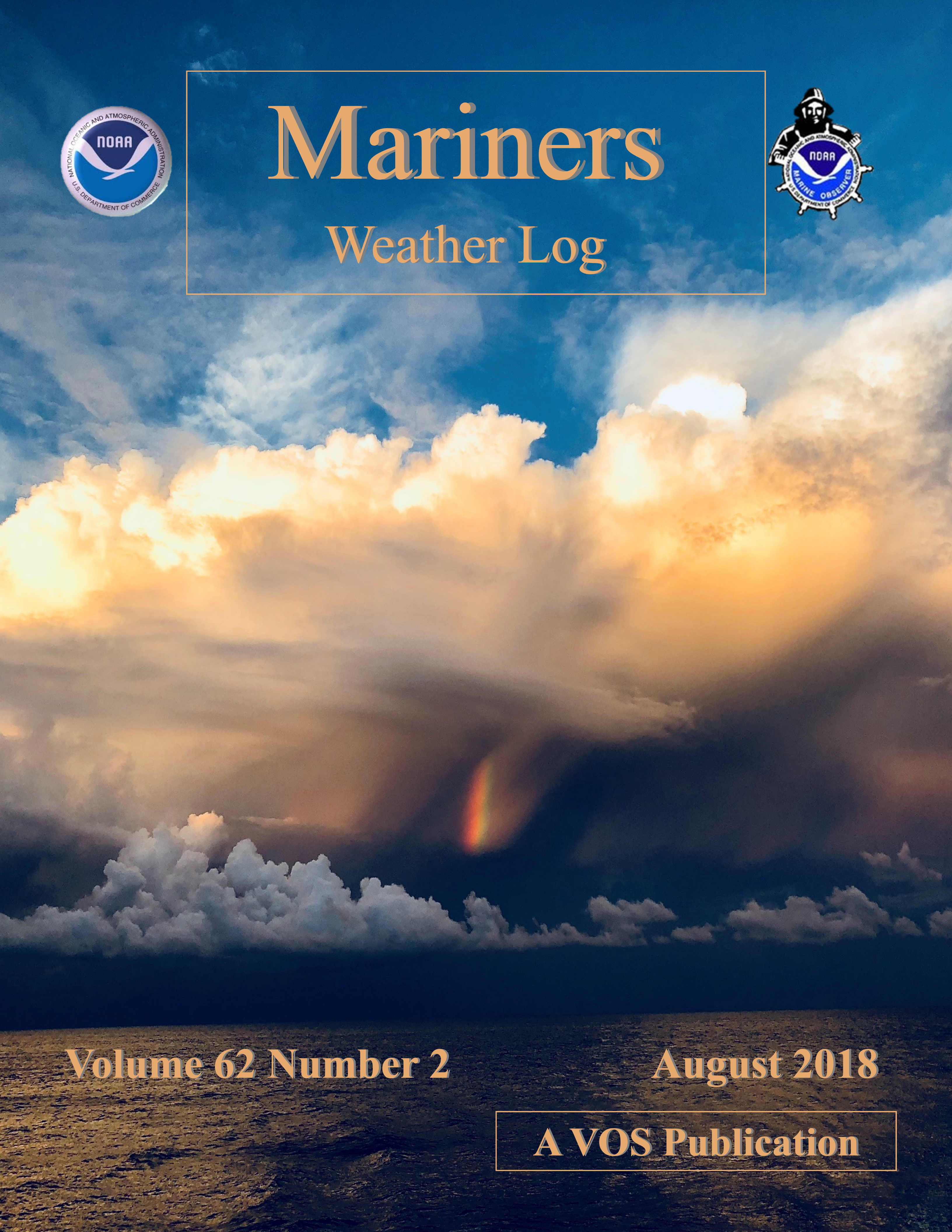
Mariners Weather Log



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Mariners Weather Log

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TURBOWIN e-logbook software
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Editor's Note

In this edition, articles are provided by Port Meteorological Officer (PMO) from Florida, Texas, and Alaska. The PMOs reflect on the importance of ship participating in the VOS program, collecting and reporting weather observations to support the quality of weather forecasts and Safety of Life at Sea (SOLAS). VOS weather observation training is provided as part of the PMO effort to support shipping companies, captains, and crew. VOS PMOs also participate in the Maritime Academy Sea Terms, working to train cadets the next generations of maritime professionals. The Maine Maritime Sea Term is also reviewed in this edition.

Our regular features on the Tropical Atlantic and Tropical East Pacific, North Atlantic, and North Pacific Areas appear, along with an article about Buoy Measurements during Hurricane Jose. We also have our VOS Cooperative Ship Report.

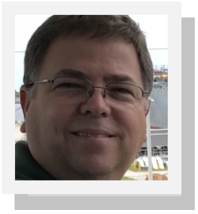
Rob Niemeyer: Picture Taken on July 9, 2018, near sunset aboard the Maine Maritime Academy Training Ship **State of Maine**. Ship was heading west toward the sun, the cloud was astern of the ship to the east, picking up the reflection of the setting sun to the west.

Mariners Weather Log

Volume 62, Number 2, August 2018

Table of Contents

The views and opinions stated herein are solely the opinions of the authors and should not be construed to reflect the views and opinions of NOAA or the Department of Commerce.



Welcome Aboard!

David Dellinger
PMO — South Florida

Today I had the distinct pleasure of conducting the Oath of Office for Mr. Bronley Stewart, NOAA — Office of Marine and Aviation Operations (OMAO), at Port Everglades, Florida. Mr. Stewart was accompanied by his beautiful wife Deloris for the occasion.

Mr. Stewart is the newest Relief Cook for NOAA Ship Operations. He comes to us with a much-storied food-service career on both commercial and research ships all around the globe. Mr. Stewart will be headquartered out of OMAO Operations in Pascagoula, Mississippi.

Welcome Aboard, Bronley!

L to R: Mr. David Dellinger, Mrs. Deloris Stewart, Mr. Bronley Stewart

Captain Craig Rumrill of the Maersk Denver provided this picture of Atlantic sea mist.

Matt Thompson Retires!

Matt Thompson retired at the end of June after more than 8 years of service to the VOS Program. He has served in the military and as a public servant, providing guidance and support to mariners and future naval sea cadets.

Matt joined the U.S. Navy in 1991 and received an honorable discharge in 1997 as an Aerographers Mate. Only 2 weeks after being discharged, he went to McMurdo Station, Antarctica, and worked as a Met Tech seasonally for the next 7 years. In 2001, he took a break from the U.S. Antarctic Program (USAP) and attended the Landing School of Boatbuilding and Design in Kennebunk, Maine, earning his American Boat and Yacht Council Mechanic Certificates. After leaving the USAP in 2005, he returned to college for a short time to finish some courses and, upon completion, the NWS hired him in Alaska. He moved to Cold Bay, Alaska, to fulfill duties as a Met Tech and later transferred to a Mobile Emergency Unit Member Met Tech based out of the Regional office in Anchorage.

On December 22, 2010, he assumed the Port Meteorological Officer duties in Seattle, Washington. Matt felt strongly about training: He promoted standards and provided guidance, training, and participated in outreach events supporting the local Weather Forecasting Office.

Matt was also a Firefighter/EMT. He is a member of U.S. Sailing and enjoys offshore sailing. Matt was also the Lieutenant (Junior Grade) (STJG) supporting the U.S. Naval Sea Cadet Corps (USNSCC) at the Everett (Washington) Division. He was also promoted as the Lieutenant Commander (LCDR) Regional Director for 13-2 in January 2016.

Laura Furgione presenting Seattle, Washington, PMO Matt Thompson with an award in recognition of outstanding performance and dedication to VOS

VOS Training Team Provides Support for Maine Maritime Academy's Sea Term 2018

Rob Niemeyer, PMO, Jacksonville

Throughout several years, NOAA's Voluntary Observing Ship (VOS) Program has provided support to various Merchant Marine Academies during their annual "Sea Terms." The most recent support was to assist the Maine Maritime Academy during its 2018 Sea Term. To support the academy's 2018 Sea Term, Rusty Albaral, PMO, New Orleans, Louisiana, and Rob Niemeyer, PMO, Jacksonville, Florida, were selected to represent NOAA in providing both formal classroom and hands-on instruction to nearly 200 cadets aboard the Training Ship **STATE OF MAINE**.

During this year's Sea Term with Maine Maritime Academy, Rusty and I provided a combined 33 days of support aboard the **STATE OF MAINE**. Rusty was first to get underway and conducted a thorough turnover at the midway during the ship's visit to Alicante, Spain, that ensured seamless support for the remainder of the cruise.

Classroom instruction included:

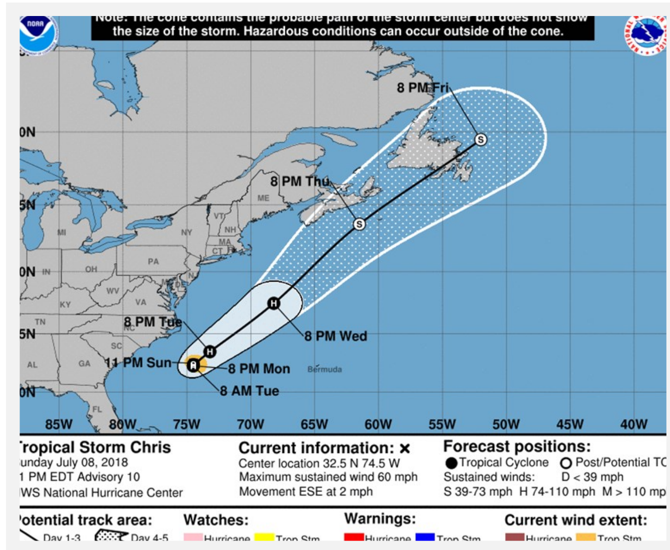
- Introduction to the VOS Program.
- Basic and Advanced Meteorology.
- Introduction to Tropical Weather and Tropical Cyclone Avoidance.
- Reception, Interpretation, and Plotting of the NOAA High Seas Forecast/Warnings Text Products.
- NOAA/NWS Products and Interpretation (Graphical and Text).
- Introduction and Use of Marine Pilot Charts for Voyage Planning.
- Ocean Waves.

Hands-on instruction included:

- Proper recording and transmission procedures of marine meteorological observations.
- Using the electronic weather-log program, Turbo Win+, for encoding weather observations.
- Proper identification of weather elements that are included in the marine synoptic reports.
- Acquisition and proper applications of NOAA Graphic and Text products including NAVTEX, Marine HF Fax products, OPC/TPC High Winds and Seas bulletins, and Satellite.
- Deploying two Drifter Buoys in support of NOAA's Global Drifter Program provided by the Atlantic Oceanographic and Meteorological Laboratory (AOML).

During the first leg of the voyage, the cadets and crew experience a real-world weather phenomenon while navigating the western Mediterranean Sea. A local wind regime, called a *Mistral* in this region, set up funneling winds through the Rhone Valley of France. While steaming eastward south of France's shoreline, the **STATE OF MAINE** experienced gale-force winds, with the maximum gust recorded at 44 knots, accompanied by 8–10-foot seas with occasional seas of 12–13 feet. Although the conditions were short lived, less than 24 hours from start to finish, the event served as an excellent opportunity to showcase how accurate weather forecasts can be, with an emphasis on our forecasters' reliance on accurate and timely ship observations. Because this event was well forecast 48 hours in advance, the Captain, crew, and cadets were able to properly secure the ship for heavy weather, minimizing potential risk to the vessel and crew. One additional training opportunity this event presented was the time to demonstrate to the cadets how to determine the frequency of events in this particular geographic region and season using pilot charts. This also effectively added an extra emphasis on yet another facet of the VOS Program, as worldwide archived ship observations are used to update the pilot charts as needed.

Another significant weather event during the cruise worth mentioning on the transatlantic portion of the trip was the development of Hurricane Chris off the coast of North Carolina, which had an initial forecast track of less than 200 nautical miles of Closest Point of Approach (CPA) to the ship using the current voyage plan. Because Tropical Storm Avoidance is one of the topics covered in our formal instruction, this event presented yet another great opportunity to have the cadets remain abreast of all forecast and warnings issued by the National Hurricane Center. The cadets were able perform various techniques taught in the classroom to analyze, interpret, and plot the storms position/track based on the latest forecast. The cadets then calculated the ship's CPA and subsequently applied all navigational avoidance rules taught in the classroom, including the Mariners 1-2-3 Rule. Using sound judgment and reasoning, Captain Leslie B. Eadie III, Master of the Training Ship, in close consultation with the U.S. Navy routing service experts, made the decision to amend the ship's voyage plan to expand the CPA of the vessel to the storm. The Captain's decision to amend the original voyage plan proved to be the best action and opened up the ship's CPA to Hurricane Chris to over 700 nautical miles, thus ensuring safe voyage of the ship and safety of the crew.



Track of Tropical Storm Chris

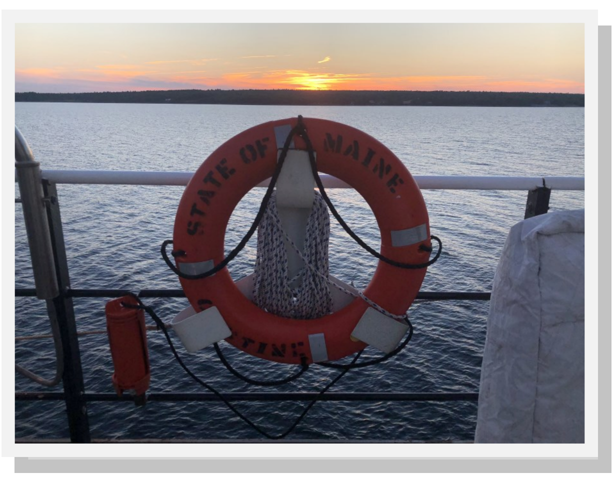
Another noteworthy event during the cruise was the deployment of two Drifter Buoys in support of NOAA's Global Drifter Program provided by the AOML. This not only provides valuable support to AOML's Global Drifter program, but is also a good training aid that demonstrates another integral piece of the NOAA's data collection and how data collection fits into the global forecasting puzzle. (See figures below.)

Cadet Plotting the Latest Hurricane Warning and Track

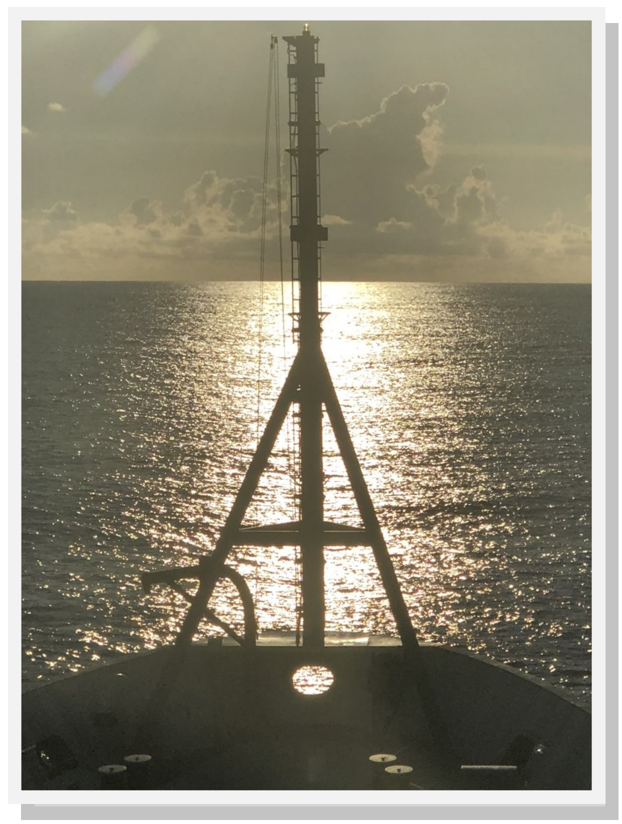
Cadet Signing Drifter Buoy

Cadets Ready to Launch Buoy

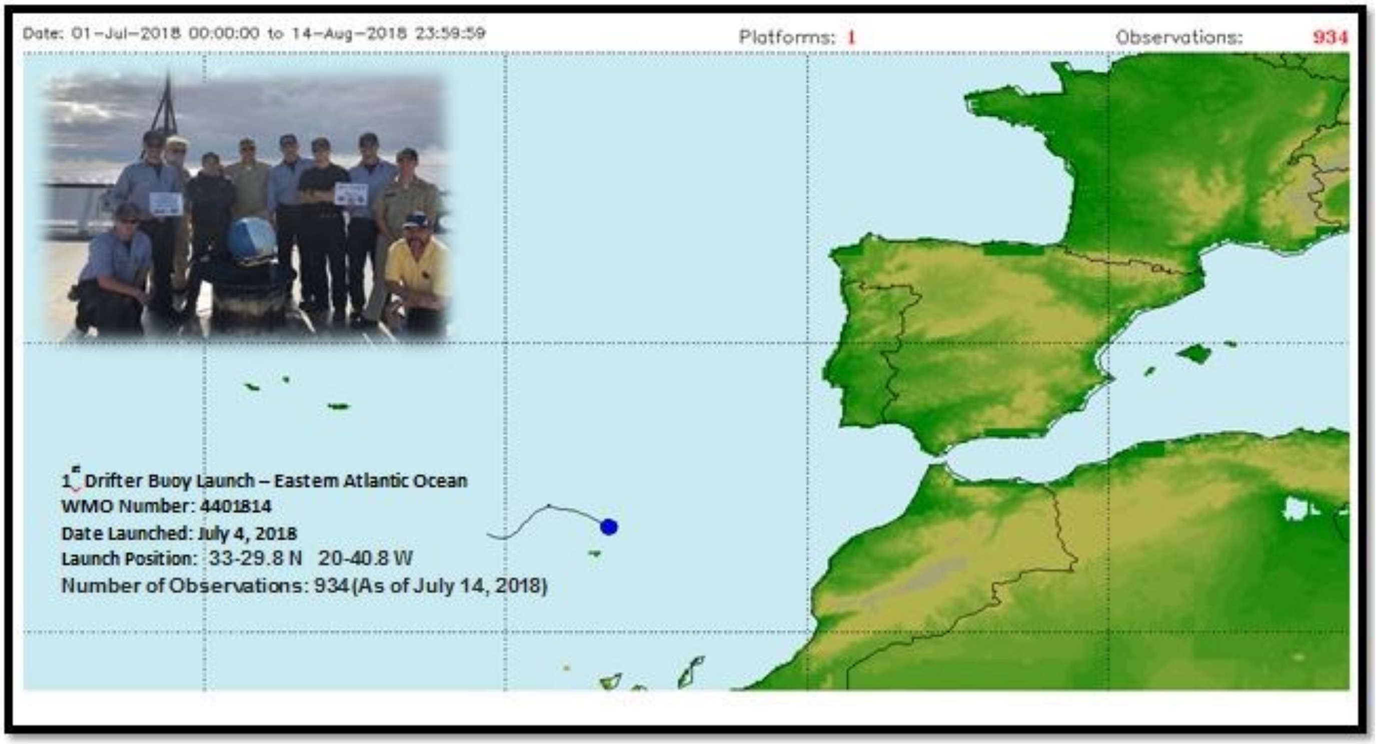
Buoy Launch Team Group Photo



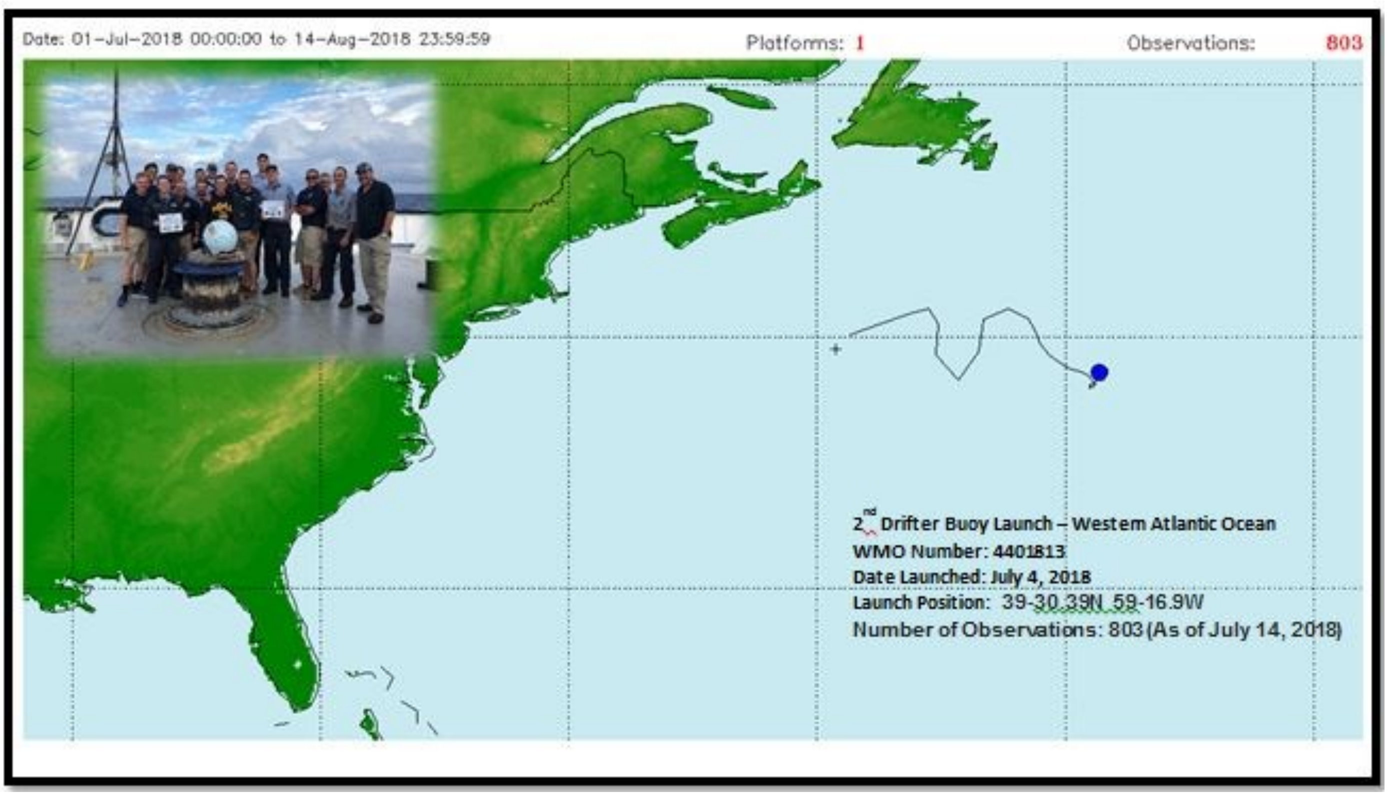
STATE OF MAINE Buoy



Sunset on the Bridge



Position of Buoy 1 Launch



Position of Buoy 2 Launch

Tragedy at Sea Drives Renewed Interest in Marine Weather Observations

Chris Fakes, PMO Dickinson

Recent tragedies at sea have driven a renewed interest to report marine weather observations. The World Meteorological Organization (WMO), International Maritime Organization (IMO), National Transportation Safety Board (NTSB), and National Oceanic and Atmospheric Administration (NOAA) are seeking a renewed pledge from all Maritime Companies to encourage their ships to report marine observations, thereby helping to improve: (1) forecast accuracy out to 10 days; hurricane track and intensity forecasts; and accuracy and timeliness of high-wind and -seas warnings.

Currently, there are over 1000 vessels participating in the U.S. Voluntary Observing Ship (VOS) Program, and they have provided 2,814,388 marine observations over the past 5 years. NOAA greatly appreciates the contributions and efforts VOS vessels have shown. They have been instrumental in the completion of our task to provide quality weather forecasts and warnings for all vessels.

The IMO Safety of Life at Sea (SOLAS) Chapter V, Regulation 5, requires all states parties, including National Meteorological Agencies to "encourage" the shipping industry to take, record, and transmit meteorological observations. The WMO VOS scheme organizes and directs the international taking and transmitting of meteorological observations. NOAA manages the U.S. contribution to the WMO VOS scheme, encouraging commercial, Federal, and private vessels to submit real-time marine observations.

Port Meteorological Officers (PMOs) are the VOS Program's field representatives and primary points of contact for vessels for all NOAA marine services. They perform ship visitations to inspect meteorological equipment, install electronic encoding software, provide training in reporting and transmission of weather observations, and assist in receiving and interpreting NOAA products and services. PMOs also provide some meteorological instrumentation for vessel use.

Despite the language provided in SOLAS Chapter V, Regulation 5, to encourage companies and mariners to report weather observations at sea, comparisons between plots of vessels captured through Automatic Identification System (AIS) data against shipboard weather reports received in real-time show that only a small number of vessels actually participate in providing observations (**Figure 1**). In 2017 (worldwide), the WMO VOS program consisting of 29 countries had only 15 percent of commercial vessels actively reporting marine observations.

If forecast accuracy is to improve, then the number of reporting ships must increase. Numerous studies here and abroad support this finding. Recently, the NOAA Director has made this one of his top three priorities, increasing observational data over the open ocean areas.

The impact of ship marine observations to operational meteorology and to global climate studies is unique and irreplaceable. Although there are a number of meteorological satellites and ocean buoys in use providing valuable data to the forecast models, *it is ship observations that provide "ground truth."* In fact, ship observations are used to verify satellite data. Their importance to the forecast process cannot be emphasized enough.

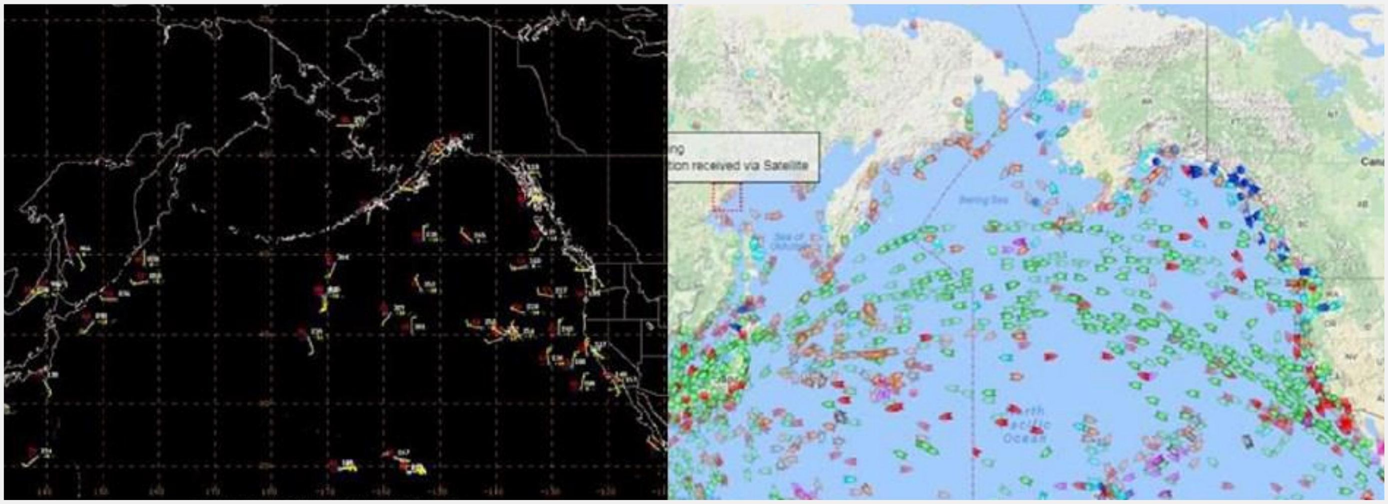


Figure 1. Comparison of received VOS (left) for 1200 UTC 13 July 2017 and AIS positions of vessels via MarineTraffic.com (right).

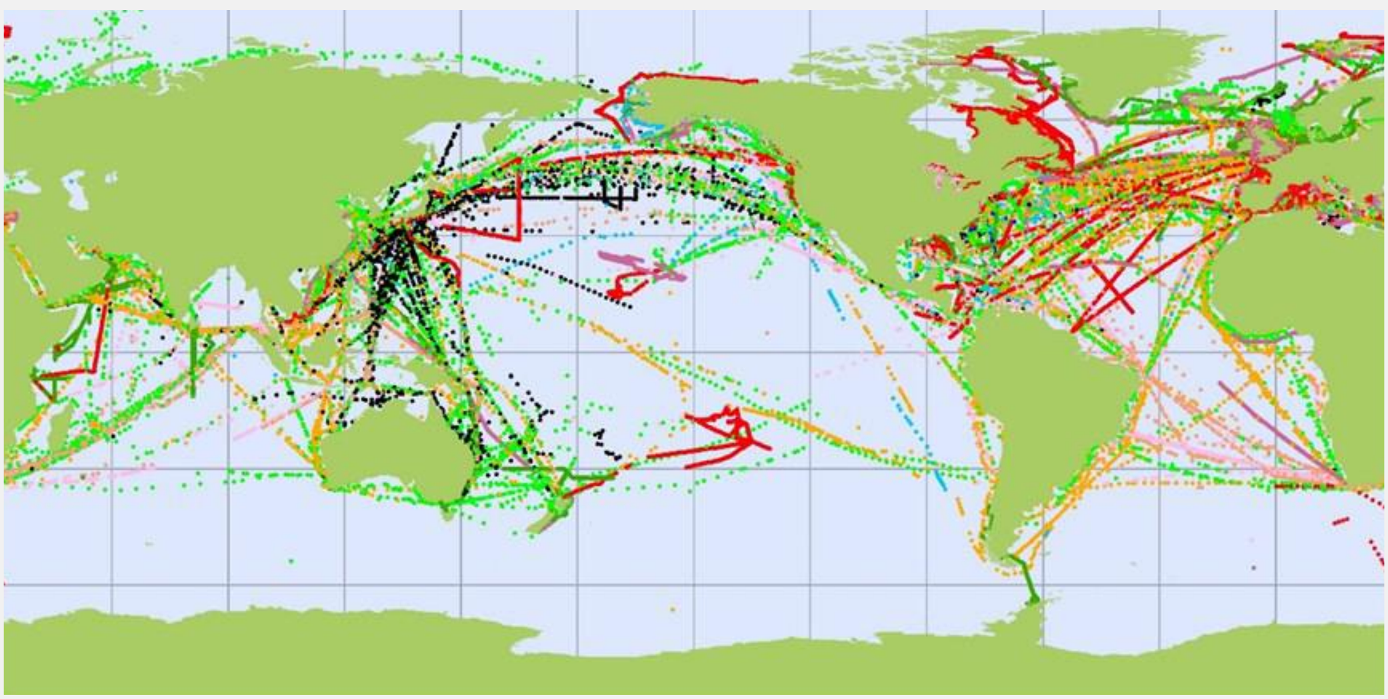


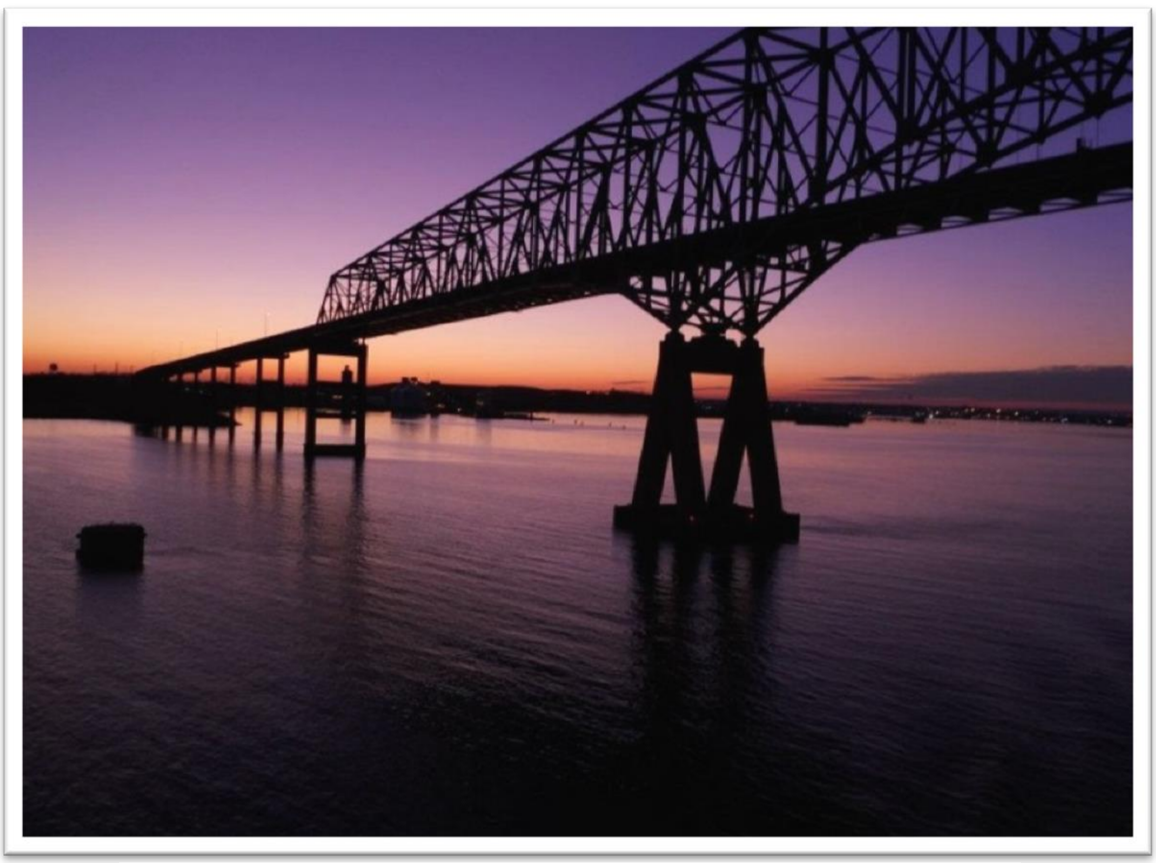
Figure 2. Total observations received for the month of July 2017. On average, we receive daily only 1200 observations for 1200 UTC worldwide.

In an effort to assist mates and shorten the time to take and transmit weather observations, a consortium of five countries, including the U.S., developed a marine weather-reporting software called TurboWin and has been in use worldwide for nearly 2 decades. With TurboWin, the time required to observe, record, and transmit an observation is often less than 5 minutes. TurboWin software often resides on the bridge computer with e-mail capability. Reports are normally sent by e-mail, but can also be transmitted by Inmarsat-C at no cost to the ship, depending on ship's preference.

NOAA is requesting a minimum commitment of at least 20 observations per month from vessels. A total of 20 is needed to maintain a quality control index of bias and standard deviations based on each observed weather element reported.

These quality checks allow marine forecasters and the models to carefully evaluate observations and, if needed, adjust the data based on ships performance index. Numerical observation decoders go to great lengths to ensure each observational element is used. The primary observation reporting times are 00-06-12-18 UTC, which corresponds to the global forecast model run times. Ships are also strongly encouraged to report observations while offshore at anchorage locations. Typically, very few observations are received within 60 miles of the coast.

If you have any questions or require additional information about the TurboWin software, NOAA services, or the VOS program, please contact the VOS Program Manager or any PMO. A representative can visit your vessel or company office to discuss further as needed. Contact information is located in the back of this magazine or can be found online at https://VOS.NOAA.gov.



Rebecca Klepacki provided this picture from the Carnival Pride Chesapeake Bay.

NWS Forecasters in Alaska Could Use More Good Marine Weather Observations

Larry Hubble
PMO, Anchorage, Alaska

Rich Lomire
Meteorological Technician

The waters around Alaska support a diverse economy, with its rich marine ecosystem having "some of the most productive and sustainable fisheries in the world" and where "Dutch Harbor has been the #1 port for fishery landings (lbs) for over 20 years." Alaska is also a crossroads "for marine transportation, with the Aleutian Islands, a major transit for the Great Circle Route linking commerce from the U.S. West Coast to southern Asia. Shipping is also expanding through the Bering Strait, a 53-mile wide chokepoint that links both the Northern (Russia) and Northwest (Canada) passages to northern Asian, Russian, and European commerce." (1) Not to be outdone by fishing and shipping traffic, it is estimated well over a million cruise ship passengers will make their way to Alaska in 2018. (2)

With such economic diversity, it is also true that "No other marine system in the U.S. has such extreme weather and climate (environmental hazards)" and "vast geographic distances larger than the combined U.S. marine system), and an extensive coastline" (1)(3), about 35 percent of the U.S. total. (4) It has, however, just 3 of the country's 47 coastal and Great Lakes weather forecast offices (WFOs), which are responsible for all of the marine forecasts in the state. (5)

The Alaskan waters marine forecast area (nearshore and offshore waters) is about 1,213,489 sq. mi. (6), an area roughly 32 percent of the total land area of the U.S., and where the WFO in Anchorage is responsible for an area over three times the size of Texas. (7) **Figure 1** indicates how large the marine areas are where the three Alaskan WFOs have forecasting responsibilities. (8)

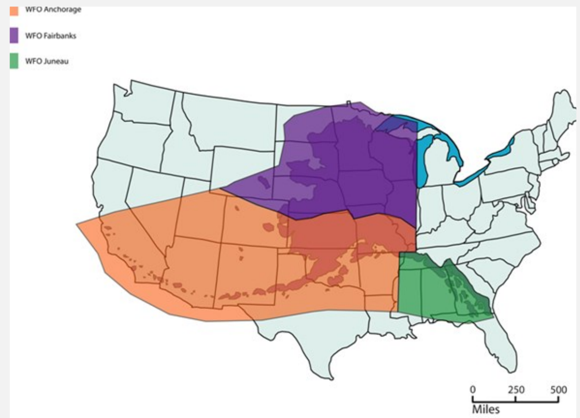


Figure 1. Marine Area Comparison

Alaska's large area of marine water, and its varied marine economy, belies the need for a great many weather observations to support weather forecasting. There are never enough observations from such a large area.

Marine weather observations taken in Alaskan waters are received from a variety of ship types, including cargo, bulk carriers (e.g., oil tankers), fishing vessels, tugs, government ships (e.g., Alaska State Ferries), and research vessels. Observations received from ships in Alaska's marine waters are displayed on computer screens at Alaskan WFOs, such as the analysis in **Figure 2**. (9) There are observations in the Gulf of Alaska as well as along Alaska's coastline. There are large areas, though, with few or no weather observations, where additional observations would be helpful.

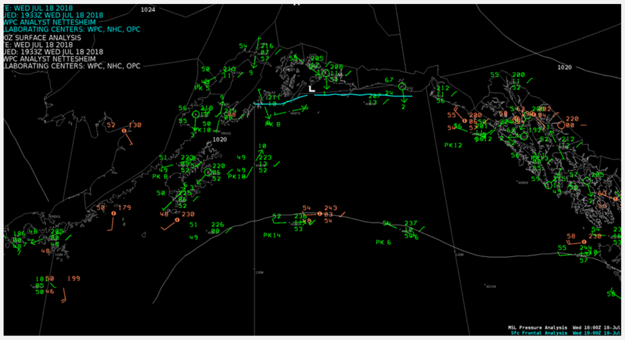


Figure 2. Computer Display

When available, observations, when available, can be used, for example, to confirm or disprove marine forecasts. (10) If a ship report (ship weather observation) is received with a wind-wave height of 10 feet, while the forecast for the same period might have been for 4–6 feet, which may prompt a forecaster on duty to issue a correct-ed forecast. If that observer had not taken and transmitted the data to the NWS (NOAA), the actual wind-wave forecast may have gone uncorrected.

Ships having established a reliable and con-sistent weather-observing program may be designated as a Voluntary Observing Ship (VOS) and even compete in leagues.

One such league is the Alaska League, where the **ALASKAN GYRE**, a research vessel and one of the newest VOS members, resides (**Figure 3**). (11)

Figure 3. ALASKAN GYRE

This ship spends a good amount of time along Alaska's Gulf Coast, in the vicinity of Seward, Homer, Kenai Fjords National Park, and points in between.

Already she has transmitted 10 observations (as of July 20th) and only recently (July 13, 2018) has she become an Active VOS Member (12), a great pick-up for the VOS Program. The Captain said he had a great barometer, and a check by PMO Larry Hubble confirmed the Captain's claims.

The **MIDNIGHT SUN** (**Figure 4**) (13) is a Ro/Ro cargo ship operating between Anchorage and Ta-coma, which often makes weekly port calls most Tuesdays in Anchorage and is another long-time observing ship becoming an active member in the VOS Program on April 1, 2003. (14) The **MID-NIGHT SUN** is in the TOTE League and consist-ently transmits many useful observations while en-route.

Figure 4. MIDNIGHT SUN

Current observation leader from the Alaska Govt League, **AURORA** (**Figure 5**) (15), has been active in VOS since May 1, 2002 (16) and is able to transmit observations for most of the year, which is helpful during winter and fall, when observational data are harder to come by.

Figure 5. AURORA

The **ZAANDAM** (**Figure 6**) (17), an active VOS member from the Holland America League (18), is among the world leaders for total number of weather observations taken manually so far during 2018. During the summer, the **ZAANDAM** makes weekly trips to and from Alaska (with over 2000 passengers and crew) and takes many weather observations while enroute.

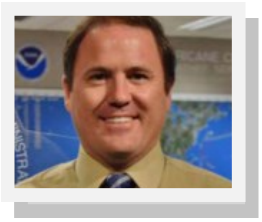
Figure 6. The ZAANDAM

These are just a few of the many ships choosing to transmit weather observations while on or near Alaskan waters. As mentioned above, there is great need for more observations, especially during the fall and winter months, when weather is at its worst. If you are captaining a ship transiting through Alaskan waters and may be interested in beginning a weather-observation program, please consider calling or e-mailing Larry Hubble (Alaska's PMO). Larry can make arrangements for you to receive all needed materials. His phone number and e-mail address are Larry Hubble, (907) 271-5135, larry.hubble@noaa.gov.

References:

1. NOAA In Alaska.
2. "Cruise Ship Market Improving for Alaska," Cordova Times, January 9, 2018.
3. Shoreline Mileage Of the United States.
4. U.S. States by Length of Coastline.
5. Links to National Weather Service Marine Forecast Offices map.
6. O'Brien, Kaitlyn. NWS Anchorage, Alaska. (data provided July 11, 2018) "Alaska Public, Marine and Offshore Summary," from Shapefile Dataset: AWIPS HRS, February 5, 2013.
7. State Area Measurements and Internal Point Coordinates.
8. Ferrin, Nicole. NWS Juneau, Alaska. (image provided July 15, 2018)
9. Nettesheim, WPC Analyst, (image provided by Victor Proton, NWS Fairbanks, Alaska.) "Marine - image - 1800Z SURFACE ANALYSIS," July 18, 2018.
10. Cox, Christopher. Personal communication. July 18, 2018.
11. USGS Research **VESSEL ALASKAN GYRE**.
12. World-Wide Voluntary Observing Ship Program. **ALASKAN GYRE**. Overview.
13. Cargo ship **MIDNIGHT SUN**.
14. World-Wide Voluntary Observing Ship Program. **MIDNIGHT SUN**. Overview.
15. **MV AURORA**.
16. World-Wide Voluntary Observing Ship Program. **AURORA** Overview.
17. Image of **ZAANDAM**.
18. World Wide Voluntary Observing Ship Program. **ZAANDAM** Overview.

Tropical Atlantic and Tropical East Pacific Areas



January through April 2018

Carl McElroy and Andy Latto
Tropical Analysis and Forecast Branch
National Hurricane Center, Miami, Florida
NOAA National Centers for Environmental Prediction

Tropical Atlantic Ocean

The TAFB Atlantic High Seas area of responsibility (AOR) extends from 7°N to 31°N west of 35°W, including the Caribbean Sea and Gulf of Mexico. Thirty gale warnings were issued for this area from January through April 2016; two storm-force wind warnings and no hurricane-force wind warnings were issued during the period. Gale conditions persisted over the Caribbean almost continuously from January 25 through February 22. The number of warnings issued during this period agrees precisely with the January through April 5-year average of 31. Of the 31 warnings issued, 10 of these were located in the Gulf of Mexico, 12 of these were located in the Atlantic Ocean, 8 were located in the Caribbean Sea, and 1 was located over the Straits of Florida.

Table 1. Nontropical warnings issued for the TAFB Atlantic High Seas AOR between January 1, 2018, and April 30, 2018. Storm events are shaded, and the duration of the storm warning is in parentheses.

Onset	Region	Peak Wind	Gale Duration (Storm)	Forcing
1200 UTC 01 Jan	W Atlc 30N W of 77W	35 kt	18 hr	Front
1200 UTC 01 Jan	SW Gulf of Mexico	40 kt	30 hr	Front
1200 UTC 02 Jan	W Atlc N of 27N W of 77W	55 kt	72 hr (6 hr)	Low/Front
1200 UTC 03 Jan	SW Gulf of Mexico	35 kt	18 hr	Front
0600 UTC 04 Jan	Caribbean	35 kt	18 hr	Pressure Gradient
0000 UTC 07 Jan	Caribbean	40 kt	30 hr	Pressure Gradient
0600 UTC 07 Jan	W Atlc 22N to 25N W of 77W	35 kt	24 hr	Front
0600 UTC 12 Jan	W Gulf of Mexico	40 kt	12 hr	Front
0600 UTC 14 Jan	Caribbean	35 kt	36 hr	Pres Gradient
1200 UTC 16 Jan	N and W Gulf of Mexico	35 kt	42 hr	Front
1200 UTC 18 Jan	W Atlc N of 30N W of 70W	35 kt	12 hr	Front
0000 UTC 21 Jan	Caribbean	35 kt	12 hr	Pres Gradient
0600 UTC 23 Jan	Caribbean	35 kt	30 hr	Pres Gradient
1800 UTC 23 Jan	SW Gulf of Mexico	40 kt	48 hr	Front
0600 UTC 25 Jan	Caribbean	40 kt	606 hr	Pres Gradient
1800 UTC 26 Jan	Large area of W Atlc	35 kt	84 hr	Low/Front
0000 UTC 27 Jan	Straits of Florida	35 kt	12 hr	Front
0000 UTC 29 Jan	SW Gulf of Mexico	35 kt	12 hr	Front
0600 UTC 12 Feb	SW Gulf of Mexico	35 kt	12 hr	Front
0000 UTC 26 Feb	Atlc N of 29N E of 51W	40 kt	42 hr	Front
1200 UTC 02 Mar	Atlc N of 26N E of 77W	50 kt	132 hr (12 hr)	Front
1200 UTC 02 Mar	Atlc N of 29N E of 42W	35 kt	12 hr	Low
0000 UTC 10 Mar	Caribbean	35 kt	36 hr	Pres Gradient
1200 UTC 12 Mar	SW Gulf of Mexico	35 kt	18 hr	Front

Table 1. Nontropical warnings issued for the TAFB Atlantic High Seas AOR between January 1, 2018, and April 30, 2018. Storm events are shaded, and the duration of the storm warning is in parentheses.				
Onset	**Region**	**Peak Wind**	**Gale Duration (Storm)**	**Forcing**
1800 UTC 20 Mar	Atlc N of 29N W of 72W	35 kt	18 hr	Front
1800 UTC 20 Mar	NE Gulf of Mexico	35 kt	18 hr	Front
1800 UTC 21 Mar	Atlc N of 30N W of 66W	40 kt	18 hr	Front
0000 UTC 24 Mar	Caribbean	35 kt	156 hr	Pres Gradient
1200 UTC 14 Apr	W Gulf of Mexico	35 kt	24 hr	Front
0000 UTC 16 Apr	Atlc N of 29N W of 74W	35 kt	12 hr	Front

Web URL References:
https://www.nhc.noaa.gov/archive/text/HSFAT2/2018/
https://www.nhc.noaa.gov/archive/text/HSFEP2/2018/

Tropical Northeast Pacific Ocean

The TAFB Northeast Pacific High Seas AOR extends from the equator to 30°N east of 140° W, and from the equator to 3.4°S east of 120° W. Nineteen Gale Warnings and two Storm Warnings were issued across this area from January through April 2018. Of the 21 warnings that occurred during this time period, 15 were across the Gulf of Tehuantepec, 3 were over the open waters west of Baja California, 2 were over the Gulf of California, and 1 was over the Gulf of Papagayo. Both storm warnings occurred over the Gulf of Tehuantepec.

The latest update to the Tropical Analysis and Forecast Branch's Graphical Composite Marine Forecast Web page includes expanded domain coverage to include their entire High Seas Forecast AOR for both the Atlantic and Pacific basins. **Figure 1** shows 12-hour time resolution of our forecast wind barbs, wave heights, and features out to 72 hours over the entire TAFB eastern Pacific High Seas AOR. **Figure 2** shows the same forecast parameters for the entire TAFB Atlantic AOR. This interface is available through the main composite page at www.hurricanes.gov/marine/forecast where the mariner can choose seven regions:

Table 2. Nontropical warnings issued for the Pacific Ocean between January 1, 2018, and April 30, 2018. Storms are shaded, and the duration of the storm warning is in parentheses.				
Onset	**Region**	**Peak Wind**	**Gale Duration (Storm)**	**Forcing**
0600 UTC 01 Jan	Eastern Pacific 28.5N	35 kt	06 hr	Front
2100 UTC 01 Jan	Gulf of Tehuantepec	45 kt	141 hr	Gap
1800 UTC 05 Jan	Eastern Pacific 24N	40 kt	30 hr	Extratropical Low
0300 UTC 09 Jan	Gulf of Tehuantepec	35 kt	21 hr	Gap
1500 UTC 12 Jan	Gulf of Tehuantepec	50 kt	171 hr (18 hr)	Gap
1200 UTC 14 Jan	Gulf of Papagayo	35 kt	30 hr	Gap
0000 UTC 24 Jan	Gulf of Tehuantepec	45 kt	84 hr	Gap
1200 UTC 28 Jan	Gulf of Tehuantepec	55 kt	90 hr (36 hr)	Gap
0000 UTC 03 Feb	Gulf of Tehuantepec	40 kt	18 hr	Gap
1200 UTC 08 Feb	Gulf of Tehuantepec	40 kt	30 hr	Gap
0000 UTC 11 Feb	Gulf of California	35 kt	9 hr	Trough

Table 2 Nontropical warnings issued for the Pacific Ocean between January 1, 2018, and April 30, 2018. Storms are shaded, and the duration of the storm warning is in parentheses.				
Onset	**Region**	**Peak Wind**	**Gale Duration (Storm)**	**Forcing**
1800 UTC 12 Feb	Gulf of Tehuantepec	40 kt	66 hr	Gap
0000 UTC 20 Feb	Gulf of California	35 kt	12 hr	Front
0000 UTC 03 Mar	Gulf of Tehuantepec	35 kt	18 hr	Gap
0000 UTC 08 Mar	Gulf of Tehuantepec	40 kt	18 hr	Gap
2100 UTC 12 Mar	Gulf of Tehuantepec	40 kt	69 hr	Gap
1800 UTC 20 Mar	Eastern Pacific 28N	35 kt	06 hr	Front
0000 UTC 22 Mar	Gulf of Tehuantepec	40 kt	42 hr	Gap
0600 UTC 31 Mar	Gulf of Tehuantepec	35 kt	30 hr	Gap
1200 UTC 15 Apr	Gulf of Tehuantepec	45 kt	51 hr	Gap
0300 UTC 20 Apr	Gulf of Tehuantepec	40 kt	12 hr	Gap

Eastern Pacific offshore from Mexico to 122W, eastern Pacific offshore from Central America to 97W, the Gulf of Mexico, Caribbe-an Sea and tropical N Atlantic waters east to 64W, the southwestern north Atlantic east to 64W, and these two new expanded full forecast AOR domains.

