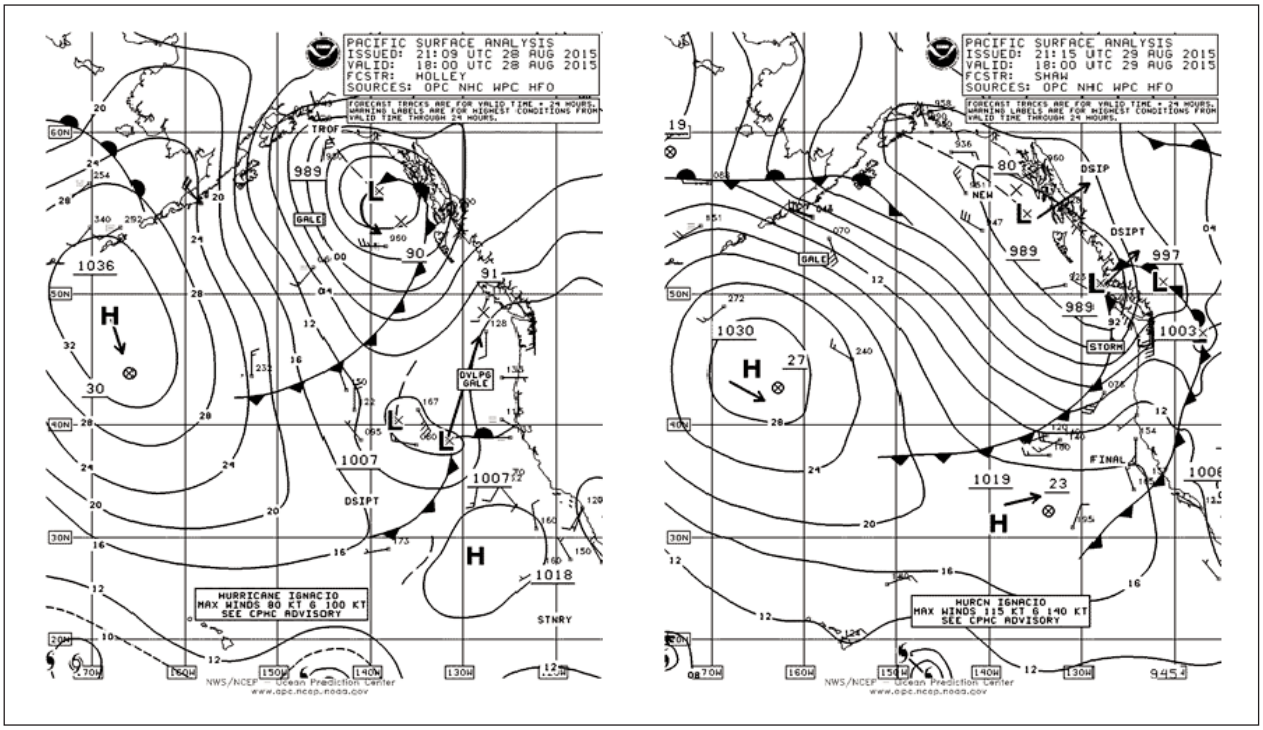

Figure 20. OPC North Pacific Surface Analysis charts (Part 1) valid 1800 UTC August 28 and 29, 2015.

References

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8. Central Pacific Tropical Weather Summary, http://www.prh.noaa.gov/cphc/summaries/

9. Frequently Asked Questions, http://www.usno.navy.mil/JTWC/

Tropical Atlantic and Tropical East Pacific Areas

September through December 2015

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NOAA National Centers for Environmental Prediction

Tropical North Atlantic Ocean to 31N and Eastward to 35W, including the Caribbean Sea and the Gulf of Mexico

Atlantic Highlights

The autumn period of September through December 2015 proved to be active in terms of gale conditions across the TAFB Area of Responsibility (AOR). Although a strong El Nino event across the Pacific Basin limited tropical cyclone activity in the Atlantic Basin, the 21 non-tropical cyclone warnings issued for the Tropical North Atlantic were slightly above average (18) for warnings issued during this same period 2010 through 2015.

Table 1. Below shows the non-tropical warning events that occurred across the Tropical Atlantic, Gulf of Mexico, and Caribbean Sea during this period. While only 7 events occurred September through early November, late November through December proved very active, with 14 events occurring during the last 6 weeks of the year.

Table 1. Non-tropical Warnings issued for the Atlantic Basin between 01 Sept 2013 and 31 Dec 2015.

ONSET	REGION	PEAK WIND (kts)	DURATION	FORCING
0000 UTC 29 Sep	Gulf of Mexico	35	06 h	Cold Front
1800 UTC 01 Oct	SW North Atlantic	35	42 h	Low Pressure
1200 UTC 17 Oct	Gulf of Mexico	35	90 h	Cold Front
0600 UTC 25 Oct	Gulf of Mexico	40	42 h	Cold Front
0000 UTC 31 Oct	Gulf of Mexico	35	18 h	Return Flow
1800 UTC 01 Nov	Gulf of Mexico	40	12 h	Cold Front
0000 UTC 08 Nov	Gulf of Mexico	35	18 h	Cold Front and Low Pressure
0000 UTC 20 Nov	SW North Atlantic	35	12 h	Cold Front
1800 UTC 21 Nov	Gulf of Mexico	40	42 h	Cold Front
0000 UTC 23 Nov	SW North Atlantic	35	12 h	Cold Front
1200 UTC 25 Nov	SW North Atlantic	35	48 h	Cold Front
0600 UTC 03 Dec	Gulf of Mexico	35	24h	Cold Front
0600 UTC 05 Dec	SW North Atlantic	35	24 h	Cold Front
0600 UTC 06 Dec	Central Caribbean	40	12 h	Pressure Gradient

ONSET	REGION	PEAK WIND (kts)	DURATION	FORCING
0000 UTC 12 Dec	SW North Atlantic	35	24 h	Cold Front
0600 UTC 17 Dec	SW North Atlantic	35	06 h	Cold Front
1200 UTC 18 Dec	Gulf of Mexico	35	12 h	Cold Front
0000 UTC 20 Dec	Central Caribbean	40	204 h	Pressure Gradient
1800 UTC 27 Dec	Gulf of Mexico	35	30 h	Cold Front
0600 UTC 29 Dec	Central Caribbean	40	18 h	Pressure Gradient
0000 UTC 30 Dec	Central Caribbean	35	24 h	Pressure Gradient

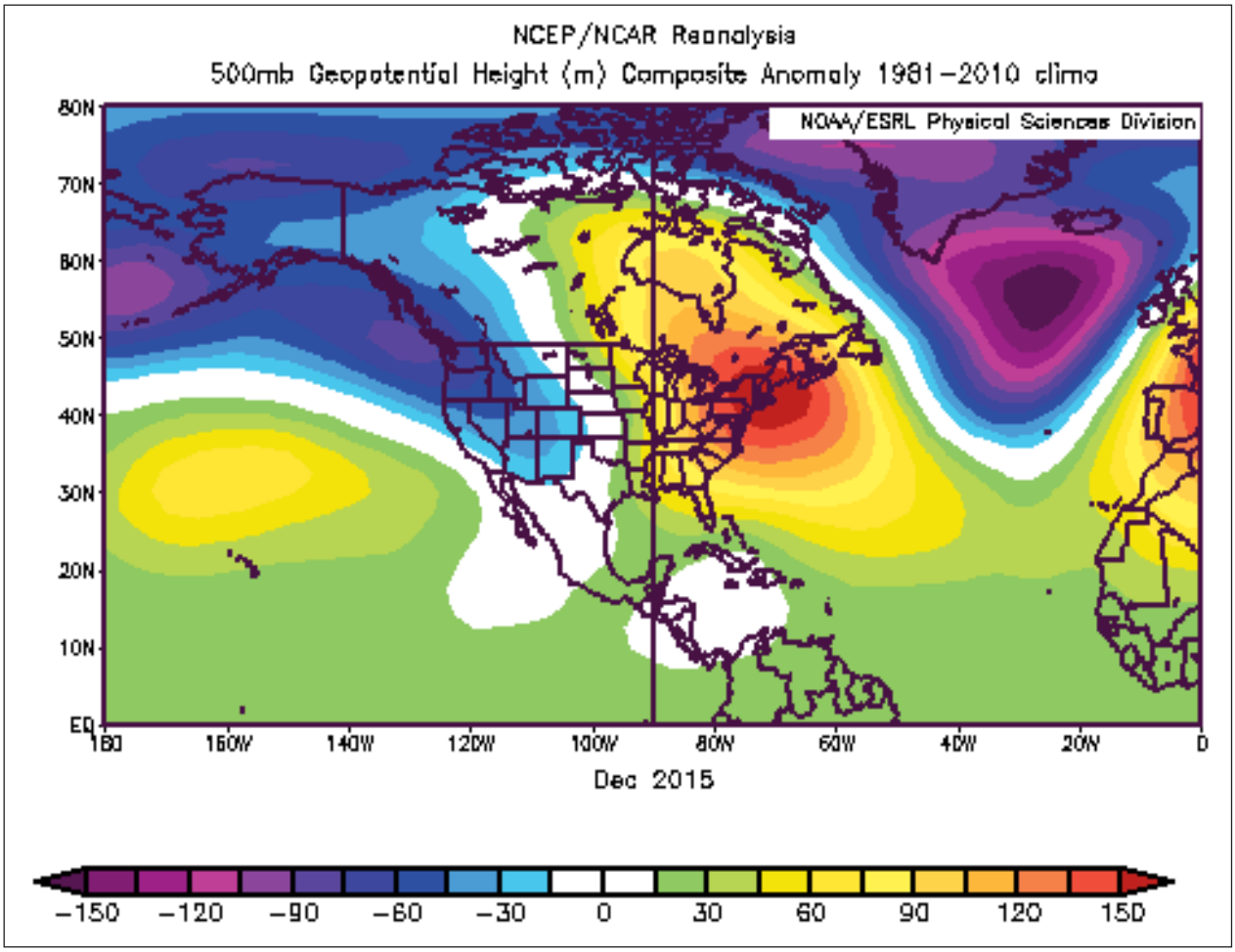

Figure 1. NOAA ESRL Reanalysis plot of mean 500 HPa height anomalies for December 2015, where warm colors represent above normal heights and cool colors below normal heights. Note the high amplitude blocking pattern north of 30N. Cool colors along the west coast of North America depict persistent middle to upper level troughing. The narrow strip of warm colors extending from the eastern Pacific across southern Mexico and Gulf of Mexico identify the mean location of the southern branch of the jet stream during the period. This position of the jet stream is typical of active El Nino seasons. Deep layered high pressure across the northwest Atlantic contributed to the gale events across the Tropical North Atlantic and central Caribbean during late November and December.

The first gale of the season occurred across the northern Gulf of Mexico on 29 September in the southerly flow ahead of a cold front and supporting surface low pressure system moving across the Gulf Coast region. This event was very short lived, only 6 hours. From mid October through the first week of November, the Gulf of Mexico then became the focus for warnings as five consecutive cold fronts moving into the basin produced gales. All of these occurred in the northerly flow behind the fronts, except for gale force southerly return flow ahead of a front approaching the basin on 31 October. The orographic influence of eastern Mexico aided in focusing post frontal gales over western portions of the basin, across the near and offshore coastal waters from Tampico to south of Veracruz. The strongest of these northerly gales occurred 25-27 October when ASCAT METOP-A scatterometer data confirmed 40 Kt winds across Texas near and offshore coastal waters at 1629 UTC 25 November.

A gradual change in the upper level pattern in mid to late November moved the focus of gales from the western Gulf of Mexico to northern portions of the Tropical North Atlantic waters as a blocking upper level ridge became prevalent through December across the NW Atlantic and eastern North America, **Figure 1**. Several cold fronts swept across north and northeast portions of the TAFB AOR, while strong post frontal surface high pressure systems lingered across the western Atlantic. The position of these strong ridges located due north of the central Caribbean combined with semi-permanent low pressure across Colombia to yield 4 separate gale events across the Colombian Basin in the month of December. One such event lasted nearly eight consecutive days, 20 through 28 of December.

Large Wave Causes Damage to MSC DIVINA, 27 November 2015

With the increasing popularity of the cruise industry during the past decade, and the explosion of social media, adverse weather conditions at sea are now frequently documented and shared with a large audience. On 26 November, the **MSC DIVINA** was in transit from San Juan, Puerto Rico to Nassau, Bahamas when it encountered very rough weather and large seas. At around 1140 pm local time, or 0340 UTC 27 November, what was described as a “freak” wave estimated at 30 ft (9 m), struck the starboard side of the ship while located approximately 150 nm ESE of Nassau, Bahamas causing damage to a small cabin porthole. Onboard **MSC** technicians immediately sealed the damaged porthole, and guests staying in the area affected by the damage were given alternative accommodations. Only minor injuries to two guests were reported during this event. **Reference 1**.

