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U.S. Department of Commerce
Dr. Kathryn D. Sullivan
Under Secretary of Commerce for Oceans and Atmosphere & Acting NOAA Administrator
Acting Administrator

National Weather Service
Dr. Louis Uccellini
NOAA Assistant Administrator for Weather Services

Editorial Supervisor
Paula M. Rychtar

Layout and Design
Stuart Hayes
NTSC Technical Publications Office

ARTICLES, PHOTOGRAPHS, AND LETTERS SHOULD BE SENT TO:

Ms. Paula M. Rychtar, Editorial Supervisor
Mariners Weather Log
NDBC (W/OPS 51)
Bldg. 3203
Stennis Space Center, MS 39529-6000
Phone: (228) 688-1457 Fax: (228) 688-3923
E-Mail: paula.rychtar@noaa.gov

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From the Editor

Hello and welcome to the December issue of the Mariners Weather Log. We have some great articles that I am sure you will find interesting and informative. One of our submissions comes from the Deutscher Wetterdienst, the German Meteorological Office and provides even more credence to the importance of ship observations. In keeping with that theme, I would like to expound upon the importance of marine observations and the ever growing need for the collection of environmental data across the oceans and in particular within the data sparse regions of the world. VOS, as you all know, is a global effort. One of our key issues and of great concern is the lack of data available within the remote regions of our oceans. Our never ending need to recruit vessels into VOS that are transiting through these locations continues to be a priority. In this effort, we have found some creative and unconventional methods to enlist the help of tall ships, training ships and yachts; engaging them in data collection, transmitting data real time and possibly in the deployment of drifting buoys. Automatic Identification System (AIS) gives new hope by providing a snapshot of ships traveling these areas; identifying these ships, making contact and enlist their help to our cause. It is also hopeful that the mandatory AIS messages can provide additional information such as sea level pressure data (at the very minimum) from all ships traversing across the oceans. This would compliment our data collection and our ability to provide better model guidance and climate studies.

A warm wish to all of you, that you may have a safe and happy holiday season. Be patient and kind, and treat others as you would like to be treated. Some of you reading this are far from home and away from family and friends. I want to take this opportunity to thank you for all that you do, and remember…. ***Only YOU know the weather at your position! Report it!***

- Paula

On the Cover: Near flat calm mid Pacific Ocean. Image from the National Data Buoy Center (NDBC) archives.

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The Importance of Weather Observations On Board Ships – The Experience of AS VICTORIA

-Submitted by: Horst von Bargen, Deutscher Wetterdiens – Hamburg, DE
Horst.Bargen-von@dwd.de
-Written by: J. Jansen, C. Lefebvre

Weather observations and measurements are regularly undertaken by the Voluntary Observing Ships (VOS). Their importance was recently recognized by an award given to the crew of the **AS VICTORIA**, which belongs to the shipping company, Ahrenkiel Steamship Group, Hamburg Germany. In April 2016 it received a certificate of "Recognition of Special Service" of the *India Meteorological Department* (IMD) in appreciation of their contribution to marine safety and public welfare through their special weather observations from the area of the tropical cyclone *MEGH*, November 2015. The *India Meteorological Department* has been designated as Regional Specialized Meteorological Centre (RSMC) New Delhi; which is responsible for the monitoring and prediction of cyclonic storms in the Arabian Sea and the Bay of Bengal. The weather observations produced by the **AS VICTORIA** improved the analysis of *Tropical Cyclone MEGH* and lead to an improvement of the prediction of the future course of the storm, from which the crew of the **AS VICTORIA** benefited from later.

The Development of *MEGH* along the Route of the AS VICTORIA

On November 4, while **AS VICTORIA** was on her way from Singapore to Suez, she continuously observed and reported the weather conditions. At the same time a tropical low developed over the Arabian Sea around 14 N and 67 E. A positive Indian Ocean Dipole (IOD) (**see information box**) provided sea surface temperatures (SST) above 29 °C and low vertical wind shear provided favorable atmospheric conditions for intensification. *MEGH* intensified into a tropical storm on November 5th while moving westward. (Distance to the ship about 250 nm at 12 UTC).

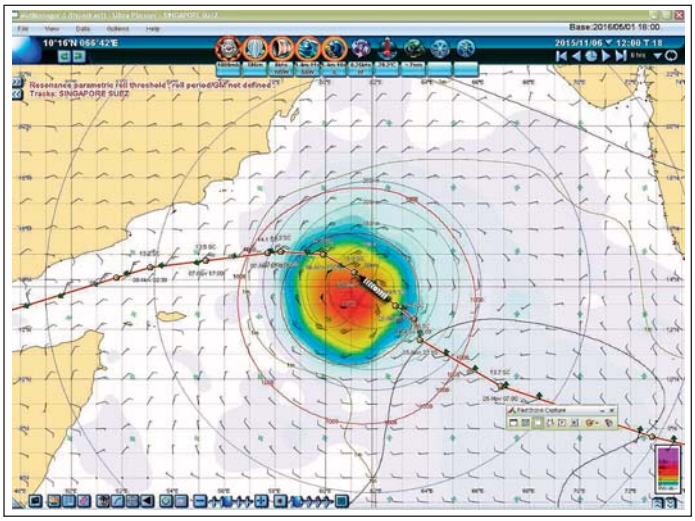


Figure 1: Weather conditions and position and way of AS VICTORIA, 6 November, 12 UTC (Source: AS Victoria)

Although dry air was being entrained into the circulation, the storm continued to intensify on November 6th. It developed into a small system with a convective core of 150 nm in diameter and a well-developed pinhole eye. On November 6th, **AS VICTORIA** crossed the track of *MEGH* with the intention to approach the NE-sector to use favorable winds and to overtake the cyclone. At 12 UTC the vessel was positioned only 38 nm from the center (**Figure. 1**) and reported wind speeds of Beaufort wind 8 from SSE and a wave height of 1.5 m (**Figure. 2**). The maximum wind near the eye at this time was 45 kts (Beaufort wind 9) (**Table. 1**). **AS VICTORIA** succeeded in reaching an appropriate location to the north resp. north-west, in the following of *Tropical Cyclone MEGH*, which continued to intensify. On November 7th, *MEGH* increased to hurricane force and on the 8th it reached peak intensity with maximum wind speeds up to 110 kts for a period of 3 hours (06 – 09 UTC).

Rufzeichen	Jahr	Mon	Tag	Stunde	Breit	Breite	Lae	Laenge	DS	VS	DD	FF	BFT	TT	TF	TD	RH	PPPP	A	PPP	W	WW	W1	W2	TW	TW	NH	CL	CM	CH	PW	HW
A8S07	2015	11	05	06	+	0960	+	06710	6	3	27	004	02	+340	290	275	069	10120	0	005	98	02	1	1	+	270	3	1	4	6	02	02
A8S07	2015	11	05	12	+	1020	+	06580	7	3	28	010	03	+310	270	257	073	10092	2	08	96						5	6	1		04	01
A8S07	2015	11	05	18	+	1090	+	06470	7	3	10	004	02	+290	260	249	079	10105	1	010	97	03	1	1	+	280	3	7	7	8	04	03
A8S07	2015	11	06	01	+	1190	+	06360	8	3	25	014	04	+290	260	249	079	10088	3	008	96										04	01
A8S07	2015	11	06	06	+	1280	+	06290	7	3	27	019	05	+290	280	277	093	10102	4	000	94	03	2	2	+	270	5	7	7	2	03	03
A8S07	2015	11	06	12	+	1360	+	06180	7	3	15	038	08	+260	249	246	092	10050	7	012	95						5	6	7		05	03
A8S07	2015	11	07	00	+	1500	+	05940	6	3	07	014	04	+260	249	246	092	10094	2	006	96										05	02
A8S07	2015	11	07	12	+	1480	+	05640	6	3	05	012	04	+290	250	235	072	10093	6	007	96						5	7	7		04	02
A8S07	2015	11	08	12	+	1370	+	05080	6	3	05	010	03	+300	270	260	079	10112	7	003	96						3	4	1		04	01
A8S07	2015	11	09	00	+	1290	+	04830	6	3	01	008	03	+270	230	213	071	10120	6	010	97	03	0	0	+	240	5	7			01	00
A8S07	2015	11	10	00	+	1300	+	04310	7	3	14	015	04	+270	250	243	085	10100	6	020	97	01	2	2	+	240	1	1	4		01	02

Figure 2: Weather observations by AS Victoria received at DWD (Source: DWD)

Vmax: Maximum sustained winds (1 min-average)					
DATE	UTC	Lat.	Long.	Vmax	Air Pressure
04.11.	06.00	13.7N	67.8E	25	1004
	12.00	13.8N	67.0E	25	1004
	18.00	13.9N	66.3E	25	1004
05.11.	00.00	14.0N	65.9E	30	1000
	06.00	14.1N	64.9E	35	996
	12.00	13.9N	63.9E	35	996
	18.00	13.7N	63.4E	40	993
06.11.	00.00	13.4N	62.7E	40	993
	06.00	13.2N	61.9E	45	989
	12.00	13.1N	61.4E	45	989
	18.00	13.0N	60.7E	45	989
07.11.	00.00	12.9N	60.0E	50	985
	06.00	12.8N	59.2E	60	978
	12.00	12.8N	58.3E	75	967
	18.00	12.8N	57.2E	90	956
08.11.	00.00	12.7N	56.1E	90	956
	06.00	12.6N	54.9E	110	941
	12.00	12.7N	53.5E	100	948
	18.00	12.3N	52.3E	95	952
09.11.	00.00	12.2N	51.0E	90	956
	06.00	12.3N	49.6E	55	982
	12.00	12.5N	48.6E	45	989
	18.00	12.6N	48.1E	35	996
10.11.	00.00	12.8N	47.7E	.30	1000
	06.00	13.1N	47.1E	25	1004
	12.00	13.6N	46.5E		
	14:30	13.9N	46.6E		

Table 1: Re-analysis by the Naval Research Laboratory (NRL), Monterey CA. (Institution of Joint (U.S. Air Force and Navy) Typhoon Warning Centre (JTWC))

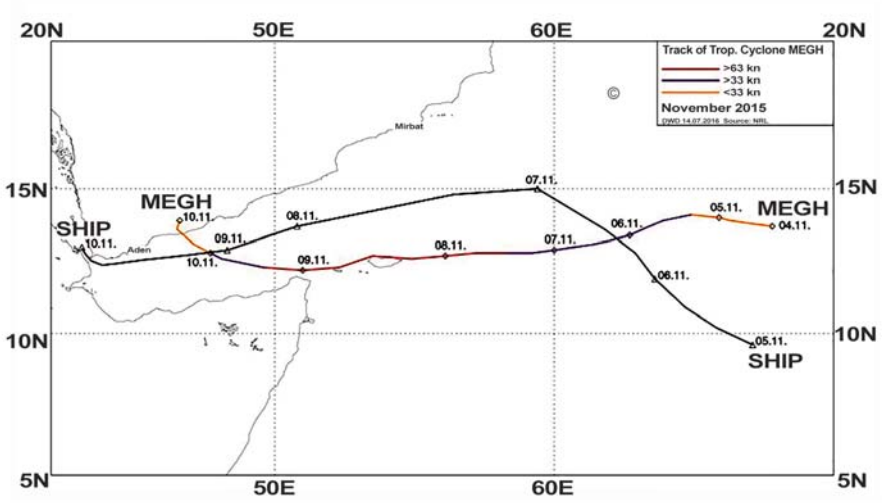


Figure 3: Track of Tropical Cyclone MEGH and the way of AS Victoria (Source: DWD)

The radius of hurricane-force winds was about 15 nm, gale-force winds 40 to 45 nm. Meanwhile the distance of **AS VICTORIA** to the storm center had increased to more than 160 nm. During this time the eye of *MEGH* had started to cross the northern coast of Socotra and the interaction with land weakened the cyclone (**Figure. 3**). Continuing its westward movement *MEGH* weakened further over the Gulf of Aden due to cooler SST, the entrainment of dry air, and land interaction over the Arabian Peninsula and Somalia. On November 10th, the system now downgraded to a depression, made landfall in Yemen.

The average forward speed during the entire life cycle was 8 – 9 kts; on the 8th and 9th, however, *MEGH* moved at a speed of 10 – 12 kts.

Why are Observations by Ships Still Essential in the Era of Weather Satellites?

Meteorological satellites (geostationary at an altitude of about 36.000 km and sun-synchronous at a height of about 850 km) provide images and data in numerous spectral ranges. Their advantage is the generation of region-wide measurements. They allow us to receive information also from areas where there are no weather stations.

The parameters are not measured directly, but are derived from electromagnetic radiation of the Earth's surface, the atmosphere as well as from reflected signals emitted from radar and sonar instruments by applying extensive computational procedures. By combining several spectral ranges, a variety of meteorological parameters may be derived. This enables us to obtain information about the atmospheric properties and phenomena such as clouds and precipitation, but also about oceanographic surface parameters like sea surface temperature and wind speed. But it is not always possible to derive all parameters. Heavy rain e.g. impedes the view of the sea surface and therefore the derivation of the wind speed from wave characteristics. Above all, the direct measurement of air pressure from space is not feasible. Ship observations are used as a ground-based reference to calibrate measurements from satellites and the applied algorithms and to evaluate their correctness.

Surface-based measurements e.g. onboard of ships are indispensable for weather analysis and prediction as well as for long-term climate analysis. Therefore, ship observations provide an essential contribution - not just in individual cases – to the safety at sea.

J. Jansen, C. Lefebvre

Info-Box:

The Indian Ocean Dipole (IOD) , also known as the Indian El Nino, is an irregular oscillation of sea-surface temperatures in which the western Indian Ocean becomes alternately warmer and then colder than the eastern part of the ocean.

MEMORIES OF MY LIFE WITH GREAT LAKES BOATS

By Skip Gillham
Article courtesy Inland Seas Quarterly Journal
http://www.inlandseas.org/inland-seas-quarterly-journal/

Introduction by Al Hart:

Many of our readers are familiar with the name Skip Gillham. Inland Seas® asked the GLHS member to reflect on his 50 years of writing marine history, how he became interested in the ships of the Great Lakes and how this has developed in the past half-century.

RENVOYLE, part of the original set of photos given to me by John H. Bascom.

Looking back, I can reflect on how the influence of others developed my personal interest in the ships of the Great Lakes. I grew up in Toronto, once a very busy port with lakers and pre-seaway salties coming and going on a regular basis. I was an only child and, when my mom got sick in the mid-1940s, my dad would take me out for a few hours on a Saturday or Sunday afternoon. Our habit was to go to High Park, a large grass and forested area in the west end of the city, to feed the animals such as the deer, buffalo and a camel. We would then drive along the lake to see the boats. My dad had a notebook where he recorded the names of the ships that we saw and this routine carried on for a few years. When my mom succumbed to her illness, life changed. My father re-married a widow with three children and we moved into their house in the suburb of Etobicoke. Weekend afternoon activities became sports with family and neighbors but I remember regularly reading the Toronto newspaper features "Shipping On The Lakes" the *Toronto Star*, "On The Waterfront" in the *Toronto Telegram* and even "Vessel Movements" in the *Toronto Globe & Mail*. My interest was still there even if I was not going to the docks every weekend. Sadly, these three columns have long since disappeared.

One afternoon my dad, who worked in insurance, came home with about 18 ship photos that had been given to him for me by an insurance colleague John H. Bascom. I now had the start of my photo collection. The only ship in the group that I had ever seen was the **RENVOYLE**, a regular trader in and out of the Canada Steamship Lines docks at Toronto, so that became my favorite ship. I still have all of those original photos. Mr. Bascom, and later his son Jay, have been a great encouragement to me and set a standard for careful research, keeping records and preserving photos. That set me in the right direction for a time when I too would be writing about the ships.

Another influence in these early years was our neighbor George R. Donovan Jr., who managed Lakeland Tankers, a Canadian subsidiary of Cleveland Tankers and Ashland Oil. He graciously invited my dad, step-brother and I to go to the docks one evening and board the company tanker **MAKAWELI**, which was unloading. It was my first time to board a lake ship. I only wish I had had a camera.

By 1960, I was out of high school and attending the University of Toronto to obtain a degree in history. By then I had a cheap camera with points earned earlier for getting new customers on my newspaper

route. I spent three summers working at a day camp at Centre Island, across the bay from the downtown core of the city, and each day we rode the ferry to and from the island. I always had my camera along and was soon taking photos of the ships I saw at the docks or on Toronto Bay. These photos were added to the ones that Mr. Bascom had given me years earlier.

MAKAWELI in the Welland Canal on November 12, 1955. First ship I ever went aboard. Jay Bascom photo.

In 1963, I graduated from U. of T. but had decided to pursue a second degree in Physical Education at McMaster University in Hamilton. This required more money than I had been making at the island. I thought about my longtime interest in the ships and began writing the oil companies about a summer job. The replies were encouraging and came from Imperial Oil, Shell Oil and Porter Shipping but the first with a concrete offer was my old neighbor Mr. Donovan. He had a position open as an oiler on his second tanker, the **LUBROLAKE**. I climbed aboard in Lock 8 at Port Colborne in the early morning hours of May 13, 1963, and I was off on a life changing adventure. The opportunity to sail gave me a chance to see new parts of Canada from the perspective of the water. I marveled at the beauty of the Thousand Islands, the impressive skyline of Montreal as we departed the Seaway for the first time, the farms along the lower St. Lawrence and the towns centered around the parish church just like the school textbooks had described. Perhaps the most inspiring was the magnificent Saguenay River when we headed to Chicoutimi to unload one of the various grades of fuel we carried that summer.

The weeks went quickly and when I left the **LUBROLAKE** in Kingston to take the bus home, I not only had the money for the next stage in my education, I had also gained an education about the geography of my country. What followed was my last and most enjoyable year as a student, a career as a high school teacher that spanned 33 years with an additional ten years as a volunteer coach in my sports of cross country, and track and field. I had another discovery that summer — the ships my dad had recorded in his notebook were disappearing. What became of them in this new era of the St. Lawrence Seaway was a question I wanted to answer. Somewhere, I stumbled upon the journal *Telescope of the Great Lakes Maritime Institute* and discovered I could get a monthly magazine about the ships of the Great Lakes. I joined immediately and was soon sending them Toronto news and seeing my name in print.

I took a photo of the French Line freighter **MARQUETTE** at the Toronto dock at the foot of Yonge Street in July 1960 and sent that to *Telescope* when that ship caught fire in the Atlantic on July 21, 1964. They printed it in the July 1964 issue. I was getting hooked. *Telescope* also published my first article “Reprieved Canallers” in their January 1965 issue.

I began my teaching career in the town of Waterford, Ontario, but came home to see my parents many weekends and occasionally found time to visit the Toronto waterfront. My first fall as a teacher, with a day off for Remembrance Day, I journeyed to the Welland Canal for the first time to take photos of ships. My collection was beginning to grow.

I discovered that Upper Lakes Shipping printed a newsletter called *Ship-Shore Digest* and I

was fortunate when they added me to the subscribers list. Lou Cahill, through his public relations firm Ontario Editorial Bureau, produced the publication and he soon became a good friend, a great help and a wonderful encouragement in future projects.

Two other friendships developed at this time. I began corresponding with George Ayoub and Dan McCormick, and exchanging news and photos. Both were a wonderful influence and a great example of keeping ship records. Dan and I both coached cross-country running, so he organized the Can-Am Invitational Cross Country Meet at Massena, New York, in 1970 so we could get together. I took some of my team and this provided me with an opportunity to meet Dan and his family. The fall running event continued into the mid-1980s, and when I meet my athletes from that era, they still talk about those races.

The LUBROLAKE at Montreal when I was part of the crew in May 1963. Skip Gillham photo.

MARQUETTE at Toronto in July 1960, the first photo I ever had published.

Towards the end of our trips to Massena, Dan had retired and the meet was now called the Daniel C. McCormick Invitational Meet in his honor and I was thrilled when my son earned a ribbon with Dan's name on it. I also have Dan to thank for choosing me to be his successor as Regional News Editor for *Steamboat Bill*, the quarterly journal of the Steamship Historical Society of America. I assumed that position in 1973 and remained in that capacity for 37½ years, a total of 150 columns, before passing the torch to Mark Shumaker in 2011.

During one of my canal visits in 1965, I came across a gentleman hiking down the canal road with a briefcase. I had heard about Rev. Cameron Orr and the Welland Canal Mission while I was onboard the **LUBROLAKE** and had gone to summer camp with two of his sons.

Although we had never met, I was pretty sure that this hiker was the chaplain, so I stopped and offered him a ride. He accepted and, after chatting, he told me he was about to board the steamer **BLACK BAY** in Lock 3 and asked if I would like to join him. I did not take long to answer. I was impressed with the chaplain, his interest in and concern for the sailors. That meeting began an association with the Welland Canal Mission that still lasts. They invited me to join their Board of Directors in 1970 and two years later, they elected me President of the Board. I have been re-elected every two years since and continue in the capacity of President to this writ-

ing. I remain impressed with the work of the mission that dates from 1868 and the fact that only four men have served as chaplain in the 146 years since the mission began. They have indeed been "four men, called of God, to a lifetime of service" to the sailors and their families.

In 1967, a chance meeting under the Bluewater Bridge in Port Huron with marine photographer Paul Michaels was another of those important moments, much like the day John Bascom sent photos home with my dad. Paul sold ship photos so I began filling the gaps in my collection of the ships I remembered but, of which, had not yet obtained photos. I would order photos from Paul almost monthly and he and I became good friends for the rest of his life.

Now married, my wife and I moved to Vineland in the Niagara area in 1968 to continue my teaching career at Beamsville D.S.S. I discovered that the local *St. Catharines Standard* newspaper had a column called "Ships That Ply The Lakes" each Saturday. I read Capt. Geoffrey Hawthorn's feature, which had begun in 1956, and continued until he died in July 1969 at the age of 73. I applied to be his successor and persistence paid off as I had to write the editor three times before it was decided that I should continue the series. I recall my eager anticipation of seeing my first story on the Parkdale when it appeared on March 14, 1970.

I have now written well over 2,000 "Ships That Ply The Lakes" columns in the *Standard*; have surpassed 1,500 in the *Port Huron Times Herald*, which began on a seasonal, but now year-around, basis, in 1973; over 1,000 shipwreck columns in various West Niagara area weekly papers; and many hundreds more during my run as a columnist with the *Dunnville Chronicle*, *Port Colborne News* (now *Port Colborne Leader*), *Collingwood Enterprise-Bulletin*, *Midland Free Press*, *Goderich Signal Star*, *Sarnia Observer* and *Thorold Niagara News*. At present, I am in eight different papers per week with six completely different stories as my *Thorold* column also runs in the *Pelham News* and *Inport News*. I also write a regular column for *Mariners Weather Log*, have contributed stories to a variety of other newspapers, historical journals, corporate publications and the News Channel of the "Boatnerd" website.

My contact with Upper Lakes Shipping through *Ship-Shore Digest* opened my eyes to opportunities to write for other companies and this has included close to 40 years with Canada Steamship Lines doing a feature called "Yesterday's Fleet" in their newsletter *CSL World*. I have also done stories for Fednav and their publication *Spanner* as well as for the Misener and Paterson fleet newsletters.

My first book, S*hips Along the Seaway*, was published by Stonehouse Publications in 1972. I produced four books in this series and, with the help of the aforementioned Lou Cahill, I teamed with the late Al Sykes to write *The Pulp and Paper Fleet: A History of the Quebec & Ontario Transportation Co*. in 1988. This opened a new concept for me of doing corporate histories. While some I did on my own, it also led to teaming up with some well-known marine historians and photographers to do books for Stonehouse Publications, its successor Riverbank Traders, as well as Vanwell Press.

When I retired from teaching in 1997, my wife and I created Glenaden Press to begin producing our own books. These have included various fleet histories, shipbuilding and shipwreck books as well as *The Visitors Guide to the Welland Canal*. But we have also done some community history, one on the history of the summer camp we attended, our church's anniversary, the history of the Welland Canal Mission, some family history, family genealogy, sports statistics books, family travels and a ten-volume series called *Birds and Nature* for my grandchildren. All of these limited-edition booklets are only done in small press runs of about 25 copies or less and given to friends and family. For those who have wondered, the name Glenaden Press comes from Glenaden Avenue, the name of the street where I lived in Etobicoke.

I am fortunate to have worked with outstanding marine historians and photographers who

served as co-authors in my various books. These have included Jay Bascom, Ron Beaupre, Bruno Boissonneault, Tom Brewer, Dave Bull, Steven Duff, Buck Longhurst, Mac Mackay, Dan McCormick, Skip Meier (in a book not yet published), Gene Onchulenko, Gerry Ouderkirk, Don Revell, Alfred Sagon-King, Vern Sweeting, Al Sykes, Dick Wicklund and Garnet Wilcox.

PARKDALE, inbound at Port Colborne, on September 2, 1968, the photo used in my first "Ships That Ply The Lakes" column. Photo by Skip Gillham.

I must also express thanks to my "spy network" who have provided me with news, photos and information over the years. Anything I may have accomplished could not have been done without the long-term and consistent help of the individuals already mentioned throughout this write up as well as others such as Barry Andersen, Jim Bartke, Rene Beauchamp, BillBruce, Jeff Cameron, Bob Campbell, Michael Cassar, Marc Dease, Terry Doyon, Alex Duncan, Jeff Dwor, Steve Elve, Hubert Hall, Alfred King, Ken Lowes, the Marine Room of the Milwaukee Public Library, Selim San, Jim Sprunt, Robert Walton, and many, many more in years gone by and in more recent years. To all, I say thank you for helping me over the past 50 years.

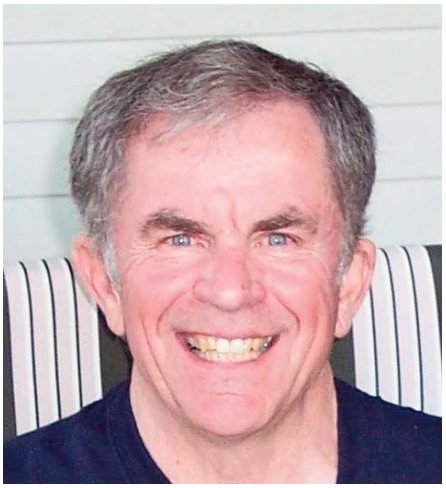
I must also say thanks to the who have purchased my various books to keep the publishing venture going. It has meant a lot to have orders for the next book from people I have never had the privilege of meeting but whosenames were recognized as former customers. I thank each one. I have been fortunate to have a good pension so I did not have to write books for profit. Good thing! My goal has been to pay for the cost of printing each book and have enough left over for the next one. From the beginning, this has worked for Glenaden Press.

Lastly, I extend thanks to my wife Carol and our family. I have been able to use photos from five generations of family beginning with an old image taken by my maternal grandfather M.O. Hammond, who was a well respected journalist and photographer in his day, plus those of my dad, wife, two brothers-in-law, two sons, both daughters-in-law and, as of 2014, five grandchildren. I am truly thankful!

On board the SAGUENAY with Rev. Cameron Orr in 1971. Rev. Cameron Orr photo.

SKIP GILLHAM
1941 - 2016

May the road rise up to meet you, may the wind ever be at your back, may you find old friends waiting to greet you, there on the outside track.



We're gathered together old times to remember, 'tis but for ourselves we would grieve, so we'll sing you a chorus and bid you farewell – fair winds and a following sea.

It is with profound sadness that we must bid farewell to one of our longtime contributors of the *Mariners Weather Log*, Skip Gillham. Skip, without fail, had a never-ending offering of stories of ship wrecks in the Great Lakes. Skip fast became a friend and colleague to me and over the years I looked forward to "ringing" him up for a quick catch up on life before taking care of business. The conversations with Skip would most certainly turn to his family bursting with great enthusiasm whenever the discussions involved pending family vacations.

When I first took my position as Editorial Supervisor of the *Mariners Weather Log*, it was Skip who actually called to remind me (from time to time) to send out the email reminder for article submissions. He was so gracious, patient and kind; never once did he make me feel anything but appreciative to receive those little "heads up" notes or quick calls. I guess after providing three articles a year, since 1998, he was pretty in tune with how things ran, and I was glad for the help. I sure will miss him and all of those articles. I think it would be a grand idea to run some of his older articles from time to time. His stories are timeless and amazing pieces of history.

Skip lost his battle to cancer this past July at age 75.

http://www.stcatharinesstandard.ca/2016/07/30/skip-remembered-for-marine-passion

The previous article was a story written by Skip and originally printed in the Inland Seas Journal, spring of 2015. http://www.inlandseas.org/inland-seas-quarterly-journal/

Relation Between Significant Wave Height and Wind Speed at 10 m during Hurricane Wilma

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

In the August 2016 issue of this Journal, the author presented following formula for wind seas,

$$H_s = aU_{10} - b, \quad (1)$$

Here H_s and U_{10} are the significant wave height in meters and wind speed at 10 meters in meters per second, respectively. The coefficients "a" and "b" need to be determined from field measurements.

When Hurricane Wilma in 2005 was over the Northwestern Caribbean Sea, simultaneous measurements of H_s and U_{10} were made at Buoy 42056 by the National Data Buoy Center (NDBC) (for the location of this buoy and Wilma's track, see http://www.ndbc.noaa.gov/hurricanes/2005/wilma/). On the basis of these measurements, **Figure 1** is presented, which indicates that

$$H_s = 0.42\ U_{10} - 2, \quad (2)$$

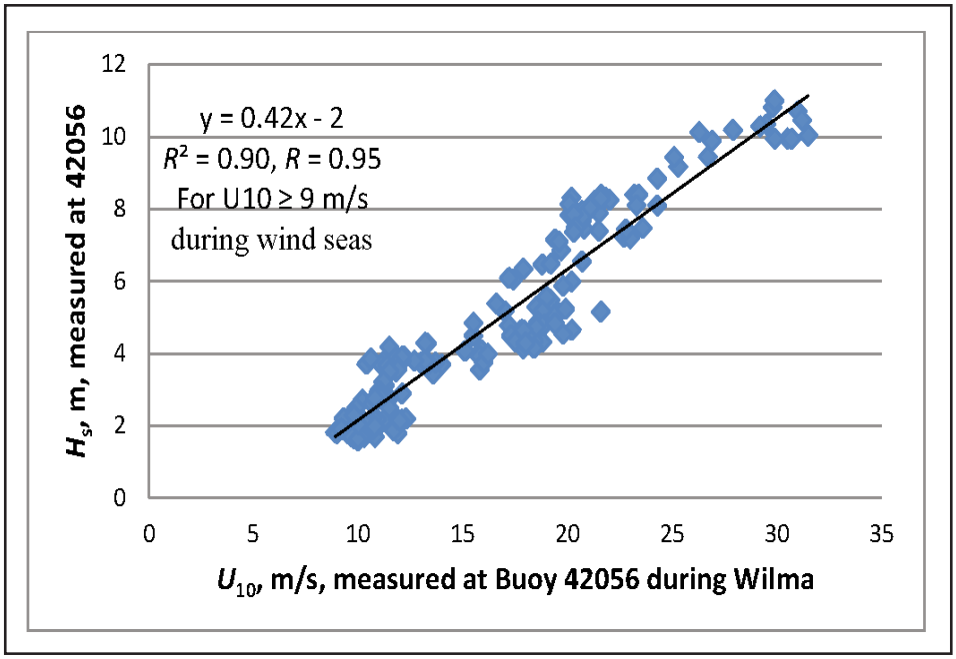


Figure 1. Relation between H_s and U_{10} at 42056 during Wilma.

Since the correlation coefficient (**R = 0.95**) is very high or the coefficient of determination (**R^2) = 0.90**, meaning that 90% of the linear variation between H_s and U_{10} can be explained, **Equation (2)** is thus recommended for estimating H_s from U_{10} or vice versa under hurricane conditions.

Mean Circulation Highlights and Climate Anomalies

May through August 2016

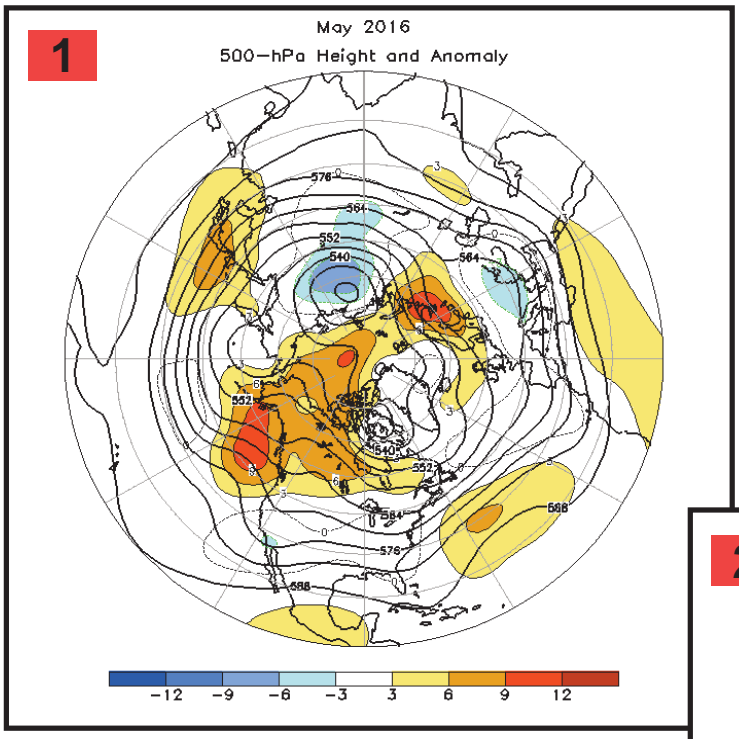
Anthony Artusa, Meteorologist, Operations Branch,
Climate Prediction Center NCEP/NWS/NOAA

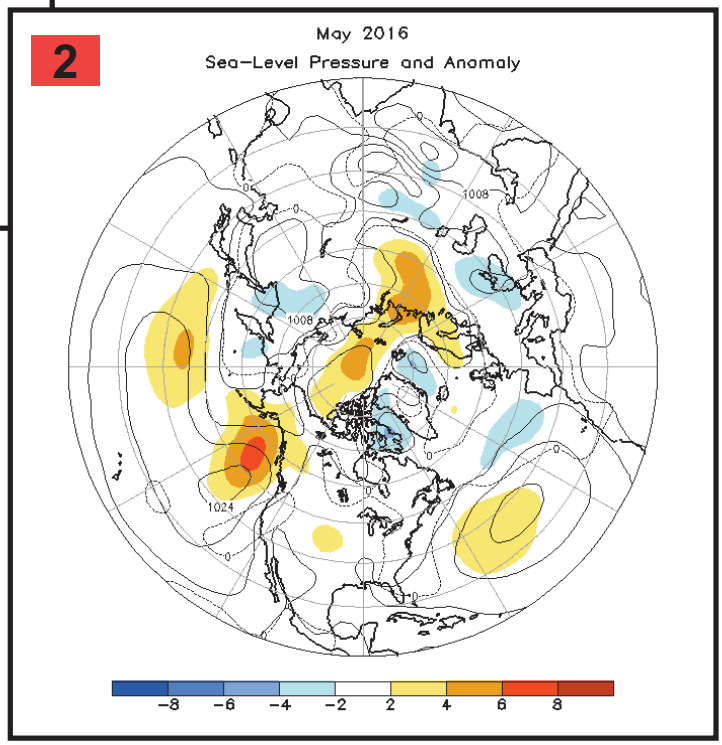
All anomalies reflect departures from the 1981-2010 base period.

May - June 2016

In May 2016, the mid-tropospheric flow pattern featured above average heights over the Gulf of Alaska, Canada, the temperate latitudes of the North Atlantic, and northern Europe **Figure 1**. Below average heights were observed across much of Siberia, and southeastern Europe. The Sea Level Pressure and Anomaly map (SLPA) mirrored the 500 hPa flow pattern **Figure 2**. During February, 500 hPa heights were above average across the subtropical North Pacific, western North America, the North Atlantic, and from the eastern Mediterranean region to central Asia, continuing northward to (and including) the Arctic Ocean **Figure 3**.

In June, the 500 hPa flow pattern was characterized by above average heights from the north central Pacific to extreme eastern Siberia, north central Russia, the western contiguous U.S., and the high latitudes of the North Atlantic **Figure 3**. Below average heights were mostly confined to the north of Alaska, covering about one half of the Arctic Ocean. The SLPA pattern resembled the 500 hPa height anomaly pattern **Figure 4**.

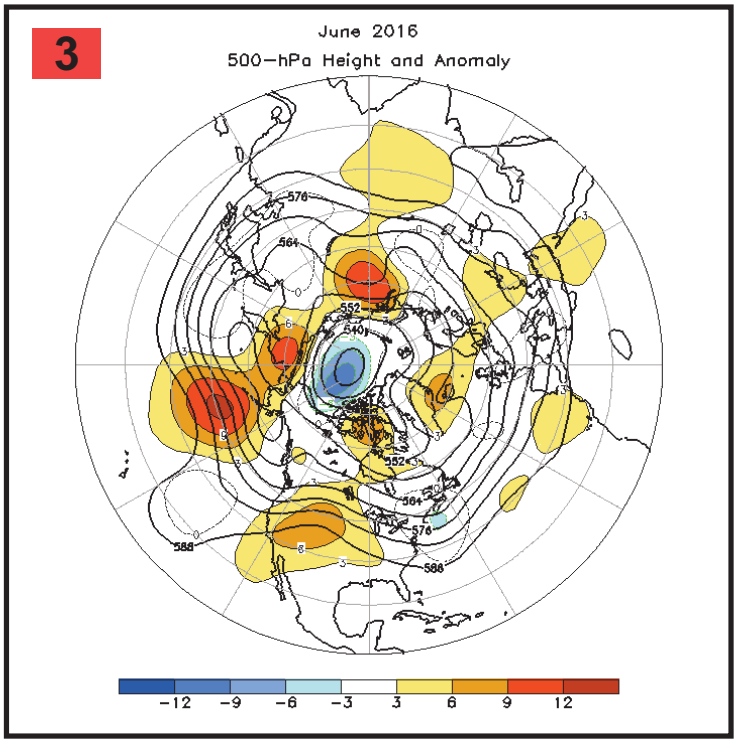




Caption for 500 hPa Heights and Anomalies: Figures 1,3,5,7 Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis). Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures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

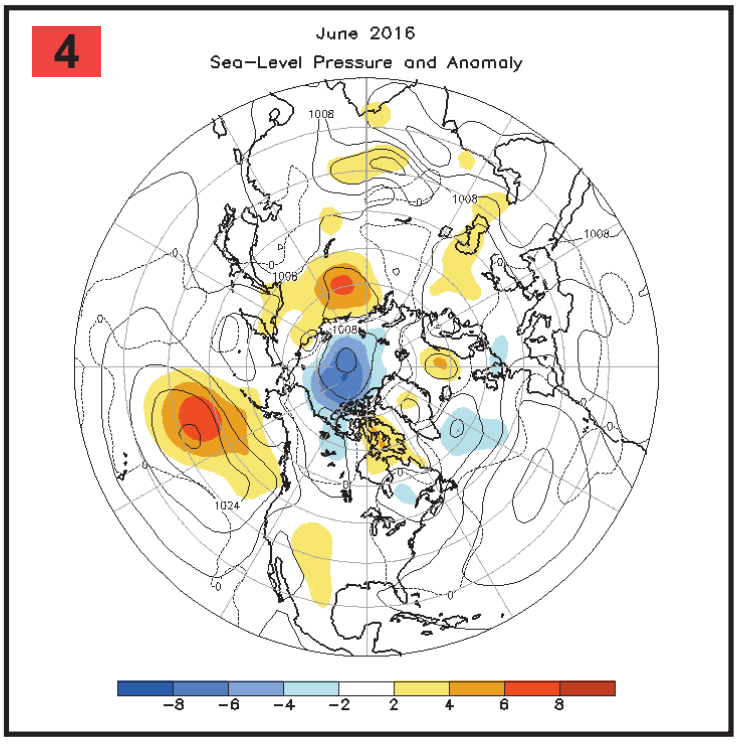
Caption for Sea-Level Pressure and Anomaly: Figures 2,4,6,8 Northern Hemisphere mean and anomalous sea level pressure (CDAS/Reanalysis). Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is indicated by shading. Anomalies are calculated as departures from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

The Tropics



During May and June, sea surface temperatures (SSTs) were near average across the central and eastern equatorial Pacific. The monthly Nino 3.4 indices were +0.3C in May and -0.1C in June. The depth of the oceanic thermocline (measured by the depth of the 20C isotherm) was below average in the central and eastern during the 2 month period. Low level (850 hPa) and upper level (200 hPa) wind anomalies were close to long term averages across the central and eastern equatorial Pacific in both May and June. Convection was also close to average across the equatorial Pacific during this two month period. Collectively, these oceanic and atmospheric anomalies are consistent with a transition from El Nino to ENSO Neutral conditions.