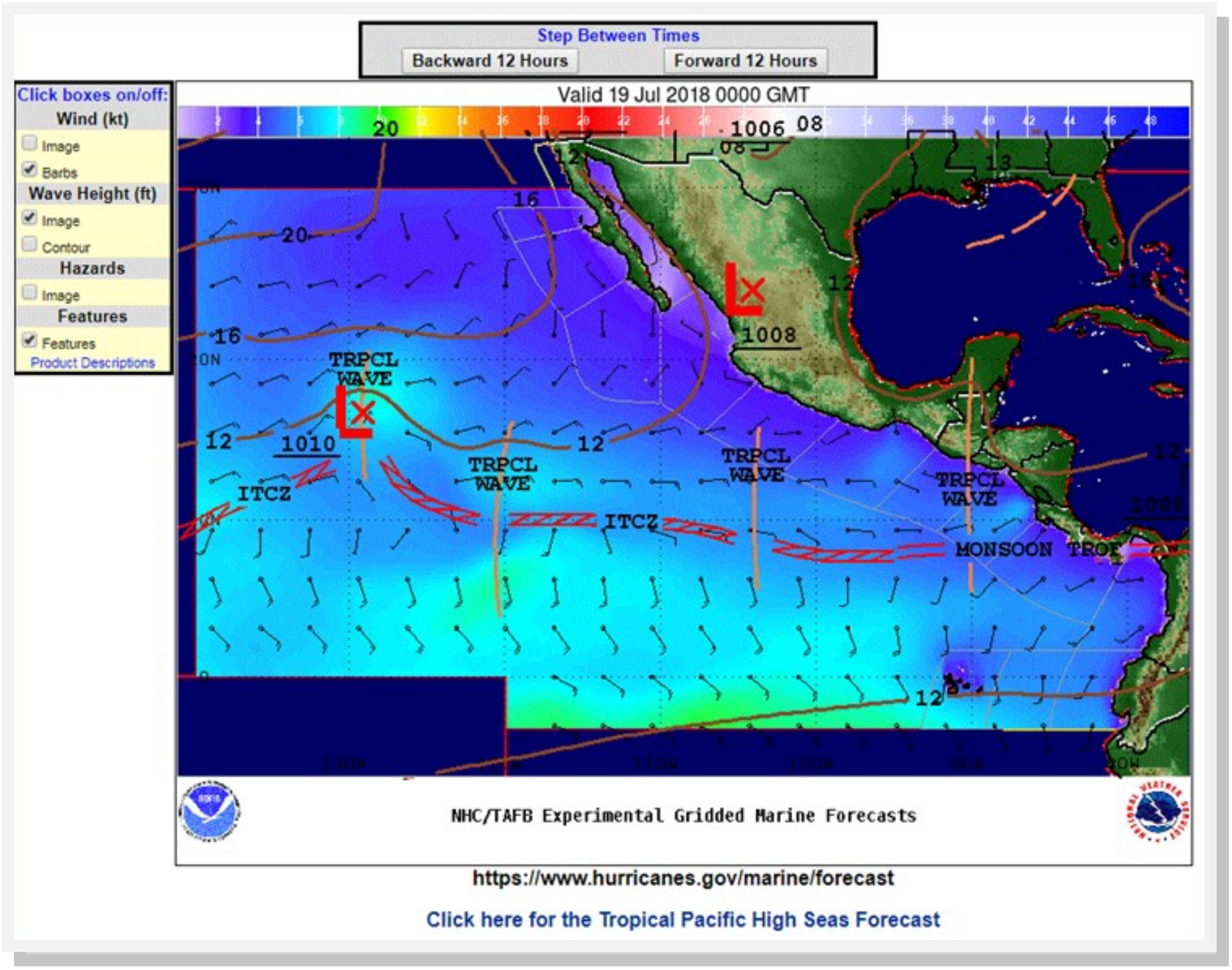


Figure 1. The graphical composite forecast web page with low-bandwidth capability (www.hurricanes.gov/marine/forecast) full eastern Pacific forecast domain of the Tropical Analysis and Forecast Branch. The page is capable of displaying, in 12-hour resolution, winds, significant wave heights, hazards, and surface features.

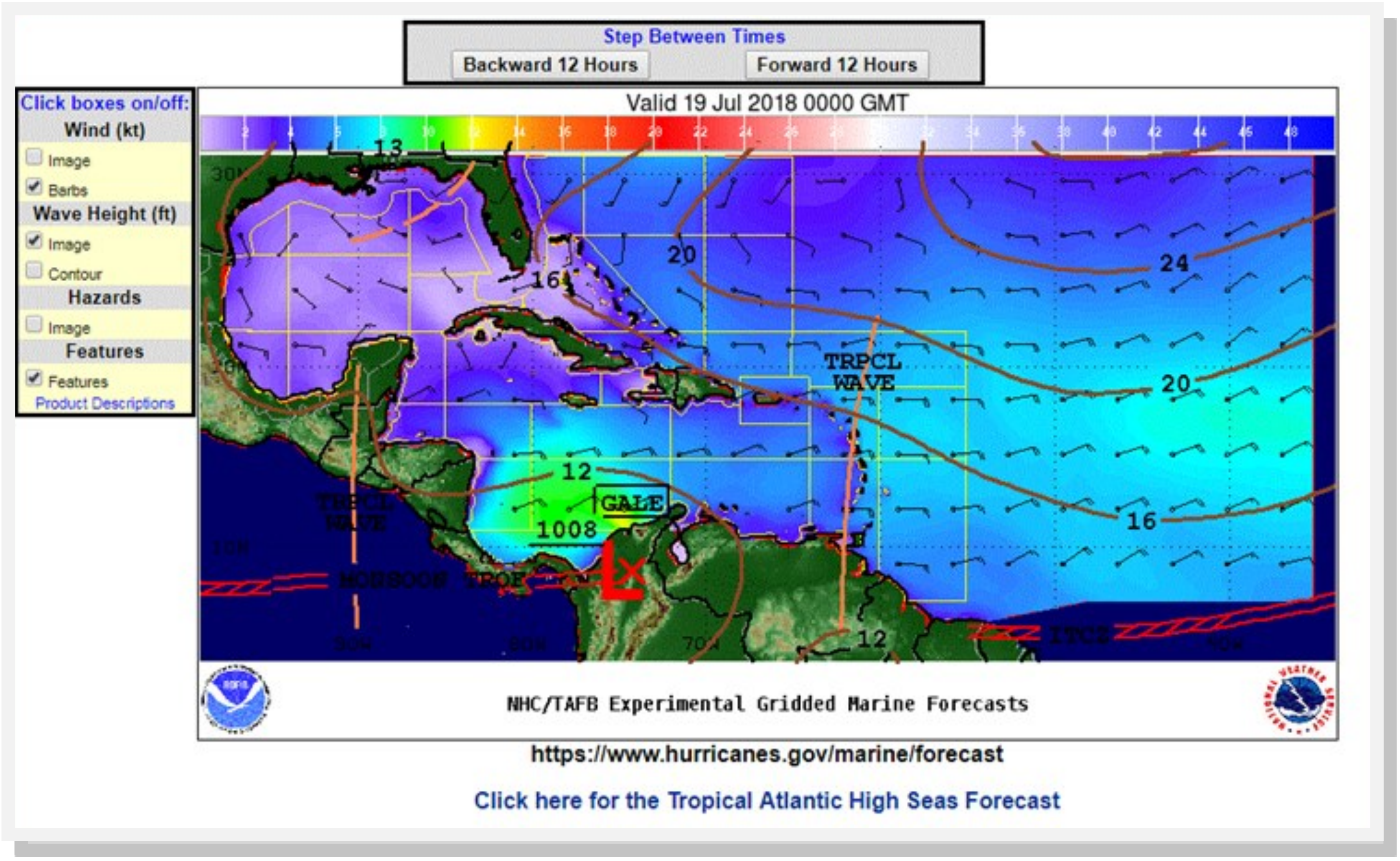


Figure 2. The graphical composite forecast web page with low-bandwidth capability (www.hurricanes.gov/marine/forecast) full Atlantic forecast domain of the Tropical Analysis and Forecast Branch. The page is capable of displaying, in 12-hour resolution, winds, significant wave heights, hazards, and surface features.

MARINE WEATHER REVIEW — NORTH ATLANTIC AREA

September to December 2017

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Introduction

The fall-to-early-winter period of September to December 2017 featured the onset of mainly a progressive and increasingly active pattern of developing cyclones moving from southwest to northeast across the North Atlantic toward the area from the northern British Isles to the eastern Greenland waters, with cyclones frequently taking a more northerly track toward the Labrador Sea and occasionally the Davis Strait after the middle of November. In terms of numbers of cyclones developing hurricane-force winds, the numbers increased during the 4-month period, from none in September to four in October, five in November, and eight in December, the most active month of the period. This was similar to the seasonal trend found in a study based on QuikSCAT winds in 2005 (Von Ahn and Sienkiewicz, 2005). These numbers include a mid-October system with tropical origin in the eastern North Atlantic near Ireland (extratropical Ophelia).

The 4-month period includes the last half of the hurricane season in the Atlantic basin. Of the five tropical systems affecting OPC's marine area of responsibility north of 31N, three occurred in September, considered the peak of the hurricane season in the Atlantic basin, followed by one each in October and November. All were hurricanes, except for Rina in November. Hurricane Maria, although a major hurricane while south of 31N, weakened as it moved north into OPC's southwestern waters between Bermuda and the U.S. East Coast. Hurricanes Lee and Ophelia attained major-hurricane intensity at Category 3 on the Saffir-Simpson scale (Reference 3). Hurricanes Jose and Maria passed between the U.S. East Coast and Bermuda before entering the midlatitude westerlies and becoming posttropical (extratropical). The other tropical systems tracked farther out in the Atlantic prior to becoming posttropical. Of the five tropical cyclones, only Ophelia became an intense post\tropical cyclone with hurricane-force winds. (See Reference 6 for more details on the tropical cyclones of the period, including those that stayed south of OPC's marine area.)

Tropical Activity

Hurricane Jose: Jose crossed 31N between the U.S. East Coast and Bermuda as a hurricane with 80-kt sustained winds (Category 1 on the Saffir-Simpson scale at 1800 UTC September 17 with a slow weakening trend, becoming a minimal hurricane (65-kt sustained winds) near 37N 71W 1800 UTC on the 19th). **Figure 1** shows Tropical Storm Jose as it stalled southeast of New England at 0600 UTC on the 21st, and **Figure 2** shows Jose as a posttropical cyclone 24 hours later. The **RMS Queen Mary 2** (ZCEF6) reported south winds of 64 kt and 8.5-meter seas (28 feet) near 39N 66W at 1300 UTC on the 21st. A quality control check of the report indicated that the ship had a recent (5-day) history of reporting 9.6 kt high relative to the forecast from a U.S. global model. The **Sampogracht** (PHDL) reported northeast winds of 45 kt near 41N 69W 2 hours later. The **Norwegian** Gem (C6VG8) near 41N 69W encountered northeast winds of 50 kt and 7.0-meter seas (23 feet) at 1000 UTC on the 22nd. Buoy 44008 (40.5N 69.2W) reported

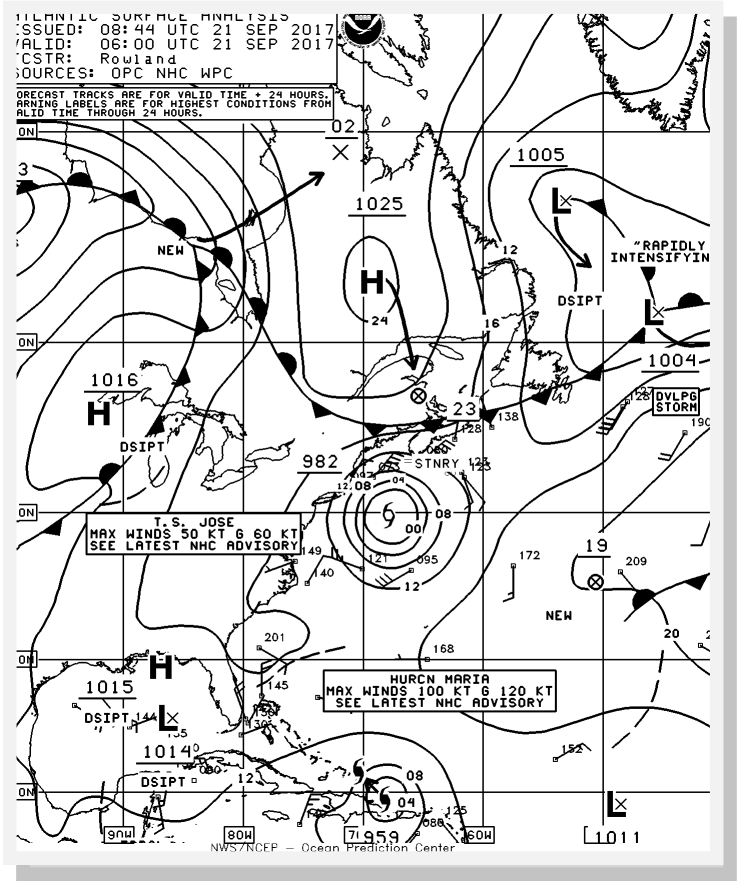

Figure 1. OPC North Atlantic Surface Analysis chart (Part 2 — west) valid 0600 UTC September 21, 2017. The 24-hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in hPa or millibars, except for tropical cyclones at 24 hours (tropical symbol at the forecast position). Text boxes contain warning and tropical cyclone information.

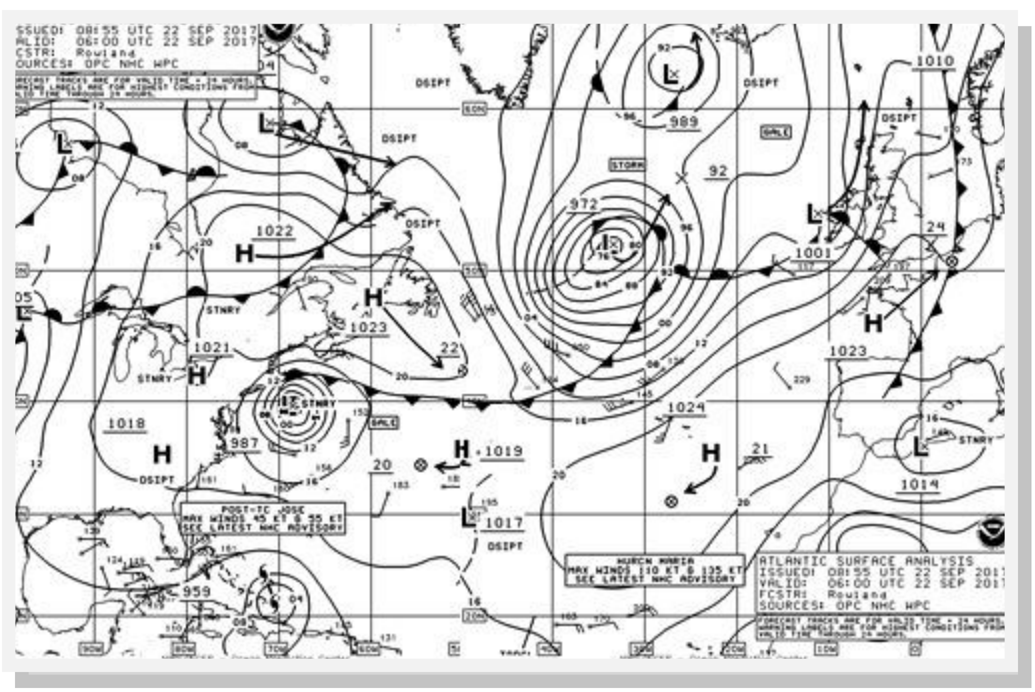

Figure 2. OPC North Atlantic Surface Analysis charts (Parts 1 — east and 2 — west) valid 0600 UTC September 22, 2017. The two parts overlap between 40W and 50W.

north winds 37 kt with gusts to 49 kt and 6.0-meter seas (20 feet) at 1800 UTC on the 21st. The stalled cyclone weakened to a subgale-force low early on the 23rd and then dissipated on the 26th.

Hurricane Lee: Lee moved northwest into OPC's high seas area near 31N 49W as a strengthening tropical storm by 0600 UTC September 23rd and meandered west near 31N over the following 4 days, becoming an 80-kt hurricane 36 hours later near 31N 50W and reaching a peak intensity of 100 kt near 30N 56W on the morning of the 27th. This made Lee a major hurricane at the low end of Category 3 on the Saffir-Simpson hurricane wind scale (Reference 3). The cyclone accelerated north-east ahead of an approaching cold front with a gradual weakening trend beginning early on the 28th, with **Figure 3** showing Lee as a tropical storm near 43N 45W at 0000 UTC on the 30th. **Figure 4** is a Geocolor daytime-visible satellite image showing Lee as a compact cyclone at maximum intensity with a well-defined central-eyewall feature casting a shadow inside the eye. Lee became posttropical at 1200 UTC on the 30th while passing near 51N 33W and merged with the cold front 6 hours later.

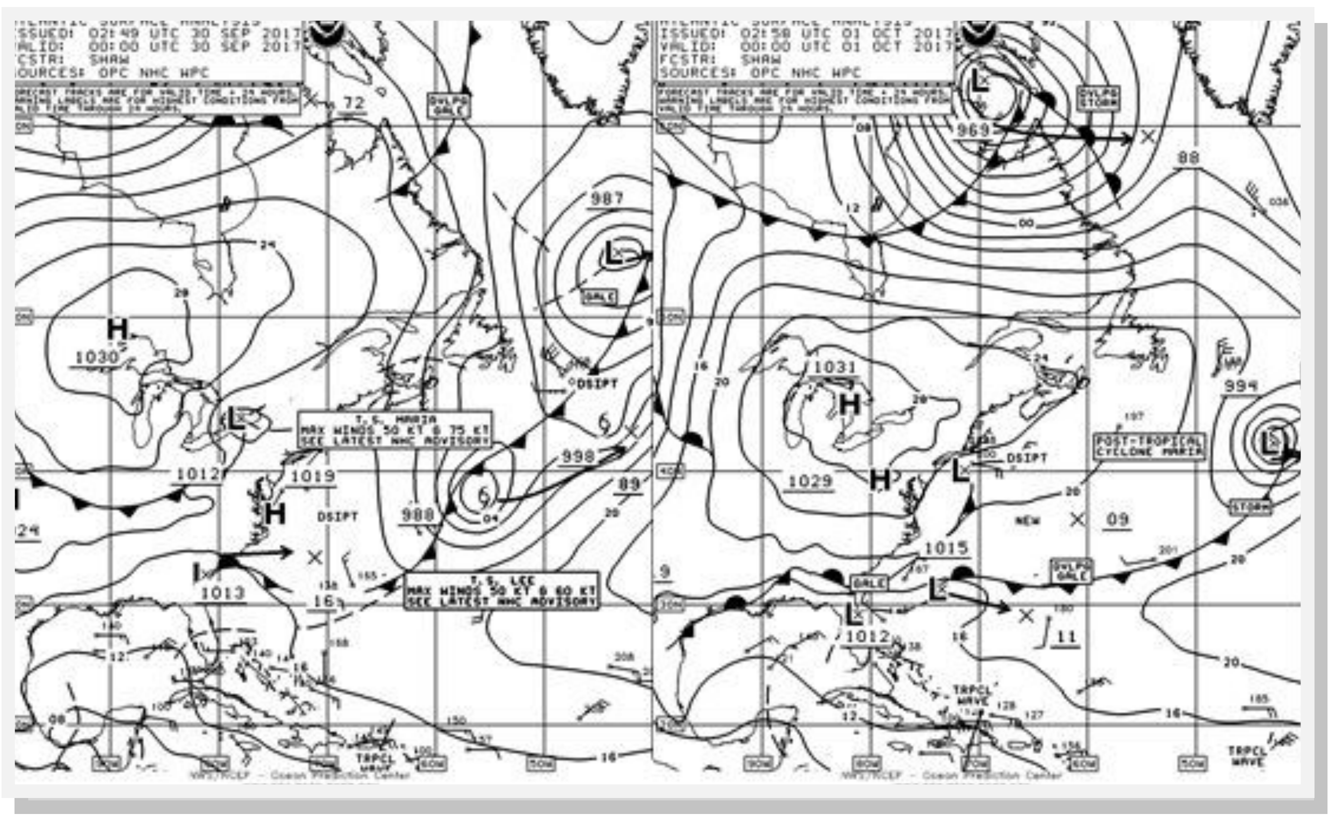

Figure 3. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC September 30 and 0000 UTC October 1, 2017.

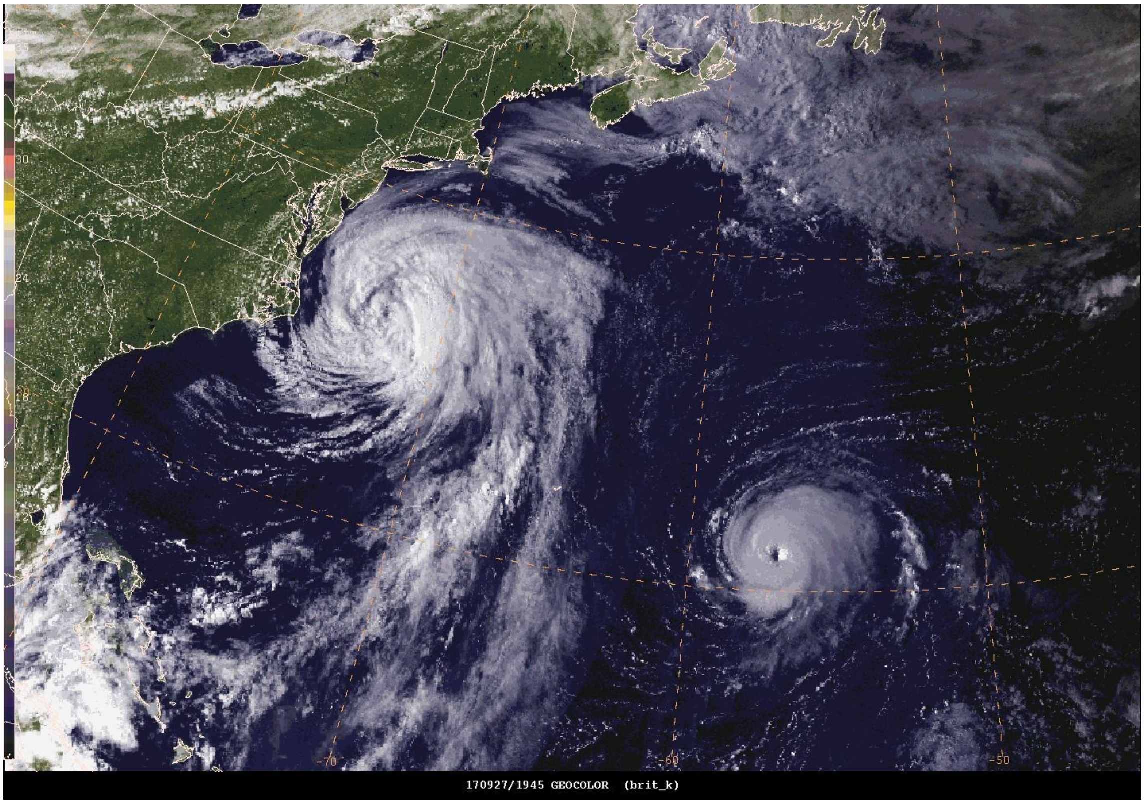

Figure 4. Geocolor daytime true color image of Hurricane Lee and Tropical Storm Maria (closer to the U.S. East Coast) valid at 1945 UTC September 27, 2017. See Reference 1 for more information on this type of imagery.

Hurricane Maria: With a prior history as a destructive major hurricane south of OPC's southern boundary of 31N (Figures 1 and 2), Maria, like Jose, entered the southwestern waters as a weakening 80-kt hurricane and initially tracked north through OPC's mid-Atlantic offshore waters from September 25th to early on the 28th and then, like Jose, accelerated ahead of an approaching cold front. **Figure 3** shows Tropical Storm Maria transitioning to a posttropical storm-force low over a 24-hour period ending at 0000 UTC October 1. The satellite image in **Figure 4** shows Maria and Lee, both hurricanes, but with the weaker Maria having a larger cloud pattern and hint of an eyewall feature and eye as a minimal hurricane. The **Maersk** Chicago (WMCS) near 34N 68W encountered southeast winds of 40 kt and 5.8-meter seas (19 feet) at 0600 UTC on the 27th as Maria passed to the west. Buoy 41002 (31.8N 74.8W) reported northwest winds of 41 kt with gusts to 52 kt and 6.0-meter seas (20 feet) at 2200 UTC on the 25th and highest seas of 7.5 meters (25 feet) at 1300 UTC that day. Maria subsequently weakened as an extratropical cyclone over the central North Atlantic on October 1st before dissipating west of France late on the 2nd.

Hurricane Ophelia: Hurricane Ophelia crossed 31N near 34W with 90-kt sustained winds at 0600 UTC October 13th and tracked northeast over the eastern Atlantic. After weakening slightly later that day, Ophelia re-intensified into a major hurricane with 100-kt winds while passing near 36N 25W at 1800 UTC on the 14th and became the farthest east major hurricane observed in the satellite era (Stewart, 2018). The cyclone's sustained winds weakened to 75 kt as the center passed near 43N 14W 24 hours later. **Figure 5** depicts the transition of Ophelia into a powerful extratropical hurricane-force low over a 24-hour period ending at 1200 UTC on the 16th. A postseason report on Ophelia (Stewart, 2018) revealed a maximum intensity of 957 hPa as a posttropical low at 0600 UTC on the 16th, a maximum individual wave height of 26.1 meters (85 feet) at the Kinsale gas platform near the south coast of Ireland, and the ranking of Ophelia as the worst

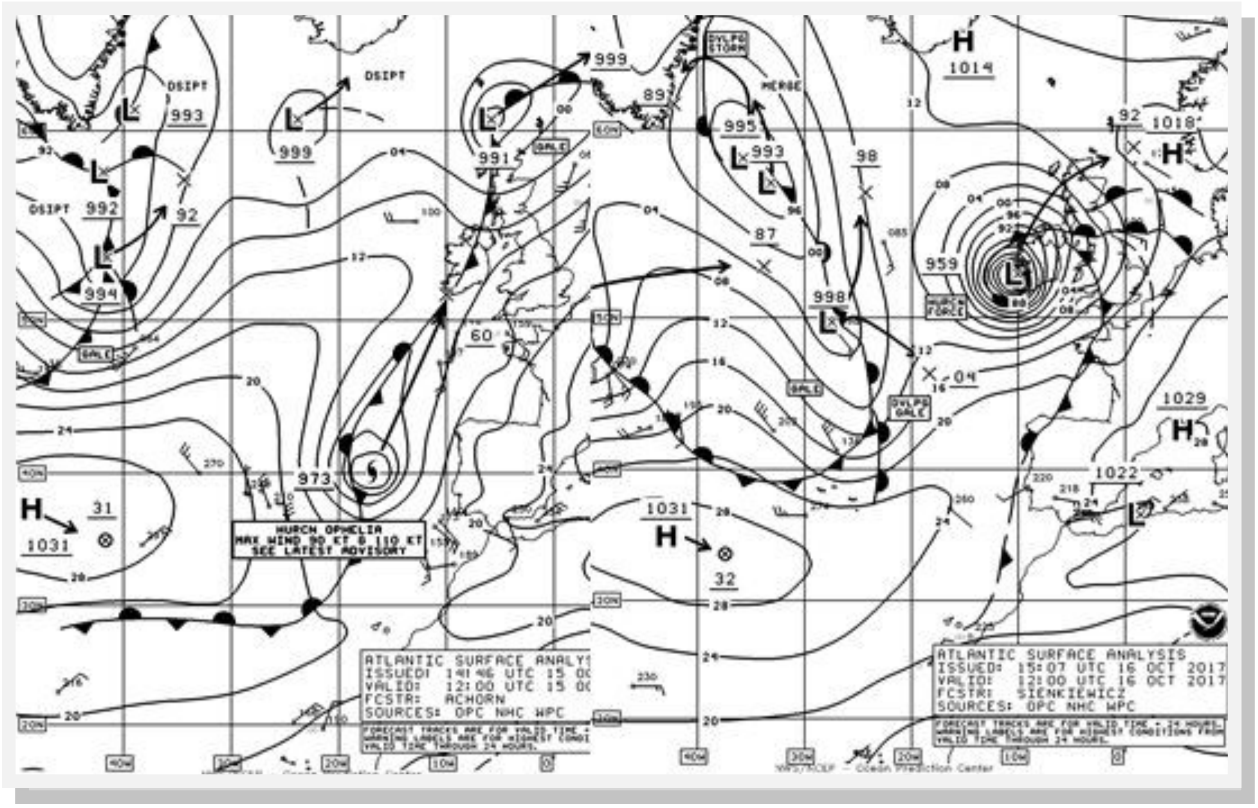

Figure 5. OPC North Atlantic Surface Analysis charts (Part 1 – east) valid 1200 UTC October 15 and 16, 2017.

extratropical storm to affect Ireland in 50 years. (See Reference 8 for additional information on this storm.) The ASCAT-B image in **Figure 6** reveals wind retrievals as high as 65 kt to the southwest of Ireland. (Selected observations taken during this event appear in **Table 1.**) The cyclone subsequently weakened rapidly after passing north of Ireland, moved across Scotland as a gale late on the 16th, and dissipated as it moved into southern Norway on the night of the 17th.

Tropical Storm Rina: Tropical Depression 19 formed south of the area near 29N 50W early on November 6th and became Tropical Storm Rina as it passed north into OPC's marine area near 31N 50W the following night with 35-kt maximum sustained winds, becoming the last-named cyclone of the 2017 season. Rina moved north and developed maximum sustained winds as high as 50 kt while passing near 38N 48W early on the 7th. A slow weakening trend followed, with the cyclone losing tropical characteristics just northeast of the Grand Banks by 1800 UTC on the 9th and becoming a gale-force low. The **Federal Margaree** (V7RI7) near 46N 51W encountered north winds of 35 kt and 7.0-meter seas (23 feet) at 2300 UTC on the 9th. The **Henry Goodrich** platform (YJQN7, 46.7N 48.0W) reported northeast winds of 48 kt at 0900 UTC on the 9th, and seas as high as 4.6 meters (15 feet) 6 hours later. The remnants of Rina then moved across the north-central waters late on the 9th and on the 10th and dissipated over southern Great Britain the following night.

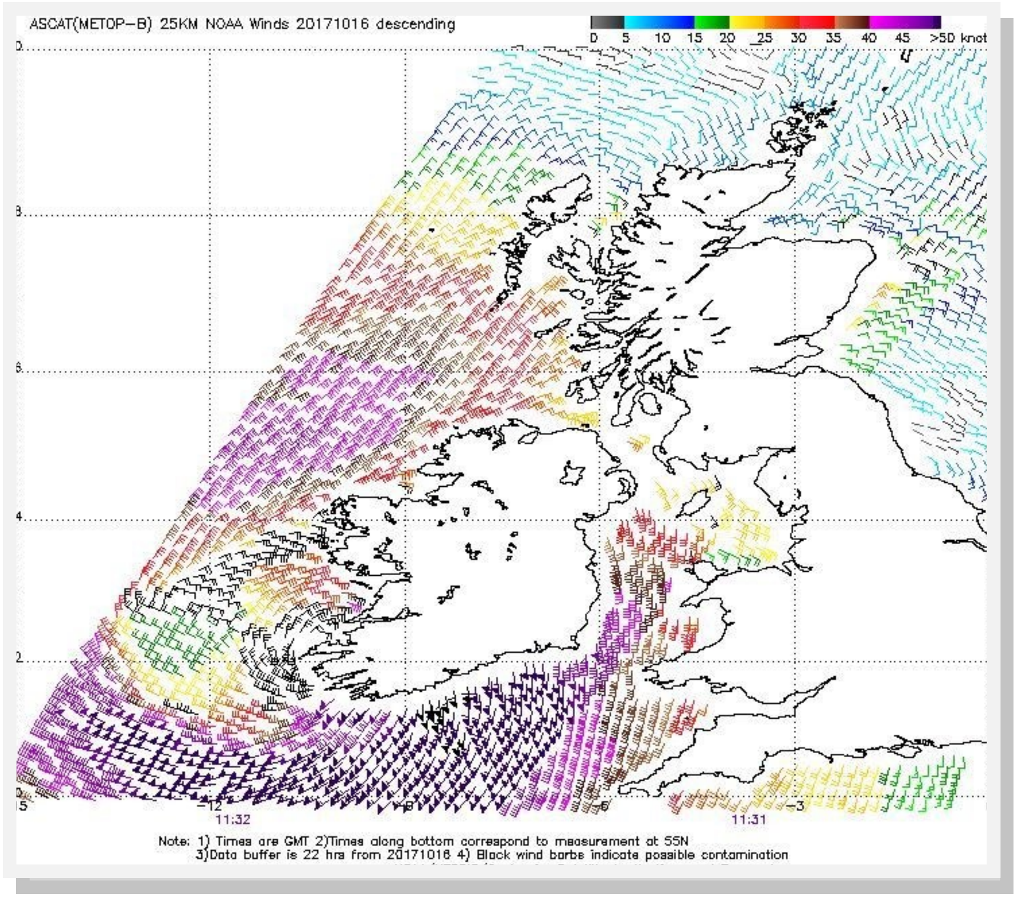

Figure 6. ASCAT METOP-B (Advanced Scatterometer) image of satellite-sensed winds with 25-km resolution around the hurricane-force low (Posttropical Cyclone Ophelia) shown in the second part of Figure 5. The valid time of the pass is 1132 UTC October 16, 2017, or about 0.5 hour prior to the valid time of the second part of Figure 5. Imagery is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research.

Table 1. Selected observations taken during the passage of Posttropical Cyclone Ophelia. Maximum seas shown are significant wave heights.

Observation	Position	Date/Time (UTC)	Wind	Seas (m/ft)	Pressure
Kinsale Energy 62023	51.4N 7.9W	16/1600	SW 60 G72		
Buoy 62107	50.1N 6.1W	16/0700	S 43 G57	2.5/8	
		16/1100	Peak gust 65		
		16/1200		Maximum 6.5/21	
Buoy 62029	48.8N 12.4W	16/0700		Maximum 11.0/36	
		16/0400			968.1 hPa
Buoy 62163	47.5N 8.4W	16/0600	SW 38 G50	6.5/21	
		16/1300		Maximum 8.5/28	
Buoy 62442	49.0N 16.3W	16/0400	NW 38 G47	5.5/18	
		16/0100	Peak gust 51		
		16/0600		Maximum 6.5/21	

Other Significant Events of the Period

North Atlantic Storm, September 3–4: An unusually strong late summer or early fall storm developed a lowest central pressure of 972 hPa and storm-force winds just west of Iceland by 1200 UTC September 4. It was similar in intensity to other lows that developed later in the month. It originated from the merging of a low in the Labrador Sea with another low near the southern tip of Greenland early on the 3rd. An ASCAT(METOP-A) pass from 2000 UTC on the 4th showed northerly wind retrievals to the north of Iceland. The cyclone then weakened while passing south and then east of Iceland from the night of the 4th through the following night.

North Atlantic Storm, September 21–23: Another 972-hPa storm developed farther south over the central waters early on the 22nd after originating from a complex low-pressure system off the Newfoundland and Labrador coasts early on the 21st (**Figures 1 and 2**). The central pressure of the secondary 1004-hPa low shown in **Figure 1** fell 32 hPa in the following 24-hour period, and this development qualifies as a bomb cyclone (Sanders and Gyakum, 1980). An ASCAT (METOP-B) pass from 1312 UTC on the 22nd returned winds of 50–55 kt in the southwest quadrant of the low. The cyclone then reformed to the north as a new cyclone late on the 22nd,which became slightly deeper at 968 hPa near 58N 25W at 0600 UTC on the 23rd with gale-force winds. It passed west of Iceland early on the 24th.

North Atlantic Storm, September 26–29: **Figure 7**, besides showing the tropical cyclones Lee and Maria over the southwest waters, also depicts the development of another 972-hPa storm over the eastern waters to the west of Ireland over a 36-hour period. It originated from the open low-pressure wave passing east of Newfoundland. This cyclone developed winds approaching hurricane force as shown in the ASCAT-A image of **Figure 8**, with retrievals as high as 60 kt south of the storm center near the northern edge of the figure. At 0000 UTC on the 28th, the **Maersk Iowa** (KABL) near 45N 29W reported west winds of 45 kt, followed by a report of 6.1-meter seas (20 feet) near 45N 24W 12 hours later. Buoy 62095 (53.1N 15.8W) reported southwest winds of 38 kt, with gusts to 48 kt, at 1600 UTC on the 28th, a peak gust of 60 kt 12 hours later, and highest seas of 9.0 meters (30 feet) at 0500 UTC on the 29th. Buoy 62442 (49.0N 16.3W) reported west winds of 36 kt with gusts to 47 kt at 1200 UTC on the 28th and highest seas of 10.1 meters (33 feet) 4 hours later. The storm turned toward the north near 17W late on the 28th, slowly weakened, and passed north across Iceland by the 30th.

Northeastern Atlantic Storm, September 30–October 2: Another cyclone followed a track similar to that of the September 26–29 event, originating in the Gulf of St. Lawrence early on the 28th and developed storm-force winds with a 976-hPa center passing near 57N 25W at 0600 UTC October 1st. An ASCAT-A pass from 1228 UTC on the 1st revealed retrievals to 50 kt south of the center and to the west of Ireland. Buoy 62105 (55.2N 12.8W) reported west winds of 40 kt with gusts to 68 kt and 9.0-meter seas (30 feet) at 2300 UTC on the 1st. The cyclone redeveloped to the northeast as a new storm center with a 968-hPa center near the Faroe Islands by 0600 UTC on the 2nd, but winds detected by scatterometer were not quite as high. It then weakened in the Norwegian Sea on the 3rd.

Western North Atlantic Storm, October 1–4: This cyclone developed quickly early in its history while passing south and then southeast of the Canadian Atlantic provinces as depicted in **Figure 9**, accompanied by storm-force winds with relatively modest central pressures of 1004–991 hPa. It originated as a new low near 35N 68W (1014 hPa) at 0600 UTC on the 1st. Remarkably, ASCAT winds to 55 kt appear southwest of the center when it was most intense (**Figure 10**). These winds appear at the edge of the pass and might miss the strongest winds. The cyclone weakened to a gale-force low over the central waters on the 4th, passed southeast of Iceland on the 6th, and moved inland over Denmark the following night.

North Atlantic Storm, October 11–13: This cyclone developed rapidly over a 24-hour period from the merging of weak lows over Labrador and near the island of Newfoundland, to form a 967-hPa low with storm-force winds near 54N

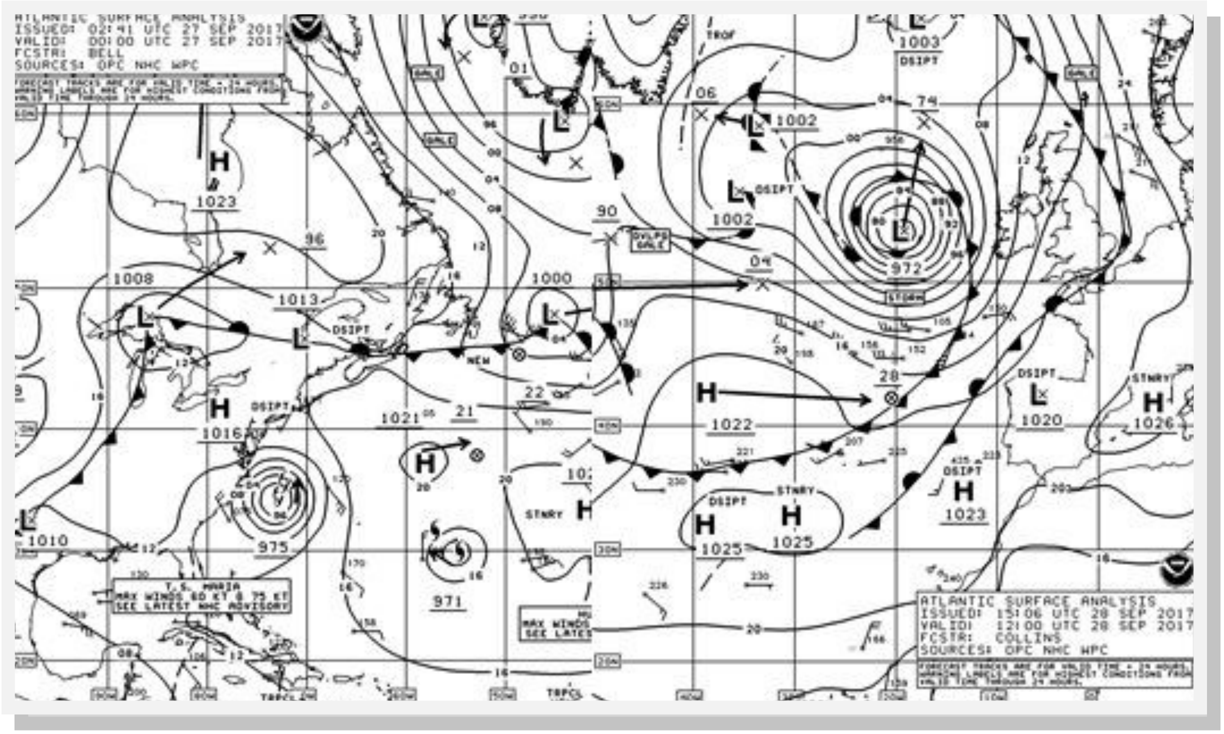

Figure 7. OPC North Atlantic Surface Analysis charts valid 0000 UTC September 27 (Part 2) and 1200 UTC September 28, 2017 (Part 1).

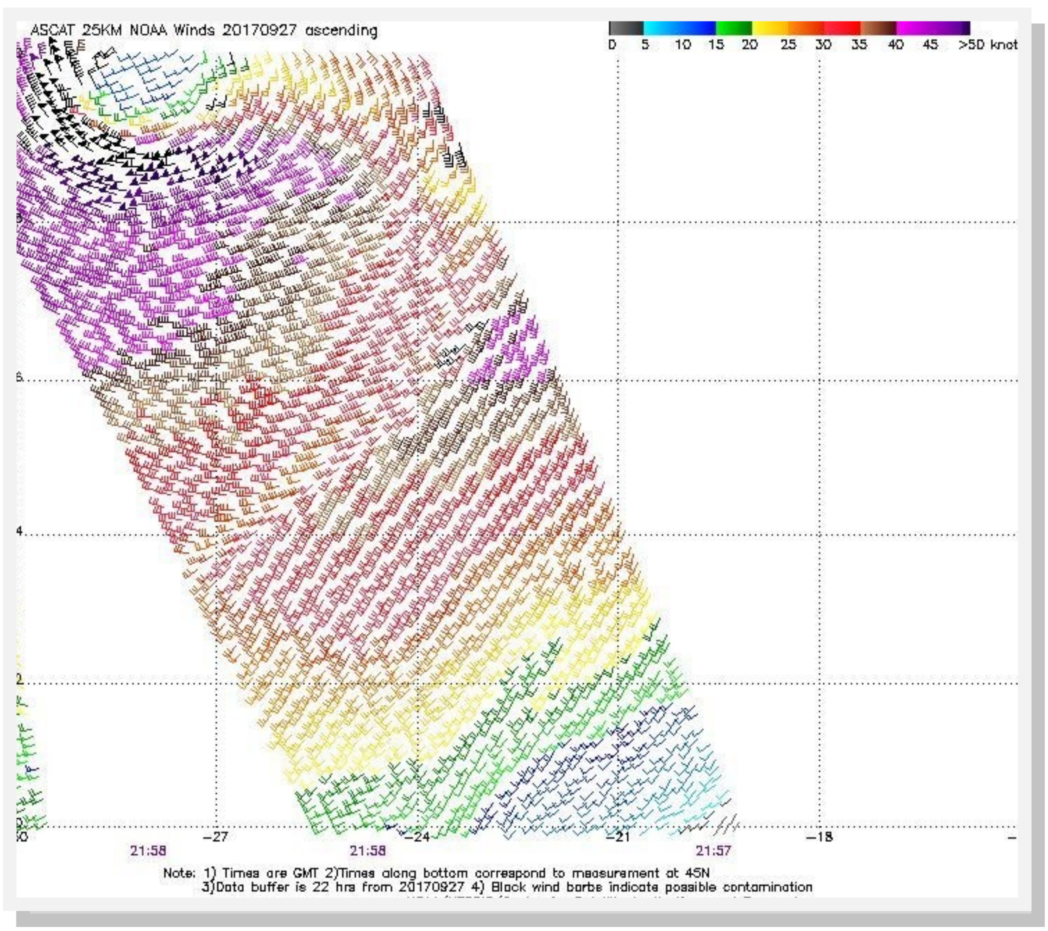

Figure 8. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the south semicircle of the storm shown in the second part of Figure 7. The valid time of the pass is 2158 UTC September 27, 2017, or about 14 hours prior to the valid time of the second part of Figure 7. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

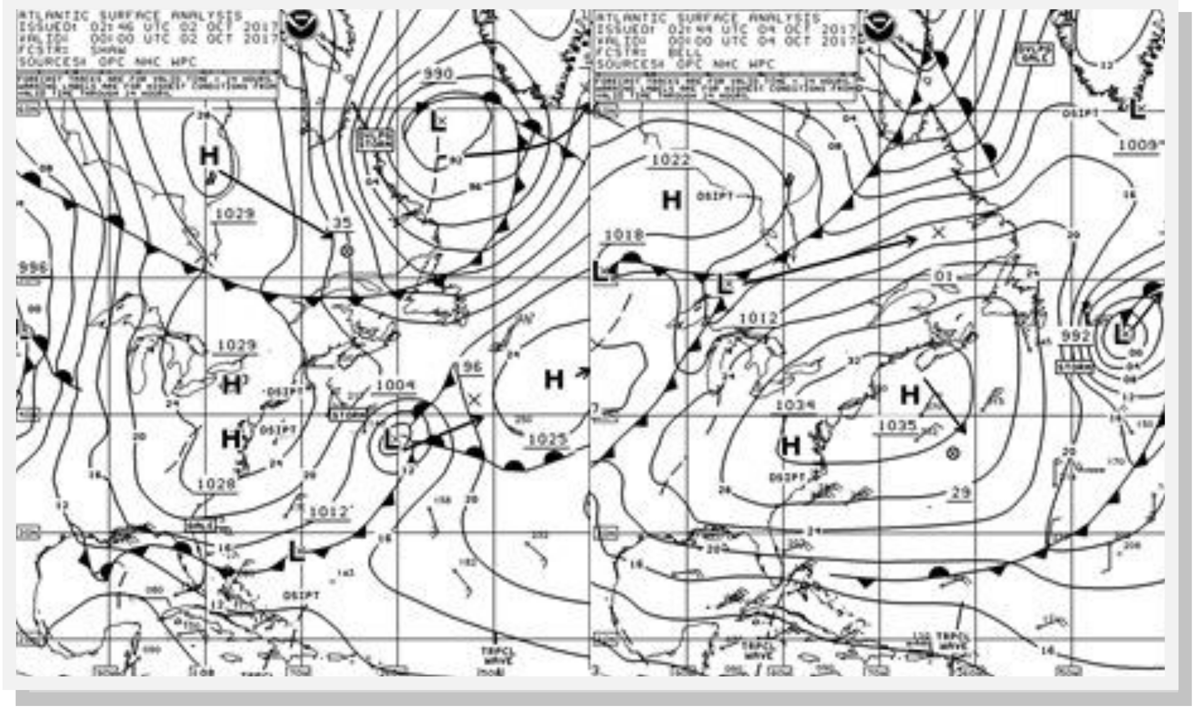

Figure 9. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC October 2 and 4, 2017.

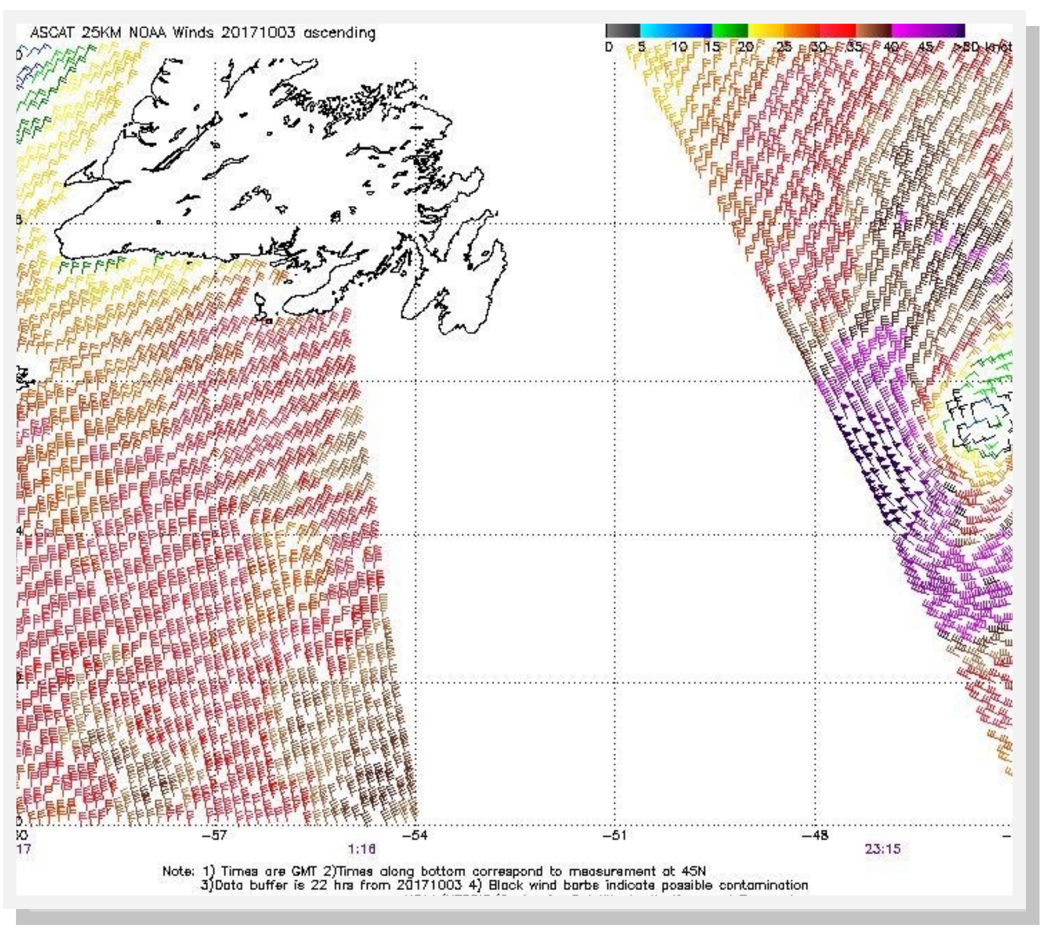

Figure 10. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the south, west, and north sides of the storm shown in the second part of Figure 9. The valid time of the pass is 2315 UTC October 3, 2017, or 0.75 hour prior to the valid time of the second part of Figure 9. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

43W at 1800 UTC October 11th. Its central pressure fell 36 hPa during this period. The cyclone briefly developed hurricane-force winds with a 962-hPa center in the north-central waters on the night of the 11th and early on the 12th. The highest scatterometer winds were from a 2305 UTC pass on the 11th, with 50-kt retrievals on the south side prior to analysis as a hurricane-force low. This was the first hurricane-force low of the 4-month period with nontropical origin. It developed a lowest central pressure of 958 hPa while approaching Iceland late on the 12th, before passing northeast of the island the next day.