Although the damage to the **MSC DIVINA** was attributed to a single large wave, meteorological conditions across the region during the previous days had generated a broad and extensive area of seas 12 ft or greater, which prevailed east of the Bahamas on the night of 26-27 November. A cold front moved off of the eastern seaboard of the U.S. on 23 November and quickly merged with an old frontal boundary lingering offshore. This merged frontal boundary then continued moving southeastward across the Atlantic through early 25 November, where it stalled across the central Atlantic to just southeast of Bermuda to the southern Bahamas. A persistent low to middle level inverted trough residing across the subtropical Atlantic between 55W and 65W during this time helped to block the front from progressing further southeastward. Strong surface high pressure in excess of 1040 hPa building across the NW Atlantic on 25 November created a tight pressure gradient to the northwest of the stalled frontal boundary, which produced an elongated zone of strong to gale force northeast winds. Northeasterly gales began by 0600 UTC on 25 November just north of 31N and by 1200 UTC extended southwestward to 27N. **Figure 2** below shows the Unified Surface Analysis (USA) valid at 1800 UTC 25 November, 2015.

As the front remained nearly stationary through late on 26 November, the resultant 1000 nm long NE to SW fetch of 25-40 kts winds generated an impressive area of seas 12 to 22 ft (3.5 to 6.5 m).

Figure 3 shows the NOAA WAVEWATCH III (WW3) forecast for 00 UTC 27 November with ship and buoy observations for 0300 UTC and recent altimeter measurements. Note the location of the **DIVINA** identified by the yellow star, moving NW and parallel to the Bahamas and passing through the southwestern periphery of this extensive area of high seas. At this time, buoy 40147 reported significant wave heights (SWH) of 16 ft (5 m) with dominant wave period of 11 seconds, while 2310 UTC altimeter data showed seas 12 to 14 ft (3.5 to 4.5m) the northeast and upwind of the **DIVINA**. Also shown is the observation from the freighter **TROPIC SUN** (J8AZ2) estimating seas of 19 ft (5.5 m). This scenario suggests very rough and hazardous marine conditions along the path of the **DIVINA** but certainly within the capabilities of such a vessel.

To further exacerbate marine conditions on this night, strong thunderstorms and squalls developed along and to the north of the stalled frontal boundary. Personal communications later forwarded to TAFB indicate that squalls had impacted the **DIVINA** in the few hours preceding the destructive 30 ft (9 m) wave. Approximately 30 minutes prior to the destructive wave, the **DIVINA'S** onboard cruise information channel displayed current weather conditions of NE winds at 64 kts.

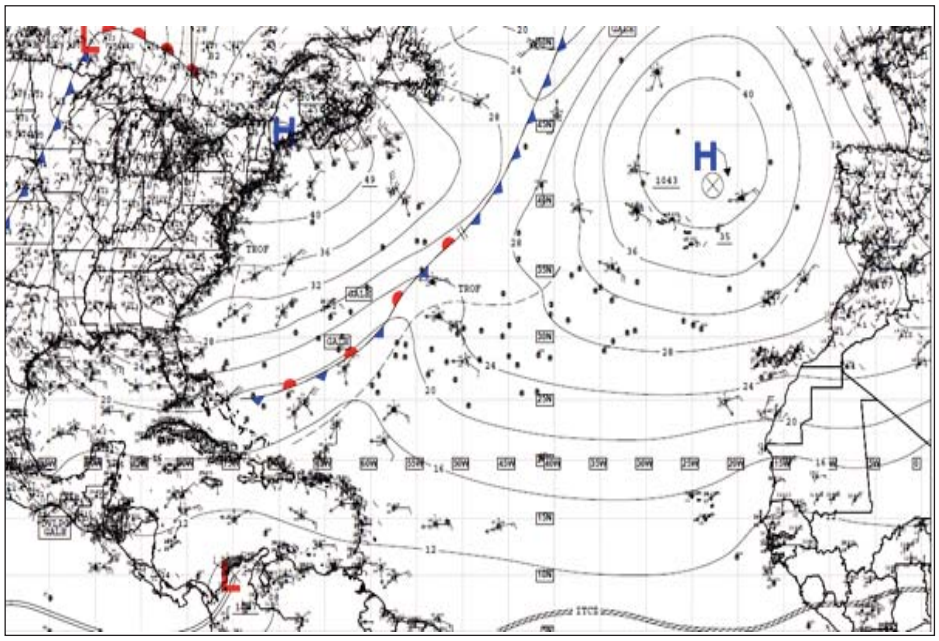

Figure 2. NWS Unified Surface Analysis for 1800 UTC 25 November showing cold front stretched from the central Atlantic to southeast of Bermuda to the central Bahamas. A 1046 hPa high across New England helped to produce a strong pressure gradient along and northwest of the stalled front, where gales developed earlier in the day. Gale labels indicate general areas of NHC Gale Warnings.

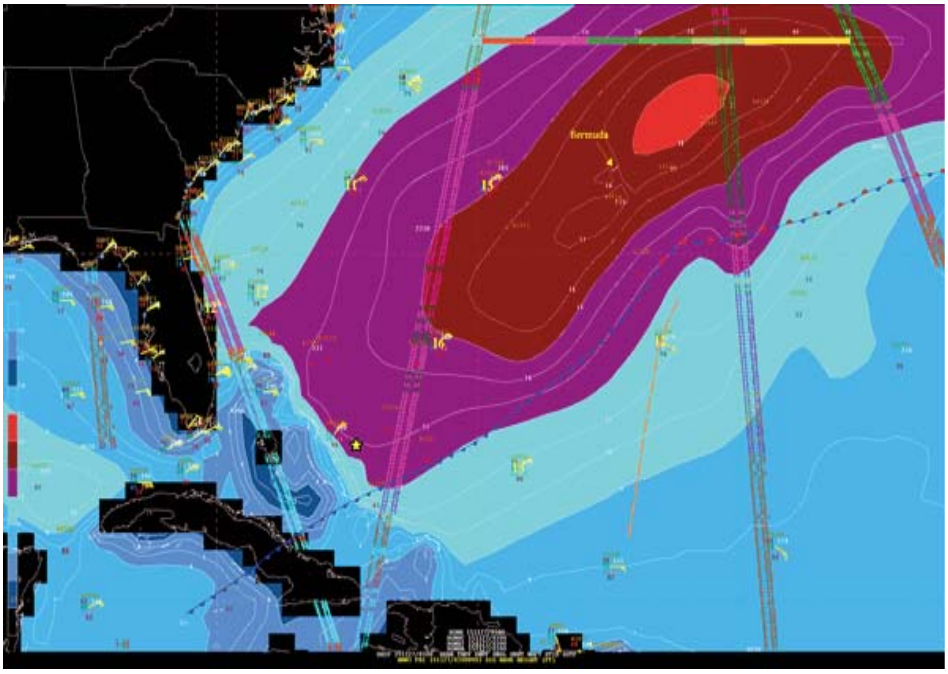

Figure 3. TAFB screen capture showing NOAA WW3 initial conditions at 0000 UTC 27 November, with color coded SWH scale in ft at left. Buoy and ship wind observations appear as yellow colored wind flags, while buoy SWH, is indicated by large yellow numerals in ft. Also shown are several recent polar orbiting altimeter measurements, with color scale bar at top in ft, where pink numerals depict 11-16 ft (3.4-4.9m), and dark green 16-20 ft (4.9-6m). Note the extensive area of 12+ ft in purple and maximum SWH of 20 ft northeast of Bermuda, where 40 kts gales prevailed. Yellow star denotes 0340 UTC position of MSC DIVINA.

Figure 4 shows a 0315 UTC GOES-E IR satellite image with **DIVINA** position indicated by the yellow star, and estimated post analysis of the frontal position. Note the bright green colored cloud tops of -50 to -55 deg C, depicting strong thunderstorms moving southeastward towards the Bahamas and the **DIVINA**. **Figure 5** shows an ASCAT wind data composite from 0100-0300 UTC across the broader region, with 0300 UTC surface observations, and cold frontal position at 00 UTC. Inset at bottom right is a blow up of central Bahamas region and **DIVINA** location, where ASCAT wind data from 0154 to 0240 UTC clearly identifies the gale force downdraft winds being produced by the cluster of strong convection approaching the **DIVINA**. The ASCAT data suggest winds in the 30-45 kts range, with a few wind flags identified as potentially rain contaminated by the closed circle at base of flag. Given the height of the anemometer on a cruise ship such as the **DIVINA**, the 64 kts reading on the ship information channel is certainly possible. Additionally, the **WESTERDAM** (PINX) also reported NE winds of 60 kts in this same area at 0600 UTC. The combination of prevailing large northeast swell and wind driven seas generated by these squalls and thunderstorms certainly would be capable of producing seas of 19 ft (6 m) as the **TROPIC SUN** reported.

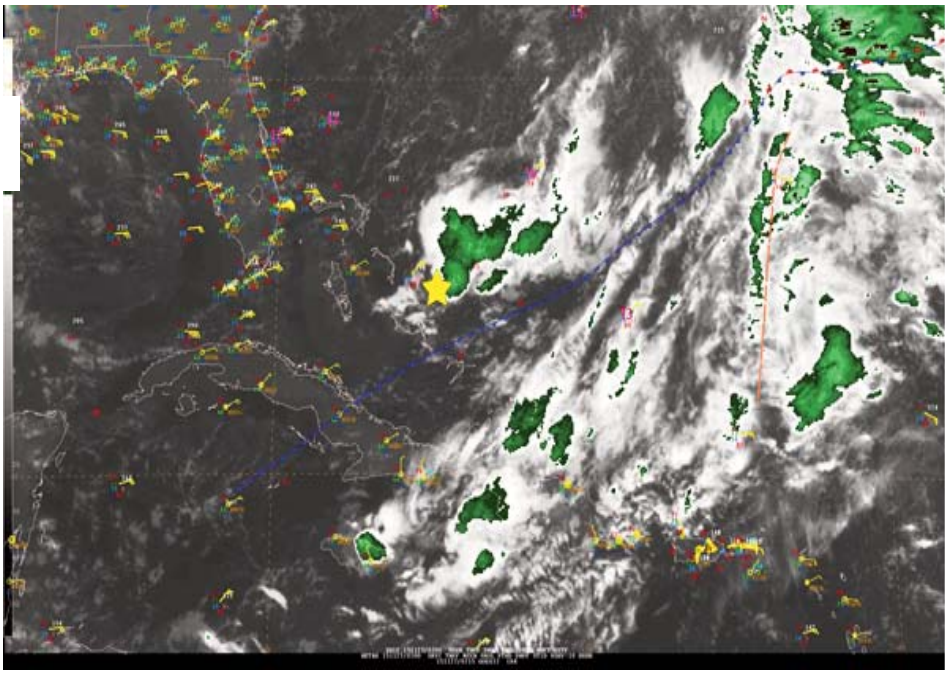

Figure 4. TAFB screen capture showing GOES-13 0315 UTC IR image, with color temperature scale at left in deg C. Surface metar, buoy, and ship observations in yellow colored wind flags. Note green cloud tops to the E and NE of MSC DIVINA, yellow star, indicating high cloud tops and very strong convection.

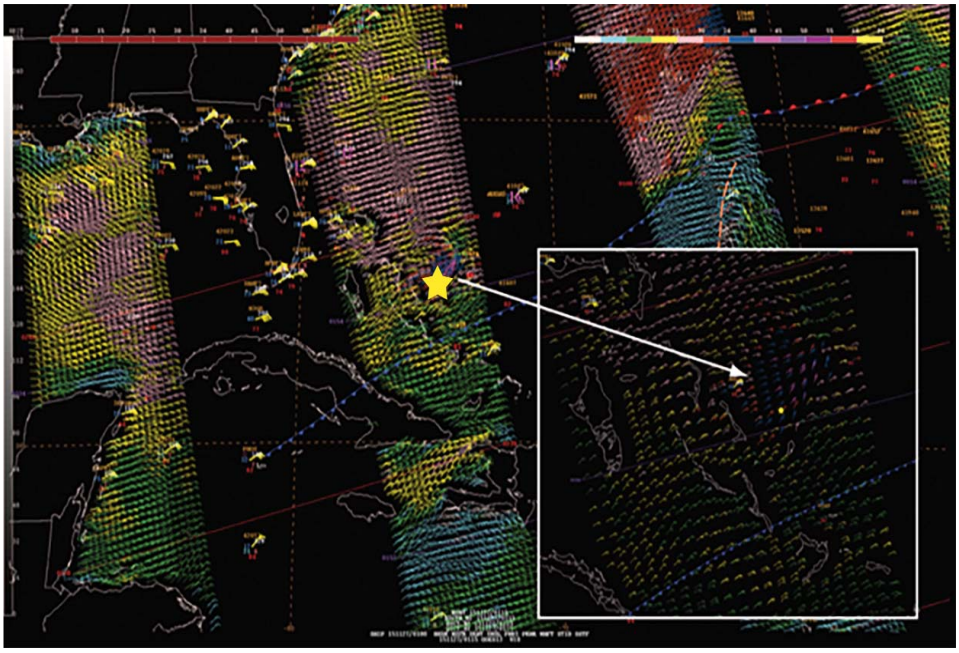

Figure 5. TAFB screen capture showing 27 November 0000 through 0330 UTC compilation of scatterometer wind data in multi colored wind barbs, with legend at top right (kts), and buoy, C-MAN and ship observations in yellow colored wind flags. 0300 UTC buoy SWH indicated in large magenta numerals (ft). Inset at bottom right shows 0154-240 UTC ASCAT data depicting area of NE gales produced by outflow of strong convection moving into area. 0340 UTC location of MSC Divina shown by yellow star. In the inset, red colored wind flags indicate 30-34 kts, dark blue 34-40 kts, and pink 40-45 kts respectively.