During May and June, there were a total of five Tropical Storms around the globe, with three in the northern Atlantic Ocean and two in the northern Indian Ocean. In the Atlantic basin, Tropical Storm Bonnie briefly affected the South Carolina coast, but remained mostly off the Southeast U.S. coast. Colin tracked from the northern Yucatan to the central Florida Panhandle and Georgia coast, while Danielle appeared for a brief time over the Bay of Campeche. In the northern Indian Ocean, Tropical Storm Roanu affected the northwest Bay of Bengal, while Tropical Storm Two influenced the northern Arabian Sea.

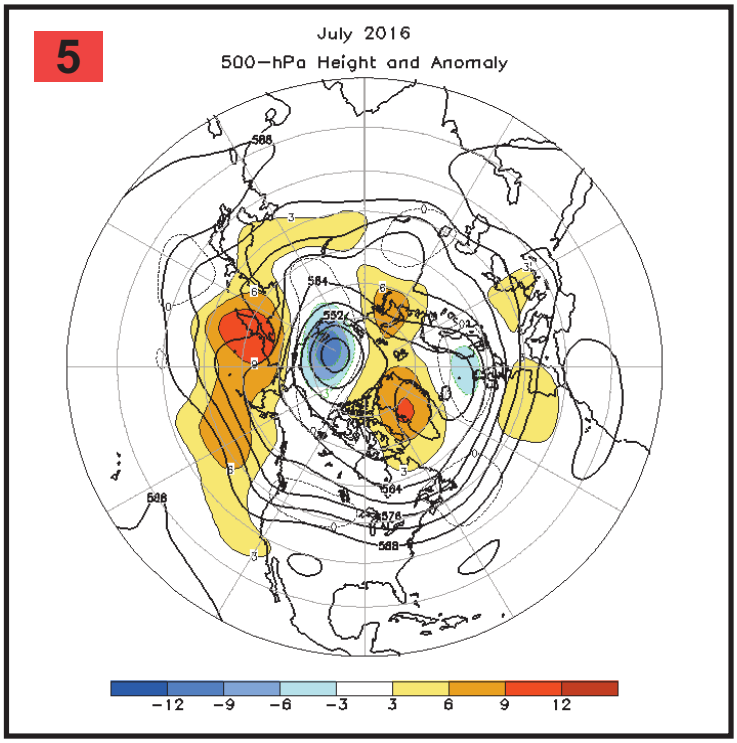


June - August 2016

During July, the 500 hPa circulation was characterized by above average heights across the high latitudes of the North Pacific, Greenland, and in the vicinity of the Russian arctic island of Novaya Zemlya **Figure 5**. Below average heights were observed over the Arctic Ocean bordering the Siberian coast, and near Scandinavia. The SLPA pattern roughly resembled the associated mid tropospheric height anomaly pattern **Figure 6**.

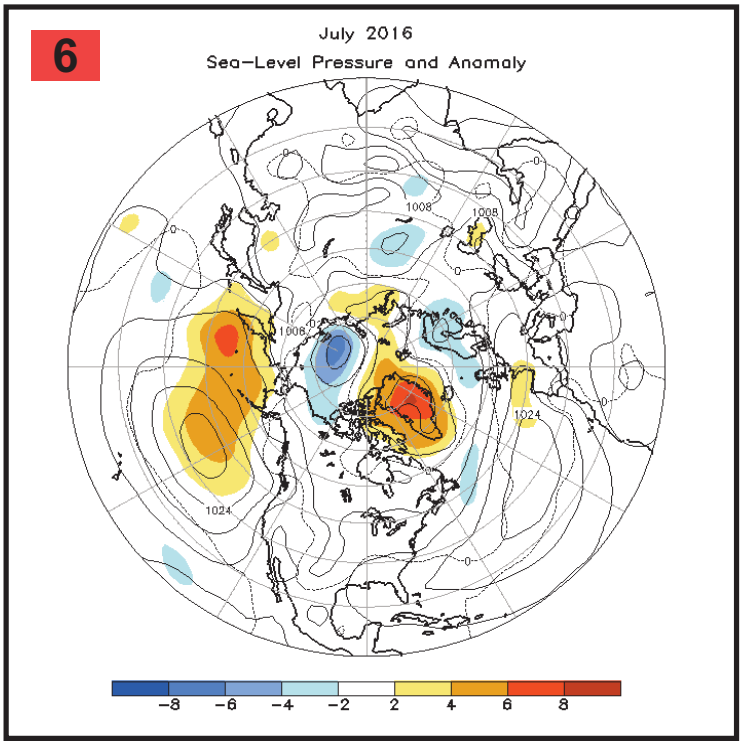
The mean circulation pattern in August featured above average heights over western and eastern portions of the North Pacific, northern Alaska and northern Canada, and western Russia **Figure 7**. Below average heights were generally limited to the vicinity of the North Pole, and the mid to high latitudes of the North Atlantic. Once again, the SLPA pattern mirrored the 500 hPa height anomaly pattern **Figure 8**.

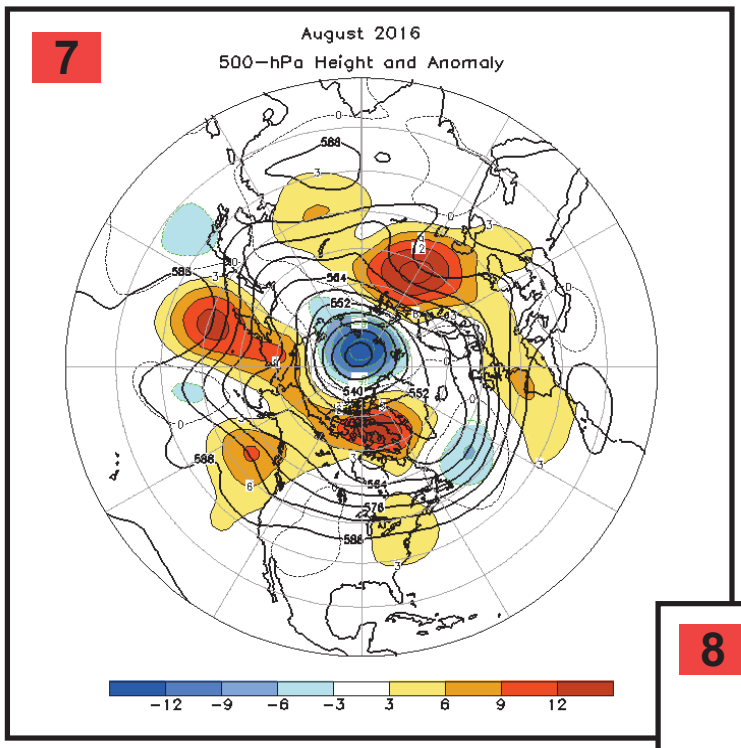
The Tropics

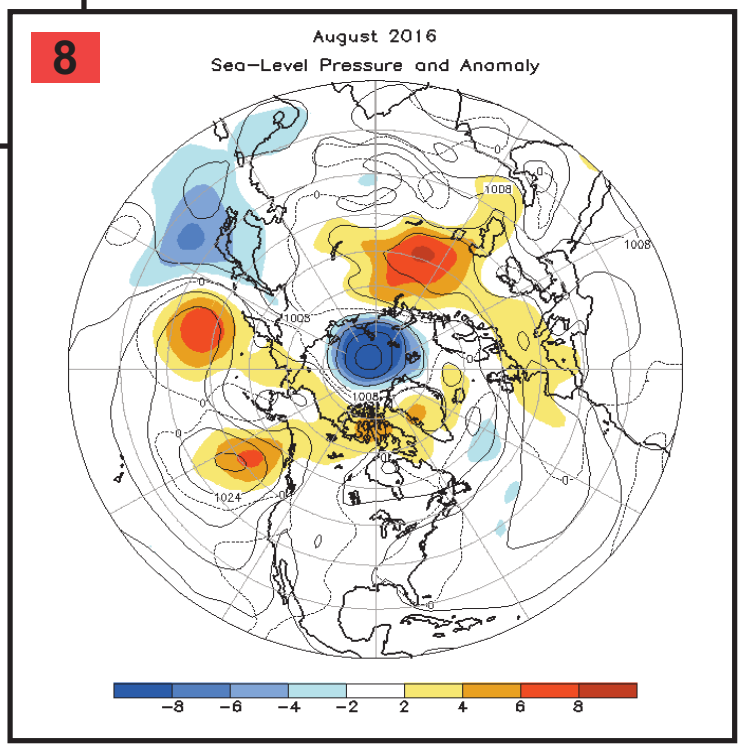


SSTs across portions of the central and eastern equatorial Pacific continued to be near average during July, though slightly below average in August. The monthly Nino 3.4 indices were -0.5C for both months. The depth of the oceanic thermocline remained below average in the central and eastern equatorial Pacific during the two month period, and sub surface temperatures ranged from 1-3C below average. Low level (850 hPa) wind anomalies remained near average over this region during the period. Upper level (200 hPa) wind anomalies remained near average in July, but became westerly east of the Date Line in August. Deep tropical cloudiness and related thunderstorm activity was suppressed over the central Pacific in July, and suppressed over the western and central Pacific in August. Collectively, these oceanic and atmospheric anomalies are consistent with ENSO Neutral conditions.

Across the global tropics, the Madden Julian Oscillation (MJO) became increasingly weak and incoherent during the two month period **Reference 1**. In a simplistic sense, the MJO can be thought of as alternating regions of rising and sinking motion that circumnavigates the global tropics in about 30-60 days. The enhanced phase of the MJO (associated with rising motion and convection) has been concentrated in the general vicinity of the Maritime Continent, especially in August. The MJO is an important topic for study, as it can have a significant influence on the development and intensity of tropical cyclones and monsoon systems. The MJO signal is often masked by higher frequency intraseasonal signals such as Kelvin Waves, and lower frequency signals such as equatorial Rossby Waves.The enhanced convection centered in the vicinity of the Maritime Continent is a reflection of constructive interference between the evolving background state (ENSO Neutral) and the negative phase of the Indian Ocean Dipole (IOD). The negative IOD phase is typically associated with unusually warm SSTs, rising motion, and increased convection across the eastern Indian Ocean and Maritime Continent region.







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

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

References

1.(MJO): http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/ARCHIVE/PDF/

Much of the information used in this article originates
from the Climate Diagnostics Bulletin archive:

(http://www.cpc.ncep.noaa.gov/products/CDB/CDB_Archive_html/CDB_archive.shtml)

Marine Weather Review – North Atlantic Area

January to April 2016

George P. Bancroft
Ocean Forecast Branch, Ocean Prediction Center, College Park, MD
NOAA National Center for Environmental Prediction

Introduction

The author considers this four month period the second half of the heavy weather season when hurricane force lows are most likely. January is normally the most active month in North Atlantic (VonAhn and Sienkiewicz, 2005), this year February produced 11 hurricane force lows versus nine in January. The numbers then declined later in the season to six in March and two in April. The period featured mainly a progressive pattern of developing cyclones moving from southwest to northeast across the North Atlantic toward Greenland and Iceland. Some of the cyclones, especially in January, took a more northerly track toward the Labrador Sea and Davis Strait; at times, moving erratically. Five cyclones developed central pressures below 950 hPa through March, with most of these occurring in January and the beginning of February. There were several noteworthy events over the southwestern waters in which cyclones developed rapidly off the U.S. East Coast, especially from January to early March.

Tropical cyclones are rare during this period, but Hurricane Alex developed in mid-January in subtropical waters south of the Azores. Alex was the first tropical or subtropical cyclone to form in January since an unnamed storm formed in 1978, and only the fourth in the record going back to 1851, (Reference 5).

Tropical Activity

Hurricane Alex:

Alex appeared to have origins as a non-tropical low which moved northeast from the Bahamas early on January 6th, then turned east across Ocean Prediction Center's southern waters and developed into a relatively compact hurricane force low pressure, late on the 9th with a 992 hPa center near 35N 56W. The **ST. LOUIS EXPRESS** (WDD3825) reported northeast winds of 45 kts and 8.5 m seas (28 ft) near 37N 55W at 1800 UTC on the 9th. The top winds weakened to storm force the following day before the low attained a lowest central pressure of 982 hPa near 31N 44W at 0600 UTC on the 11th. The cyclone then tracked southeast to well southwest of the Azores near 25N 35W late on the 12th while maintaining gale to storm force winds, gradually losing its frontal structure. The National Hurricane Center declared it Subtropical Storm Alex at 2100 UTC on the 13th near 27N 31W with maximum sustained winds of 45 kts and gusts to 55 kts. Alex became a hurricane the next day near 32N 28W (**Figure 1**) with the eye quite visible, with maximum sustained winds of 75 kts with gusts to 90 kts, which is a Category 1 on the Saffir-Simpson scale (Reference 4). Alex then moved north and weakened to a tropical storm the next day before becoming extratropical near 45N 29W (**Figure 4**). The ship **BATFR17** (38N 24W) reported southeast winds of 40 kts and 9.8 m seas (32 ft) at 1500 UTC on the 15th. **INDEPENDENT VOYAGER** (A8XY2) reported southeast winds of 50 kts near 49N 21W at 0600 UTC on the 16th. Post Tropical Alex then turned northwest and became a hurricane force low south of Greenland 0000 UTC on the 17th before looping back to the southwest (**Figure 5**). The cyclone then became absorbed by a developing low moving off the East Coast on the 18th (**Figure 4** and **Figure 5**) on the 18th.

Other Significant Events of the Period

North Atlantic Storm / Greenland area, January 5-9:

This cyclone began as a new development on a front near 56N 30W at 1800 UTC January 5th and **Figure 2** shows the subsequent strengthening and consolidation into a 948 hPa

hurricane force low, one of the deepest of the period. **Figure 3** shows widespread 50 to 60 kts winds north of the occluded front retrieved by the ASCAT-B scatterometer. Not shown, these winds also extended south of Greenland along the front. The cyclone then drifted back to the southeast the next day with a weakening trend.

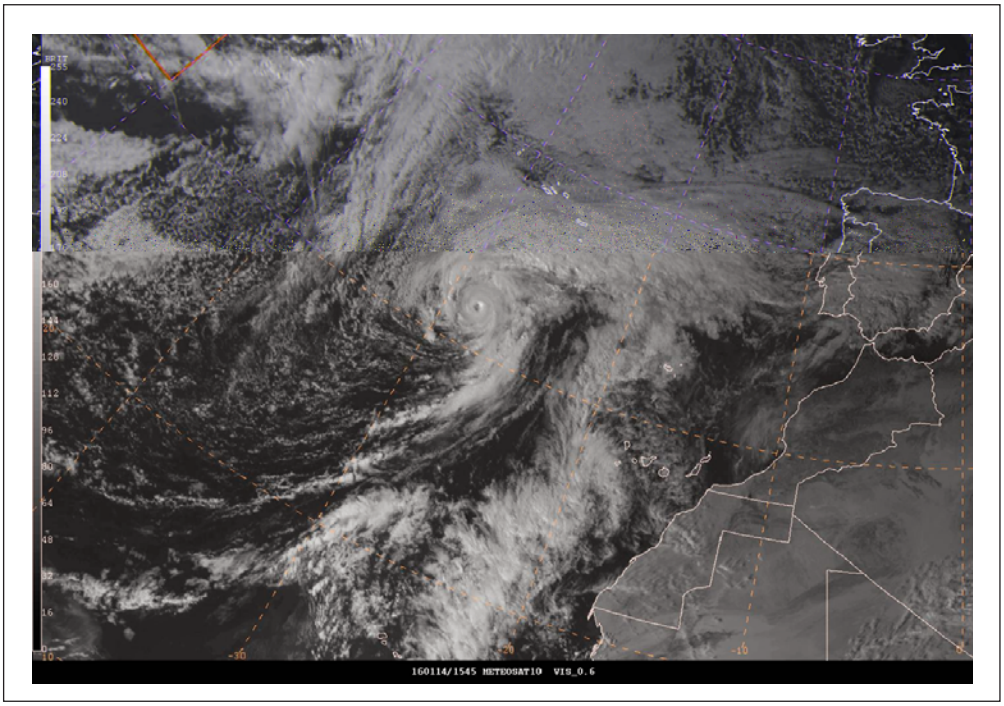


Figure 1. METEOSAT10 visible satellite image of the eastern North Atlantic showing Hurricane Alex near the center of the image. The valid time is 1545 UTC January 14, 2016.

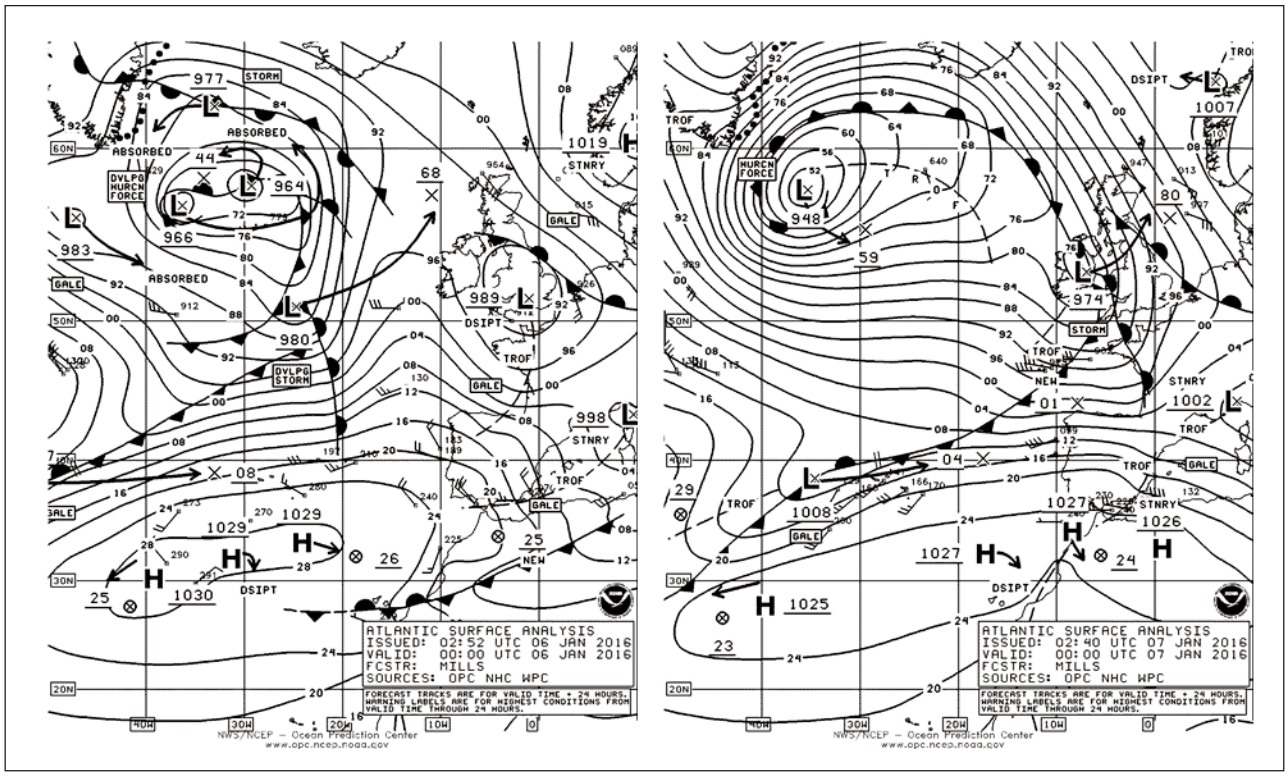


Figure 2. OPC North Atlantic Surface Analysis charts (Part 1 – east) valid 0000 UTC January 6 and 7, 2016. 24 hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars (hPa).

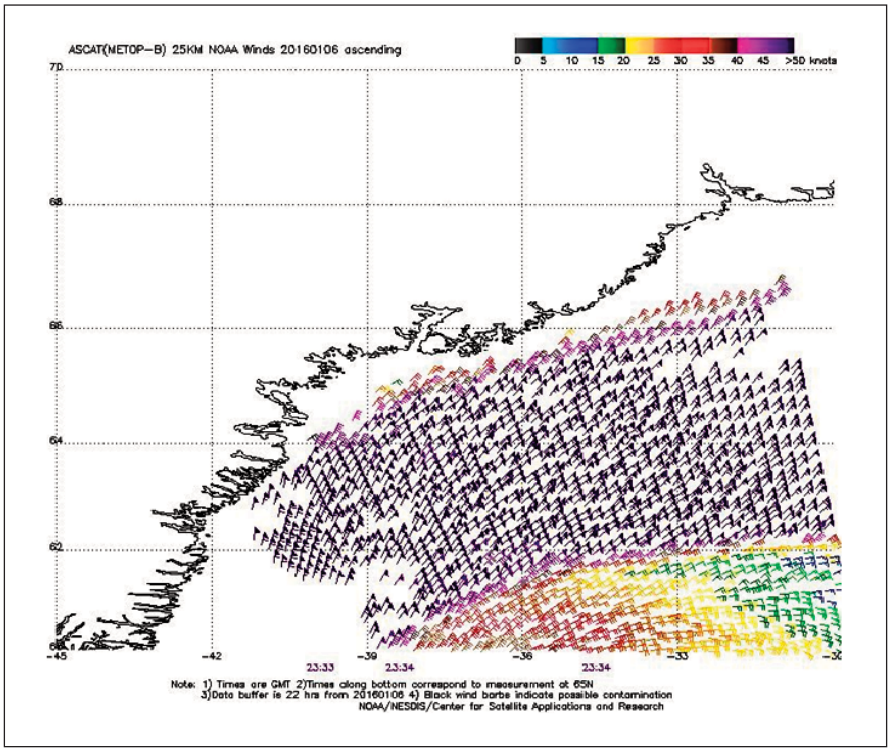


Figure 3. 25-km ASCAT METOP-B (European Advanced Scatterometer) image of satellite-sensed winds around the north side of the cyclone shown in the second part of Figure 2. The valid time of the pass is 2334 UTC January 6, 2016, or within one half hour of the valid time of the second part of Figure 2. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

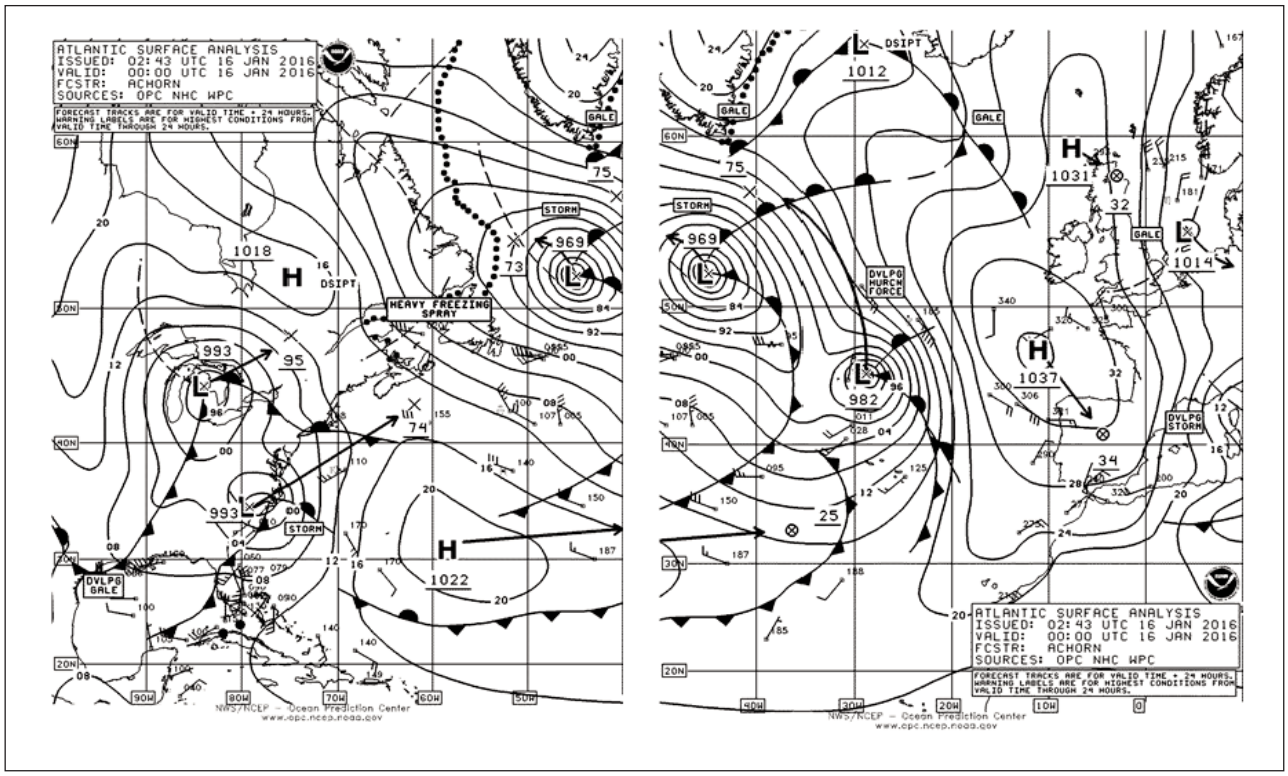


Figure 4. OPC North Atlantic Surface Analysis charts (Parts 2 – west and 1 - east) valid 0000 UTC January 16, 2016. The two parts overlap between 40W and 50W.

North Atlantic Storm, January 14-16:

The initial development was as a new low south of Newfoundland near 41N at 0000 UTC on the 15th followed by rapid intensification over 24 hours, with the central pressure falling 36 hPa. **Figure 4** and **Figure 5** shows the cyclone east of Labrador turning northwest. It developed a lowest central pressure of 964 hPa 12 hours later and hurricane force winds later that day before stalling and becoming absorbed by Post Tropical Alex the following night.

North Atlantic Storm, January 15-17:

Figures 4 and **5** also show an intensifying storm moving offshore from the southeast U.S. coast. The **MAERSK DENVER** (WMDQ) reported west winds of 50 kts and 8.0 m seas (26 ft) near 38N 57W at 1200 UTC on the 17th. Buoy 44141 (43.0N 58.0W) reported northwest winds of 47 kts with gusts to 62 kts and 9.5 m seas 31 ft) at 0800 UTC on the 17th. The cyclone briefly developed hurricane force winds while passing near 46N 51W at 1200 UTC on the 17th. The cyclone then headed northeast toward the east Greenland waters and weakened, except for briefly developing hurricane force winds while passing near Greenland late on the 18th.

North Atlantic Storm, January 22-25:

The development of this cyclone over a 36 hour period is depicted in **Figure 6**. The cyclone developed hurricane force winds on the night of the 22nd which continued to 0000 UTC on the 24th when it developed a lowest central pressure of 957 hPa. **Figure 7** is an ASCAT pass showing wind retrievals of up to 60 kts in the south semicircle of the low. The **EVER UNITY** (3FCD9) encountered west winds of 45 kts near 33N 54W at 0600 UTC on the 22nd, and seas of 9.5 m (31 ft) six hours later, near 33N 55W. The cyclone subsequently turned toward the north, passing near Iceland late on the 24th.

Western North Atlantic Storm, January 29-31:

Figure 8 shows the explosive development of a hurricane force low from a flat frontal wave over only a 24 hour period. The central pressure fell

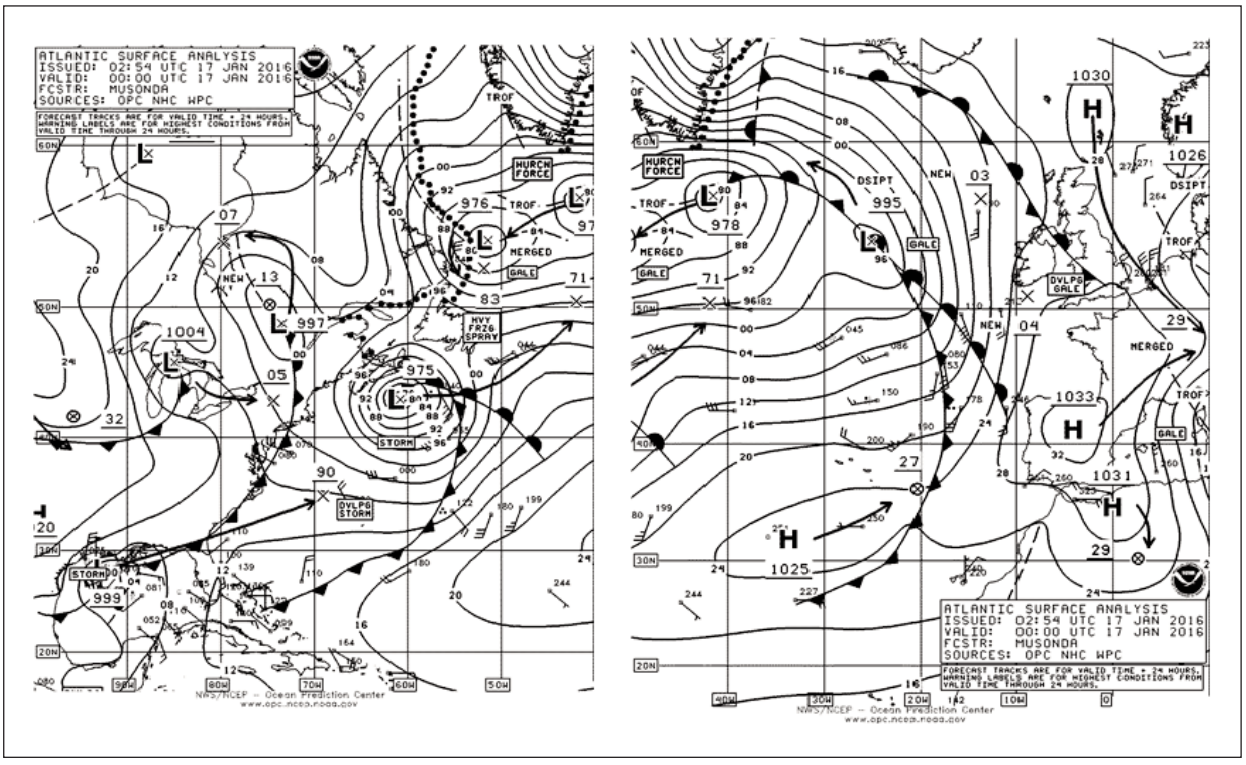


Figure 5. OPC North Atlantic Surface Analysis charts (Parts 2 and 1) valid 0000 UTC January 17, 2016. The two parts overlap between 40W and 50W.

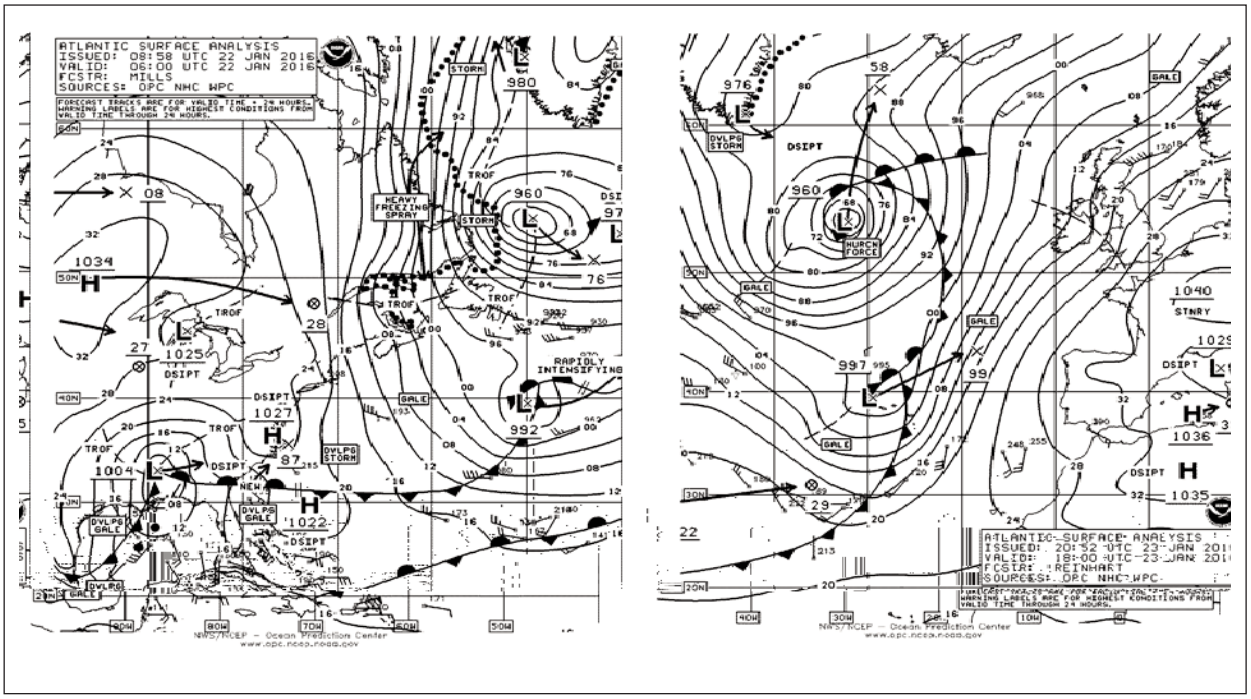


Figure 6. OPC North Atlantic Surface Analysis charts valid 0600 UTC January 22 (Part 2) and 1800 UTC January 23, 2016

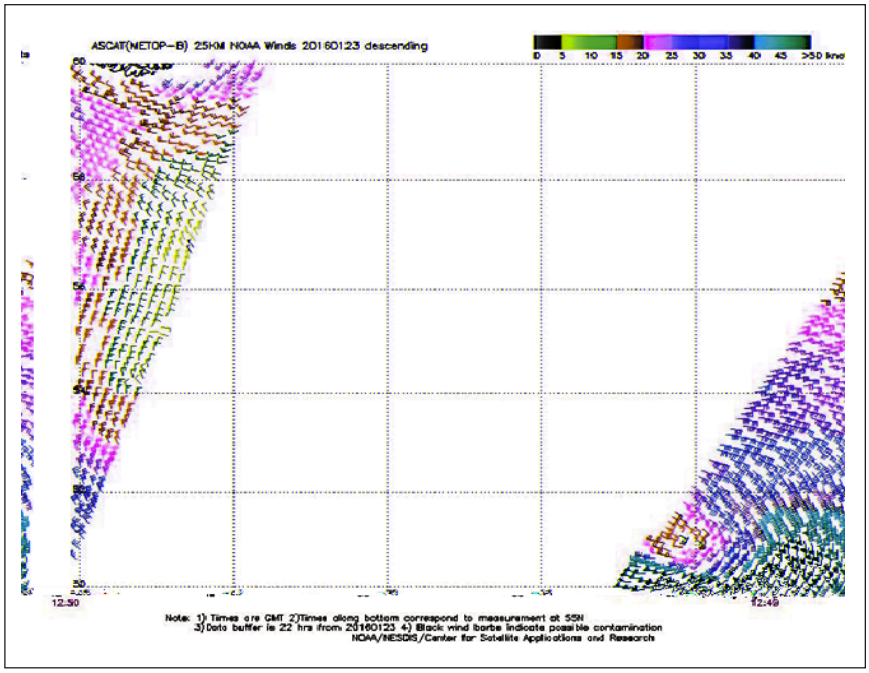


Figure 7. 25-km ASCAT (METOP-B) image of satellite-sensed winds around the southeast semicircle of the cyclone shown in the second part of Figure 6. The valid time of the pass is 1249 UTC January 23, 2016 or about five and one-quarter hours prior to the valid time of the second part of Figure 6. The southern tip of Greenland appears near the northwest corner of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

36 hPa in the 24 hour period ending at 1800 UTC on the 29th. From Sanders and Gyakum (1980) this would be well within the requirement for this cyclone to be called a “bomb”.

THEBAUD PLATFORM (CFO383, 43.9N 60.2W) reported southwest winds of 53 kts with gusts to 63 kts at 2300 UTC on the 29th. Buoy 44139 (44.2N 57.1W) reported southwest winds of 49 kts with gusts to 66 kts and 9.0 m seas (30 ft) four hours later,

followed by a report of 13.0 m (43 ft) two hours later. The cyclone weakened as it passed northeast of Newfoundland on the 30th and became absorbed on the 31st.

North Atlantic Storms, January 28 to February 2:

A pair of strong lows of similar intensity moved northeast to north of the British Isles during this period. The first one formed in the Labrador Sea on the 28th and tracked northeast, developing a lowest central pressure of 949 hPa and hurricane force winds near 63N 2W at 1200 UTC on the 29th. The central pressure fell 38 hPa in the preceding 24 hours. At 1300 UTC on the 29th the ship **BATEU08** (59N 2E) reported west winds of 60 kts. Buoy 64046 (60.5N 4.2W) reported west winds of 48 kts with gusts to 65 kts and 9.5 m seas (31 ft) at 1200 UTC on the 29th. Oil platforms in the northern North Sea reported west to southwest winds up to 71 kts and seas up to 14.0 m (46 ft) (at 63104, 61.2N 1.6E). The cyclone proceeded northeast through the Norwegian Sea late on the 29th. The next development was a new low forming south of Newfoundland on the 30th and moving to south of Iceland with a lowest central pressure of 945 hPa early on February 1st (**Figure 9**). This was the deepest low of the period. The central pressure fell 45 hPa in the 24 hour period ending at 0000 UTC on the 1st. The ASCAT pass in **Figure 10** returned a swath of west to southwest winds of 50 to 60 kts west of the British Isles. Buoy 62105 (55.2N 12.7W) at 1700 UTC on the 1st reported west winds 47 kts with gusts to 61 kts and 15.0 m seas (50 ft), and a gust of 64 kts nine hours earlier. Altimeter data in **Figure 11** reveal seas as high as 63.5 ft (19.5 m) west of Scotland. The cyclone then moved east into southern Norway early on the 2nd.