North Atlantic Storms, October 18–21, 20–23: Two hurricane-force lows developed in close succession as shown in **Figures 11** and **13**. Both cyclones originated off the southeast U.S. coast, with the more-intense second system taking a more-northern track and the first low moving across the British Isles. The central pressure of the first cyclone fell 35 hPa in the 24-hour period covered by Figure 11. The second system deepened by an impressive 53 hPa in the 24-hour period covered by Figure 13, or more than twice the rate for a “bomb” at 60N (Sanders and Gyakum, 1980). The lowest central pressure of 947 hPa made it the deepest low of the period in the North Atlantic. The ASCAT retrievals for both cyclones (**Figures 12 and 14**) show winds at least 65 kt, but the higher retrievals for the less-intense first event, up to 80 kt in **Figure 12**, may have rain contamination. The 500-millibar analysis in Figure 15 shows a short-wave trough passing east of North America and indications of a second trough and wind maximum approaching from the west, supporting the rapid development of the second low, which was located at 40N 50W at that time. More information on use of the 500-millibar chart may be found in Reference 7 (Sienkiewicz and Chesneau, 2008). In the first event, the ship **BATEU07** (41N 26W) encountered west winds of 45 kt at 0500 UTC on the 20th. Buoy 62442 (49.0N 16.3W) reported west winds of 44 kt, with gusts to 54 kt, at 1800 UTC on the 20th, a peak gust of 59 kt at 1500 UTC on the 20th, and seas as high as 11.6 meters (38 feet) 1 hour later. Buoy 62095 (53.0N 15.7W) reported a northwest wind of 42 kt with gusts to 62 kt and 7.9-meter seas (26 feet) at 0600 UTC on the 21st, and a peak gust of 68 kt 1 hour later. Buoy 62029 (48.8N 12.4W) reported maximum seas of 11.9 meters (39 feet) at 2200 UTC on the 20th. In the second event, the **RMS Queen Mary 2** (ZCEF6) encountered northwest winds of 50 kt at 0400 UTC on the 23rd near 44N 50W and also seas of 8.5 meters (28 feet) 2 hours prior. The first cyclone developed a lowest-central pressure of 964 hPa at 1200 UTC on the 20th near 51N 19W, before weakening and moving across the British Isles and then the North Sea through the 22nd. The second system weakened over the north-central waters on the 22nd to the 24th, passed north of Scotland on the 25th, and passed inland in southern Norway on the 26th.

Northwest Atlantic/Greenland area Storm, November 4–6: **Figure 16** depicts the rapid development of a hurricane-force low over the northern waters over a 24-hour period in which the central pressure dropped 43 hPa. The ASCAT-B image in **Figure 17** reveals winds of 50–70 kt around the center, highest on the southwest side, although some data is missing. The cyclone passed east of southern Greenland on the 5th, where it stalled while maintaining hurricane-force winds. OPC’s high seas forecasts that day called for winds of 50–80 kt with this system. The cyclone weakened the next day before becoming absorbed by another cyclone near Iceland late on the 6th.

Northwest Atlantic/Greenland area Storm, November 11–12: Low pressure originating inland over eastern Canada on November 10th moved off the Labrador coast the next day and developed a lowest central pressure of 974 hPa near 57N 57W and briefly hurricane-force winds at 0000 UTC on the 12th. An ASCAT-A pass from 2310 UTC on the 11th revealed east winds 50–60 kt on the north side, near the southwest Greenland coast, as in **Figure 17** in the previous event, but did not have winds nearly as high on the south side. A weakening trend followed the next day and into the 13th as the cyclone passed through the east Greenland waters.

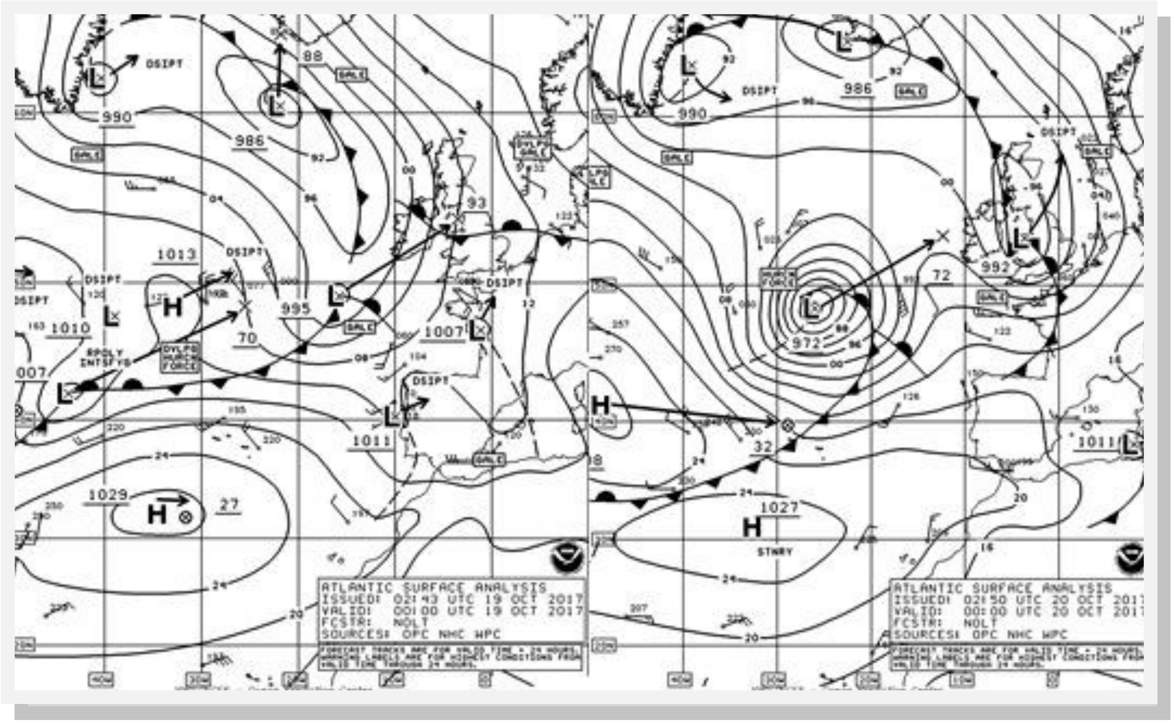

Figure 11. OPC North Atlantic Surface Analysis charts (Part 1) valid 0000 UTC October 19 and 20, 2017.

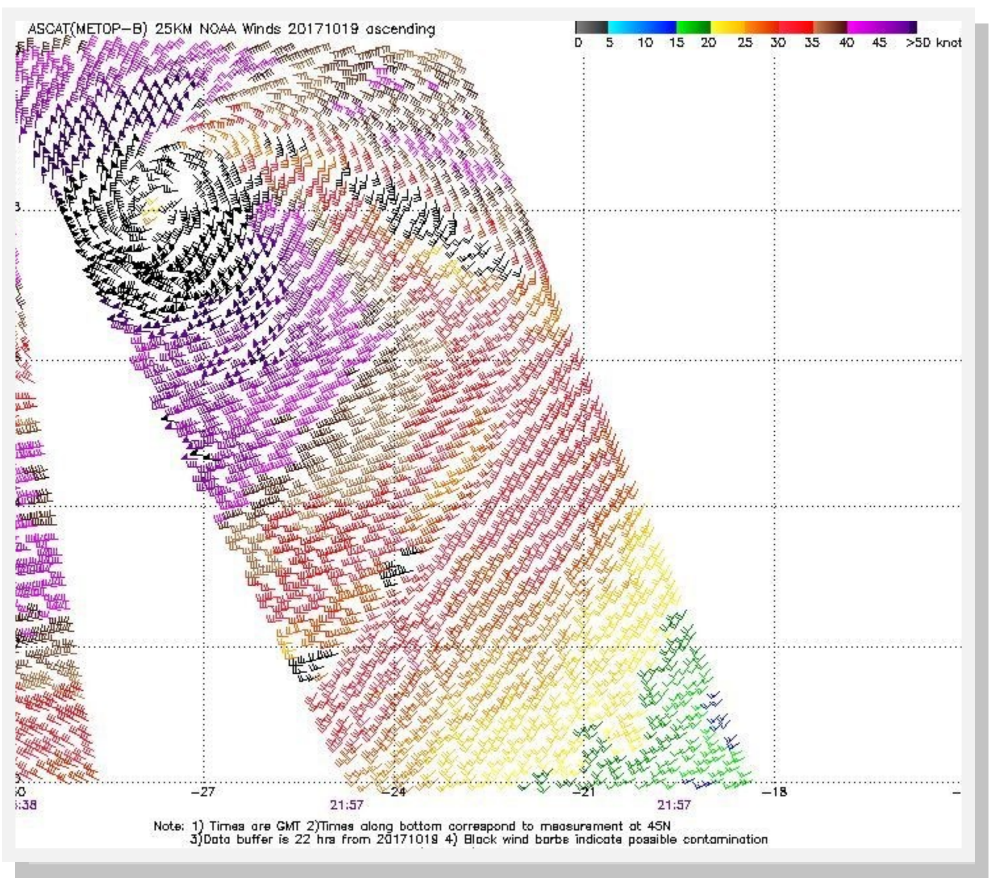

Figure 12. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the hurricane-force low shown in the second part of Figure 11. The valid time of the pass is 2157 UTC October 19, 2017, about 2 hours prior to the valid time of the second part of Figure 11. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

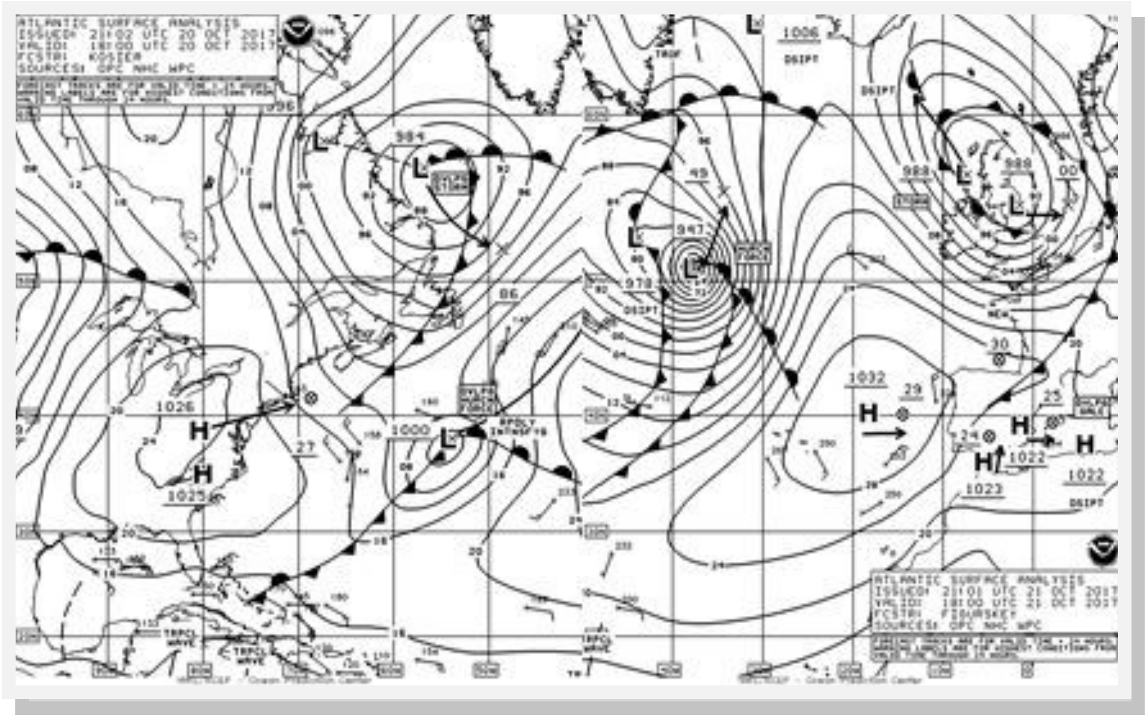

Figure 13. OPC North Atlantic Surface Analysis charts valid at 1800 UTC October 20 (Part 2) and 1800 UTC October 21, 2017 (Part 1).

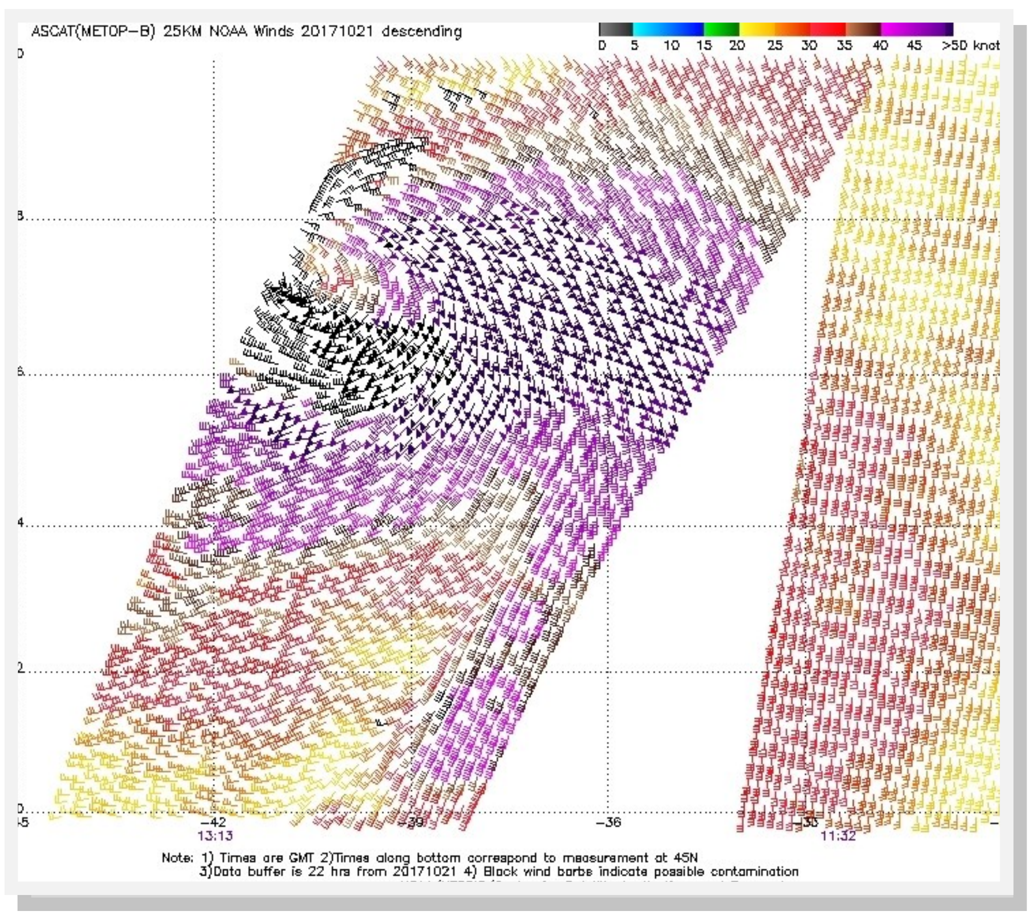

Figure 14. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the hurricane-force cyclone shown in the second part of Figure 13. The valid time of the pass containing the higher wind retrievals is 1313 UTC October 21, 2017, or about 4.75 hours prior to the valid time of the second part of Figure 13. Imagery is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research.

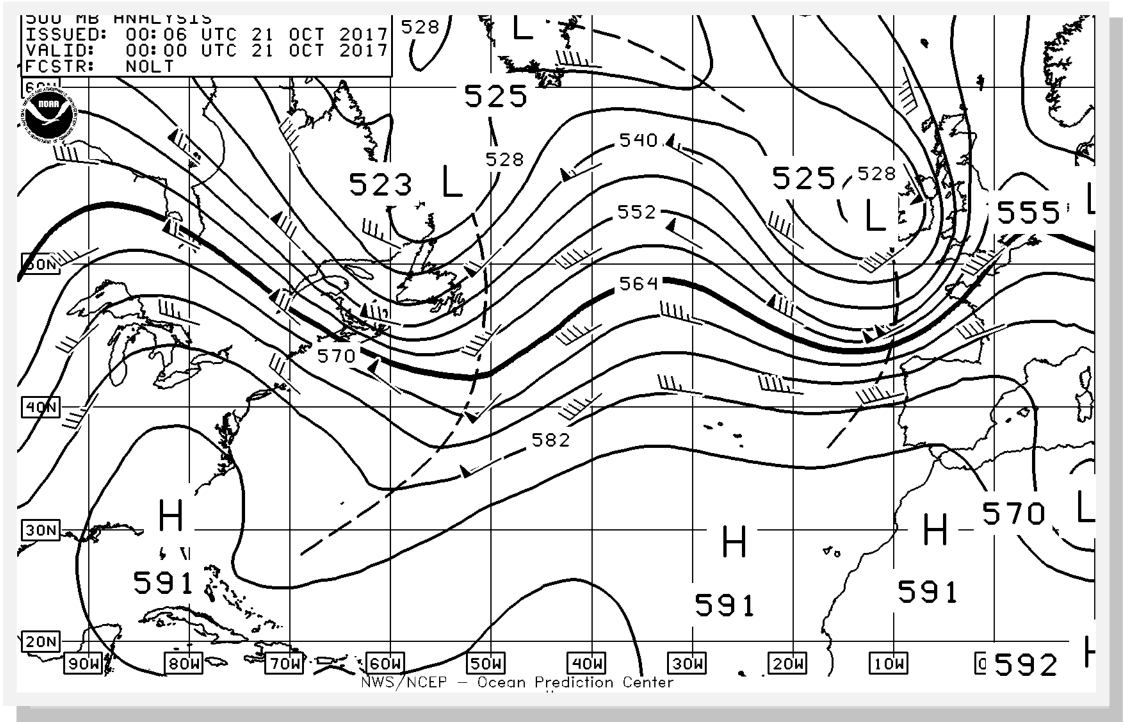

Figure 15. North Atlantic 500-Millibar Analysis valid at 0000 UTC October 21, 2017. The chart is computer generated, with short-wave troughs (dashed lines) manually added.

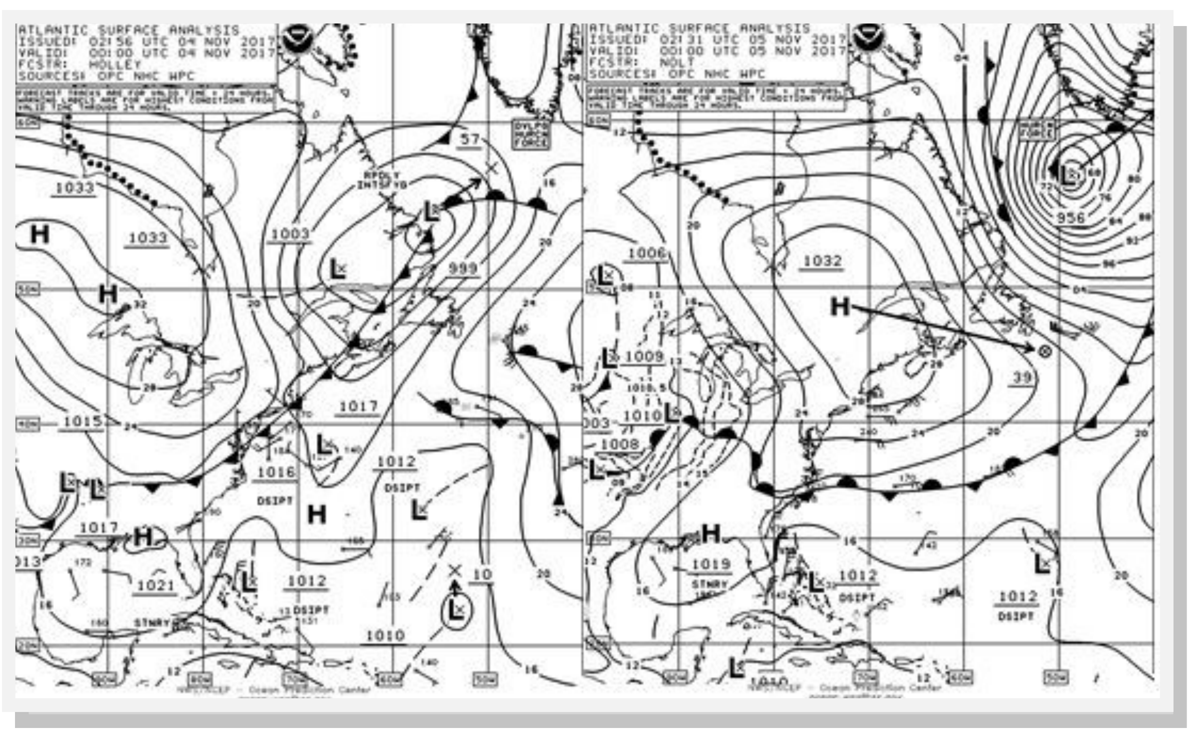

Figure 16. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC November 4 and 5, 2017.

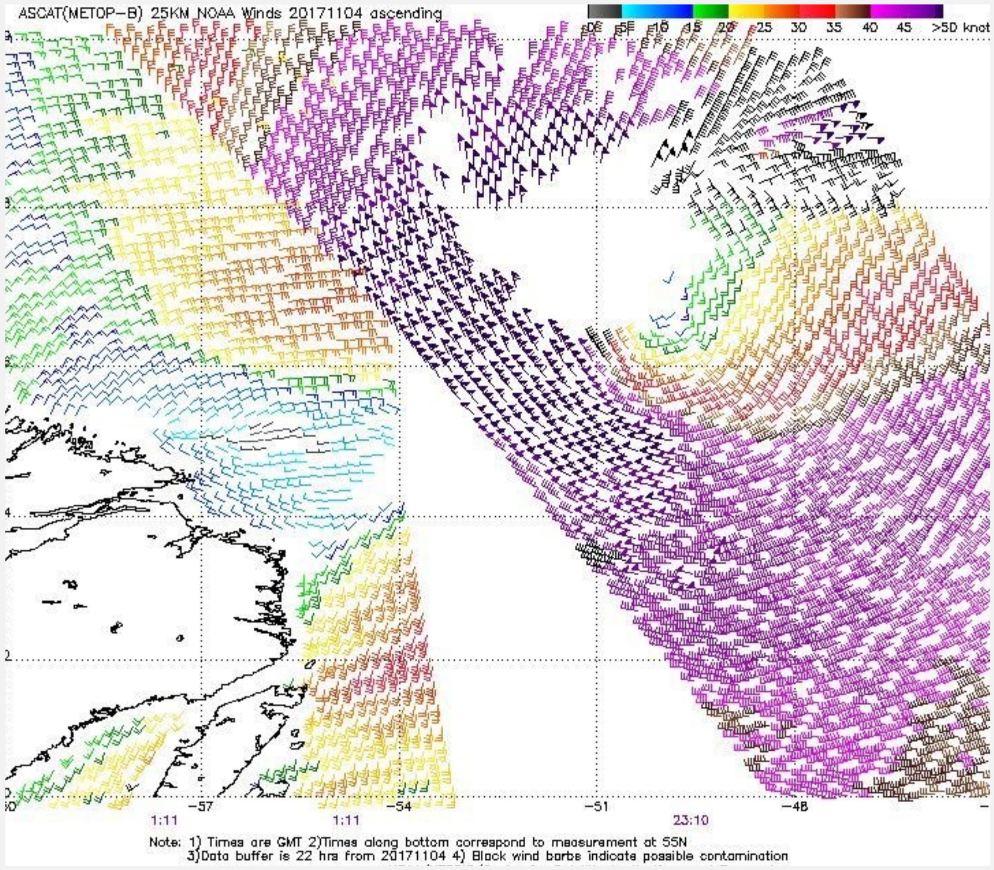

Figure 17. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the hurricane-force low shown in the second part of Figure 16. The pass containing the stronger wind retrievals has a valid time of 2310 UTC November 4, 2017, or about 0.75 hour prior to the valid time of the second part of Figure 16. Imagery is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research.

North Atlantic Storm, November 16–18: This cyclone followed a southern track, originating 250 nm south of Bermuda early on November 15 and moving northeast over the south-central waters. It briefly developed hurricane-force winds with a pressure of 993 hPa while passing near 41N 41W on the night of the 16th. ASCAT imagery missed the stronger winds in this system, which was otherwise similar in strength to the October 1–4 cyclone. The cyclone then became absorbed by a new low forming to the north on the 17th.

Western North Atlantic Storms, November 22–24 and 26–28: The pattern became more amplified in late November, forcing developing cyclones off the U.S. mid-Atlantic coast to move north into the Davis Strait. Both developed central pressures of 973 hPa off the north Labrador coast. **Figure 18** shows the first system that developed storm-force winds earlier while still south of Nova Scotia late on the 22nd. Its central pressure initially dropped 32 hPa to 976 hPa in the 24-hour period ending at 1200 UTC on the 23rd, when it was in the Gulf of St. Lawrence. It weakened to a gale as it passed over southern Labrador late on the 23rd, before re-intensifying in the Labrador Sea to a hurricane-force low on the 24th (**Figure 18**). ASCAT-B wind retrievals in **Figure 19** on the morning of the 24th indicate the southwest Greenland coastal waters as the likely location for hurricane-force winds. The cyclone weakened in the Davis Strait the following night and the next day. The second cyclone originating off the U.S. mid-Atlantic coast early on the 25th did not develop storm- and hurricane-force winds until it reached the northern Labrador Sea on the 27th. An ASCAT-A pass from 1428 UTC on the 27th like in **Figure 19** showed an area of southeast winds 50–60 kt off the southwest Greenland coast. The cyclone weakened in the Davis Strait on the following day.

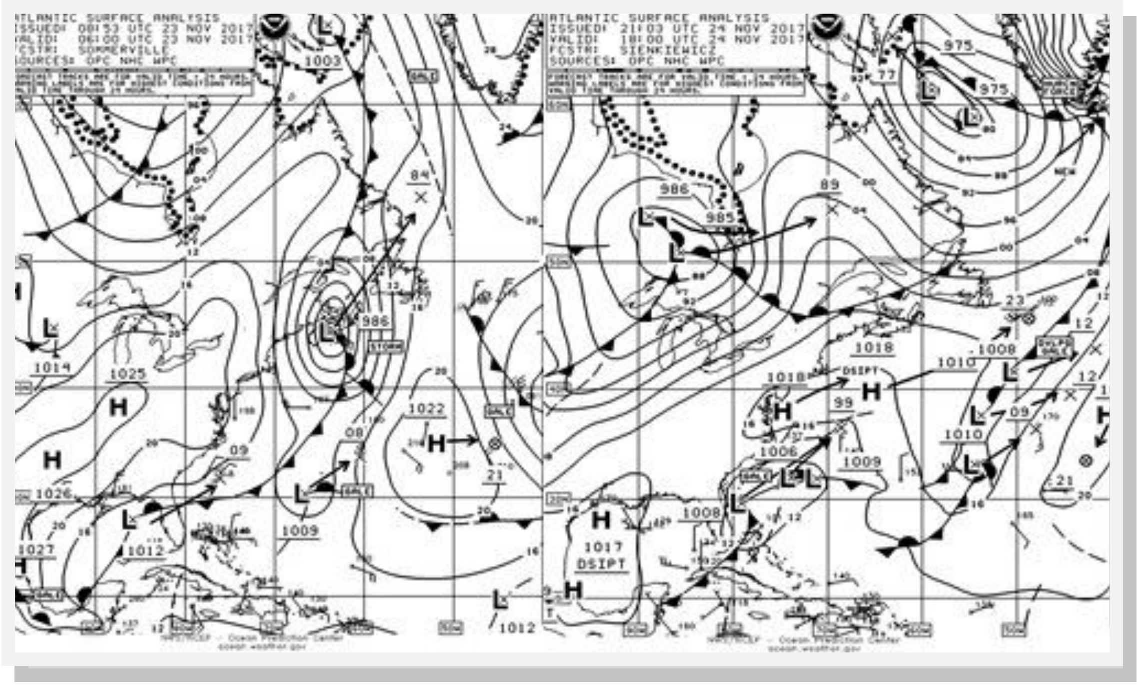

Figure 18. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC November 23 and 1800 UTC November 24, 2017.

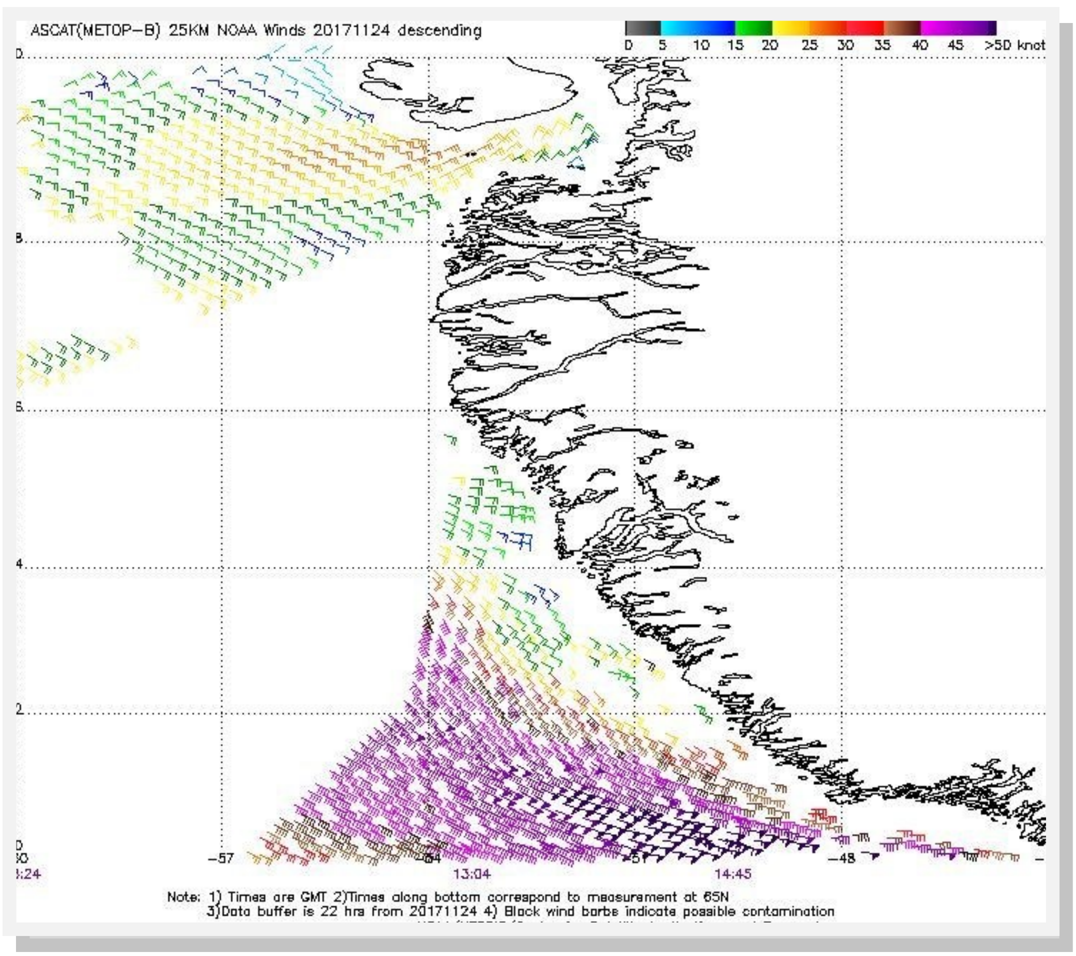

Figure 19. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the north side of the hurricane-force low shown in the second part of Figure 18. The valid time of the pass with the stronger wind retrievals off the southwest coast of Greenland is 1445 UTC November 24, 2017, or 3.25 hours prior to the valid time of the second part of Figure 18. Imagery is courtesy of NOAA/NESDIS/ Center for Satellite Applications and Research.

Northeastern Atlantic Storm, December 6–8: December was the most active of the 4-month period with eight hurricane-force events. The first of these developed quickly as a complex system of lows in the northeastern waters and consolidated into a hurricane-force low in 24 hours (**Figures 20** and **21**). The scatterometer retrievals in **Figure 22** shows a swath of north winds 50–65 kt from north of Scotland into the southern Norwegian Sea in the west semicircle of the cyclone. **Table 2** lists selected platform and buoy observations from this event. The cyclone subsequently weakened near the coast of Norway late on the 8th.

Northwestern Atlantic Storms, December 7–8 and 8–10: A strong low-pressure area moved from James Bay northeast across Quebec to near the Hudson Strait in the initial development of this system. As it moved into the Davis Strait, south winds increased to hurricane-force near the southwest Greenland coast by early on the 8th, when an ASCAT-B pass from 1458 UTC on the 8th showed a swath of southeast winds 50–55 kt off the southwest Greenland coast. The cyclone then weakened while moving through the Davis Strait late on the 8th. Meanwhile, a secondary low formed on the front moving off the Canadian coast near 55N 48W at 1200 UTC on the 8th and briefly developed hurricane-force winds as it approached southern Greenland on the evening of the 8th, with a central pressure of 980 hPa. ASCAT data was limited. The cyclone became absorbed with the approach of a stronger system from the southwest on the 11th.

North Atlantic Storm, December 9–14: The initial development of this cyclone to near maximum intensity is shown in **Figure 23**. It originated near the North Carolina coast early on December 9th. The central pressure fell 33 hPa in the 24-hour period ending at 0600 UTC on the 11th. Hurricane-force winds occurred with this system as it moved from the northern Labrador Sea on the 11th to the east Greenland waters the following night. **Figure 24** shows an area of wind retrievals on the edge of a pass, in the 50- to 60-kt range. The cyclone then tracked southeast beginning on the 12th and weakened, but maintained storm-force winds through the 14th, before moving into France as a gale on the 15th.

Western North Atlantic Storm, December 14–16: This developing low quickly developed storm-force winds as it moved off the northern mid-Atlantic coast of the U.S. on December 14th before turning north and then northwest over the Labrador Sea, where it briefly developed hurricane-force winds with a 964-hPa center at 1800 UTC on the 15th (**Figure 25**). The central pressure fell 34 hPa in the 24-hour period ending at 0000 UTC on the 16th, when the center developed a lowest pressure of 958 hPa. An ASCAT-B pass from 0025 UTC on the 16th returned a swath of southeast winds 50–60 kt off the southwest Greenland coast. The cyclone then made a slow cyclonic loop in the Labrador Sea while weakening over the next 2 days and dissipated by the 18th.

North Atlantic Storm, December 15–19: The initial rapid development of this system was over the southwest waters leading to the hurricane-force low shown in the second part of **Figure 25**. The central pressure dropped 38 hPa in the 24-hour period ending at 1800 UTC on the 16th, when the cyclone was still south of Newfoundland. The cyclone developed a lowest-central pressure of 953 hPa south of Greenland near 56N at 1200 UTC on the 17th. The ASCAT–B image in **Figure 26** reveals winds of 50–60 kt on the southeast side of the cyclone at the pass edge and may miss the highest wind retrievals. The **Independent Voyager** (A8XY2) reported southeast winds of 59 kt near 43N 56W at 1200 UTC on the 16th, followed by a report of northwest winds at 55 kt and 8.2-meter seas (27 feet) near 43N 57W 3 hours later. The **COSCO Vietnam** (VRID5) encountered north winds of 55 kt near 46N 55W at 2000 UTC on the 16th. The cyclone subsequently stalled and weakened in the east Greenland waters near 65N on the 18th and 19th, with its winds diminishing to gale force.

North Atlantic Storm, December 19–22: The next developing cyclone originated south of Newfoundland near 39N at 1800 UTC on December 19th and tracked northeast, developing a lowest-central pressure of 974 hPa over the north-central waters and hurricane-

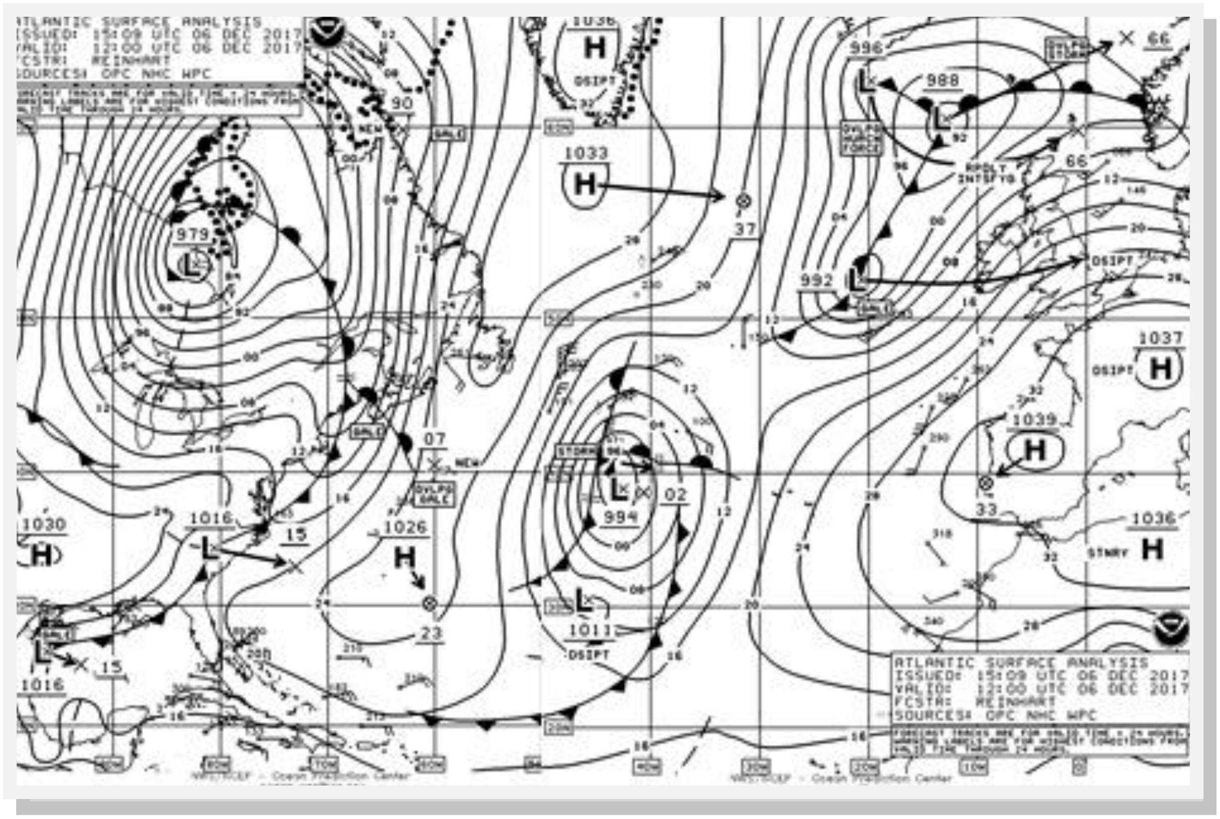

Figure 20. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid at 1200 UTC December 6, 2017. The two parts overlap between 40W and 50W.

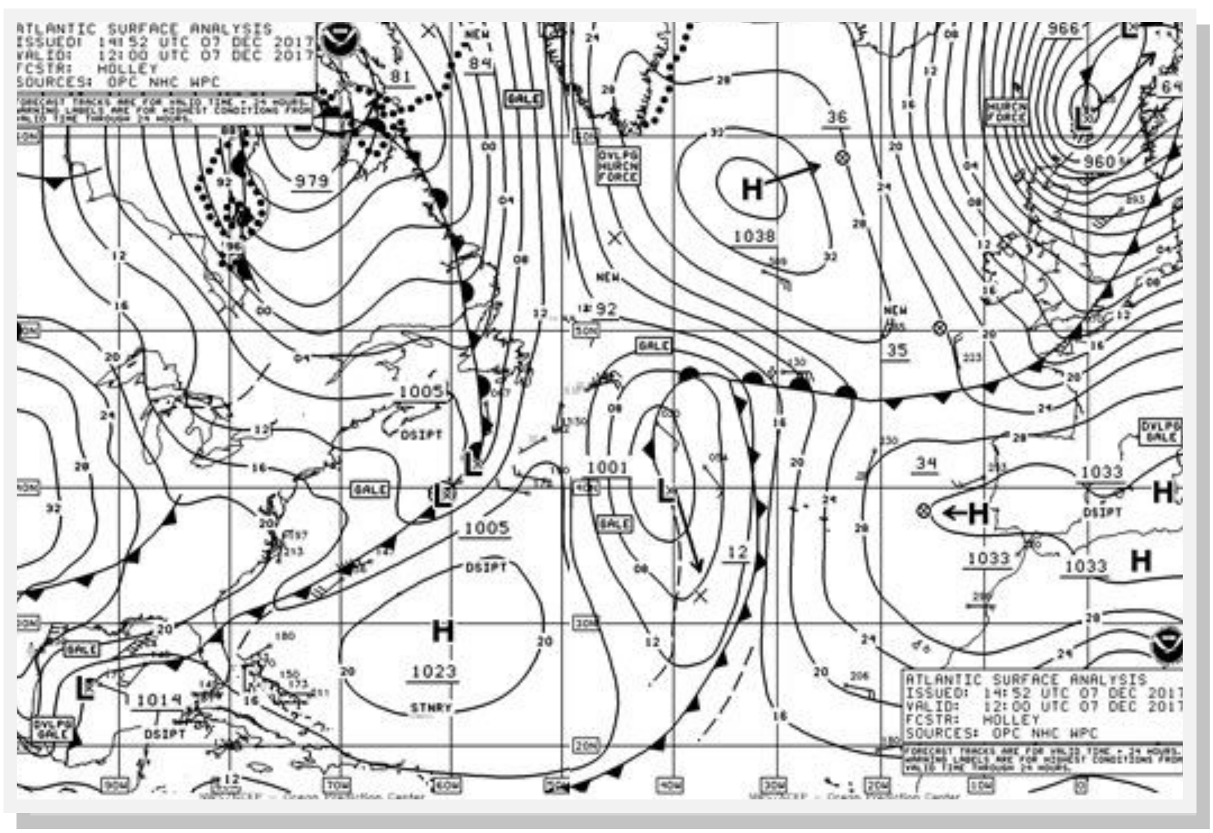

Figure 21. OPC North Atlantic Surface Analysis charts (Parts 1 and 2) valid at 1200 UTC December 7, 2017. The two parts overlap between 40W and 50W.

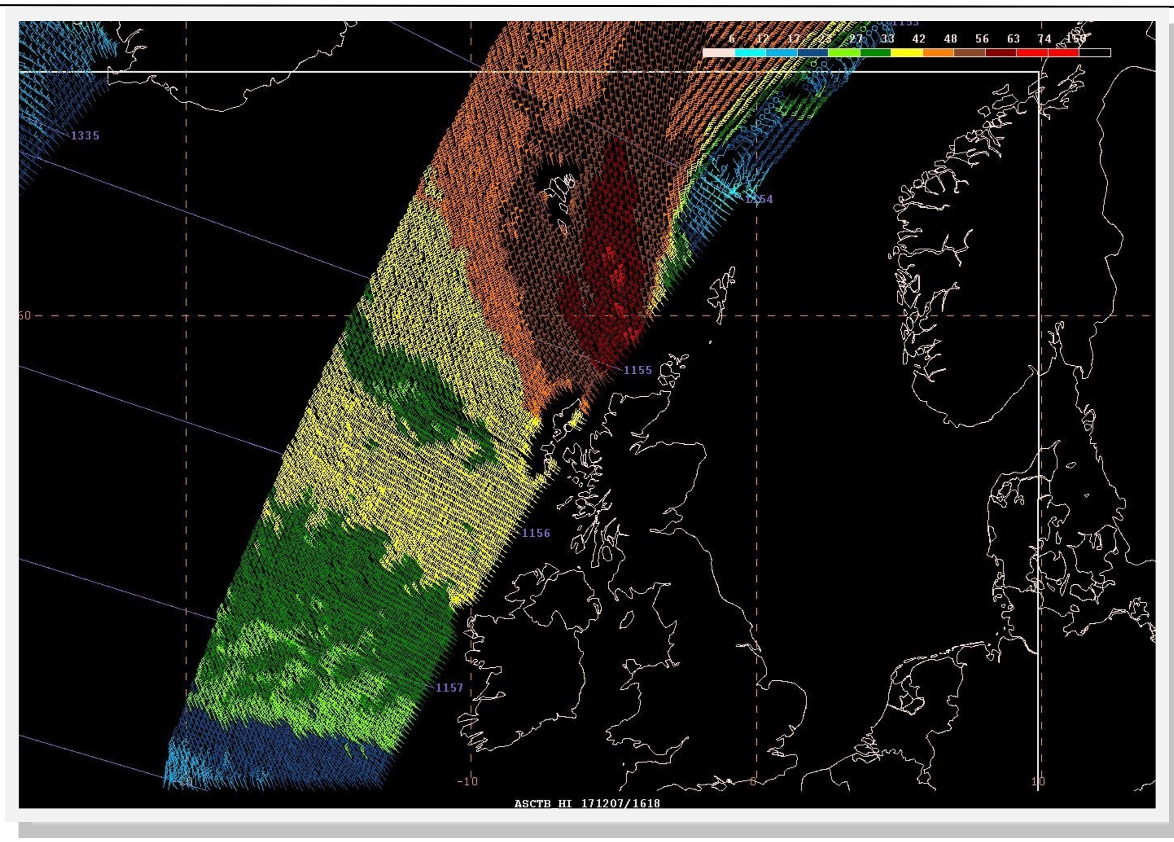

Figure 22. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the hurricane-force low over the northeastern North Atlantic shown in Figure 21. The valid time of the pass containing the higher wind retrievals is 1153 UTC December 7, 2017, or approximately the valid time of Figure 22. The diagonal lines labeled with four-digit UTC times are cross-track time lines of the satellite. Wind barbs are colored according to the scale near the top of the image. Image is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research, adapted for operational use on OPC workstations.

Table 2. Selected platform and buoy observations taken during the northeastern Atlantic storm of December 6–8, 2017. Some of the observations listed as buoys may actually be platforms especially in the North Sea.

Observation	Position	Date/Time (UTC)	Wind	Seas (m/ft)
Troll A (LF4B)	60.6N 3.7E	08/0200	NW 49	9.0/30
		08/0000	Gust 61	
Heimdal (LF4H)	59.6N 2.2E	07/2000	NW 51	8.0/26
		07/1800	Gust 62	
		07/2300		Maximum 12.0/39
Buoy 64045	59.1N 11.6W	07/0300	NW 42 G56	5.5/18
		07/1100		Maximum 11.0/36
Buoy 64046	60.5N 4.2W	07/1300	NW 50 G65	7.5/25
		07/1400		Maximum 10.5/34
Buoy 64041	60.6N 2.5W	07/1400	NW 62	5.5/18
		07/1800		Maximum 12.5/41
Buoy 63101	61.2N 0.9E	07/2300	NW 57	12.0/39
		08/0000		Maximum 12.8/42
Buoy 63103	61.2N 1.1E	07/2200	NW 59	11.5/38
Buoy 62105	55.3N 12.3W	07/0900	NW 40 G63	8.0/26
		07/1500		Maximum 9.0/30

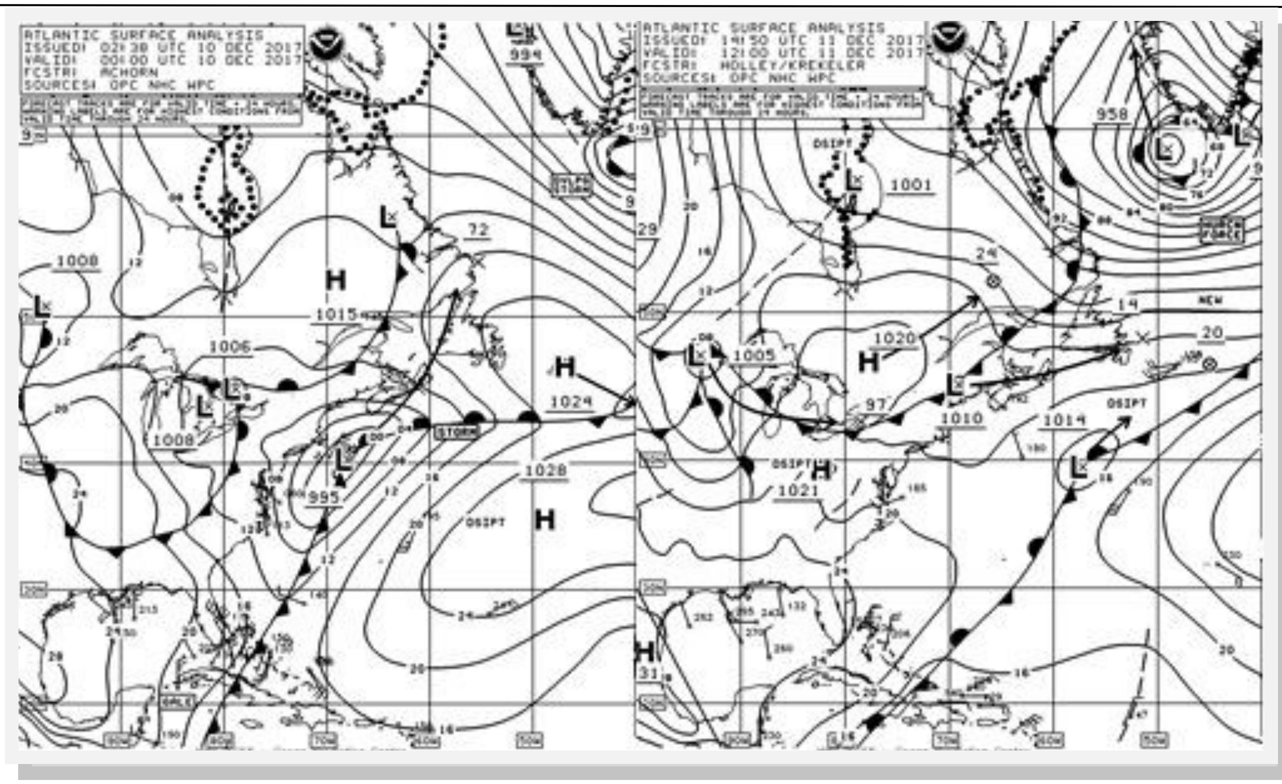

Figure 23. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC December 10 and 1200 UTC December 11, 2017.