Remember that NWS wave forecasts provide the SWH, which by definition is the average of the highest 33% of all waves. When considering the full statistical spectrum of sea state, the highest 10% of all waves is 1.27 x SWH, and maximum wave height equals 2 x SWH. Thus given the wave to wave interaction occurring between the prevailing large NE swell and the steep waves generated by the squalls and thunderstorms that night, the reported 30 ft wave is well within the range of wave heights statistically expected with this scenario.

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

The fall and winter months are an active time for gale and storm force wind events in this portion of the Eastern North Pacific Ocean. This tabulation is for the time period of 1 September to 31 December 2015. The majority of the events typically occur in the Gulf of Tehuantepec. This 2015 fall season, had 10 Gulf of Tehuantepec gale and storm events, one (1) Gulf of California gale event, and one (1) Gulf of Papagayo gale event. **Table 2** provides details on these events.

Table 2. Non-tropical cyclone Warnings issued for the Pacific Basin between 01 Sep 2015 and 31 Dec 2015.

ONSET	REGION	PEAK WIND (kts)	GALE / STORM DURATION
1200 UTC 15 Oct	Gulf of Tehuantepec	35	138 hr
0600 UTC 26 Oct	Gulf of Tehuantepec	35	18 hr
0600 UTC 09 Nov	Gulf of Tehuantepec	35	12 hr
1200 UTC 13 Nov	Gulf of Tehuantepec	40	90 hr
0600 UTC 20 Nov	Gulf of Tehuantepec	35	30 hr
0600 UTC 22 Nov	Gulf of Tehuantepec	50	42 hr / 36 hr
1200 UTC 28 Nov	Gulf of Tehuantepec	35	06 hr
1200 UTC 29 Nov	Gulf of Tehuantepec	40	30 hr
1200 UTC 03 Dec	Gulf of Tehuantepec	50	48 hr / 30 hr
1800 UTC 18 Dec	Gulf of Tehuantepec	50	48 hr / 18 hr
0000 UTC 27 Dec	Gulf of California	35	18 hr
0600 UTC 27 Dec	Gulf of Papagayo	35	06 hr

Ship reports received through the **Voluntary Observing Ship** (VOS) program are a vital source of data in verifying gale and storm events. Some select ship reports that directly verified some of this season's gales are listed in **Table 3**.

Table 3. Ship reports that verified gale events over the Gulf of Tehuantepec and Gulf of Papagayo between 01 Sep 2015 and 31 Dec 2015.

SHIP	CALL SIGN	WIND SPEED and SEAS	LOCATION	DATE / TIME
Amsterdam	PBAD	38 kts / 3 ft (1 m)	15.6N 95.7W	1700 UTC 23 Nov
Tasman Crusader	A8NQ7	40 kts 10 ft (3 m)	14.6N 94.9.4W	1800 UTC 23 Nov
Amsterdam	PBAD	40 kts 16 ft (5 m)	15.2N 94.4W	0400 UTC 24 Nov

SHIP	CALL SIGN	WIND SPEED and SEAS	LOCATION	DATE / TIME
Pazifik	ZDKS7	35 kts	13.8N 96.5W	1200 UTC 24 Nov
Cap Palliser	A8OH4	38 kts	14.4N 94.3W	1200 UTC 04 Dec
CSCL Dalian	VRBH4	39 kts 16 ft (5 m)	14.3N 95.8W	1800 UTC 04 Dec
Alliance Fairfax	WLMQ	45 kts 16 ft (5 m)	13.1N 96.2W	1300 UTC 06 Dec
Regatta	V7DM3	50 kts	10.9N 86.6W	0700 UTC 27 Dec
Island Princess	ZCDG4	39 kts 7 ft (2 m)	11.3N 86.2W	1100 UTC 27 Dec

The Gulf of Tehuantepec wind events are usually driven by mid-latitude cold frontal passages through the narrow Chivela Pass in the Isthmus of Tehuantepec between the Sierra Madre de Oaxaca Mountains on the west and the Sierra Madre de Chiapas Mountains on the east. The northerly winds from the southwest Gulf of Mexico funnel through the pass delivering stronger winds into the Gulf of Tehuantepec. The events are of various duration with the longer events associated with reinforcing secondary cold fronts in the Gulf of Mexico. The events are usually void of precipitation in the Gulf of Tehuantepec, thus scatterometer passes are not rain contaminated and wind retrievals are of the highest quality. The Gulf of Tehuantepec gale and storm events for the 2015 season totaled 546 hours, a 10% decrease from last season's 606 hours. The 2013 season had a very active 642 hours. The 2012 and 2011 seasons had 492 hours. The first storm event of the season occurred on 23-24 November 2015. Gale force northerly winds in thesouthwest Gulf of Mexico behind a cold front funneled through the Chivela Pass resulting in a storm event in the Gulf of Tehuantepec (**Figure 6**).

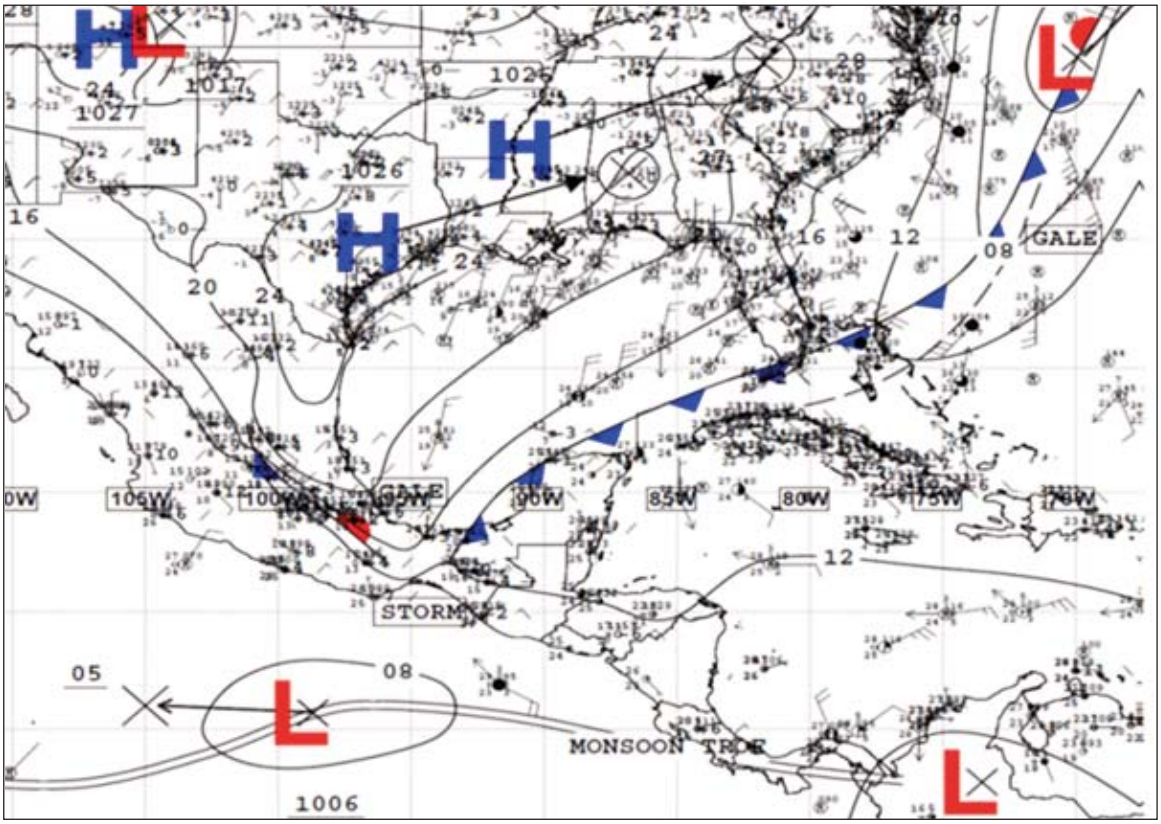

Figure 6. National Weather Service Unified Surface Analysis (USA) valid 0600 UTC 23 November 2015.

Note that the 1026 hPa High over southeast Texas significantly increased the surface pressure gradient over the Isthmus of Tehuantepec. This wind event commenced at 1800 UTC 22 November 2015 as a gale. Winds increased to storm force 12 hours later and lasted until 24 November 1800 UTC when winds once again decreased to gale force. The event ended on 26 November 0000 UTC and lasted a total of 78 hours, one of the longest events of the season thus far.

A European Advanced Scatterometer (ASCAT A) pass captured the gale portion of the event in both the Bay of Campeche and the Gulf of Tehuantepec (**Figure 7**). A large gale area was depicted over the Gulf of Tehuantepec surrounded by a larger area of 20-30 kts winds. Gale force winds extended southward to 14N between 94W and 96W. The **TASMAN CRUSADER** (A8NQ7), the **AMSTERDAM** (PBAD), and the **PAZIFIK** (ZDKS7) traversed the area and reported gale force winds on 23 November and 24 November 2015.

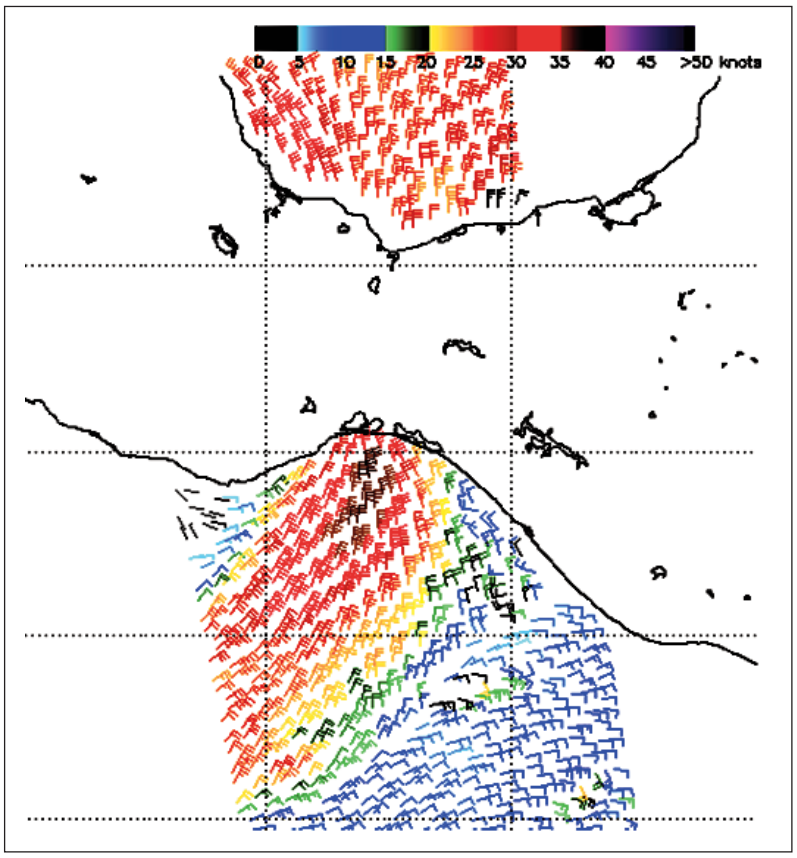

Figure 7. European Advanced Scatterometer (ASCAT A) pass valid at 0400 UTC 23 November 2015. Note the 40-45 kts wind barbs south of the Gulf of Tehuantepec near 15N95W.

The Gulf of Papagayo gap wind events are usually driven by strong Caribbean Sea trade winds that traverse the San Juan River valley and the southern portion of Lake Nicaragua to the Pacific Ocean. Winds in the Gulf of Papagayo during these events are usually less than gale force. The winds are further enhanced by nocturnal and early morning drainage flow. On rare occasions, a strong cold front reaches the coast of southern Nicaragua and funnels stronger winds through the gap. These winds on occasional reach gale force in the Gulf of Papagayo.

The **REGATTA** (V7DM3) and the **ISLAND PRINCESS** (ZCDG4) reported gale force winds on 27 December 2015. A WindSat scatterometer pass captured the wind event in the Gulf of Papagayo. (**Figure 8**). WindSat is a polar orbiting satellite with a microwave radiometer developed by the U.S. Navy. The satellite was launched on a Titan II rocket from Vandenburg Air Force Base California on 6 Jan 2003. The satellite was built for a three year lifetime that it handily exceeded.