North Atlantic Storms, February 2-6:

February was a stormy period, beginning with three systems moving northeast into the northern waters. The first one moved from inland over eastern Canada on the 1st to the northern Labrador Sea the next day, where it briefly developed hurricane force winds at 1800 UTC on the 2nd before drifting east and spawning a new low east of Greenland on the night of the 3rd. The new low quickly took over as the main low by early on the 5th (**Figure 12**). Its central pressure fell 37 hPa in only 18 hours. The cyclone

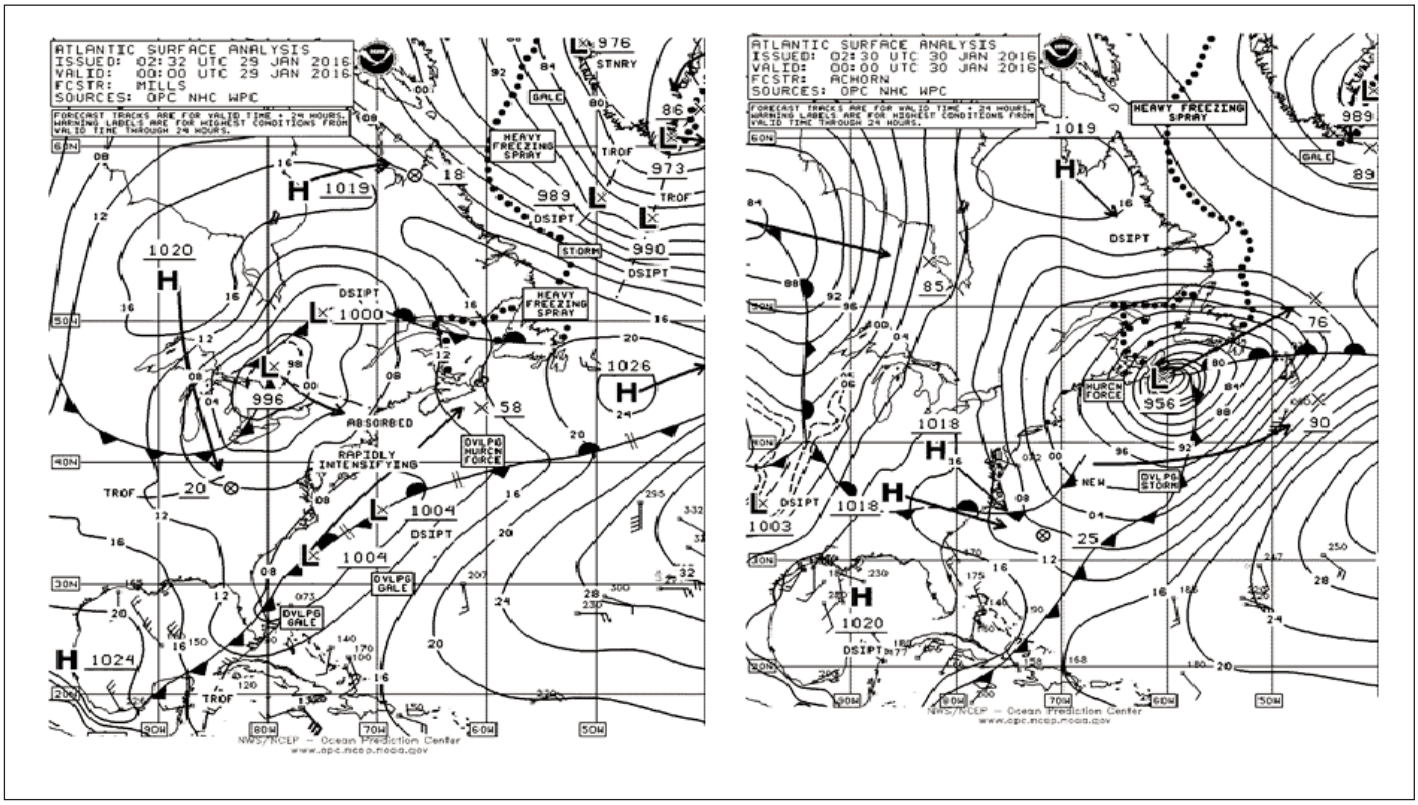


Figure 8. OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC January 29 and 30, 2016.

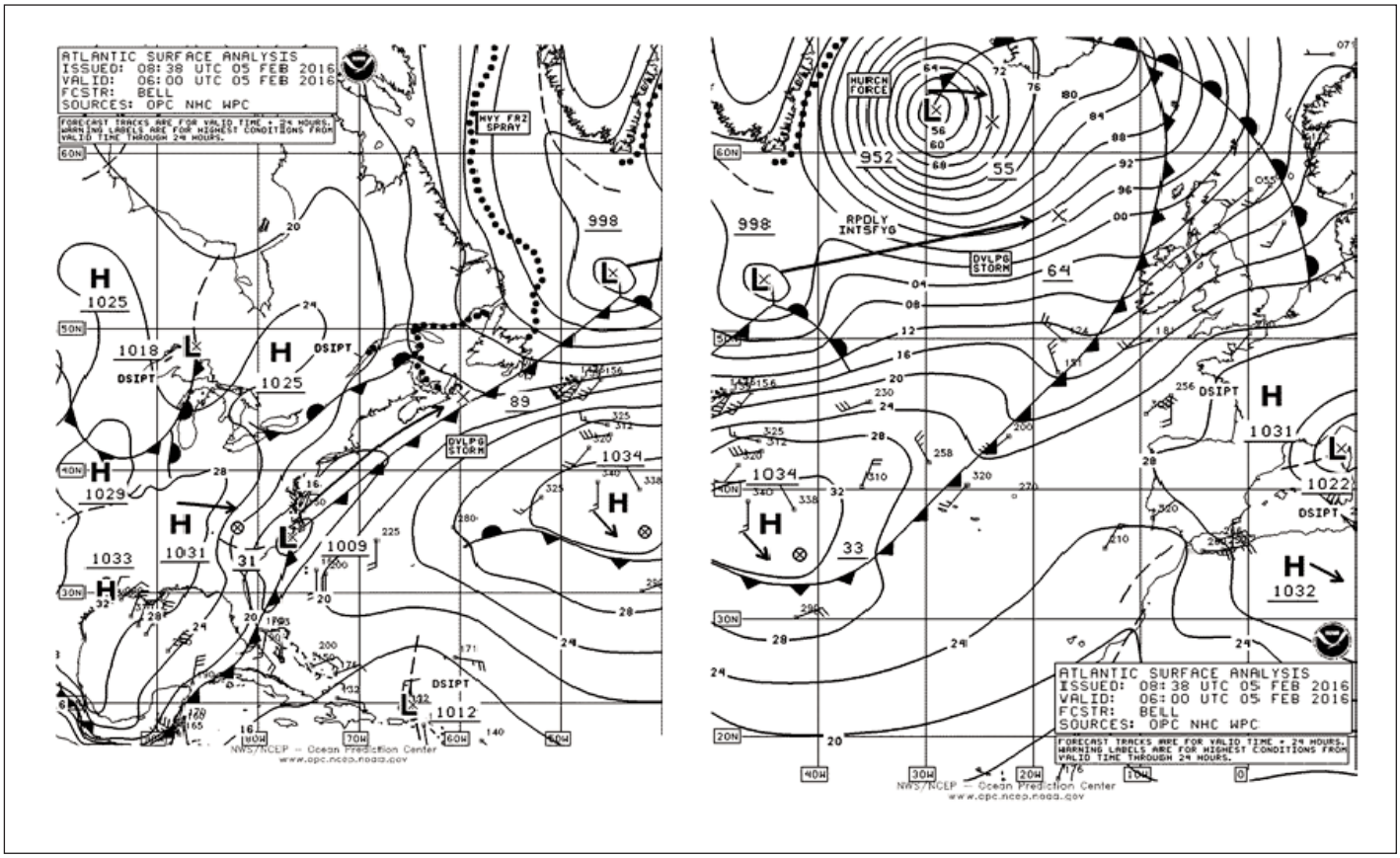


Figure 9. OPC North Atlantic Surface Analysis charts valid 1800 UTC January 30 (Part 2) and 0600 UTC February 1, 2016 (Part 1).

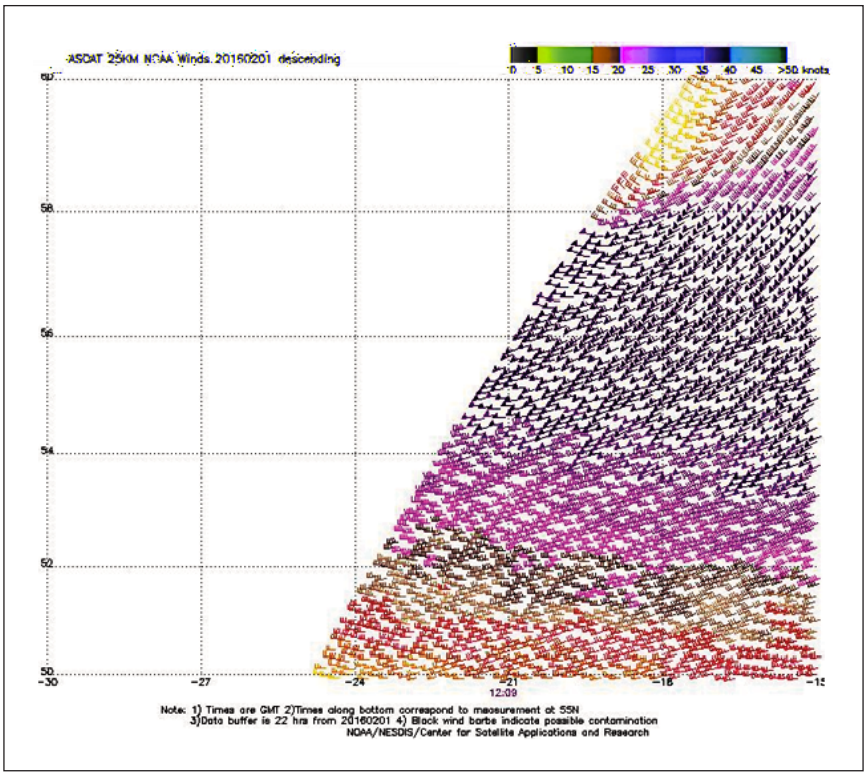


Figure 10. 25-km ASCAT (METOP-A) image of satellite-sensed winds around the south side of the cyclone shown in the second part of Figure 9. The valid time of the pass is 1209 UTC February 1, 2016, or approximately six hours later than the valid time of the second part of Figure 13. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

subsequently drifted east and then south with **Figure 13** indicating a new intense low taking over. This new storm originated off the New England coast late on the 5th and while tracking northeast its central pressure fell 41 hPa in the 24 hour period ending at 0000 UTC on the 7th. An ASCAT-A pass from 2134 UTC on the 7th revealed a swath of west winds 50 to 60 kts on the south side similar to **Figure 10** from an earlier event.

HIBERNIA PLATFORM

(VEP717, 46.7N 48.7W) reported west winds of 69 kts and 7.0 m seas (23 ft) at 0600 UTC on the 7th, at a height of 139 m.

above sea level. The cyclone weakened while passing across northern Scotland late on the 8th. Before then, Buoy 62107 (50.1N 6.1W) reported west winds of 49 kts with gusts to 76 kts at 0400 UTC on the 8th, and highest seas 9.5 m (31 ft) two hours later. Buoy 62095 (53.0N 15.8W) reported seas of 16.5 m (54 ft) at 0300 UTC on the 8th.

Southwestern North Atlantic Storm, February 6-10:

Figure 13 and **Figure 14** depict the rapid development of this storm over a 24 hour period. The central pressure fell 31 hPa in the 24 hour period ending at 1200 UTC on the 8th, when the cyclone developed its lowest central pressure of 974 hPa, quite intense for a low latitude development. **Figure 15** is an infrared satellite image of the cyclone near maximum intensity with intense frontal bands and an eye like feature at the center. Buoy 41002 (31.9N 74.8W) reported west winds of 51 kts with gusts to 64 kts and 9.0 m seas (30 ft) at 0300 UTC on the 8th. Buoy 41001 (34.6N 72.7W) reported northwest winds of 47 kts with gusts to 66 kts at 1000 UTC on the 8th and seas 8.5 m (28 ft) one hour later. Another

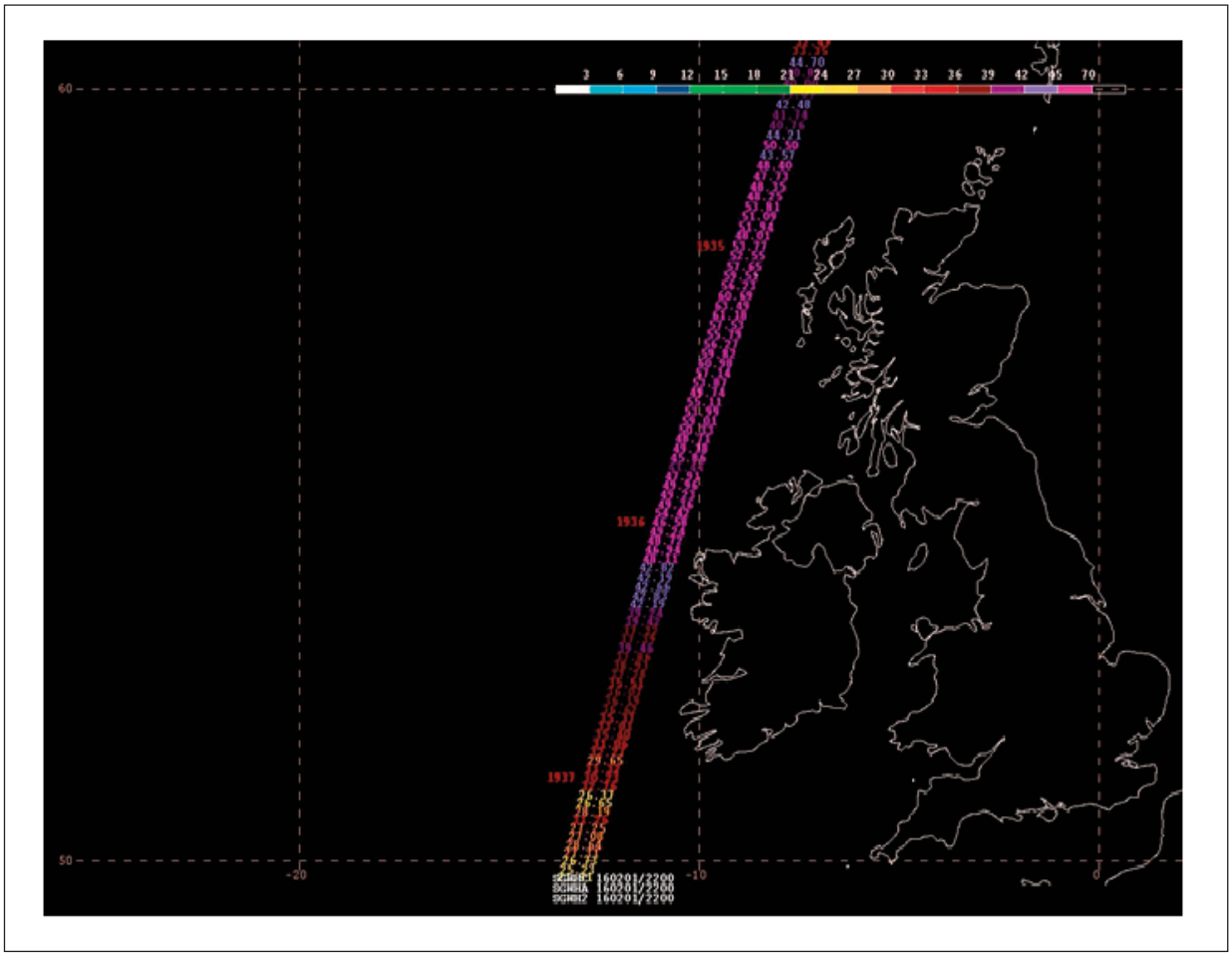


Figure 11. Remotely-sensed significant wave heights (in feet to two decimal places) along a satellite track from the AltiKa altimeter. The times of the satellite overpass (UTC) appear to the left of the swath. The time in the center of the image, 1936 UTC February 1, 2016, or about thirteen and one-half hours later than the valid time of the second part of Figure 9. Satellite data is reprocessed by NOAA/NESDIS for operational use.

buoy, 41048 (31.9N 69.6W), reported southwest winds of 47 kts with gusts to 58 kts at 1000 UTC on the 8th and highest seas 12.0 m (40 ft) three hours later. The ASCAT-B image in **Figure 16** shows wind retrievals of up to 65 kts in the west semicircle and possibly up to 70 kts. The cyclone then moved off to the northeast with its top winds weakening to storm force as it passed north of 40N, and then passed over Newfoundland late on the 9th.

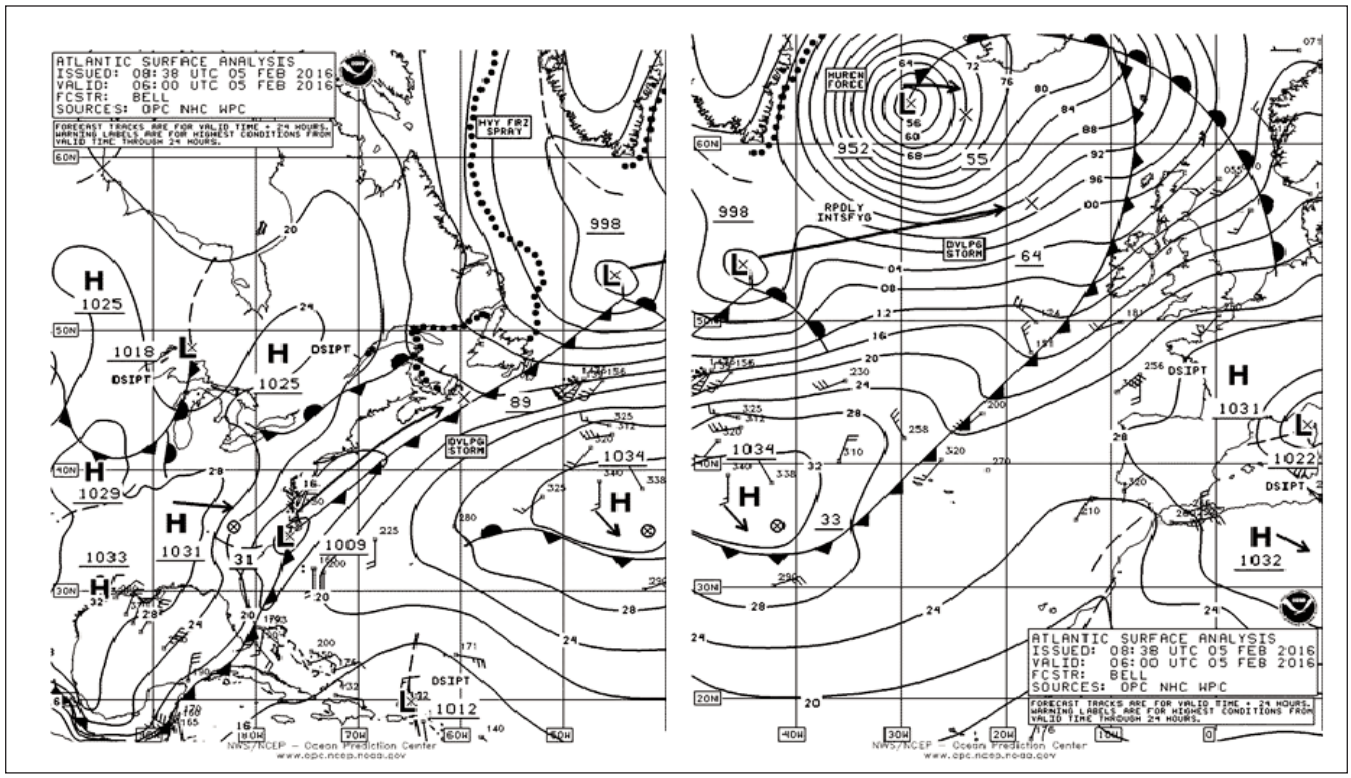


Figure 12. OPC North Atlantic Surface Analysis chart (Parts 2-west and 1-east) valid 1800 UTC February 4, 2016. The two parts include an overlap area between 40W and 50W.

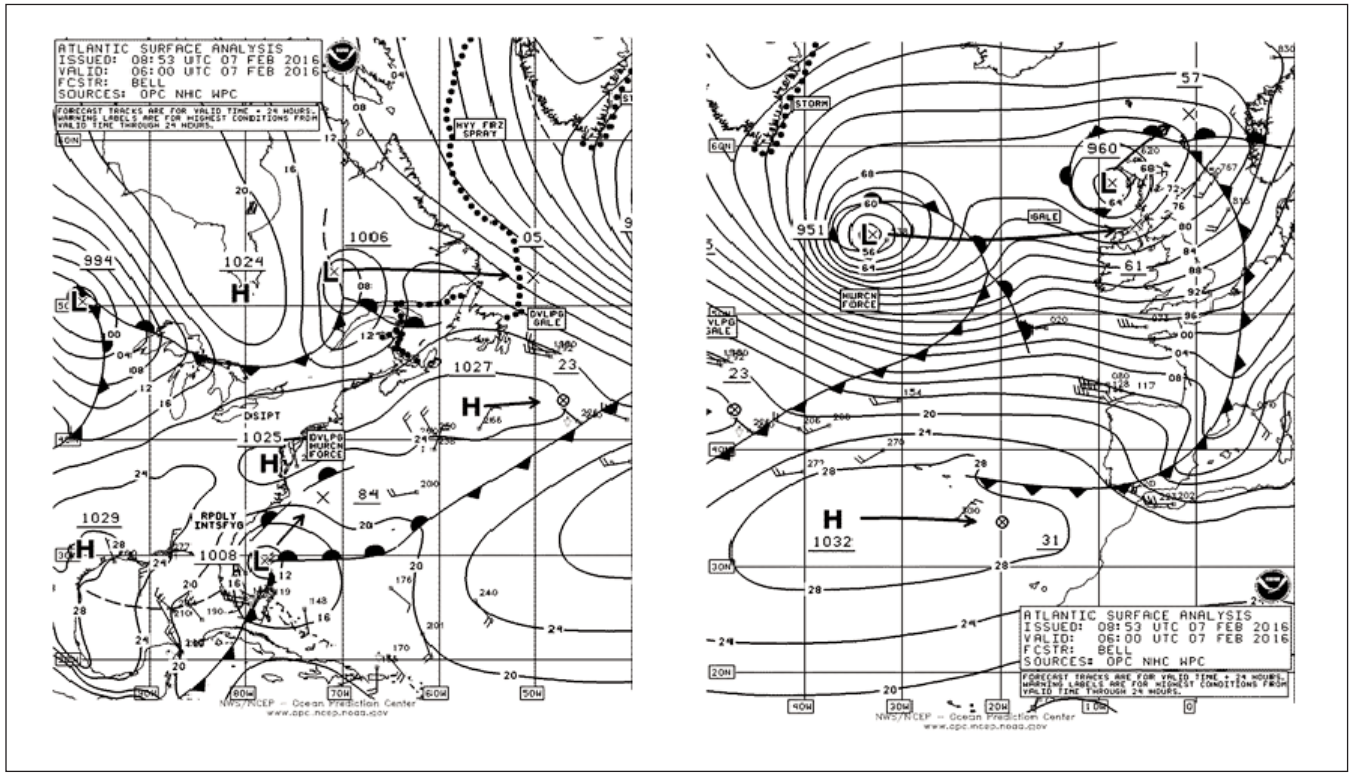


Figure 13. OPC North Atlantic Surface Analysis chart (Parts 2-west and 1-east) valid 0600 UTC February 7, 2016.

Western Atlantic Storm, February 9-14:

A new low formed on a front along the U.S. mid Atlantic coast early on the 9th and briefly developed hurricane force winds offshore near 38N 67W with a 990 hPa center at 1800 UTC on the 9th. A Rapidscat pass from 0355 UTC on the 10th revealed west to southwest winds of 50 to 60 kts south of the low center. The **OLEANDER** (V7SX3) near 33N 65W encountered west winds of 45 kts at 1600 UTC on the 9th. The cyclone then moved off to the northeast into the North Atlantic, where it stalled on the 13th and became absorbed the next day.

Northwestern Atlantic Storm, February 13-15:

A new low formed on the southeast U.S. coast on the 12th and quickly developed storm force winds offshore the following night. The system passed over Newfoundland and into the Labrador Sea on the 14th. It approached the southern coast of Greenland the following night and briefly developed hurricane force winds with a 961 hPa pressure the following night, then rapidly weakened in the Davis Strait.

North Atlantic Storm, February 14-16:

The next development consisted of a new low near Newfoundland late on the 14th moving into the north central waters and developing hurricane force winds and then with further intensification maintaining such conditions until passing north of the British Isles. An ASCAT-B pass from 1112 UTC on the 16th returned a swath of west to southwest winds 50 to 60 kts on the south side, with similarity to **Figure 10** from an earlier event. The system then passed east of Iceland late on the 16th. Buoy 62105 (55.1N 12.8W) reported west winds of 34 kts with gusts to 48 kts at 1500 UTC on the 16th, a peak gust of 54 kts four hours prior, and highest seas 11.0 m (36 ft) at 2100 UTC on the 16th.

North Atlantic Storms, February 18-20:

Similar to the February 9-14 event, a low moved off the southeast U.S. coast early on the 18th and briefly developed hurricane force winds near 38N 55W late on the 19th but the central pressure was only 1000 hPa. The system tracked east northeast and dissipated over the central waters on the 21st.

North Atlantic Storms, Greenland area, February 23-27:

The first of two lows originating near the northeast U.S. coast moved northeast and briefly developed hurricane force winds near Greenland with a 982 hPa center at 0600 UTC on the 26th before dissipating east of Greenland on the 26th. A second low followed a similar track but was deeper, more like the February 13-15 event with the cyclone turning north into the Davis Strait. It developed hurricane force winds with a 964 hPa central pressure near 60N 57W late on the 26th. An ASCAT pass with limited coverage revealed an area of east to southeast winds 50 to 60 kts off the southwest Greenland coast at 2225 UTC on the 26th. The system weakened in the Davis Strait shortly thereafter.

North Atlantic Storm, March 4-8:

Figure 17 depicts the initial rapid development of this cyclone over the southwestern waters, with the central pressure falling 27 hPa in the 24 hour period ending at 0600 UTC March 5th. The Rapidscat image in **Figure 18** reveals hurricane force winds up to 80 kts around the south, west and north sides, although some of the reports are rain flagged and may be questionable. Buoy 44137 (42.3N 62.0W) reported north winds of 49 kts with gusts to 62 kts at 1800 UTC on the 5th and highest seas 9.5 m (31 ft) one hour later. The platforms **THEBAUD** (CFO383, 43.9N 60.2W) and **CFL24** (43.8N 60.6W) reported north to northwest winds of 61 kts with gusts to 77 kts at 2200 UTC on the 5th, with the latter site reporting 7.5 m seas (25 ft) six hours prior. The cyclone then moved off to the northeast past Newfoundland on the 6th as a storm force low with the lowest central pressure 970 hPa occurring as the storm passed between Greenland and Iceland late on the 7th.

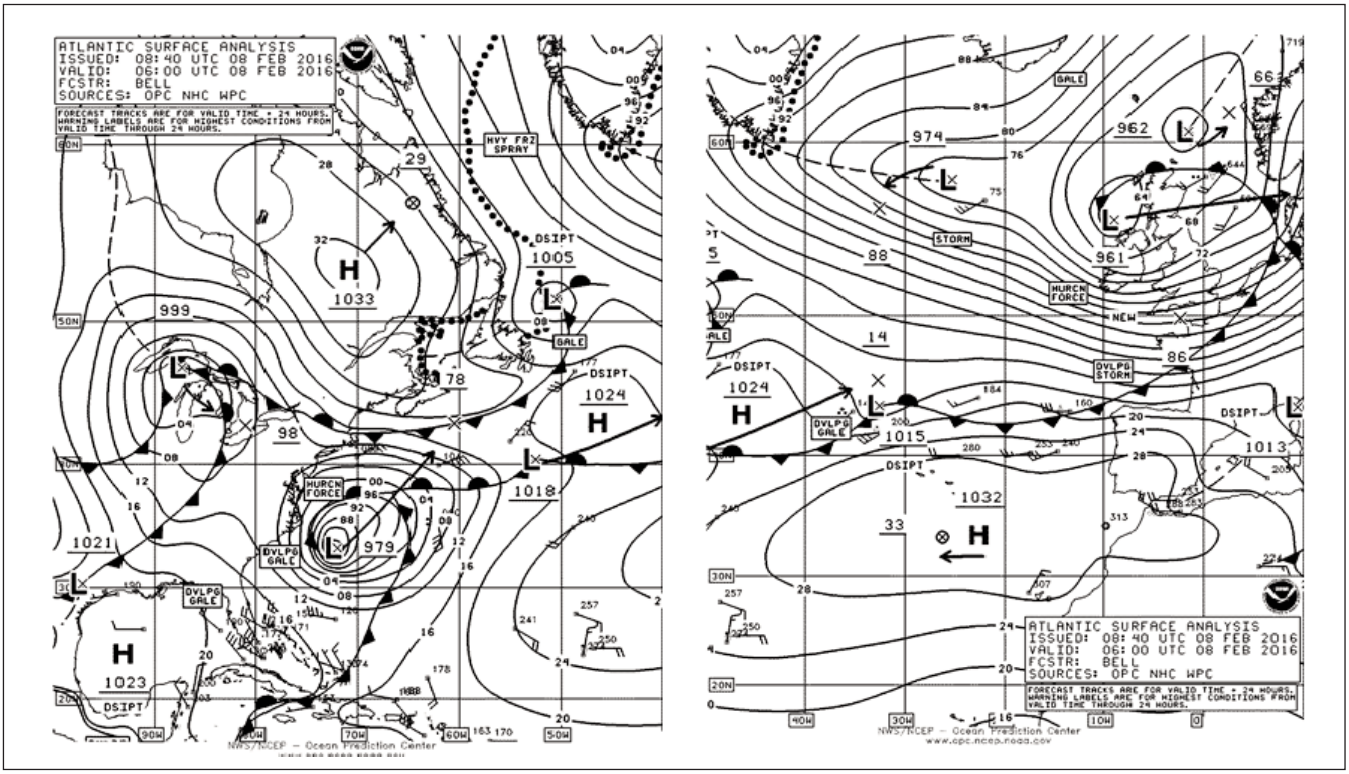


Figure 14. OPC North Atlantic Surface Analysis chart (Parts 2-west and 1-east) valid 0600 UTC February 8, 2016.

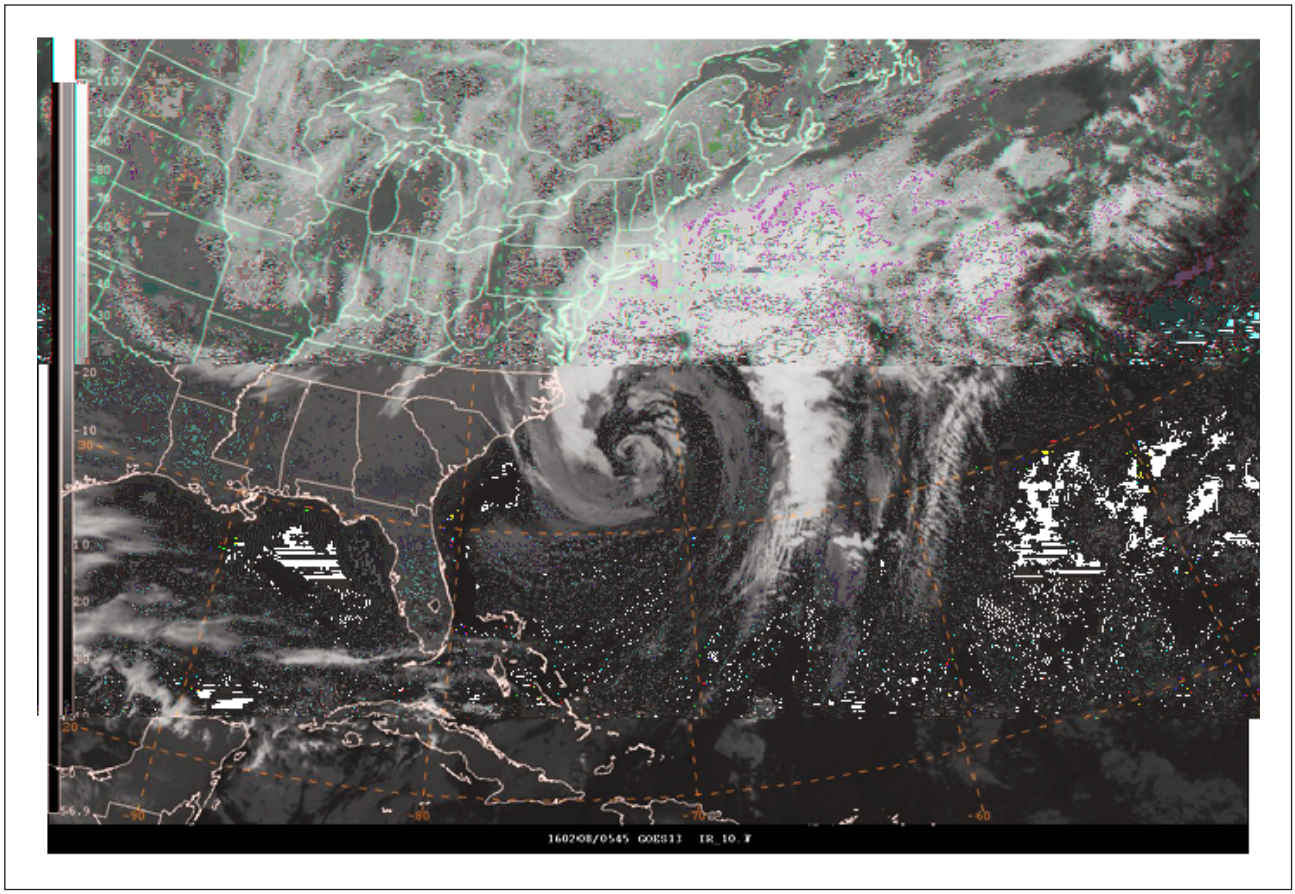


Figure 15. GOES13 infrared visible satellite image valid 0545 UTC February 8, 2016, or approximately the valid time of Figure 14.

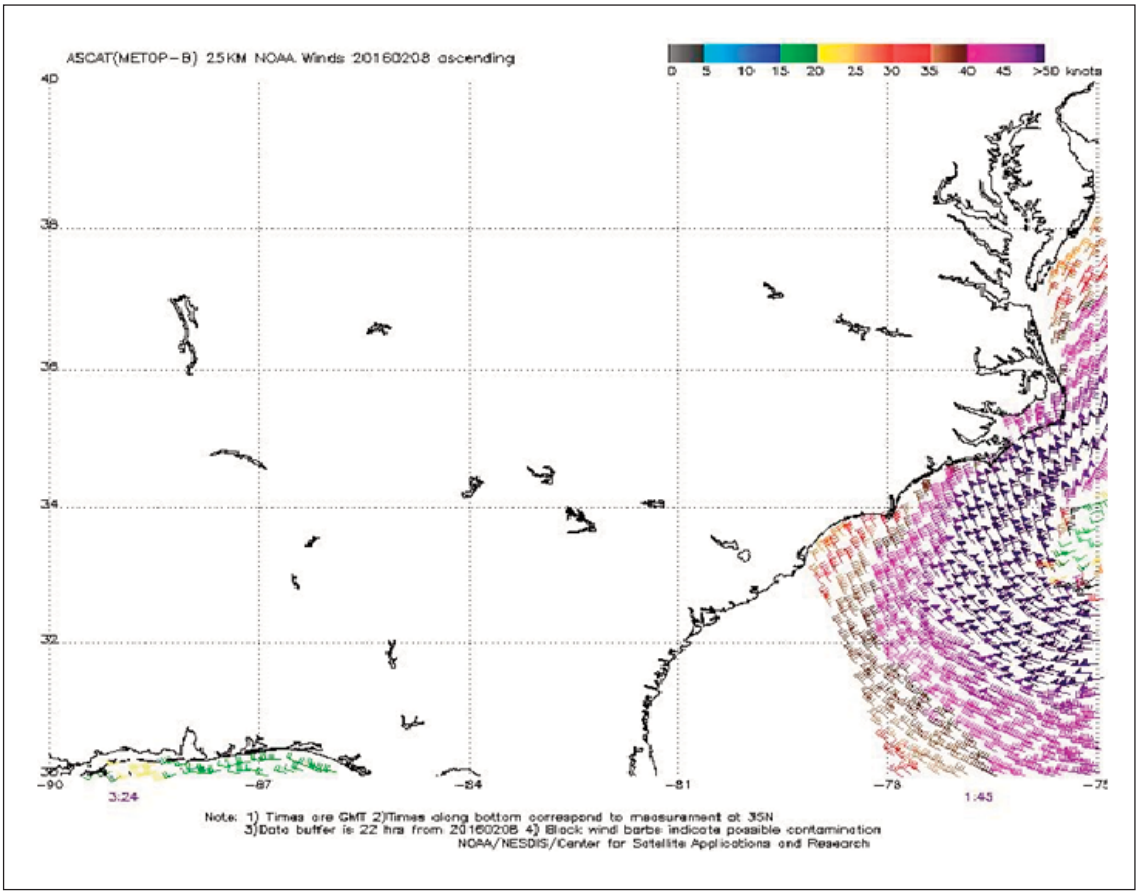


Figure 16. 25-km ASCAT (METOP-B) image of satellite-sensed winds around the west semicircle of the cyclone shown in Figure 14. The valid time of the pass is 0145 UTC February 8, 2016, or four and one-quarter hours prior to the valid time of Figure 14. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

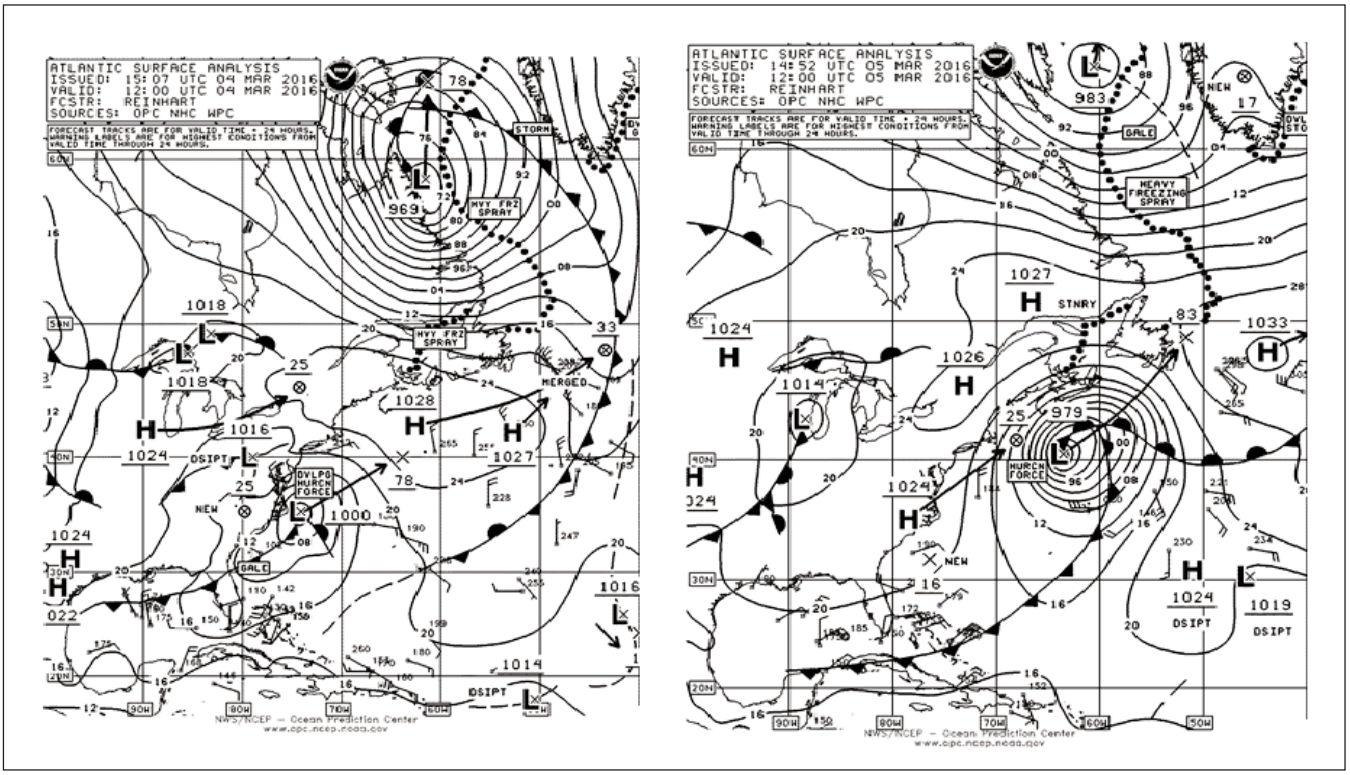


Figure 17. OPC North Atlantic Surface Analysis charts (Part 2) valid 1200 UTC March 4 and 5, 2016.