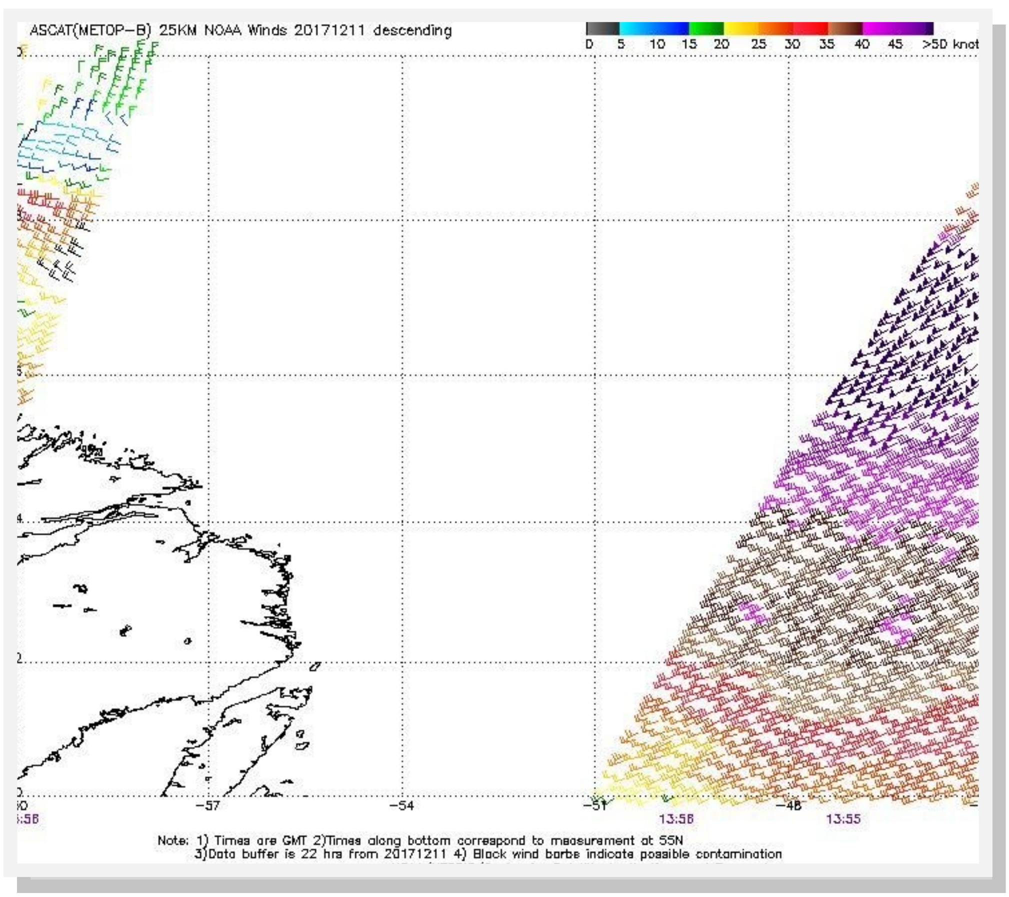

Figure 24. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the south side of the hurricane-force cyclone shown in the second part of Figure 23. The valid time of the pass is 1355 UTC December 11, 2017, or about 2 hours later than the valid time of the second part of Figure 23 . Portions of Newfoundland and Labrador appear in the lower-left side of the image. Imagery is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research.

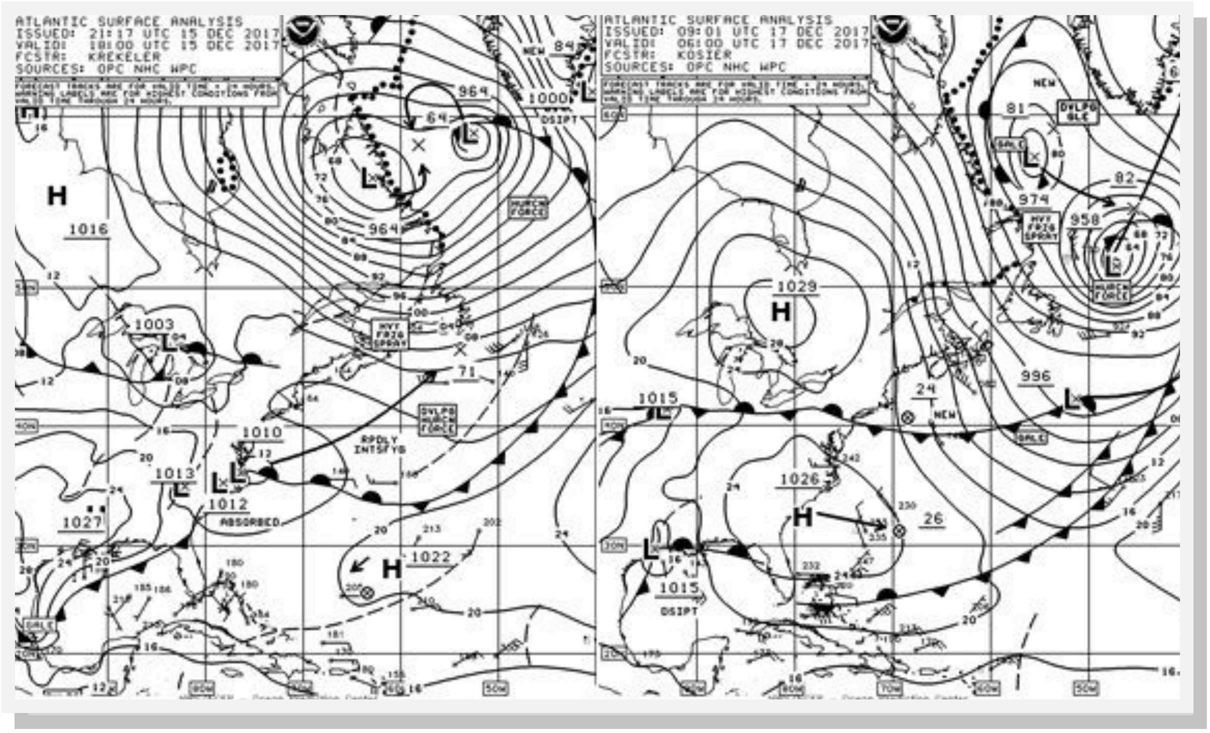

Figure 25. OPC North Atlantic Surface Analysis charts (Part 2) valid 1800 UTC December 15 and 0600 UTC December 17, 2017.

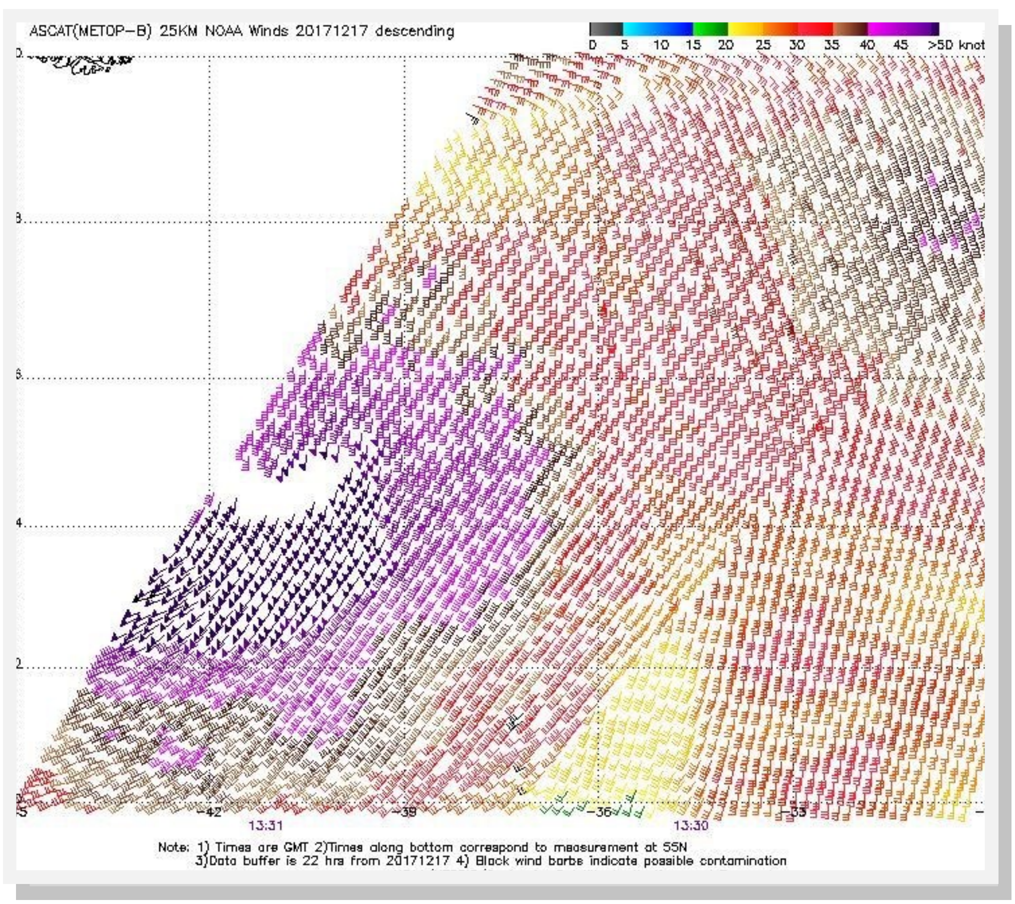

Figure 26. ASCAT (METOP-B) image of satellite-sensed winds with 25-km resolution around the southeast semicircle of the hurricane-force cyclone shown in the second part of Figure 25. The valid time of the pass is 1331 UTC December 17, 2017, or 7.5 hours later than the valid time of the second part of Figure 25. The southern tip of Greenland appears near the upper-left corner of the image. Imagery is courtesy of NOAA/ NESDIS/Center for Satellite Applications and Research.

force winds on the 21st. An ASCAT-A pass from 1432 UTC on the 21st showed a small area of northeast winds 50–60 kt north of the center near 59N at the edge of the pass. The **Hamburg Express** (DGXS) near 42N 43W encountered southwest winds of 40 kt and 4.9-meter seas (16 feet) at 0000 UTC on the 21st. The cyclone subsequently stalled and weakened in the Labrador Sea over the following 2 days and dissipated early on the 24th.

North Atlantic Storm, December 25–28: Initial rapid development of the final significant event of the month was in the first 24-hour period after the developing low moved off the North Carolina coast at 0000 UTC December 25th, when the central pressure fell 33 hPa. **Figure 27** depicts the final period of development with the cyclone close to maximum intensity in the second part of the figure. The **Hamburg Express** (DGXS) near 40N 70W reported west winds of 60 kt at 1500 UTC on the 25th. The **Maersk Atlanta** (WNTL) encountered west winds of 50 kt at that time. Buoy 44137 (42.3N 62.0W) reported west winds of 41 kt, with gusts to 52 kt at 2200 UTC on the 25th, with maximum seas 8.0 meters (26 feet) 3 hours later. Buoy 44150 (42.5N 64.0W) reported southwest winds of 45 kt with gusts to 54 kt and 6.5-meter seas (21 feet) at 2100 UTC on the 25th, followed by maximum seas of 9.0 meters (30 feet) 5 hours later. Mount Desert Island C/MAN (MDRM1, 44.0N 68.0W) reported northwest winds of 46 kt with gusts to 56 kt at 1800 UTC on the 25th and a peak gust of 64 kt 1 hour later. With the cyclone off the Labrador coast, the ASCAT-A winds in **Figure 28** show strongest winds of 50 to as high as 60 kt ahead of the occluded front, with even some 50-kt retrievals south of the cyclone center. The cyclone subsequently stalled in the Labrador Sea with its top winds weakening to storm force the next day and then drifted east on the 28th before dissipation by the 29th.

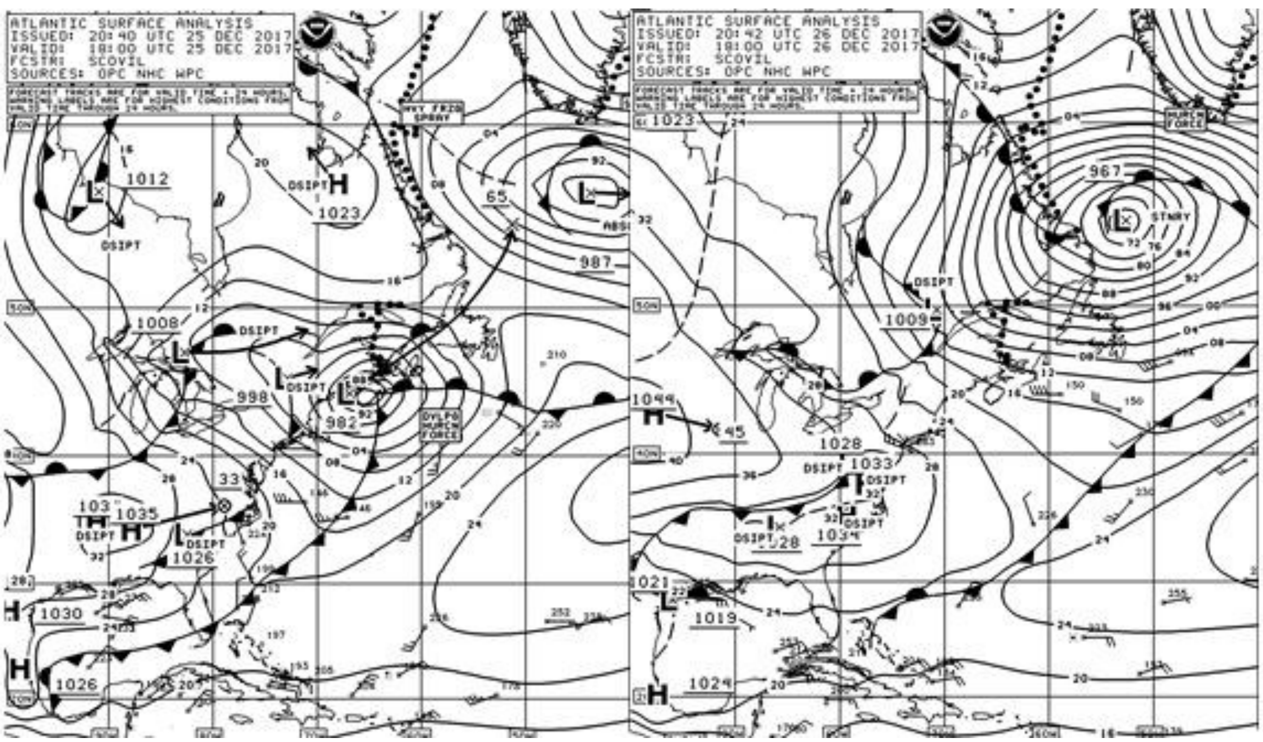

Figure 27. OPC North Atlantic Surface Analysis charts (Part 2) valid at 1800 UTC December 25 and 26, 2017.

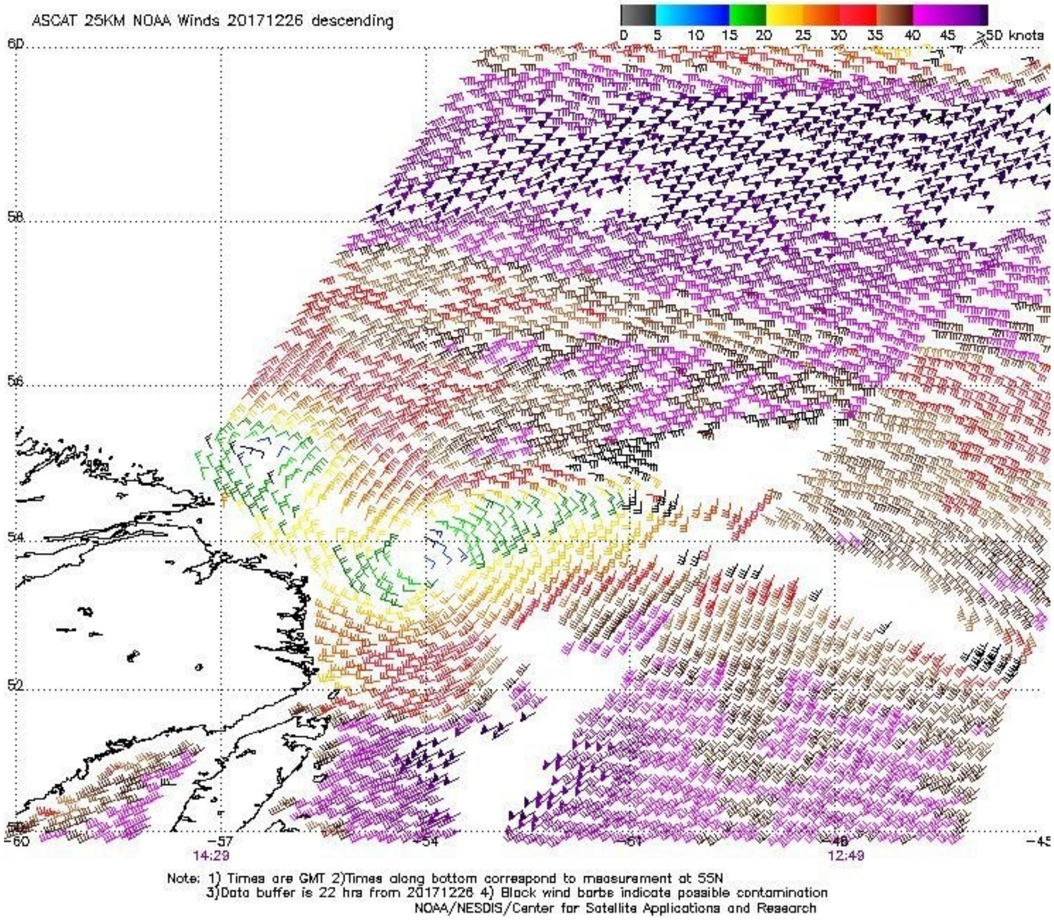

Figure 28. ASCAT (METOP-A) image of satellite-sensed winds with 25-km resolution around the hurricane-force cyclone shown in the second part of Figure 27. Portions of two passes are shown (1249 and 1429 UTC December 26, 2017) with the later pass valid 3.5 hours prior to the valid time of the second part of Figure 27. Portions of Newfoundland and Labrador appear in the lower-left side of the image. Imagery is courtesy of NOAA/NESDIS/Center for Satellite Applications and Research.

References for North Atlantic

1. http://rammb.cira.colostate.edu/research/goes-r/proving_ground/cira_product_list/geocolor_imagery.asp

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

3. Saffir-Simpson Scale of Hurricane Intensity: http://www.nhc.noaa.gov/aboutsshws.php

4. Sanders, Frederick and Gyakum, John R., Synoptic-Dynamic Climatology of the "Bomb", *Monthly Weather Review*, October 1980.

5. Stewart, Stacy R., 27 March 2018: Hurricane Ophelia (2017) Tropical Cyclone Report. NOAA National Hurricane Center, Miami, Florida, [weblink https://www.nhc.noaa.gov/data/tcr/AL172017_Ophelia.pdf]

6. Tropical Cyclone Reports, 2017, National Hurricane Center, http://www.nhc.noaa.gov/data/tcr/index.php?season=2017&basin=atl

7. Sienkiewicz, Joe and Chesneau, Lee, "Mariner's Guide to the 500-Millibar Chart," *Mariners Weather Log,* December 2008.

8. LeComte, Douglas, "International Weather Highlights 2017: Catastrophic Hurricanes, Asian Monsoon Floods, Near Record Global Warmth," *Weatherwise,* May/June 2018, www.weatherwise.org

MARINE WEATHER REVIEW — NORTH PACIFIC AREA

September to December 2017

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Introduction

The weather pattern over the North Pacific featured increasingly active weather during the early fall months of September and October, enhanced by tropical activity coming out of the western Pacific. Many of the cyclonic systems tracked northeast out of the western North Pacific off Japan or the Kuril Islands to the Bering Sea and sometimes turned north on a track west of the Kamchatka Peninsula. Others originated in the central waters and moved toward the western Gulf of Alaska. A similar pattern with some variation in November and December was influenced by varying strength of blocking over Alaska, causing some cyclones moving through the Bering Sea to re-form in the Gulf of Alaska, where they moved erratically, or tracked southeast toward British Columbia or the U.S. Pacific Northwest. The strongest activity developing pressures below 960 hPa and hurricane-force winds occurred mainly west of 160W. Six cyclones developed extreme intensities below 950 hPa, occurring in October to December, in contrast to the North Atlantic, which had only one.

Tropical activity in North Pacific including cyclones appearing on OPC oceanic-surface analyses was concentrated in September and October. Typhoon Sanvu originating well southeast of Japan in late August remained a typhoon into early September, before becoming an intense posttropical/extratropical cyclone in early September (Reference 1). Otherwise, Tropical Storm Talim occurred in mid-September and Supertyphoon Lan and Typhoon Saola in late October, with the October cyclones becoming powerful extratropical cyclones with hurricane-force winds. The 4-month period was less active than the corresponding period in 2016 (Reference 2) in which there were eight tropical cyclones.

Tropical Activity

Tropical Storm Talim: Tropical Storm Talim moved from southwest of Japan on September 16 and northeast across Japan on the 17th, while becoming a posttropical cyclone with storm-force winds as shown in **Figure 1**. The **British Vantage** (2HCH5) near 29N 127E reported northwest winds of 35 kt and 5.2-meter seas (17 feet) at 0500 UTC on the 17th. A vessel reporting with the **SHIP** callsign reported southeast winds of 45 kt and 7.3-meter seas (24 feet) near 40N 150E at 0600 UT C on the 18th. The cyclone developed a lowest central pressure of 974 hPa 6 hours later while entering the southern Sea of Okhotsk. The **Millennium** (9HJF9) near 46N 149E encountered southeast winds of 60 kt and 8.5-meter seas (28 feet) at 1400 UTC on the 18th. The cyclone then moved slowly north and weakened and then dissipated over the northern Sea of Okhotsk on the 22nd.

Supertyphoon Lan: A recurving and rapidly intensifying Lan crossed 130E into the waters well south of Japan and became a supertyphoon near 21N 131E at 1800 UTC October 20th, with maximum sustained winds of 130 kt. This is the minimum intensity needed for a supertyphoon, according to the Joint Typhoon Warning Center near Honolulu. The cyclone developed a maximum intensity of 135 kt 6 hours later, equivalent to a strong Category 4 on the Saffir-Simpson wind scale (Reference 3). A weakening trend set in later on the 21st,

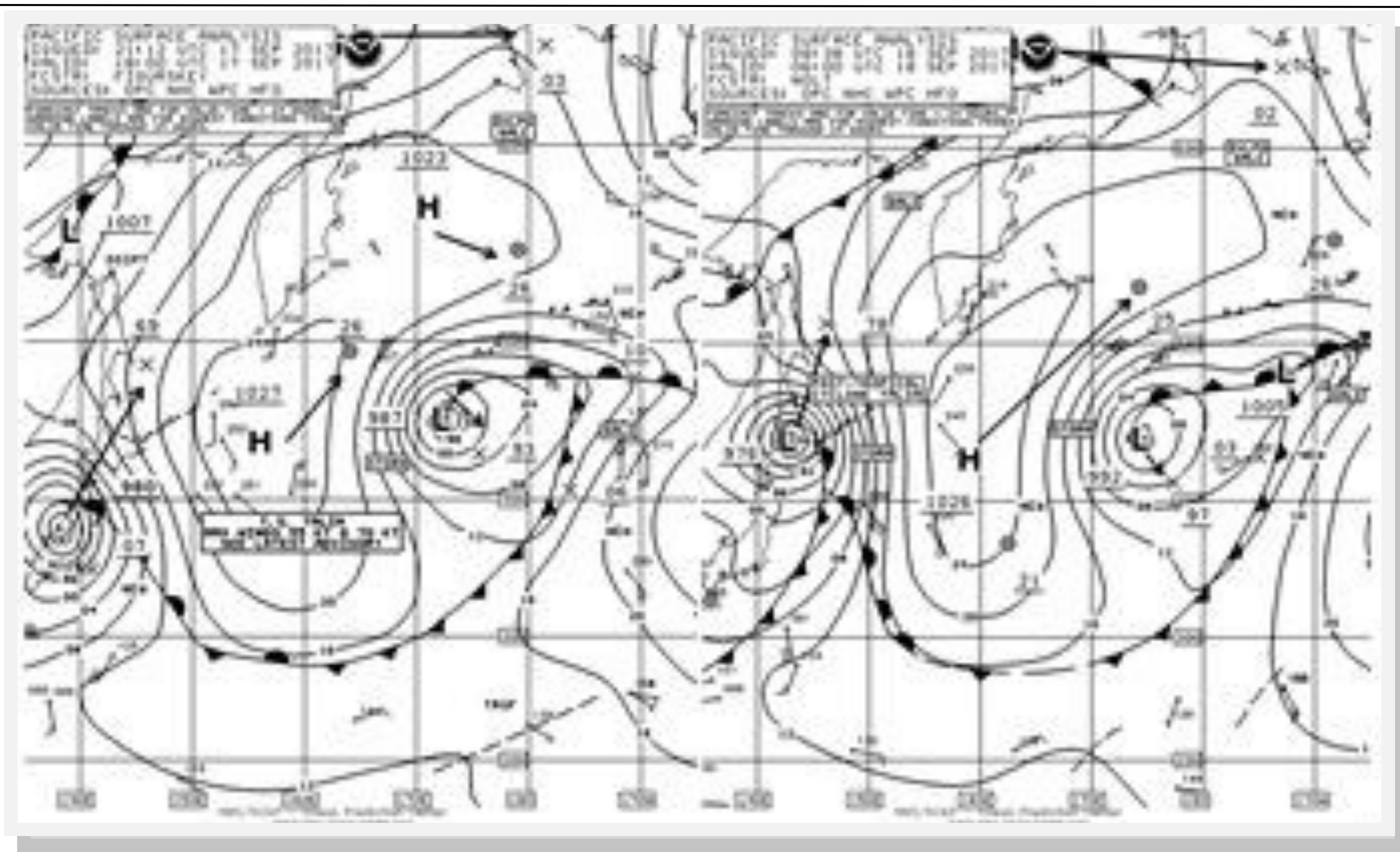


Figure 1. OPC North Pacific Surface Analysis charts (Part 2 — west) valid 1800 UTC September 17 and 0600UTC September 18, 2017. The 24-hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars (hPa), with the exception of tropical cyclones, for which just a tropical symbol is given at the 24-hour position (if still a tropical cyclone). Text boxes contain warning and tropical cyclone information.

with the intensity dropping below 90 kt as the typhoon passed near Tokyo just after 1800 UTC on the 22nd. Lan became a posttropical storm-force low near 41N 147E 12 hours later, and **Figure 2** shows Posttropical Lan approaching a frontal zone to the northeast and probably contributed to the explosive development of the low on the front to the northeast. The central pressure fell 49 hPa in the 24-hour period ending at 0600 UTC on the 24th , more than twice the rate of deepening needed for a bomb cyclone (Sanders and Gyakum, 1980), and the cyclone developed hurricane-force winds at that time. Remarkably, the lowest central pressure of 937 hPa (27.67 inches) reached 12 hours later (**Figure 2**) was matched by another cyclone later in the month, described below. The **APL Thailand** (WCX8882) near 35N 130E reported northeast winds of 65 kt and 7.0-meter seas (23 feet) at 1100 UTC on the 22nd, when Lan was still a typhoon. The **Asia Excellence** (C6AX5) near 30N 131E encountered north winds of 60 kt at 1500 UTC on the 21st. The **APL China** (WDB3161) near 42N 142W reported north winds of 50 kt and 5.8-meter seas (19 feet) at 0700 UTC on the 23rd, when Lan was posttropical. Later, the **Pacific Freedom** (WDD9283) encountered south winds of 69 kt near 52N 177W at 0600 UTC on the 24th. A full 16 hours later, the **Chang Hui** (VRQE5) near 55N 171E experienced northeast winds 55 kt and 11.3-meter seas (37 feet). Buoy 46035 (57.0N 177.7W) reported east winds of 45 kt with gusts to 52 kt at 1600 UTC on the 24th, a peak gust of 56 kt 3 hours later, and maximum seas 10.5 meters (34 feet) at 2200 UTC that day. The ASCAT-B image in **Figure 3** reveals widespread wind retrievals in the 50- to 65-kt range on the north side of the system. There is less coverage of the south and west sides. **Figure 4** shows a satellite altimeter pass through Supertyphoon Lan with

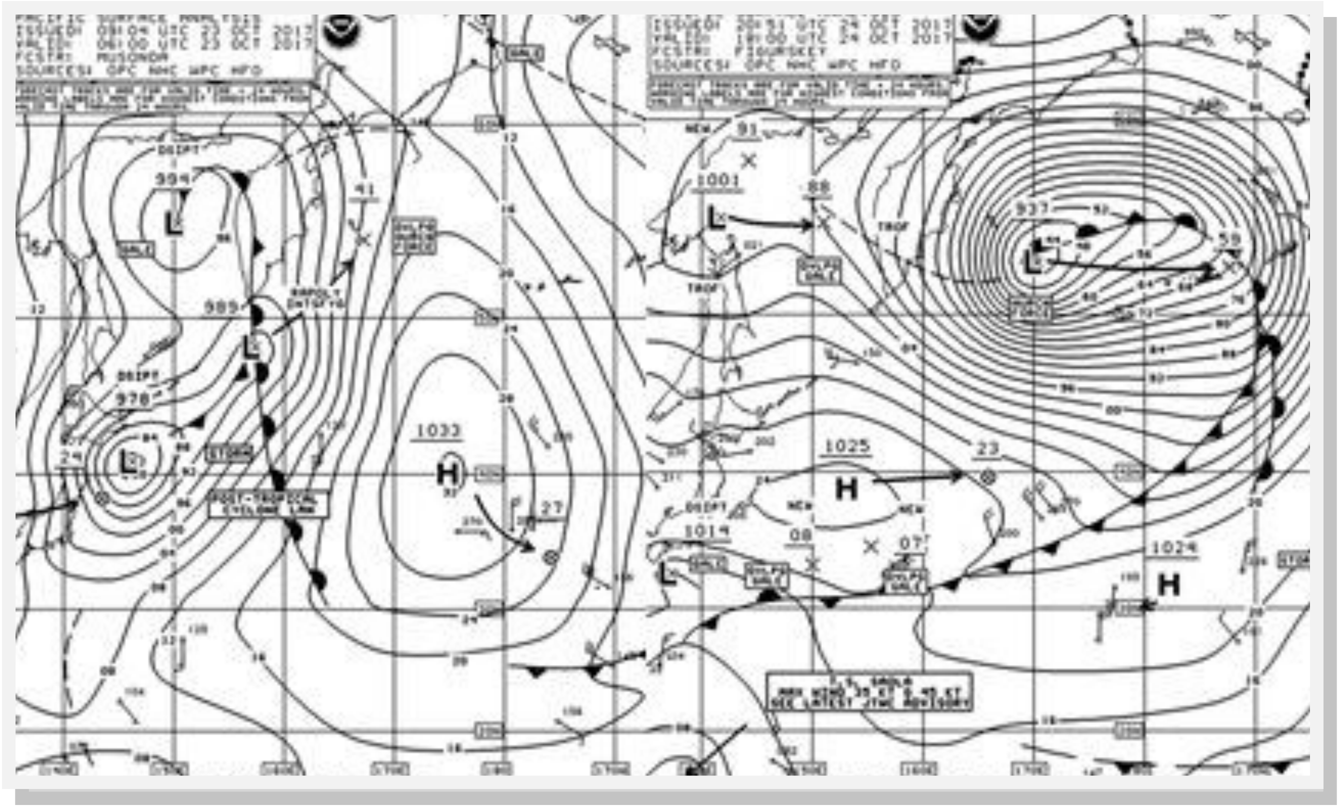


Figure 2. OPC North Pacific Surface Analysis charts (Part 2) valid 0600 UTC October 23 and 1800

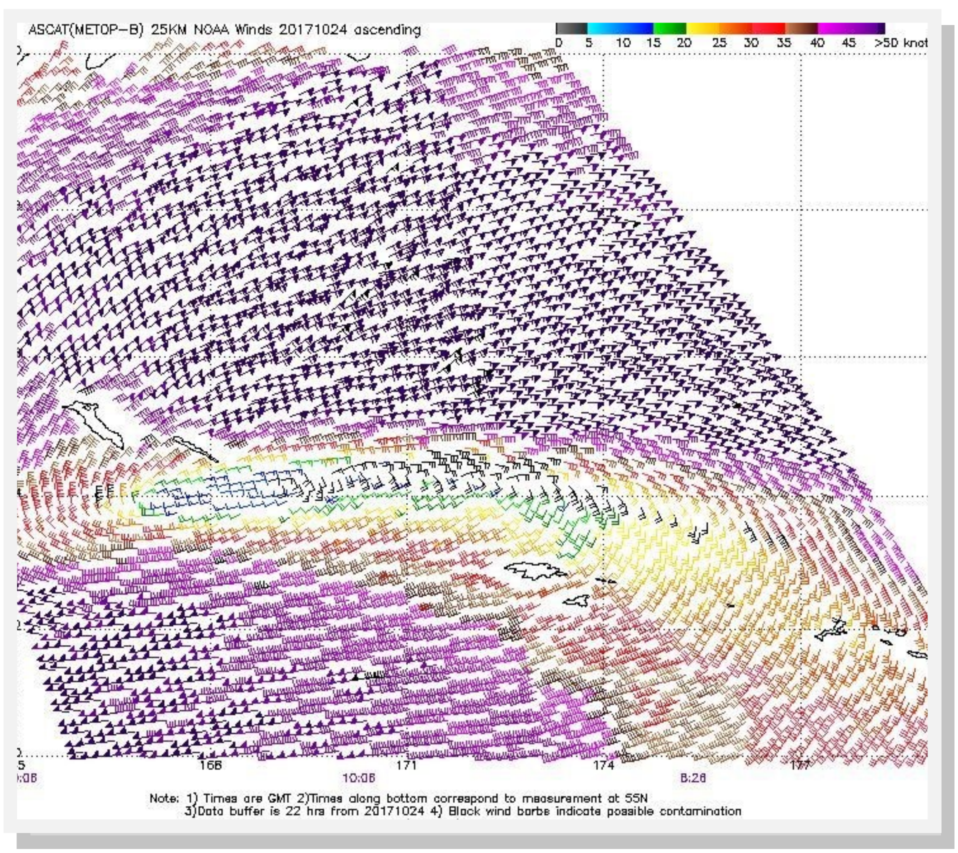


Figure 3. ASCAT METOP-B (Advanced Scatterometer) image of satellite-sensed winds (25-km resolution) around the hurricane-force cyclone shown in the second part of Figure 2. Portions of two passes are shown (0826 and 1006 UTC October 24, 2017) with the later pass valid about 8 hours prior to the valid time of the second part of Figure 2. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

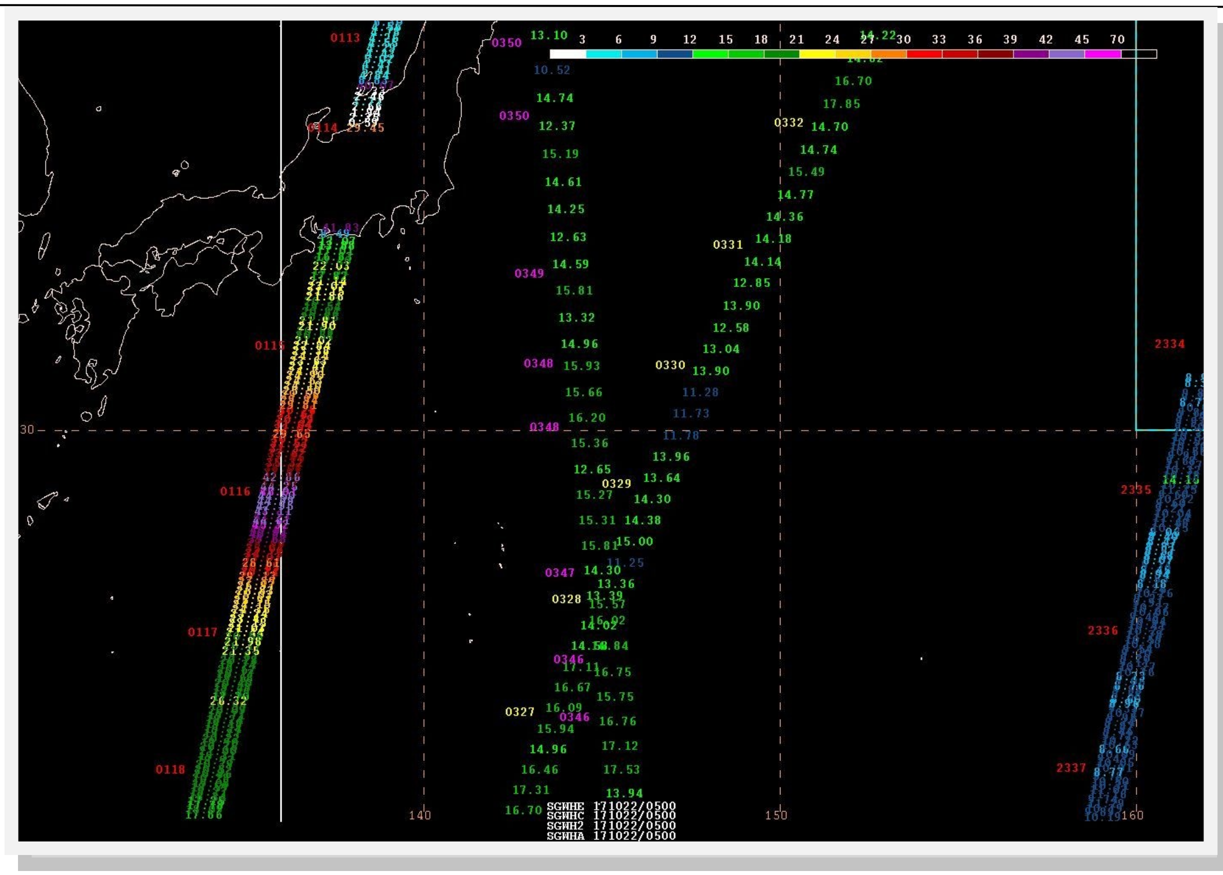


Figure 4. Altimeter pass from the AltiKa satellite with remotely sensed significant wave heights through Typhoon Lan south of Japan valid at 0116 UTC October 22, 2017. Wave heights in feet are given to two decimal places with satellite overpass times shown to the left in UTC. The color scale appears for the wave heights. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research, adapted for operational use at OPC.

remotely sensed significant wave heights. There are wave heights of around 45 feet (13.7 meters) near the cyclone which was located near 28N 134E at that time. The cyclone subsequently moved east toward the eastern Aleutian Islands while weakening over the next 2 days, before turning north and dissipating over western Alaska by the 28th.

Typhoon Saola: This cyclone moved northwest into the waters south of Japan early on October 25, passing near 17N 134E and then moving west of 130E later the next day, while maintaining tropical-storm strength of 45 to 50 kt. It recurved west of the waters and re-emerged as Typhoon Saola. with a maximum intensity of 75 kt at 1800 UTC on the 28th while passing near 30N 131E. It weakened to a tropical storm 12 hours later before becoming posttropical at 1200 UTC on the 29th. It evolved in a manner similar to Lan and merged with a nontropical low to the northeast to form another intense 937-hPa hurricane-force low as shown in **Figure 5**. The central pressure fell 49 hPa in a 24-period, similar to the prior event. The **Quantum of the Seas** (C6BH8) near 32N 129E reported north winds of 50 kt at 1900 UTC on the 28th near Typhoon Saola. A vessel reporting with the **SHIP** callsign near 41 N 143E reported northwest winds of 65 kt and 5.8-meter seas (19 feet) at 1800 UTC on the 29th. The **Stella Pearl** (9V2680) encountered north winds of 50 kt and 9.8-meter seas (32 feet) near 51N 149E at 2100 UTC on the 30th. The scatterometer data in **Figure 6** shows the higher retrievals in the 45- to 65-kt range around the west and southwest sides of the cyclone. Unlike with Lan, the extratropical Saola tracked north along the west side of the Kamchatka Peninsula with more rapid weakening. Dissipation followed on November 1st.

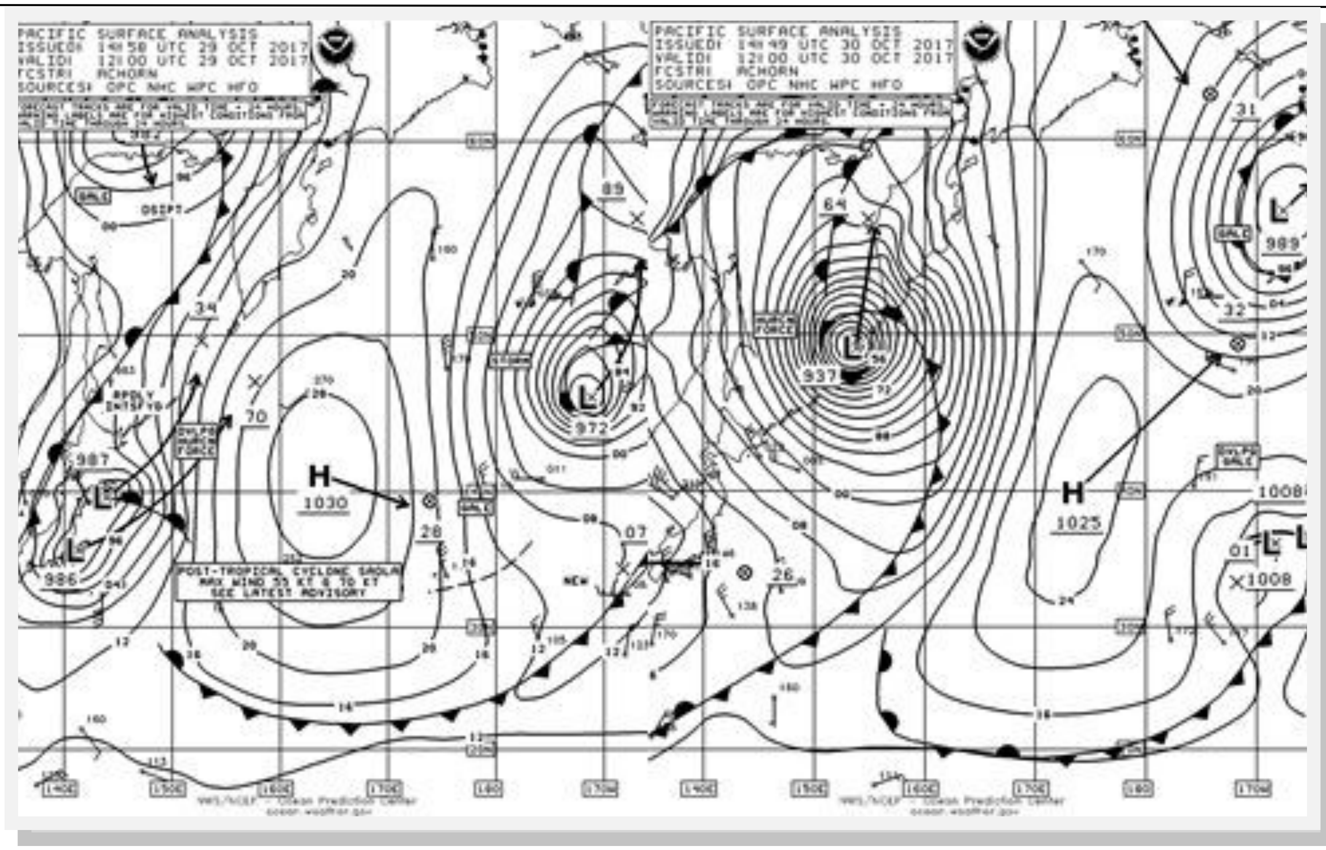


Figure 5. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC October 29 and 30, 2017.

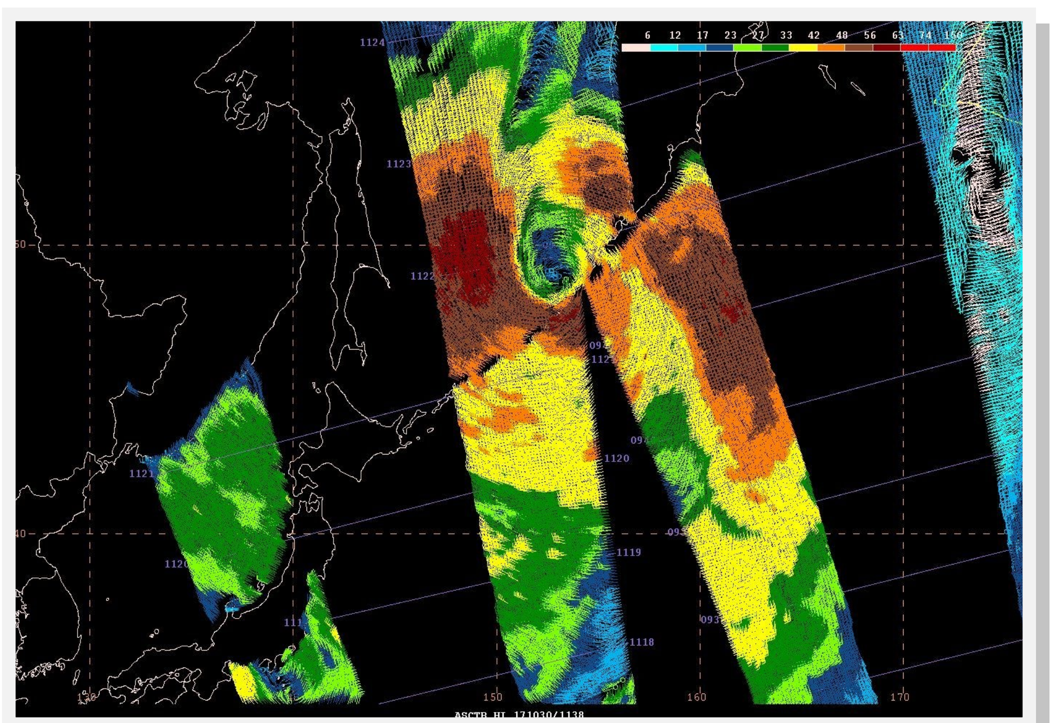


Figure 6. ASCAT (METOP-B) image of satellite-sensed winds (25-km resolution) around the hurricane-force low shown in the second part of Figure 5. The color scale is for the wind barbs and cross-track time lines of the satellite are labeled with four-digit UTC times. The 1122 UTC time line near the center of the cyclone is valid about three-quarters of an hour prior to the valid time of the second part of Figure 5, with the valid time of 0024 UTC October 12, or 0.25 hours later than the valid time of the first part of Figure 4. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research, adapted for operational use at OPC.

Other Significant Events of the Period

Eastern North Pacific Storm, September 2–4: An unseasonably strong low for late summer or early fall developed in the eastern waters, originating as a frontal wave of low pressure near Japan early on August 29th. It moved northeast and became a gale near 48N 171W at 0000 UTC September 2nd, and a storm-force low with a 972-hPa central pressure 24 hours later. The central pressure fell 30 hPa during this period, unusual for so early in the season. **Figure 7** depicts the development of this low over a 36-hour period, ending with it reaching maximum intensity.

North Pacific/Bering Storm, September 15–17: A developing storm originating near northern Japan on September 12th moved to the eastern Bering Sea over the next 3 days and developed a lowest central pressure of 970 hPa (**Figure 8**). It was the stronger of two storms in mid-September (with the other shown in **Figure 1**) and was almost as intense as the September 2–4 event. An ASCAT-A pass with partial coverage in **Figure 9** reveals about half the circulation, but containing what may be the highest wind retrievals of 50 kt. The **Ocean Lily** (V7WC7) near 54N 172W reported west winds of 50 kt and 8.2-meter seas (27 feet) at 2000 UTC on the 15th. The **Elisabeth Oldendorff** (9HA4056) encountered west winds of 40 kt and 8.8-meter seas (29 feet) near 52N 163W at 1900 UTC the next day. Buoy 46075 (54.0N 160.8W) reported maximum seas of 8.5 meters (28 feet) at 2000 UTC on the 16th. Buoy 46066 (52.8N 155.0W) reported west winds of 35 kt with gusts to 56 kt and 7.0-meter seas (23 feet) at 0000 UTC on the 17th. The cyclone then weakened on approach to the Alaskan coast before becoming a gale in the Gulf of Alaska by the 17th, then tracking southeast, and dissipating near the Washington coast late on the 18th.

Bering Sea Storm, October 4–5: A primary low center west of the Kamchatka Peninsula spawned a secondary low on a "triple point," where the occluded front and cold and warm fronts intersect, and the new low developed rapidly over a 36-hour period as depicted in **Figure 10**. This became the deepest cyclone of the Pacific basin up to that time, with a lowest -central pressure of 960 hPa. The ASCAT image in **Figure 11** shows slightly higher wind retrievals than in the somewhat weaker mid-September event with a larger area of 50 kt. The **Saldanha** (9HFM9) near 50N 168W reported southwest winds of 45 kt and 7.3-meter seas (24 feet) at 2300 UTC on the 4th. Buoy 46035 (57.0N 177.7W), which is close to the area of highest ASCAT winds, reported west winds of 43 kt with gusts to 54 kt at 0600 UTC on the 5th and highest seas of 9.5 meters (31 feet) 5 hours later. The cyclone subsequently weakened over western Alaska and became absorbed by a new gale in the Gulf of Alaska on the 6th.

North Pacific/ Bering Storm, October 10–12: Low pressure originating near northern Japan early on October 9th moved to the western Bering Sea, where it briefly developed hurricane-force winds around 1800 UTC on the 11th (**Figure 12**) and a lowest-central pressure of 956 hPa near 57N 172E 6 hours later. This was the most intense cyclone of the period so far, until the much-deeper posttropical events later in the month, and it was also the first cyclone of the period given a "hurricane-force" label. **Figure 13** valid closer to 0000 UTC on the 12th showed 50-kt wind retrievals both south of the center and to the north near the Siberian coast. The B version of ASCAT shows better coverage south of the cyclone center of 50-kt winds. The **African Jay** (C6BW4) near reported southwest winds of 40 kt and 7.0-meter seas (23 feet) near 55N 172W at 2000 UTC on the 12th, while Buoy 46035 (57.0N 177.7W) reported southwest winds of 35 kt (with gusts 45 kt) and 9.4-meter seas (31 feet). The cyclone then moved north and weakened slowly, and then more rapidly after moving inland over eastern Siberia on the night of the 12th.