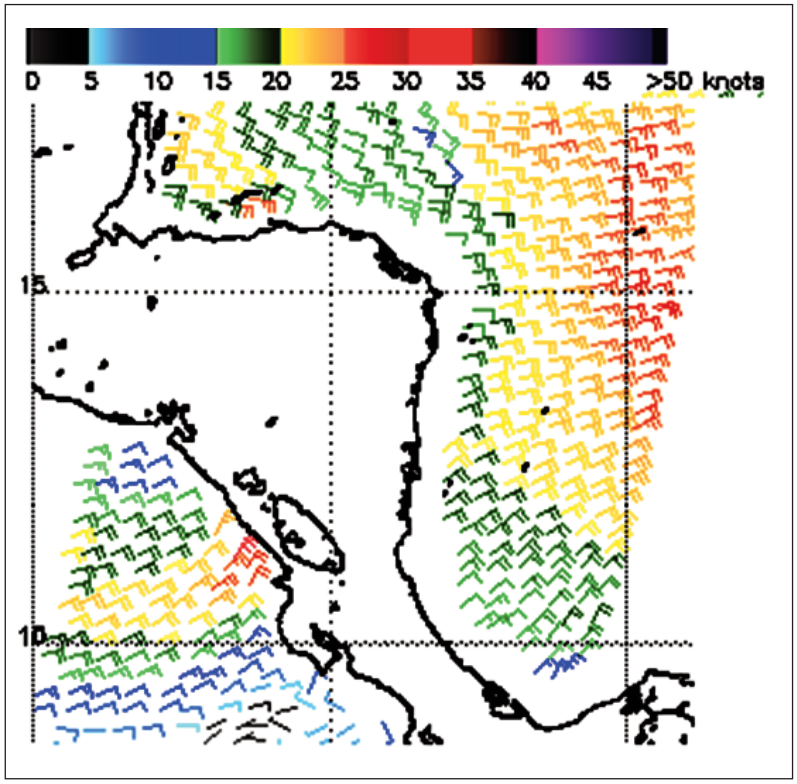

Figure 8. WindSat Scatterometer pass valid at 1158 UTC 27 December 2015. Note the 25-30 kts wind barbs over the Gulf of Papagayo.

References

1. http://www.seatrade-cruise.com/news/news-headlines/freak-wave-causes-minor-damage-to-msc-divina-cruise-unaffected.html

National Weather Service
VOS Program New Recruits:
November 1, 2015 through February 29, 2016

SHIP NAME	CALL SIGN
AMALTHEA	CQDE
ATLANTIC GRACE	V7UX9
CLIPPER KYTHIRA	V7JJ2
HAMMONIA HUSUM	HUSUM
ISLA BELLA	WTOI
MOL EMPIRE	VRGE7
NORWEGIAN ESCAPE	C6BR3
SAGA ENTERPRISE	VRCC8
SPICA	A8QJ5

Got Weather Photo Submissions

Weather Images from Our Readers:

This photograph was taken at West-central Gulf of Mexico,
Lat 27-02N Long 094-54 W, on board the **DEEPWATER CHAMPION**
by Mr. Douglas Banfield, Master of **DEEPWATER CHAMPION**-Transocean

This was the leading edge of a cold front on November 21, 2015.

Pre-frontal winds of 12-15 kts were out of the South. The wind veered just after this image was taken to NNW at 15 kts, then filled in within 2 hours to NNW at 40 kts with gusts to 50 kts. Winds and Seas stayed up for 12 hours then started to ease to 25-30 kts from the NNE. Maximum Sea Height observed was approximately 12 ft.

VOS Program
Cooperative Ship Report:
November 1, 2015 through February 29, 2016

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ADRIAN MAERSK	OXLD2	A	New York City	4	0									26	4	34
ADVENTURE OF THE SEAS	C6SA3	A	Miami	0	0									0	0	0
ADVENTURER	WBN3015	A	Jacksonville	0	0									0	0	0
ALASKA MARINER	WSM5364	A	Anchorage	29	8									0	0	37
ALASKA TITAN	WDE4789	A	Anchorage	40	1									16	15	72
ALASKAN EXPLORER	WDB9918	A	Anchorage	39	29									38	54	160
ALASKAN FRONTIER	WDB7815	A	Anchorage	42	58									45	23	168
ALASKAN LEADER	WDB7198	A	Anchorage	2	1									2	0	5
ALASKAN LEGEND	WDD2074	A	Anchorage	53	71									57	31	212
ALASKAN NAVIGATOR	WDC6644	A	Anchorage	25	174									89	76	364
ALBEMARLE ISLAND	C6LU3	A	Miami	12	15									28	40	95
ALERT	WCZ7335	A	Anchorage	0	4									0	7	11
ALGOLAKE	VCPX	A	Duluth	1	0									5	6	12
ALGOMA GUARDIAN	CFK9698	A	Duluth	0	0									33	33	66
ALGOMA MARINER	CFN5517	A	Duluth	7	0									0	0	7
ALGOMA NAVIGATOR	VGMV	A	Duluth	0	0									8	0	8
ALLIANCE FAIRFAX	WLMQ	A	Jacksonville	31	11									34	27	103
ALLIANCE NORFOLK	WGAH	A	Jacksonville	0	0									14	0	14
ALLIANCE ST LOUIS	WGAE	A	Charleston	0	19									42	13	74
ALLURE OF THE SEAS	C6XS8	A	Miami	35	42									58	39	174
ALPENA	WAV4647	A	Duluth	0	0									123	4	127
AM HAMBURG	V7ZZ5	A	Anchorage	0	0									0	0	0
AMALTHEA	CQDE	A	New York City	0	0									0	0	0
AMERICAN CENTURY	WDD2876	A	Duluth	91	0									261	238	590
AMERICAN COURAGE	WDD2879	A	Duluth	0	0									17	9	26
AMERICAN INTEGRITY	WDD2875	A	Duluth	6	0									36	20	62
AMERICAN MARINER	WQZ7791	A	Duluth	0	0									58	23	81
AMERICAN SPIRIT	WCX2417	A	Duluth	0	0									0	0	0
AMSTERDAM	PBAD	A	Anchorage	165	79									143	125	512
ANDROMEDA VOYAGER	C6FZ6	A	Anchorage	50	37									66	31	184
APL AGATE	WDE8265	A	Charleston	28	29									20	42	119
APL ANTWERP	3FRT9	A	Charleston	0	0									0	0	0
APL BELGIUM	WDG8555	A	New York City	65	54									50	63	232
APL CHINA	WDB3161	A	Los Angeles	0	28									68	5	101
APL CORAL	WDF6832	A	Charleston	33	10									8	17	68
APL CYPRINE	WDE8293	A	Charleston	0	0									0	0	0
APL HOLLAND	9VKQ2	A	Los Angeles	0	0									0	0	0
APL JAPAN	9V2165	A	Charleston	0	0									0	0	0
APL KOREA	WCX8883	A	Los Angeles	26	52									49	76	203

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
APL PHILIPPINES	WCX8884	A	Los Angeles	30	19									25	42	116
APL SCOTLAND	9VDD3	A	New York City	38	28									33	15	113
APL SINGAPORE	WCX8812	A	Los Angeles	76	81									110	81	348
APL THAILAND	WCX8882	A	Los Angeles	11	41									16	51	119
APL TOURMALINE	9VVP	A	Charleston	0	0									0	0	0
AQUARIUS VOYAGER	C6UC3	A	Jacksonville	5	7									24	36	72
ARCTIC BEAR	WBP3396	A	Anchorage	0	0									0	0	0
ARCTIC TITAN	WDG2803	A	Anchorage	21	3									1	10	35
ARCTURUS VOYAGER	C6YA7	A	Anchorage	40	37									62	91	230
ARI CRUZ	WDG9588	A	Anchorage	0	0									0	0	0
ARIES VOYAGER	C6UK7	A	Anchorage	39	9									7	36	72
ARNOLD MAERSK	OXES2	A	Seattle	0	37									0	7	44
ARTHUR MAERSK	OXJH2	A	New York City	0	0									0	0	0
ASHKINI SPIRIT	C6WJ9	A	Anchorage	125	158									0	89	372
ASIAN KING	3FYS8	A	Charleston	0	0									0	0	0
ATLANTIC BREEZE	VRDC6	A	Anchorage	0	0									0	0	0
ATLANTIC CARTIER	SCKB	A	Norfolk	35	35									26	27	123
ATLANTIC EXPLORER (AWS)	WDC9417	A	Anchorage	32	0									64	201	297
ATLANTIC GEMINI	VRDO9	A	Anchorage	0	0									0	0	0
ATLANTIC GRACE	VRDT7	A	Anchorage	0	0									0	0	0
ATLANTIC GRACE	V7UX9	A	New Orleans	0	0									3	6	9
ATLANTIC HOPE	VRDT5	A	Baltimore	54	26									46	50	176
ATLANTIC ROSE	VREF7	A	Anchorage	26	15									0	0	41
ATLANTIS (AWS)	KAQP	A	Anchorage	0	10									649	221	880
ATTENTIVE	WCZ7337	A	Kodiak	16	5									0	1	22
AURORA	WYM9567	A	Anchorage	75	0									102	103	280
AURORA LEO	V7GI7	A	Anchorage	0	0									0	0	0
AURORA TAURUS	V7EX3	A	Anchorage	9	14									0	0	23
AVIK	WDB7888	A	Anchorage	0	0									0	0	0
AWARE	WCZ7336	A	Kodiak	22	7									16	0	45
AXEL MAERSK	OUUY2	A	New York City	18	19									0	30	67
BADGER	WBD4889	A	Duluth	0	0									0	0	0
BALTIC COVE	A8VG9	A	Anchorage	0	0									0	0	0
BALTIC LEOPARD	V8VG9	A	Anchorage	8	0									15	16	39
BALTIC WOLF	V7QX8	A	Anchorage	0	0									0	0	0
BANSUI	3FMI5	A	Los Angeles	0	0									0	0	0
BARBARA FOSS	WYL4318	A	Anchorage	0	0									0	0	0
BARRINGTON ISLAND	C6QK	A	Miami	26	28									66	31	151
BBC TASMANIA	V2CZ2	A	Charleston	0	0									0	0	0
BELL M. SHIMADA (AWS)	WTED	A	Seattle	440	479									0	0	919
BERGE NANTONG	VRBU6	A	Anchorage	48	16									66	38	168
BERGE NINGBO	VRBQ2	A	Anchorage	0	17									31	38	86
BEARING LEADER	WDC7227	A	Anchorage	0	1									2	0	3
BERLIAN EKUATOR	HPYK	A	Anchorage	0	0									15	0	15
BERNARDO QUINTANA A.	C6KJ5	A	New Orleans	77	71									72	78	298

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BILLIE H.	WCY4992	A	Anchorage	0	0									0	0	0
BISMARCK SEA	WDE5016	A	Anchorage	4	3									0	0	7
BLS ABILITY	ELXX8	A	Anchorage	0	0									3	0	3
BLS LIWA	VREF5	A	Anchorage	61	34									0	0	95
BLUEFIN	WDC7379	A	Seattle	0	0									0	0	0
BOLD HORIZON	WKWB		Los Angeles	0	0									0	0	0
BOMAR QUEST	V7JX5	A	Anchorage	0	0									0	0	0
BRILLIANCE OF THE SEAS	C6SJ5	A	Miami	0	0									0	0	0
BRISTOL LEADER	WDE7168	A	Anchorage	0	0									1	0	1
BUCCANEER	WYW5588	A	Kodiak	0	0									0	1	1
BUFFALO	WXS6134	A	Duluth	3	0									70	62	135
BULK SPAIN	A8VL9	A	Anchorage	43	25									0	0	68
BULWARK	WBN4113	A	Anchorage	6	5									17	8	36
BURNS HARBOR	WDC6027	A	Duluth	35	0									31	63	129
CALIFORNIA VOYAGER	WDE5381	A	New Orleans	17	7									15	12	51
CALUMET	WDE3568	A	Duluth	0	0									39	2	41
CAPRICORN VOYAGER	C6UZ5	A	Anchorage	28	65									2	73	168
CAPT. STEVEN L. BENNETT	KAXO	A	Houston	57	0									0	0	57
CARNIVAL BREEZE	3FZO8	A	Miami	3	0									6	11	20
CARNIVAL CONQUEST	3FPQ9	A	Miami	0	0									6	6	12
CARNIVAL DREAM	3ETA7	A	Jacksonville	59	94									5	32	190
CARNIVAL ECSTASY	H3GR	A	Miami	48	58									361	227	694
CARNIVAL ELATION	3FOC5	A	New Orleans	28	9									12	15	64
CARNIVAL FANTASY	H3GS	A	Charleston	35	9									35	57	136
CARNIVAL FASCINATION	C6FM9	A	Jacksonville	7	11									13	12	43
CARNIVAL FREEDOM	3EBL5	A	Miami	10	11									7	11	39
CARNIVAL GLORY	3FPS9	A	Miami	53	37									54	67	211
CARNIVAL IMAGINATION	C6FN2	A	Miami	33	27									11	16	87
CARNIVAL INSPIRATION	C6FM5	A	Los Angeles	30	0									36	45	111
CARNIVAL LEGEND	H3VT	A	Miami	225	372									59	160	816
CARNIVAL LIBERTY	HPYE	A	Jacksonville	0	0									0	0	0
CARNIVAL MAGIC	3ETA8	A	Houston	19	9									0	34	62
CARNIVAL MIRACLE	H3VS	A	Seattle	0	22									77	31	130
CARNIVAL PARADISE	3FOB5	A	Miami	34	0									2	16	52
CARNIVAL PRIDE	H3VU	A	Jacksonville	8	8									9	13	38
CARNIVAL SENSATION	C6FM8	A	Jacksonville	0	0									1	0	1
CARNIVAL SPLENDOR	3EUS	A	Anchorage	3	18									11	19	51
CARNIVAL SUNSHINE	C6FN4	A	Jacksonville	34	27									41	34	136
CARNIVAL TRIUMPH	C6FN5	A	Houston	0	10									0	0	10
CARNIVAL VALOR	H3VR	A	Jacksonville	30	5									43	26	104
CARNIVAL VICTORY	3FFL8	A	Miami	9	21									2	5	37
CAROLINE MAERSK	OZWA2	A	Seattle	25	15									23	37	100
CASON J. CALLAWAY	WDH7556	A	Duluth	2	0									40	37	79
CASTOR VOYAGER	C6UZ6	A	Anchorage	38	33									0	17	88
CELEBRITY CONSTELLATION	9HJI9	A	Miami	316	170									293	347	1136