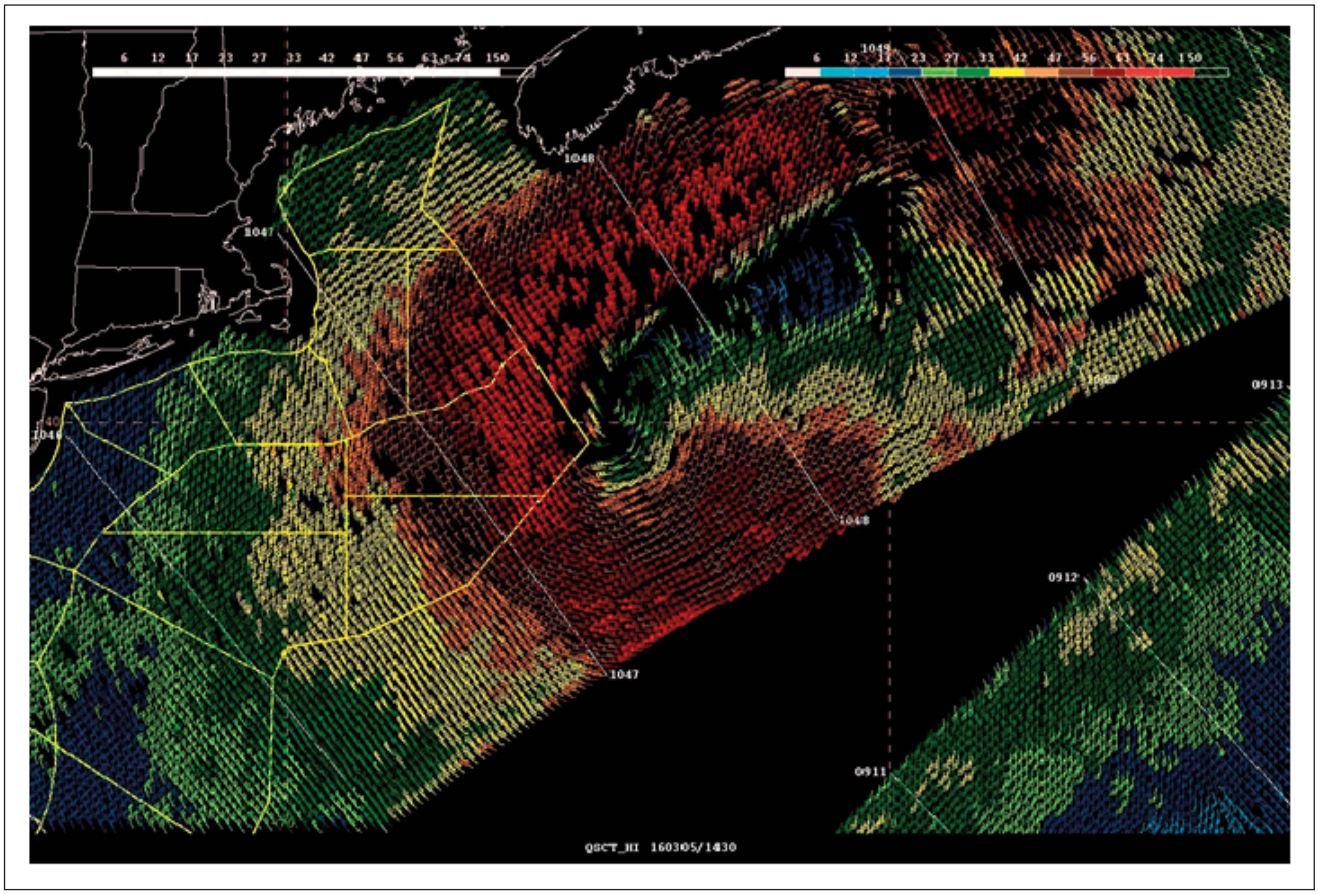


Figure 18. 12.5-km Rapidscat image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 17. Rapidscat is a QuikSCAT-type scatterometer aboard the International Space Station. The valid time of the pass in the center of the image is 1048 UTC March 5, 2016, or approximately one and one-quarter hours prior to the valid time of the second part of Figure 17. Cross-track time lines appear in the image, labeled in UTC. A color scale for the wind barbs appears at the top of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

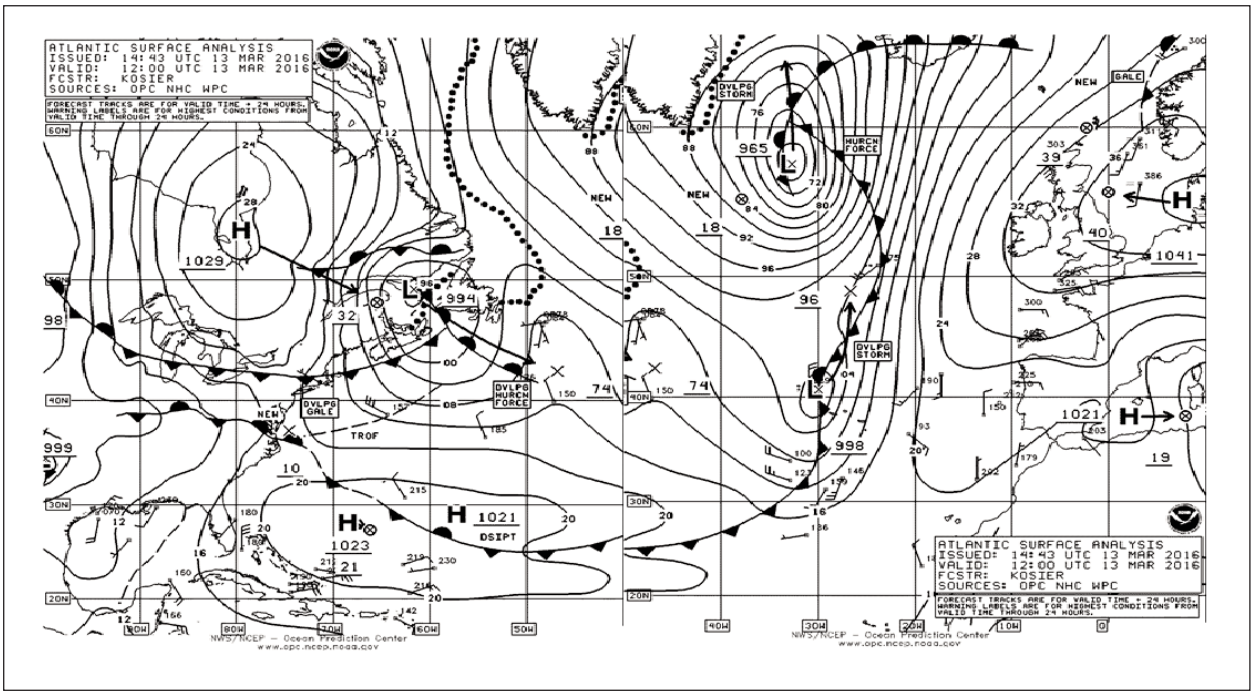


Figure 19. OPC North Atlantic Surface Analysis chart (Parts 2 and 1) valid 1200 UTC March 13, 2016.

Northeast Atlantic Storm, March 11-16:

The early to middle part of March continued to be active, with three hurricane force lows developing over a period of several days. The first one originated near Newfoundland early on the 10th and moved northeast, developing storm force winds while passing east of Greenland late on the 11th and briefly hurricane force winds 1200 UTC on the 12th in the Denmark Strait before weakening rapidly. A second cyclone moved east off the New England coast as a gale early on the 11th and developed hurricane force winds over the central waters on the 12th and early on the 13th while turning north with a lowest central pressure of 960 hPa. **Figure 19** shows this system as it approached the east Greenland waters and began to weaken. The next two systems developed about at the same time south of 50N as shown in **Figures 19** and **20**. The stronger of these developed hurricane force winds southeast of Newfoundland while the weaker low moved north along 30W as a developing frontal wave and is shown as a storm force low in **Figure 20**. **Figure 21** is a Rapidscat image of the two systems with the larger cyclone showing a larger area of hurricane force winds on the south side with white barbs indicating possible rain contamination and even the smaller cyclone to the northeast revealing a small area of 65 kts on the east side around 0935 UTC on the 14th. Both cyclones then moved north with a weakening trend. **MAERSK PALERMO** (PDHW) near 41N 47W reported west winds of 50 kts and 5.0 m seas (16 ft) at 1200 UTC on the 14th.
KUALA LUMPUR EXPRESS (DFNB2) near 46N 31W encountered east winds of 45 kts and 7.9 m seas (26 ft) at 0900 UTC on the 15th.

North Atlantic Storm, March 21-25:

A cyclone similar to the one in early April in the northwestern waters originated near the southeast U.S. coast early on the 20th and developed hurricane force winds and a lowest central pressure of 948 hPa in the Labrador Sea by 0000 UTC on the 23rd, making it one of the deepest lows of the period. The central pressure fell 36 hPa in the 24 hour period ending at that time. The ship **BATEU08** (59N 47W) reported southeast winds of 67 kts at 0200 UTC on the 23rd. The system stalled in that area before moving east and weakening late on the 23rd.

Northwestern Atlantic Storm Greenland area, March 28-April 2:

A second cyclone following a similar track originated near the North Carolina coast on the 27th and moved into the waters south of Greenland with a central pressure as low as 964 hPa early on the 31st with a brief period of hurricane force winds. The **MARY ARCTICA** (BATEU00) near 58N 45W encountered north winds of 71 kts at 0500 UTC on the 31st. The cyclone then weakened in the east Greenland waters in early April.

Northwestern Atlantic Storm, April 3-5:

This cyclone quickly developed hurricane force winds while moving off the New England coast early on April 3rd (**Figure 22**) and maintained its winds through 1800 UTC on the 4th, when it developed a lowest central pressure of 952 hPa. The platform **CFL24** (43.8N 60.6W) reported northwest winds of 68 kts at 0100 UTC on the 4th and two hours later seas of 6.0 m (20 ft). Buoy 44141 (43.0N 58.0W) reported west winds 54 kts with gusts to 68 kts at 0100 UTC on the 4th one hour later seas of 12.5 m (41 ft). The cyclone then stalled and weakened west of southern Greenland from late on the 5th through the 7th.

North Atlantic Storm Greenland area, April 7-10:

Figure 23 depicts the final 36 hour period of development of this system, as a developing frontal wave off southern Labrador absorbed two other lows north of 60N with the second part of **Figure 23** showing the cyclone at maximum intensity. **Figure 24** is an ASCAT image showing the strongest winds southeast of the southern tip of Greenland and also channeled northeast winds between the occluded front and the coast of Greenland. An altimeter passes through the area of strongest winds southeast of Greenland revealed wave heights approaching 49 ft (14.9 m).

The cyclone subsequently moved southeast and weakened, with its top winds weakening to gale force on the 11th.

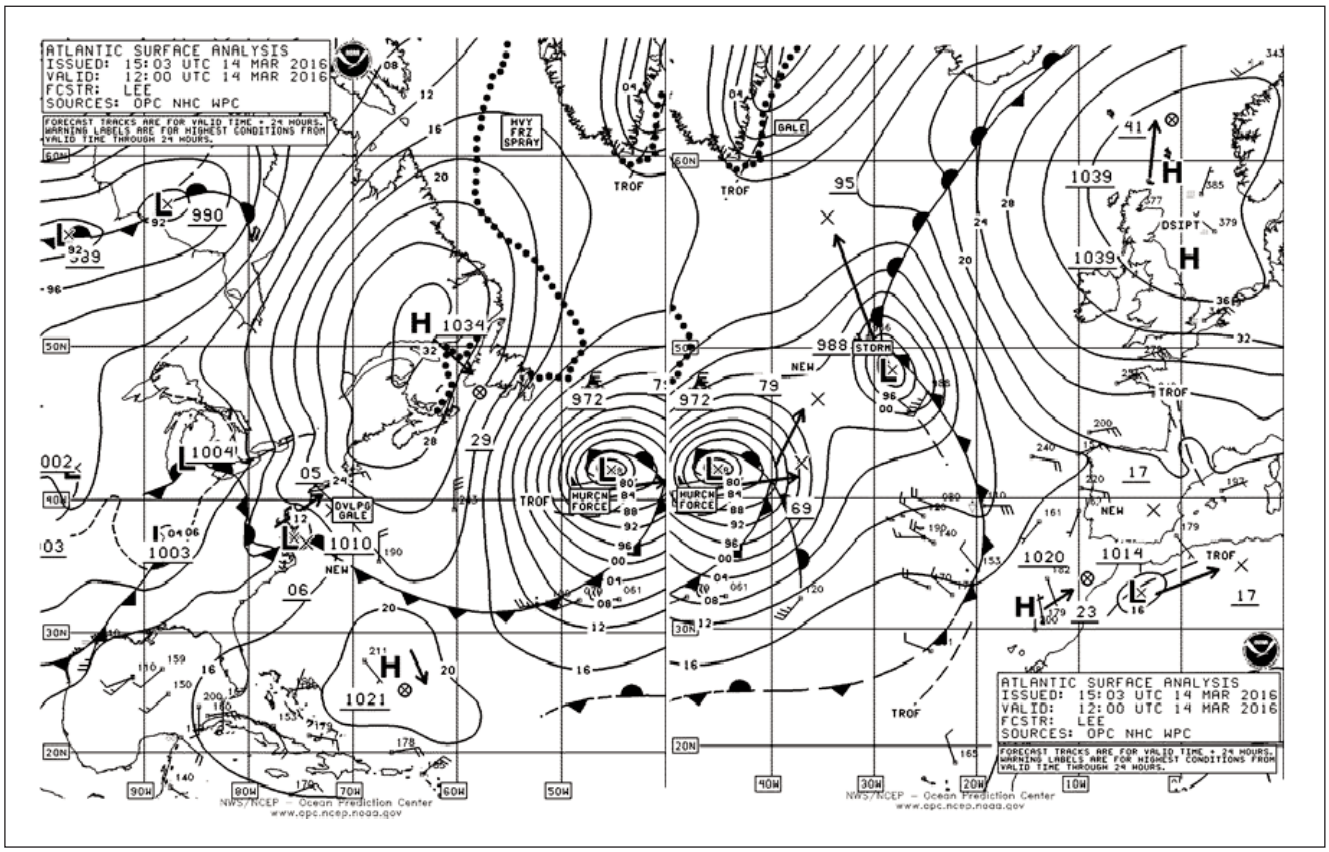


Figure 20. OPC North Atlantic Surface Analysis chart (Parts 2 and 1) valid 1200 UTC March 14, 2016.

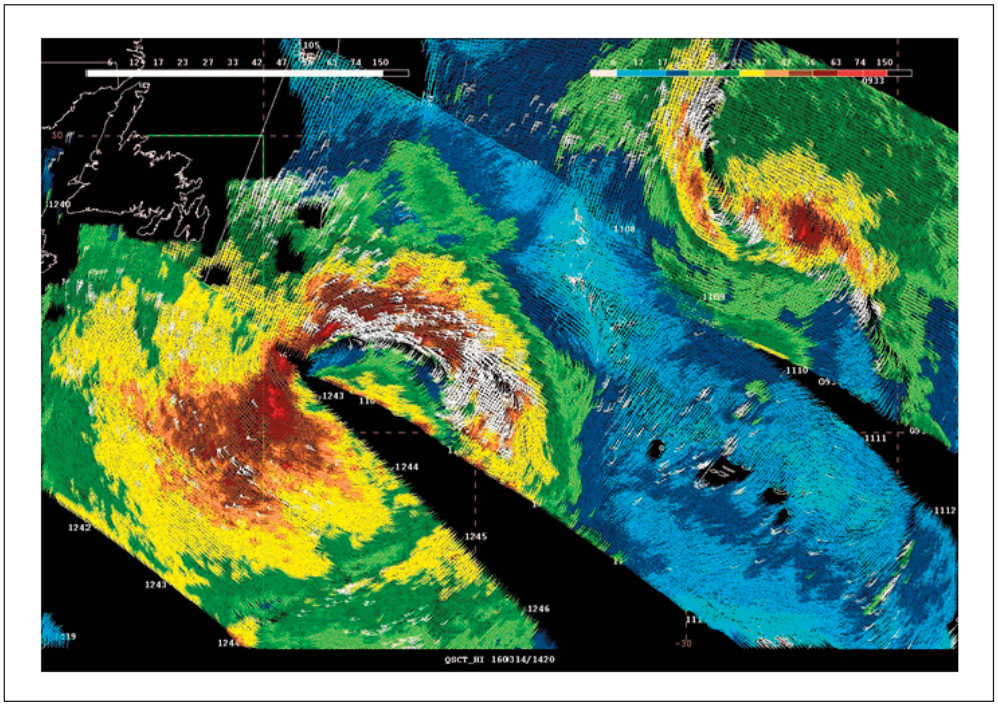


Figure 21. 12.5-km Rapidscat image of satellite-sensed winds around the two cyclones shown near the center of Figure 20. Portions of three passes are shown, with valid times 0933, 1108 and 1243 UTC March 14, 2016. The valid time of the middle pass is approximately one hour prior to the valid time of Figure 20. Cross-track time lines appear in the image, labeled in UTC. A color scale for the wind barbs appears at the top of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

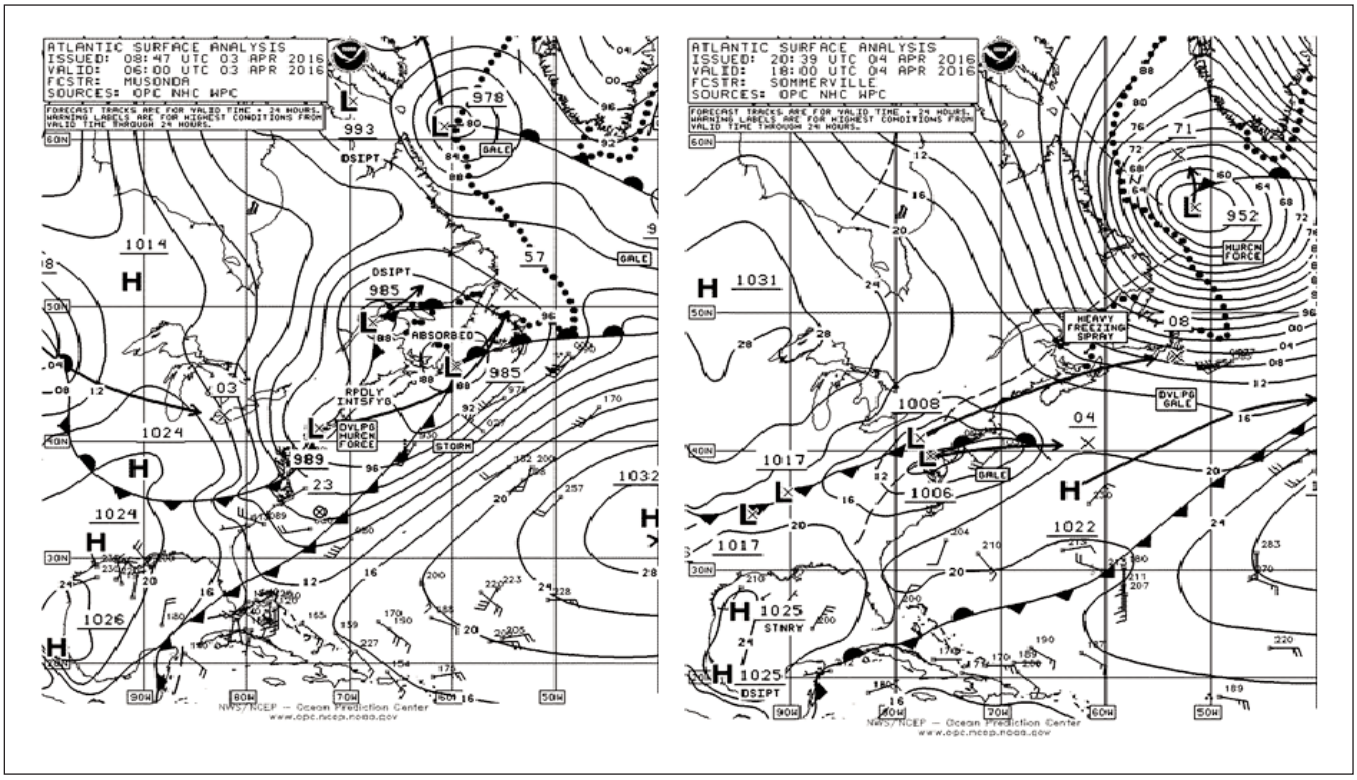


Figure 22. OPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC April 3 and 1800 UTC April 4, 2016.

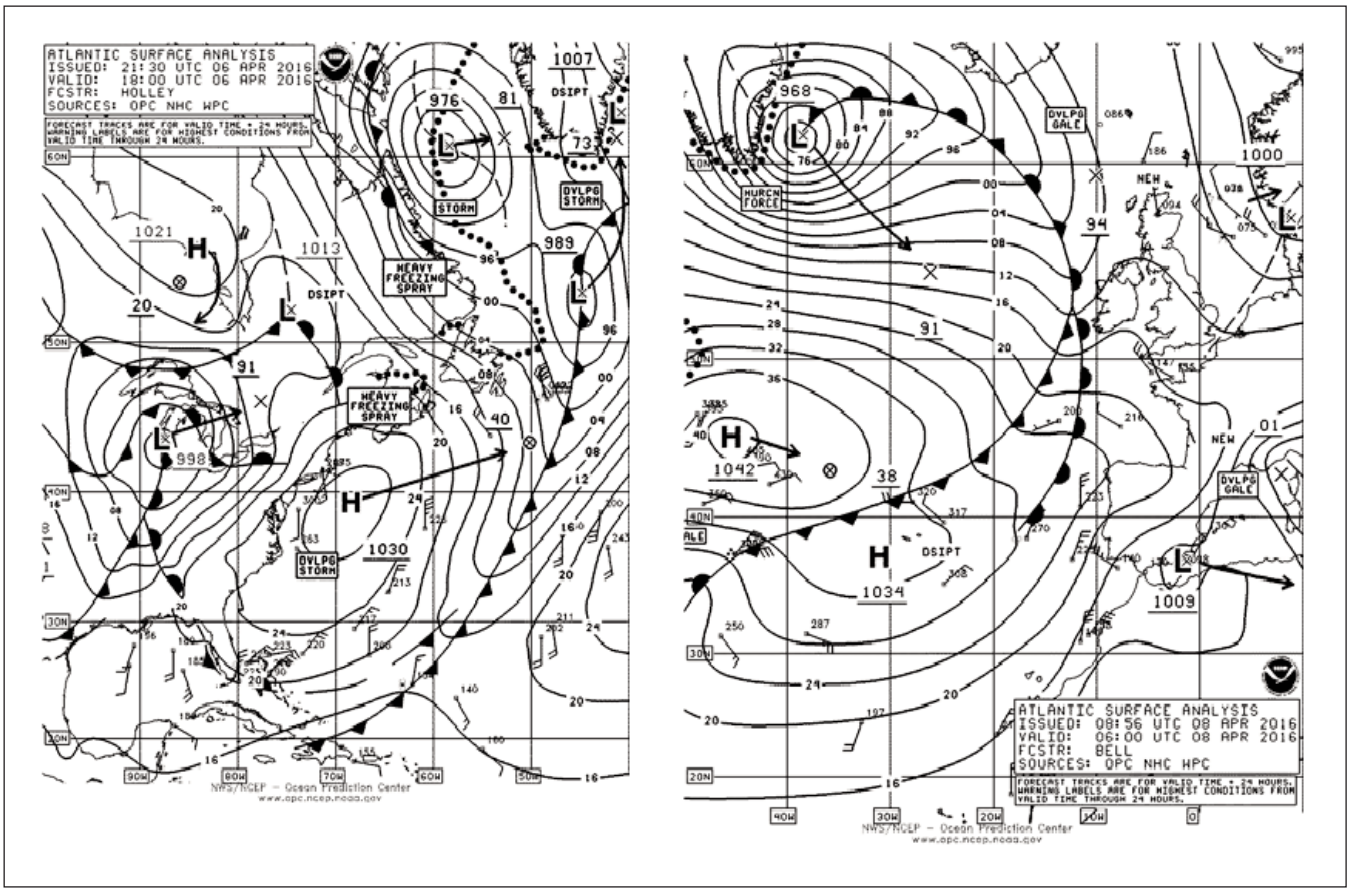


Figure 23. OPC North Atlantic Surface Analysis charts valid 1800 UTC April 6 (Part 2) and 0600 UTC April 8, 2016 (Part 1).

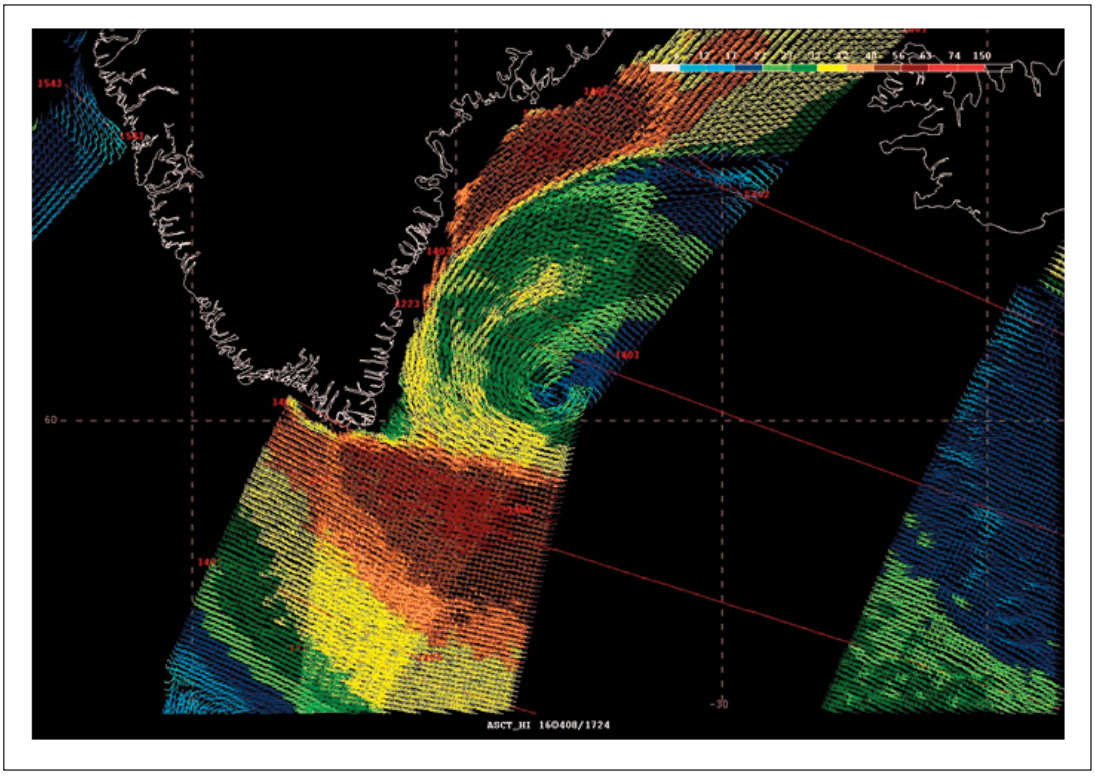


Figure 24. 25-km ASCAT (METOP-A) image of satellite-sensed winds around the west and north sides of the hurricane-force low shown in the second part of Figure 23. Portions of two satellite overpasses are shown, valid about 1223 and 1403 UTC April 8, 2016, with the valid time of the earlier pass about six and one-half hours later than the valid time of the second part of Figure 23. Image includes cross-track time lines of the satellite (four-digit UTC) and a color scale for the wind barbs in the upper right side.
Satellite data reprocessed at 12.5-km resolution by NOAA/NESDIS.

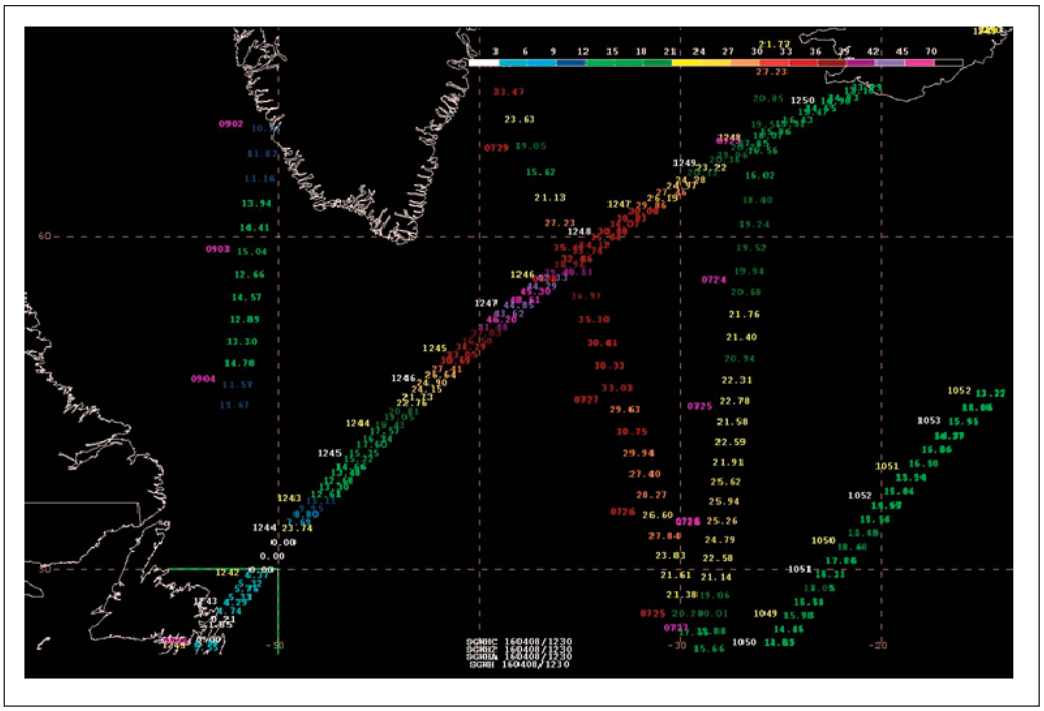


Figure 25. Remotely-sensed significant wave heights (in feet to two decimal places) along satellite tracks from the Jason-2, Jason 3, Cryosat and AltiKa altimeters. The times of the satellite overpasses (UTC) appear to the left of the swaths. The time in the center of the image, 1245 UTC April 8, 2016, is six and three quarters hours later than the valid time of the second part of Figure 23. A color scale appears at the top of the image.
Satellite data is reprocessed by NOAA/NESDIS for operational use.

Marine Weather Review – North Pacific Area

January to April 2016

George P. Bancroft
Ocean Forecast Branch, Ocean Prediction Center, College Park, MD
NOAA National Center for Environmental Prediction

Introduction

The weather pattern over the North Pacific was very active especially during January and February, in stark contrast to a year ago when there was only one hurricane force low during February and March 2015. Developing cyclones generally tracked east and northeast across the central waters after originating near or south of Japan, before weakening near or in the Gulf of Alaska. Some cyclones moved into the Bering Sea, with one strong system moving into the Bering Sea in January. There was at times a secondary storm track out of the south central waters toward the U.S. Pacific Northwest or British Columbia. There were nine hurricane force lows each in January and February, the most active months, followed by six in March and three in April. During the heavy weather season ending in April Ocean Prediction Center (OPC) detected a record number of hurricane force lows, fifty. Four of the January events developed central pressures below 950 hPa. There were no tropical cyclones appearing on OPC oceanic analysis charts during the four month period.

Significant Events of the Period

North Pacific Storm, January 1-5:

This cyclone actually formed near Japan late in December 2015 and moved into OPC's high seas area past 160E as a rapidly intensifying low as January began (**Figure 1**). The second part of **Figure 1** shows the cyclone at maximum intensity. A scatterometer image from near that time (**Figure 2**) shows a partial view of the northwest semicircle of the cyclone with wind retrievals of 50 to as high as 65 kts, from an area where there is usually sparse ship reports. The cyclone then moved northeast and then east with a weakening trend and dissipated on the 6th.

North Pacific / Bering Sea Storm, January 5-7:

One of few strong cyclones to move into the Bering Sea during this period, this storm developed a lowest central pressure of 945 hPa near the central Aleutian Islands 1800 UTC on January 6 (**Figure 3**) after originating near Japan early on the 4th. The central pressure fell 40 hPa in the 24 hour period ending at 0600 UTC on the 6th. An ASCAT scatterometer pass from 2209 UTC on the 6th showed 50 kts wind retrievals in the southeast semicircle at the edge of a pass. The system then weakened and moved into the northwest Bering Sea, where it dissipated on the 9th.

North Pacific Storm, January 6-9:

This cyclone followed a track more typical of other significant storms of the period. Originating southeast of Japan late on the 5th, this system moved across the south central waters well south of the Aleutian Islands from the 6th through the 9th before turning north toward the Gulf of Alaska on the 11th. It developed hurricane force winds with central pressures as low as 961 hPa while moving along 40N between 170W and 150W on the 8th and early on the 9th (**Figure 4**). **Figure 5** is an ASCAT-B pass from near the time of maximum intensity with only partial coverage of the south side of the cyclone where the strongest winds are often found, revealing winds to 60 kts near the pass edge. The cyclone later dissipated in the Gulf of Alaska on the 12th.

North Pacific Storm, January 12-16:

The development of the most intense cyclone of the period (lowest pressure 940 hPa) over a 36 hour period is depicted in **Figure 6**. It originated well south of western Japan early on

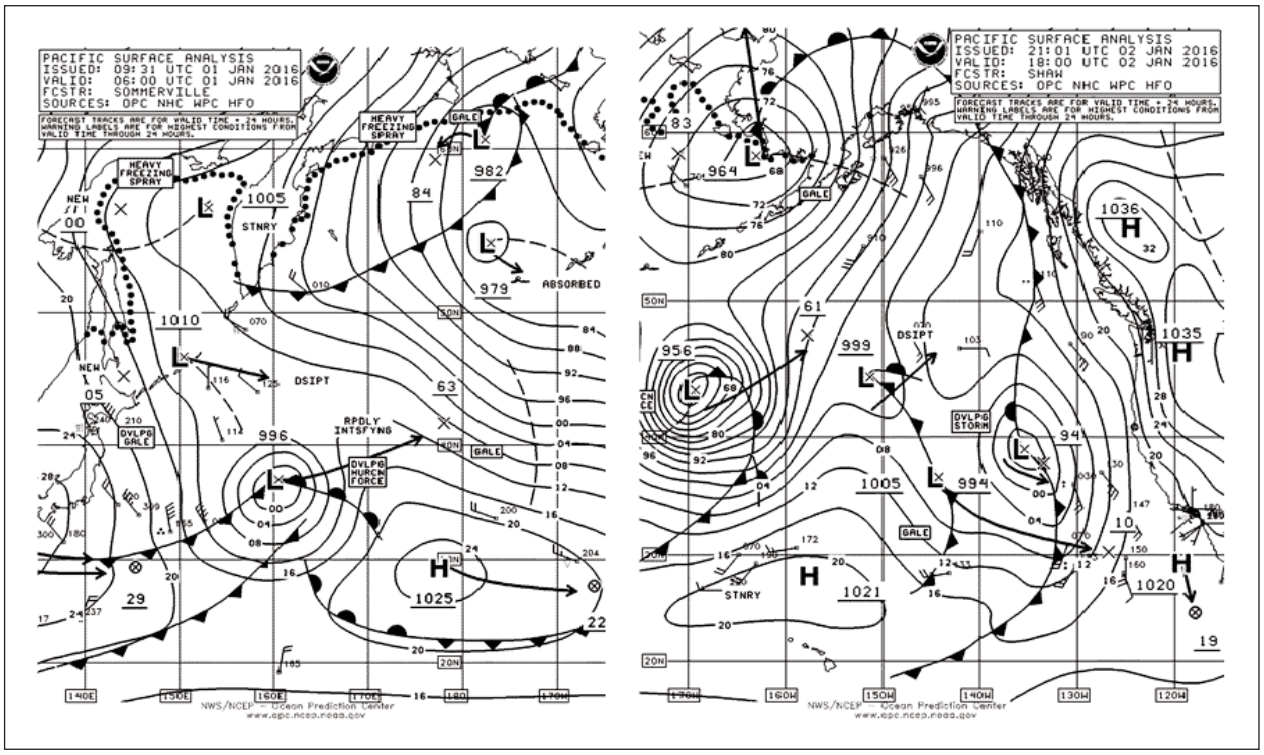


Figure 1. OPC North Pacific Surface Analysis charts valid 0600 UTC January 1 (Part 2 - west) and 1800 UTC January 2, 2016 (Part 1 – east). Twenty-four hour forecast tracks are shown with the forecast central pressures given as the last two whole digits in millibars (hPa).