Western North Pacific Storm, November 17–21: Low pressure passing south of Japan near 31N 137E with a 996-hPa central pressure at 0600 UTC November 18th intensified rapidly east of Japan on the 18th. It developed storm-force winds 12 hours later near 38N 148E and briefly hurricane-force winds with a 974-hPa center passing near 42N 151E at 0000 UTC on the 19th. The central pressure fell 22 hPa in the previous 18-hour period, impressive at such a low latitude. An ASCAT image from close to this

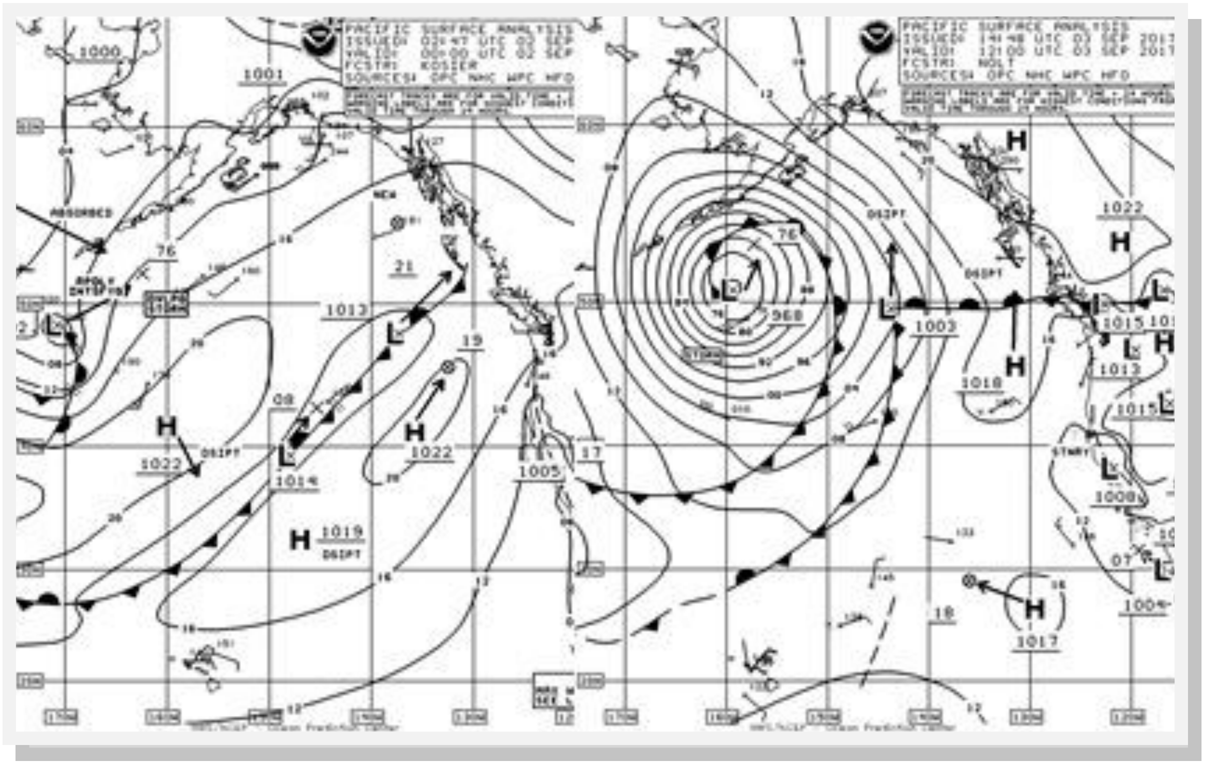


Figure 7. OPC North Pacific Surface Analysis charts (Part 1 — east) valid 0000 UTC September 2 and 1200 UTC September 3, 2017.

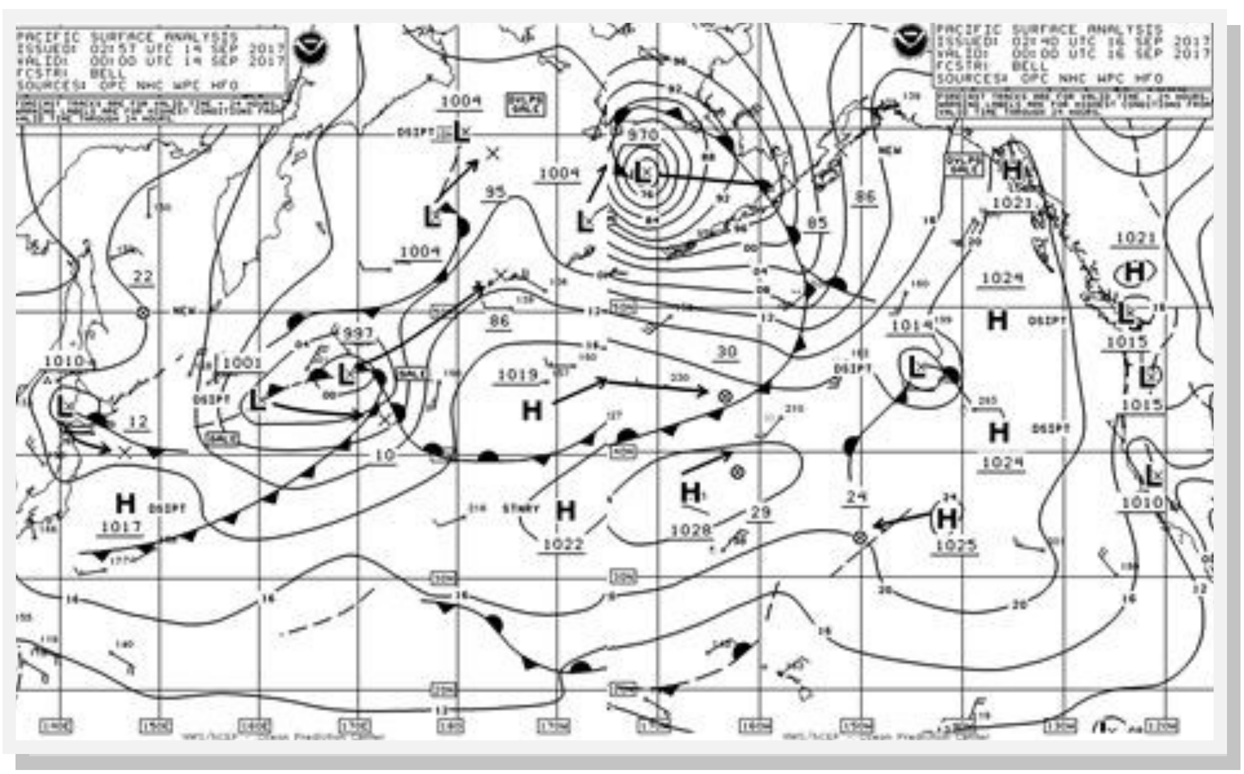


Figure 8. OPC North Pacific Surface Analysis charts valid 0000 UTC September 14 (Part 2) and 0000 UTC September 16, 2017 (Part 1).

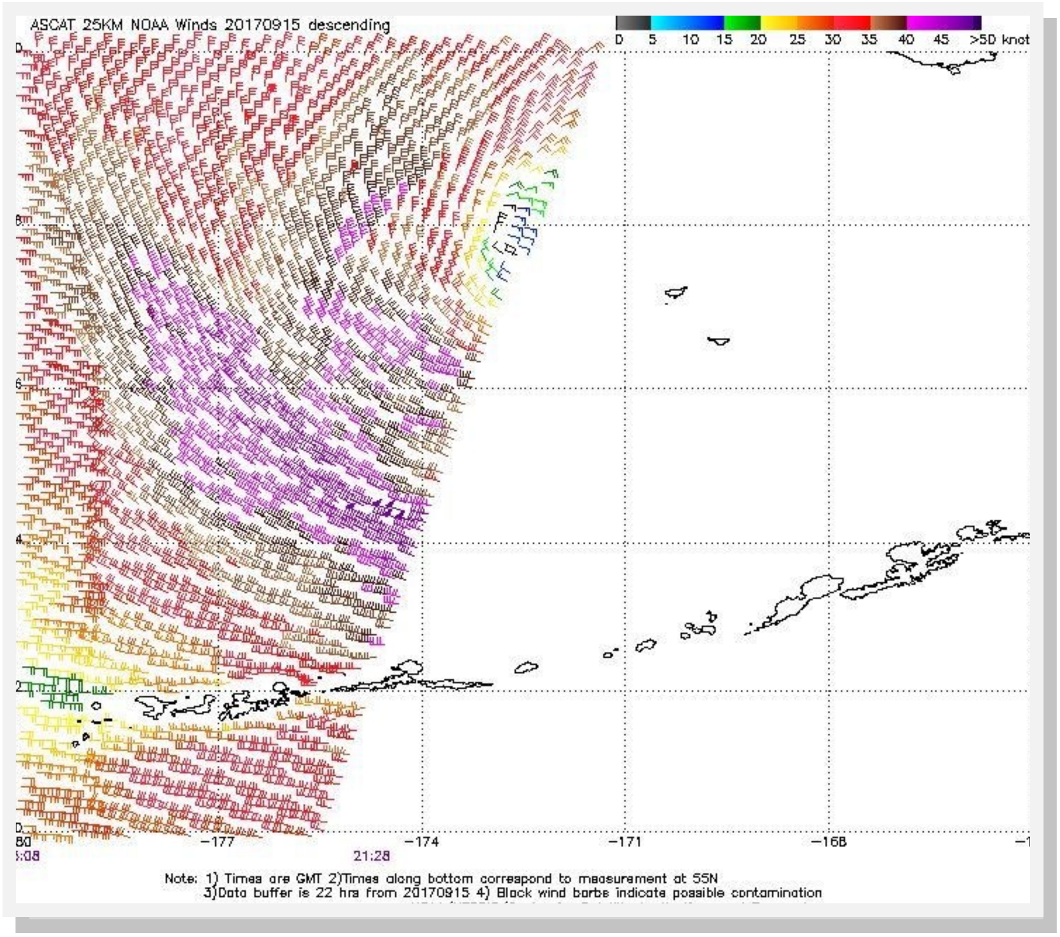


Figure 9. ASCAT (METOP-A) image of satellite-sensed winds (25-km resolution) around the northwest semicircle of the storm shown in the second part of Figure 8. The valid time of the pass with the highest wind retrievals is 2128 UTC September 15, 2017, or about 2.5 hours prior to the valid time of the second part of Figure 8. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

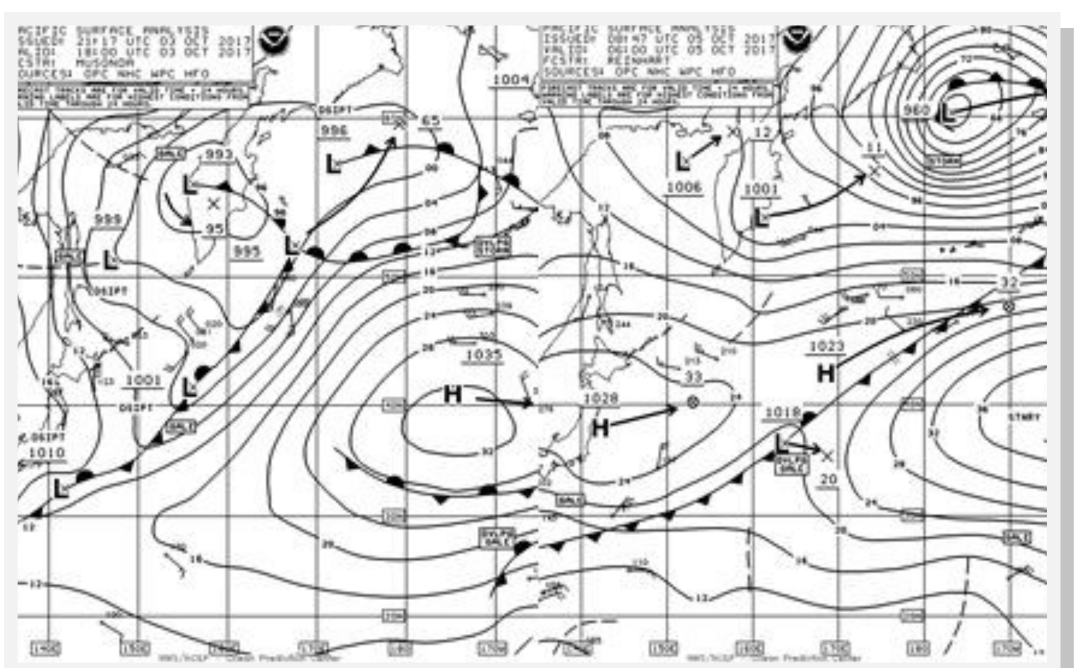


Figure 10. OPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC October 3 and 0600 UTC October 5, 2017.

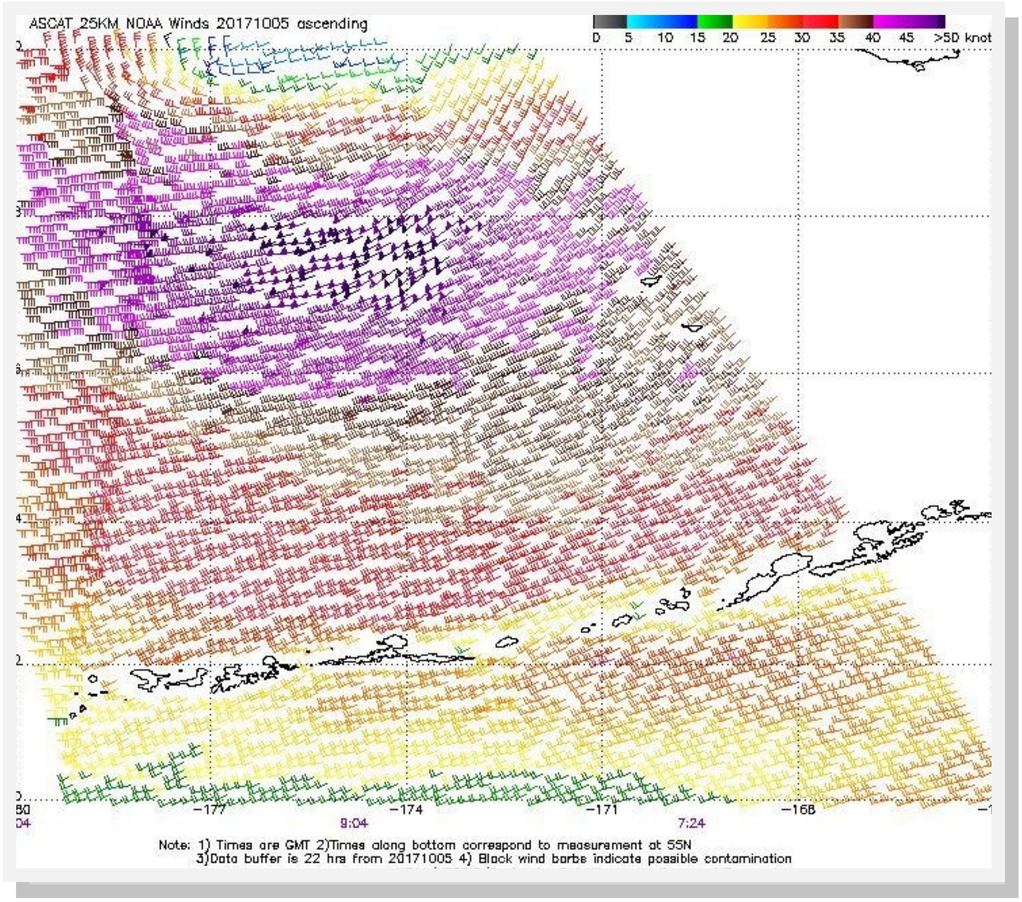


Figure 11. This is a 25-km ASCAT (METOP-A) image of satellite-sensed winds around the south side of the storm depicted in the second part of Figure 10. Portions of two passes are shown (0724 UTC and 0904 UTC October 5, 2017). The valid time of the later pass containing the highest wind retrievals is about 3 hours later than the valid time of the second part of Figure 10. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

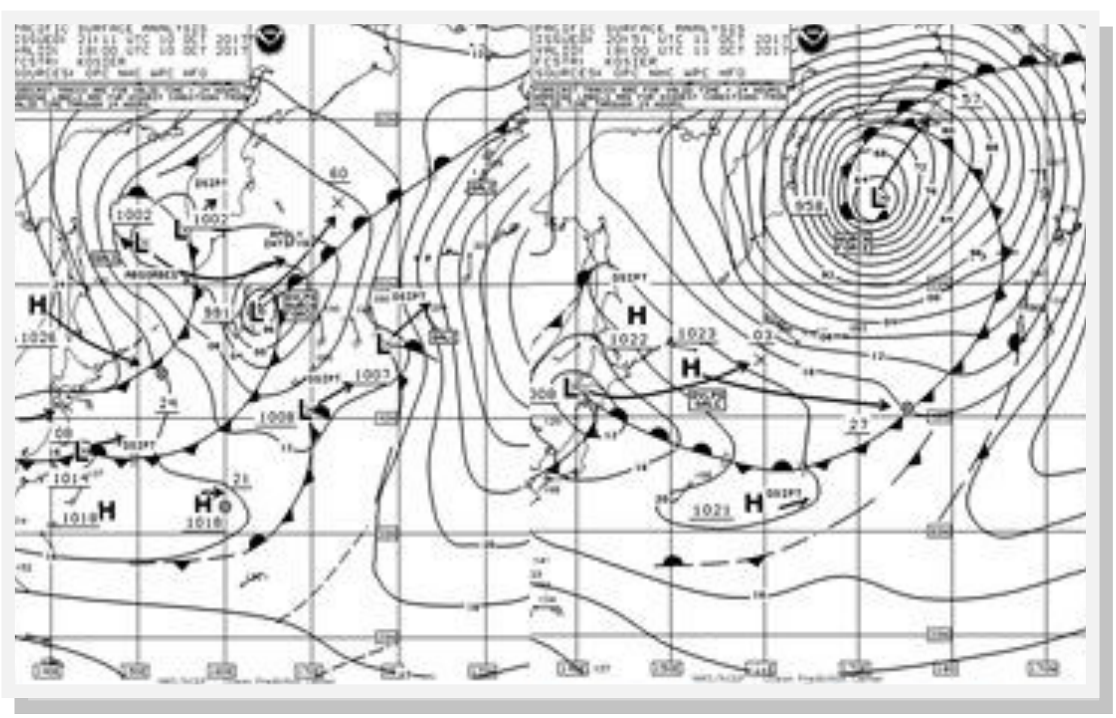


Figure 12. OPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC October 10 and 11, 2017.

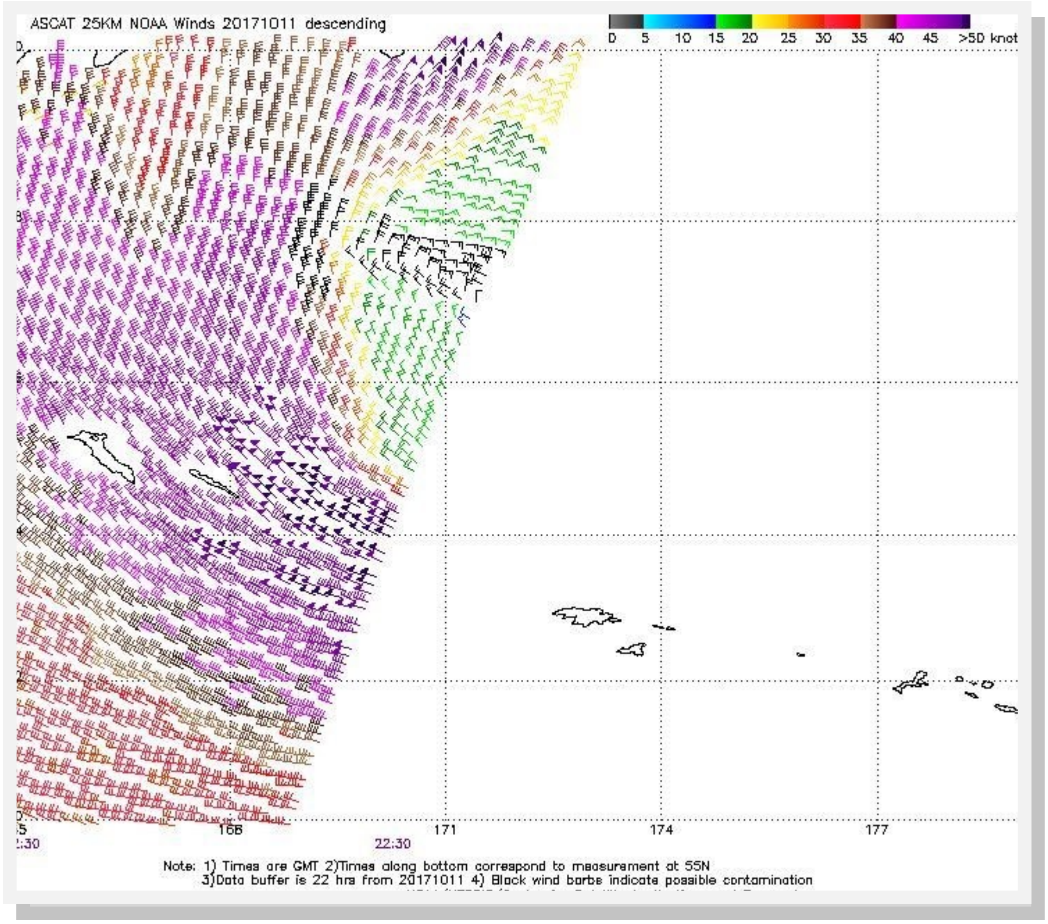


Figure 13. ASCAT (METOP-A) image of satellite-sensed winds (25-km resolution) around the northwest semicircle of the hurricane-force low displayed in the second part of Figure 12. The valid time of the pass is 2230 UTC October 11, 2017, or 4.5 hours later than the valid time of the second part of Figure 12. A portion of the western Aleutian Islands appears in the lower-right side of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

time at 0027 UTC on the 19th reveals a compact center, with wind retrievals up to 60 kt to the east and even some 50-kt south winds farther north along a front with which the low center had merged (Reference 5). The cyclone moved quickly north along a north-south front and weakened over the Kamchatka Peninsula early on the 19th, while developing a new gale-force low on the east side of the Kamchatka Peninsula that day. The cyclone then re-intensified rapidly over the northwest Bering Sea and then over eastern Siberia on the 20th, while redeveloping storm-force winds from the west over the far northern Bering Sea from late on the 20th through the next day. An ASCAT-A pass from 2318 UTC November 21 shows a swath of retrieved west winds 40 to 50 kt from the Bering Strait area to the Gulf of Anadyr (Reference 6). Winds diminished on the 22nd as the cyclone passed well north of Alaska.

North Pacific/ Bering Storms, November 24–29: Three intense cyclones developed in close succession in the North Pacific and portions of the Aleutian Islands and Bering Sea in late November. The most-intense cyclone was the first, originating east of Japan near 37N 152E at 1200 UTC November 24th and moving rapidly northeast with explosive intensification beginning later that day. The cyclone developed gale-force winds with a 1002-hPa center at 0600 UTC on the 25th, storm-force winds 6 hours later near 48N 171E, and hurricane-force winds after another 6 hours with the center near 50N 173E at 970 hPa. The central pressure dropped 55 hPa in 24-hour period ending at 0600 UTC on the 26th or more than twice the rate for a bomb cyclone (Sanders and Gyakum, 1980). **Figure 14** shows the development of this system over a 36-hour

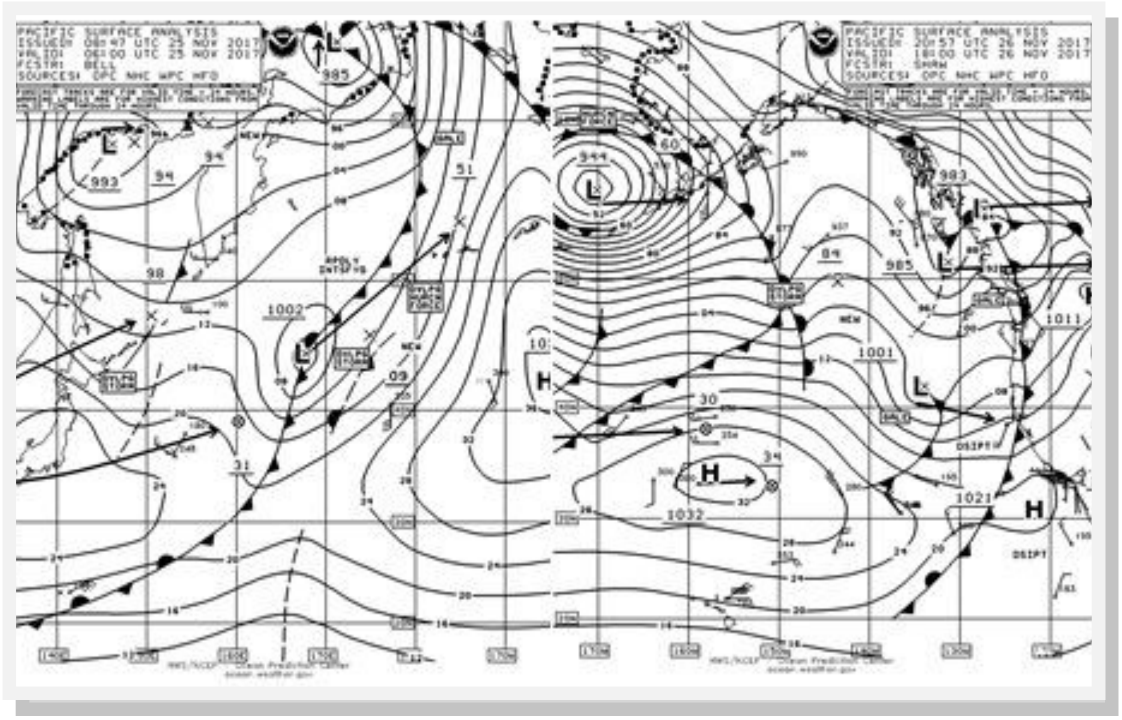


Figure 14. OPC North Pacific Surface Analysis charts valid 0600 UTC November 25 (Part 2) and 1800 UTC November 26, 2017 (Part 1).

period, with the cyclone at maximum intensity (944 hPa) in the southeast Bering Sea, and the cyclone was the strongest cyclone in terms of central pressure in the world at that time (Reference 7). **Figure 15** reveals west to southwest winds of 50 to 65 kt near and south of the eastern Aleutian Islands and even some retrievals of up to 50 kt in the easterly flow ahead of the occluded front. Hurricane-force winds persisted into the night of the 26th, when the cyclone slowed down while turning eastward. The cyclone weakened rapidly the following day and dissipated in the northern Gulf of Alaska early on the 28th. A second cyclone originated in the Sea of Japan early on the 25th and tracked northeast over the next 3 days, developing storm-force winds while approaching the western Aleutian Islands late on the 26th. It developed a new center near the central Aleutians at 1800 on the 27th (**Figure 16**), which moved into the southern Bering with a lowest central pressure of 952 hPa 12 hours later. The central pressure fell 32 hPa in the 24-hour period ending at 0600 UTC on the 28th. An ASCAT-A pass from 0845 UTC on the 28th revealed 50-kt wind retrievals just south of the Aleutian Islands near 170W while the cyclone passed to the north. The cyclone soon became absorbed late on the 28th. A third cyclone, which became almost as intense as the first, developed rapidly over a 24 -hour period, when it deepened by 58 hPa, even more rapidly than in the first event (**Figure 16**). It originated as a new low-pressure wave near 39N 175E at 1200 UTC on the 27th and developed a lowest-central pressure of 947 hPa at 0000 UTC on the 29th as it slowed down while turning northwest into the Bering Sea. The scatterometer winds in **Figure 17** show the stronger wind retrievals of 50 to 55 kt southeast of the low center, which was located near 50N 165W. The cyclone then stalled and weakened in the southeast Bering Sea on the 29th before moving into the Gulf of Alaska late on the 29th, with its winds lowering to gale force. **Table 1** lists the more notable observations taken during this period.

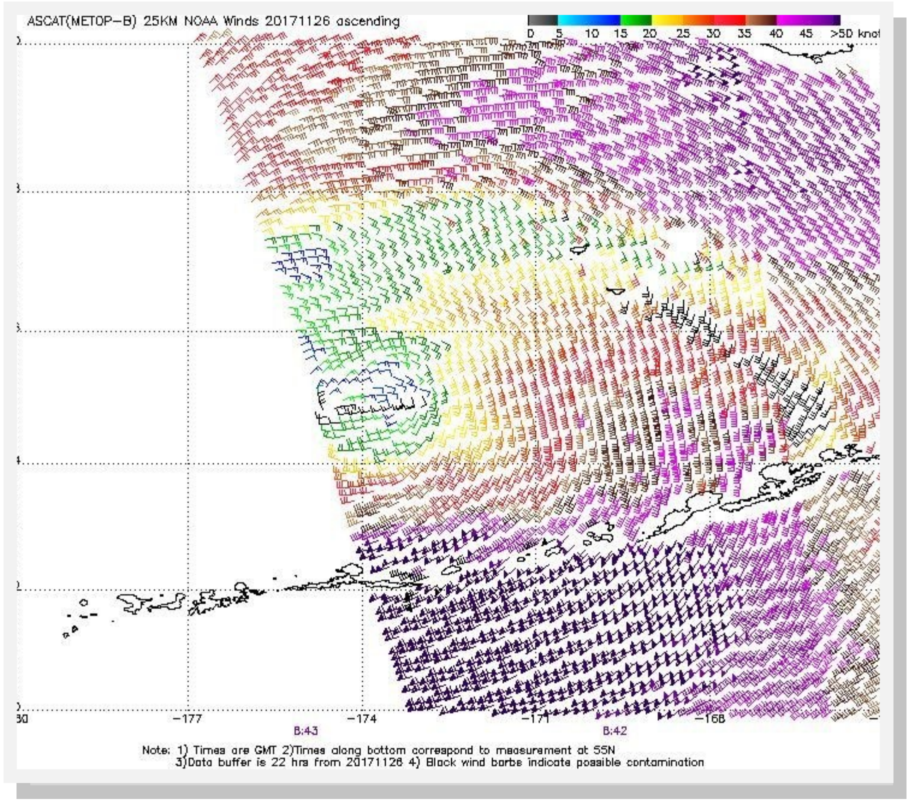


Figure 15. This is a 25-km ASCAT (METOP-B) image of satellite-sensed winds around the north, east, and south sides of the hurricane-force low shown in the second part of Figure 14. The valid time of the pass is 0842 UTC November 26, 2017, or about 9.25 hours prior to the valid time of the second part of Figure 14. The central and eastern Aleutian Islands appear in the image. Image is courtesy of NOAA/ NESDIS/ Center for Satellite Application and Research.

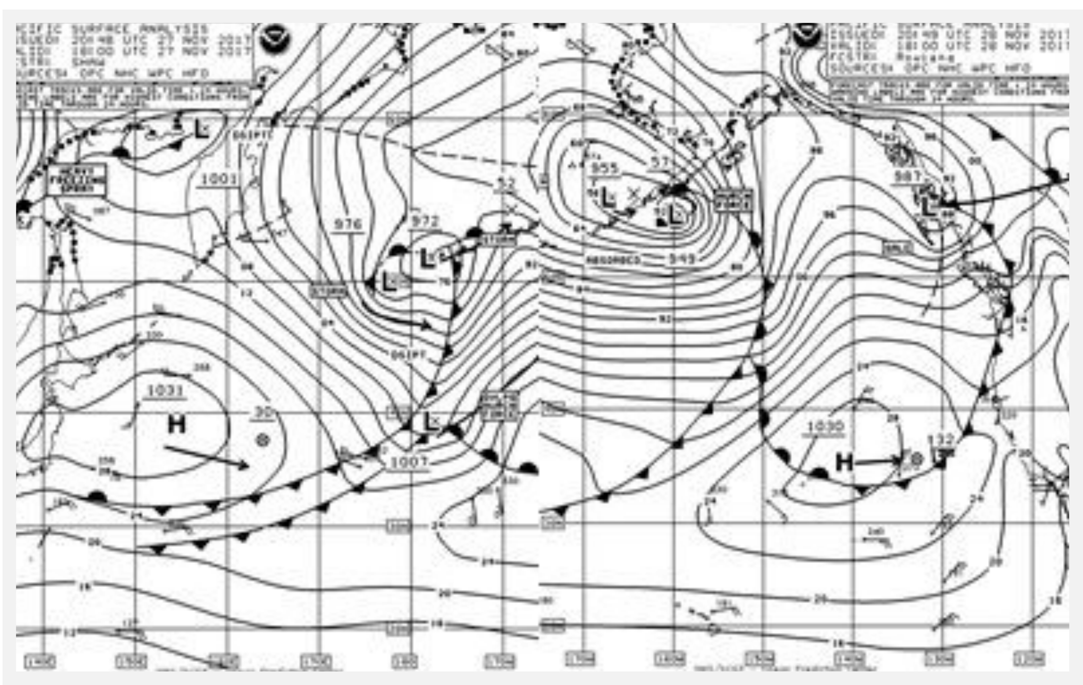


Figure 16. OPC North Pacific Surface Analysis charts valid 1800 UTC November 27 (Part 2) and 1800 UTC November 28, 2017 (Part 1).

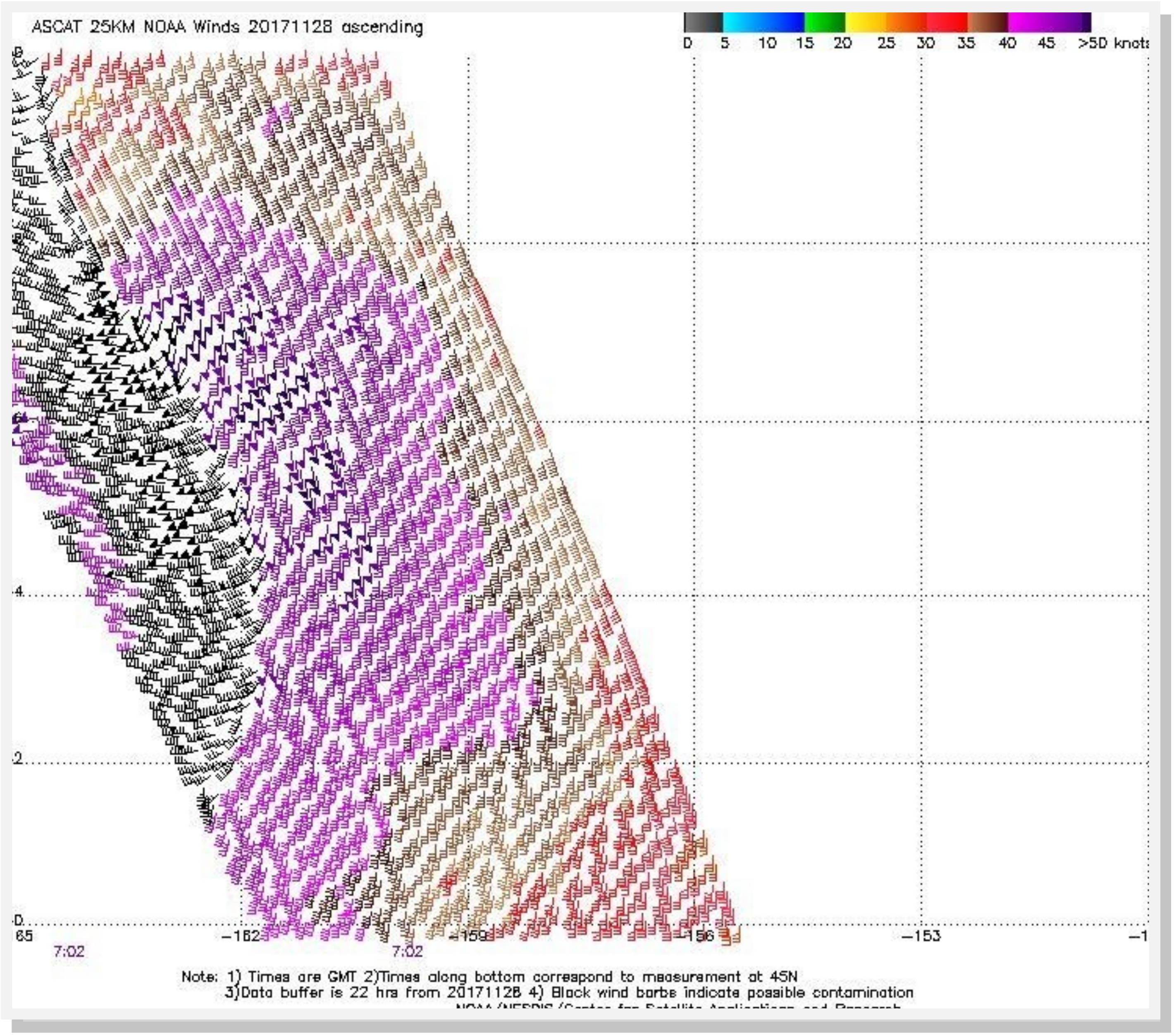


Figure 17. ASCAT (METOP-A) image of satellite-sensed winds (25-km resolution) around the hurricane-force low shown in the second part of Figure 16. The valid time of the pass is 0702 UTC November 28, 2017, or about 11 hours prior to the valid time of the second part of Figure 16. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

Table 1. Selected ship and buoy observations taken during the North Pacific and Bering Sea storms of November 24–29, 2017.				
Observation	**Position**	**Date/Time (UTC)**	**Wind**	**Seas (m/ft)**
Port Alfred (VRLZ7)	48N 177W	26/0000	SW 65	
Sakizaya Orchid (3FMC6)	49N 159W	16/0700	W 43	13.4/44
	48.4N 161.3W	28/1700	W 52	7.9/26
Pegasus Ocean (9V2597)	49N 177E	27/2100	NW 35	9.1/30
GH Glory (VRHU3)	48N 153W	27/2200	W 40	10.7/35
Coastal Progress (WDC6363)	55N 162W	28/1500	SE 50	
Ocean Ambitious (VRPG4)	46N 177W	28/2000	NW 60	10.1/33
Fomento One (9V5170)	54N 162W	28/2200	W 50	9.1/30
Buoy 46075	54.0N 160.8W	27/0700		15.8/52
		27/2000		14.0/46
		29/0000		9.0/30
Buoy 46066	52.8N 155.0W	27/0700		13.0/43
		28/0100		11.0/36
Buoy 46035	57.0N 177.7W	26/1900	NW 39 G49	7.0/23
		27/0000		Maximum 9.0/30

Western North Pacific Storm, December 8–11: Low pressure originating south of Japan near 29N late on December 7th moved northeast and then beginning 0000 UTC on the 9th rapidly intensified, as it absorbed another low and front to the north (**Figure 18**). The central pressure fell 36 hPa in the 24-hour period ending at 0000 UTC December 10th. The cyclone is shown in **Figure 18** at maximum intensity (952 hPa) near 51N 167E, where it stalled before drifting southeast and weakening the following day and night, before dissipating on the 11th. **Figure 19** shows a swath of ASCAT wind retrievals in the 50- to 60-kt range in the stronger easterly flow ahead of the cyclone's occluded front. The highest wind reported by a ship was northwest 50 kt from the **Hatsu Excel** (VSXV3) near 30N 137E at 1200 UTC on the 8th. The **Ever Lively** (9V9726) reported west winds of 35 kt and 6.1-meter seas (20 feet) near 35N 153E at 0000 UTC on the 9th, the highest seas reported by a ship. Shemya, a small island just east of the larger Attu Island in the westernmost Aleutian Islands, reported southeast winds of 46 kt, with gusts to 53 kt at 2050 UTC on the 9th, and a peak gust of 56 kt at 2342 UTC that day.

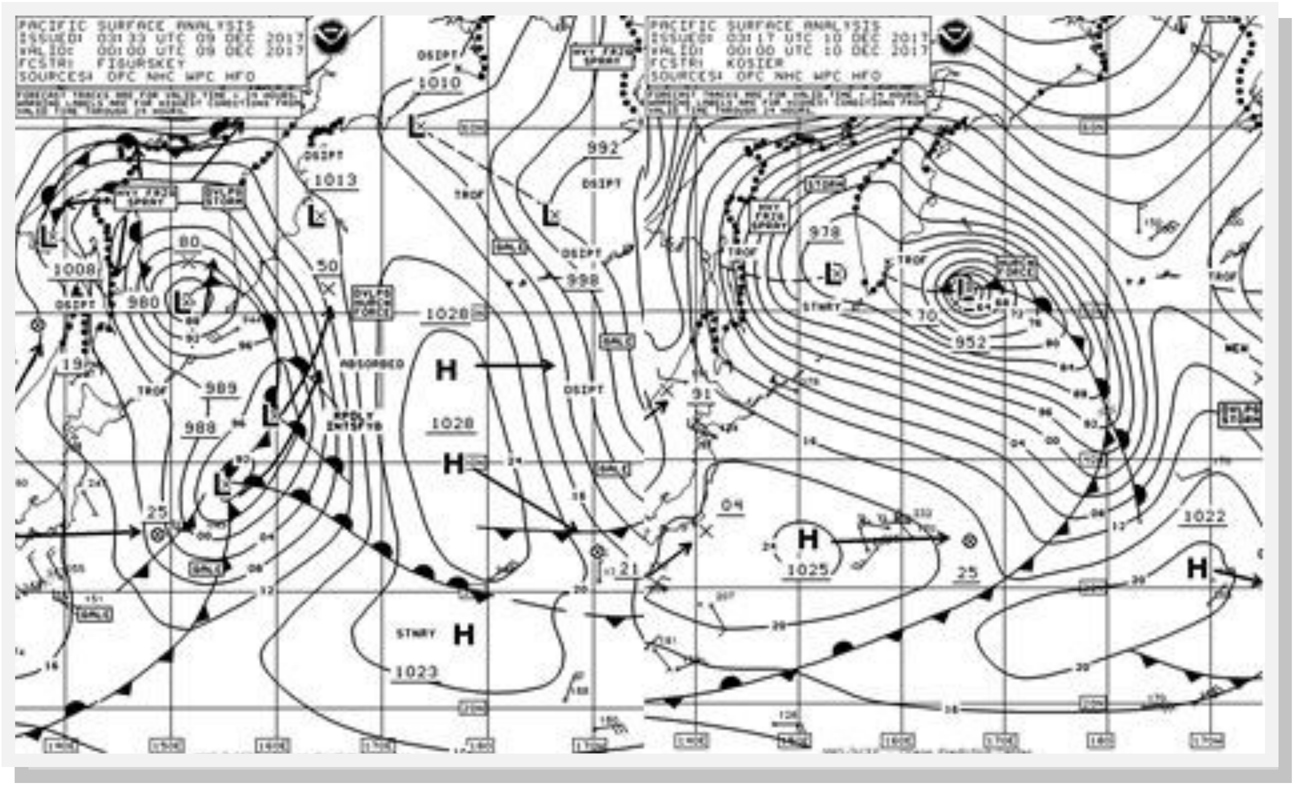


Figure 18. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC December 9 and 10, 2017.

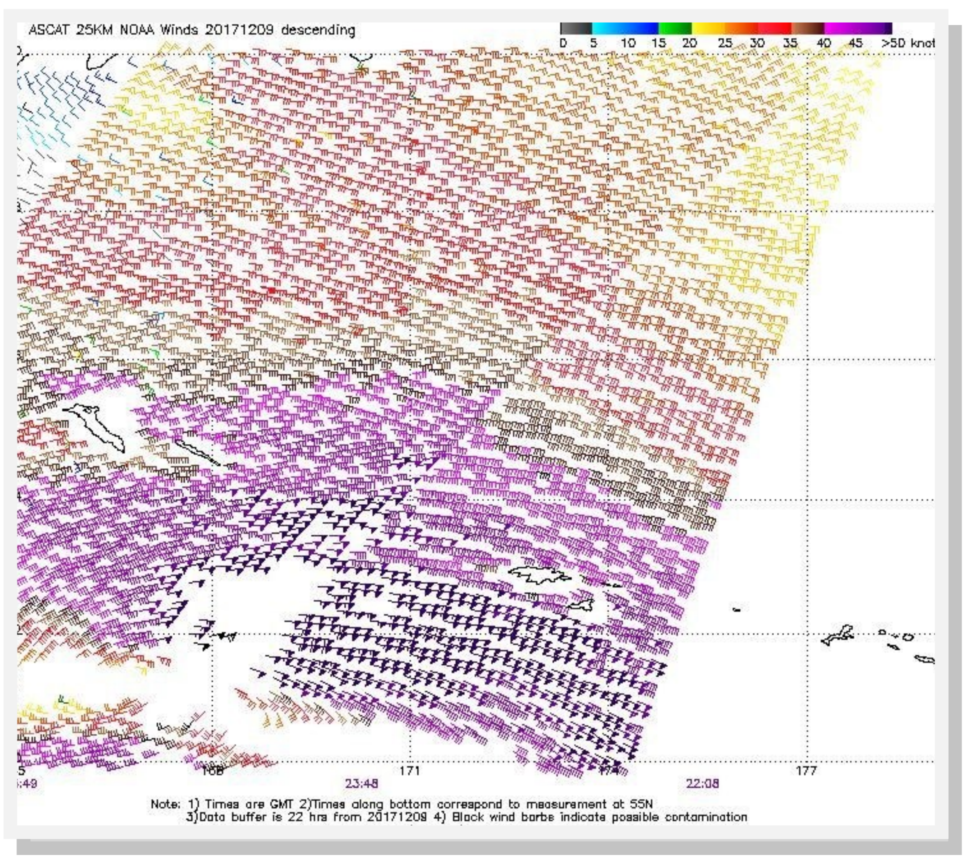


Figure 19. This is a 25-km ASCAT (METOP-A) image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 18. The valid time of the pass containing the stronger wind retrievals is 2348 UTC December 9, 2017, or about 0.25 hours prior to the valid time of the second part of Figure 18. The western Aleutian Islands appear in the lower-right side of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

North Pacific Storm, December 10–12: A secondary low formed near 46N 172W at 0600 UTC on the 10th on the front associated with the primary cyclone shown in the second part of **Figure 18**. It then moved east and intensified, briefly developing hurricane-force winds while passing near 46N 162W with a 965-hPa pressure 24 hours later. An ASCAT-A pass from 2149 UTC on the 10th revealed a relatively compact circulation with a small area of west winds 50 to 60 kt just south of the low center near 44N 167W. The cyclone subsequently turned northeast and then north, with its top winds weakening to gale force just south of Kodiak Island early on the 12th before dissipating inland over mainland Alaska early on the 13th.

Western North Pacific/ Bering Sea Storm, December 16–19: Low pressure east of Japan at 0000 UTC on December 17th moved northeast and rapidly intensified over the next 36 hours while absorbing two other lows to the north as depicted in **Figure 20**. The central pressure fell 40 hPa in the 24-hour period ending at 1200 UTC on the 18th, when it developed a lowest-central pressure of 944 hPa, equal to the lowest pressure of the southeast Bering cyclone in late November and the second-lowest pressure from a nontropical low in the North Pacific during the 4-month period. Storm-force winds accompanied this system from 0600 UTC on the 17th through early on the 19th, before the cyclone weakened and passed across eastern Siberia later on the 19th. The ASCAT-A image in **Figure 21** indicates winds approached hurricane force in the northeast flow near the Russian coast as indicated by the wind retrievals of up to 60 kt. The **OOCL Canada** (VRIB2) near 53N 174W encountered south winds of 50 kt at 1300 UTC on the 18th. A full 11 hours later, the **Catalina** (9HDE8) reported southwest winds of 45 kt and 7.9-meter seas (26 feet) near 52N 179E. Buoy 46035 (57.0N 177.7W) reported south winds of 37 kt, with gusts to 49 kt and 6.5-meter seas (21 feet) at 0200 UTC on the 18th, and maximum seas of 10.0 meters (33 feet) at 1900 UTC on the 19th.

Far Western North Pacific Storm, December 24–26: This very intense cyclone developed from the merging of two cyclones near Japan over a 24-hour period as depicted in **Figure 22**. It originated as a weak low near 37N 131E at 0600 UTC December 24th with a pressure of 1002 hPa. The central pressure dropped 52 hPa in the 24-hour period ending at 1200 UTC on the 25th, more than twice the deepening rate for a bomb cyclone. The 946-hPa lowest-central pressure was the third lowest for an extratropical cyclone during the 4-month period. The ASCAT-B image in **Figure 23** shows areas of retrieved winds of 50 to as high as 60 kt around the south and west sides of the cyclone near the time of maximum intensity, but with some areas of missing data, it might not show the highest winds. Some notable ship observations taken in this storm are listed in **Table 2**. The cyclone subsequently stalled in the southern Sea of Okhotsk from the night of the 25th through the 26th, with its winds diminishing to gale force late on the 26th, before moving east and dissipating east of the Kuril Islands late on the 28th.

North Pacific Storm, December 30–January 2: A new cyclone formed east of Japan near 37N 158E at 1200 UTC December 30th and tracked east-northeast, developing hurricane-force winds with a 972-hPa center near 40N 180W 24 hours later, during which time the central pressure fell 27 hPa. An ASCAT-B pass from 0754 UTC January 1st showed west winds 50 to 60 kt on the south side of the low center, similar to the December 10–12 event. Hurricane-force winds continued through the afternoon of the 31st, but the central pressure fell further, to 960 hPa near 50N 160W at 1200 UTC January 1, 2018, with top winds lowered to storm force. The storm turned north and weakened over southwestern mainland Alaska January 2nd.

References for North Pacific

1. Bancroft, G., "Marine Weather Summary, North Pacific Area," *Mariners Weather Log,* April 2018.

[Web link http://www.vos.noaa.gov/MWL/201804/201804.pdf]

2. Bancroft, G., "Marine Weather Summary, North Pacific Area," *Mariners Weather Log,* August 2017.

[Web link http://www.vos.noaa.gov/MWL/201708/201708.pdf]

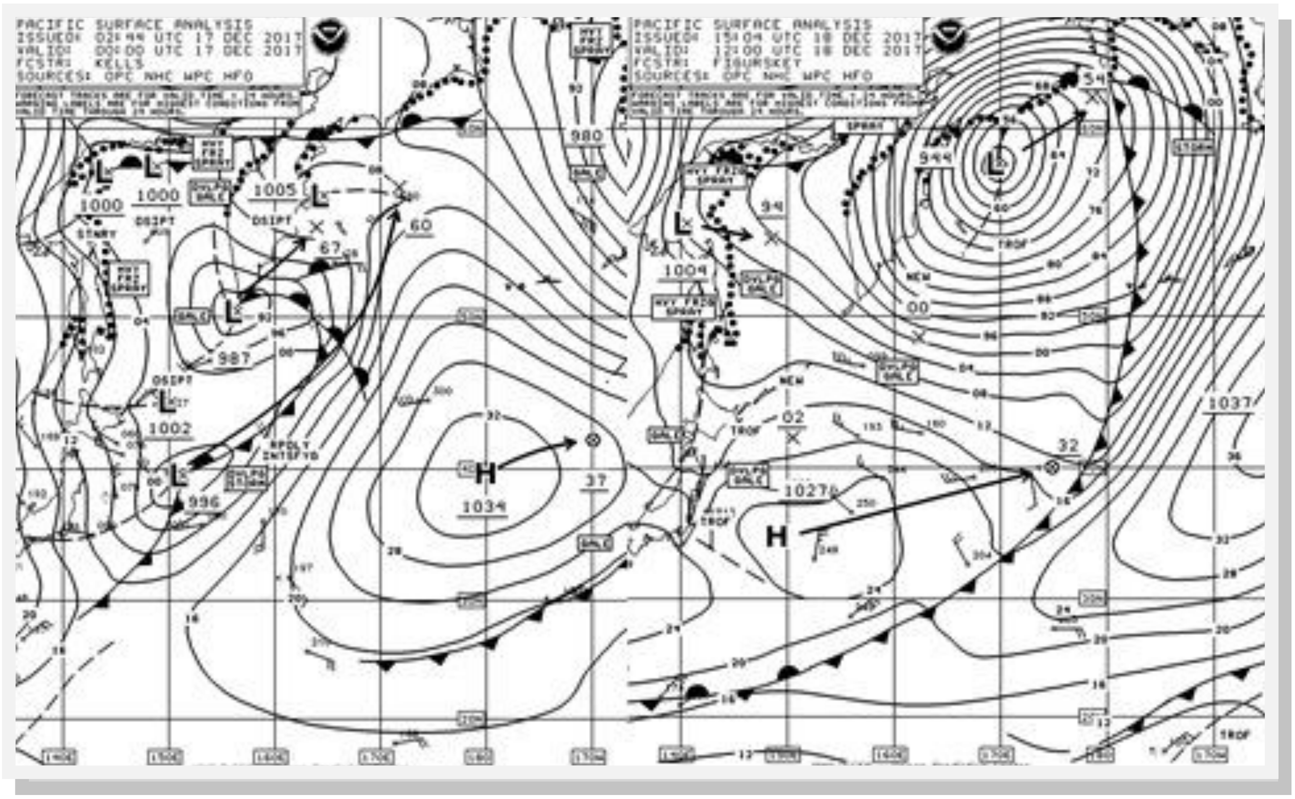


Figure 20. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC December 17 and 1200 UTC December 18, 2017.