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CELEBRITY ECLIPSE	9HXC9	A	Miami	300	261									218	303	1082
CELEBRITY EQUINOX	9HXD9	A	Miami	0	0									0	0	0
CELEBRITY INFINITY	9HJD9	A	Miami	81	27									54	138	300
CELEBRITY MILLENNIUM	9HJF9	A	Anchorage	235	159									139	253	786
CELEBRITY REFLECTION	9HA3047	A	Miami	85	78									65	82	310
CELEBRITY SILHOUETTE	9HA2583	A	Miami	132	106									126	132	496
CELEBRITY SOLSTICE	9HRJ9	A	Seattle	194	150									207	201	752
CELEBRITY SUMMIT	9HJC9	A	Miami	24	28									22	23	97
CENTURION	WBN3022	A	Jacksonville	0	0									0	0	0
CHARLES ISLAND	C6JT	A	Miami	45	28									50	49	172
CHARLESTON EXPRESS	WDD6126	A	Houston	66	50									81	155	352
CHENEGA	WDC3997	A	Anchorage	0	0									0	0	0
CHUKCHI SEA	WDE2281	A	Anchorage	0	0									0	0	0
CLIPPER KYTHIRA	V7JJ2	A	New Orleans	1	61									0	0	62
CMB BIWA	ONED	A	Anchorage	0	0									0	0	0
CMB MAXIME	VRHM4	A	Anchorage	0	0									0	0	0
COASTAL NOMAD	WDC6439	A	Anchorage	13	1									1	8	23
COASTAL PROGRESS	WDC6363	A	Anchorage	4	5									0	2	11
COASTAL TRADER	WSL8560	A	Anchorage	3	10									2	1	16
COASTAL VENTURE	WDF3547	A	Charleston	0	0									0	0	0
COLUMBIA	WYR2092	A	Anchorage	0	0									0	0	0
COLUMBINE MAERSK	OUHC2	A	Norfolk	0	0									43	2	45
CORBIN FOSS	WDB5265	A	Anchorage	0	0									3	0	3
CORNELIA MAERSK	OWWS2	A	New York City	12	2									29	16	59
CORWITH CRAMER	WTF3319	A	Anchorage	0	0									5	40	45
COSCO DEVELOPMENT	VRIZ9	A	Anchorage	0	0									0	6	6
COSTA ATLANTICA	IBLQ	A	Miami	0	0									0	0	0
COSTA FASCINOSA	ICPO	A	Anchorage	0	0									0	0	0
COSTA FORTUNA	IBNY	A	Miami	74	66									48	38	226
COSTA LUMINOSA	ICGU	A	Miami	0	0									0	0	0
COSTA MEDITERRANEA	IBCF	A	Anchorage	0	0									19	0	19
COURAGE	WDC6907	A	Baltimore	0	0									0	0	0
CROSS POINT	WDA3423	A	Anchorage	0	0									5	0	5
CRYSTAL MARINE	9VIC4	A	Anchorage	3	3									13	8	27
CRYSTAL SUNRISE	9V2024	A	Anchorage	20	4									16	22	62
CS RELIANCE	V7CZ2	A	Baltimore	31	76									0	0	107
CSAV LONCOMILLA	VRFB3	A	Charleston	0	0									13	1	14
CSAV LUMACO	VRFB5	A	Charleston	0	0									0	0	0
CSCL MANZANILLO	VRFO2	A	Anchorage	0	0									0	0	0
CSCL MELBOURNE	VRBI8	A	Anchorage	151	436									10	1	598
CSCL SYDNEY	VRBH9	A	Norfolk	0	11									0	4	15
CSL ASSINIBOINE	VCKQ	A	Duluth	4	0									8	8	20
CSL LAURENTIEN	VCJW	A	Duluth	21	0									7	6	34
CSL ST-LAURENT	CFK5152	A	Duluth	0	0									12	3	15
CWB MARQUIS	XJBO	A	Duluth	0	0									1	1	2

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CYGNUS VOYAGER	CO6B	A	San Francisco	0	0									0	0	0
DANIEL FOSS	WTS3171	A	Anchorage	0	0									0	0	0
DARYA SHREE	VRZZ2	A	Anchorage	0	0									0	0	0
DARYA TARA	VRWS5	A	Anchorage	0	0									0	0	0
DEEPWATER CHAMPION	YJVM9	A	Houston	52	35									76	59	222
DEFENDER	WBN3016	A	Jacksonville	0	0									0	0	0
DELIVERANCE	WDE2632	A	Kodiak	0	0									0	0	0
DEPENDABLE	V7DI6	A	Baltimore	0	0									0	0	0
DIANE H	WUR7250	A	Anchorage	0	0									0	0	0
DISCOVERER CLEAR LEADER	V7MO2	A	Houston	121	114									118	96	449
DISCOVERER DEEP SEAS	V7HC6	A	Houston	189	10									154	183	536
DISCOVERER INSPIRATION	V7MO3	A	Houston	24	25									73	50	172
DISCOVERER SPIRIT	V7HC8	A	Houston	0	0									0	0	0
DISNEY DREAM	C6YR6	A	Jacksonville	4	44									63	43	155
DISNEY FANTASY	C6ZL6	A	Jacksonville	10	7									1	40	58
DISNEY MAGIC	C6PT7	A	Jacksonville	41	50									41	61	193
DISNEY WONDER	C6QM8	A	Miami	36	16									55	54	161
DOMINATOR	WBZ4106	A	Anchorage	18	42									0	0	60
DUNCAN ISLAND	C6JS	A	Miami	44	10									40	1	95
EAGLE ATLANTA	S6TE	A	Houston	76	74									5	23	178
EAGLE AUSTIN	S6TB	A	Houston	0	0									0	0	0
EAGLE BALTIMORE	9VHG	A	New York City	28	7									34	36	105
EAGLE KANGAR	9V8472	A	Houston	0	0									0	0	0
EAGLE KLANG	9V8640	A	Houston	0	0									0	0	0
EAGLE KUANTAN	9V8376	A	Houston	0	2									0	0	2
EAGLE KUCHING	9V8132	A	Houston	20	0									41	55	116
EAGLE MILAN	3FBJ6	A	Anchorage	0	0									0	0	0
EAGLE SIBU	9VIJ3	A	New York City	21	9									0	84	114
EAGLE STAVANGER	3FNZ5	A	Houston	18	22									55	1	96
EAGLE SYDNEY	3FUU	A	New York City	0	0									0	0	0
EAGLE TAMPA	S6NK6	A	Houston	0	0									0	0	0
EAGLE TOLEDO	S6NK3	A	Houston	0	0									0	0	0
EAGLE TORRANCE	9VMG5	A	Houston	27	0									144	45	216
EAGLE TUCSON	S6NK5	A	Houston	30	15									84	48	177
EAGLE TURIN	9VMG6	A	Houston	0	0									0	0	0
EDGAR B. SPEER	WDH7562	A	Duluth	128	0									174	226	528
EDWIN H. GOTT	WDH7558	A	Duluth	77	0									11	68	156
EL YUNQUE	WGJT	A	Jacksonville	21	28									21	25	95
EMPIRE STATE	KKFW	A	New York City	0	0									0	0	0
ENCHANTMENT OF THE SEAS	C6FZ7	A	Jacksonville	0	0									0	0	0
ENDEAVOR (AWS)	WCE5063	A	New York City	607	650									386	0	1643
ENDURANCE	WDE9586	A	Baltimore	21	58									38	59	176
ENDURANCE	WDF7523	A	Anchorage	16	0									20	18	54
ENSIGN	WBN3012	A	Jacksonville	0	0									0	0	0
EOT SPAR	WDE9193	A	Miami	44	23									46	47	160

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ERNEST N	A8PQ6	A	Anchorage	49	36									37	79	201
EURODAM	PHOS	A	Miami	60	58									195	43	356
EURUS LISBON	A8MI2	A	New Orleans	0	0									0	0	0
EURUS LONDON	A8MH7	A	New Orleans	0	0									0	0	0
EVER DAINTY	9V7951	A	Baltimore	15	10									19	25	69
EVER DECENT	9V7952	A	New York City	45	52									66	18	181
EVER DELIGHT	3FCB8	A	New York City	12	0									0	0	12
EVER DEVELOP	3FLF8	A	New York City	14	12									11	9	46
EVER DEVOTE	9V7954	A	New York City	0	0									0	12	12
EVER DIADEM	9V7955	A	New York City	0	32									47	48	127
EVER DYNAMIC	3FUB8	A	New York City	81	1									94	114	295
EVER EAGLE	ZNZH6	A	Seattle	4	2									10	13	29
EVER EXCEL	VSXV3	A	Los Angeles	16	26									13	13	68
EVER LASTING	2FRK7	A	New York City	0	0									0	0	0
EVER LEADING	2FRK8	A	Norfolk	38	8									1	27	74
EVER LEGACY	9V9290	A	New York City	18	33									0	0	51
EVER LEGEND	9V9724	A	New York City	0	0									0	55	55
EVER LISSOME	2HDG3	A	New York City	0	0									32	5	37
EVER LIVEN	BKIE	A	New York City	3	0									22	0	25
EVER SAFETY	3EMQ4	A	Anchorage	2	3									3	3	11
EVER SALUTE	3ENU5	A	Anchorage	0	0									0	0	0
EVER SHINE	MJKZ4	A	Anchorage	31	1									46	36	96
EVER SMART	MLBD9	A	Anchorage	0	2									45	4	51
EVER STEADY	3EHT6	A	Anchorage	0	0									0	0	0
EVER SUMMIT	3EKU3	A	Anchorage	0	1									0	0	1
EVER SUPERB	3EGL5	A	Anchorage	15	0									5	0	20
EVER UBERTY	9V7960	A	Seattle	0	0									11	3	14
EVER ULYSSES	9V7962	A	Anchorage	0	2									0	0	2
EVER UNIFIC	9V7961	A	Anchorage	7	22									17	9	55
EVER UNION	3FFG7	A	Seattle	19	14									0	0	33
EVER UNITY	3FCD9	A	New York City	67	66									64	54	251
EVER USEFUL	3FCC9	A	Anchorage	21	7									17	9	54
EVER UTILE	3FZA9	A	Seattle	6	5									10	3	24
EVEREST SPIRIT	C6FY8	A	Anchorage	0	0									0	0	0
EVERGREEN STATE	WDE4430	A	San Francisco	0	0									0	0	0
EXCALIBUR	ONCE	A	Houston	120	106									78	93	397
EXCEL	ONAI	A	Houston	4	54									34	15	107
EXCELERATE	ONDY	A	Houston	68	58									108	108	342
EXCELLENCE	ONBG	A	Houston	0	0									0	0	0
EXCELSIOR	ONCD	A	Houston	66	68									16	62	212
EXPEDIENT	ONFY	A	Houston	0	0									0	0	0
EXPLORER	WBN7618	A	Jacksonville	0	0									16	0	16
EXPLORER OF THE SEAS	C6SE4	A	Jacksonville	0	0									0	0	0
FAIRCHEM FILLY	3EJM9	A	Anchorage	0	0									0	0	0
FAIRCHEM FRIESIAN	V7PU7	A	Anchorage	0	31									0	0	31