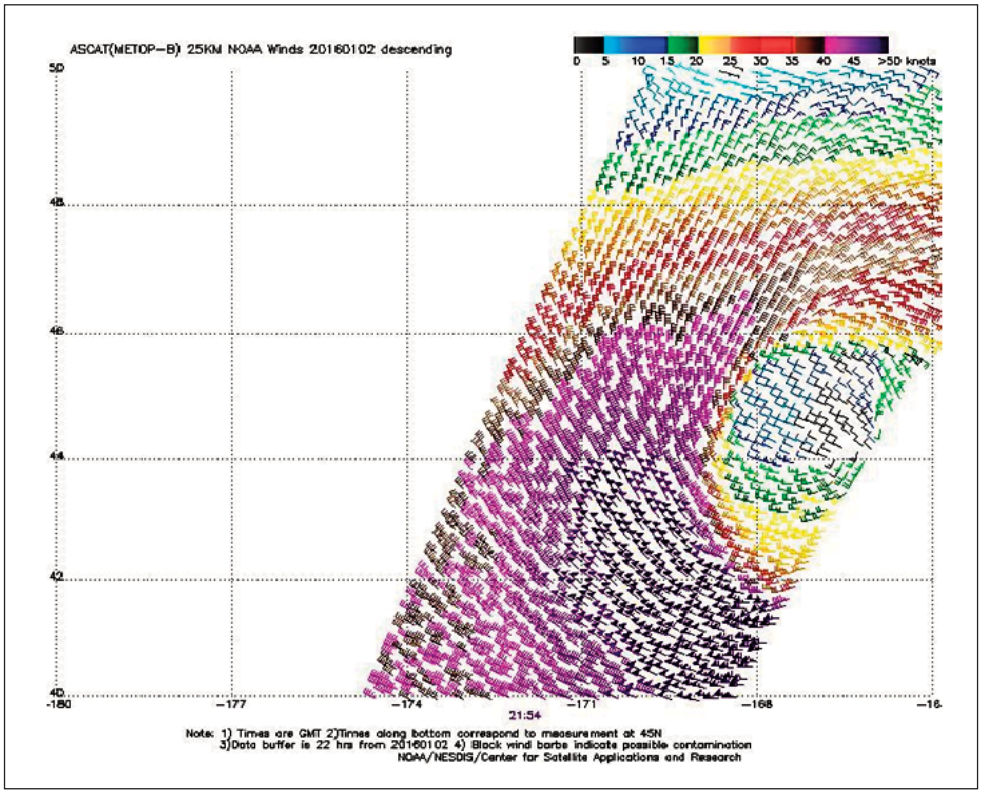


Figure 2. 25-km ASCAT METOP-B (European Advanced Scatterometer) image of satellite-sensed winds around the cyclone shown in the second part of Figure 1. The valid time of the pass is 2154 UTC January 2, 2016, or about four hours later than the valid time of the second part of Figure 1. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

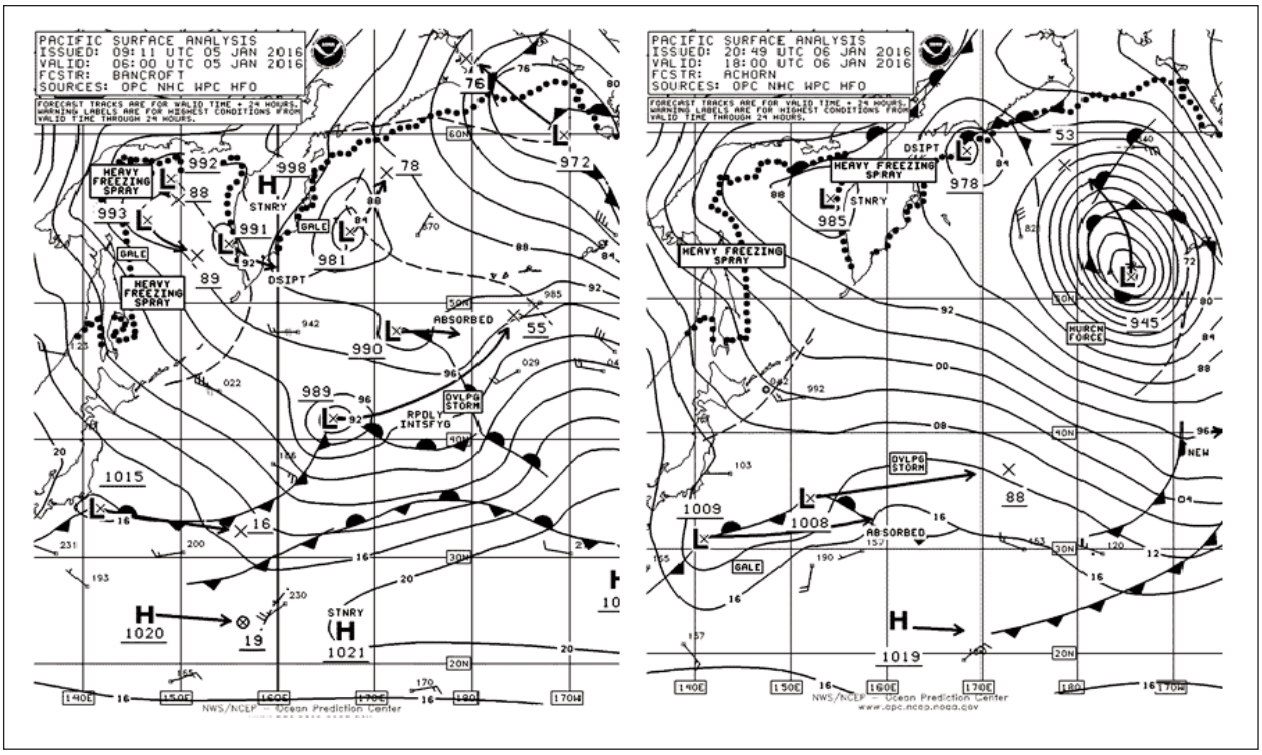


Figure 3. OPC North Pacific Surface Analysis charts (Part 2) valid 0600 UTC January 5 and 1800 UTC January 6, 2016.

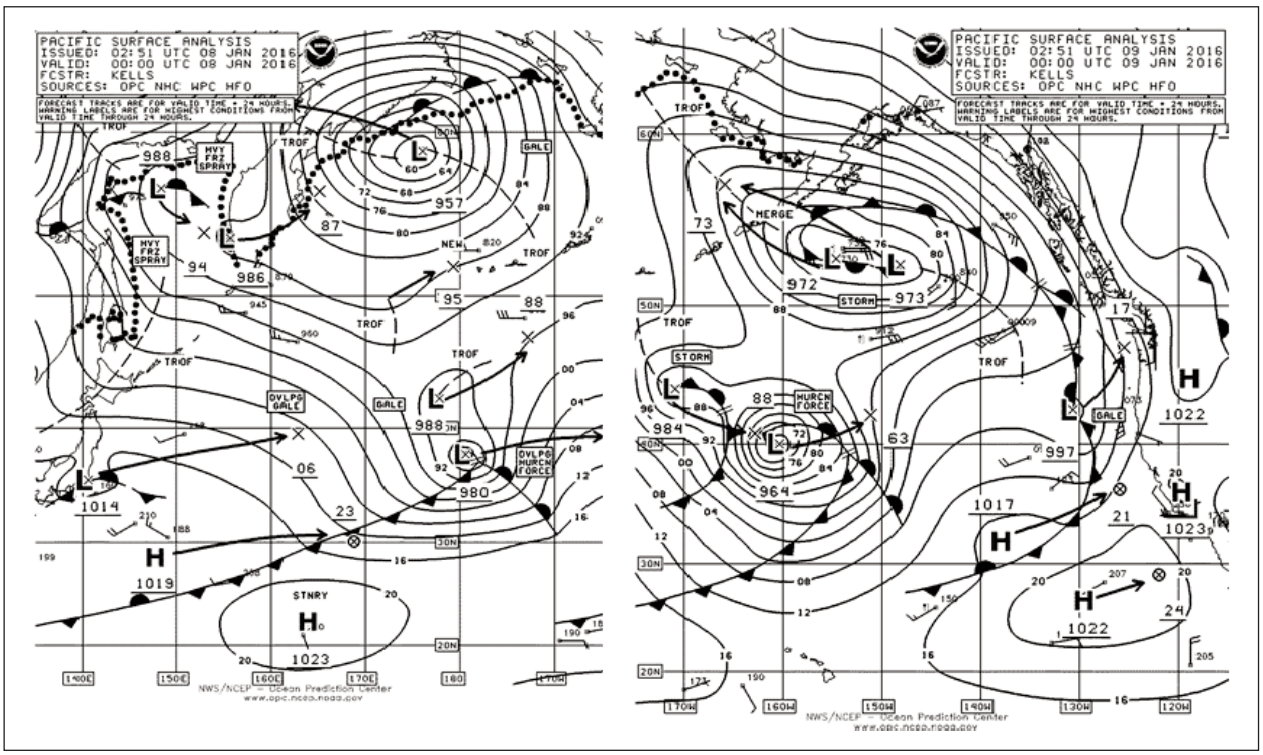


Figure 4. OPC North Pacific Surface Analysis charts valid 0000 UTC January 8 (Part 2) and 0000 UTC January 9, 2016 (Part 1).

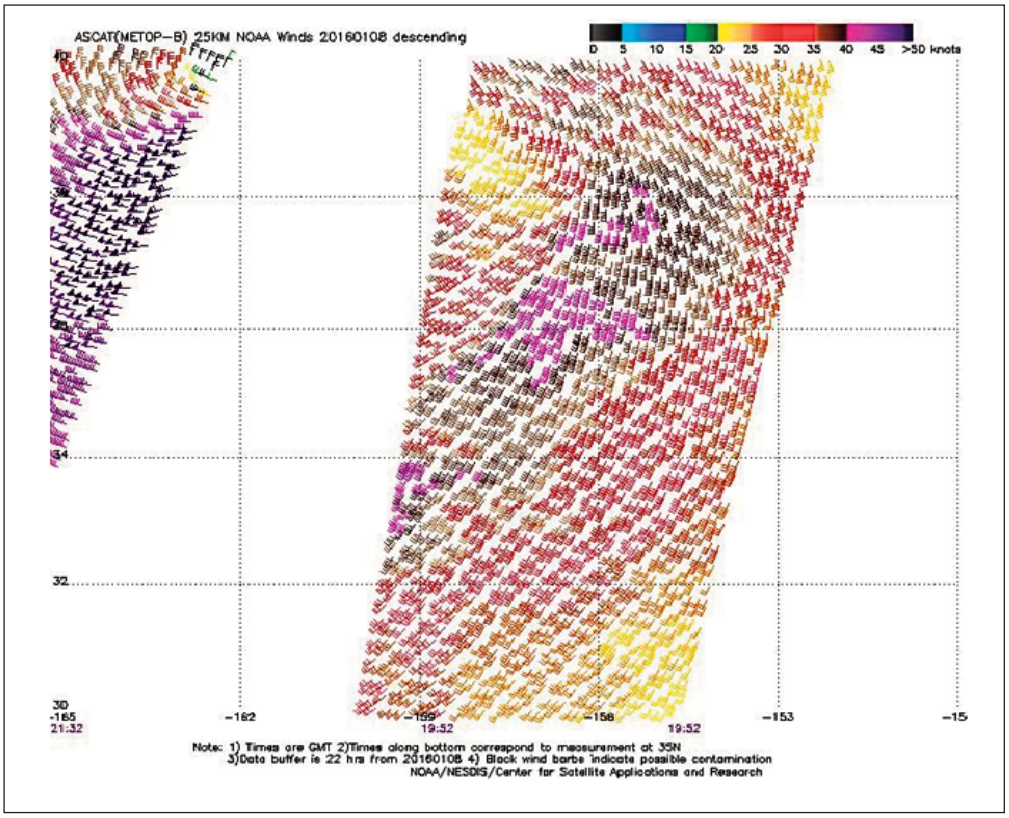


Figure 5. 25-km ASCAT (METOP-B) image of satellite-sensed winds around the cyclone shown in the second part of Figure 4. The valid time of the pass containing the strongest winds is 2132 UTC January 8, 2016, or about two and one-half hours prior to the valid time of the second part of Figure 4. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

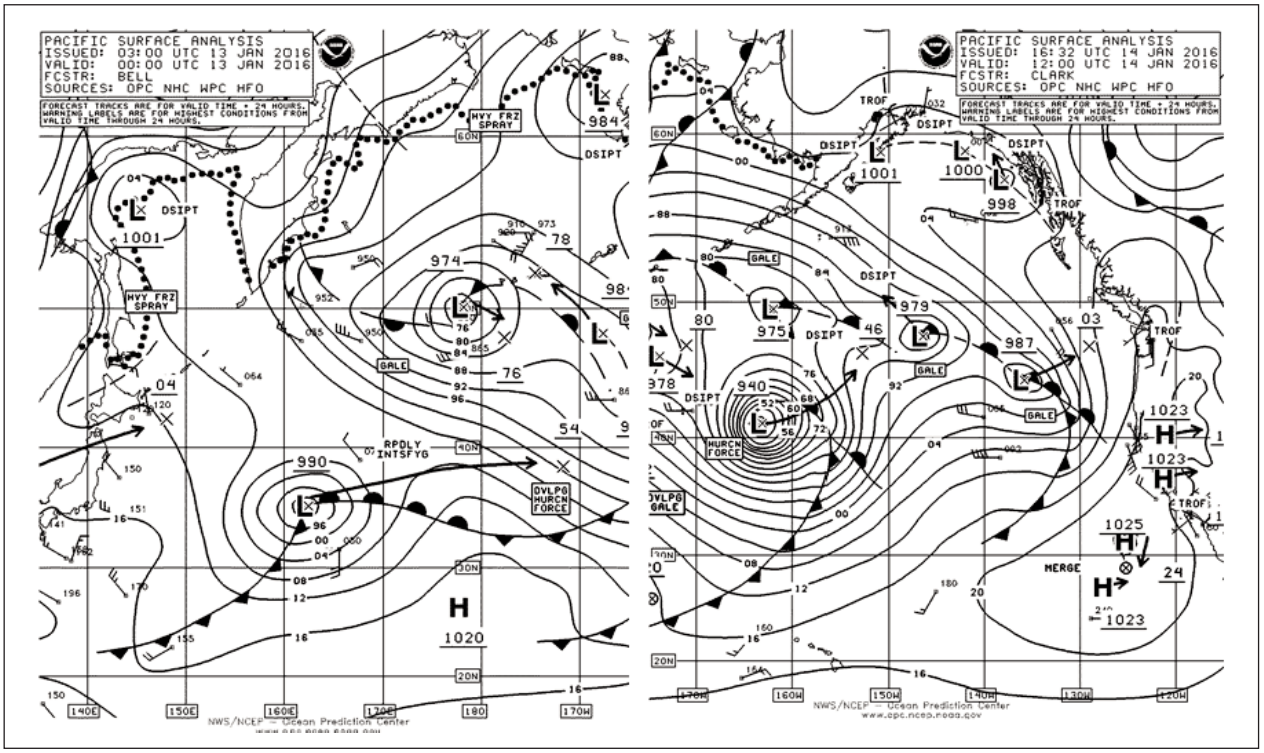


Figure 6. OPC North Pacific Surface Analysis charts valid 0000 UTC January 13 (Part 2) and 1200 UTC January 14, 2016 (Part 1).

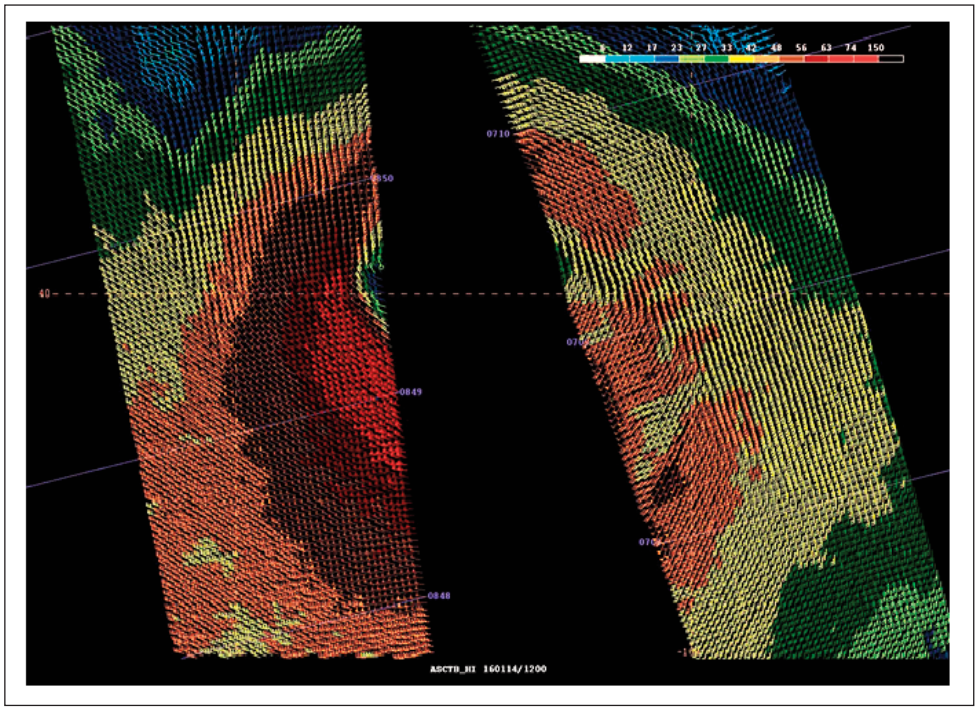


Figure 7. High-resolution ASCAT (METOP-B) image of satellite-sensed winds around the cyclone shown in the second part of Figure 6. Cross-track time lines of the satellite overpass are numbered (UTC) and a color scale appears at the top.
Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

the 11th. The central pressure fell 38 hPa in the 24 hour period ending at 0600 UTC on the 14th. The ASCAT-B image in **Figure 7** indicated that this cyclone likely had winds of at least 80 kts. The image does miss the south side of the cyclone and wind retrievals to 50 kts or more surround the cyclone except on the east side. A satellite altimeter pass in **Figure 8** which cuts through the south side of the cyclone revealed wave heights as high as 50 ft (15.2 m). The ship **HATSU EXCEL** (VSXV3) near 54N 162W encountered northeast winds of 52 kts at 0000 UTC on the 16th, and seas of 10.1 m (33 ft) six hours prior. Buoy 46075 (53.9N 160.8W) reported northeast winds of 37 kts with gusts to 49 kts and 7.5 m seas (25 ft) at 2100 UTC on the 15th, and three hours later reported 8.5 m seas (28 ft). The cyclone then moved northeast and gradually weakened, moving into the southern Gulf of Alaska as a gale force low by the 18th.

Eastern North Pacific Storm, January 15-17:

This low formed on a front over the south central waters, well south of the western Aleutian Islands late on the 14th and developed hurricane force winds before turning north just west of the offshore waters of the U.S. Pacific Northwest on the 16th, with central pressures as low as 962 hPa. There were some reports of winds gusting to near hurricane force and seas above 30 ft (9 m) in that area. Buoy 46036 (48.4N 133.9W) reported southwest winds of 45 kts with gusts to 60 kts at 1200 UTC on the 17th, and seas 10.0 m (33 ft) one hour later. Buoy 46208 (52.5N 132.7W) reported southeast winds of 41 kts with gusts to 51 kts at 1600 UTC on the 17th, a peak gust of 56 kts five hours prior, and seas of 10.0 m (33 ft) at 2100 UTC that day. The cyclone then turned northwest into the Gulf of Alaska late on the 17th, and dissipated on the 18th.

Western Pacific Storm, January 17-19:

Figure 9 shows two hurricane force cyclones that formed at about the same time in mid-January 2016. The first to develop was the western system originating south of western Japan early on January 17 and developing hurricane force winds just east of Japan the next day. The Rapidscat image in **Figure 10** reveals winds to hurricane force north of the center along the occluded front and also a smaller area in westerly flow south of the center. The ship **BATFR05**

(33N 138E) reported west winds of 50 kts at 1300 UTC on the 18th, and 8.5 m seas (28 ft) seven hours prior near the same location. A vessel with a **Masked** call sign encountered east winds of 55 kts and 8.2 m seas (27 ft) near 37N 143E at 0600 UTC on the 18th. The cyclone drifted northeast and developed a lowest central pressure of 964 hPa at 0600 UTC on the 19th, before stalling near the southern Kurile Islands late on the 19th, when its winds diminished to gale force.

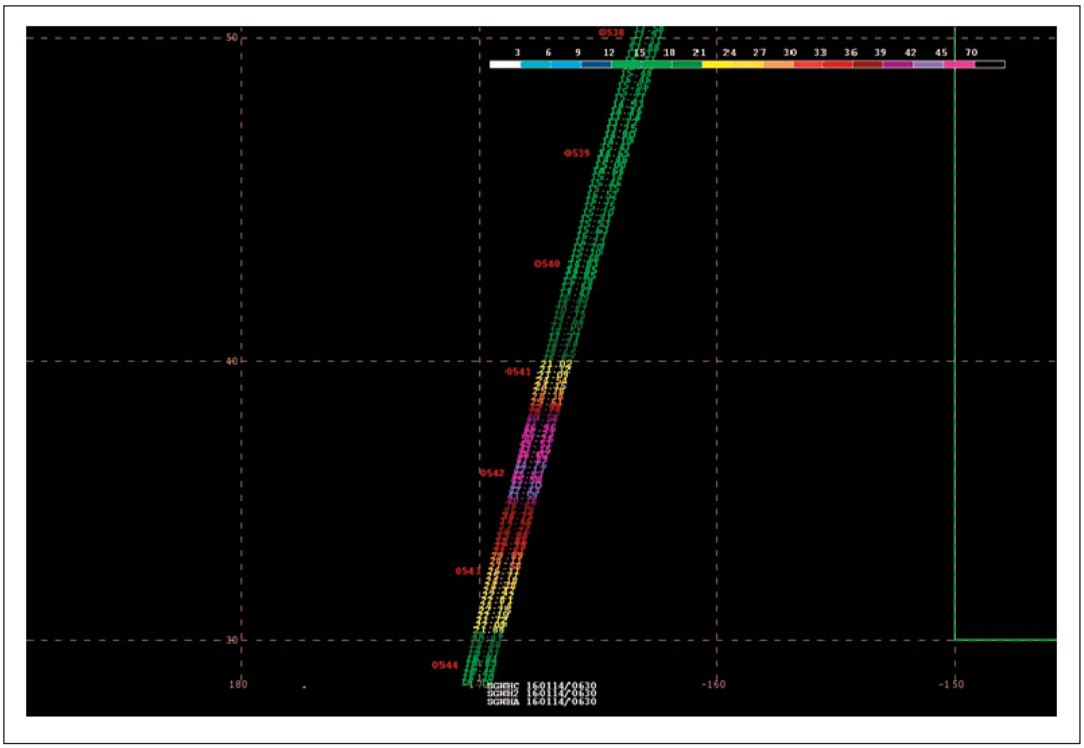


Figure 8. Remotely-sensed significant wave heights along a swath through the cyclone shown in the second part of Figure 6. Satellite overpass times in UTC appear to the left. The time of 0541 UTC near the center of the image is about six and one-quarter hours prior to the valid time of the second part of Figure 6. Satellite data is reprocessed by NOAA/NESDIS for operational use.

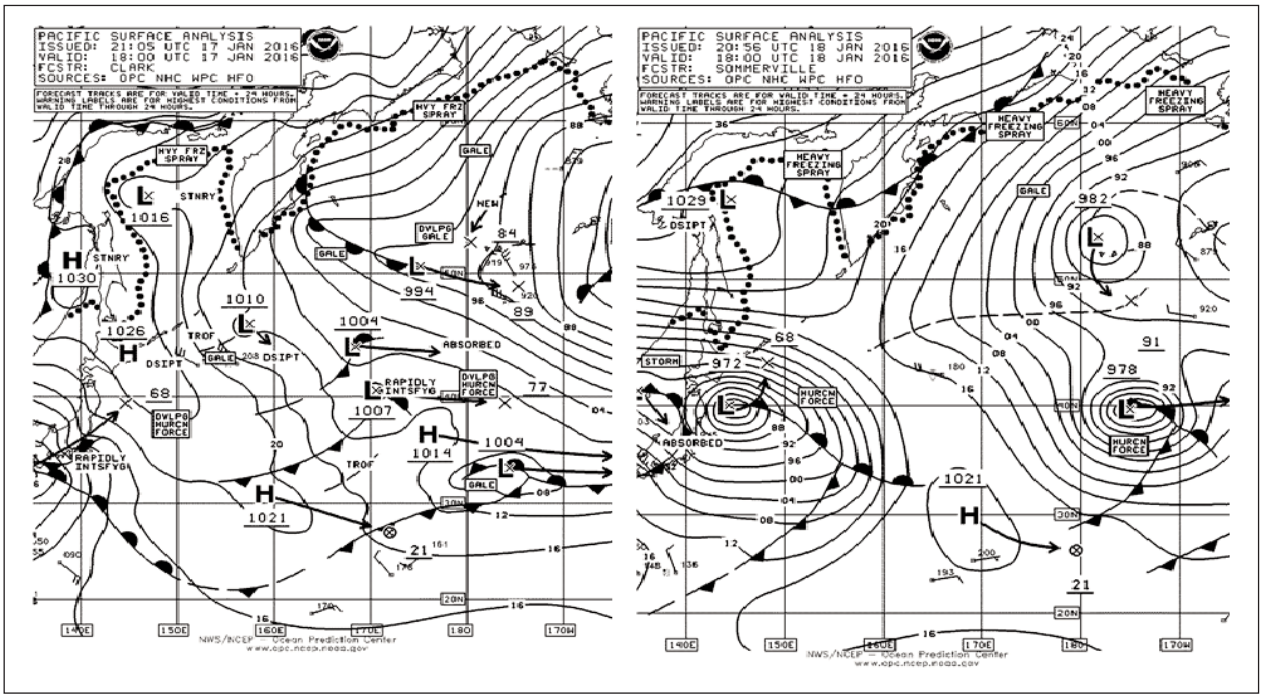


Figure 9. OPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC January 17 and 18, 2016.

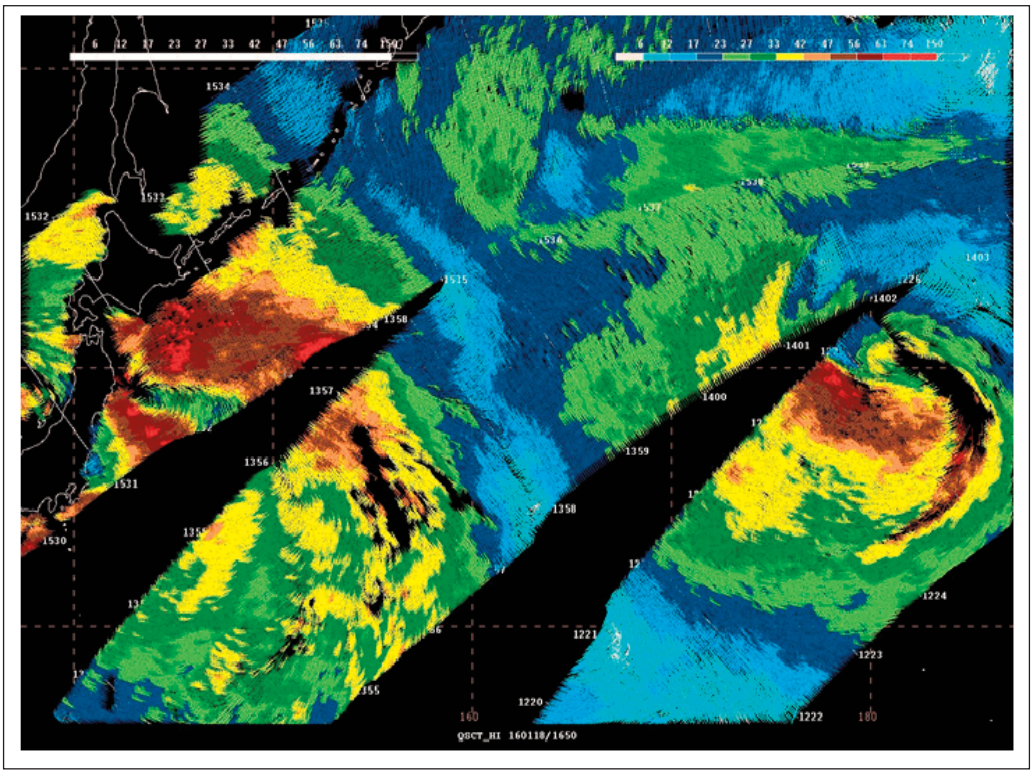


Figure 10. 12.5-km Rapidscat image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 9. Rapidscat is a QuikSCAT-type scatterometer aboard the International Space Station. Portions of three overpasses are shown, with the valid time of the pass in the center of the image 1359 UTC January 18, 2016, or four hours prior to the valid time of the second part of Figure 9. Cross-track time lines appear in the image, labeled in UTC. A color scale for the wind barbs appears at the top of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

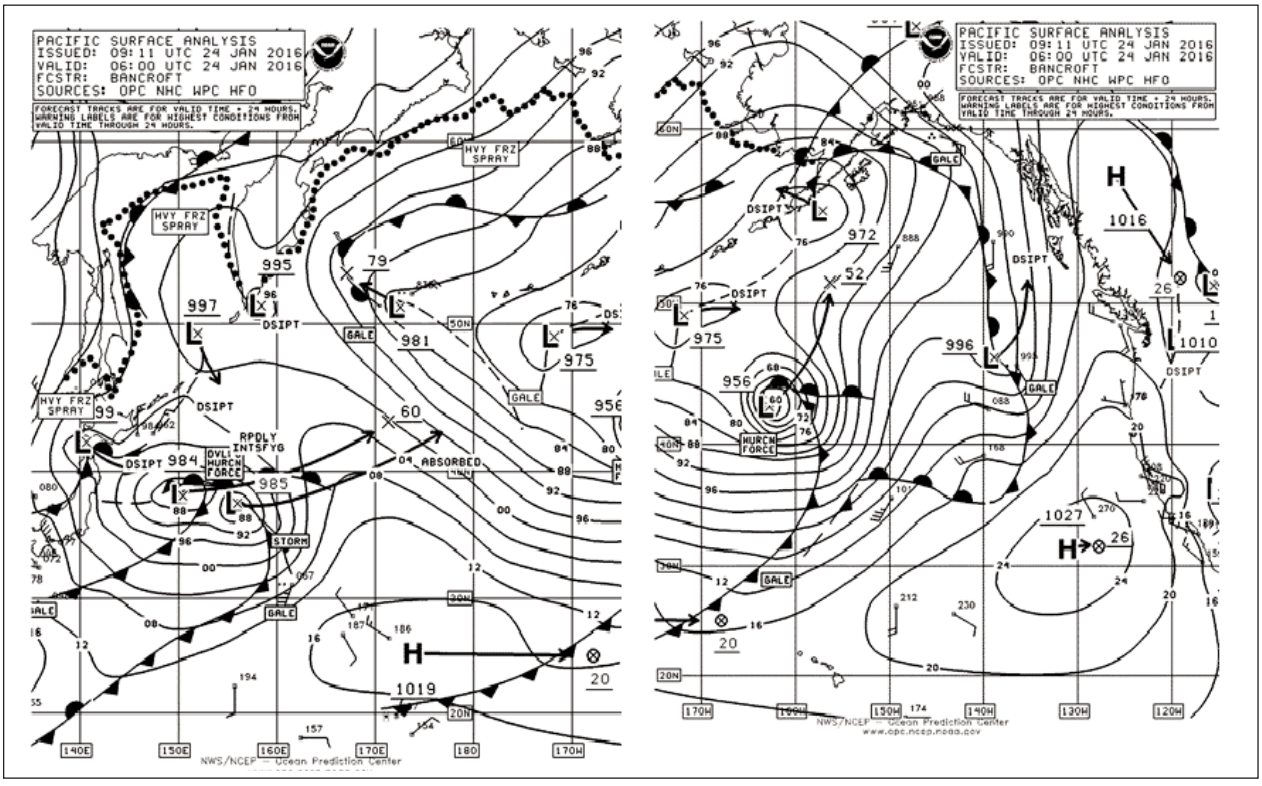


Figure 11. OPC North Pacific Surface Analysis chart (Parts 2 – west and 1 – east) valid 0600 UTC January 24, 2016. The two parts overlap between 165W and 175W.

North Pacific Storms, January 22-28:

Figures 11 and 12 display the development of another pair of hurricane force lows at nearly the same time in late January. The first of these is shown in Figure 11 in the eastern waters after a period of rapid intensification, with the pressure falling 36 hPa in the preceding 24 hour period. It originated east of Japan near 160E early on the 22nd and developed a lowest central pressure of 949 hPa while turning north into the Gulf of Alaska after its winds had peaked. Figure 12 shows the system as a weakening gale in the western Gulf of Alaska. The stronger of the two cyclones developed from the merging of two cyclones east of Japan (Figures 11 and 12) and followed a more southern track and developed winds estimated at 80 kts, almost as strong as January 12-16 event. An AltiKa altimeter pass through the southwest side of the storm (Figure 13) revealed wave heights as high as 62 ft (18.9 m). The lowest central pressure of 945 hPa late on the 26th came as winds were weakening. The cyclone weakened in the Gulf of Alaska on the 27th and 28th.

North Pacific Storm, January 30-February 2:

Low pressure originating southeast of Japan early on January 30th moved northeast and rapidly intensified to become yet another powerful Pacific cyclone (Figure 14). In initial development the central pressure dropped 29 hPa in the 24 hour period ending at 0600 UTC February 1st, impressive for that low latitude. The Rapidscat image in Figure 15 shows numerous wind retrievals exceeding 65 kts south of the cyclone center and winds as high as 85 kts. The image was available when the cyclone was still intensifying. As evident from prior events, the highest winds in a cyclone may occur before the lowest central pressure is reached. The cyclone is shown at maximum (957 hPa) in the right panel of Figure 14. The **MAERSK STOCKHOLM** (41N 152W) reported south winds of 50 kts at that time. OPC analysis showed the system to be below hurricane force six hours later. The system then weakened and turned northwest into the southeast Bering Sea, where it dissipated.

Eastern North Pacific Storm, February 4-5:

This event was short lived, originating as a new low 43N 142W early on the 4th and briefly developing hurricane force winds of 65 kts mainly as southerly winds along the Canadian coast north of Vancouver island as seen in Rapidscat imagery near 0500 UTC on the 6th.
The **HORIZON ANCHORAGE** (KGTX) near 50N 129W reported north winds of 55 kts at 0000 UTC on the 5th. The center moved inland on the 5th.

Eastern North Pacific Storm, February 5-7:

This was the first of two powerful cyclones that developed in close succession early in February. Originating in the south central waters early on the 4th, it developed a lowest central pressure of 959 hPa near 46N 154W at 1200 UTC on the 6th. An ASCAT image at 0640 UTC on the 6th returned an area of southwest winds to 60 kts on the southwest side at a pass edge. The system then weakened and moved into the Gulf of Alaska by the 8th.

North Pacific Storm, February 6-10:

The stronger of the two powerful cyclones mentioned above developed as depicted in Figure 16. The second part of Figure 16 shows the cyclone at maximum intensity. The central pressure fell 46 hPa in 24 hour period ending at 1800 UTC on the 7th. This is almost twice the "bomb" rate at 60N (Sanders and Gyakum, 1980). The ASCAT-B image in Figure 17 shows a large area of 50 to 70 kts winds south of the center and even some 50 kts barbs on the north side. The cyclone then moved east with a gradual weakening trend, and its top winds lowered to storm force by the 9th.

Northwest Pacific Bering Sea Storm, February 17-19:

This was one of few cyclones to move into the Bering Sea during the period. It moved from the northern Kurile Islands early on the 17th to the northwest Bering Sea by 1800 UTC on the 18th, where it briefly developed hurricane force winds with a 964 hPa

center. It then weakened near the Russian coast the next day.

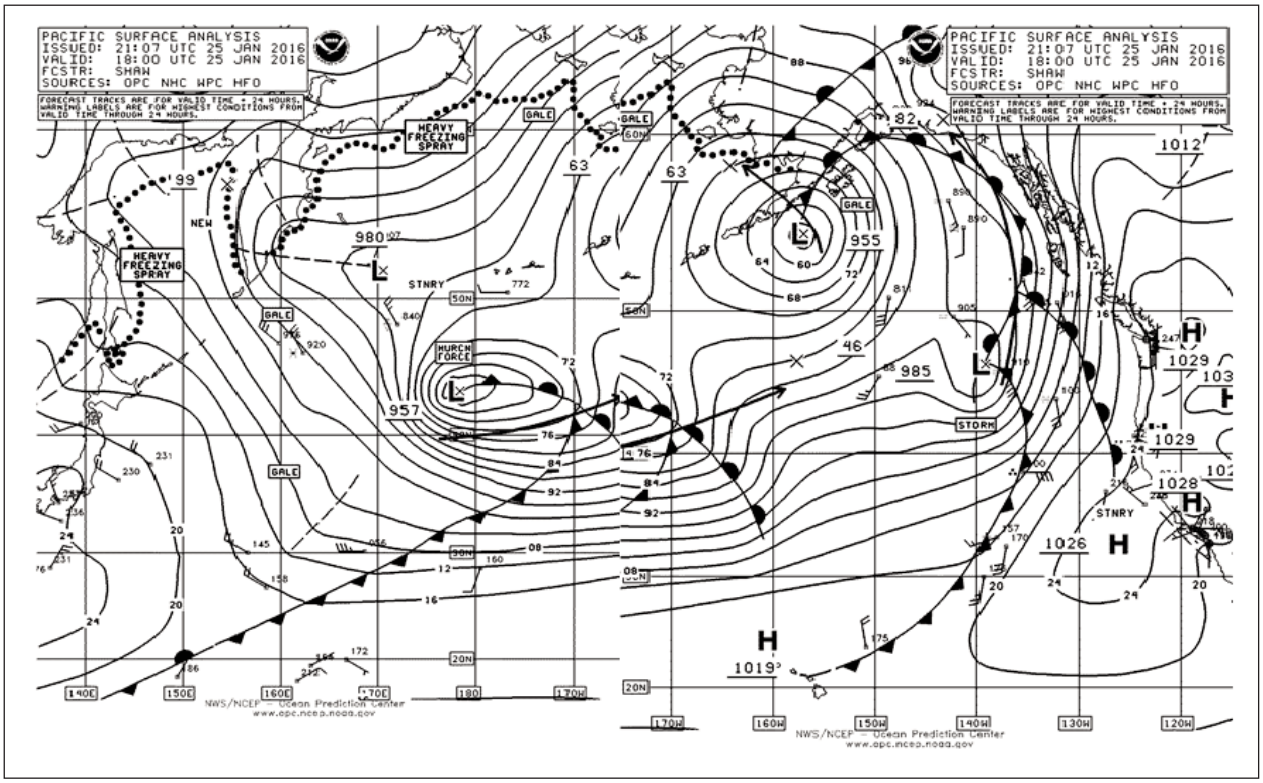


Figure 12. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 1800 UTC January 25, 2016.

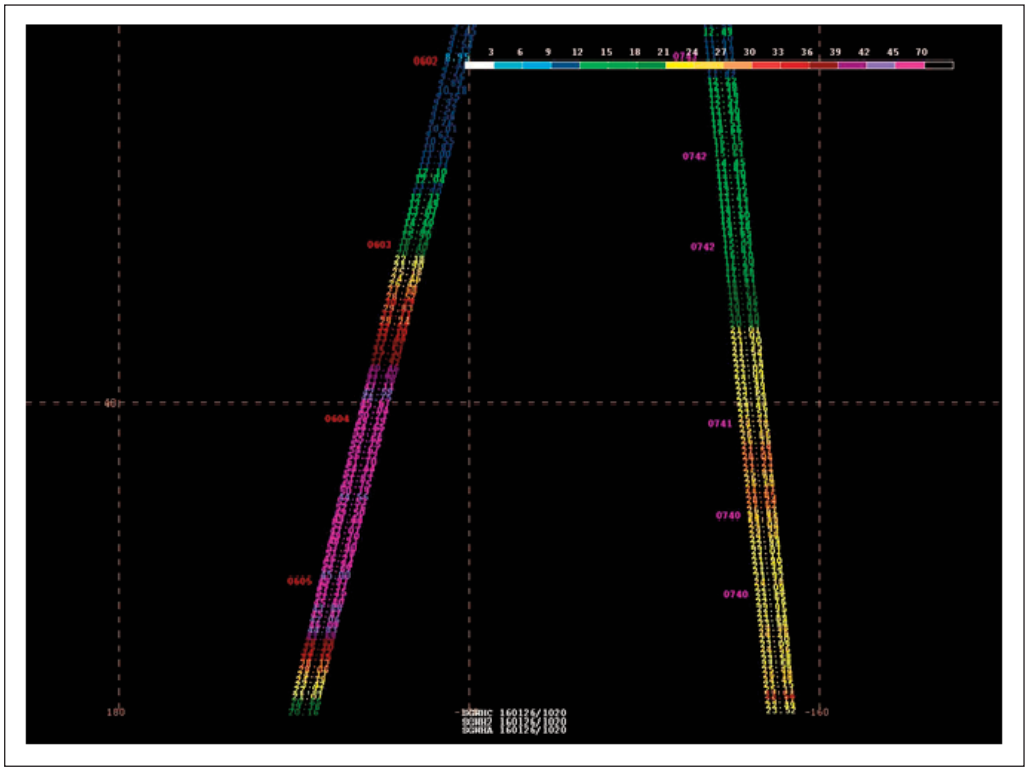


Figure 13. Remotely-sensed significant wave heights from the AltiKa and Jason-2 altimeters along swaths through the cyclone shown in the second part of Figure 12. Satellite overpass times in UTC appear to the left. The time of 0604 UTC January 26 near 40N is about twelve hours later than the valid time of the second part of Figure 12. Satellite data is reprocessed by NOAA/NESDIS for operational use.