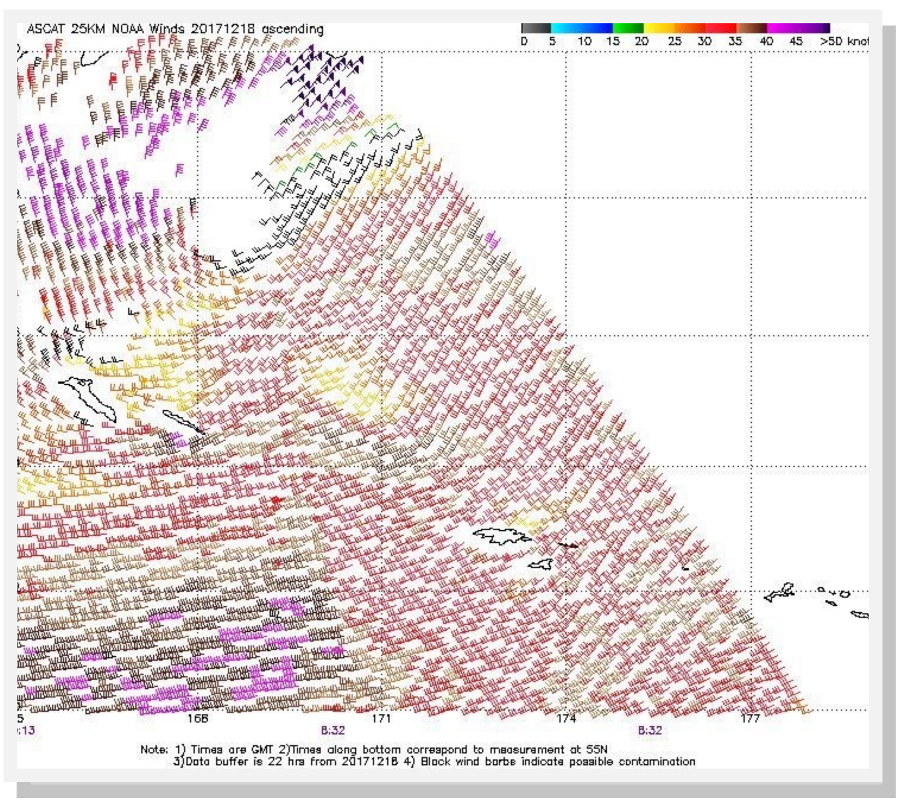


Figure 21. ASCAT (METOP-A) image of satellite-sensed winds (25-km resolution) around the storm shown in the second part of Figure 20. The valid time of the pass containing the higher wind retrievals is 0832 UTC December 18, 2017 or about 3.5 hours prior to the valid time of the second part of Figure 20. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

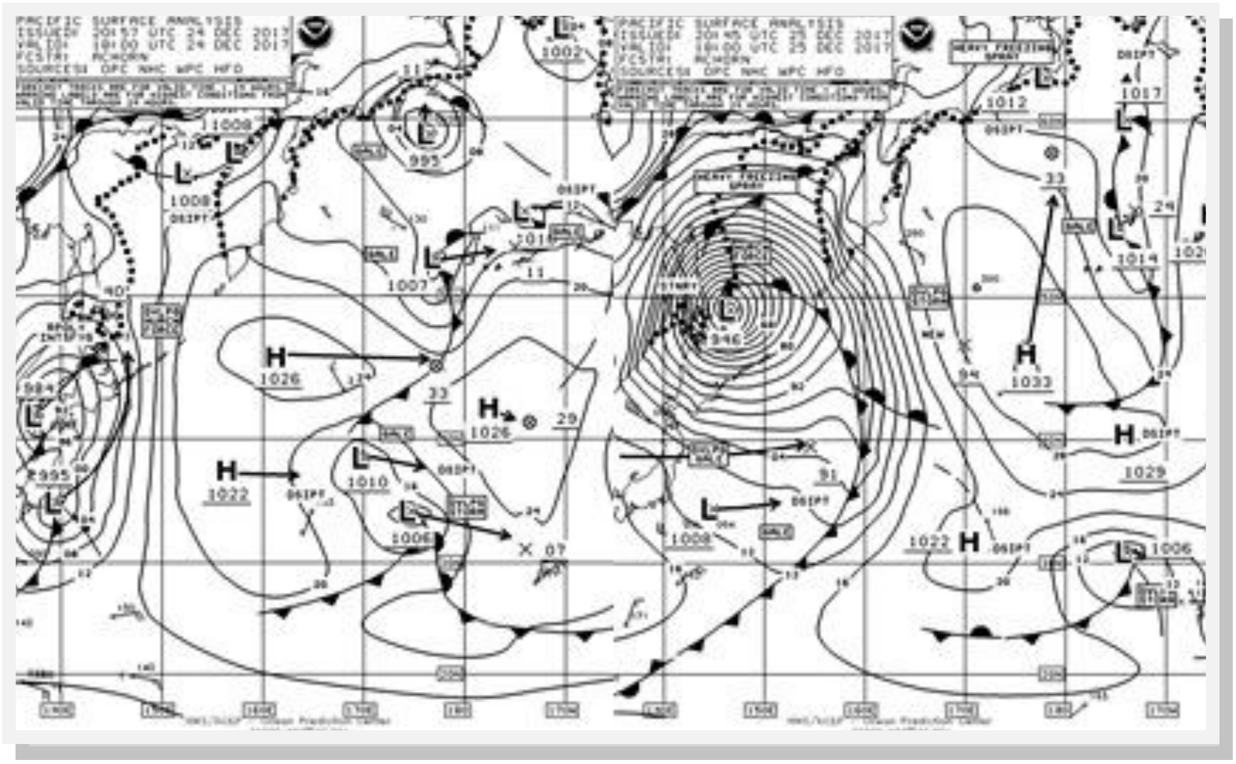


Figure 22. OPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC December 24 and 25, 2017.

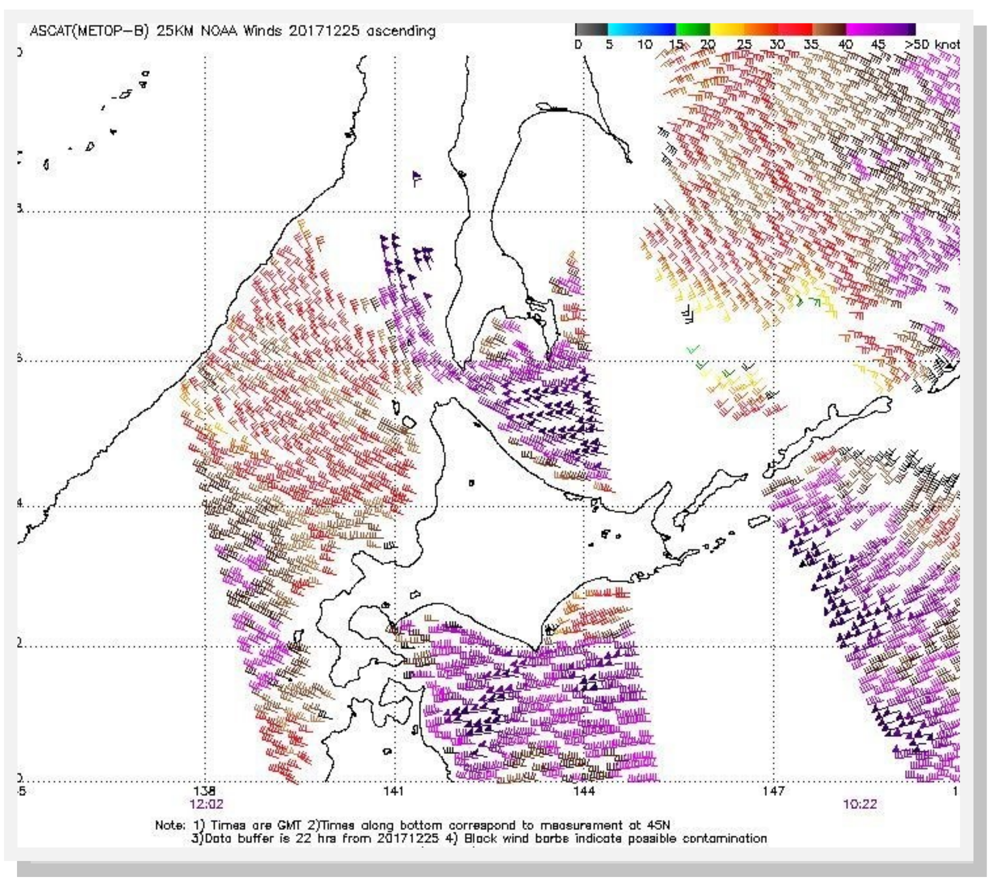


Figure 23. ASCAT (METOP-B) image of satellite-sensed winds (25-km resolution) around the hurricane-force low shown in the second part of Figure 22. Portions of two passes are shown (1022 and 1202 UTC December 25, 2017), with the later pass valid about 6 hours prior to the valid time of the second part of Figure 22. Portions of northern Japan and the Kuril and Sakhalin islands are shown. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

Table 2. Selected ship observations taken during the far western North Pacific storm of December 24–26, 2017.

Observation	Position	Date/Time (UTC)	Wind	Seas (m/ft)
Majestic Princess (MABI4)	32N 132E	24/1500	NW 45	
Cosco Malaysia (VRGV9)	43N 146E	25/1200	SW 50	7.9/26
	42N 144E	25/2000	S 60	
	40N 139E	26/1200	NW 40	11.9/39
TBWUK96	46N 164E	25/1700	SE 50	
APL Chongqing (9V9373)	42N 144E	26/1200	W 50	
Ever Libra (BKIC)	49N 156E	27/0000	SE 45	7.3/24
SHIP	54N 168E	27/0000	SE 40	8.2/27

3. Saffir-Simpson Scale of Hurricane Intensity: https://www.nhc.noaa.gov/aboutsshws.php

4. Sanders, Frederick and Gyakum, John R., Synoptic-Dynamic Climatology of the "Bomb," *Monthly Weather Review*, October 1980.

5. Ocean Surface Winds, https://manati.star.nesdis.noaa.gov/ascat_images/arch_25km_META/AS2017323/zooms/WMBds265.png

6. Ocean Surface Winds,

https://manati.star.nesdis.noaa.gov/ascat_images/arch_25km_META/AS2017325/zooms/WMBds288.png

7. https://weather.com/news/news/2017-11-26-powerful-alaska-aleutian-storm

CLIMATE NARRATIVE AND NOTES: July 2018 (Conditions during July and as noted)

Jerrod Norton, Research Oceanographer

During the last week of July 2018, Coastal (0–100 km) Sea Surface Temperature (SST) ranged from 11°–12°C off California, north of Cape Mendocino along the coasts of Northern California and Oregon, to 22°–23°C off of southern California, north of the Mexican border. SST of 16°–12°C occurred along the Washington Coast north of the Columbia River. Coastal SST between Cape Mendocino and Point Conception was 15°–17°C. Positive SST anomaly less than 2°C was found in a band 500–700 km wide along the coast from northern Mexico to northern California, south of Cape Mendocino during late July. A band of negative SST anomaly extended from the coast of Oregon and Washington 1500 km seaward. (These notes are from the Multiscale Utrahigh Resolution (MUR) analysis.)

Other North Pacific areas of negative SST anomaly occurred in the central North Pacific between 25°N and 50°N, south east of the Kamchatka Peninsula and in the far western tropical north Pacific. Positive SST anomaly (≤ 2°C) occurred west of Japan and extending east to 180°E/W at 40°N. Another area of positive SST anomaly appeared at 150°E between 40°N and 60°N.

Sea-level anomaly (SLA) across the Pacific between retained features of previous months. During the final days of July, positive SLA appeared across the Equator. An equally persistent band of negative SLA anomaly (≥–20 cm) was observed across the tropical north Pacific extending from 130°E to 100°W.

At the CAPE SAN MARTINE DATA BUOY (46028), off Central California (35.7°N), average monthly SST is 14°C for July. The monthly mean for July 2018 was 14.4°C. During 1–10, 11–20, and 21–31 July average SST 14.2°, 14.6°, and 14.3°C, respectively. Hourly SST values during July 2018 were between 11.8 and 17.2°C.

SHORE-BASED WATER TEMPERATURES

At the Scripps Institution of Oceanography Pier at LA JOLLA (32.87°N), where temperatures are measured about 300 m from shore, the SST began to diverge sharply from the historical mean in June 2018. The SST on 2 August was 24.8°C, the second-warmest SST of the 100+ year record. However, the bottom temperature at the pier was 18.4°C cooler (61^{st} warmest).

At the SANTA MONICA tide station (34.1°N), the subtidal water temperature (STWT) was 20°–22°C, 23°–24.4°C, 22.7°–23.6°C, and 20.2°–22.4°C during 1–6 July, 11 July, 14–16 July, and 31 July, respectively. In southern MONTEREY BAY (36.6°N), the tidal signal was muted with some of the cyclic character seen at Arena Cove. STWT was 13.4°–16.2°C during 2–4 July, 16.2°–17°C on 10 July, 13.4°C on 12 July, and 16.2–16.1°C on 30–31 July. Monthly maximum of 17.2°C occurred on 20 July at Monterey. At ARENA COVE in Northern California (38.9°N), STWT shows three warming cycles. Maxima occurred on 5–6 July (13.6°C), 13–14 July (14.5°C), and 23 July (14.7°C). Minima occurred on 9–10 July (9.8°C), 16–17 July (9.9°C), and 28–31 July (SST<10°C). At the PORT ORFORD tide station (42.7°N), near Cape Blanco, upwelling continued in the vicinity and

STWT remained low, starting the month at 8°–9°C and having high STWT of about 13°C. At NEAH BAY, 48.4°N in northern Washington, STWT had complex oscillations. On 1 July, STWT was 11°–12°C, falling to 9.5°C on 6 July, then rising to a monthly max of 14.4°C. By 20 July, STWT at Neah Bay was back down to 10°C; then climbing to 12°–13°C by July's final days.

EQUATORIAL AND SOUTH PACIFIC CONDITIONS

El Niño-Southern Oscillation (ENSO)-neutral conditions prevailed through July with neutral-to-positive SST anomalies across the Equatorial Pacific. The upper 300-m heat-content anomaly from 180–100°W trended positive during March and has remained positive throughout April, May, June, and July. Subsurface temperature anomalies exceeding 2°C were found across the equatorial Pacific, due to thermocline downwelling. Positive subsurface temperature anomalies extended to the surface in the central and eastern equatorial Pacific. In the west at 140°E, the largest subsurface temperature anomalies are between 100 and 150 m. Positive SLAs are found across the equatorial Pacific with negative SLA to the north. South Pacific SST anomalies were neutral to negative in the east and neutral to positive in the west, with SST anomaly to 2°C east of New Zealand. Negative SST anomaly persisted along the Antarctic coast. SLA was positive across the equatorial ocean between 7°N and 10°S and in the western South Pacific. Negative SLH anomalies occurred along the coast of South America. Generally, models favor ENSO-neutral conditions through boreal summer, with a 50-percent probability of ENSO-positive conditions in the fall.

The NOAA OCEANIC EL NIŇO INDEX (ONI) [3-month running mean of ERSST.v4 SST anomalies in the Nino 3.4 region (5N–5S, 120–170W)] for April–June (AMJ) was neutral at –0.1 followed by the (May–July) MJJ neutral value of 0.1, the first positive ONI index value since June–August (JJA) of 2017.

MULTIVARIATE ENSO INDEX (MEI)

The MEI is showing ENSO-neutral to El Niño-like conditions. The MEI values for May–June and June–July MEI, short of the weakest possible MEI-El Niño ranking. Dr. Wolter notes increasing negative-SST anomaly at the South American coast, but suggests that the odds for El Niño conditions in 2018 have firmed up, although initiation, duration, and event intensity remain uncertain.

The NCEI PACIFIC DECADAL OSCILLATION (PDO) index is based on SSTs assembled in ERSST v4. Recent computations may show a trend toward possibly more negative index values: 0.29, –0.19, –0.60, –0.83, –0.61, –0.96, and –0.23 in July, nominally negative, but neutral.

The JISAO PDO had low magnitude values between –0.05 and 0.11 from March–June 2018.

The PACIFIC/NORTH AMERICAN Teleconnection Index (PNA), computed from atmospheric pressure over the Pacific Ocean and North American Continent, was weakly positive during most of June and weakly negative during most of July with a near-neutral monthly value of –0.04 for July 2018. A trend to higher values, often associated with El Niño, occurred in early August.

During June 2018, the ERD UPWELLING INDEX (UI), computed from monthly average sea-level atmospheric-pressure fields, indicated robust upwelling conditions from 33° to 42° N, with strongly positive UI anomalies from 36°N to 42°N.

Average to above-average UI were indicated from 45°N to 60°N. At 36°N, the UI computed at six hourly intervals indicated moderate-to-strong upwelling favorable conditions during much of the month, leading to a positive UI anomaly. Six hourly computations are routinely available for all 15 UI computation locations from Baja California to the Gulf of Alaska.

PRECIPITATION AND RUNOFF

The Fraser River in British Columbia is the freshwater environment of several important anadromous fish species commercially harvested by the U.S and Canada. At the end of July, the Fraser River was flowing at about at about 250,000 cubic feet per second (cfs) at Mission, British Columbia, variable on strong tidal fluctuations. The Hoh River was flowing at 958 cfs [1160, historical median in brackets] at U.S. 101 near Forks, Washington. The Puyallup River was flowing at 1,650 cfs [2,150] near Puyallup, and the Skagit River was flowing at 10,900 cfs [11,800] near Mount Vernon at the end of July. The Columbia River at the Dalles was at 180,000 cfs [200,000], and it was about 170,000 cfs [190,000] at Port Westward near the end of July. The Rogue River in Oregon was flowing at 1,510 cfs at Grants Pass and 1,990 at Agnees, both near the historical median. Parts of Oregon have normal-water, year-to-date conditions, but increasing areas in central and southern Oregon are not getting usual spring and summer rains, and to date, totals are falling to 70–90 percent of to-date averages. Accumulated flow for water year to date (late July), in percentage of average for Central and northern California Reservoirs was: Trinity (45 percent), Shasta (67 percent), Folsom (94 percent), New Melones (84 percent), and Millerton (83 percent). However, all are now filled to near-15-year averages.

The Trinity River near Hoopa was 929 cfs [780], and the Klamath River near Klamath was at 2950 cfs [3110]. At the Battle Creek Coleman National Fish Hatchery, the flow was 258 cfs [241]. The Sacramento River at Freeport was 19,300 cfs [15,600] and 16,100 [12,900] at Verona Marina. San Joaquin River flow was 700 cfs [1,120] at Vernalis. All "natural" Southern California rivers were in no-flow or very-low-flow conditions during July. In Southern California, every kind of maximum surface atmospheric temperature record was increased during July. The 49°C (120°F) recorded at Chino, California, about 20 miles (32 km) east of Los Angeles), was likely the highest surface air temperature ever recorded within 100 miles (160 km) of the coast.

https://waterdata.usgs.gov/ca/nwis/current/?type=flow
https://www.climate.gov/news-features/featured-images/exceptional-drought-parts-seven-states-us-southwest
https://www.cnrfc.noaa.gov/awipsProducts/RNOWRKCLI.php
https://waterdata.usgs.gov/ca/nwis/current/?type=flow

Several WILDFIRES in the western states burned thousands of acres of forest land during July 2018. Winds during forest fires may take thousands of tons of fire products to sea. Ash and charred remains of vegetation and other combustibles will be carried seaward during winter rains. The effects of wildfires on the ocean are beginning to be studied at the University of California, Santa Barbara. These studies began during the Thomas fire of 2017.

Commercial salmon harvest in southeast Alaska is expected to be down 30 percent from last year. The Copper, Chignik, and Kodiak Rivers have had the weakest sockeye harvest in nearly 40 years. Exceptions are Bristol Bay, where a 37 million sockeye catch so far has pushed Alaska's total salmon harvest towards a weak overall total 60 million. The Kuskokwim River, where king, chum, and red salmon are taken, are meeting the Alaska escapement goals.

Studies examining the increasing number of PINK SALMON (Oncorhynchus gorbuscha) in the North Pacific suggest perturbation of the ecosystem by pink salmon hatchery successes in Russia and the U.S. (Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1720577115 (2018), Fisher. Oceanogr. 10.1111/fog.12276 (2018))

The first 4 months of the California COMMERCIAL MARKET SQUID season yielded

18,881 metric tons (mt). Total July California landings were 2,109 mt. Totals may vary as new reports add to the total.

ECOCAST MAPS, generated daily, help commercial fishers locate the most productive fishing spots in near real time, while warning them of where they have greater risk of entangling sea turtles, marine mammals, and other protected species. The maps were developed to help reduce accidental catches of protected species.

Alexandrium, the dinoflagellate that produces paralytic shellfish poison (PSP), has occurred in relatively low abundance along the entire California coast during July. *Pseudo-nitzschia,* the diatom that will, under some conditions, produce the neurotoxin Domoic Acid (DA), has recently been detected along the majority of the California coast. Razor clams from Humboldt and Del Norte Counties have DA concentrations above alert levels. Recreationally harvested Rock Crabs taken north of Mendocino County are also part of the California DA advisory prohibitions. DA health advisories for July and August are in effect for razor clams along specific stretches of the Oregon coast. Additional information is available from:

- California marine bio-toxin hotline, (800) 553-4133.
- https://www.cdph.ca.gov/Programs/CEH/DRSEM/Pages/EMB/Shellfish/Marine-Biotoxin-Monitoring-Program.aspx
- Oregon marine biotoxin hotline, (800) 448-2474. (N16)
- http://www.oregon.gov/ODA/shared/Documents/Publications/FoodSafety/CurrentBiotoxinData.pdf
- Washington State (800), 562-5632 hotline.
- https://fortress.wa.gov/doh/eh/portal/odw/si/BiotosxinBulletin.aspx
- For Canadian shellfish testing for DA, PSP, and other toxic agents.

Mean Circulation Highlights and Climate Anomalies

January–April 2018

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

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

January–February 2018

The 500-hPa mean circulation during January 2018 featured positive height anomalies across the central North Pacific, western North America, the midlatitude North Atlantic, and northwest Russia. Negative height anomalies prevailed across the Gulf of Alaska, the high latitudes of the North Atlantic, and east Asia (**Figure 1**). The corresponding Sea-Level Pressure (SLP) and Anomaly map (**Figure 2**) featured anomalies of similar sign to that of the 500-hPa height anomalies, except over the CONUS, where positive SLP anomalies were noted over the eastern half, and near normal SLP was noted over the western half.

During February, a highly anomalous wave pattern was noted in the middle troposphere, with positive height anomalies (or equivalently, above-average height anomalies) over the middle-to-high latitudes of the North Pacific, the eastern CONUS/western Atlantic, and much of the polar region (**Figure 3**). Below-average heights were noted for most of Canada, the western CONUS, western Europe, and east Asia. The corresponding SLP and Anomaly map depicts a roughly similar pattern to the middle tropospheric configuration in anomaly sign (**Figure 4**).

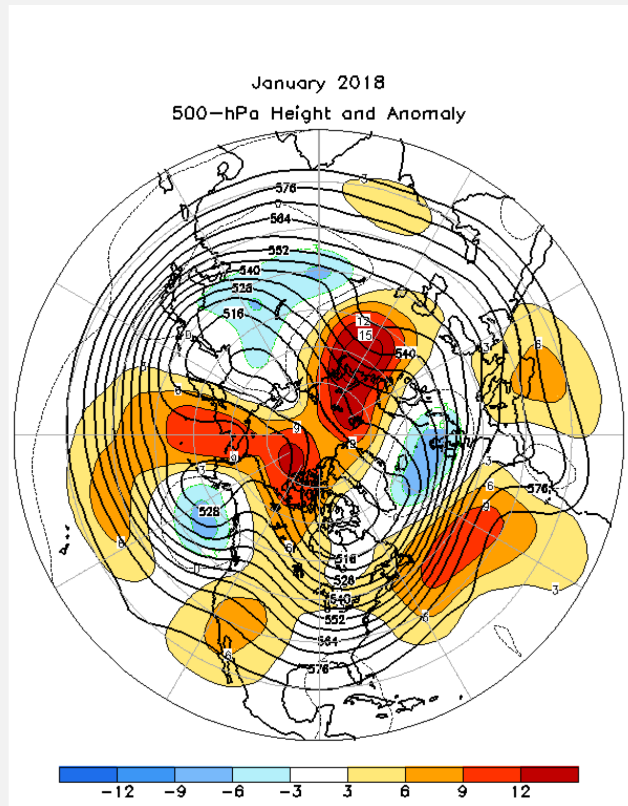


Figure 1. Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010 base-period monthly means.

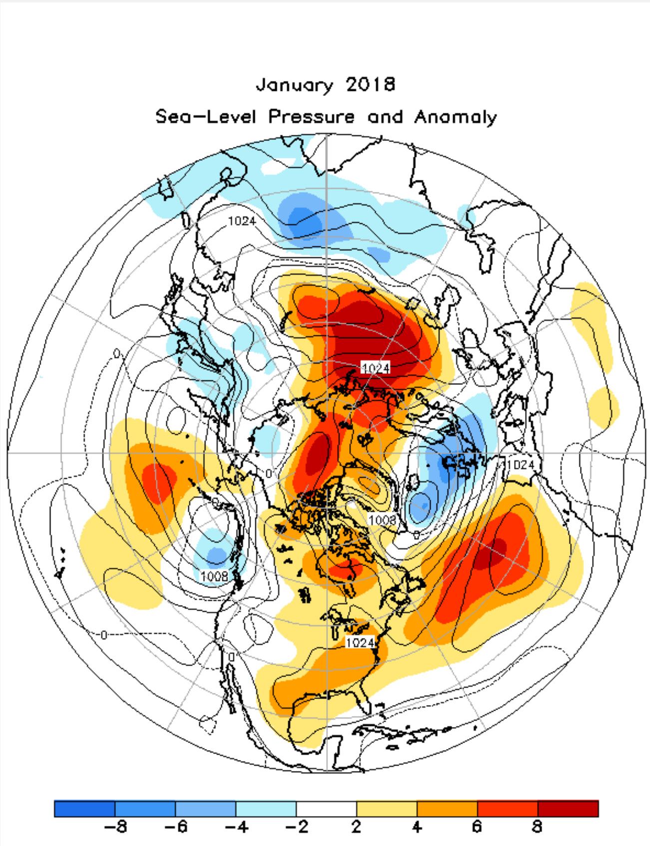


Figure 2. Northern Hemisphere mean and anomalous sea level pressure (CDAS/Reanalysis). Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010 base-period monthly means.

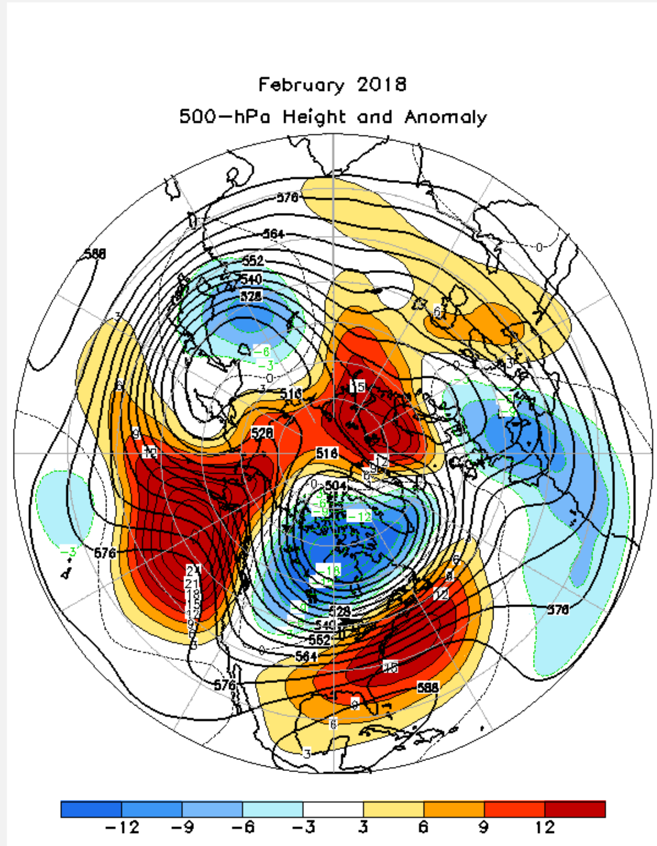


Figure 3. Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010 base-period monthly means.

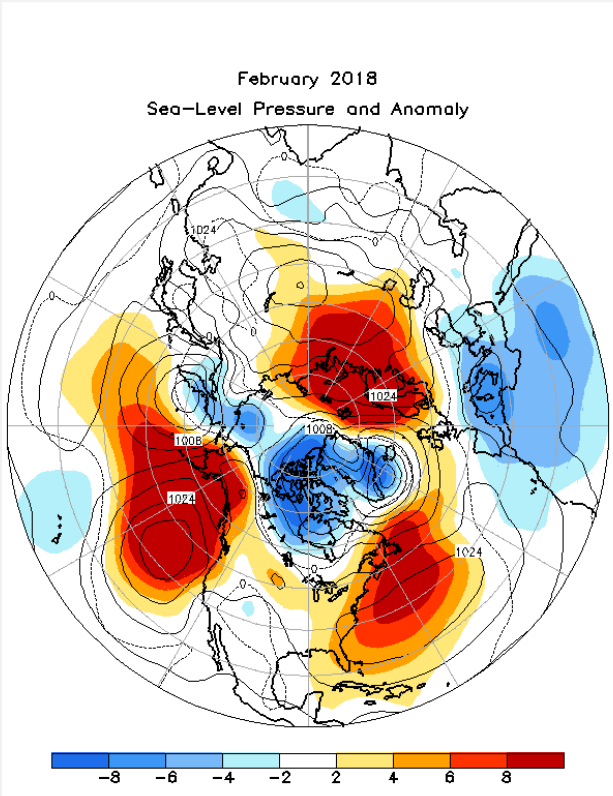


Figure 4. Northern Hemisphere mean and anomalous sea level pressure (CDAS/ Reanalysis). Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010 base-period

The Tropics

Sea surface temperatures (SSTs) were below average in the central and eastern equatorial Pacific in January and February. The latest monthly Nino index for the Nino 3.4 region was –0.8C (January) and –0.9C (February). The depth of the oceanic thermocline (measured by the depth of the 20C isotherm) was below average in the eastern Pacific, as is typical during a La Nina winter. Subsurface temperatures ranged from 1–4C below average in January and 0–1C in February. Equatorial low-level trade winds were above average in the western and central Pacific (January), and westerly anomalies were noted over the western and central Pacific (February). Upper-level westerly wind anomalies were above average over the central and eastern Pacific (January) and in the eastern Pacific (February). Tropical convection was enhanced over Indonesia and the western Pacific in January, as well as the far western and west-central Pacific in February. Suppressed convection was noted over the central equatorial Pacific in January and over Indonesia and the east-central Pacific in February. Collectively, these oceanic and atmospheric anomalies reflect the continuation of a La Niña (January) and weakening La Niña conditions (February).

March–April 2018

The March circulation pattern featured above-average 500-hPa heights across the Southwest CONUS, eastern Canada, Greenland, from the Middle East to Japan, and most of the mid- to high-latitude North Pacific (**Figure 5**). Below-average heights were noted for far-western and far-eastern portions of the CONUS, Europe, and northern Asia. Above-average SLP was observed across much of the polar region and mid- to high-latitude North Pacific, with a ring of below-normal SLP over the midlatitudes (Figure 6). The mean 500-hPa circulation during April 2018 was characterized by above-average heights across the Southwest CONUS, the west-central North Atlantic, and central and eastern Europe (**Figure 7**). Below-average 500 -hPa heights were noted over eastern Canada and the high-latitude North Atlantic. The SLP and Anomaly pattern was mostly reversed in sign during April, with below-normal SLP at high latitudes, undercut by above-normal SLP at midlatitudes (**Figure 8**).

The Tropics

SSTs were below average in the east-central and eastern equatorial Pacific during March, and near average in the central and eastern Pacific in April. The latest monthly Niño index values for the Niño 3.4 region were –0.7C (March) and –0.4C (April). In March and April, the depth of the oceanic thermocline remained above average in the east-central Pacific and below average in the far-eastern Pacific. Corresponding subsurface temperatures were 1–2C below average (March) and moderated to 1–2C above average (April). Low-level easterly anomalies were observed in the eastern and east-central Pacific (March), and easterly anomalies were above average in the east-central Pacific (April). Upper-level westerly wind anomalies were above average over the eastern Pacific during the 2-month period. Deep convective cloudiness and tropical rainfall were enhanced over Indonesia and the western Pacific (March), and over the western Pacific (April). Convection was suppressed over eastern and central portions of the Pacific. Collectively, these oceanic and atmospheric anomalies reflect the transition from a weak La Nina (March) to ENSO-neutral (April).

Selected Notable Events

According to the National Centers for Environmental Information (NCEI), March 2018 featured four major winter storms across the Northeast U.S., which caused major disruptions to this region (**Reference 1**). These storms were accompanied by heavy snowfall and strong winds, resulting in numerous downed trees and electrical power lines, as well as flooded streets (in Duxbury, Massachusetts), numer-ous school closings, and the cancellation of thousands of commercial airline flights.

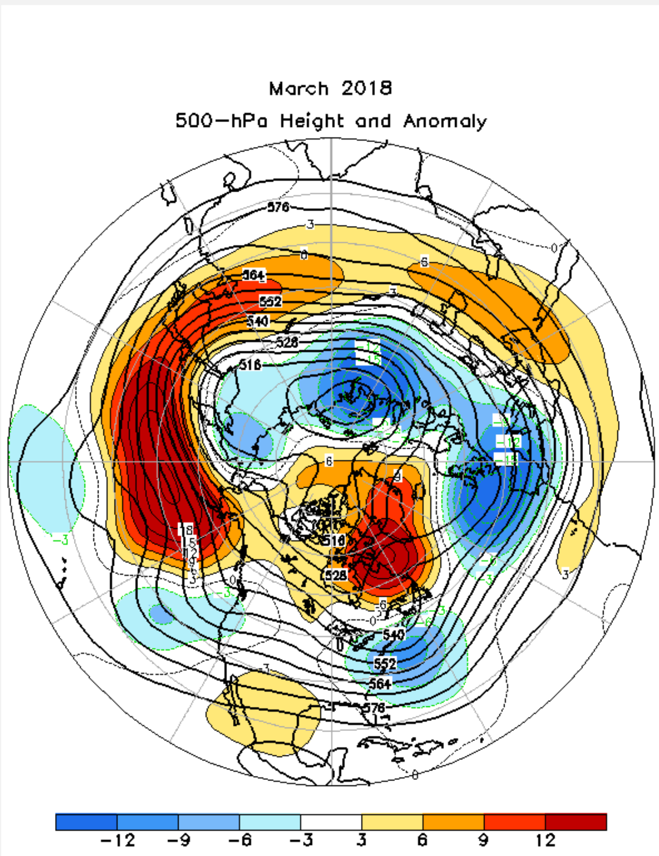


Figure 5. Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010 base-period monthly means.

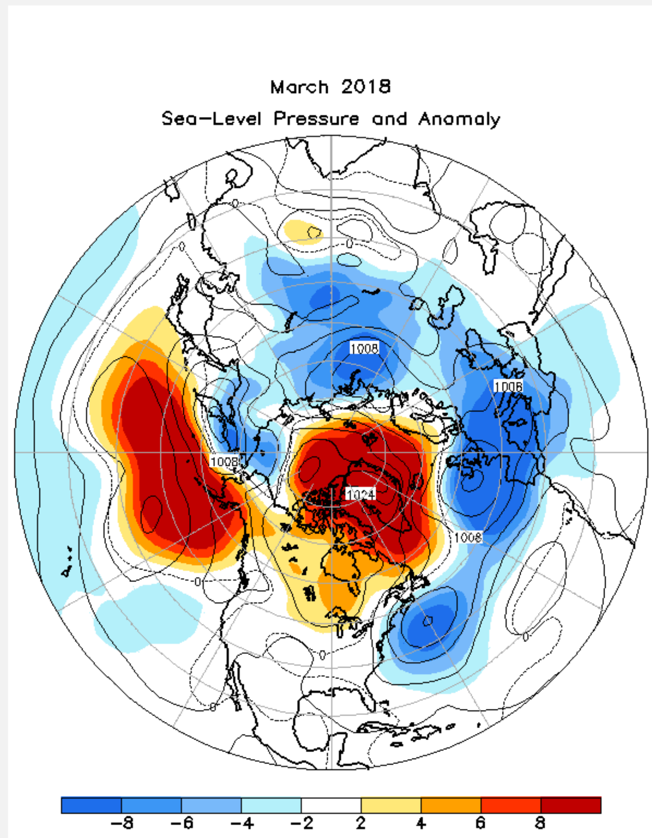


Figure 6. A 25-km ASCAT (METOP-A) image of satellite-sensed winds around the cyclone shown in the second part of Figure 5. The valid time of the pass containing the strongest wind retrievals is 1159 UTC May 30, 2017, or approximately the valid time of the second part of Figure 5. Image is courtesy of NOAA/ NESDIS/Center for Satellite Application and Research.

Numerous (227) severe-weather reports were noted in March, which is near the median monthly frequency of 217 reports during 2000–2016. Approximately 75 percent of the monthly reports were recorded during a severe weather outbreak on March 19 and 20, with over 70 percent of these reports occurring in Alabama and Georgia. On March 19, very large hail, with diameters ranging from 7 cm (baseball sized) to more than 10 cm (softball sized), caused extensive damage and destruction to homes, businesses, and vehicles across Cullman County, Alabama. In the community of Walter, an exceptionally large hailstone was found that measured 13.7 cm in diameter, with a circumference of 34.9 cm and a weight of 277.8 grams. (This is officially the largest hailstone on record for Alabama.) Prior to this storm, the largest hailstone recorded in Alabama was 11.4 cm in diameter (grapefruit sized). On this same day, a short-lived EF-2

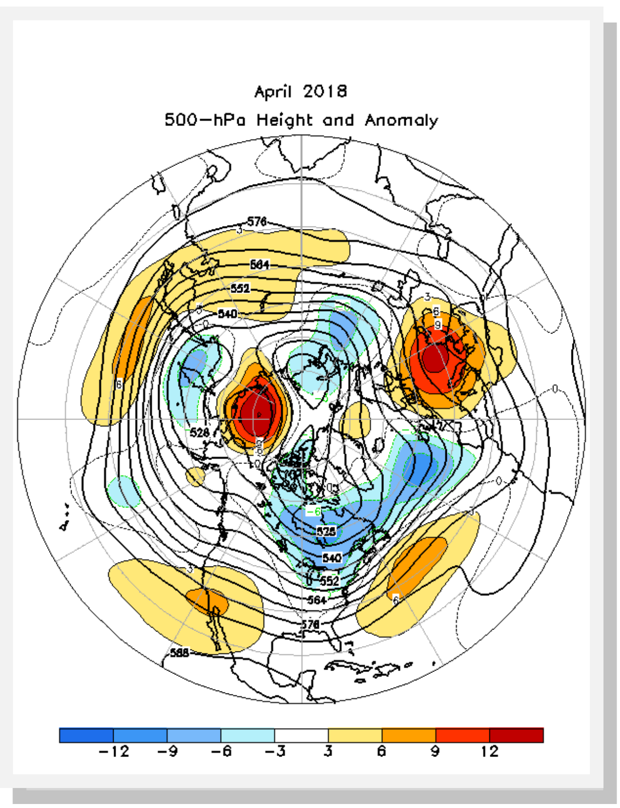
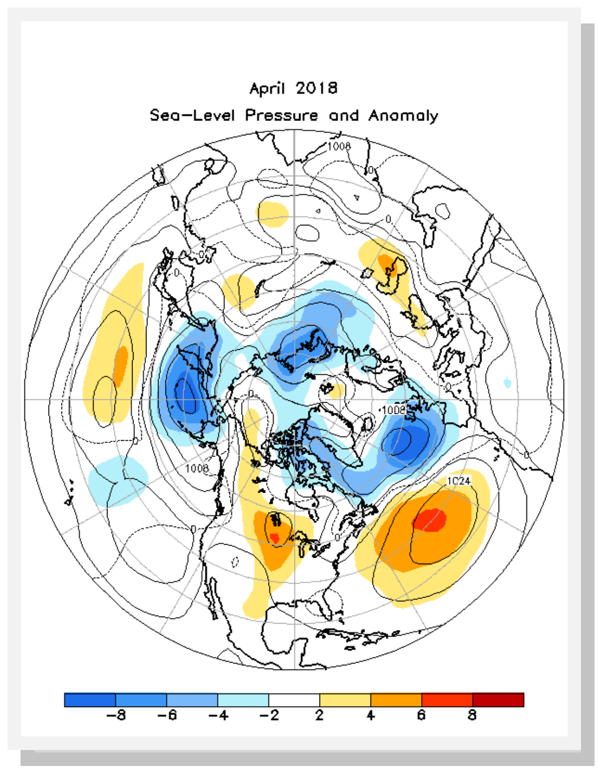


Figure 7. Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from the 1981–2010



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Buoy Measurements of Wind-Wave Relation during Hurricane Maria in 2017

Professor S. A. Hsu, Louisiana State University

Abstract: In September 2017 during Hurricane Maria, the National Data Buoy Center (NDBC) Buoy Station 41047, located on the right side of the storm's track, recorded a total of 62 hours of continuous wind seas with the wind speed at 4 m measured up to 27 m s $^{-1}$, wind gust up to 38 m s $^{-1}$, and significant wave height, H_s over 12 m. Using two independent analytical methods, it is found that $H_s = 0.4U_{10} - 1$. Here U_{10} is the wind speed at 10 m in m s $^{-1}$. Since the correlation coefficient was 0.93, this simple formula is useful for practical applications during hurricanes.

In September 2017, from 0740 UTC on 23rd–2040 UTC on 25th, the NDBC Buoy Station 41047 recorded continuously the wind seas induced by Hurricane Maria. For station location and datasets employed, see https://www.ndbc.noaa.gov/view_text_file.php?filename=41047h2017.txt.gz&dir=data/historical/stdmet/; and for a description and the track of Hurricane Maria, see https://www.nhc.noaa.gov/data/tcr/AL152017_Maria.pdf. (Note that the data buoy was located on the right side of storm's track.)

According to Hsu et al. (2017), the criteria for the wind seas when the effects of swell are minimized are as follows:

$$U_{10} \geq 9 \text{ m s}^{-1}, \quad (1)$$

$$H_s/L_p \geq 0.020, \quad (2)$$

$$L_p = (g/2\pi)\, T_p^2 = 1.56 T_p^2 . \quad (3)$$

Here, U_{10} is the wind speed at 10 m in meters per second, H_s is the significant wave height in meters, L_p is the peak or dominant wave length in meters, g is the gravitational acceleration (= 9.8 m s $^{-2}$), and T_p is the peak or dominant wave period in seconds. Note that the parameter H_s/L_p is called "wave steepness."

Because the wind speed at 10 m, U_{10}, is the reference or standard height for use at sea, one needs to adjust the wind speed from measurements at 4 m, U_4 to U_{10}. This is performed as follows: according to Hsu (2003),

$$U_{10} = U_4\,(10/4)^a \ , \quad (4)$$

$$a = 0.5\,(G - 1), \quad (5)$$

As shown in **Figure 1**, the gust factor $G = U_{gust}/\ U_4$ = 1.32 with a correlation coefficient R = 0.99, so a = 0.16 and

$$U_{10} = 1.16 U_4, \quad (6)$$

Here U_{gust} is the wind gust as measured at Buoy 41047.

Analysis of the relation between atmospheric pressure, *p*, and significant wave height, H_s, is presented in **Figure 2**, indicating that they are linearly, but negatively, related. Similar relation between p and U_{10} is also valid as shown in **Figure 3**. Therefore, it is postulated that H_s and U_{10} is linearly and positively related such that

$$H_s = b\ U_{10} + c, \quad (7)$$

Here coefficients "b" and "c" need to be determined from buoy measurements.

Analytically, the dimensionless wave height, gH_s/U_{10}^2, and wave period, gT_p/U_{10}, are often related according to a power law (Hsu et al., 2017) that

$$gH_s/U_{10}^2 = A\ (gT_p/U_{10})^B, \quad (8)$$

Here coefficients "A" and "B" need to be determined from buoy measurements.

An evaluation of Equation (8) is provided in **Figure 4**, indicating that

$$gH_s/U_{10}^2 = 0.030\ (gT_p/U_{10})^{1.0}, \quad (9)$$

So that, as shown in **Figure 5**,

$$U_{10} = 32\ H_s/T_p\ , \quad (10)$$

However, H_s/T_p is also relate linearly to H_s as indicated in **Figure 6**, that

$$H_s/T_p = 0.0689 H_s + 0.123, \quad (11)$$

Now, by substituting H_s/T_p from Equations (11) into (10) and rearranging, one gets the same generic formula as presented in Equation (7).

A validation for Equation (7) is presented in **Figure 7** that

$$H_s = 0.4\ U_{10} - 1. \quad (12)$$

With a high correlation coefficient, R = 0.93.

Therefore, on the basis of aforementioned two independent analyses, it is concluded that Equation (12) is useful for rapid estimation of H_s from U_{10} or vice versa during hurricanes at sea.

Acknowledgments: Appreciation goes to the NDBC for proving the datasets used in this analysis.

References:

Hsu, S. A., 2003, Estimating overwater friction velocity and exponent of power-law wind profile from gust factor during storms, *Journal of Waterway, Port, Coastal and Ocean Engineering*, 129(4), 174–177.

Hsu, S. A., He, Y., and Shen H., 2017, Buoy measurements of wind-wave relations during Hurricane Matthew in 2016, *Journal of Physical Oceanography*, 47, 2603–2609.

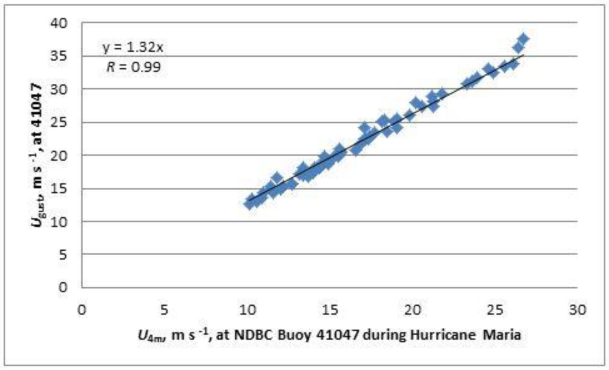


Figure 1. The Gust Factor over NDBC Buoy 41047 during the Passage of Hurricane Maria.

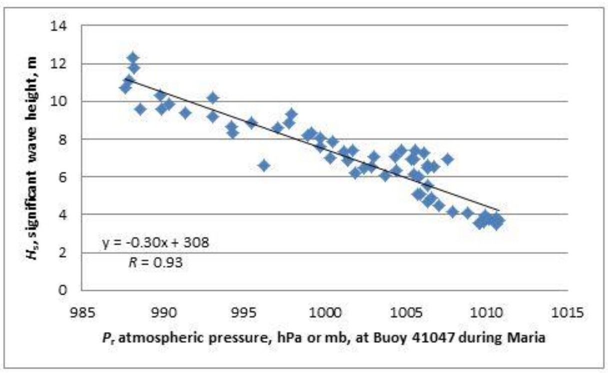


Figure 2. Relation between Significant Wave Height and Atmospheric Pressure during Maria.

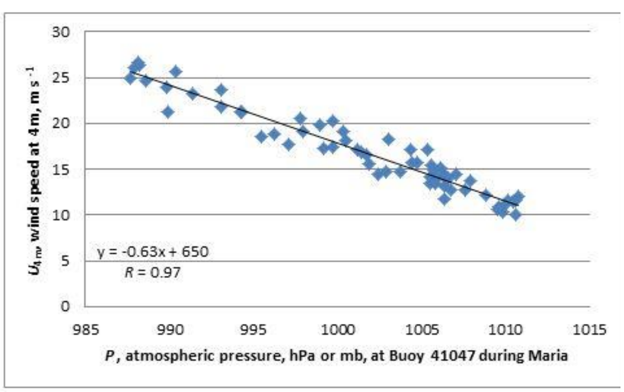


Figure 3. Relation between Wind Speed at 4 m and Atmosphere Pressure during Maria.

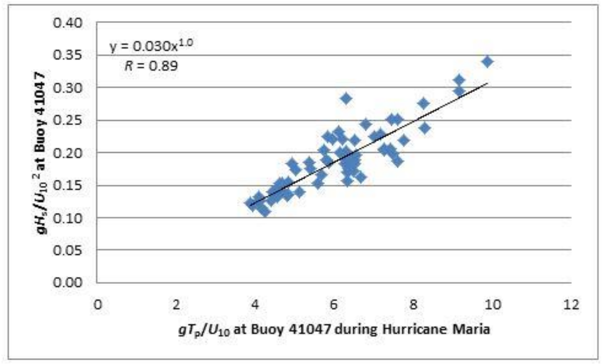


Figure 4. Relation between Dimensionless Wave Height and Dimensionless Wave Period at 41047 during Maria.