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
FAIRCHEM MAVERICK	V7EP2	A	Anchorage	27	46									0	39	112
FAIRCHEM MUSTANG	HPOW	A	Anchorage	0	0									0	0	0
FAIRCHEM STEED	3EBR5	A	Anchorage	0	0									0	0	0
FAIRWEATHER	WDB5604	A	Anchorage	0	0									0	0	0
FAIRWEATHER (AWS)	WTEB	A	Anchorage	0	0									209	64	273
FEDERAL BERING	V7NB6	A	Anchorage	0	1									58	3	62
FEDERAL KIVALINA	VRWK5	A	Anchorage	0	0									0	0	0
FEDERAL SCHELDE	8POF	A	Anchorage	0	0									0	0	0
FEDERAL SETO	VRZT5	A	Anchorage	0	0									0	0	0
FEDERAL SEVERN	V7WS8	A	Anchorage	0	0									0	0	0
FEDERAL TAMBO	V7YW3	A	Anchorage	0	0									0	0	0
FEDERAL TIBER	V7YW2	A	Anchorage	0	0									0	0	0
FEDERAL YUKINA	VRHN7	A	Anchorage	0	0									0	0	0
FERDINAND R. HASSLER	WTEK	A	Norfolk	0	272									0	29	301
FISH HAWK	WRB5085	A	Anchorage	0	0									3	0	3
FLORIDA VOYAGER	WDF4764	A	Baltimore	0	2									94	2	99
FREEDOM	WDB5483	A	Jacksonville	58	22									43	36	159
FREEDOM OF THE SEAS	C6UZ7	A	Jacksonville	0	2									21	17	40
FRITZI N	A8PQ4	A	Anchorage	0	0									0	1	1
G. L. OSTRANDER	WCV7620	A	Duluth	21	0									76	104	201
GENCO AUGUSTUS	VRDD2	A	Anchorage	0	0									7	66	73
GENCO CLAUDIUS	V7SY6	A	Anchorage	0	0									0	0	0
GENCO CONSTANTINE	VRDR8	A	Anchorage	0	0									0	0	0
GENCO HADRIAN	V7QN8	A	Anchorage	78	52									60	25	215
GENCO RAPTOR	V7NB8	A	Anchorage	0	0									1	0	1
GENCO THUNDER	V7LZ4	A	Anchorage	0	12									0	0	12
GENCO TIBERIUS	VRDD3	A	Anchorage	1	0									0	0	1
GENCO TITUS	VRDI7	A	Anchorage	0	0									0	0	0
GENERAL RUDDER	WTAU	A	Houston	0	0									0	0	0
GEORGE N	A8PQ5	A	Anchorage	0	1									0	0	1
GERDA MAERSK	OUJS2	A	Los Angeles	0	0									0	0	0
GLEN CANYON BRIDGE	3EFD9	A	Norfolk	20	23									36	2	81
GOLDEN BEAR	NMRY	A	San Francisco	0	0									0	0	0
GORDON GUNTER (AWS)	WTEO	A	New Orleans	160	0									0	0	160
GRANDEUR OF THE SEAS	C6SE3	A	Jacksonville	54	14									51	56	175
GREAT REPUBLIC	WDH7561	A	Duluth	2	0									77	63	142
GREEN BAY	WDI3177	A	Jacksonville	0	0									2	0	2
GREEN COVE	WDG5660	A	Baltimore	0	0									0	0	0
GREEN LAKE	WDDI	A	Jacksonville	47	44									58	48	197
GREEN RIDGE	WZZF	A	Jacksonville	0	33									0	0	33
GRETCHEN H	WDC9138	A	Anchorage	0	0									0	0	0
GSF GRAND BANKS	YJUF7	A	Houston	0	0									0	0	0
GUARD	WCY2823	A	Kodiak	0	0									0	0	0
GUARDIAN	WBO2511	A	Kodiak	14	7									2	0	23
GUARDSMAN	WBN5978	A	Anchorage	0	0									0	0	0

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
GULF TITAN	WDA5598	A	Anchorage	20	31									9	0	60
GUNDE MAERSK	OUIY2	A	Seattle	0	0									0	0	0
GUTHORM MAERSK	OUJN2	A	Los Angeles	0	0									0	0	0
H A SKLENAR	C6CL6	A	Houston	170	129									120	153	572
H. LEE WHITE	WZD2465	A	Duluth	2	0									10	28	40
HANJIN AMI	VRNF8	A	Los Angeles	34	20									0	12	66
HANJIN MILANO	V7SG8	A	New York City	9	13									6	25	53
HENRY B. BIGELOW (AWS)	WTDF	A	New York City	0	0									254	0	254
HENRY BRUSCO	WDC9691	A	Anchorage	0	0									0	0	0
HENRY GOODRICH	YJQN7	A	Houston	0	0									0	0	0
HERBERT C. JACKSON	WL3972	A	Duluth	0	0									715	255	970
HH EMILIA	D5IM6	A	Charleston	0	0									0	0	0
HI'IALAKAI (AWS)	WTEY	A	Honolulu	0	0									11	0	11
HOEGH CHIBA	LAVD7	A	Jacksonville	0	0									0	0	0
HOEGH MASAN	S6HK	A	Charleston	0	0									0	0	0
HON. JAMES L. OBERSTAR	WL3108	A	Duluth	46	0									719	744	1509
HONOR	WDC6923	A	Baltimore	24	32									23	23	102
HOOD ISLAND	C6LU4	A	Miami	23	27									39	36	125
HORIZON ANCHORAGE	KGTX	A	Anchorage	54	35									69	54	212
HORIZON CONSUMER	WCHF	A	Seattle	31	53									32	31	147
HORIZON ENTERPRISE	KRGB	A	Seattle	33	67									27	67	191
HORIZON PACIFIC	WSRL	A	Seattle	49	47									47	55	198
HORIZON RELIANCE	WFLH	A	Los Angeles	0	0									65	74	139
HORIZON SPIRIT	WFLG	A	Los Angeles	37	41									0	13	91
HORIZON TACOMA	KGTY	A	Anchorage	30	4									34	27	95
HOS ACHIEVER	YJVG4	A	Houston	0	0									0	0	0
HOUSTON	KCDK	A	Miami	0	0									2	9	11
HUNTER	WBN3744	A	Anchorage	0	3									2	4	9
HYDRA VOYAGER	C6AB8	A	Anchorage	35	11									6	6	58
IBRAHIM DEDE	V7QW6	A	New York City	15	43									0	18	76
INDEPENDENCE II	WGAX	A	Baltimore	31	28									0	18	76
INDEPENDENCE OF THE SEAS	C6WW4	A	Miami	28	8									52	49	137
INDIANA HARBOR	WXN3191	A	Duluth	0	0									0	0	0
INLAND SEAS	WCJ6214	A	Duluth	0	0									0	0	0
INTEGRITY	WDC6925	A	Baltimore	50	62									22	43	177
INTEGRITY	WDD7905	A	Anchorage	31	49									0	0	80
ISLA BELLA	WTOI	A	Jacksonville	37	55									10	18	120
IVER FOSS	WYE6442	A	Anchorage	0	0									1	0	1
IVS MERLION	S6LP5	A	Baltimore	18	0									26	15	59
JAMES L. KUBER	WDF7020	A	Duluth	0	0									113	151	264
JAMES R. BARKER	WYP8657	A	Duluth	330	0									705	703	1738
JEAN ANNE	WDC3786	A	Los Angeles	9	1									0	5	15
JENNY N	A8PQ7	A	Anchorage	84	20									0	168	272
JEWEL OF THE SEAS	C6FW9	A	Miami	0	0									0	0	0
JOHN B. AIRD	VCYP	A	Duluth	0	0									36	2	38

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
JOHN BRIX	WDD9277	A	Anchorage	0	0									0	0	0
JOHN D. LEITCH	VGWM	A	Duluth	0	0									6	2	8
JOHN G. MUNSON	WDH7557	A	Duluth	0	0									21	9	30
JONATHAN SWIFT	A8SN5	A	New York City	155	61									211	62	489
JOSEPH L. BLOCK	WXY6216	A	Duluth	400	0									606	740	1746
JUSTINE FOSS	WYL4978	A	Anchorage	33	37									6	29	105
KAAN KALKAVAN	TCTX2	A	New York City	53	26									24	28	131
KAROLINE N	A8PQ8	A	Anchorage	3	1									1	1	6
KATRINA EM	WTK2245	A	Anchorage	0	0									0	0	0
KAYE E. BARKER	WCF3012	A	Duluth	352	0									698	707	1757
KEA	D5DG4	A	Charleston	0	0									0	0	0
KENNICOTT	WCY2920	A	Anchorage	0	0									0	0	0
KESWICK	C6XE5	A	Anchorage	2	5									12	11	30
KILO MOANA	WDA7827	A	Honolulu	2	0									47	53	102
KOTA HARUM	9VFF8	A	Anchorage	0	0									0	0	0
KOTA JATI	VRWJ7	A	Anchorage	0	0									0	0	0
LAHORE EXPRESS	VRBY8	A	Anchorage	23	16									22	22	83
LAURENCE M. GOULD (AWS)	WCX7445	A	Seattle	744	696									717	744	2901
LECONTE	WZE4270	A	Anchorage	28	0									0	46	74
LEE A. TREGURTHA	WUR8857	A	Duluth	573	0									700	696	1969
LIBERTY DESIRE	V7AB6	A	Anchorage	0	0									0	0	0
LIBERTY EAGLE	WHIA	A	Houston	32	40									0	64	136
LIBERTY GLORY	WADP	A	Houston	34	51									34	63	182
LIBERTY GRACE	WADN	A	Houston	121	11									6	25	163
LIBERTY OF THE SEAS	C6VQ8	A	Miami	0	0									0	0	0
LIBERTY PRIDE	KRAU	A	Charleston	30	37									53	27	147
LIBERTY PROMISE	WWMZ	A	Jacksonville	0	0									12	22	34
LION CITY RIVER	9VJC5	A	Anchorage	0	1									11	6	18
LOIS H	WTD4576	A	Anchorage	0	0									0	0	0
LOWLANDS OPAL	ONGH	A	Baltimore	0	0									0	0	0
LOWLANDS ORCHID	ONFP	A	Anchorage	15	0									38	43	96
LOWLANDS PHOENIX	9HIY9	A	Anchorage	24	29									0	0	53
LYLA	V7QK3	A	Anchorage	0	9									0	0	9
MAASDAM	PFRO	A	Miami	130	66									227	312	735
MAERSK ATLANTA	WNTL	A	Charleston	42	46									44	56	188
MAERSK CAROLINA	WBDS	A	Charleston	47	52									32	23	154
MAERSK CHICAGO	WMCS	A	Norfolk	0	0									0	0	0
MAERSK COLUMBUS	WMCU	A	Norfolk	0	0									0	0	0
MAERSK DANANG	A8PS5	A	New York City	34	16									54	38	142
MAERSK DENVER	WMDQ	A	New York City	68	28									38	68	202
MAERSK DETROIT	WMDK	A	Norfolk	56	34									47	56	194
MAERSK HARTFORD	WMHA	A	New York City	12	0									1	5	18
MAERSK HEIWA	9V9746	A	Anchorage	2	2									2	2	7
MAERSK IDAHO	WKPM	A	New York City	37	30									1	14	82
MAERSK IOWA	KABL	A	Norfolk	30	22									36	0	88

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MAERSK JAUN	HBDD	A	Charleston	0	0									0	0	0
MAERSK KENSINGTON	WMKN	A	Charleston	29	69									1	7	106
MAERSK KENTUCKY	WKPY	A	New York City	10	10									1	17	44
MAERSK MEMPHIS	WMMK	A	Charleston	7	59									28	9	103
MAERSK MISSOURI	WAHV	A	Norfolk	26	51									12	5	94
MAERSK MONTANA	WCDP	A	New York City	80	45									1	48	174
MAERSK NIAGARA	VREO9	A	Anchorage	0	0									5	11	16
MAERSK OHIO	KABP	A	New York City	88	95									23	23	229
MAERSK PEARY	WHKM	A	Houston	104	84									88	79	355
MAERSK PITTSBURGH	WMPP	A	New York City	49	49									67	47	212
MAERSK UTAH	WKAB	A	Norfolk	0	0									0	0	0
MAERSK WESTPORT	VRFO4	A	Charleston	54	55									0	24	133
MAERSK WISCONSIN	WKPN	A	Norfolk	8	18									17	37	80
MAHIMAHI	WHRN	A	Los Angeles	2	1									26	6	35
MAIA H	WYX2079	A	Anchorage	0	0									0	0	0
MAJESTY OF THE SEAS	C6FZ8	A	Miami	29	7									21	41	98
MALASPINA	WI6803	A	Anchorage	2	0									0	0	2
MALOLO	WYH6327	A	Anchorage	2	0									0	7	9
MANISTEE	WDB6831	A	Duluth	0	0									179	8	187
MANITOWOC	WDE3569	A	Duluth	25	0									108	104	237
MANOA	KDBG	A	San Francisco	0	0									0	0	0
MANUKAI	WRGD	A	Los Angeles	81	55									48	50	234
MANULANI	WECH	A	Los Angeles	41	41									42	52	176
MARCUS G. LANGSETH (AWS)	WDC6698	A	Anchorage	715	684									679	733	2811
MARINE EXPRESS	3FHX2	A	Anchorage	0	0									9	0	9
MARVELLOUS	VRJI2	A	Baltimore	0	0									0	0	0
MATANUSKA	WN4201	A	Anchorage	1	0									0	0	1
MATSON KODIAK	KGTZ	A	Anchorage	37	63									0	0	100
MATSON PRODUCER	WJBJ	A	Jacksonville	0	0									15	4	19
MATSONIA	KHRC	A	Los Angeles	13	10									0	0	23
MAUNALEI	KFMV	A	Baltimore	32	23									33	3	96
MAUNAWILI	WGEB	A	Los Angeles	18	45									2	0	65
MEIN SCHIFF 2	9HJG9	A	Miami	0	0									0	0	0
MELVILLE (AWS)	WECB	A	Los Angeles	343	0									720	744	1807
MESABI MINER	WYQ4356	A	Duluth	417	0									693	727	1847
METTE MAERSK	OUJK2	A	Los Angeles	0	0									0	2	2
MIDNIGHT SUN	WAHG	A	Seattle	12	21									32	29	94
MIKE O'LEARY	WDC3665	A	Anchorage	0	0									0	0	0
MINERAL BEIJING	ONAR	A	Anchorage	34	40									112	52	238
MINERAL BELGIUM	VRKF5	A	Anchorage	3	0									11	0	14
MINERAL DALIAN	ONFW	A	Anchorage	26	29									49	16	120
MINERAL DRAGON	ONFN	A	Anchorage	25	16									12	26	79
MINERAL FAITH	VRKS4	A	Anchorage	55	42									42	51	190
MINERAL KYOTO	ONFI	A	Anchorage	13	1									21	21	56
MINERAL NEW YORK	ONGI	A	Anchorage	0	14									45	29	88