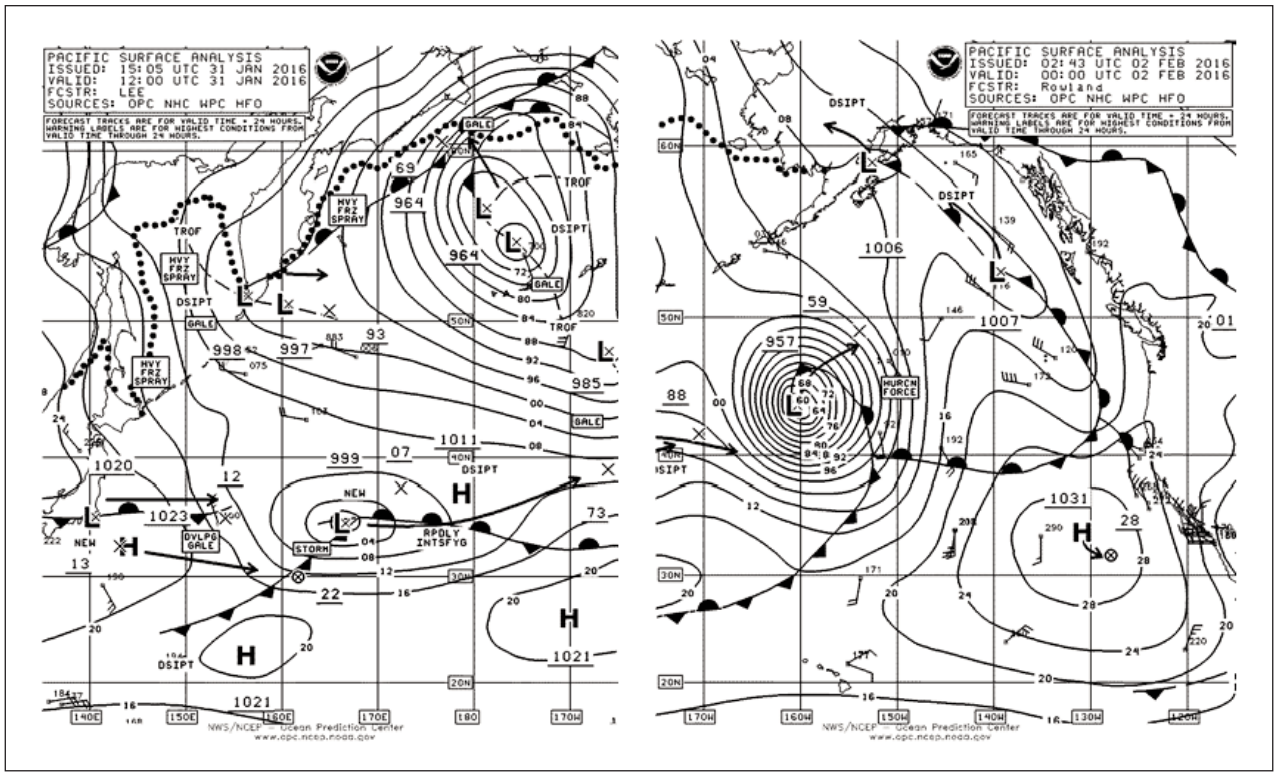


Figure 14. OPC North Pacific Surface Analysis charts valid 1200 UTC January 31 (Part 2) and 0000 UTC February 2, 2016 (Part 1).

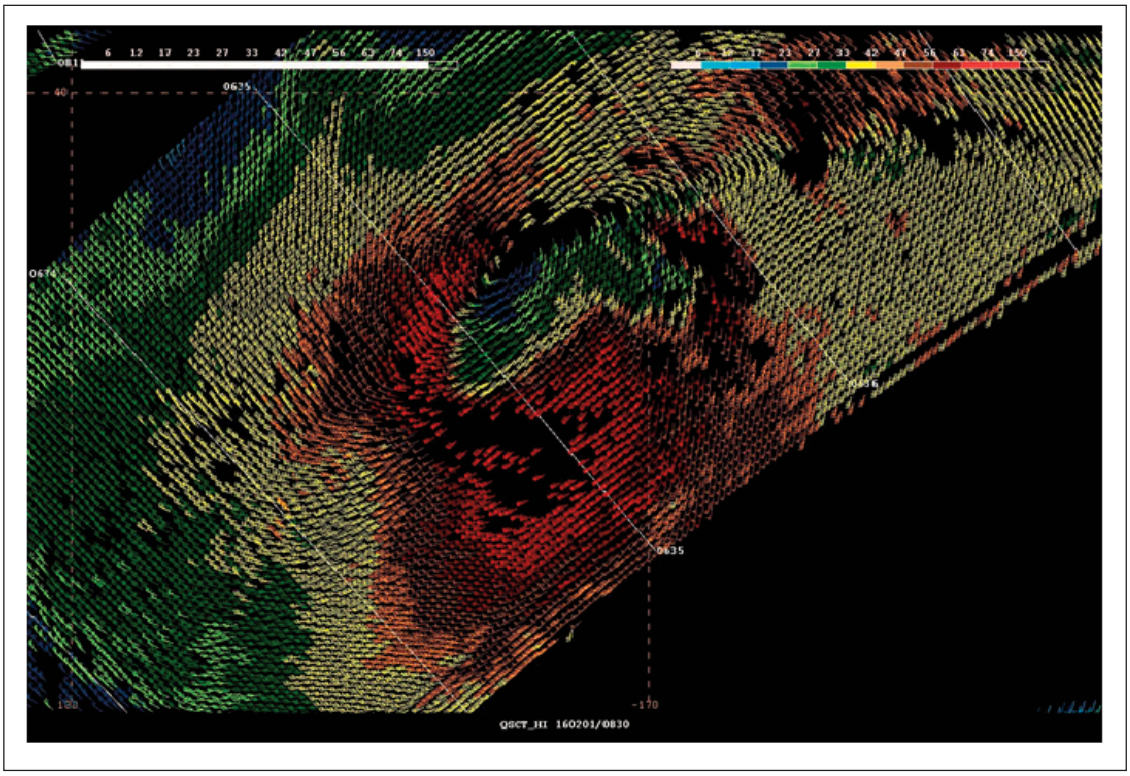


Figure 15. 12.5-km Rapidscat image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 14. Cross-track time lines appear in the image, labeled in UTC. The timeline near the center of the image, 0635 UTC February 1, is about seventeen and one-half hours prior to the valid time of the second part of Figure 14. A color scale for the wind barbs appears at the top of the image. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

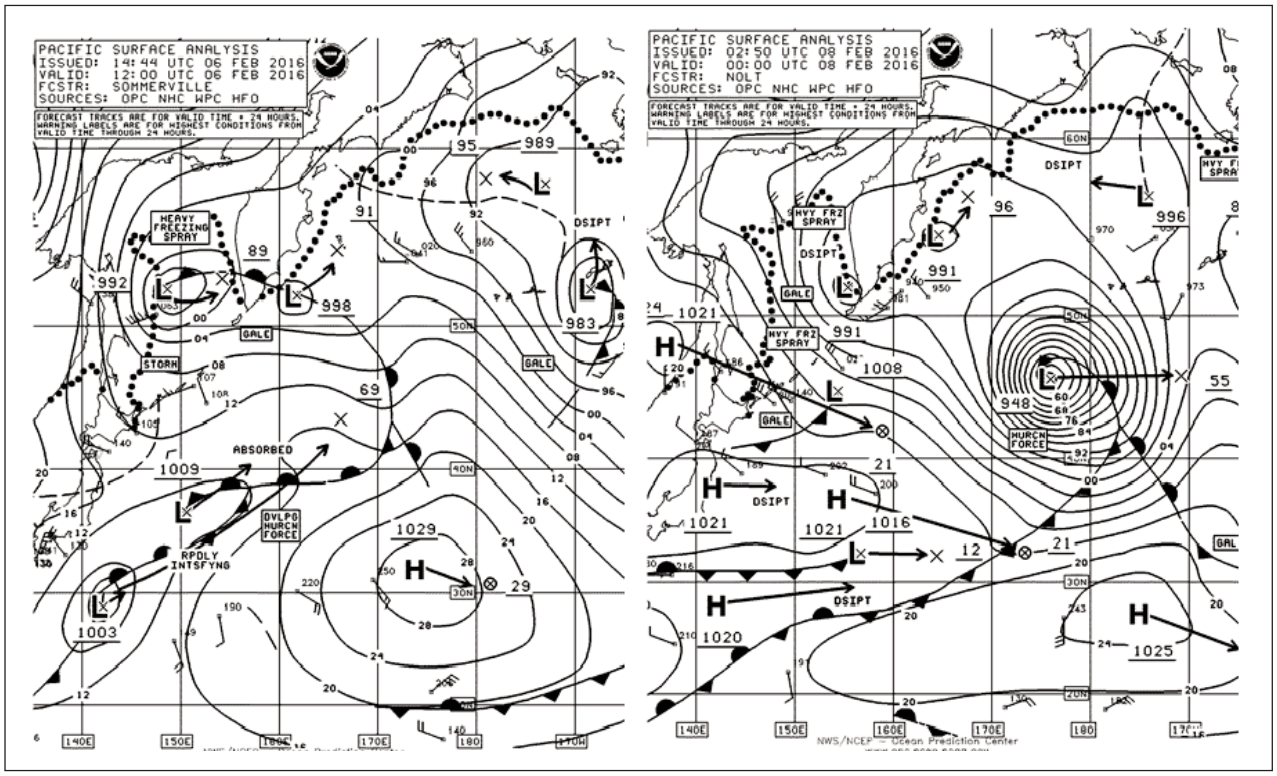


Figure 16. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC February 6 and 0000 UTC February 8, 2016).

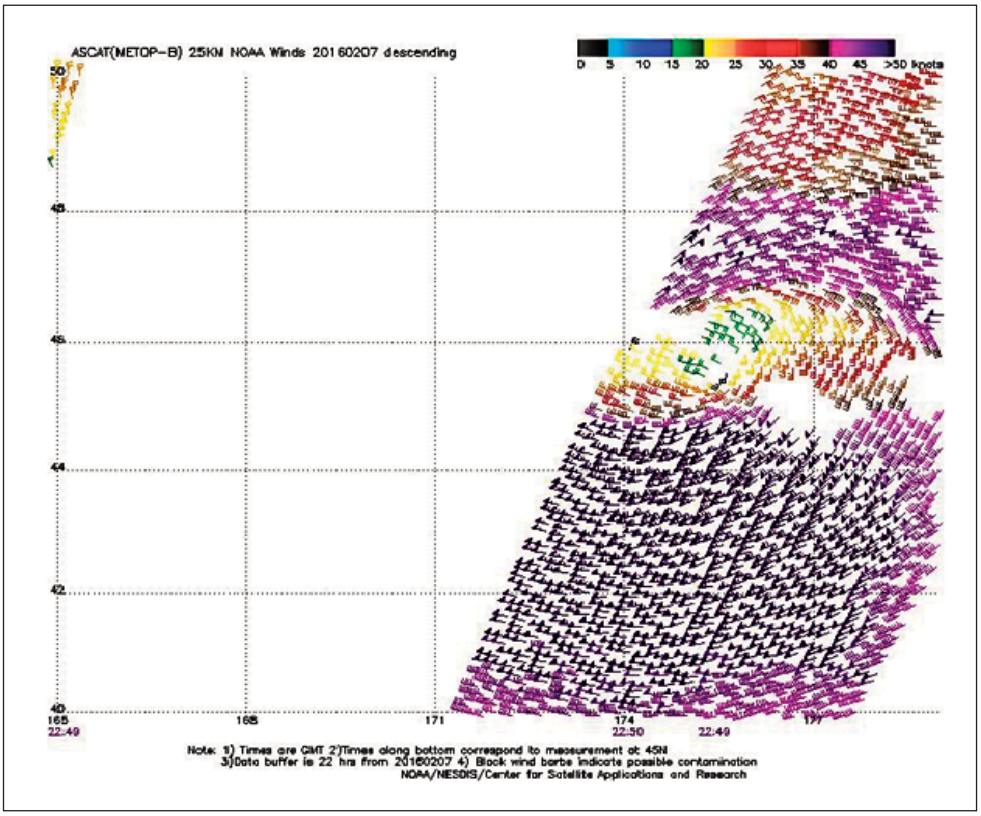


Figure 17. 25-km ASCAT (METOP-B) image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 16. The valid time of the pass is 2250 UTC February 7, 2016, or about one hour prior to the valid time of the second part of Figure 16. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

North Pacific Storms, February 19-24:

Once again in a very active month, two powerful cyclones developed about at the same time. **Figures 18** and **19** depict the developments over a thirty six hour period, leading to two intense hurricane force lows of about the same intensity at 0600 UTC on the 22nd. With the development of the eastern system at low latitude, an ASCAT pass from 2029 UTC on the 21st showed a swath of northwest winds 50 to 60 kts but at a pass edge with the image likely missing the strongest winds south of the storm. The central pressure of the eastern system dropped 33 hPa in the twenty four hour period ending at 1800 UTC on the 21st. The ship **TANGGUH HIRI** (C6XC2) near 30N 178W encountered northwest winds of 45 kts and 5.8 m seas (19 ft) at 2200 UTC on the 20th. The western cyclone subsequently tracked east southeast and the eastern low northeast, with both weakening to gale force in the eastern waters on the 24th.

North Pacific Storms, February 27-March 2:

Figures 20 and **21** covering a 36 hour period depicts three hurricane force lows of varying size that formed late in February and the beginning of March. The eastern systems were strong and relatively compact lows with the one in **Figure 20** originating near 39N 173E late on the 26th and developing hurricane forcewinds early on the 28th before moving northwest and weakening near the eastern Aleutians by March 1st. This was replaced by the low latitude development east of Japan (**Figure 20**). The development of a larger system of similar intensity near the Kurile Islands is also shown in **Figure 20** and **Figure 21**. The southern storm near 39N 160W deepened by 38 hPa in the 24 hour period ending at 0600 UTC March 1st. An ASCAT pass from 0822 UTC on the 1st returned a swath of northwest winds 50 to as high as 65 kts at a pass edge, missing the area of strongest winds (**Figure 23**).

Eastern North Pacific Storm, March 6-9:

A cyclone coming from the south central waters on the 5th moved northeast and briefly developed hurricane force winds near 47N 152W with a central pressure as low as 962 hPa at 0000 UTC March 8th. An ASCAT pass from 0559 UTC on the 8th revealed a swath of west winds 50 to 55 kts and isolated 60 kts south of the low center. The ship **BASLE EXPRESS** (DGWD2) located near 49N 136W encountered southwest winds of 55 kts at 1100 UTC on the 8th. The cyclone then weakened and became a weakening gale in the Gulf of Alaska late on the 8th.

North Pacific Bering Sea Storm, March 8-11:

The development of this storm is depicted in **Figures 23** and **24**, taking a northern track from the Kurile Islands to the southern Bering Sea over a 24 hour period. It developed a lowest central pressure of 957 hPa and hurricane force winds while turning east to cross the eastern Aleutian Islands 12 hours later. The ASCAT A image in **Figure 25** shows a swath of west to northwest winds to 50 kts south and southwest of the cyclone center. Ships in the area reported winds 45 kts or less. Buoy 46035 (57.0N 177.7W) reported northeast winds of 37 kts with gusts to 47 kts and 7.5 m seas (25 ft) at 1200 UTC on the 10th. The system then weakened to a gale while moving across the southern Gulf of Alaska over the next two days.

Eastern North Pacific Storm, March 8-10:

Figures 23 and **24** also depict the quick development of a low pressure wave into a complex hurricane force system late on March 9th. **Destruction Island** C-MAN (47.7N 124.4W) reported south winds of 57 kts with gusts to 67 kts at 1100 UTC on the 10th and a gusts of 74 kts two hours later. Buoy 46089 (45.9N 125.8W) reported southwest winds 41 kts with gusts to 54 kts and a peak gust of 60 kts, and 10.5 m seas (34 ft). The storm complex then moved inland on the 10th.

Western North Pacific Storm, March 13-16:

Figure 26 depicts the development of this intense system (pressure as low as 951 hPa) from a complex area of low pressure east of Japan over a thirty six hour period. The central pressure dropped 35 hPa in

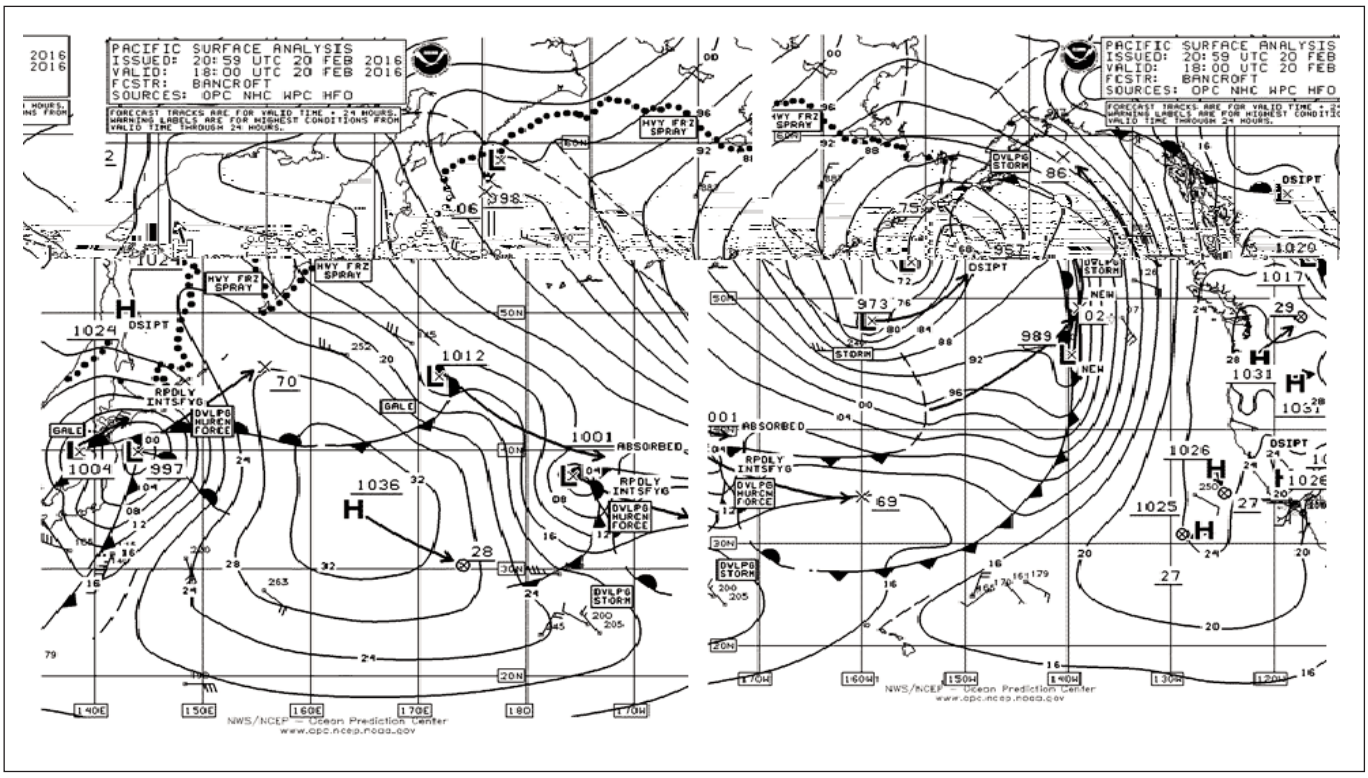


Figure 18. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 1800 UTC February 20, 2016.

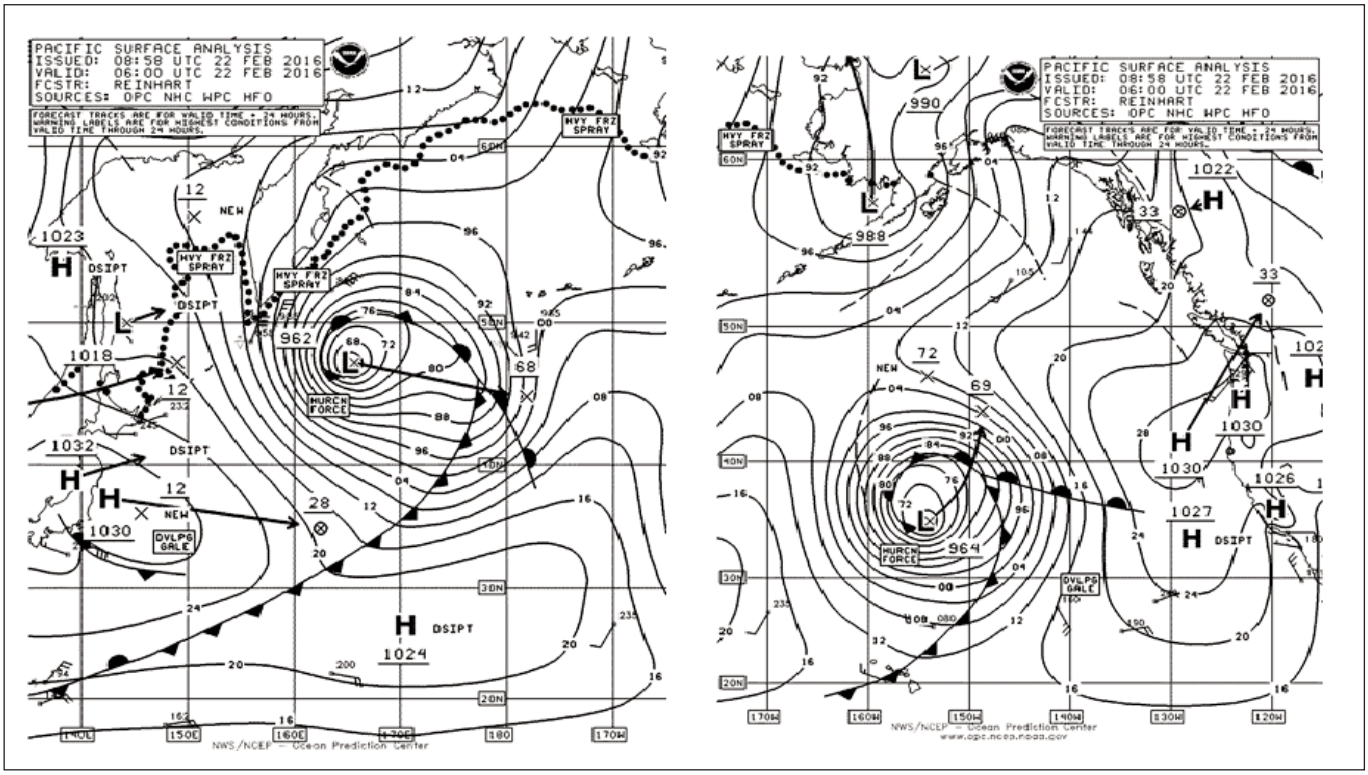


Figure 19. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 0600 UTC February 22, 2016.

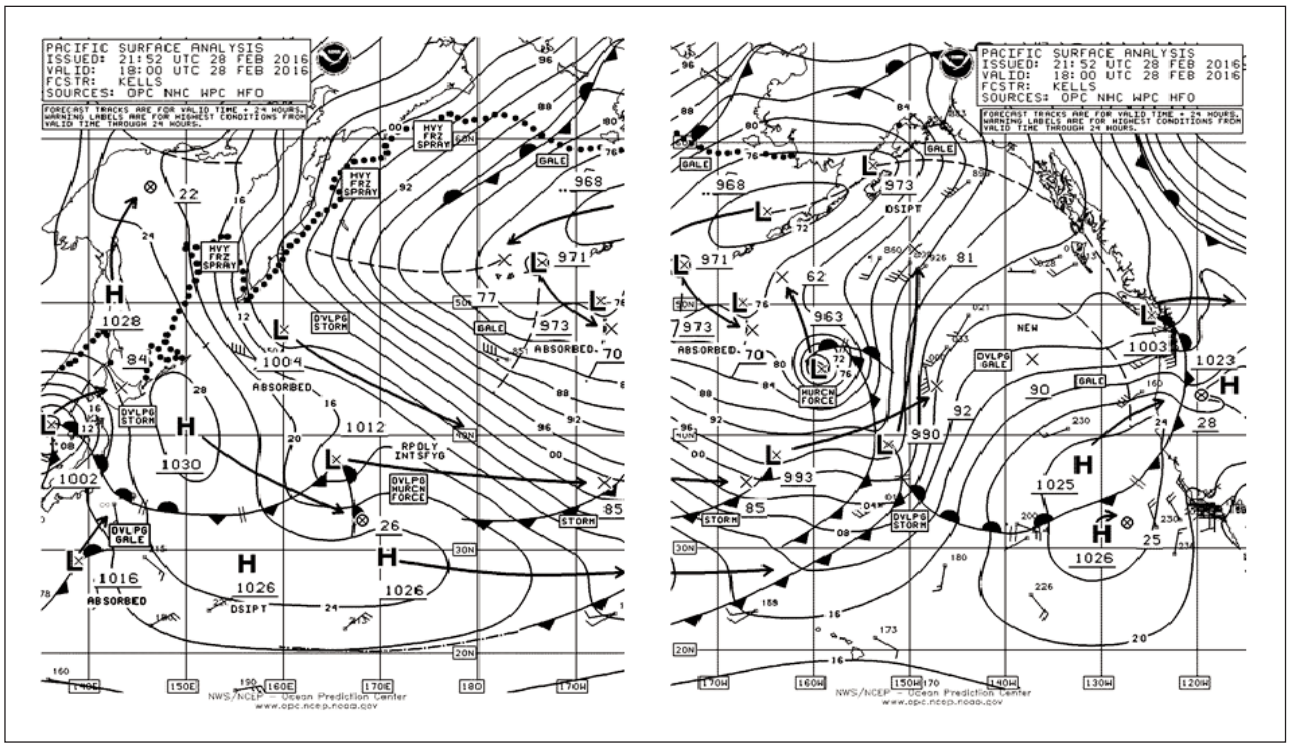


Figure 20. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 1800 UTC February 28, 2016.

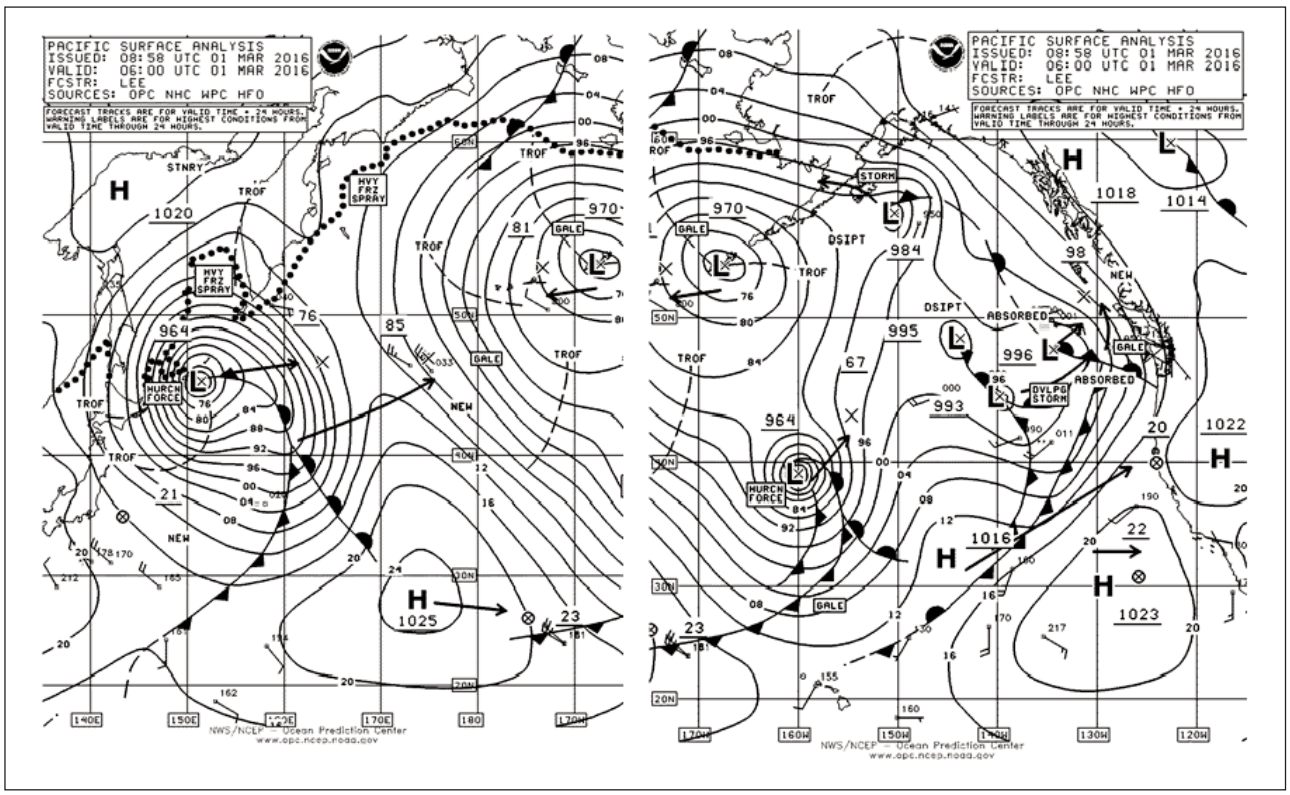


Figure 21. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 0600 UTC March 1, 2016.

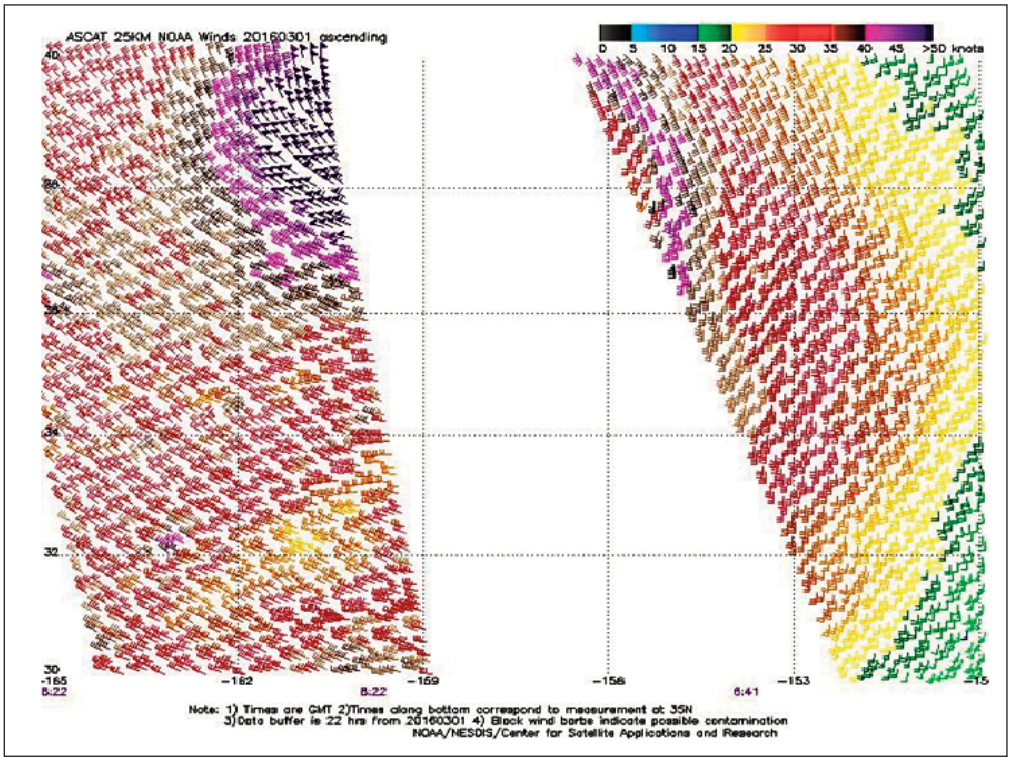


Figure 22. 25-km ASCAT (METOP-A) image of satellite-sensed winds around the hurricane-force low shown in Figure 21. The valid time of the pass containing the strongest wind retrievals is 0822 UTC March 1, 2016, or about two and one-quarter hours later than the valid time of Figure 21.
Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

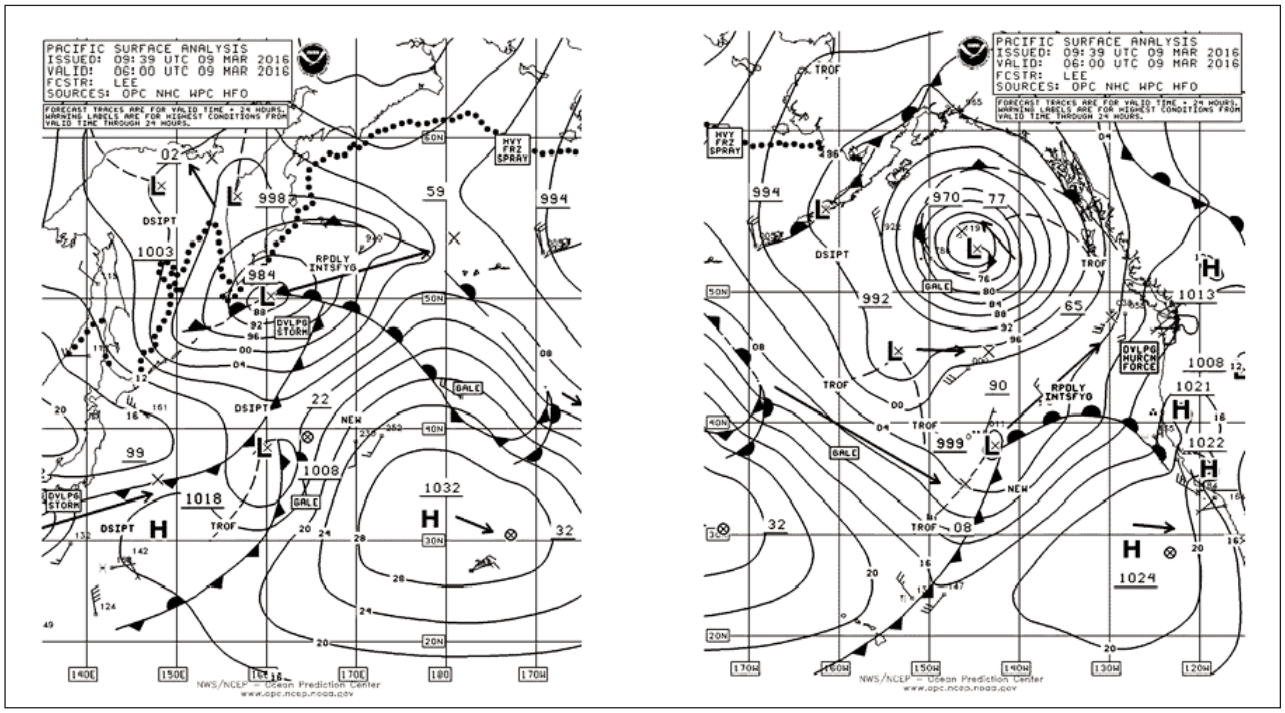


Figure 23. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 0600 UTC March 9, 2016.

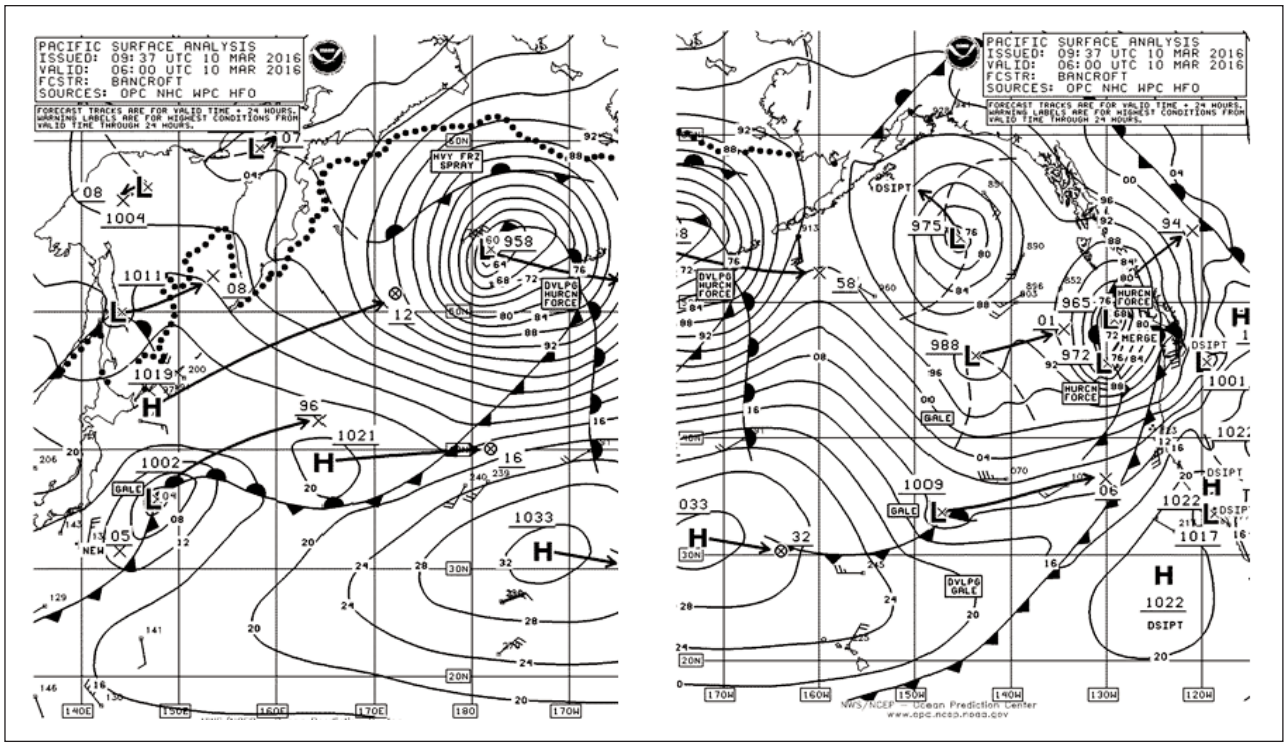


Figure 24. OPC North Pacific Surface Analysis chart (Parts 2 and 1) valid 0600 UTC March 10, 2016.