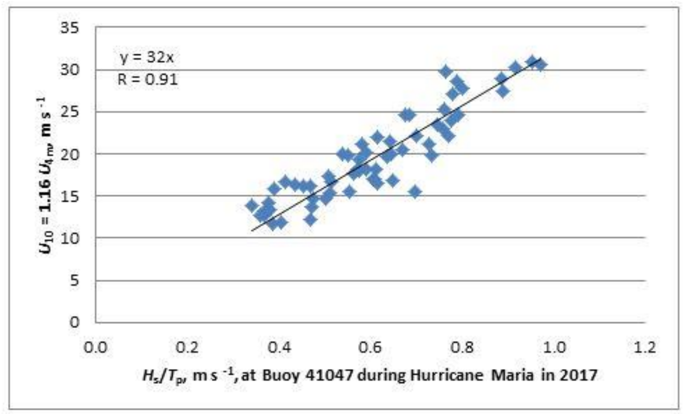


Figure 5. Relation between U_{10} and H_s/T_p at 41047 during Maria.

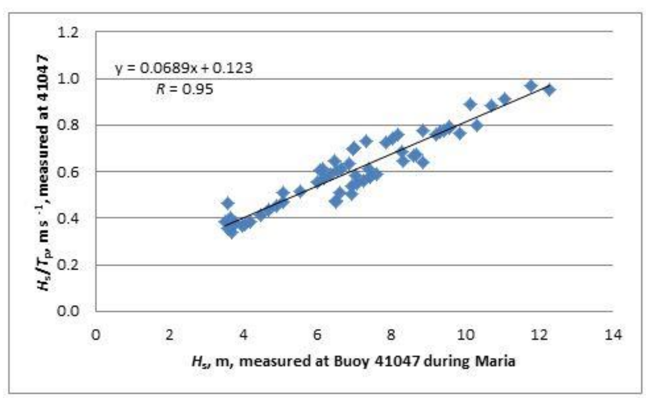


Figure 6. Relation between H_s and H_s/T_p at 41047 during Maria.

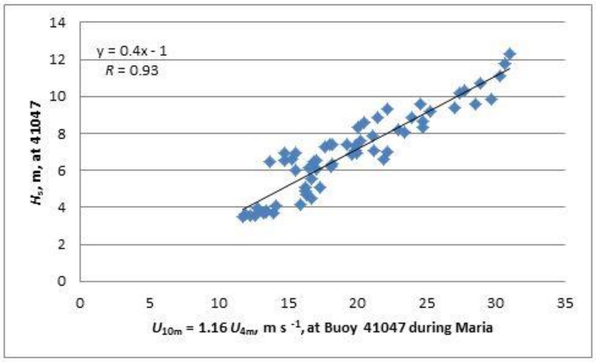
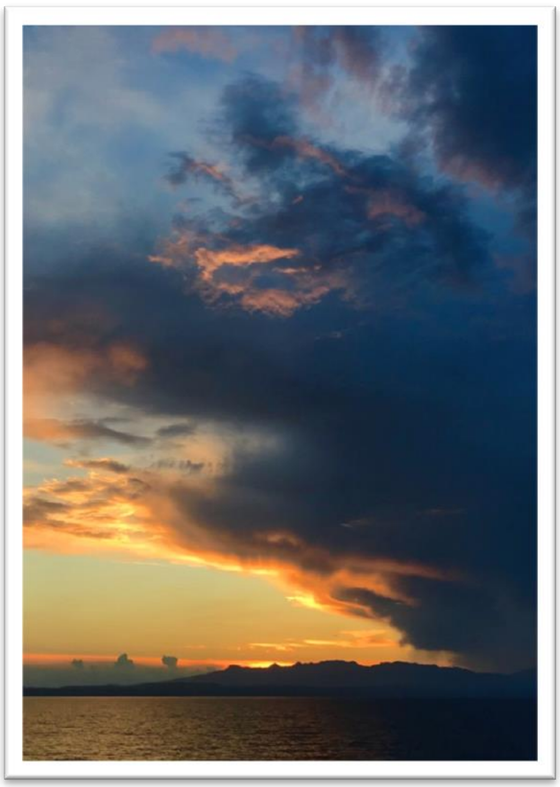
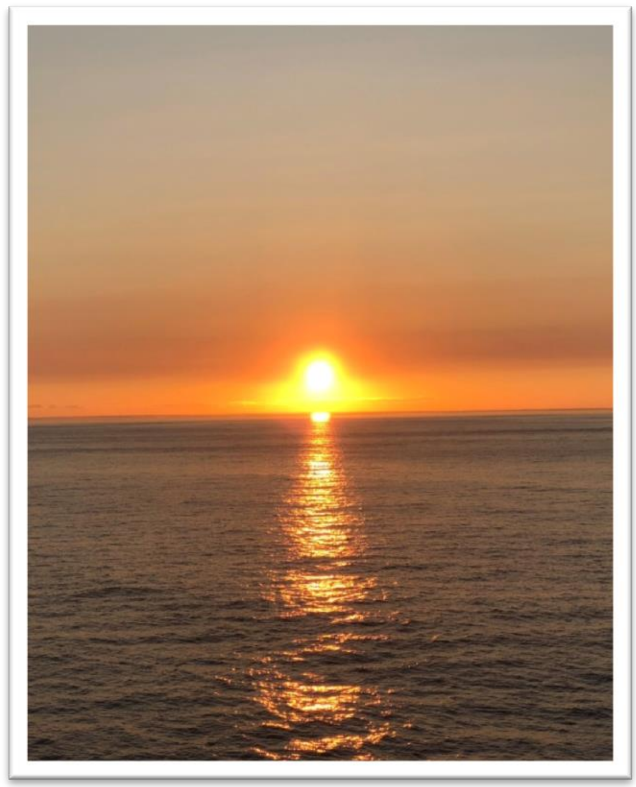


Figure 7. Relation between Significant Wave Height and the Wind Speed at 10 m during Maria.



Rusty Albaral: Taken on Maine Maritime Sea Term Departing Trip



Rob Niemeyer: Taken on Maine Maritime Sea Term Return Trip

VOS Program
Cooperative Ship Report:
January 1, 2018, through July 31, 2018

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
ALASKA MARINER	WSM5364	Anchorage	2	0	0	1	45	30	30	108
ALASKA TITAN	WDE4789	Anchorage	13	17	12	16	6	21	3	88
ALASKAN EXPLORER	WDB9918	Anchorage	0	0	34	50	88	0	20	192
ALASKAN FRONTIER	WDB7815	Anchorage	0	25	30	17	14	0	0	86
ALASKAN GYRE	WZ3376	Anchorage	0	0	0	0	0	0	18	18
ALASKAN LEGEND	WDD2074	Anchorage	205	123	50	8	0	0	20	406
ALASKAN NAVIGATOR	WDC6644	Anchorage	92	80	35	74	60	53	30	424
ALBANY SOUND	VRXM4	Anchorage	18	9	15	6	8	10	5	71
ALERT	WCZ7335	Anchorage	0	0	1	0	0	0	0	1
ALGOMA COMPASS	WCY9870	Duluth	0	0	0	0	0	9	2	11
ALASKA MARINER	WSM5364	Anchorage	2	0	0	1	45	30	30	108
ALGOMA DISCOVERY	CFK9796	Duluth	0	0	0	0	8	2	6	16
ALGOMA GUARDIAN	CFK9698	Duluth	0	0	0	2	15	12	7	36
ALGOMA MARINER	CFN5517	Duluth	14	8	1	0	0	0	0	23
ALGOMA SPIRIT	CFN4309	Duluth	0	0	0	15	11	28	1	55
ALLIANCE FAIRFAX	WLMQ	Jacksonville	2	0	49	47	76	31	34	239
ALLIANCE NORFOLK	WGAH	Jacksonville	53	0	0	26	27	17	37	160
ALLIANCE ST LOUIS	WGAE	Charleston	18	1	1	18	3	36	48	125
ALLURE OF THE SEAS	C6XS8	Miami	12	16	19	27	25	27	21	147
ALPENA	WAV4647	Duluth	0	0	2	16	1	1	14	34
AM ANNABA	V7BY3	Anchorage	1	0	17	300	14	55	2	389
AM BUCHANAN	V7AT9	Anchorage	0	0	0	0	0	0	4	4
AM GHENT	A8ZA8	Anchorage	0	0	0	0	0	0	20	20
AM HAMBURG	V7ZZ5	Anchorage	318	484	402	549	243	133	201	2330
AM QUEBEC	V7AE7	Anchorage	0	0	89	183	94	117	97	580
AM ZENICA	V7FJ8	Anchorage	0	0	6	0	0	0	0	6
AMERICAN CENTURY	WDD2876	Duluth	151	0	72	221	137	110	57	748
AMERICAN ENDURANCE	KAED	Anchorage	1	0	0	0	4	1	1	7
AMERICAN FREEDOM	KAFK	Anchorage	0	0	6	3	9	8	7	33
AMERICAN INTEGRITY	WDD2875	Duluth	0	0	0	0	5	4	61	70
AMERICAN MARINER	WQZ7791	Duluth	4	0	0	2	10	21	20	57
AMERICAN SPIRIT	WCX2417	Duluth	2	0	0	11	13	9	7	42
AMERICAS SPIRIT	C6FW2	Anchorage	40	36	17	0	0	0	0	93
AMSTEL OSPREY	3FRX8	Anchorage	6	24	9	14	0	0	0	53
AMSTEL STORK	3FOP7	Anchorage	0	12	0	10	1	0	0	23
AMSTERDAM	PBAD	Anchorage	111	168	142	98	117	204	100	940
ANDROMEDA VOYAGER	C6FZ6	Anchorage	17	13	3	5	0	16	6	60
ANSAC MOON BEAR	3FKS5	Anchorage	8	23	5	22				100

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
ANTARES VOYAGER	C6ZJ5	Anchorage	10	2	51	54	20	8	0	145
ANTHEM OF THE SEAS	C6BI7	New York City	0	0	0	34	41	42	35	152
ANTWERPEN	VRBK6	Anchorage	0	0	0	0	8	1	13	22
APL BARCELONA	9V9402	Anchorage	6	6	9	6	6	5	10	48
APL BELGIUM	WDG8555	Los Angeles	57	24	4	9	8	14	50	166
APL CHINA	WDB3161	Los Angeles	39	109	81	108	85	54	36	512
APL CHONGQUING	9V9373	Anchorage	69	15	18	32	47	13	1	195
APL COLUMBUS	9V9920	New York City	0	0	0	2	3	18	5	28
APL DANUBE	9HA3553	Anchorage	0	0	17	39	0	81	67	204
APL DETROIT	9V9925	Anchorage	0	0	18	55	17	29	31	150
APL DUBLIN	9V9404	Anchorage	0	0	0	2	6	10	9	27
APL ENGLAND	9VDD2	Anchorage	0	21	4	0	0	0	0	25
APL ESPLANADE	S6LT4	Los Angeles	27	18	24	38	31	27	35	200
APL FULLERTON	S6NQ	Anchorage	20	14	13	18	12	18	13	108
APL GUAM	WAPU	Anchorage	14	13	17	29	35	32	35	175
APL HOLLAND	9VKQ2	Charleston	15	14	0	3	14	29	22	97
APL HOUSTON	9V9921	Los Angeles	10	0	0	0	0	0	0	10
APL KOREA	WCX8883	Los Angeles	41	45	34	42	157	208	236	763
APL LE HAVRE	9V9375	Anchorage	75	28	4	49	76	111	94	437
APL LION CITY	S6LT6	Anchorage	4	0	0	0	0	6	115	125
APL MEXICO CITY	9V9926	Norfolk	0	0	0	23	0	47	16	86
APL NEW YORK	9V9916	Anchorage	10	7	4	14	0	0	0	35
APL PARIS	9V9403	Anchorage	0	8	5	32	53	76	86	260
APL PHILIPPINES	WCX8884	Los Angeles	26	20	53	28	44	54	8	233
APL PHOENIX	9V9918	Los Angeles	49	8	28	0	1	0	0	86
APL QINGDAO	9V9376	Anchorage	7	5	10	3	34	66	94	219
APL SAIPAN	WDJ2573	Anchorage	105	50	61	64	72	113	98	563
APL SANTIAGO	9V9924	Charleston	0	0	0	0	0	3	24	27
APL SCOTLAND	9VDD3	Anchorage	0	0	0	0	2	102	11	115
APL SENTOSA	S6LT5	Anchorage	12	23	23	21	57	39	86	261
APL SINGAPORE	WCX8812	Los Angeles	1	0	4	7	13	20	14	59
APL SINGAPURA	S6LT3	Anchorage	0	0	0	0	1	19	22	42
APL SOUTHAMPTON	9V9399	Anchorage	0	2	1	8	3	9	7	30
APL TEMASEK	S6LT9	Anchorage	0	0	5	13	32	0	0	50
APL THAILAND	WCX8882	Los Angeles	34	31	44	26	20	42	59	256
APL VANCOUVER	9V9915	Anchorage	0	0	0	0	0	53	17	70
APL YANGSHAN	9V9401	Anchorage	0	0	4	8	0	57	76	145
AQUARIUS VOYAGER	C6UC3	Jacksonville	74	77	47	37	63	63	37	398
		Anchorage	0	0	0	0	19	4	0	23

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
ARCTIC TITAN	WDG2803	Anchorage	5	12	13	17	9	21	11	88
ARCTURUS VOYAGER	C6YA7	Anchorage	69	58	41	39	33	34	36	310
ARI CRUZ	WDG9588	Anchorage	0	0	0	0	1	20	37	58
ARIES VOYAGER	C6UK7	Anchorage	9	2	18	0	0	0	15	44
ARNOLD MAERSK	OXES2	New Orleans	68	48	18	0	0	0	0	134
ASIA ENDEAVOUR	C6AX6	Anchorage	144	58	20	30	306	253	205	1016
ASIA ENERGY	C6AX4	Anchorage	20	42	50	33	53	53	33	284
ASIA EXCELLENCE	C6AX5	Anchorage	79	76	80	71	57	22	66	451
ASIA INTEGRITY	C6BC8	Anchorage	93	72	32	69	59	69	117	511
ASIA VENTURE	C6BC9	Anchorage	112	96	84	28	30	34	32	416
ASIA VISION	C6AX3	Anchorage	34	28	34	46	69	176	136	523
ASTORIA BAY	VRKB6	Anchorage	7	5	3	11	5	10	7	48
ATLANTIC BRAVE	D5LQ8	New Orleans	56	21	0	46	4	0	56	183
ATLANTIC EXPLORER (AWS)	WDC9417	Anchorage	0	0	78	0	0	0	0	78
ATLANTIC GEMINI	VRDO9	Anchorage	34	41	50	35	2	0	0	162
ATLANTIC HURON	VCQN	Duluth	1	0	1	2	0	0	3	7
ATLANTIC OLIVE	VREF8	Anchorage	10	9	9	8	4	23	8	71
ATLANTIS (AWS)	KAQP	Anchorage	715	669	740	702	739	716	728	5009
ATTENTIVE	WCZ7337	Anchorage	1	0	4	3	0	0	2	10
AURORA	WYM9567	Anchorage	9	2	0	67	149	85	102	414
AVIK	WDB7888	Anchorage	0	0	0	0	7	27	44	78
AVONBORG	PCOF	New Orleans	0	0	0	10	50	15	0	75
AWARE	WCZ7336	Anchorage	1	0	1	0	0	0	2	4
AYESHA	V7LC9	Baltimore	0	0	0	0	0	0	0	0
AZAMARA JOURNEY	9HOB8	Anchorage	35	5	2	5	4	3	21	75
AZAMARA QUEST	9HOM8	Anchorage	0	0	23	66	34	25	20	168
AZUL LIBERO	9VMU5	Anchorage	29	22	21	20	23	22	21	158
BADGER	WBD4889	Duluth	0	0	0	0	18	40	60	118
BAI CHAY BRIDGE	3FAD8	Anchorage	56	150	116	92	145	149	121	829
BAIE COMEAU	CFN6357	Duluth	0	0	1	2	2	8	1	14
BAKER RIVER	VRMV3	Anchorage	16	17	16	15	31	16	54	165
BAKER SPIRIT	C6BQ4	Anchorage	33	57	23	17	20	9	8	167
BALTIC BEAR	V7QN4	Anchorage	0	0	0	14	16	24	18	72
BALTIC WASP	V7HZ4	Anchorage	7	4	9	1	0	0	0	21
BARCELONA EXPRESS	VRLX6	Anchorage	0	0	0	0	0	27	16	43
BARRINGTON ISLAND	C6QK	Miami	6	0	12	1	0	0	0	19
BARROW ISLAND	VRMK7	Anchorage	7	4	0	0	0	0	0	11
BASS STRAIT	VRBR6	Anchorage	0	0	0	20	5	10		
BERGE NANTONG	VRBU6	Anchorage	362	38	12	0	0	0	0	412
BERGE NINGBO	VRBQ2	Anchorage	0	0	20	2	0	2	11	35
BERING TITAN	WDI6469	Anchorage	18	17	37	15	35	17	16	155

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
BERLIN BRIDGE	VRIM5	Norfolk	27	18	5	11	9	3	37	110
BILBAO BRIDGE	VRHY6	New York City	0	0	0	0	19	42	19	80
BLACK FOREST	VRZA8	Anchorage	8	0	0	0	0	9	20	37
BLACKHAWK	WDG2439	Anchorage	0	0	0	3	1	0	0	4
BLUEFIN	WDC7379	Seattle	21	83	63	69	79	48	84	447
BOB FRANCO	WDG8180	Anchorage	35	31	18	20	1	0	9	114
BOCHEM LONDON	VRQF6	Anchorage	0	3	3	0	8	1	6	21
BONNY ISLAND	VRMC7	Anchorage	0	0	0	11	9	0	0	20
BRAZOS	V7UU4	Anchorage	115	316	97	98	88	137	113	964
BRENTON REEF	KREQ	New Orleans	23	5	14	4	18	5	8	77
BRILLIANCE OF THE SEAS	C6SJ5	Miami	40	41	54	32	28	91	54	340
BROTONNE BRIDGE	VRHO2	New York City	42	27	18	26	24	20	26	183
BTS SABINA	9V5722	Anchorage	22	23	9	2	5	10	3	74
BUDAPEST BRIDGE	VRIZ5	New York City	0	0	32	40	62	58	14	206
BURNS HARBOR	WDC6027	Duluth	14	0	0	13	35	26	35	123
CAFER DEDE	V7PR8	New York City	0	13	1	0	0	0	0	14
CALIFORNIA	KEBO	Anchorage	7	19	20	0	0	1	20	67
CALUMET	WDE3568	Duluth	2	0	16	15	36	22	36	127
CAPE AZALEA	9V9450	Anchorage	2	26	0	0	0	0	0	28
CAPE LILY	9V8843	Anchorage	30	32	19	29	21	23	22	176
CAPE MORETON	VRGG6	Anchorage	8	29	13	14	13	19	15	111
CAPE NELSON	VRWZ5	Anchorage	13	15	35	4	0	0	0	67
CAPRICORN VOYAGER	C6UZ5	Anchorage	53	31	22	40	30	31	36	243
CAPT. HENRY JACKMAN	VCTV	Duluth	0	0	0	4	0	0	0	4
CARNIVAL BREEZE	3FZO8	Houston	3	0	1	114	93	86	92	389
CARNIVAL CONQUEST	3FPQ9	Miami	49	60	46	17	21	18	43	254
CARNIVAL DREAM	3ETA7	New Orleans	51	22	92	146	114	39	9	473
CARNIVAL ECSTASY	H3GR	Miami	87	74	62	43	48	55	54	423
CARNIVAL ELATION	3FOC5	Jacksonville	70	100	133	102	27	5	35	472
CARNIVAL FANTASY	H3GS	New Orleans	3	70	69	25	78	64	125	434
CARNIVAL FASCINATION	C6FM9	Jacksonville	0	0	112	101	92	15	18	338
CARNIVAL FREEDOM	3EBL5	Houston	3	3	28	100	84	52	7	277
CARNIVAL GLORY	3FPS9	Miami	2	74	77	28	46	34	73	334
CARNIVAL HORIZON	H3WI	Anchorage	0	0	0	13	9	9	38	69
CARNIVAL IMAGINATION	C6FN2	Los Angeles	79	65	87	63	44	13	46	397
CARNIVAL INSPIRATION	C6FM5	Los Angeles	7	9	9	23	55	27	20	150
CARNIVAL LEGEND	9HA3667	Miami	162	201	257	316	67	135	119	1257
CARNIVAL LIBERTY	HPYE	Jacksonville	34	15	58	24	22	59	64	276

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
CARNIVAL MAGIC	3ETA8	Jacksonville	101	45	14	138	111	115	89	613
CARNIVAL MIRACLE	H3VS	Miami	5	18	27	154	112	43	36	395
CARNIVAL PARADISE	3FOB5	Miami	80	40	1	35	8	21	32	217
CARNIVAL PRIDE	H3VU	Baltimore	10	3	10	17	56	103	55	254
CARNIVAL SENSATION	C6FM8	Miami	54	18	19	42	6	1	0	140
CARNIVAL SPLENDOR	3EUS	Anchorage	0	0	2	58	64	38	54	216
CARNIVAL SUNSHINE	C6FN4	Jacksonville	30	14	11	63	25	4	6	153
CARNIVAL TRIUMPH	C6FN5	New Orleans	66	39	41	47	28	23	9	253
CARNIVAL VALOR	H3VR	Houston	15	9	2	0	1	0	0	27
CARNIVAL VICTORY	3FFL8	Miami	34	63	40	32	28	8	14	219
CARNIVAL VISTA	3EMB9	Miami	76	66	59	46	46	29	18	340
CAROLINE MAERSK	OZWA2	Seattle	93	56	68	0	20	75	41	353
CASCADE SPIRIT	C6BQ5	Anchorage	4	0	0	0	0	2	8	14
CASON J. CALLAWAY	WDH7556	Duluth	30	0	25	61	34	34	43	227
CASTOR VOYAGER	C6UZ6	Anchorage	0	0	16	0	3	20	18	57
CAVEK	WDF7988	Anchorage	0	0	0	0	5	5	1	11
CEDARGLEN	VCLN		0	0	0	4	0	0	0	4
CELEBRITY CONSTELLATION	9HJB9	Miami	34	10	0	101	23	0	0	168
CELEBRITY ECLIPSE	9HXC9	Miami	270	296	434	423	318	189	191	2121
CELEBRITY EQUINOX	9HXD9	Miami	346	247	267	155	224	164	159	1562
CELEBRITY INFINITY	9HJD9	Miami	257	56	21	69	199	271	243	1116
CELEBRITY MILLENNIUM	9HJF9	Anchorage	142	118	110	103	103	87	106	769
CELEBRITY REFLECTION	9HA3047	Miami	135	166	183	169	180	169	171	1173
CELEBRITY SILHOUETTE	9HA2583	Miami	145	123	154	148	151	124	91	936
CELEBRITY SOLSTICE	9HRJ9	Miami	297	142	143	223	172	403	361	1741
CELEBRITY SUMMIT	9HJC9	Miami	105	29	88	118	112	91	116	659
CHALLENGE POLLUX	9V5639	Anchorage	0	0	0	0	0	0	89	89
CHALLENGE PROCYON	3EXV7	Anchorage	11	16	4	0	0	5	7	43
CHAMPION BAY	VRYP3	Anchorage	99	1	0	20	0	43	22	185
CHARLES ISLAND	C6JT	Miami	0	0	21	30	7	0	0	58
CHARLESTON EXPRESS	WDD6126	Houston	18	4	24	53	107	95	61	362
CHILEAN REEFER	C6UM2	Anchorage	0	0	0	2	16	7	25	50
CHILOE ISLAND	VRMO4	Anchorage	0	0	7	2	0	0	0	9
CHILTERN	V7PW8	Anchorage	0	0	0	11	86	100	86	283
CHINOOK	WCY2791	Anchorage	0	0	0	2	5	1	0	8
CHUKCHI SEA	WDE2281	Anchorage	1	1	2	4	4	18	4	34
CISNES	D5HF4	Anchorage	0	39	50	21	2	19	37	168
CLYDE S. VANENKEVORT	WDJ4194	Duluth	0	0	1	5	2	13	2	23

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
CMA CGM J. ADAMS	MAZS6	New York City	133	65	162	127	139	145	146	917
CMA CGM T. ROOSEVELT	MAZS3	New York City	0	0	0	5	95	27	71	198
CMA CGM TUTICORIN	VRNY5	Anchorage	33	5	0	13	32	30	2	115
CMA CGM UTRILLO	5BAA2	Anchorage	0	0	0	0	26	18	0	44
CMB GIULIA	VRJQ4	New Orleans	0	1	0	1	0	0	0	2
CMB PAUILLAC	VROS3	Anchorage	0	0	0	0	5	25	15	45
CMB PAULE	VRJF3	New Orleans	5	1	3	9	7	0	0	25
CMB WEIHAI	V7NG2	Anchorage	105	69	82	91	307	428	615	1697
CMB YASMINE	VRIC4	Anchorage	12	0	4	0	0	0	0	16
COASTAL NAVIGATOR	WCY9686	Anchorage	0	8	8	9	15	6	7	53
COASTAL NOMAD	WDC6439	Anchorage	7	0	6	0	0	5	8	26
COASTAL PROGRESS	WDC6363	Anchorage	7	5	16	4	7	10	11	60
COASTAL STANDARD	WDI5038	Anchorage	9	11	19	6	6	19	17	87
COASTAL TRADER	WSL8560	Anchorage	9	5	1	6	5	0	2	28
COASTAL VENTURE	WDF3647	Charleston	0	0	0	0	0	0	0	0
COLORADO	V7UU7	Anchorage	0	0	13	0	4	0	0	17
COLUMBIA RIVER	VRNB4	New Orleans	0	12	5	13	14	0	0	44
COLUMBINE MAERSK	OUHC2	Norfolk	2	9	0	0	0	0	0	11
COMMITMENT	WDE3894	Anchorage	0	0	0	0	0	1	16	17
COOK STRAIT	VRAE5	Anchorage	0	0	0	0	10	9	2	21
COOPER ISLAND	VRRD6	Anchorage	0	13	2	50	14	51	23	153
CORCOVADO	D5HF3	Anchorage	22	27	0	0	17	75	107	248
CORIO BAY	VRBU9	Anchorage	0	0	0	0	4	17	10	31
CORNELIA MAERSK	OWWS2	New York City	3	1	3	0	0	0	0	7
CORWITH CRAMER	WTF3319	Anchorage	0	0	0	0	24	0	0	24
COSCO DEVELOPMENT	VRIZ9	New York City	65	78	77	170	154	191	172	907
COSCO EXCELLENCE	VRJT8	Anchorage	0	0	0	56	54	65	70	245
COSCO FAITH	VRJL6	New York City	2	11	32	38	13	65	73	234
COSCO FORTUNE	VRKE9	Anchorage	1	0	53	145	32	12	2	245
COSCO GLORY	VRIR7	New York City	19	33	25	61	40	63	34	275
COOPER ISLAND	VRRD6	Anchorage	0	13	2	50	14	51	23	153
COSCO HARMONY	VRJA4	Anchorage	0	3	0	0	0	0	123	126
COSCO HOPE	VRKF2	Anchorage	0	14	5	0	23	40	76	158
COSCO INDONESIA	VRHE3	New York City	1	11	14	33	59	36	84	238
COSCO JAPAN	VRFX5	New York City	19	8	0	0	4	0	0	31
COSCO KOREA	VRGH3	New York City	9	19	34	17	18	11	20	128
COSCO MALAYSIA	VRGV9	New York City	25	25	50	14	57	152	302	625
COSCO PHILIPPINES	VRGM7	New York City	57	27	18	13	19	12	0	146

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
			0	0	0	0	0	7	57	64
COSCO PRINCE RUPERT	VRID6	New York City	0	30	61	21	29	33	65	239
COSCO THAILAND	VRHM2	Anchorage	4	13	56	32	33	33	20	191
COSCO VIETNAM	VRID5	New York City	43	32	37	60	54	57	32	315
COSTA DELIZIOSA	IBJD	Anchorage	0	0	0	0	107	137	60	304
COSTA DIADEMA	IBCX	Anchorage	31	23	10	0	82	55	39	240
COSTA FORTUNA	IBNY	Miami	106	48	73	93	63	15	132	530
COSTA NEOCLASSICA	ICIC	Anchorage	17	58	72	11	0	0	0	158
COSTA PACIFICA	ICJA	Anchorage	0	0	129	128	36	0	0	293
COSTA SERENA	ICAZ	Anchorage	2	33	13	16	83	12	67	226
COYHAIQUE	D5HF5	Anchorage	0	11	1	3	12	1	15	43
CROSS POINT	WDA3423	Anchorage	0	0	0	1	2	0	1	4
CROWNED EAGLE	V7QP4	Anchorage	0	0	0	0	0	0	14	14
CRYSTAL MARINE	9VIC4	Anchorage	0	9	47	60	22	1	19	158
CRYSTAL SERENITY	C6SY3	Anchorage	105	127	105	85	141	131	173	867
CRYSTAL SUNRISE	9V2024	Anchorage	18	10	8	0	0	0	0	36
CRYSTAL SYMPHONY	C6MY5	Anchorage	0	0	0	0	0	15	71	86
CS GLOBAL SENTINEL	KGSU	Baltimore	63	49	42	0	45	5	0	204
CSCL AFRICA	VRBI3	New York City	69	39	6	21	22	14	11	182
CSCL ASIA	VRAB8	Anchorage	7	18	13	9	17	13	6	83
COYHAIQUE	D5HF5	Anchorage	0	11	1	3	12	1	15	43
CSCL BRISBANE	VRBJ9	Anchorage	29	3	0	0	0	1	64	97
CSCL CALLAO	VRFB4	Anchorage	4	7	0	0	0	0	0	11
CSCL LONG BEACH	VRCZ7	Anchorage	12	16	0	0	16	20	11	75
CSCL MELBOURNE	VRBI8	Anchorage	0	0	0	0	9	34	17	60
CSCL NEW YORK	VRBH7	Anchorage	0	0	0	0	9	6	3	18
CSCL SYDNEY	VRBH9	Norfolk	0	0	0	0	5	82	67	154
CSCL ZEEBRUGGE	VRCS2	Anchorage	0	0	0	0	0	11	22	33
CSL ASSINIBOINE	VCKQ	Duluth	0	0	0	0	17	82	103	202
CSL LAURENTIEN	VCJW	Duluth	2	0	0	3	18	8	9	40
CSL NIAGARA	VCGJ	Duluth	16	0	3	20	9	24	25	97
CSL ST-LAURENT	CFK5152	Duluth	0	0	0	0	3	5	9	17
DANA CRUZ	WDF4762	Anchorage	0	0	0	0	5	14	10	29
DARLING RIVER	DARI	Anchorage	0	0	0	0	3	16	10	29
DARYA DEVI	VRLG6	Anchorage	0	0	0	0	0	0	5	5
DARYA LOK	VRKQ7	Anchorage	28	52	69	3	0	0	0	152
DARYA SATI	VRQO5	Anchorage	0	0	0	9	25	0	21	55
DELTA MARINER	WCZ7837		0	0	0	0	0	0	9	9

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
	V7DI6	Baltimore	34	31	2	1	1	36	49	154
DESERT ORCHID	9V3865	Anchorage	0	0	0	0	17	41	9	67
DETROIT EXPRESS	VRLX4	Anchorage	0	0	0	52	51	40	64	207
DIAMOND HARBOUR	VREI6	Anchorage	0	0	0	0	0	4	8	12
DIANE H	WUR7250	Anchorage	0	0	0	0	0	0	2	2
DISCOVERER INSPIRATION	V7MO3	Houston	123	109	120	115	122	117	113	819
DISNEY DREAM	C6YR6	Jacksonville	43	35	71	194	114	14	15	486
DISNEY FANTASY	C6ZL6	Jacksonville	0	0	26	126	175	31	6	364
DISNEY MAGIC	C6PT7	Miami	0	26	4	14	30	1	0	75
DISNEY WONDER	C6QM8	Jacksonville	20	41	75	52	14	0	25	227
DOMINATOR	WBZ4106	Anchorage	0	0	27	35	0	42	70	174
DUNCAN ISLAND	C6JS	Miami	0	0	20	0	0	0	0	20
DUNEDIN STAR	D5FF5	Anchorage	0	0	5	0	0	0	24	29
EAGLE KUCHING	9V8132	Houston	11	0	0	0	0	0	0	11
EAGLE STAVANGER	3FNZ5	Houston	21	22	0	0	0	0	0	43
EAGLE SYDNEY	3FUU	New Orleans	10	17	9	0	0	0	10	46
EAGLE TAMPA	S6NK6	Houston	17	1	0	0	0	0	0	18
EARTH SUMMIT	9V2911	Anchorage	0	3	0	0	0	1	43	47
EASTER N	3FMO7	New Orleans	28	21	8	17	25	33	32	164
EASTERN CAPE	VRLD8	Anchorage	0	0	0	0	10	22	26	58
EDGAR B. SPEER	WDH7562	Duluth	46	0	27	130	117	109	216	645
EDWIN H. GOTT	WDH7558	Duluth	115	0	27	135	72	92	30	471
EL COQUI	WDJ4838	Jacksonville	0	0	0	0	0	0	8	8
ELCIE	WDF2656	Baltimore	5	16	7	8	0	3	0	39
ELIZABETH RIVER	VRBJ5	Anchorage	10	14	14	13	10	22	2	85
ELRINGTON	WDJ8313	Anchorage	0	0	0	0	0	0	8	8
EMERALD SPIRIT	C6BC3	Anchorage	0	0	111	28	50	0	0	189
EMERY ZIDELL	WDH7301	Anchorage	0	0	0	0	0	12	6	18
EMILIUS	9V2909	Anchorage	97	120	133	142	146	158	156	952
EMPERY	9V2907	Anchorage	24	0	0	0	0	0	0	24
EMPIRE STATE	KKFW	New York City	0	0	0	0	120	127	148	395
EMPRESS OF THE SEAS	C6CM8	Miami	0	0	74	42	13	21	22	172
ENCHANTMENT OF THE SEAS	C6FZ7	Miami	16	23	10	79	17	0	11	156
ENDEAVOR (AWS)	WCE5063	New York City	716	594	735	715	741	718	730	4949
ENDURANCE	WDE9586	Baltimore	74	61	58	54	154	87	83	571
ENDURANCE	WDF7523	Anchorage	7	0	7	2	3	0	0	19
ESPERANCE BAY	VRHM6	Anchorage	0	0	7	0	7	20	0	34
EURODAM	PHOS	Miami	108	63	99	88	59	32	40	489

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun		Total
EUROPA 2	9HA3283	Charleston	0	0	0	0	0	0	0	0
EVER DAINTY	9V7951	Baltimore	0	0	5	0	0	0	0	5
EVER DIVINE	9V7956	Norfolk	0	0	0	0	32	19	6	57
EVER EAGLE	ZNZH6	Seattle	14	11	0	14	12	4	1	56
EVER ELITE	VSJG7	Los Angeles	46	19	15	28	29	33	29	199
EVER ETHIC	VQFS4	Seattle	4	2	24	6	0	5	35	76
EVER EXCEL	VSXV3	Los Angeles	65	0	0	0	0	0	0	65
EVER LAMBENT	2FRE8	New York City	2	1	0	52	10	66	34	165
EVER LAUREL	9V9287	New York City	43	39	87	92	240	285	309	1095
EVER LAWFUL	9V9288	New York City	19	20	170	18	14	12	19	272
EVER LEADER	9V9289	New York City	12	15	35	12	29	19	49	171
EVER LEADING	2FRK8	Norfolk	78	0	0	27	56	45	55	261
EVER LEGACY	9V9290	New York City	0	9	7	6	12	1	2	37
EVER LEGEND	9V9724	New York City	15	2	0	3	17	17	14	68
EVER LEGION	9V9725	New York City	35	21	61	78	69	79	86	429
EVER LENIENT	2HDF9	Los Angeles	0	14	9	10	11	23	9	76
EVER LIBERAL	2HDG2	New York City	6	13	26	20	21	23	14	123
EVER LIBRA	BKIC	New York City	37	38	57	36	39	39	23	269
EVER LIFTING	2ILJ7	New York City	7	24	24	48	1	18	21	143
EVER LINKING	2GLI9	New York City	0	0	29	0	20	15	0	64
EVER LISSOME	2HDG3	New York City	16	35	47	42	27	0	11	178
EVER LIVELY	9V9726	Anchorage	9	9	17	14	19	17	11	96
EVER LIVEN	BKIE	New York City	41	29	56	35	193	172	175	701
EVER LOADING	2HDG4	New York City	0	0	0	0	34	37	18	89
EVER LOGIC	BKIF	New York City	4	9	35	29	22	24	45	168
EVER LOVELY	9V9793	Charleston	6	12	10	16	10	0	1	55
EVER LOYAL	BKIZ	New York City	34	15	41	60	17	83	69	319
EVER LUCKY	3FAE4	New York City	9	4	1	1	18	19	18	70
EVER LUNAR	BKKF	New York City	18	0	3	0	1	0	0	22
EVER SALUTE	3ENU5	Anchorage	3	5	2	3	7	99	37	156
EVER SHINE	MJKZ4	Anchorage	0	3	6	2	3	5	0	19
EVER SIGMA	MKKZ7	Seattle	0	0	9	0	0	0	0	9
EVER SMART	MLBD9	Anchorage	0	9	13	12	2	24	70	130
EVER SMILE	MLTH5	Anchorage	33	48	53	41	40	18	17	250
EVER STEADY	3EHT6	Anchorage	13	18	24	11	11	9	11	97
EVER SUMMIT	3EKU3	Anchorage	30	24	28	0	19	10	9	120
EVER SUPERB	3EGL5	Anchorage	13	13	22	18	25	1	0	92
EVER UNICORN	9V7963	Seattle	6	0	0	0	0	0	0	6

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr		Jun	Jul	Total
EVER UNIFIC	9V7961	Anchorage	0	0	6	0	0	0	0	6
EVER UNITED	9V7957	Seattle	7	9	13	5	8	17	0	59
EVERGREEN STATE	WDE4430	Seattle	15	28	14	0	0	0	0	57
EXCALIBUR	ONCE	Houston	0	8	21	26	39	20	8	122
EXCEL	9HA4691	Houston	0	0	0	0	0	0	0	0
EXCELLENCE	ONBG	Houston	0	0	0	21	0	0	0	21
EXCELSIOR	ONCD	Houston	39	11	0	0	0	0	0	50
EXPLORER OF THE SEAS	C6SE4	Jacksonville	51	67	56	45	8	10	12	249
EXPRESS	ONFL	Houston	54	30	28	47	35	23	3	220
FAIRCHEM FILLY	V7MS4	Anchorage	0	0	0	0	0	0	1	1
FAIRCHEM STEED	V7LF9	Anchorage	0	0	0	9	0	0	0	9
FAIRWEATHER	WDB5604	Anchorage	0	0	0	0	0	1	0	1
FEDERAL BALTIC	V7DS8	Anchorage	0	0	3	4	12	24	9	52
FEDERAL BEAUFORT	V7MF7	Anchorage	1	0	0	0	22	38	97	158
FEDERAL BRISTOL	V7NB9	Anchorage	0	0	0	0	59	36	7	102
FEDERAL CHURCHILL	V7NK3	Anchorage	8	0	1	0	0	0	0	9
FEDERAL CLYDE	V7NK4	Anchorage	0	0	0	16	16	8	10	50
FEDERAL COLUMBIA	V7NK5	Anchorage	0	0	0	0	0	50	38	88
FEDERAL DART	V7GG7	Anchorage	0	0	0	13	14	0	20	47
FEDERAL IRIS	3EXR8	Anchorage	0	0	11	9	24	15	16	75
FEDERAL KIVALINA	V7RF2	Anchorage	0	0	36	37	46	27	25	171
FEDERAL KUMANO	V7RF4	Anchorage	25	6	1	0	0	0	2	34
FEDERAL MARGAREE	V7RI7	Anchorage	11	15	1	0	0	0	0	27
FEDERAL MAYUMI	V7YF2	Anchorage	0	0	25	8	0	0	0	33
FEDERAL NAGARA	V7HU4	Anchorage	0	0	0	0	0	9	26	35
FEDERAL SABLE	V7WS4	Anchorage	0	1	25	23	15	23	49	136
FEDERAL SCHELDE	8POF	Anchorage	30	10	14	0	0	0	0	54
FEDERAL SWIFT	V7WS6	Anchorage	0	0	0	0	14	7	42	63
FEDERAL TAKASE	V7NJ9	Anchorage	29	25	25	17	10	19	15	140
FEDERAL TAMBO	V7YW3	Anchorage	0	0	0	0	9	19	22	50
FEDERAL TRIDENT	V7NJ6	Anchorage	0	0	0	0	8	3	0	11
FEDERAL TYNE	V7YW5	Anchorage	110	88	138	15	49	67	4	471
FEDERAL WELLAND	V7RG7	Anchorage	0	0	0	18	1	0	0	19
FEDERAL WESER	V7WU4	Anchorage	0	0	0	11	173	47	3	234
FEDERAL YUKINA	VRHN7	Anchorage	7	9	6	17	5	12	6	62
FISH HAWK	WDF2995	Anchorage	0	0	0	16	23	11	8	58
FLORIDA	WFAF	Houston	14	24	0	0	0	1	3	42
FLORIDA VOYAGER	WDF4764	New Orleans	40	12	25	4	42	0	0	123

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
FMG AMANDA	VRRD3	Anchorage	0	0	0	0	0	0	16	16
FMG MATILDA	VRRD2	Anchorage	0	23	20	21	12	0	0	76
FOMENTO TWO	9V5542	Anchorage	10	7	3	2	9	17	17	65
FREEDOM	WDB5483	Jacksonville	13	21	11	20	27	35	19	146
FREEDOM OF THE SEAS	C6UZ7	Miami	2	17	1	0	10	8	21	59
FRIO	V7UU3	Anchorage	0	0	0	128	111	86	73	398
FRITZI N	A8PQ4	Anchorage	8	28	39	52	44	51	137	359
FRONTIER ISLAND	VRID4	Anchorage	0	15	12	0	0	0	3	30
G. L. OSTRANDER	WCV7620	Duluth	1	0	0	1	13	20	20	55
G. SYMPHONY	3FCJ9	Anchorage	13	15	16	17	12	30	30	133
G3 MARQUIS	XJBO	Duluth	6	0	2	46	9	2	29	94
GARDEN STATE	KGSG	Anchorage	0	0	0	0	1	2	3	6
GENCO CLAUDIUS	V7SY6	Anchorage	34	44	30	2	0	5	0	115
GENCO RAPTOR	V7NB8	Anchorage	0	0	0	0	0	0	0	0
GENCO TITUS	VRDI7	Anchorage	16	0	0	9	1	14	16	56
GENER8 COMPANION	ZCDI4	Anchorage	550	582	619	486	0	42	8	2287
GENMAR COMPATRIOT	ZCDK2	Anchorage	0	0	18	37	10	23	7	95
GENOA EXPRESS	VRLX5	Anchorage	23	28	2	0	0	0	0	53
GEORGE N	A8PQ5	Anchorage	14	23	16	48	15	15	5	136
GLEN CANYON BRIDGE	3EFD9	Norfolk	6	21	30	0	62	26	18	163
GLOBAL SUCCESS	3FYT2	New Orleans	0	0	0	0	0	70	0	70
GOLDEN BEAR	WDL2000	San Francisco	0	0	0	0	28	26	0	54
GOODWYN ISLAND	VRRL7	Anchorage	5	0	8	1	0	0	3	17
GORDON JENSEN	WDG3440	Anchorage	0	0	15	5	0	0	0	20
GRANDEUR OF THE SEAS	C6SE3	Jacksonville	36	88	87	54	235	262	273	1035
GREAT REPUBLIC	WDH7561	Duluth	16	0	0	5	11	78	83	193
GREEN BAY	WDI3177	Jacksonville	5	7	15	8	18	23	18	94
GREEN COVE	WDG5660	Baltimore	7	3	9	21	0	0	0	40
GREEN LAKE	WDDI	Jacksonville	1	27	12	1	17	29	29	116
GREEN RIDGE	WZZF	Jacksonville	0	0	0	0	51	47	4	102
GRETCHEN H	WDC9138	Anchorage	0	0	0	1	0	0	0	1
GUANG DONG BRIDGE	3EFI	New York City	28	13	25	31	34	25	26	182
GUARDSMAN	WBN5978	Anchorage	5	0	3	3	0	5	4	20
GULF CAJUN	WDE2831	Anchorage	1	8	20	10	6	12	0	57
GULF RELIANCE	WDD2703	Anchorage	0	0	0	10	5	20	10	45
GULF TITAN	WDA5598	Anchorage	0	1	0	0	0	0	0	1
GYR FALCON	WCU6587	Anchorage	0	0	0	0	2	2	0	4
H A SKLENAR	C6CL6	Houston	3	13	147	72	96	132	75	538

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
H. LEE WHITE	WZD2465	Duluth	3	0	0	27	26	24	6	86
HAINAN ISLAND	VRMY3	Anchorage	16	4	0	1	0	0	0	21
HALIFAX EXPRESS	VRMW7	New Orleans	2	16	0	23	13	16	17	87
HARBOUR BRIDGE	3EIQ5	Anchorage	0	6	0	0	0	0	0	6
HARMONY OF THE SEAS	C6BX8	Miami	25	8	45	10	21	1	0	110
HAWAII	WDI5794	Anchorage	0	0	0	7	10	5	16	38
HENRY GOODRICH	YJQN7	Houston	200	122	211	210	220	202	213	1378
HERBERT C. JACKSON (AWS)	WL3972	Duluth	291	2	309	666	741	696	714	3419
HERCULES VOYAGER	C6AB9	Anchorage	10	6	15	18	77	23	14	163
HIGH FORCE	3FMA2	Anchorage	0	0	0	0	0	27	2	29
HOEGH CHIBA	LAVD7	Jacksonville	20	21	15	27	9	0	0	92
HON. JAMES L. OBERSTAR (AWS)	WL3108	Duluth	211	123	741	720	741	719	744	3999
HONEY ISLAND	VRPT5	Anchorage	0	0	0	0	0	6	64	70
HONOR	WDC6923	Baltimore	2	31	13	9	11	23	20	109
HORIZON ENTERPRISE	KRGB	Seattle	90	69	67	0	0	0	64	290
HORIZON PACIFIC	WSRL	Seattle	66	29	33	68	75	42	76	389
HORIZON RELIANCE	WFLH	Los Angeles	32	0	18	37	54	45	47	233
HORIZON SPIRIT	WFLG	Los Angeles	18	21	60	54	39	12	0	204
HOUSTON	KCDK	New Orleans	17	13	19	13	13	9	9	93
HOVDEN SPIRIT	V7UT7	Anchorage	6	0	1	0	16	13	2	38
HUNTER	WBN3744	Anchorage	2	2	9	0	0	0	2	15
HYDRA VOYAGER	C6AB8	Anchorage	0	0	1	0	15	14	0	30
HYUNDAI BUSAN	5BZN3	Anchorage	39	21	74	23	30	51	20	258
HYUNDAI GOODWILL	3EQO	Anchorage	0	14	10	13	16	7	9	69
HYUNDAI SHANGHAI	5BZM3	Anchorage	2	17	12	8	21	10	11	81
HYUNDAI TOKYO	5BZK3	Anchorage	13	8	8	19	11	11	5	75
ILE DE BATZ	FOSU	Anchorage	0	0	0	0	7	3	0	10
IMABARI LOGGER	VRNE6	Anchorage	22	16	10	19	3	0	0	70
IMPRESSION BAY	VROV6	Anchorage	8	0	13	6	17	0	0	44
INDEPENDENCE II	WGAX	Baltimore	51	38	37	12	48	38	44	268
INDEPENDENCE OF THE SEAS	C6WW4	Miami	0	0	3	0	0	2	0	5
INDIANA HARBOR	WXN3191	Duluth	5	0	0	5	26	25	28	89
INDIGO LAKE	VROY7	Anchorage	28	2	16	6	16	13	13	94
INGOT	WDJ9413	Anchorage	0	0	0	0	0	0	8	8
INLAND SEAS	WCJ6214	Duluth	0	0	0	0	8	7	6	21
INTEGRITY	WDC6925	Baltimore	20	11	4	20	29	34	27	145
ISLA BELLA	WTOI	Jacksonville	25	51	70	47	62	54	42	351
IVER FOSS	WYE6442	Anchorage	0	0	0	0	0	21	2	23

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
JACAMAR ARROW	C6YT3	Charleston	0	0	0	0	0	0	0	0
JAKOB SELMER	V7OX8	Anchorage	0	0	0	0	0	0	12	12
JAMAICA BAY	VRMC9	Anchorage	6	18	17	3	15	17	9	85
JAMES BAY	VRLU4	Anchorage	16	14	21	7	21	18	20	117
JAMES L. KUBER	WDF7020	Duluth	6	0	0	63	57	15	0	141
JAMES R. BARKER (AWS)	WYP8657	Duluth	0	0	386	716	743	719	744	3308
JANE S	V7JJ4	Anchorage	0	1	0	0	1	0	2	4
JAVA SEA	WDB5557	Anchorage	0	3	2	0	4	2	2	13
JEAN ANNE	WDC3786	Los Angeles	36	2	1	7	18	27	6	97
JENNY N	A8PQ7	Houston	664	659	728	695	688	695	722	4851
JERICHO BEACH	VRMQ5	Anchorage	0	0	0	10	14	0	10	34
JERVIS BAY	VRMM1	Anchorage	7	0	11	6	1	0	0	25
JEWEL OF THE SEAS	C6FW9	Miami	49	28	56	57	38	11	23	262
JIANGMEN TRADER	VRLK2	Anchorage	0	0	15	17	13	0	0	45
JOHN D. LEITCH	VGWM	Duluth	0	0	0	0	0	0	0	0
JOHN G. MUNSON	WDH7557	Duluth	0	0	1	14	26	26	25	92
JOHN J. BOLAND	WZE4539	Duluth	0	0	0	17	10	32	48	107
JONATHAN SWIFT	A8SN5	New York City	17	38	43	23	8	15	21	165
JOSEPH L. BLOCK	WXY6216	Duluth	0	0	0	588	612	719	741	2660
JOYCE L. VANENKEVORT	WDB9821	Duluth	1	0	0	0	2	0	2	5
KAHYASI	9V2738	Anchorage	0	0	0	0	9	0	0	9
KAI XUAN	V7YL7	Anchorage	11	6	28	0	7	19	0	71
KANDA LOGGER	VRPN7	Anchorage	16	5	16	5	19	20	21	102
KAPRIJKE	ONIK	Houston	126	83	69	10	84	27	81	480
KAREN ANDRIE	WBS5272	Duluth	1	1	0	0	1	0	1	4
KAROLINE N	A8PQ8	Anchorage	7	0	10	9	1	0	265	292
KAUAI	WSRH	Seattle	2	1	2	6	19	31	5	66
KAYE E. BARKER (AWS)	WCF3012	Duluth	207	0	318	716	528	713	737	3219
KENDAL	C6XE9	Anchorage	238	40	72	76	8	15	0	449
KENNICOTT	WCY2920	Anchorage	0	0	0	1	25	2	13	41
KESTREL	WDE7804	Anchorage	0	0	0	3	6	0	3	12
KEY WEST	VRQK2	Anchorage	0	0	0	2	13	6	5	26
KILO MOANA	WDA7827	Honolulu	2	4	74	74	72	48	57	331
KINGCRAFT	9V2737	Anchorage	15	85	69	64	165	66	29	493
KISBER	9V2736	Anchorage	10	0	0	0	0	0	0	10
KIWI TRADER	VRWN7	Anchorage	0	0	8	30	5	7	5	55
KN ARCADIA	9V3913	Anchorage	59	43	36	59	11	15	1	224
KODIAK ISLAND	VRQO7	Anchorage	8	7	7	11	6	13	3	55