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MINERAL NINGBO	ONGA	A	Anchorage	73	0									13	83	169
MINERAL NOBLE	ONAN	A	Anchorage	0	0									60	39	99
MINERAL TIANJIN	ONBF	A	Anchorage	75	45									84	91	295
MISSISSIPPI VOYAGER	WDD7294	A	San Francisco	0	2									12	13	27
MOKIHANA	WNRD	A	San Francisco	37	19									26	43	125
MOKU PAHU	WBWK	A	San Francisco	0	0									0	0	0
MOL EMPIRE	VRGE7	A	Charleston	0	0									0	0	0
MOL PARADISE	9V3118	A	Anchorage	24	27									0	5	56
MONITOR	WCX9104	A	Jacksonville	0	0									0	0	0
MORNING HARUKA	A8GK7	A	Anchorage	0	3									36	8	47
MSC KINGSTON	9HA3344	A	New York City	30	13									26	34	103
MSC POESIA	3EPL4	A	Miami	0	0									0	0	0
MUKADDES KALKAVAN	V7AP5	A	New York City	33	9									35	47	124
MV GEYSIR	WDF3296	A	Norfolk	17	0									0	0	17
NAKOLO	WDD9308	A	Anchorage	0	0									1	0	1
NANCY FOSTER (AWS)	WTER	A	Charleston	0	0									0	224	224
NANUQ	WDF2026	A	Anchorage	0	0									0	0	0
NATHANIEL B. PALMER (AWS)	WBP3210	A	Seattle	744	696									628	744	2812
NATIONAL GLORY	WDD4207	A	Houston	33	25									36	52	146
NAVIGATOR	WBO3345	A	Jacksonville	0	0									0	0	0
NAVIGATOR OF THE SEAS	C6FU4	A	Houston	2	1									28	7	38
NEPTUNE VOYAGER	C6FU7	A	New Orleans	11	32									3	0	46
NEVZAT KALKAVAN	TCMO2	A	New York City	19	0									41	51	111
NIEUW AMSTERDAM	PBWQ	A	Miami	131	131									213	146	621
NOKEA	WDD6946	A	Anchorage	0	1									0	0	1
NOORDAM	PHET	A	Miami	313	129									100	121	663
NORTH STAR	KIYI	A	Seattle	12	5									40	13	70
NORTHERN VICTOR	WCZ6534	A	Anchorage	0	0									0	0	0
NORTHWEST SWAN	ZCDJ9	A	Anchorage	33	44									19	17	113
NORWEGIAN BREAKAWAY	C6ZJ3	A	New York City	48	71									62	25	206
NORWEGIAN DAWN	C6FT7	A	New Orleans	421	282									536	479	1718
NORWEGIAN EPIC	C6XP7	A	Miami	0	0									0	0	0
NORWEGIAN ESCAPE	C6BR3	A	Miami	65	49									0	2	116
NORWEGIAN GEM	C6VG8	A	Jacksonville	43	27									218	190	478
NORWEGIAN GETAWAY	C6ZJ4	A	Miami	11	14									4	12	41
NORWEGIAN JADE	C6WK7	A	Anchorage	101	116									1	137	355
NORWEGIAN JEWEL	C6TX6	A	Jacksonville	81	56									70	90	297
NORWEGIAN PEARL	C6VG7	A	Anchorage	331	219									520	447	1517
NORWEGIAN SKY	C6PZ8	A	Miami	48	35									101	95	279
NORWEGIAN SPIRIT	C6TQ6	A	New Orleans	75	250									184	102	611
NORWEGIAN STAR	C6FR3	A	Anchorage	101	53									94	156	404
NORWEGIAN SUN	C6RN3	A	Miami	304	309									281	286	1180
NUNANIQ	WRC2049	A	Anchorage	0	0									0	0	0
NYK ARCADIA	3EXI5	A	Charleston	0	0									0	1	1
NYK FUSHIMI	9V8741	A	Anchorage	0	0									0	0	0

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
NYK LIBRA	HOJY	A	Los Angeles	0	0									0	0	0
NYK RUMINA	9V7645	A	New York City	24	33									35	28	120
NYK TRITON	3FUL2	A	New York City	35	51									40	38	164
OASIS OF THE SEAS	C6XS7	A	Miami	5	0									12	14	31
OCEAN CRESCENT	WDF4929	A	Houston	18	30									40	29	117
OCEAN EAGLE	WDG8082	A	Anchorage	3	1									0	0	4
OCEAN GIANT	WDG4379	A	Jacksonville	76	94									14	7	191
OCEAN GLOBE	KOGE	A	Houston	0	0									0	0	0
OCEAN HOPE 3	WDF2354	A	Anchorage	0	0									0	0	0
OCEAN MARINER	WCF3990	A	Anchorage	0	0									0	0	0
OCEAN NAVIGATOR	WSC2552	A	Anchorage	0	0									0	1	1
OCEAN RANGER	WAM7635	A	Anchorage	0	0									0	0	0
OCEAN TITAN	WDB9647	A	Anchorage	0	0									0	0	0
OKEANOS EXPLORER (AWS)	WTDH	A	New York City	167	359									0	0	526
OLEANDER	V7SX3	A	New York City	25	38									39	34	136
OLIVE L. MOORE	WDF7019	A	Duluth	0	0									278	0	278
OOCL HALIFAX	VQUQ4	A	New York City	49	29									59	54	191
OOCL VANCOUVER	3EBG2	A	New York City	8	12									22	18	60
OOSTERDAM	PBKH	A	Anchorage	90	197									129	187	603
ORANGE BLOSSOM 2	D5DS3	A	New York City	0	0									0	23	23
ORANGE OCEAN	D5DS2	A	New York City	12	5									20	17	54
ORANGE SKY	ELZU2	A	New York City	4	15									17	1	37
ORANGE STAR	A8WP6	A	New York City	0	0									0	0	0
ORANGE SUN	A8HY8	A	New York City	36	4									16	6	62
ORANGE WAVE	ELPX7	A	New York City	5	68									0	0	73
ORE DONGJIAKOU	9V9116	A	Anchorage	0	1									0	0	1
ORE ITALIA	9V9129	A	Anchorage	93	213									51	41	398
OREGON II (AWS)	WTDO	A	New Orleans	0	0									0	0	0
OREGON VOYAGER	WDF2960	A	San Francisco	0	1									7	9	17
ORIENTAL QUEEN	VRAC9	A	Anchorage	0	0									2	0	2
OSCAR DYSON (AWS)	WTEP	A	Anchorage	98	413									1	0	512
OSCAR ELTON SETTE (AWS)	WTEE	A	Honolulu	7	400									90	0	497
OURO DO BRASIL	ELPP9	A	Baltimore	47	36									59	46	188
OVERSEAS ANACORTES	KCHV	A	Miami	10	21									15	9	55
OVERSEAS ANDROMAR	V7HP4	A	Los Angeles	0	0									0	0	0
OVERSEAS BOSTON	WJBU	A	Anchorage	38	56									13	20	127
OVERSEAS CASCADE	WOAG	A	Miami	15	7									0	21	43
OVERSEAS CHINOOK	WNFQ	A	Houston	84	83									32	33	232
OVERSEAS HOUSTON	WWAA	A	Miami	0	2									1	0	3
OVERSEAS LONG BEACH	WAAT	A	Houston	2	17									0	21	40
OVERSEAS LOS ANGELES	WABS	A	Seattle	42	45									33	82	202
OVERSEAS LUXMAR	WDC7070	A	Miami	0	0									0	0	0
OVERSEAS MARTINEZ	WPAJ	A	Anchorage	3	21									19	22	65
OVERSEAS NIKISKI	WDBH	A	Anchorage	26	12									24	40	102
OVERSEAS SANTORINI	WOSI	A	Houston	29	38									27	47	141

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OVERSEAS TAMPA	WOTA	A	Baltimore	4	0									12	6	22
OVERSEAS TEXAS CITY	WHED	A	New York City	10	40									6	11	67
PACIFIC CHALLENGER	WDD9281	A	Anchorage	0	0									0	0	0
PACIFIC FREEDOM	WDD3686	A	Anchorage	1	0									0	0	1
PACIFIC RAVEN	WDD9283	A	Anchorage	0	0									1	0	1
PACIFIC SANTA ANA	A8W13	A	Houston	0	0									16	1	17
PACIFIC SHARAV	D5DY4	A	Houston	9	16									19	22	66
PACIFIC STAR	WDD3686	A	Anchorage	0	0									0	0	0
PACIFIC TITAN	WCZ6844	A	Anchorage	0	0									0	0	0
PACIFIC WOLF	WDD9286	A	Anchorage	0	1									2	1	4
PANDALUS	WAV7611	A	Anchorage	0	0									0	0	0
PARADISE ACE	H9CL	A	Jacksonville	0	0									0	0	0
PARAGON	WDD9285	A	Anchorage	0	0									0	0	0
PATRIARCH	WBN3014	A	Jacksonville	0	0									4	0	4
PAUL GAUGUIN	C6TH9	A	Anchorage	52	0									57	74	183
PAUL R. TREGURTHA	WYR4481	A	Duluth	302	0									627	492	1421
PELICAN STATE	WDE4433	A	New Orleans	0	0									0	0	0
PERLA DEL CARIBE	KPDL	A	Jacksonville	0	0									0	0	0
PERSEVERANCE	WDE5328	A	Anchorage	1	1									126	0	128
PHILADELPHIA EXPRESS	WDC6736	A	Houston	104	113									59	91	367
PHILIP R CLARKE	WDH7554	A	Duluth	17	0									39	22	78
PILOT	WBN3011	A	Jacksonville	0	0									0	0	0
PISCES (AWS)	WTDL	A	New Orleans	0	0									398	65	463
POINT SUR	WSC2276	A	Anchorage	0	0									0	0	0
POLAR ADVENTURE	WAZV	A	Seattle	45	22									58	56	181
POLAR CLOUD	WDF5296	A	Anchorage	0	0									0	0	0
POLAR DISCOVERY	WACW	A	Seattle	48	42									1	0	91
POLAR ENDEAVOUR	WCAJ	A	Seattle	73	14									12	58	157
POLAR ENDURANCE	WDG2085	A	Anchorage	0	0									0	0	0
POLAR ENTERPRISE	WRTF	A	Seattle	30	31									46	44	151
POLAR RANGER	WDC8652	A	Anchorage	0	0									0	0	0
POLAR RESOLUTION	WDJK	A	Seattle	14	54									16	43	127
POLAR STORM	WDE8347	A	Anchorage	0	2									0	0	2
POLAR VIKING	WDD6494	A	Anchorage	0	0									0	0	0
PREMIUM DO BRASIL	A8BL4	A	Baltimore	26	20									38	42	126
PRESQUE ISLE	WDH7560	A	Duluth	0	0									1	0	1
PRESTIGE NEW YORK	KDUE	A	Jacksonville	0	0									0	0	0
PRIDE OF AMERICA	WNBE	A	Anchorage	0	0									0	0	0
PRINSENDAM	PBGH	A	Miami	54	41									149	68	312
PROSPEROUS	VRIA3	A	Anchorage	0	0									0	0	0
PSU EIGHTH	9V6346	A	Anchorage	48	30									160	63	301
PT. THOMPSON	WBM5092	A	Kodiak	0	0									0	0	0
R. J. PFEIFFER	WRJP	A	Los Angeles	25	30									29	27	111
R/V KIYI	KAO107	A	Duluth	0	0									3	0	3
RADIANCE OF THE SEAS	C6SE7	A	Anchorage	0	0									0	9	9