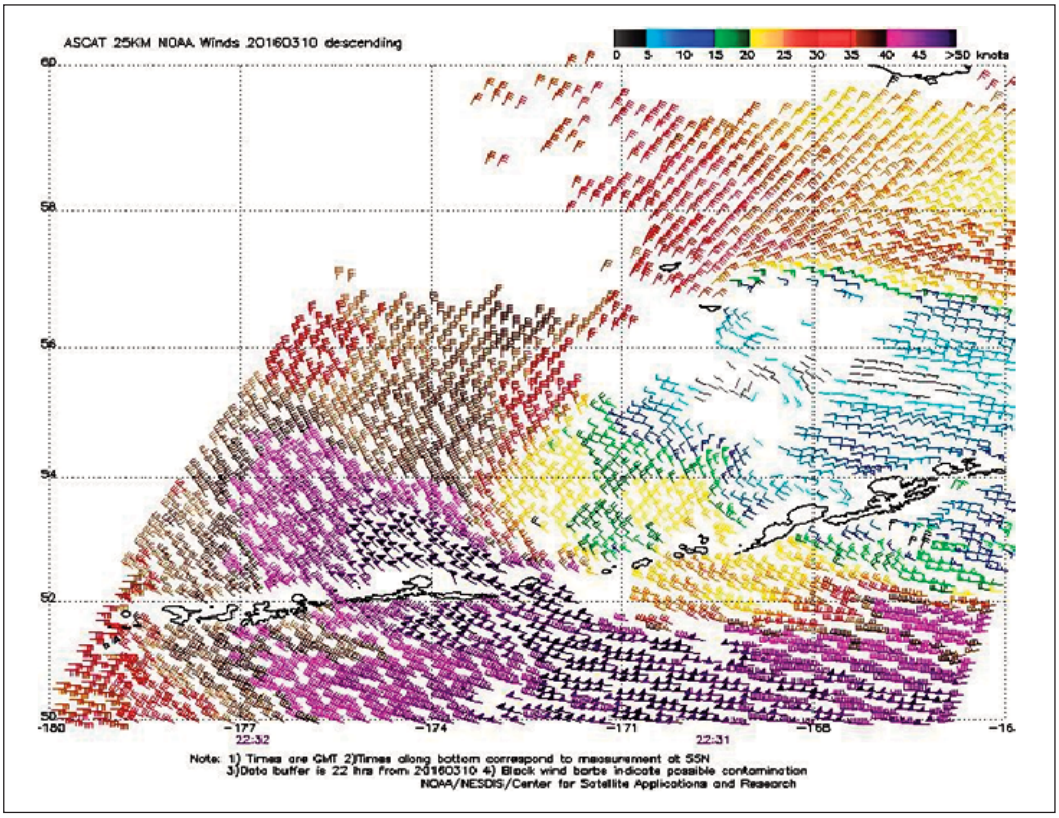


Figure 25. 25-km ASCAT (METOP-A) image of satellite-sensed winds around the storm shown in Figure 24. The valid time of the pass is 2231 UTC March 10, 2016, or about sixteen and one-half hours later than the valid time of Figure 24. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

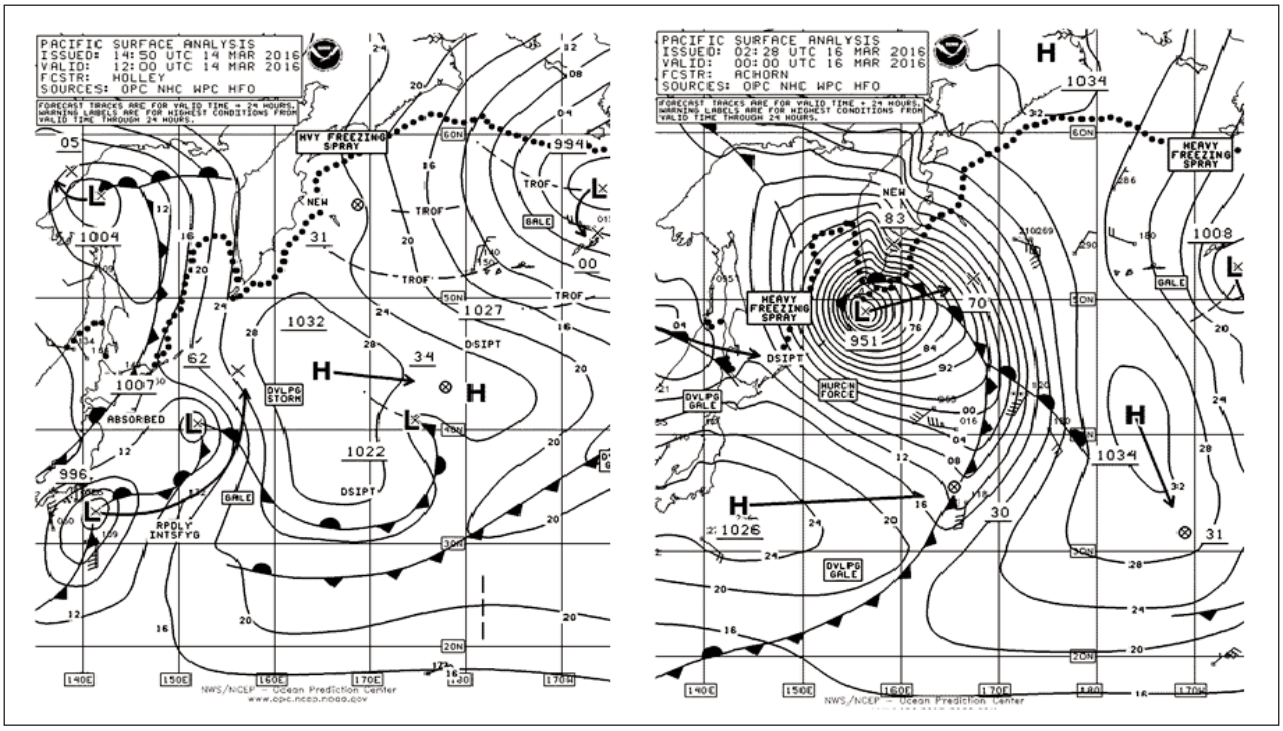


Figure 26. OPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC March 14 and 0000 UTC March 16, 2016.

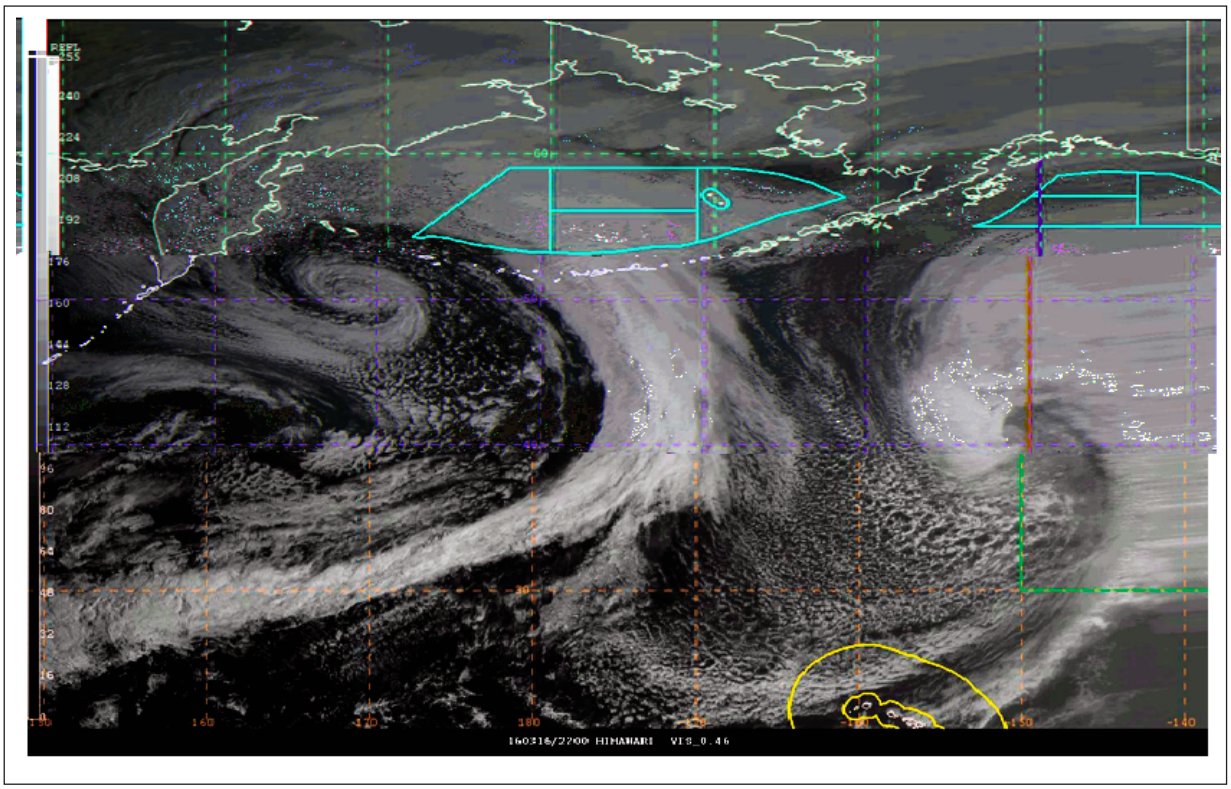


Figure 27. Himawari visible satellite image valid 2200 UTC March 16, 2016. The valid time of the image is 22 hours later than the valid time of the second part of Figure 26.

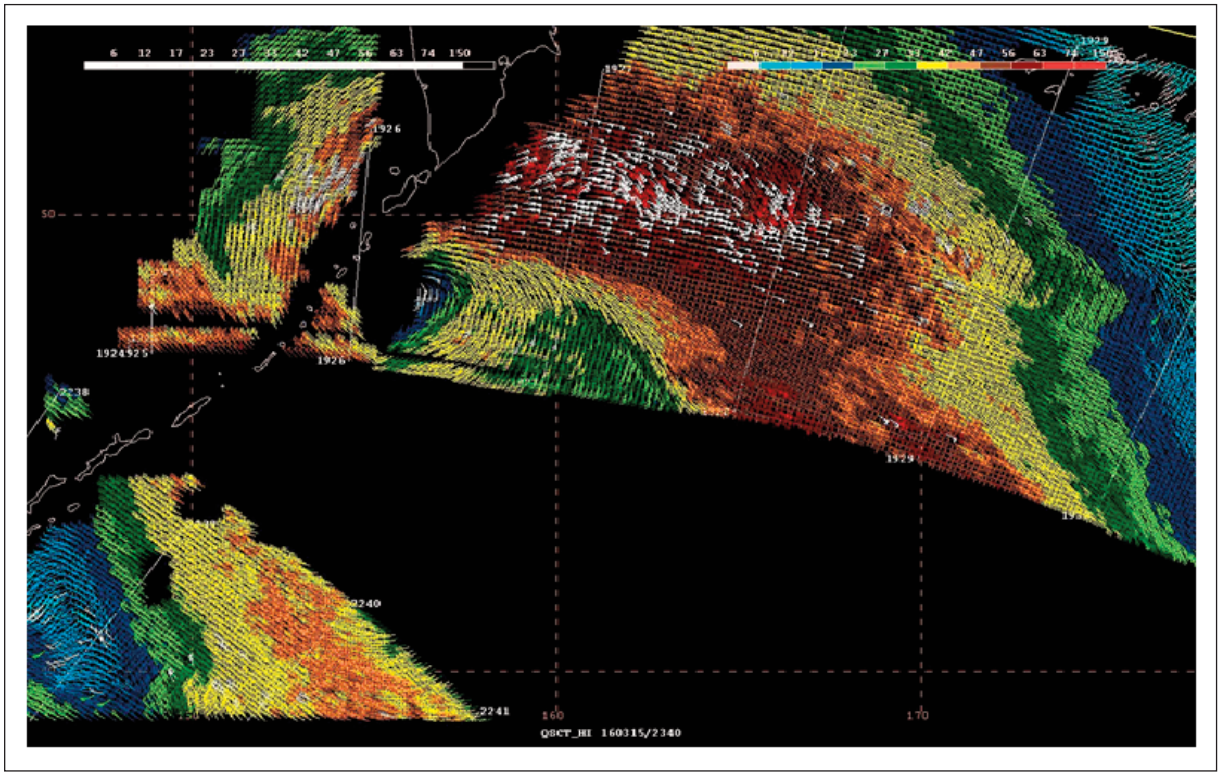


Figure 28. 12.5-km Rapidscat image of satellite-sensed winds around the hurricane-force low shown in the second part of Figure 26. Portions of two overpasses are shown with cross-track time lines labeled in UTC. The valid time of 1927 UTC near the middle of the image is about four and one-half hours prior to the valid time of the second part of Figure 26. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

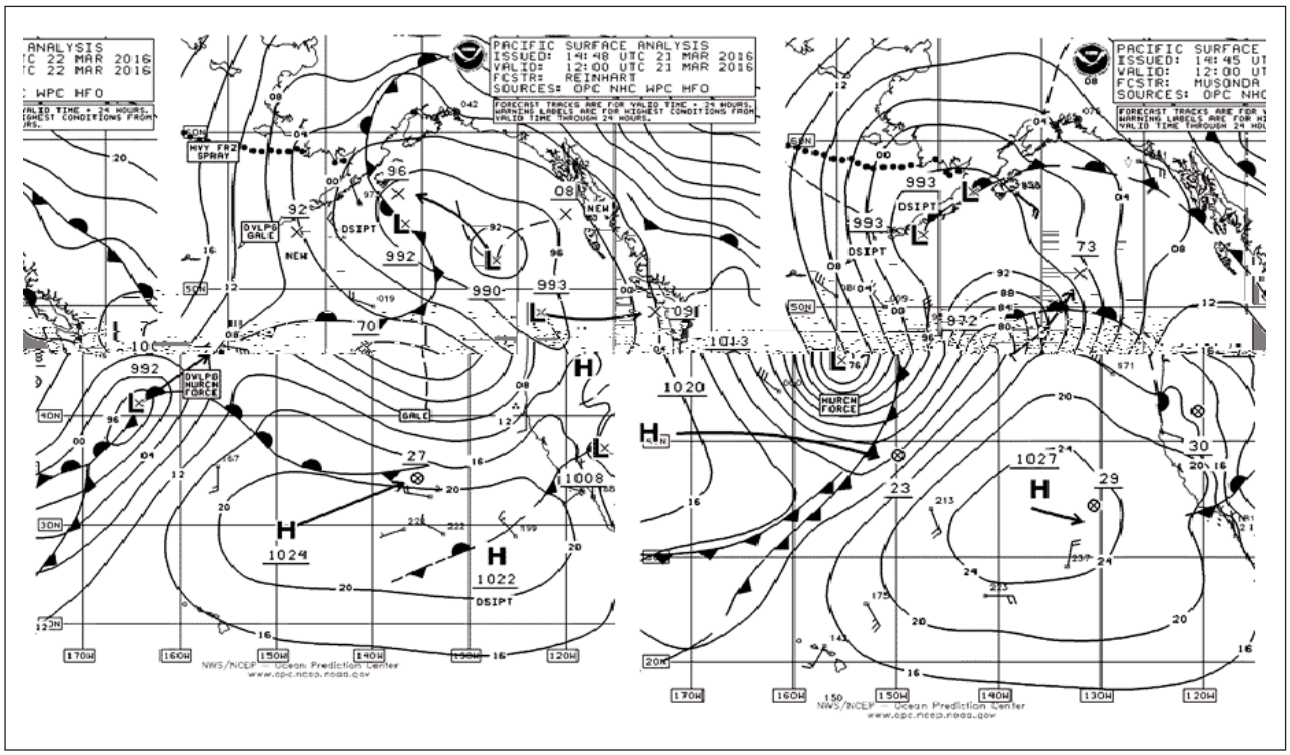


Figure 29. OPC North Pacific Surface Analysis charts (Part 1) valid 1200 UTC March 21 and 22, 2016.

in the 24 hour period ending at 1800 UTC on the 15th. The **INDIGO LAKE** (VROY7) near 42N 161E reported southeast winds of 58 kts at 0600 UTC on the 15th, while **APL THAILAND** (WCX8882) near 34N 143E encountered north winds of 50 kts and 7.9 m seas (26 ft) six hours prior. **Figure 27** is a visible satellite image of the cyclone, fully mature with a well-defined center around which frontal cloud features wrap around the center. A separate comma like cloud system is seen well to the east and was associated with a 972 hPa storm near 41N 151W. The Rapidscat image in **Figure 28** shows a broad area of winds 60 kts or higher north of the strong occluded front but misses the stronger winds on the south side. The white barbs indicate possible rain contamination. The cyclone subsequently weakened rapidly while moving into the western Bering Sea on the night of the 16th and on the 17th.

Eastern North Pacific Storm, March 21-23:

This cyclone originated well southeast of Japan late on the 16th with the final development over a 24 hour period depicted in **Figure 29**. The lowest central pressure was 969 hPa at 1800 UTC on the 22nd. An ASCAT (METOP-B) pass from 0702 UTC on the 22nd reveals a swath of winds 50 to 60 kts south of the center.

The **POLAR RESOLUTION** (WDJK) near 51N 138W reported southwest winds of 50 kts and 10.7 m seas (35 ft). The cyclone subsequently moved into the Gulf of Alaska by the 24th where its winds weakened to gale force.

North Pacific Storms
April 7-13:

Two separate hurricane force cyclones are shown in **Figure 30**, covering a two day period. The first or weaker of the cyclones is shown in the left panel near maximum intensity. It originated near Japan already at storm force, weakened to a gale the next day and then re intensified late on the 8th and briefly developed hurricane force winds on the afternoon of the 9th. An ASCAT pass valid near 0000 UTC on the 10th revealed winds to 55 kts on the south side. The cyclone then tracked east northeast and weakened to a gale in the southern Gulf of Alaska three days later. The next development, more intense, came as an area of low pressure moved off Japan and developed quickly on the night of the 10th and on the 11th, when the central pressure fell 36 hPa in the 24 hour period ending at 0000 UTC on the 12th. The lowest central pressure of 964 hPa came six hours later. The visible satellite image

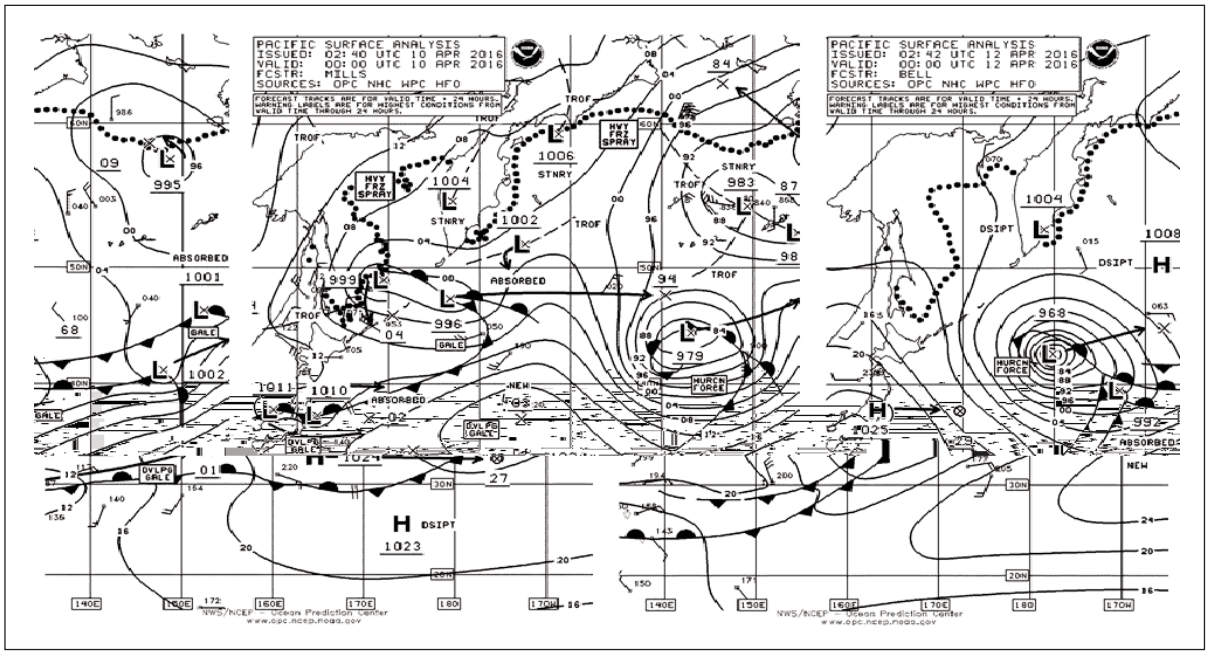


Figure 30. OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC April 10 and 12, 2016.

of the cyclone near maximum intensity appears to resemble a T-bone cloud structure with an intense warm front and bent back front and a weaker cold front (Shapiro and Keyser, 1990) similar to the appearance in **Figure 30**. The Rapidscat image in **Figure 32** reveals an intense circulation associated with the warm front and bent back front with an 80 kts wind maximum southeast of the cyclone center. The system then moved northeast and began to weaken on the 12th, becoming a gale force low near the eastern Aleutian Islands late on the 13th.

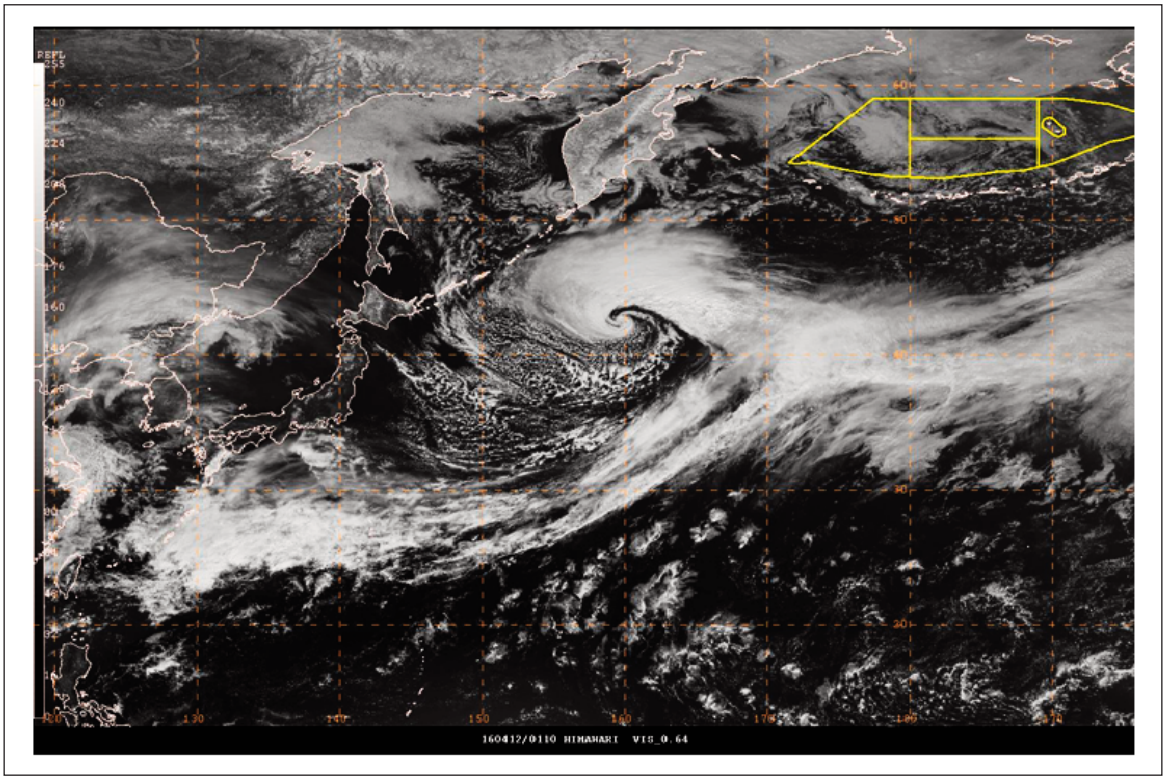
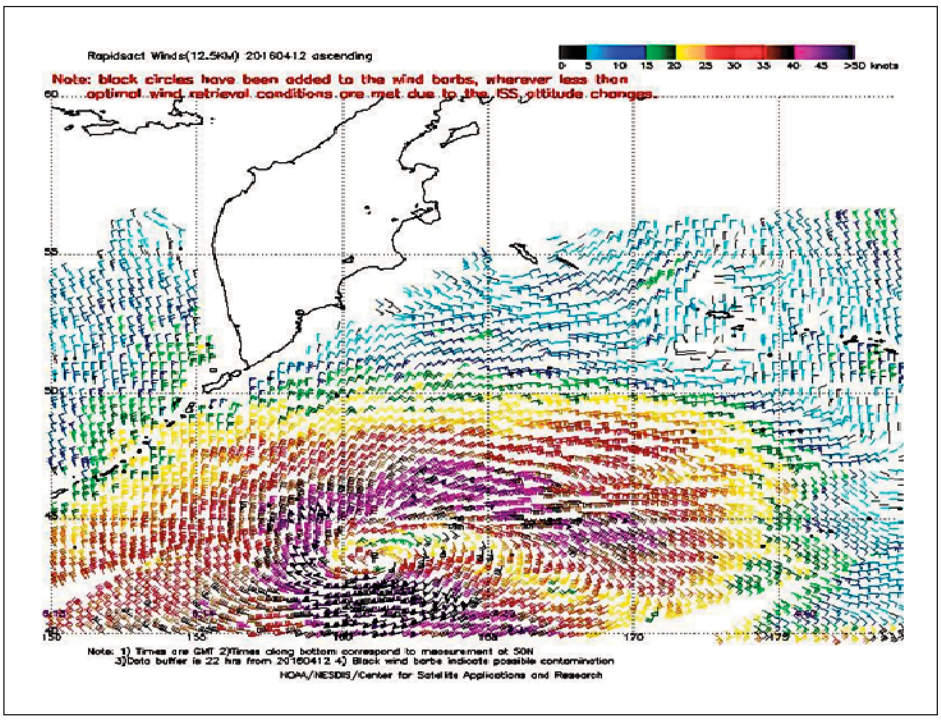


Figure 31. Himawari visible satellite image valid 0100 UTC April 12, 2016. The valid time of the image is about one hour later than the valid time of the second part of Figure 30.

Figure 32. 12.5-km Rapidscat image of satellite-sensed winds around the cyclone shown in the second part of Figure 30. The valid time of the pass is 0439 UTC April 12, 2016, approximately four and one-half hours later than the valid time of the second part of Figure 30.
Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.



Storm in the Far West (Sea of Japan), April 16-17:

This cyclone was short lived, but briefly developed hurricane force winds in the southern Sea of Japan late on the 16th or early on the 17th, as seen in the Rapidscat image of **Figure 33**. The cyclone developed a central pressure of 977 hPa near 41N 135W at 0600 UTC on the 17th.
The **COSCO PHILIPPINES** (VRGM7) near 37N 135.5E reported south winds of 62 kts at 0200 UTC on the 17th. The cyclone weakened to a gale when passing east of northern Japan late on the 17th.

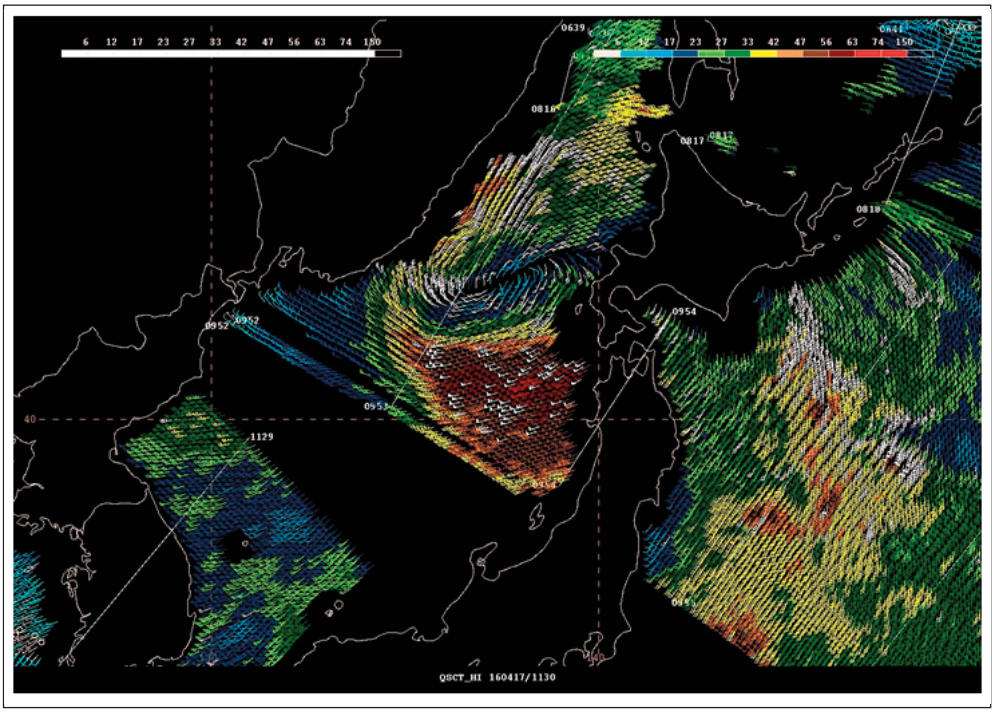


Figure 33. 12.5-km Rapidscat image of satellite-sensed winds around a small but potent cyclone in the Sea of Japan. Cross-track timelines of the satellite are shown, with the time of the image approximately 0954 UTC April 17, 2016. Image is courtesy of NOAA/NESDIS/ Center for Satellite Application and Research.

References

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

2. Ocean Surface Winds, http://manati.star.nesdis.noaa.gov/products.php

3. 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.

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

5. Tropical Cyclone Reports, 2015, NOAA National Hurricane Center, http://www.nhc.noaa.gov/archive/2016/al012016.discus.001.shtml?

6. Bancroft, G., “Marine Weather Summary, North Pacific and North Atlantic Areas”, *Mariners Weather Log*, August 2016.

7. Shapiro,M. A. and D. Keyser, 1990: Fronts, Jet Streams and the Tropopause. Extratropical Cyclones, *The Erik Palmen Memorial Volume*, C.W. Newton and E.O. Holopainen, Eds, Amer.Meteor. Soc., 167-191.

Tropical Atlantic and Tropical East Pacific Areas

May through August 2016

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

Atlantic Ocean including the Caribbean Sea and the Gulf of Mexico

There were seven (7) non-tropical cyclone gale events that occurred between 1 May and 31 August 2016 in the area of high seas forecast responsibility (7ºN to 31ºN, west of 35ºW including the Caribbean Sea and Gulf of Mexico) of the National Hurricane Center's (NHC) Tropical Analysis and Forecast Branch (TAFB). The Caribbean Sea basin had the most gale events for this time period, but considerably less than last year.

Table 1. Non-tropical cyclone warnings issued for the subtropical and tropical Atlantic Ocean, including the Gulf of Mexico and Caribbean Sea between 1 May and 31 August 2016.

ONSET	REGION	PEAK WIND (kts)	GALE DURATION (STORM)	FORCING
00 UTC 17 Jun	Caribbean	35	12 h	Pressure Gradient
00 UTC 1 Jul	Caribbean	35	18 h	Pressure Gradient
06 UTC 4 Jul	Caribbean	35	09 h	Pressure Gradient
00 UTC 1 Aug	Caribbean	35	40 h	Low Pressure / Pre-Earl
09 UTC 5 May	SW N Atlantic	35	40 h	Pressure Gradient
12 UTC 23 Aug	SW N Atlantic	35	06 h	Low Pressure
12 UTC 24 Aug	SW N Atlantic	35	30 h	Low Pressure / Pre-Hermine

Pre-Earl Caribbean Gale Event:

A strong tropical wave entered the eastern Caribbean Sea at about 1200 UTC on 31 July. The wave was moving rapidly westward along the southern periphery of the Atlantic subtropical high pressure. By 0000 UTC 1 August, low pressure of 1010 hPa had formed along the wave axis near 15N68W. (**Figure 1**) A tight isobaric spacing between the low pressure and the strong Atlantic high pressure induced east to southeast gale force winds of 25 to 35 kts from 15N to 18N between 66W and 69W with seas of 8 to 11 ft. (**Figures 2** and **3**). The Ship **BRASIL VOYAGER** (C6ZJ8) just to the northeast of the low reported east winds of 35 kts. This report was very valuable to forecasters in confirmimg the presence of the gale force winds. By 1800 UTC on the same day the low had deepened some to 1007 hPa near 16.5N74W. The pressure gradient to its north remained tight per the surface analysis. (**Figure 4**)

An observation from ship **KAROLINE N** (A8PQ8) near the low center reported southeast winds of 35 kts at 18 UTC on August.1 near location 16N74W. During the night of 1 August, the low continued to deepen as was evident in the very cold cloud tops noted on satellite imagery from 0245 UTC 2 August with the METOP-B Advanced Scatterometer ASCAT pass showing quite an impressive coverage of strong gale force winds east of the low. (**Figure 5**). The low level circulation eventually became Tropical Storm Earl over the northwest Caribbean Sea at midday on 2 August.

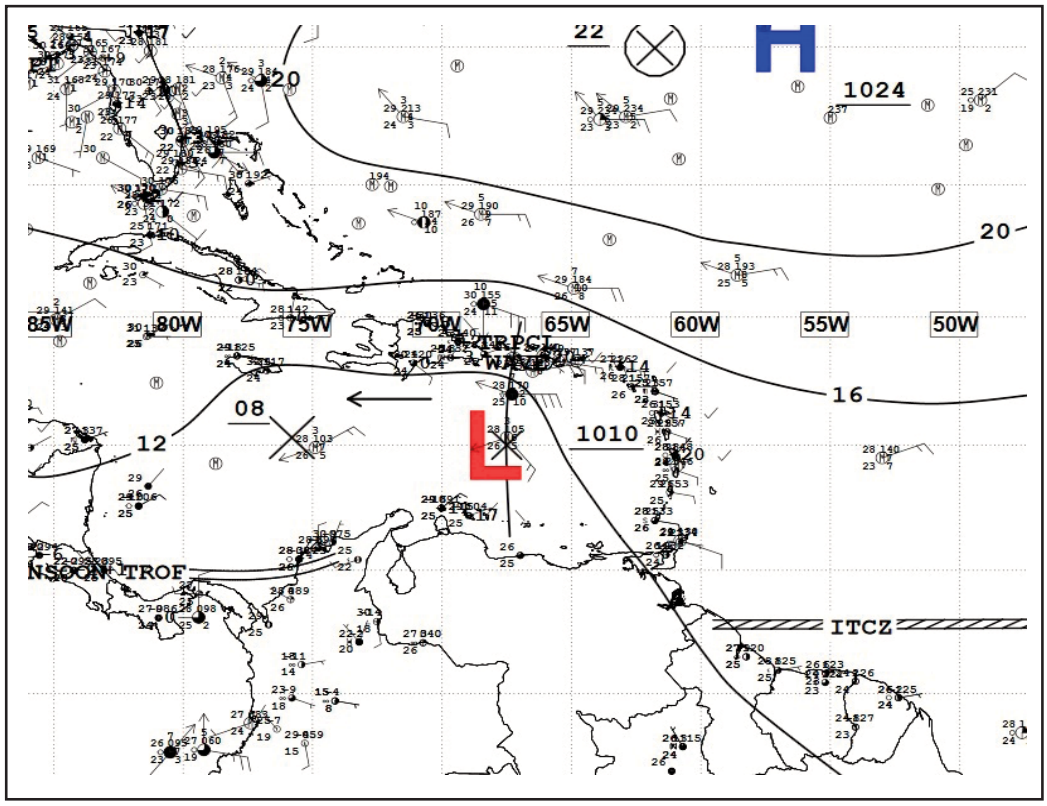


Figure 1. National Weather Service Unified Service Analysis (USA) map from 0000 1 Aug. showing the low pressure along the tropical wave.

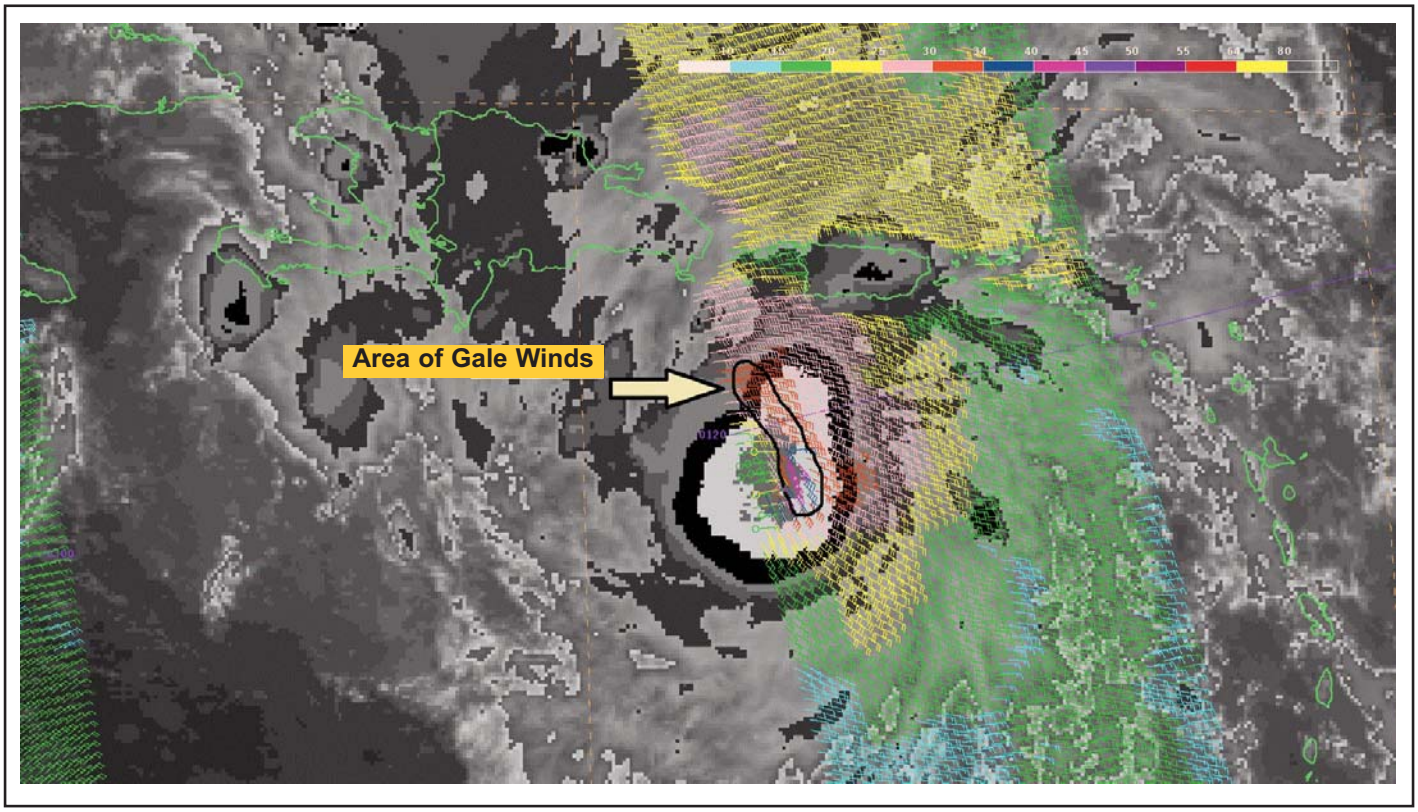


Figure 2. METOP-B Advanced Scatterometer (ASCAT) wind retrieval valid 0120 UTC 1 Aug. 2016. Note the area of gale force winds north through northeast of the low.