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
KONINGSDAM	PBGJ	Miami	35	8	10	0	1	0	0	54
KOOMBANA BAY	VRHQ9	Anchorage	0	0	0	0	0	0	54	54
KRIS KIN	9V2739	Anchorage	40	23	12	4	0	14	1	94
KULTUS COVE	VRQD7	Anchorage	13	4	12	23	24	17	16	109
LA STELLA	ONIS	Anchorage	44	34	12	12	9	7	11	129
LAKE DOLPHIN	ONHA	Anchorage	19	33	30	22	8	10	42	164
LAURENCE M. GOULD (AWS)	WCX7445	Seattle	744	672	621	683	702	720	84	4226
LECONTE	WZE4270	Anchorage	20	24	14	0	12	3	0	73
LEE A. TREGURTHA (AWS)	WUR8857	Duluth	233	0	77	720	744	438	693	2905
LEGACY	WDI5321	Anchorage	2	6	4	4	3	4	10	33
LEO VOYAGER	C6AB7	Anchorage	13	32	29	33	0	36	0	143
LIBERTY	KLIG	Baltimore	0	9	13	0	1	39	29	91
LIBERTY EAGLE	WHIA	Houston	0	37	48	69	45	20	31	250
LIBERTY GLORY	WADP	Houston	61	81	65	10	11	56	10	294
LIBERTY GRACE	WADN	Houston	68	56	49	57	34	32	41	337
LIBERTY OF THE SEAS	C6VQ8	Houston	33	22	36	22	16	29	47	205
LIBERTY PASSION	WLPI	Charleston	0	0	0	7	9	6	2	24
LIBERTY PEACE	WLIU	Houston	45	55	56	55	22	48	37	318
LIBERTY PRIDE	KRAU	Charleston	21	35	49	55	34	25	25	244
LIBRA VOYAGER	C6AB6	Anchorage	13	23	80	50	8	0	0	174
LISA ANN 2 (AWS)	WDB3573	Anchorage	80	60	61	141	96	164	131	733
LIVORNO EXPRESS	VRLU9	Anchorage	39	10	7	4	3	0	0	63
LOIRE	V7QJ5	Anchorage	18	8	14	15	11	14	14	94
LOIS H	WTD4576	Anchorage	0	0	1	5	1	0	0	7
LONE STAR STATE	WLSY	Anchorage	0	0	0	0	86	85	53	224
LONGVIEW LOGGER	VRDK7	Anchorage	36	53	47	21	58	16	105	336
LUZON STRAIT	VRCJ2	Anchorage	0	18	5	22	25	9	47	126
M.V. IRELAND	C6DD6	Jacksonville	0	0	0	0	0	21	38	59
MAASDAM	PFRO	Miami	97	49	55	5	6	7	13	232
MAERSK ATLANTA	WNTL	Charleston	7	5	15	33	22	0	24	106
MAERSK CHICAGO	WMCS	Norfolk	58	36	20	20	37	60	48	279
MAERSK COLUMBUS	WMCU	Norfolk	9	9	23	39	32	36	47	195
MAERSK DENVER	WMDQ	New York City	10	16	5	23	25	22	0	101
MAERSK DETROIT	WMDK	Norfolk	98	8	84	26	54	49	68	387
MAERSK HARTFORD	WMHA	New York City	36	30	31	47	41	36	17	238
MAERSK IDAHO	WKPM	Houston	22	12	22	18	9	51	33	167
MAERSK IOWA	KABL	Norfolk	70	39	48	55	35	39	50	336
MAERSK KENSINGTON	WMKN	Charleston	84	83	42	69	140	117	85	620

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
MAERSK KENTUCKY	WKPY	Norfolk	25	41	46	65	91	93	90	451
MAERSK KINLOSS	WMKA	New York City	0	0	0	0	9	2	53	64
MAERSK KOTKA	D5OV9	Charleston	0	27	35	0	0	0	0	62
MAERSK MEMPHIS	WMMK	Charleston	62	6	11	51	77	63	49	319
MAERSK MONTANA	WCDP	Norfolk	60	30	49	41	35	28	18	261
MAERSK NIAGARA	VREO9	Anchorage	26	27	31	14	2	1	0	101
MAERSK OHIO	KABP	Houston	64	44	31	93	100	61	56	449
MAERSK PEARY	WHKM	Houston	36	33	34	11	11	4	10	139
MAERSK PITTSBURGH	WMPP	New York City	84	58	58	42	27	97	91	457
MAERSK SENTOSA	WSEP	New York City	0	6	15	17	8	55	55	156
MAERSK VARNA	9V8838	Anchorage	0	0	0	0	0	0	30	30
MAGNOLIA STATE	KGNQ	Charleston	0	0	0	0	0	0	0	0
MAHIMAHI	WHRN	Los Angeles	35	15	27	35	16	7	19	154
MAIA H	WYX2079	Anchorage	0	0	0	0	2	0	0	2
MAIPO RIVER	VREZ3	Anchorage	0	0	10	13	24	12	26	85
MAJESTY OF THE SEAS	C6FZ8	Miami	31	0	9	24	9	9	23	105
MALOLO	WYH6327	Anchorage	29	32	28	25	37	27	27	205
MANIFESTO	9V9574	Anchorage	0	0	0	77	91	97	58	323
MANITOULIN	XJBX	Duluth	0	0	0	0	0	13	8	21
MANITOWOC	WDE3569	Duluth	0	0	0	112	48	47	94	301
MANOA	KDBG	Los Angeles	5	5	16	25	27	17	8	103
MANUKAI	WRGD	Los Angeles	10	23	16	36	10	18	0	113
MANULANI	WECH	Los Angeles	21	29	6	1	30	18	0	105
MARCELLUS LADY	9V3144	Anchorage	0	0	15	26	38	6	0	85
MARCH	V7HZ5	New Orleans	21	27	21	0	0	0	0	69
MARCUS G. LANGSETH (AWS)	WDC6698	Anchorage	542	672	695	428	214	714	712	3977
MARELLA DREAM	9HA2381	Anchorage	0	0	5	6	1	0	0	12
MARINER OF THE SEAS	C6FV9	Miami	0	2	0	0	0	7	25	34
MARJORIE C	WDH6745	Los Angeles	5	11	29	16	7	2	39	109
MARSDEN POINT	VRNF3	Anchorage	21	18	33	45	13	13	9	152
MATAKANA ISLAND	VRGM4	Anchorage	9	19	51	35	58	6	18	196
MATSON ANCHORAGE	KGTX	Anchorage	28	18	23	53	29	46	25	222
MATSON KODIAK	KGTZ	Anchorage	29	19	74	45	26	65	57	315
MATSON TACOMA	KGTY	Anchorage	69	79	107	67	77	61	61	521
MATSONIA	KHRC	Los Angeles	0	0	0	0	0	0	3	3
MAUNALEI	KFMV	Los Angeles	22	36	38	33	41	10	18	198
MAUNAWILI	WGEB	Los Angeles	37	35	33	8	11	14	6	144
MEDEIA	WDE6486	Anchorage	0	0	3	0	11	5	7	26

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
MERCURY HOPE	3FRE6	Anchorage	0	9	24	26	4	7	1	71
MERMAID HOPE	3FOJ2	Anchorage	5	0	1	0	0	0	0	6
MESABI MINER (AWS)	WYQ4356	Duluth	339	0	204	716	744	691	734	3428
MICHELE FOSS	WDH8371	Anchorage	0	3	0	0	3	7	3	16
MIDNIGHT SUN	WAHG	Seattle	16	15	24	45	41	22	8	171
MIKE O'LEARY	WDC3665	Anchorage	0	0	0	16	21	23	24	84
MILLENNIUM STAR	WDA2184	Anchorage	0	0	0	0	0	13	3	16
MINERAL BEIJING	ONAR	Anchorage	10	0	0	2	4	7	33	56
MINERAL CHARLIE	VRJZ9	Anchorage	11	19	24	23	22	31	44	174
MINERAL CHINA	ONAC	Anchorage	33	47	44	37	10	21	43	235
MINERAL CLOUDBREAK	VRLA6	Anchorage	11	5	68	55	97	73	56	365
MINERAL DALIAN	ONFW	Anchorage	48	39	61	49	84	71	55	407
MINERAL DRAGON	ONFN	Anchorage	0	7	31	24	134	16	8	220
MINERAL FAITH	VRKS4	Anchorage	30	25	31	24	0	21	14	145
MINERAL HONSHU	D5QV7	Anchorage	0	3	37	15	15	22	15	107
MINERAL HOPE	VRKS3	Anchorage	23	11	7	0	0	0	0	41
MINERAL KYOTO	ONFI	Anchorage	32	37	53	2	19	23	31	197
MINERAL MAUREEN	VRKK2	Anchorage	13	9	35	42	25	15	35	174
MINERAL NEW YORK	ONGI	Anchorage	19	12	16	7	6	3	13	76
MINERAL NINGBO	ONGA	Anchorage	0	7	6	25	3	21	3	65
MINERAL NOBLE	ONAN	Anchorage	71	26	5	8	14	23	40	187
MINERAL STONEHENGE	ONGR	Anchorage	19	15	14	56	105	99	151	459
MINERAL SUBIC	VRIF9	Anchorage	12	21	32	36	21	20	1	143
MINERAL TIANJIN	ONBF	Anchorage	5	11	15	20	25	16	23	115
MINERAL YARDEN	D5LJ2	Anchorage	15	25	18	20	28	48	32	186
MISSISSIPPI VOYAGER	WDD7294	San Francisco	0	0	0	0	0	0	6	6
MOKIHANA	WNRD	Los Angeles	18	25	29	11	1	0	10	94
MOL BEACON	VROB9	Anchorage	27	14	22	52	82	59	93	349
MOL BEAUTY	VROG7	Anchorage	19	4	36	61	399	96	15	630
MOL BELIEF	VROD3	Anchorage	0	0	0	0	3	0	2	5
MOL BELLWETHER	VROG8	Anchorage	0	7	0	9	0	5	6	27
MOL BENEFACTOR	VRPJ6	Anchorage	18	8	43	8	34	27	32	170
MOL BREEZE	VRNL8	Anchorage	11	20	16	18	25	7	21	118
MOL BRIGHTNESS	VRNL9	Anchorage	7	11	0	47	59	50	31	205
MOL BRILLIANCE	VRNL2	Anchorage	22	1	0	24	113	86	70	316
MOL EMISSARY	VRFX6	New Orleans	56	18	8	0	0	21	25	128
MOL GLIDE	VRJF2	Charleston	103	54	58	30	0	0	0	245
MOL MANEUVER	V7VC5	Charleston	0	10	7	4	2	0	4	27

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
MOL PRESTIGE	9V3122	Anchorage	4	0	7	3	5	0	0	19
MOMO GLORY	3EWL5	Anchorage	0	0	0	5	11	9	9	34
MORNING HARUKA	A8GK7	Anchorage	0	0	0	0	13	9	7	29
MORSTON	9V9144	Anchorage	0	3	47	5	24	17	14	110
MOTIVATOR	9V9143	Anchorage	25	43	17	0	0	0	0	85
MOUNT ADAMS	VRCB7	Anchorage	0	0	0	0	0	30	6	36
MOUNT ASO	VROV7	Anchorage	0	4	12	2	6	0	0	24
MOUNT BAKER	VRMN6	Anchorage	15	18	15	0	18	0	9	75
MOUNT DRUM	WDJ7294	Anchorage	0	0	17	55	16	17	15	120
MOUNT HIKURANGI	VRMC8	Anchorage	114	111	10	100	30	22	60	447
MOUNT OWEN	VRDU6	Anchorage	61	262	0	71	55	0	0	449
MOUNT RAINIER	VRBG6	Anchorage	3	3	12	8	4	2	7	39
MOUNT SEYMOUR	VRPT4	Anchorage	0	9	15	0	28	0	0	52
MOUNT TARANAKI	VRRW9	Anchorage	0	0	0	0	0	0	7	7
MSC ANTIGUA	VRLC3	Charleston	0	0	0	0	0	0	0	0
MSC DIVINA	3FFA5	Anchorage	17	16	24	23	0	0	0	80
MSC MAGNIFICA	3FLO4	Anchorage	0	0	0	0	0	0	8	8
MSC POESIA	3EPL4	Miami	0	0	0	0	0	0	0	0
MSC SEASIDE	9HA4638	Miami	65	105	117	108	104	76	49	624
MUSTAFA DAYI	TCZF2	New York City	0	1	23	42	45	36	44	191
NACHIK	WDE7904	Anchorage	0	0	0	0	1	0	0	1
NANCY P	V7GK5	Anchorage	0	0	0	0	8	17	19	44
NANNING	9V5409	Anchorage	7	11	3	0	21	20	55	117
NATHANIEL B. PALMER (AWS)	WBP3210	Seattle	219	617	743	720	683	0	234	3216
NATIONAL GLORY	WDD4207	Houston	27	15	18	16	22	23	27	148
NATOMA	WBB5799	Anchorage	0	0	0	5	4	0	9	18
NAUTILUS	J8B3605	Anchorage	0	0	0	0	0	0	53	53
NAVAJO	WCT5737	Anchorage	0	0	0	3	11	0	3	17
NAVIGATOR OF THE SEAS	C6FU4	Miami	18	17	34	32	27	8	0	136
NEIL ARMSTRONG (AWS)	WARL	Anchorage	532	0	194	717	695	671	742	3551
NEVZAT KALKAVAN	TCMO2	New York City	14	30	31	36	18	60	14	203
NICOLE FOSS	WDJ4108	Anchorage	14	4	11	16	8	14	5	72
NIEUW AMSTERDAM	PBWQ	Miami	185	296	102	123	99	48	28	881
NIJINSKY	9VAX2	Anchorage	30	5	0	0	0	0	0	35
NOAA BELL M. SHIMADA (AWS)	WTED	Seattle	0	0	0	0	0	0	344	344
NOAA FAIRWEATHER (AWS)	WTEB	Seattle	0	0	0	0	195	383	467	1045
NOAA GORDON GUNTER (AWS)	WTEO	Seattle	48	0	0	0	0	105	677	830

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
NOAA HENRY B. BIGELOW (AWS)	WTDF	Seattle	0	0	0	1	459	266	493	1219
NOAA HI'IALAKAI (AWS)	WTEY	Seattle	0	0	0	0	0	405	385	790
NOAA NANCY FOSTER (AWS)	WTER	Seattle	0	0	0	0	353	622	501	1476
NOAA OKEANOS EXPLORER (AWS)	WTDH	Seattle	0	0	216	489	353	544	508	2110
NOAA OREGON II (AWS)	WTDO	Seattle	0	0	0	0	0	171	436	607
NOAA OSCAR DYSON (AWS)	WTEP	Seattle	0	190	388	510	535	405	248	2276
NOAA OSCAR ELTON SETTE (AWS)	WTEE	Seattle	0	0	0	157	237	536	642	1572
NOAA PISCES (AWS)	WTDL	Seattle	0	0	0	1	0	409	509	919
NOAA RAINIER (AWS)	WTEF	Seattle	0	0	0	0	0	473	202	675
NOAA REUBEN LASKER (AWS)	WTEG	Seattle	0	0	0	2	2	354	630	988
NOAA RONALD H. BROWN (AWS)	WTEC	Seattle	0	0	62	61	75	316	664	1178
NOAA THOMAS JEFFERSON (AWS)	WTEA	Seattle	0	0	0	0	0	207	586	793
NOORDAM	PHET	Anchorage	281	324	459	377	223	217	243	2124
NORDISLE	5BWH2	Anchorage	0	11	11	0	19	28	28	97
NORDSEINE	9HA3825	New Orleans	0	0	20	19	17	4	0	60
NORFOLK	WDI3067	Charleston	0	0	0	2	2	0	0	4
NORSEMAN II	WDD6688	Anchorage	0	0	0	0	0	1	7	8
NORTH STAR	KIYI	Seattle	0	16	74	69	43	64	41	307
NORTHWEST EXPLORER	WCZ9007	Anchorage	2	0	0	0	0	0	4	6
NORTHWEST SWAN	ZCDJ9	Anchorage	123	83	55	68	76	106	80	591
NORWEGIAN BLISS	C6DL4	Miami	0	0	0	0	31	58	33	122
NORWEGIAN BREAKAWAY	C6ZJ3	New York City	79	69	35	11	0	0	10	204
NORWEGIAN DAWN	C6FT7	New Orleans	122	19	60	41	128	89	33	492
NORWEGIAN ESCAPE	C6BR3	Miami	67	121	87	77	118	60	52	582
NORWEGIAN GEM	C6VG8	Jacksonville	25	41	38	48	53	47	53	305
NORWEGIAN JADE	C6WK7	Miami	93	94	37	7	0	2	0	233
NORWEGIAN JEWEL	C6TX6	Jacksonville	35	3	0	0	0	0	0	38
NORWEGIAN JOY	C6CX3	Anchorage	16	17	15	4	55	103	97	307
NORWEGIAN PEARL	C6VG7	Anchorage	535	485	573	566	293	148	89	2689
NORWEGIAN SKY	C6PZ8	Miami	0	0	0	0	0	0	43	43
NORWEGIAN SPIRIT	C6TQ6	Jacksonville	229	136	93	135	109	174	161	1037
NORWEGIAN STAR	C6FR3	Miami	123	127	71	61	6	0	0	388
NORWEGIAN SUN	C6RN3	Miami	69	3	53	33	7	0	0	165
NUNAVIK	V7CK9	Anchorage	11	19	19	3	0	14	16	82
NYK ARTEMIS	HOVU	Los Angeles	38	61	25	43	3	0	0	170
NYK ATHENA	HPDY	Anchorage	95	62	39	44	24	18	8	290
NYK FUTAGO	9V8739	Anchorage	0	0	0	17	19	12	56	104

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NYK NEBULA	3ENG6	Charleston	12	8	7	18	0	12	5	62
NYK RUMINA	9V7645	New York City	0	0	0	0	0	0	98	98
NYK TRITON	3FUL2	Los Angeles	7	25	5	5	1	10	0	53
OAK BAY	VRMA2	Anchorage	65	11	20	6	14	3	18	137
OAK HARBOUR	VRMO3	Anchorage	0	0	0	0	6	0	0	6
OASIS OF THE SEAS	C6XS7	Jacksonville	54	59	34	74	60	124	97	502
OCCITAN SKY	C6Z2044		0	0	0	0	0	0	0	0
OCEAN AMBITION	VRNM9	Anchorage	24	14	9	10	4	19	28	108
OCEAN CRESCENT	WDF4929	Houston	18	6	2	26	13	44	20	129
OCEAN EAGLE	WDG8082	Anchorage	0	0	0	0	1	0	0	1
OCEAN FORTE	VRNZ9	Anchorage	24	19	21	26	10	0	2	102
OCEAN GIANT	WDG4379	Jacksonville	14	6	0	0	0	0	39	59
OCEAN GLOBE	KOGE	Houston	11	27	0	0	0	6	26	70
OCEAN HOPE 3	WDF2354	Anchorage	6	2	0	0	0	0	0	8
OCEAN JAZZ	WDJ4909	Anchorage	7	51	3	0	0	1	1	63
OCEAN RANGER	WAM7635	Anchorage	0	10	14	0	0	2	15	41
OCEAN RELIANCE	WADY	Anchorage	31	4	17	0	0	0	14	66
OCEAN TITAN	WDJ3639	Anchorage	0	0	0	0	0	0	2	2
OCEANUS	WXAQ	Seattle	1	0	0	0	27	44	2	74
OLEANDER	V7SX3	New York City	37	36	28	32	30	34	33	230
OLIVE BAY	VRON5	Anchorage	6	0	9	4	0	86	15	120
OLIVE L. MOORE	WDF7019	Duluth	0	0	0	51	73	102	93	319
ONE CURE	WDJ7457	Anchorage	5	2	7	0	7	5	6	32
OOCL POLAND	VRLJ2	Anchorage	0	0	0	0	0	0	44	44
OOSTERDAM	PBKH	Anchorage	153	121	102	54	271	122	74	897
ORANGE BLOSSOM 2	D5DS3	New York City	55	84	78	66	68	35	9	395
ORANGE OCEAN	D5DS2	New York City	1	15	23	33	45	59	102	278
ORANGE RIVER	VRMY6	Anchorage	0	0	0	0	0	63	70	133
ORANGE SKY	ELZU2	New York City	59	43	13	56	43	36	57	307
ORANGE STAR	A8WP6	New York City	53	49	7	0	0	9	0	118
ORANGE SUN	A8HY8	New York City	27	20	40	45	30	46	60	268
ORANGE WAVE	ELPX7	New York City	8	34	13	22	10	0	34	121
ORE BRASIL	VRPY5	Anchorage	66	28	97	170	74	0	40	475
ORE GUAIBA	9V9040	Anchorage	703	585	522	696	734	318	140	3698
ORE ITALIA	VRPY6	Anchorage	3	21	57	101	47	91	132	452
ORE KOREA	VRPY7	Anchorage	427	608	392	68	285	289	271	2340
OREGON VOYAGER	WDF2960	New Orleans	11	0	0	0	0	4	15	30
ORIENTAL JUBILEE	VRPP5	Anchorage	1	0	0	0	13	0	26	40

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ORIENTAL KING	VRQZ7	Anchorage	42	57	55	87	272	281	284	1078
ORIENTAL QUEEN	VRAC9	Anchorage	2	25	50	31	10	0	1	119
ORION LEADER	3FSG9	Seattle	0	0	0	0	0	16	0	16
OSAKA BAY	VRQS2	Anchorage	0	12	15	20	23	14	0	84
OTAGO BAY	VRQK3	Anchorage	17	1	12	1	11	2	0	44
OTAGO HARBOUR	VRNI7	Anchorage	17	8	28	2	29	30	33	147
OURO DO BRASIL	ELPP9	Baltimore	59	52	54	28	64	56	40	353
OVATION OF THE SEAS	C6BX9	Anchorage	56	65	14	46	44	29	26	280
OVERSEAS ANACORTES	KCHV	Miami	9	15	7	1	0	14	5	51
OVERSEAS BOSTON	WJBU	Anchorage	31	25	25	35	5	6	1	128
OVERSEAS CASCADE	WOAG	Houston	2	1	133	130	123	15	5	409
OVERSEAS CHINOOK	WNFQ	Houston	1	2	11	24	6	2	3	49
OVERSEAS HOUSTON	WWAA	Miami	2	5	1	1	1	0	11	21
OVERSEAS LONG BEACH	WAAT	Jacksonville	11	30	8	28	24	7	0	108
OVERSEAS LOS ANGELES	WABS	Seattle	40	3	21	126	76	87	5	358
OVERSEAS MARTINEZ	WPAJ	Houston	44	33	84	26	64	41	124	416
OVERSEAS NIKISKI	WDBH	Houston	23	6	0	10	4	25	4	72
OVERSEAS SANTORINI	WOSI	Houston	25	23	47	25	6	0	3	129
OVERSEAS TAMPA	WOTA	Houston	0	3	4	2	0	0	0	9
OVERSEAS TEXAS CITY	WHED	Houston	40	3	19	51	82	36	21	252
OYSTER BAY	VRQE9	Anchorage	0	0	1	0	0	1	17	19
PACIFIC LOGGER	VRWL4	Anchorage	10	25	116	42	98	165	101	557
PACIFIC SANTA ANA	A8WI3	Houston	11	27	27	25	29	0	18	137
PACIFIC SHARAV	D5DY4	Houston	22	9	22	4	31	5	24	117
PACIFIC WOLF	WDD9286	Anchorage	1	8	8	5	9	4	4	39
PANDALUS	WAV7611	Anchorage	0	0	0	0	8	21	14	43
PARAMOUNT HAMILTON	2CWB2	Houston	4	0	0	0	0	0	0	4
PARAMOUNT HYDRA	2CWC3	Anchorage	0	0	0	0	0	4	6	10
PATRIOT	WAIU	Charleston	16	27	32	19	21	13	24	152
PAUL GAUGUIN	C6TH9	Anchorage	257	237	222	172	131	94	131	1244
PAUL R. TREGURTHA (AWS)	WYR4481	Duluth	65	0	0	0	269	523	722	1579
PECOS	V7UU5	Anchorage	8	8	5	0	0	0	0	21
PEGASUS VOYAGER	C6AP3	Anchorage	0	0	0	0	5	30	19	54
PELICAN ISLAND	VRRD7	Anchorage	0	0	0	0	0	0	100	100
PELICAN STATE	WDE4433	New Orleans	0	0	0	0	0	3	0	3
PERLA DEL CARIBE	KPDL	Jacksonville	31	3	12	29	19	53	79	226
PERSEVERANCE	WDE5328	Anchorage	1	2	0	0	0	0	0	3
PHILADELPHIA EXPRESS	WDC6736	Houston	91	44	20	35	12	45	63	310

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
PHILIP R. CLARKE	WDH7554	Duluth	15	0	24	57	17	38	22	173
PHYLLIS DUNLAP	WDA6552	Anchorage	0	3	7	4	9	6	8	37
POLAR ADVENTURE	WAZV	Seattle	26	18	22	54	26	12	58	216
POLAR CLOUD	WDJ8729	Anchorage	0	0	0	12	18	15	24	69
POLAR DISCOVERY	WACW	Seattle	7	22	68	0	0	0	22	119
POLAR ENDEAVOUR	WCAJ	Seattle	25	18	32	32	33	51	46	237
POLAR ENTERPRISE	WRTF	Seattle	28	27	39	22	9	25	71	221
POLAR KING	WDC7562	Anchorage	0	0	1	13	12	7	1	34
POLAR RANGER	WDC8652	Anchorage	0	0	0	22	11	31	19	83
POLAR RESOLUTION	WDJK	Seattle	23	63	61	70	35	26	55	333
POLAR STORM	WDE8347	Anchorage	0	20	25	8	17	11	21	102
POLAR WIND	WAZ9548	Anchorage	0	0	7	24	22	11	9	73
POLARIS VOYAGER	C6AP4	Anchorage	0	0	0	0	19	12	18	49
PORT ALBERNI	VRDT3	Anchorage	20	20	17	16	12	9	11	105
PORT ALFRED	VRLZ7	Anchorage	0	0	0	2	0	0	0	2
PORT ALICE	VRIC6	Anchorage	19	17	14	10	19	20	4	103
PORT ANGELES	VRCW8	Anchorage	0	0	2	0	1	0	0	3
PORT KENNY	VRGP2	Anchorage	7	15	24	13	19	14	21	113
PORT PEGASUS	VRAA8	Anchorage	26	13	16	28	12	18	15	128
PREMIUM DO BRASIL	A8BL4	Baltimore	15	0	15	30	21	0	0	81
PRESIDENT FD ROOSEVELT	WROT	Anchorage	0	0	0	0	0	0	5	5
PRESIDENT KENNEDY	WPKW	Anchorage	0	0	0	0	0	0	30	30
PRESQUE ISLE	WDH7560	Duluth	48	0	32	89	36	33	42	280
PRIME EXPRESS	3FUZ4	Anchorage	0	0	13	30	39	12	10	104
PRINSENDAM	PBGH	Miami	93	86	109	119	170	52	86	715
PSU SEVENTH	9V3964	Anchorage	566	649	69	0	28	0	0	1312
PUGET SOUND	VRDD9	Anchorage	8	5	10	9	0	0	0	32
PYXIS ALFA	9V3776	Anchorage	84	0	52	4	0	2	5	147
QUALIFIER 105	WDH9546	Anchorage	0	0	0	0	0	0	13	13
QUANTUM OF THE SEAS	C6BH8	Miami	19	41	50	37	42	13	40	242
R J PFEIFFER	WRJP	Los Angeles	42	47	50	40	29	45	47	300
R/V KIYI	KAO107	Duluth	0	0	0	1	24	52	42	119
RADIANCE OF THE SEAS	C6SE7	Anchorage	25	10	52	18	17	42	33	197
RAINBOW WARRIOR	PF7197	Anchorage	13	1	0	16	51	5	0	86
RED	V7UU2	Anchorage	0	0	2	47	36	88	54	227
REDOUBT	WDD2451	Anchorage	0	0	0	2	34	0	0	36
REGATTA	V7DM3	Seattle	0	0	0	35	10	3	2	50
RESOLVE	WCZ5535	Baltimore	52	25	34	16	1	30	30	188

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
RESPONDER	V7CY9	Baltimore	39	34	52	22	14	1	0	162
RHAPSODY OF THE SEAS	C6UA2	Miami	38	23	4	0	3	14	10	92
RICHARD BRUSCO	WDC3031	Anchorage	2	0	1	0	0	0	0	3
RIO GRANDE	V7UT9	Anchorage	2	17	12	1	43	26	3	104
RIO GRANDE EXPRESS	VRCE5	Anchorage	14	15	13	19	18	20	19	118
RIVIERA	V7WO5	Anchorage	0	0	3	27	9	0	0	39
ROBERT C. SEAMANS	WDA4486	Anchorage	0	24	26	69	8	10	10	147
ROBERT GORDON SPROUL (AWS)	WSQ2674	Los Angeles	713	672	543	653	739	718	490	4528
ROGER BLOUGH	WDH7559	Duluth	0	0	99	283	180	143	228	933
ROGER REVELLE (AWS)	KAOU	Los Angeles	294	8	646	710	738	718	613	3727
RONALD N	A8PQ3	Anchorage	68	41	49	41	22	52	45	318
ROSS CHOUEST	WCW7550	Anchorage	0	0	0	0	0	0	6	6
RTM CARTIER	9V2774	Anchorage	0	0	0	0	0	0	34	34
RTM COLUMBUS	9V2781	Anchorage	18	87	11	0	1	0	0	117
RTM DAMPIER	9V2775	Anchorage	10	0	0	26	76	11	4	127
RTM DHAMBUL	9V2783	Anchorage	4	0	26	19	0	0	0	49
RTM DRAKE	9V2779	Anchorage	225	0	0	0	0	1	66	292
RTM TASMAN	9V2782	Anchorage	0	102	324	293	89	11	29	848
SAFARI ENDEAVOUR	WDG2742	Anchorage	0	0	0	0	7	28	18	53
SAFARI EXPLORER	WCY5674	Anchorage	0	0	0	0	1	4	2	7
SAFARI QUEST	WDH4957	Anchorage	0	0	0	0	0	3	8	11
SAGA ADVENTURE	VRBL4	Anchorage	26	64	42	4	1	0	0	137
SAGA ANDORINHA	VRMV6	Anchorage	0	0	40	24	10	50	4	128
SAGA BEIJA-FLOR	VRVN8	Anchorage	1	28	25	22	13	0	0	89
SAGA DISCOVERY	VRBR8	Seattle	1	0	16	50	0	58	34	159
SAGA ENTERPRISE	VRCC8	Anchorage	0	0	0	0	8	0	44	52
SAGA FALCON	VRKX7	Anchorage	23	36	19	9	19	27	57	190
SAGA FANTASY	VRLT9	Anchorage	15	2	34	23	0	26	31	131
SAGA FJORD	VRLL2	Anchorage	27	0	0	0	62	103	36	228
SAGA FRAM	VRLL3	Anchorage	4	0	0	0	0	0	0	4
SAGA FREYA	VRRA4	Anchorage	0	0	0	56	74	59	54	243
SAGA FRIGG	VRLK7	Anchorage	16	35	22	33	11	5	6	128
SAGA FRONTIER	VRCP2	Anchorage	0	0	0	60	65	209	192	526
SAGA FUJI	VRMS3	Anchorage	14	7	21	12	0	0	0	54
SAGA FUTURE	VRKX8	Anchorage	71	112	130	83	89	0	0	485
SAGA JANDAIA	VRYO9	Anchorage	26	3	0	0	21	86	25	161
SAGA JOURNEY	VRCY8	Anchorage	0	0	0	0	0	0	7	7
SAGA MONAL	VRZQ9	Anchorage	202	94	9	36	13	42	1	397

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SAGA MORUS	VRZQ8	Anchorage	0	0	0	0	0	0	0	0
SAGA NAVIGATOR	VRDA4	Anchorage	0	0	0	106	4	24	37	171
SAGA ODYSSEY	VRDU9	Anchorage	133	196	329	8	88	81	42	877
SAGA PIONEER	VRED4	Anchorage	52	55	85	48	97	1	49	387
SAGA SPRAY	VRWW5	Anchorage	17	0	9	19	23	0	26	94
SAGA TIDE	VRYO8	Anchorage	28	18	43	19	4	26	15	153
SAGA TUCANO	VRVP2	Anchorage	114	348	366	115	74	104	99	1220
SAGA VIKING	VRXO6	Anchorage	0	0	9	3	0	38	0	50
SAGA VOYAGER	VRXL8	Anchorage	12	120	209	194	244	85	311	1175
SAGA WAVE	VRYO7	Anchorage	0	0	66	34	25	18	19	162
SAGINAW	VF2560	Duluth	0	0	0	0	0	1	0	1
SAIPEM 7000	C6NO5	Anchorage	0	0	0	0	0	0	0	0
SAKURA OCEAN	3FRC8	New Orleans	29	0	33	40	34	63	20	219
SALLY RIDE (AWS)	WSAF	Seattle	503	610	743	712	743	715	461	4487
SALTRAM	9V2312	Anchorage	7	14	24	22	6	0	0	73
SAMSON MARINER	WCN3586	Anchorage	0	0	0	6	0	3	0	9
SAMUEL DE CHAMPLAIN	WDC8307	Duluth	0	0	9	15	11	4	16	55
SAN JACINTO	V7QJ4	Anchorage	7	2	1	2	0	0	0	12
SAN SABA	V7UT8	Anchorage	11	0	0	0	0	0	0	11
SANDRA FOSS	WYL4908	Anchorage	0	0	0	0	0	12	10	22
SANSOVINO	9V2729	Anchorage	116	111	88	93	143	151	59	761
SANTIAGO BASIN	VREO2	Anchorage	0	0	0	0	0	0	20	20
SEA BIRD	9V2730	Anchorage	0	0	19	21	6	1	9	56
SEA HAWK	WDD9287	Anchorage	0	0	0	0	17	5	11	33
SEA HAWK	WDE8543	Anchorage	0	0	0	0	28	27	21	76
SEA PRINCE	WYT8569	Anchorage	0	0	28	108	80	122	65	403
SEA RELIANCE	WEOB	Anchorage	0	0	0	0	2	1	0	3
SEA VOYAGER	WCX9106	Anchorage	13	0	17	5	3	1	2	41
SEABOARD AMERICA	5BAW3	New Orleans	18	13	42	55	53	43	42	266
SEABOARD PERU	5BZE2	New Orleans	46	33	44	29	31	25	27	235
SEABOURN ENCORE	C6CG4	Anchorage	0	0	3	113	70	31	37	254
SEABOURN QUEST	C6YZ5	Miami	3	29	64	5	0	0	0	101
SEABOURN SOJOURN	C6YA5	Anchorage	352	558	500	276	184	356	570	2796
SEABULK ARCTIC	WCY7054	Miami	31	35	27	8	32	42	36	211
SEAFISHER	WDD6122	Anchorage	0	4	0	10	23	1	0	38
SEAFREEZE ALASKA	WDE7203	Anchorage	1	6	0	14	10	9	0	40
SEAFREEZE AMERICA	WDH8281	Anchorage	16	21	18	3	8	18	25	109
SEAMAX GREENWICH	V7ER3	Anchorage	0	0	0	0	0	37	0	37

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SEASPAN FELIXSTOWE	VRBH8	Seattle	0	0	0	0	4	1	0	5
SEASPAN GANGES	VRMV8	Anchorage	5	8	6	17	30	22	32	120
SEASPAN HUDSON	VRNY4	Anchorage	0	0	0	57	34	39	13	143
SEASPAN OCEANIA	VRBI2	New York City	25	1	9	1	0	9	40	85
SEASPAN RIO DE JANEIRO	VRCR9	Anchorage	99	17	14	2	13	3	199	347
SEASPAN YANGTZE	VRNA8	Anchorage	1	7	0	18	0	0	5	31
SEASPAN ZAMBEZI	VRNF7	Anchorage	0	0	0	0	0	6	26	32
SECRETO	9V2732	Anchorage	54	43	50	42	24	28	65	306
SEOUL TRADER	9HA3782	Los Angeles	0	0	0	0	0	0	0	0
SESOK	WDE7899	Anchorage	0	0	0	0	11	7	8	26
SEVEN SEAS EXPLORER	V7QK9	Anchorage	42	50	96	56	32	30	40	346
SEVEN SEAS MARINER	C6VV8	Jacksonville	9	37	19	12	1	59	33	170
SEVEN SEAS VOYAGER	C6SW3	Anchorage	74	112	214	173	10	94	351	1028
SG FRIENDSHIP	HPOP	Anchorage	0	0	0	0	0	50	13	63
SHAKESPEARE BAY	VRQW9	Anchorage	0	0	4	6	6	18	5	39
SHANDONG DA CHENG	VRRB5	Anchorage	569	485	688	618	736	712	539	4347
SHANDONG DA DE	VRRB6	Anchorage	73	80	222	102	194	220	154	1045
SHANDONG DA REN	VRRI5	Anchorage	77	76	88	365	728	717	737	2788
SHANDONG DA ZHI	VRRI4	Anchorage	7	164	21	123	367	378	583	1643
SHARP ISLAND	VRRD5	Anchorage	0	0	2	0	0	18	28	48
SHERGAR	9V2731	Anchorage	0	0	0	13	93	89	4	199
SIANGTAN	9V9832	Seattle	57	33	29	18	0	0	0	137
SIGAS SILVIA	S6ES6	Anchorage	20	0	0	0	0	0	0	20
SIGRID DUNLAP	WDJ9975	Anchorage	0	0	0	0	0	6	11	17
SIKU	WCQ6174	Anchorage	0	0	0	126	180	135	127	568
SIKULIAQ (AWS)	WDG7520	Anchorage	162	668	742	562	641	537	740	4052
SILVER LAKE	VRDN6	Anchorage	17	27	28	7	9	7	19	114
SILVER SHADOW	C6FN6	Anchorage	0	0	0	0	1	2	0	3
SILVIO	9V2727	Anchorage	81	98	43	4	0	24	145	395
SINNDAR	9V2735	Anchorage	0	0	28	61	39	48	70	246
SNOHOMISH	WDB9022	Anchorage	0	0	0	0	0	0	0	0
SOL DO BRASIL	ELQQ4	Baltimore	52	39	40	51	60	62	46	350
SOMBEKE	ONHD	Houston	0	0	2	0	0	0	33	35
SONANGOL BENGUELA	C6YM7	Anchorage	44	17	5	11	32	22	25	156
SONANGOL ETOSHA	C6YM5	Anchorage	74	77	65	15	2	16	16	265
SONANGOL SAMBIZANGA	C6YM6	Anchorage	43	54	103	49	6	14	13	282
SOUND RELIANCE	WXAE	Anchorage	0	0	0	2	4	1	2	9
SPICA	A8QJ5	New Orleans	19	16	16	16	11	14	10	102

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
SPREAD EAGLE	9V2314	Anchorage	34	14	0	0	0	0	0	48
ST LOUIS EXPRESS	WDD3825	Houston	15	17	25	16	27	11	18	129
ST. CLAIR	WZA4027	Duluth	19	0	0	0	0	0	1	20
STACEY FOSS	WYL4909	Anchorage	0	0	0	0	0	22	3	25
STALWART	WBN6512	Anchorage	0	0	0	0	0	0	3	3
STAR EOS	LAUZ7	Anchorage	7	3	1	0	1	0	0	12
STAR FUJI	LAVX4	Seattle	3	0	0	0	0	6	6	15
STAR GRIP	LADQ4	Charleston	8	13	6	0	19	8	0	54
STAR HERDLA	LAVD4	New Orleans	43	6	34	22	13	13	0	131
STAR HIDRA	LAVN4	Baltimore	0	4	13	0	0	17	0	34
STAR ISFJORD	LAOX5	New Orleans	0	25	47	0	17	36	6	131
STAR ISMENE	LANT5	New Orleans	7	1	18	27	2	15	14	84
STAR ISTIND	LAMP5	Seattle	25	0	27	10	0	0	0	62
STAR JAPAN	LAZV5	Seattle	46	64	59	26	0	0	0	195
STAR JAVA	LAJS6	Baltimore	8	45	18	2	22	2	0	97
STAR JUVENTAS	LAZU5	Baltimore	0	0	0	7	0	1	5	13
STAR KILIMANJARO	LAIG7	Anchorage	0	0	2	13	10	22	24	71
STAR KINN	LAJF7	Anchorage	36	30	25	39	17	62	9	218
STAR KIRKENES	LAHR7	New Orleans	14	26	0	1	57	0	42	140
STAR KVARVEN	LAJK7	Seattle	4	0	19	51	0	0	0	74
STAR LAGUNA	LAPD7	Anchorage	0	0	0	0	0	0	22	22
STAR LIMA	LAPE7	Jacksonville	17	37	0	53	4	8	3	122
STAR LINDESNES	LAQJ7	Jacksonville	0	51	0	26	6	10	31	124
STAR LIVORNO	LAQM7	Houston	57	0	0	0	0	0	12	69
STAR LOEN	LAQN7	Anchorage	0	0	30	48	4	6	54	142
STAR LOFOTEN	LAQL7	Charleston	5	58	59	7	15	0	10	154
STAR LOUISIANA	V7SD8	New Orleans	18	68	2	24	41	10	0	163
STAR LUSTER	LAQO7	Anchorage	28	32	1	76	0	26	22	185
STAR LYGRA	V7FA7	Anchorage	1	9	0	0	0	5	34	49
STAR LYSEFJORD	LAQQ7	New Orleans	8	22	15	1	20	0	21	87
STAR MINERVA	V7GR8	Jacksonville	43	8	0	18	22	6	66	163
STATE OF MAINE	WCAH	New York City	0	0	0	0	25	74	52	151
STEWART J. CORT (AWS)	WDC6055	Duluth	384	0	77	602	736	709	688	3196
STI BATTERY	V7DR9	Anchorage	0	0	0	0	0	29	38	67
STIMSON	WDG2051	Anchorage	3	0	0	0	0	0	0	3
SUN RUBY	VRZU4	Anchorage	1	24	12	11	20	13	11	92
SUNLIGHT EXPRESS	3FMK7	Anchorage	8	18	29	4	1	4	43	107
SUNSHINE STATE	WDE4432	Miami	19	9	17	18	10	20	9	102
SUNSTAR	9V2728	Anchorage	0	0	0	0	0	1	0	1

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SUPERSTAR GEMINI	C6LG5	Anchorage	29	25	26	28	26	23	27	184
SUPERSTAR LIBRA	C6DM2	Anchorage	104	78	97	77	114	103	34	607
SYLVIE	VRCQ2	Anchorage	16	20	2	0	0	0	0	38
SYMI I	D5FL9	Anchorage	12	27	56	20	41	39	29	224
SYMPHONY OF THE SEAS	C6DF6	Miami	0	0	0	126	46	25	55	252
SYROS I	D5IV5	Anchorage	16	10	12	6	0	0	0	44
TAIHUA STAR	VRCT4	Anchorage	0	0	0	0	9	21	17	47
TAKU WIND	WDI9036	Anchorage	2	4	4	5	2	4	3	24
TALISMAN	9HA4613	Anchorage	0	3	17	0	0	6	30	56
TALISMAN	LAOW5	Jacksonville	7	5	42	41	57	48	65	265
TAMPA BAY	VRLQ9	Anchorage	22	10	16	15	18	0	3	84
TANGGUH HIRI	C6XC2	Anchorage	118	51	74	80	86	109	101	619
TARGET	9HA4710	Anchorage	0	0	19	4	0	0	0	23
TASMAN SEA	VRWX4	Anchorage	0	0	0	0	0	7	0	7
TEST_SHIP_AGAIN	SSNEW		0	0	0	0	0	0	0	0
TEXAS ENTERPRISE	KSDF	Houston	0	0	0	0	0	19	27	46
THOMAS G. THOMPSON	KTDQ	Seattle	1	72	17	40	17	1	8	156
THUNDER BAY	CFN6288	Duluth	6	0	0	5	6	12	7	36
TIGLAX	WZ3423	Anchorage	0	3	0	0	0	12	15	30
TIM S. DOOL	VGPY	Duluth	0	0	0	5	12	13	23	53
TORRENTE	A8VQ2	New York City	0	0	0	0	0	9	31	40
TRF KIRKENES	V7MT7	Anchorage	4	4	1	0	0	0	0	9
TROPIC CARIB	J8PE3	Miami	108	97	17	34	33	97	121	507
TROPIC EXPRESS	J8QB8	Miami	7	6	15	29	64	62	54	237
TROPIC JADE	J8NY	Miami	106	53	62	62	87	25	27	422
TROPIC LURE	J8PD	Miami	28	85	94	112	128	120	125	692
TROPIC MIST	J8NZ	Miami	23	22	99	71	32	159	91	497
TROPIC NIGHT	J8NX	Miami	158	102	51	23	75	60	235	704
TROPIC OPAL	J8NW	Miami	119	120	174	154	168	184	216	1135
TROPIC PALM	J8PB	Miami	58	48	49	35	45	46	59	340
TROPIC SUN	J8AZ2	Miami	91	87	99	91	76	99	76	619
TROPIC TIDE	J8AZ3	Miami	79	48	125	150	113	52	48	615
TROPIC UNITY	J8PE4	Miami	96	83	69	52	35	30	38	403
TS KENNEDY	KVMU	New York City	105	100	0	0	0	204	194	603
TUG DEFIANCE	WDG2047	Duluth	60	0	2	36	25	55	72	250
TUG DOROTHY ANN (AWS)	WDE8761	Duluth	32	321	737	201	516	509	744	3060
TUG MICHIGAN	WDF5344	Duluth	21	2	28	9	11	20	13	104
TUG SPARTAN	WDF5483	Duluth	0	0	0	1	2	7	1	11
TUSTUMENA	WNGW	Anchorage	34	38	14	0	47	74	57	264

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TYCO DECISIVE	V7DI7	Baltimore	21	20	0	9	14	0	5	69
UACC RAS LAFFAN	A8VG7	Anchorage	0	0	0	0	8	27	21	56
UNIQUE CARRIER	VRCV5	Anchorage	0	0	0	16	21	14	27	78
UNIQUE GUARDIAN	VRJM6	New Orleans	21	14	1	0	0	0	0	36
UNITY SPIRIT	C6BW3	Anchorage	11	0	16	10	0	7	8	52
USCGC HEALY (AWS)	NWS0003	Anchorage	0	0	0	0	0	110	743	853
USCGC POLAR STAR	NBTM	Seattle	59	22	26	0	0	0	0	107
VAIL SPIRIT	C6BQ8	Anchorage	4	4	0	0	4	7	5	24
VEENDAM	PHEO	Miami	193	147	193	154	108	50	49	894
VERMONT TRADER	9HYN7	Charleston	36	43	27	41	7	6	0	160
VISION	WDF6306	Anchorage	0	0	0	3	1	2	2	8
VISION OF THE SEAS	C6SE8	Miami	1	107	46	0	13	30	48	245
VOLENDAM	PCHM	Anchorage	361	303	436	377	323	419	547	2766
VOYAGER OF THE SEAS	C6SE5	Miami	39	37	23	6	0	2	5	112
W. H. BLOUNT	C6JT8	New Orleans	40	54	49	53	53	50	17	316
WALTER J. MCCARTHY JR.	WXU3434	Duluth	5	0	12	40	18	3	19	97
WASHINGTON	KLBO	Anchorage	1	4	1	0	0	2	7	15
WASHINGTON	WDI5795	Anchorage	0	1	4	11	37	6	6	65
WASHINGTON EXPRESS	WDD3826	Houston	22	12	3	3	0	1	20	61
WEST BAY	VRZP8	Anchorage	7	29	23	0	0	11	12	82
WESTERDAM	PINX	Miami	54	143	136	161	131	45	58	728
WESTERN NAVIGATOR	WDE6616	Anchorage	0	0	0	0	0	0	14	14
WESTERN RANGER	WBN3008	Anchorage	0	0	1	5	17	31	1	55
WESTWOOD COLUMBIA	C6SI4	Seattle	20	8	7	15	12	5	4	71
WESTWOOD OLYMPIA	C6UB2	Seattle	18	23	20	13	14	10	11	109
WESTWOOD RAINIER	C6SI3	Seattle	30	28	18	46	14	23	12	171
WHITEFISH BAY	CFN6287	Duluth	0	0	0	3	1	0	1	5
WILDERNESS ADVENTURER	WDF6885	Anchorage	0	0	0	1	5	9	8	23
WILDERNESS DISCOVERER	WDF7009	Anchorage	0	0	0	0	20	52	46	118
WILDERNESS EXPLORER	WDG2904	Anchorage	0	0	0	0	2	0	2	4
WILFRED SYKES (AWS)	WC5932	Duluth	0	0	0	0	368	717	308	1393
WISDOM ACE	3FGZ8	Norfolk	0	0	0	0	4	0	0	4
WOLDSTAD	WDI9874	Anchorage	0	0	0	3	0	0	1	4
XPEDITION	HC2083	Anchorage	6	2	9	12	5	3	16	53
YM ANTWERP	VRET5	Anchorage	15	14	10	13	13	33	1	99
YM MOVEMENT	3FVL4	New York City	0	0	0	19	0	0	3	22
YM ULTIMATE	V7IK7	Charleston	23	37	27	8	22	61	71	249
YM UNICORN	BLHI	Anchorage	0	0	8	18	48	331	2	407
YM UNISON	V7HU7	Anchorage	46	48	52	47	38	44	28	303

Ship Name	Call Sign	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Total
YM UNITY	A8HZ4	Anchorage	1	0	48	13	11	15	27	115
YM WELLHEAD	VROH8	Anchorage	29	20	22	24	14	25	4	138
YORKTOWN EXPRESS	WDD6127	Houston	1	0	8	43	26	28	6	112
ZAANDAM	PDAN	Anchorage	94	168	360	266	477	394	244	2003
ZIM CHICAGO	A8SI9	Seattle	0	0	0	86	66	59	131	342
ZIM DJIBOUTI	A8SI4	Seattle	0	0	18	6	49	48	25	146
ZIM ROTTERDAM	A8SI8	Charleston	0	0	0	0	3	93	81	177
ZIM SAN DIEGO	A8SI7	New York City	139	160	73	204	134	76	138	924
ZIM SHANGHAI	VRGA6	New York City	25	40	0	51	20	15	58	209
ZIM YOKOHAMA	A8MY4	Charleston	22	33	0	21	3	0	11	90
ZUIDERDAM	PBIG	Anchorage	142	176	130	113	122	129	51	863

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Intergovernmental Oceanographic Commission:

http://www.ioc-unesco.org/

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) 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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