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RAINIER (AWS)	NWS0011	A	Seattle	0	0									0	0	0
RAINIER (AWS)	WTEF	A	Seattle	50	0									0	0	50
RANGER	WBN5979	A	Jacksonville	0	1									3	0	4
REBECCA LYNN	WCW7977	A	Duluth	0	0									3	5	8
REDOUBT	WDD2451	A	Anchorage	2	0									0	0	2
REGATTA	V7DM3	A	Seattle	114	39									79	91	323
RESOLVE	WCZ5535	A	Baltimore	46	22									14	23	105
REUBEN LASKER (AWS)	WTEG	A	Seattle	568	0									202	0	770
RHAPSODY OF THE SEAS	C6UA2	A	Anchorage	11	0									47	14	72
ROBERT C. SEAMANS	WDA4486	A	Anchorage	0	0									1	0	1
ROBERT GORDON SPROUL (AWS)	WSQ2674	A	Los Angeles	743	696									428	722	2589
ROBERT BLOUGH	WDH7559	A	Duluth	0	0									17	0	17
ROGER REVELLE (AWS)	KAOU	A	Los Angeles	591	696									436	0	1723
RONALD H. BROWN (AWS)	WTEC	A	Charleston	499	503									444	424	1870
RONALD N	A8PQ3	A	Anchorage	135	62									24	113	334
RT. HON. PAUL J. MARTIN	VGFJ	A	Duluth	0	0									0	0	0
RTM DHAMBUL	9V2783	A	Anchorage	0	3									0	1	4
RYNDAM	PHFV	A	Miami	0	0									0	0	0
S/R AMERICAN PROGRESS	KAWM	A	Miami	0	1									5	4	10
SAGA ADVENTURE	VRBL4	A	Anchorage	0	0									0	0	0
SAGA ANDORINHA	VRMV6	A	Anchorage	28	30									46	61	165
SAGA CREST	VRWR7	A	Anchorage	0	35									13	0	48
SAGA DISCOVERY	VRBR8	A	Seattle	0	32									0	0	32
SAGA ENTERPRISE	VRCC8	A	Anchorage	35	79									1	31	146
0SAGA FRONTIER	VRCP2	A	Anchorage	0	0									0	0	0
SAGA FUTURE	VRKX8	A	Anchorage	0	29									0	0	29
SAGA MONAL	VRZQ9	A	Anchorage	0	0									7	0	7
SAGA NAVIGATOR	VRDA4	A	Anchorage	0	0									0	0	0
SAGA PIONEER	VRED4	A	Anchorage	0	0									0	0	0
SAGA SPRAY	VRWW5	A	Anchorage	24	149									2	77	252
SAGA TUCANO	VRVP2	A	Anchorage	208	82									135	75	500
SAGA VIKING	VRXO6	A	Anchorage	39	27									17	0	83
SAIGON EXPRESS	VRBT7	A	New York City	8	0									25	16	49
SAM LAUD	WZC7602	A	Duluth	63	0									84	115	262
SAMSON MARINER	WCN3586	A	Anchorage	1	0									0	0	1
SAMUEL DE CHAMPLAIN	WDC8307	A	Duluth	5	0									8	16	29
SAN SABA	V7UT8	A	Anchorage	19	19									12	11	61
SANDRA FOSS	WYL4908	A	Anchorage	0	0									0	0	0
SEA PRINCE	WYT8569	A	Anchorage	0	0									2	0	2
SEA VOYAGER	WCX9106	A	Anchorage	0	1									25	20	46
SEABOURN ODYSSEY	C6XC6	A	Miami	158	17									235	335	745
SEABOURN QUEST	C6YZ5	A	Miami	34	21									48	23	126
SEABULK ARCTIC	WCY7054	A	Miami	55	13									21	32	121
SEABULK TRADER	KNJK	A	Miami	47	22									37	48	154
SEA-LAND CHARGER	9V3589	A	Los Angeles	0	0									0	0	0

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SEA-LAND COMET	9V3292	A	Los Angeles	0	0									0	0	0
SEA-LAND INTREPID	9V3293	A	Los Angeles	0	0									0	0	0
SEA-LAND LIGHTNING	9V3291	A	Los Angeles	33	26									0	0	59
SEASPAN CHIWAN	VRBH3	A	Anchorage	24	0									19	10	53
SEASPAN FELIXSTOWE	VRBH8	A	Seattle	22	34									3	25	84
SENTINEL	WBN6510	A	Jacksonville	0	0									0	0	0
SENTRY	WBN3013	A	Jacksonville	0	0									0	0	0
SEOUL TRADER	9HA3782	A	Los Angeles	0	0									0	0	0
SERENADE OF THE SEAS	C6FV8	A	Miami	0	0									0	0	0
SESOK	WDE7899	A	Anchorage	0	0									0	0	0
SEVEN SEAS MARINER	C6VV8	A	Anchorage	469	292									580	486	1827
SEVEN SEAS NAVIGATOR	C6ZI9	A	Anchorage	526	450									491	495	1962
SEVEN SEAS VOYAGER	C6SW3	A	Anchorage	2	117									8	5	132
SHANDONG DA CHENG	9V9131	A	Anchorage	56	43									60	75	234
SHANDONG DA DE	9V9128	A	Anchorage	8	147									58	3	216
SHEILA MCDEVITT	WDE2542	A	New Orleans	0	0									0	0	0
SIANGTAN	9V9832	A	Seattle	59	5									31	32	127
SIDNEY FOSS	WYL5445	A	Anchorage	0	0									0	0	0
SIGAS SILVIA	S6ES6	A	Anchorage	466	584									594	503	2147
SIKU	WCQ6174	A	Anchorage	0	0									2	0	2
SIKULIAQ (AWS)	WDG7520	A	Anchorage	0	51									639	114	804
SILVER SHADOW	C6FN6	A	Anchorage	0	0									0	0	0
SNOHOMISH	WDB9022	A	Anchorage	0	0									0	0	0
SOL DO BRASIL	ELQQ4	A	Baltimore	32	45									2	8	87
SPAR	NJAR	A	Kodiak	0	2									0	0	2
SPICA	A8QJ5	A	New Orleans	28	34									0	0	62
SPLENDOUR OF THE SEAS	C6TZ9	A	Anchorage	115	88									93	24	320
SS MAUI	WSLH	A	Seattle	60	49									44	49	202
ST LOUIS EXPRESS	WDD3825	A	Houston	104	42									99	100	345
ST. CLAIR	WZA4027	A	Duluth	0	0									11	0	11
STACEY FOSS	WYL4909	A	Anchorage	0	0									0	0	0
STAR ATLANTIC	LAYG5	A	Anchorage	0	0									0	0	0
STAR DIEPPE	LEQZ3	A	Anchorage	0	0									0	0	0
STAR EAGLE	LAWO2	A	New Orleans	0	0									12	14	26
STAR EVVIVA	LAHE2	A	Seattle	0	0									0	2	2
STAR FLORIDA	LAVW4	A	Jacksonville	0	0									0	0	0
STAR GRAN	LADR4	A	Jacksonville	0	2									5	0	7
STAR GRIP	LADQ4	A	Charleston	0	0									0	0	0
STAR HANSA	LAXP4	A	Jacksonville	0	0									0	0	0
STAR HARMONIA	LAGB5	A	Baltimore	0	0									23	0	23
STAR HERDLA	LAVD4	A	New Orleans	0	8									0	0	8
STAR HIDRA	LAVN4	A	Baltimore	0	0									0	0	0
STAR ISFJORD	LAOX5	A	New Orleans	0	16									13	3	32
STAR ISMENE	LANT5	A	Baltimore	35	13									30	27	105
STAR ISTIND	LAMP5	A	Seattle	20	0									14	5	39

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STAR JAPAN	LAZV5	A	Seattle	0	80									39	24	143
STAR JAVA	LAJS6	A	Baltimore	0	0									0	33	33
STAR JUVENTAS	LAZU5	A	Baltimore	1	14									10	29	54
STAR KILIMANJARO	LAIG7	A	Anchorage	0	0									0	0	0
STAR KINN	LAJF7	A	Anchorage	0	0									3	7	10
STAR KIRKENES	LAHR7	A	New Orleans	3	4									2	1	10
STAR KVARVEN	LAJK7	A	Seattle	19	37									0	41	97
STAR LIMA	LAPE7	A	Jacksonville	3	0									3	1	7
STAR LINDESNES	LAQJ7	A	Jacksonville	28	28									30	14	100
STAR LIVORNO	LAQM7	A	Houston	0	0									57	18	75
STATE OF MAINE	WCAH	A	New York City	0	0									0	0	0
STEWART J. CORT	WDC6055	A	Duluth	347	0									696	692	1735
STIKINE	WDC8583	A	Anchorage	0	0									5	0	5
SUNSHINE STATE	WDE4432	A	Miami	0	0									19	18	37
SUPERSTAR LIBRA	C6DM2	A	Anchorage	120	105									116	114	455
SUSAN MAERSK	OYIK2	A	Seattle	93	8									0	38	139
SYLVIE	VRCQ2	A	Anchorage	41	22									1	46	110
TAKU	WI9491	A	Anchorage	0	0									0	0	0
TALISMAN	LAOW5	A	Jacksonville	0	0									15	24	39
TANGGUH HIRI	C6XC2	A	Anchorage	90	125									44	69	328
TAURUS	WDF4091	A	Archorage	0	0									0	0	0
TECUMSEH	CFN5905	A	Duluth	1	0									0	1	2
TEXAS ENTERPRISE	KSDF	A	Houston	0	0									7	0	7
THOMAS JEFFERSON (AWS)	WTEA	A	Norfolk	0	7									537	221	765
TIM S. DOOL	VGPY	A	Duluth	0	0									36	71	107
TRIUMPH	WDC9555	A	Anchorage	0	0									0	0	0
TROPIC CARIB	J8PE3	A	Miami	61	54									28	63	206
TROPIC EXPRESS	J8QB8	A	Miami	42	50									37	46	175
TROPIC JADE	J8NY	A	Miami	104	62									138	91	395
TROPIC LURE	J8PD	A	Miami	42	31									62	59	194
TROPIC MIST	J8NZ	A	Miami	13	22									24	19	78
TROPIC NIGHT	J8NX	A	Miami	35	38									41	92	206
TROPIC OPAL	J8NW	A	Miami	108	98									80	112	398
TROPIC PALM	J8PB	A	Miami	29	26									50	47	152
TROPIC SUN	J8AZ2	A	Miami	92	51									96	81	320
TROPIC TIDE	J8AZ3	A	Miami	86	92									58	75	311
TROPIC UNITY	J8PE4	A	Miami	84	51									79	82	296
TS KENNEDY	KVMU	A	New York City	90	85									0	0	175
TUG DEFIANCE	WDG2047	A	Duluth	18	0									68	17	103
TUG DOROTHY ANN	WDE8761	A	Duluth	231	33									716	744	1724
TUG MICHIGAN	WDF5344	A	Duluth	17	0									47	40	104
TUG SPARTAN	WDF5483	A	Duluth	0	0									0	1	1
TUSTUMENA	WNGW	A	Anchorage	58	11									59	45	173
TYCO DECISIVE	V7DI7	A	Baltimore	59	28									0	0	87
TYCO DURABLE	V7DI8	A	Baltimore	0	0									0	0	0

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TYCO RESPONDER	V7CY9	A	Baltimore	39	7									22	23	91
UACC RAS LAFFAN	A8VG7	A	Anchorage	0	0									9	0	9
UBC SAIKI	P3GY9	A	Seattle	0	0									39	8	47
UBC SANTA MARTA	5BDK2	A	New Orleans	0	0									1	0	1
UMANG	A8PF6	A	Anchorage	0	0									0	0	0
UNIQUE BRILLIANCE	VRXK4	A	Anchorage	0	0									0	0	0
UNIQUE EXPLORER	VRGT8	A	Anchorage	0	0									2	0	2
UNIQUE GUARDIAN	VRJM6	A	New Orleans	22	31									62	32	147
USCGC ALDER	NGML	A	Duluth	0	0									10	6	16
USCGC HEALY	NEPP	A	Seattle	0	0									0	0	0
USCGC MACKINAW	NBGB	A	Duluth	7	2									0	0	9
VALDEZ RESEARCH (AWS)	WXJ63	A	Anchorage	703	684									652	742	2781
VEENDAM	PHEO	A	Miami	213	146									65	210	634
VISION OF THE SEAS	C6SE8	A	Miami	0	0									0	0	0
VOLENDAM	PCHM	A	Anchorage	221	105									202	178	706
VOYAGER OF THE SEAS	C6SE5	A	Miami	0	0									0	0	0
W. H. BLOUNT	C6JT8	A	New Orleans	41	34									41	41	156
WALTER J. MCCARTHY JR.	WXU3434	A	Duluth	0	0									135	0	135
WARRIOR	WBN4383	A	Anchorage	1	0									0	4	5
WASHINGTON	VRFD6	A	Los Angeles	0	0									0	0	0
WASHINGTON EXPRESS	WDD3826	A	Houston	64	92									28	1	185
WEST VELA	3FNX5	A	Houston	0	0									0	0	0
WESTERDAM	PINX	A	Miami	169	172									88	93	522
WESTERN NAVIGATOR	WDE6616	A	Anchorage	0	0									0	0	0
WESTERN RANGER	WBN3008	A	Anchorage	0	0									0	0	0
WESTWOOD COLUMBIA	C6SI4	A	Seattle	23	27									24	28	102
WESTWOOD OLYMPIA	C6UB2	A	Seattle	21	26									0	47	94
WESTWOOD RAINIER	C6SI3	A	Seattle	13	8									13	12	46
WHITTIER RESEARCH (AWS)	KXI29	A	Anchorage	744	684									699	742	2869
WILFRED SYKES	WC5932	A	Duluth	309	0									716	673	1698
XPEDITION	HC2083	A	Anchorage	0	8									13	7	28
YACHT EXPRESS	PJVV	A	Miami	0	0									0	0	0
YM ANTWERP	VRET5	A	Anchorage	10	23									14	18	65
YORKTOWN EXPRESS	WDD6127	A	Houston	54	35									38	5	132
YUHSAN	H9TE	A	Anchorage	1	0									0	0	1
YUYO SPIRITS	3FNF4	A	Anchorage	0	0									0	0	0
ZAANDAM	PDAN	A	Anchorage	553	466									337	583	1939
ZIM DJIBOUTI	A8SI4	A	Seattle	0	0									0	0	0
ZIM SHANGHAI	VRGA6	A	New York City	17	30									22	20	89
ZIM SHEKOU	A8KX2	A	Baltimore	0	42									0	0	42
ZIM YOKOHAMA	A8MY4	A	Charleston	0	0									0	4	4
ZUIDERDAM	PBIG	A	Anchorage	78	13									107	114	312

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NOAA Weather Radio Network

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

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

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

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

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

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