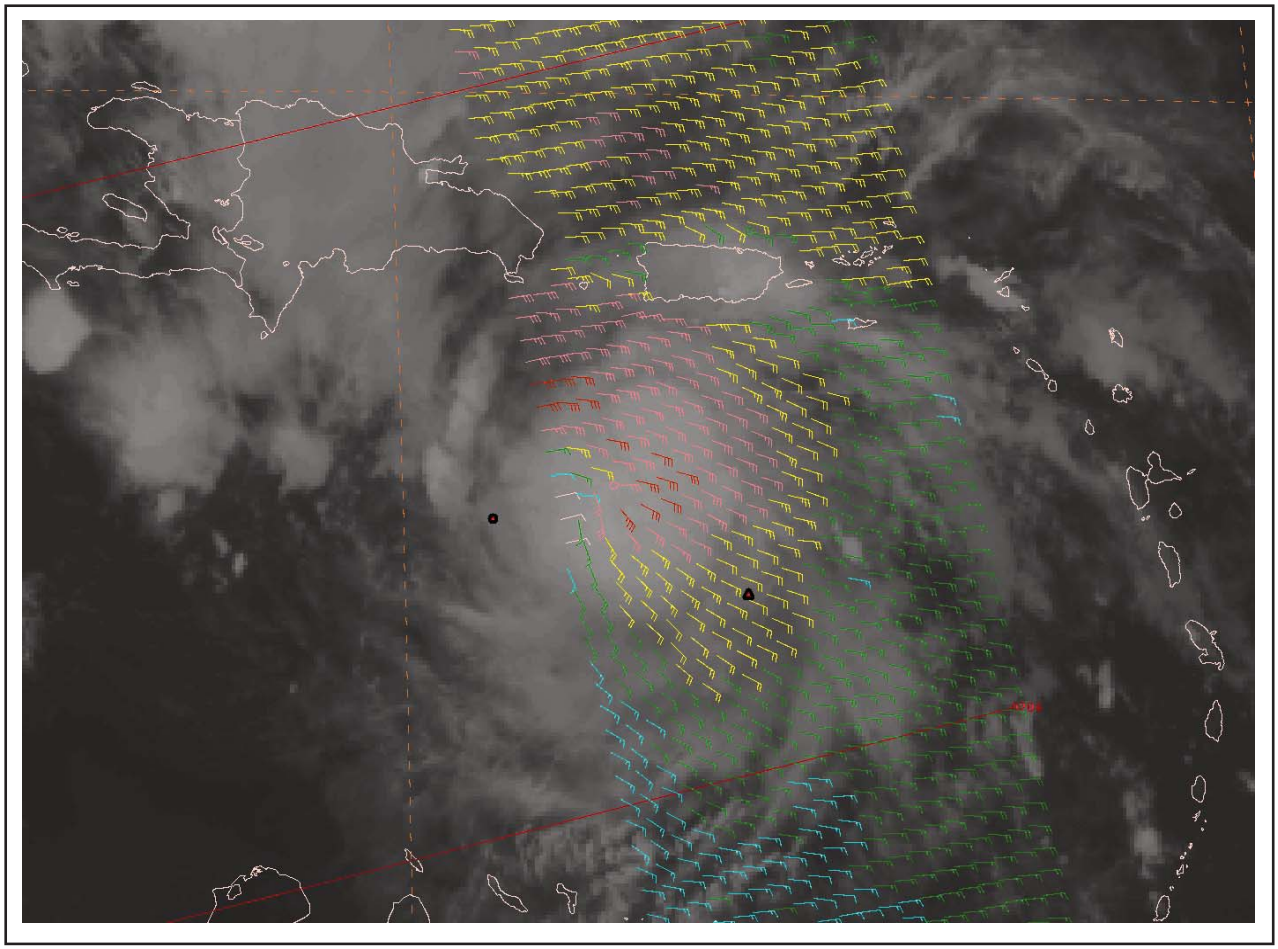


Figure 3. METOP-A Advanced Scatterometer (ASCAT) wind retrieval valid 0206 UTC 1 Aug. 2016. Note the area of gale force winds north through northeast of the low.

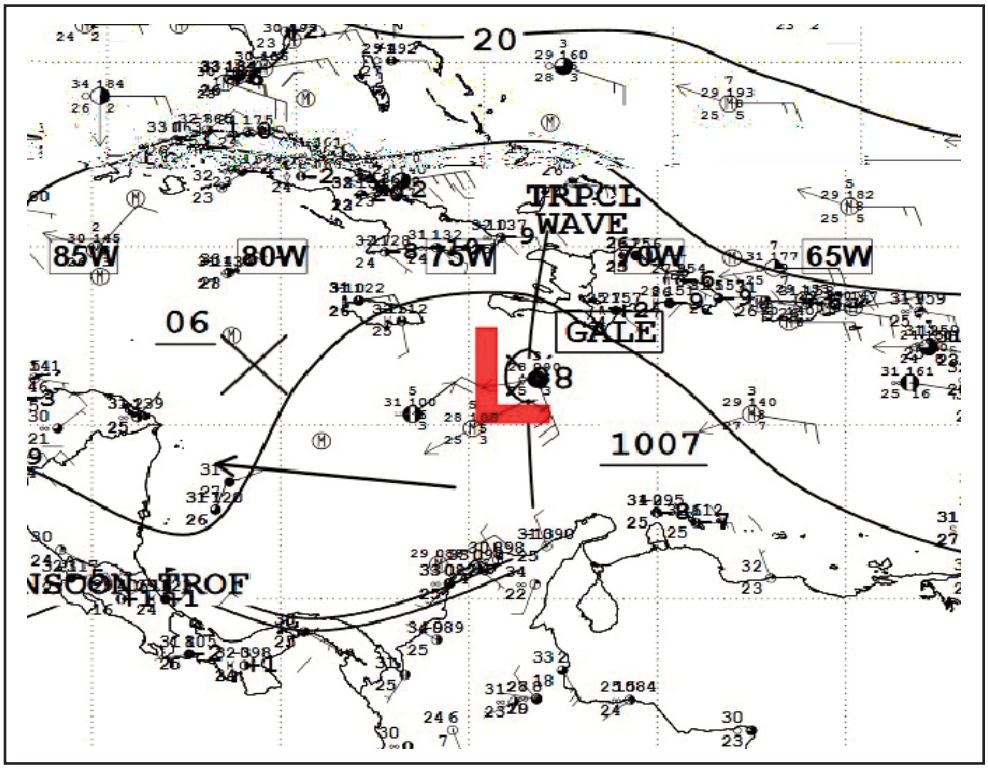


Figure 4. –National Weather Unified Surface Analysis (USA) from 1800 UTC 1 Aug.

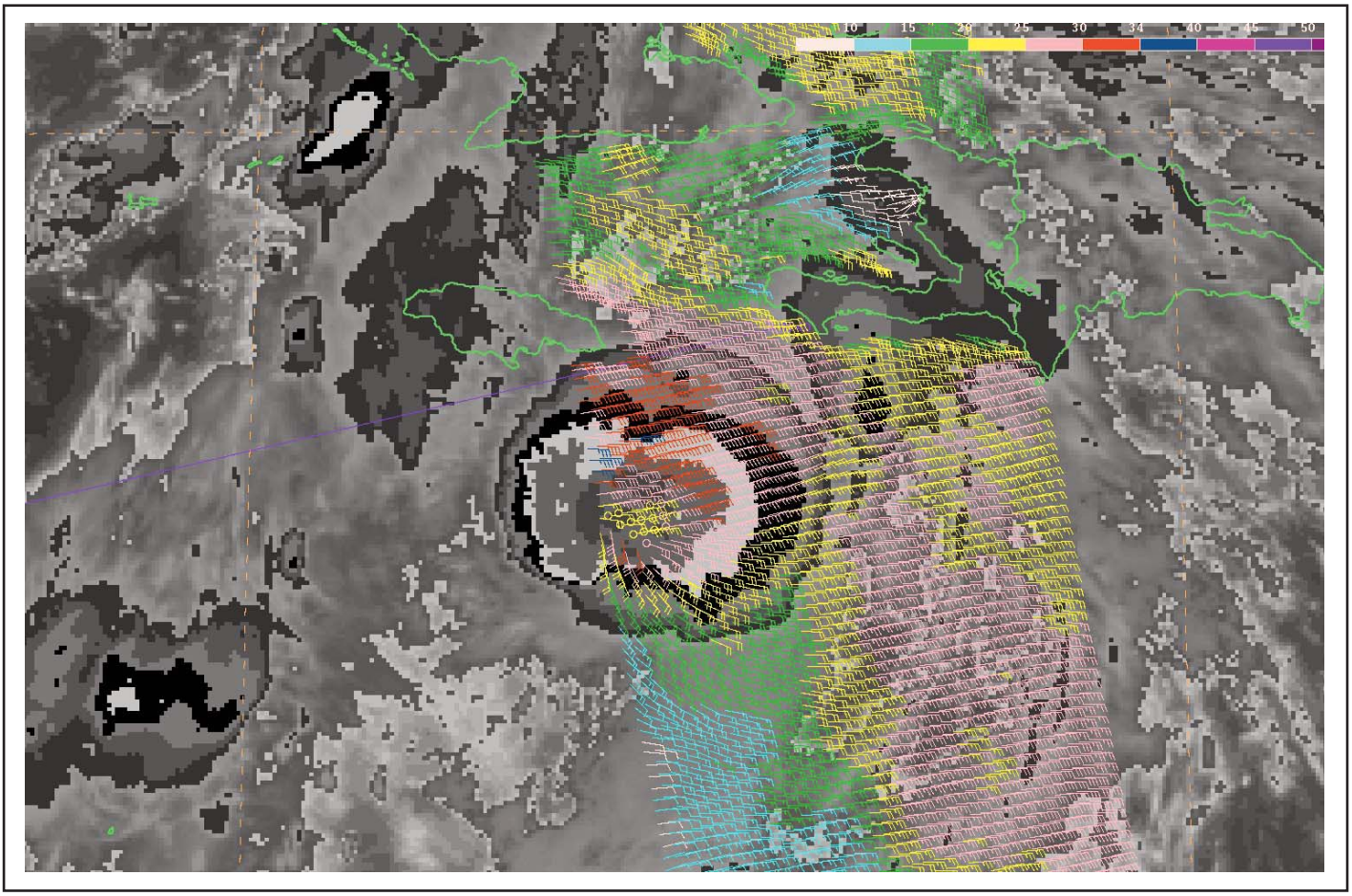


Figure 5. IR BD enhancement of GOES-E at 0245 UTC with METOP-B Advanced Scatterometer ASCAT winds superimposed on it.

Other Caribbean Gale Events

Other than the Pre-Earl gale event, there were three gale events in the favorable climatological area of strongest trade winds found over a portion of the southwest Caribbean Sea to the coasts of Colombia and northwestern Venezuela between 1 May and 31 August. The event that began at 00 UTC 17 June was rather short lived lasting for 12 hours. This particular event was confined from 11N to 13N between 74W and 77W, and included the Gulf of Venezuela. The pressure gradient between a narrow Atlantic high pressure ridge with axis roughly along 24N/25N, and low pressure across the Colombian basin initiated minimal gale force NE to E 30 to 35 kts winds with seas of 10 to 13 ft across that part of the SW Caribbean. (**Figure 6**) Note the tight gradient spacing just north of the coasts of Colombia and Venezuela between the 1016 hPa and 1012 hPa isobars.,(**Figure 7**). Interestingly, the ASCAT pass also showed similar gale force winds in the Gulf of Venezuela as noted in **Figure 7**.

This gulf is adjacent to the Caribbean Sea and serves heavy ship traffic. This gale event ended at 12 UTC 17 June when the narrow ridge began to retreat eastward in response to a broad area of troughing that began to settle in over the northwest portion of the southwest North Atlantic. The remaining gale events occurred under a similar synoptic scale pattern. The 18 hour duration event that began on 1 July was nicely captured by an ASCAT pass in its early stage, (**Figure 8**). Once these gale conditions diminished, the respite was not long before the next one started on 4 July. This gale event was even shorter in duration lasting only 9 hours.

Pre-Hermine Disturbance Gale Event

Low pressure with a pressure of 1009 hPamb was analyzed near 18N63W on the morning of 24 August. The low was along a strong tropical wave that had been moving westward at 10 to 15 kts across the tropical Atlantic, and had reached the

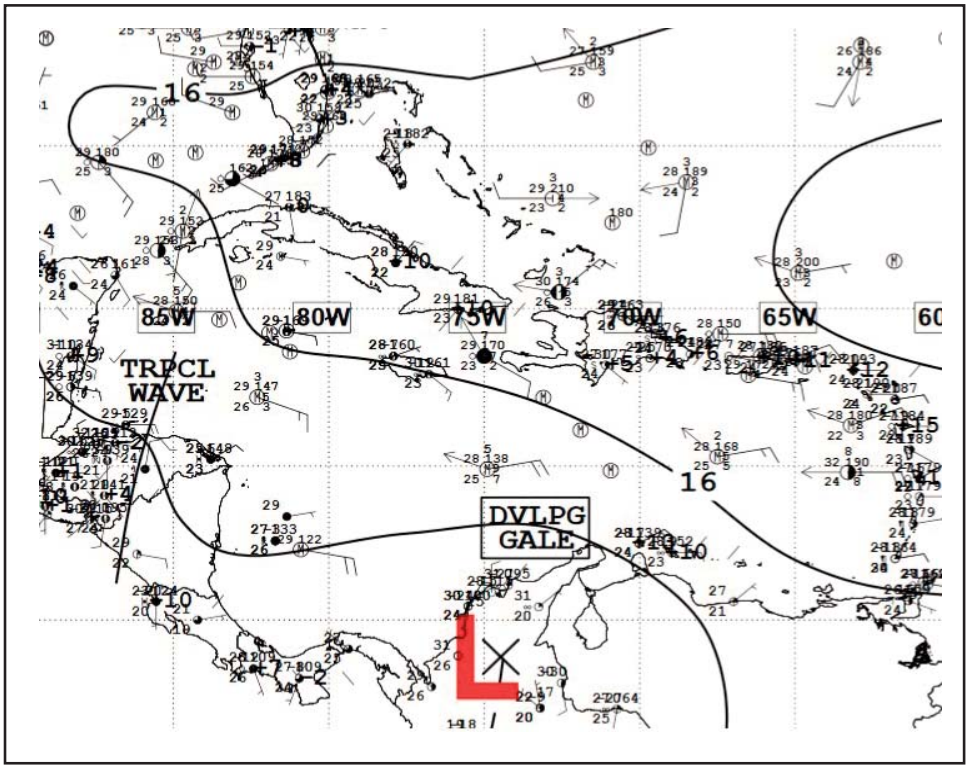


Figure 6.- National Weather Service Unified Surface Analysis (USA) from 0000 UTC 17 Jun. Note the tight gradient spacing just north of the coasts of Colombia and Venezuela between the 1016 hPa and 1012 hPa isobars.

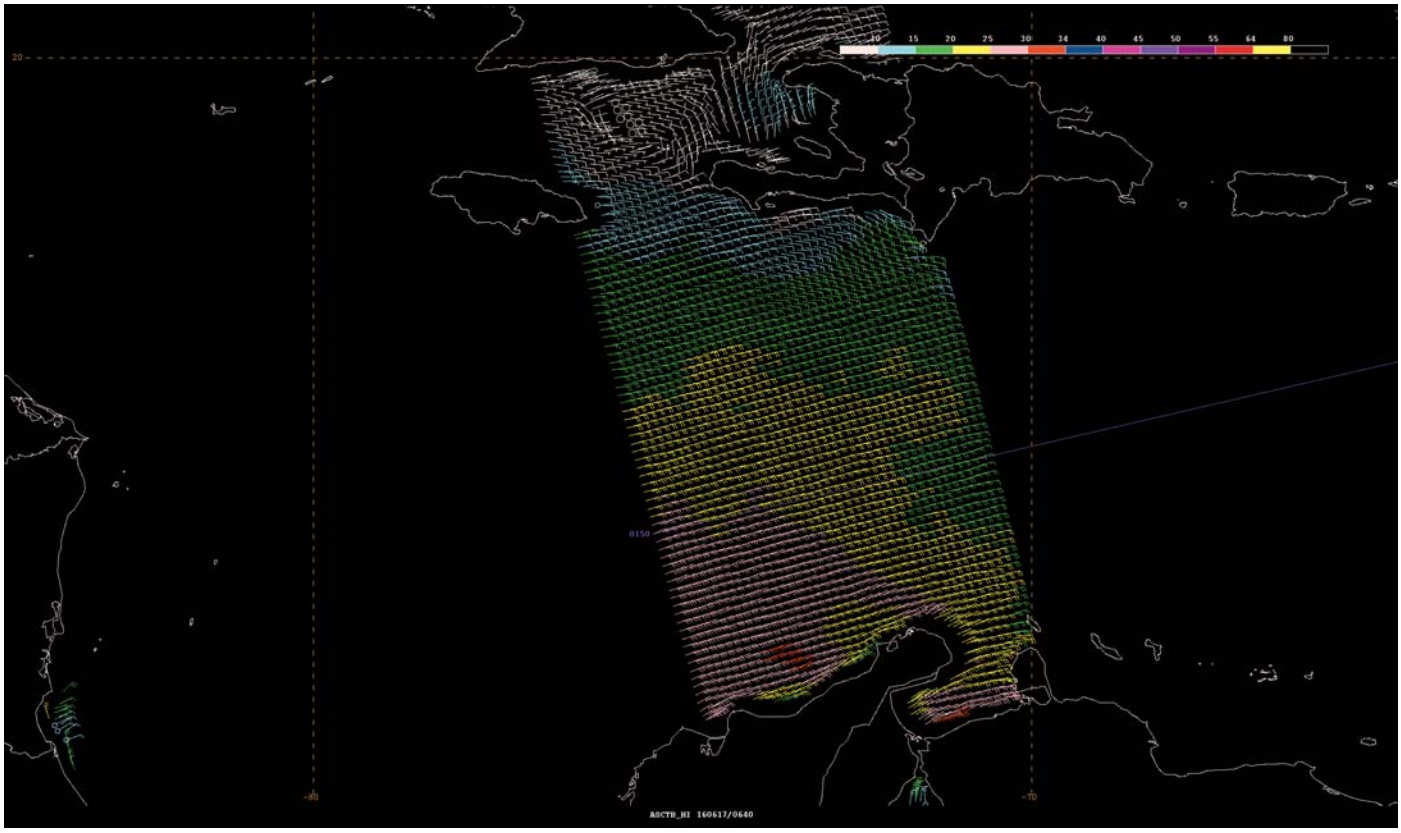


Figure 7. - METOP-B Advanced Scatterometer ASCAT wind retrieval at 0150 UTC 17 Jun with a small swath of gale force winds within a large area of 20 to 30 kts winds in the southwest Caribbean Sea. The gale force winds are in red color.

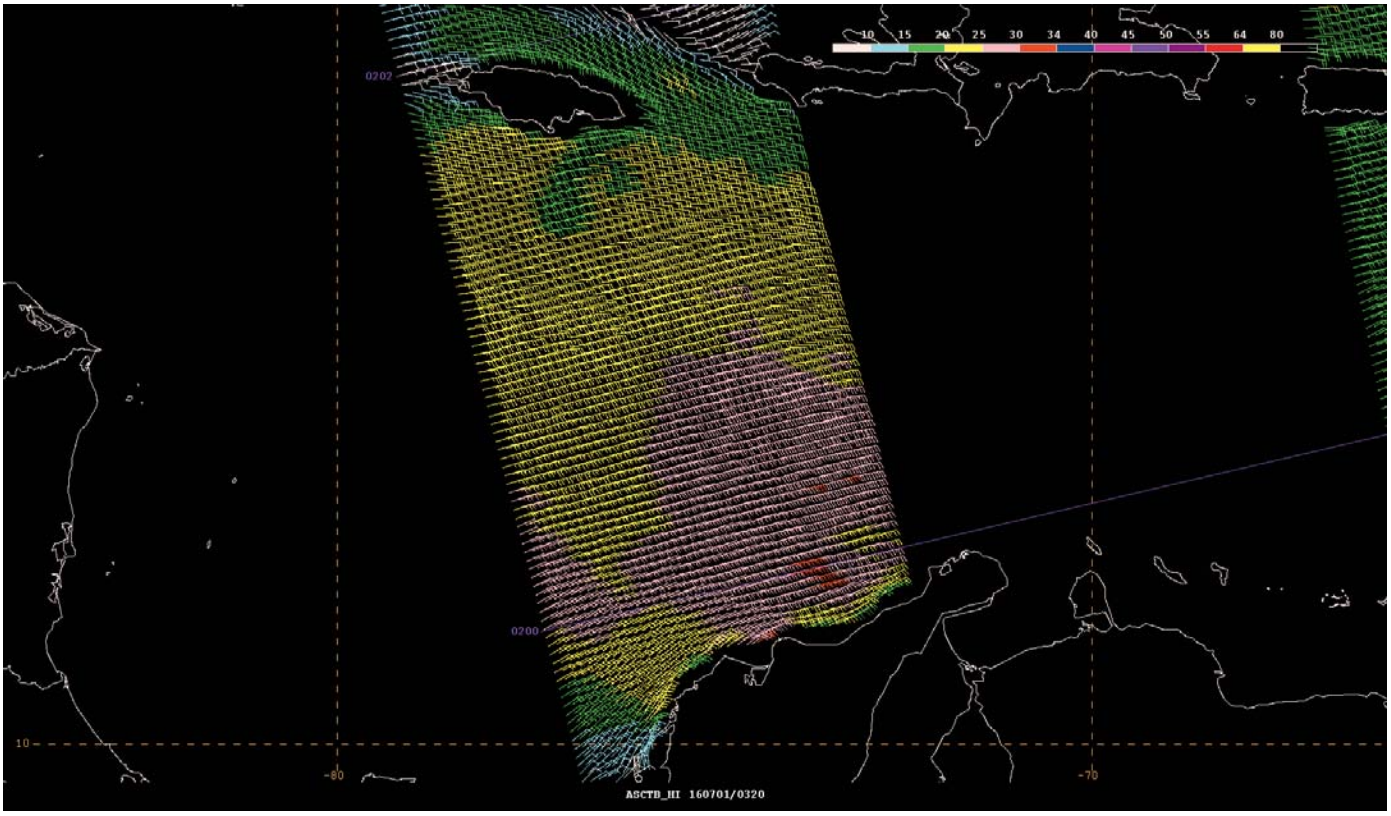


Figure 8. METOP-B Advanced Scatterometer ASCAT wind retrieval at 0200 UTC 1 Jul with a small swath of minimal gale force winds also embedded within a large area of 20 to 30 kts winds in the southwest Caribbean.

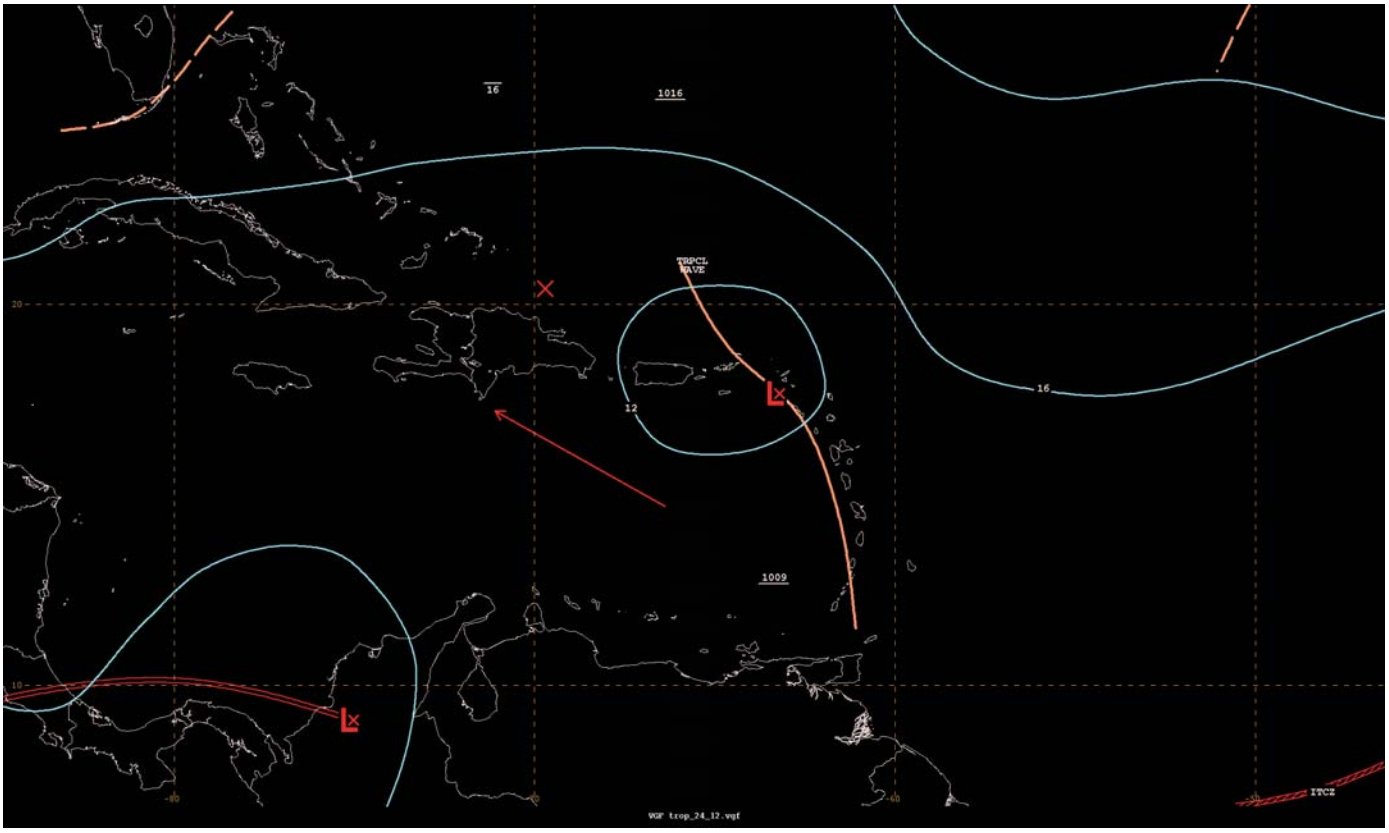


Figure 9. National Weather Service Unified Surface Analysis (USA) from 1200 UTC 24 Aug. Note the close spacing between the 1012 hPa and 1016 hPa isobars.

Pre-Hermine Disturbance Gale Event:

Low pressure with a pressure of 1009 hPa was analyzed near 18N63W on the morning of 24 August. The low was along a strong tropical wave that had been moving westward at 10 to 15 kts across the tropical Atlantic, and had reached the Lesser Antilles that morning. The pressure gradient between the low pressure and high pressure to its northeast over the central Atlantic tightened enough to produce gale force east to southeast 30 to 35 kts winds within 90 nm in the northeast quadrant of the low along with seas of 10 to 12 ft, (**Figure 9**) ASCAT scatterometer data from that morning confirmed the gale force winds as were forecasted in the TAFB Atlantic high seas forecast issued at 1200 UTC 24 August. It also revealed that gale force winds had materialized to the south of the low, (**Figures 10** and **Figure 11**). One interesting aspect of the scatterometer wind retrievals is the radial extent of the gale force winds to the northeast of the low surrounded by a large area of 20 to 30 kts winds. Also, noticeable in the imagery is a pocket of gale force southeast to south winds to the south of the low as verified by the absence of rain contaminated wind vectors there despite the presence of clouds and convection as seen in the satellite imagery. It was presumed that down bursts associated with the deep convective activity east and southeast of the low could have briefly produced wind gusts in excess of 35 kts as was observed by the Stepped Frequency Radiometer (SFMR) instrument on board an aircraft reconnaissance mission on the morning of 24 August. The aircraft observations also helped to assist in determining the radial extent of the gale force winds from the low. The low pressure moved across the southeastern Bahamas the following afternoon and evening, while at the same time weak low pressure was northeast of the Bahamas along a stationary frontal boundary. This synoptic set up helped weakened the tight gradient northeast of the aforementioned low pressure system allowing for the gale force winds to diminish to just below gale force the following day at 18 UTC on 25 August. The low continued to track westward reaching the Straits

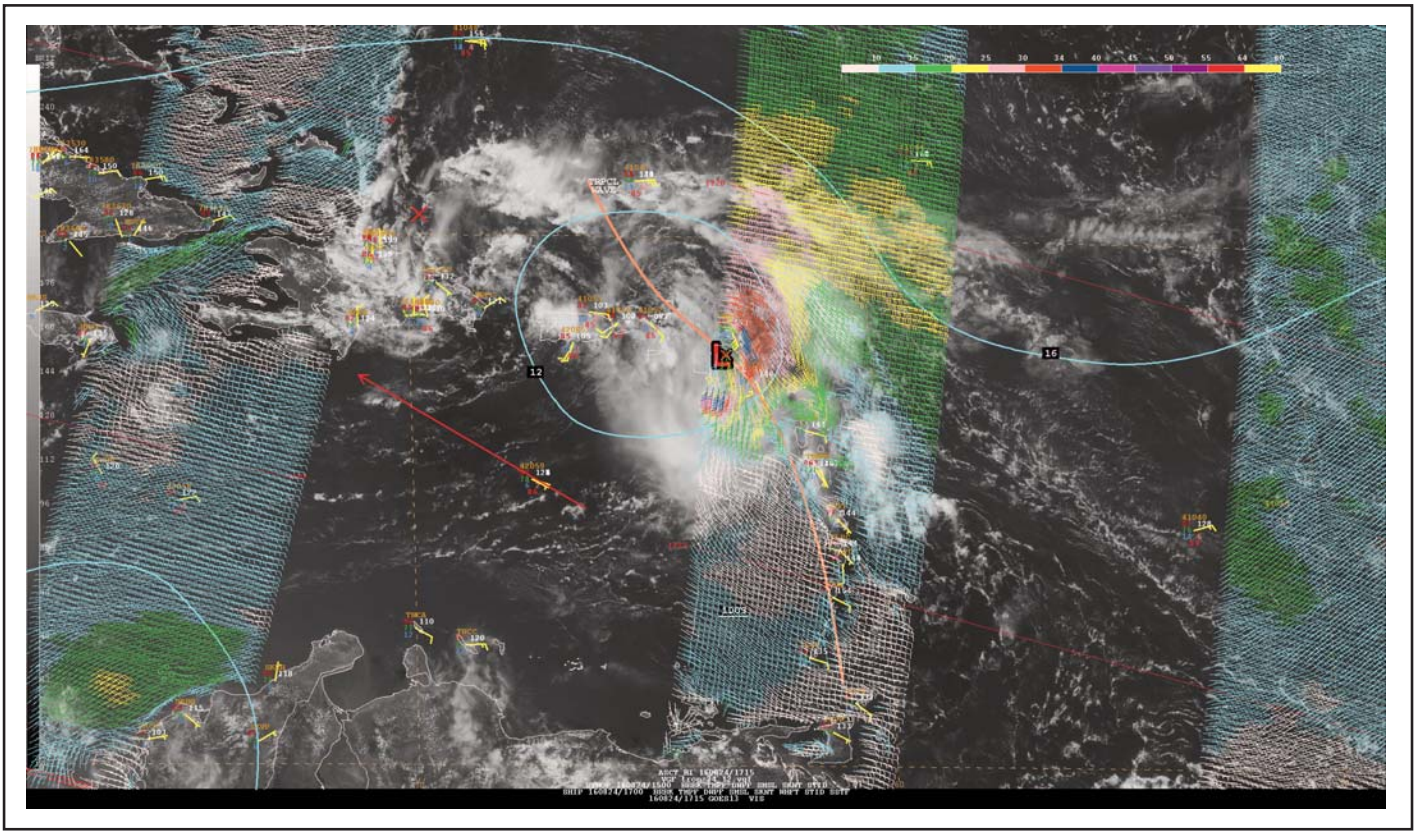


Figure 10. METOP-A Advanced Scatterometer ASCAT wind retrieval at 1320 UTC 24 Aug. Note the radial extent of the gale force winds was greatest to the northeast of the low where the east to southeast winds are embedded within a large area of 20 to 30 kts winds, while a pocket of gale force southeast to south winds is noted to the south of the low.

of Florida on 28 August where it was classified to be a tropical depression. It then intensified into tropical storm Hermine in the eastern Gulf of Mexico on 31 August.

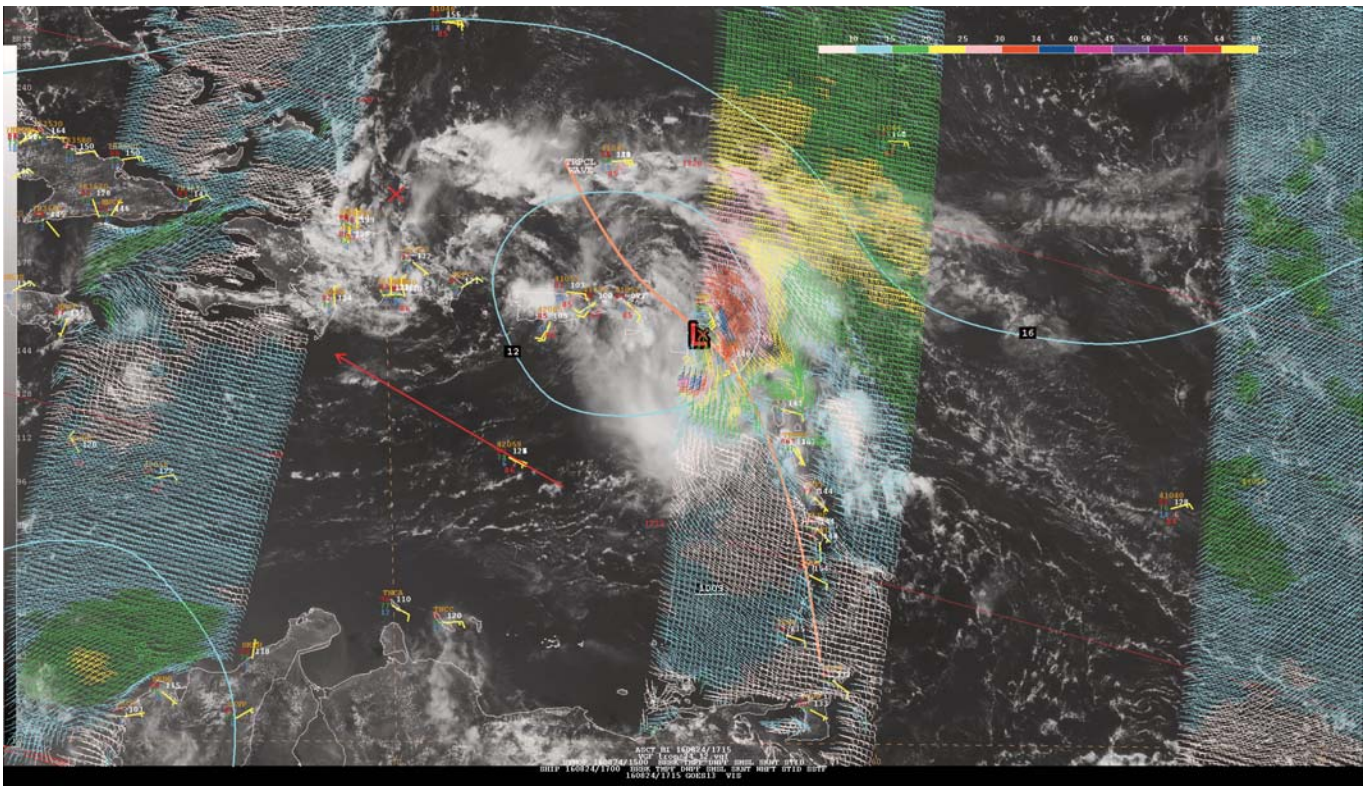


Figure 11. METOP-B Advanced Scatterometer ASCAT wind retrieval at 1414 UTC 24 Aug.

Eastern North Pacific Ocean

One brief significant warning event (not associated with tropical cyclones) occurred during the May through August 2016 time period. Table 2 provides details on the gale wind event.

Table 2. Non-tropical cyclone warnings issued for the subtropical and tropical eastern North Pacific between 1 May and 31 August 2016.

ONSET	REGION	PEAK WIND (kts)	GALE DURATION (STORM)	FORCING
0600 UTC 06 May	Gulf of Tehuantepec	35	06 h	Pressure Gradient

Gale warnings were issued prior to the first tropical cyclone advisory from the National Hurricane Center on the following tropical cyclones: Estelle, valid at 0000 UTC 15 July, fifteen hours prior to the first advisory; Lester, valid at 1200 UTC 24 August, nine hours previous to the first advisory; and Madeline, valid at 0600 UTC 26 August, fifteen hours prior to the first advisory. These gale warnings were issued for the benefit of mariners when a high probability of 34 kts or greater winds associated with a tropical low were expected within the next 48 hours, but the lack of a closed when a high probability of 34 kts or greater winds associated with a tropical low were expected within the next 48 hours, but the lack of a closed circulation or organized deep convection did not justify the issuance of tropical cyclone advisories at that time.

The only gale warning issued in the Eastern North Pacific from May through August not associated with a tropical cyclone was a late season high wind event in the Gulf of Tehuantepec during the first week of May. Late season Gulf of

Tehuantepec wind events are typically initiated by strong northerly winds behind a cold front in the southwestern Gulf of Mexico, where the strong flow funnels cold air southward through the Chivela Pass across the Isthmus of Tehuantepec. A cold front moving across the western Gulf of Mexico in early May was expected to induce 30 kts northerly winds early in the morning of 5 May, and the Global Forecast System (GFS) model indicated peak winds the next morning would exceed 35 kts. Because the higher resolution GFS model has demonstrated better skill in identifying gale wind events during the past two winter seasons to marine forecasters than previous years, and there was enough run-to-run consistency in the model guidance to indicate there was a high likelihood of winds in excess of 33 kts, a gale warning was first issued 48 hours prior to the expected onset of gales at 0600 UTC 04 May. Subsequent forecasts indicated the gales were expected to commence between 0300 and 0600 UTC on May 6th, and persist about nine to 12 hours until 1800 UTC. Scatterometer data was unavailable over the Gulf of Tehuantepec between 0400 UTC 5 May and 1500 UTC 6 May, and there were no ship reports in the area during this time, so it is impossible to determine if a brief period of gale force winds actually occurred early in the morning of May 6th in the Gulf of Tehuantepec. The gale warning was discontinued at 1200 UTC 6 May, based on the most recent GFS model runs trending toward winds below gale force. In summary, it is inconclusive whether there were any significant warning events not associated with tropical cyclones in the Eastern North Pacific during the May through August 2016 time period, but if so, was likely very brief and confined to a small area near the coast of Mexico in the Gulf of Tehuantepec.

National Weather Service VOS Program New Recruits:

July 1, 2016 through October 31, 2016

SHIP NAME	CALL SIGN
ANTHEM OF THE SEAS	C6BI7
APL GUAM	WAPU
APL HOUSTON	9V9921
APL PHOENIX	9V9918
ATLANTIC BRAVE	D5LQ8
ATLANTIC SAIL	2JCC5
BAIE ST. PAUL	CFN6120
CMB PAULE	VRJF3
COSCO VIETNAM	VRID5
DREW FOSS	WYL5718
EVER LAMBENT	2FRE8
EVER LEGION	9V9725
EVER LIFTING	2ILJ7
EVER LOVELY	9V9793
EVER LUNAR	BKKF
HHL RHINE	D5AM2
HOUSTON BRIDGE	3FLC7
HUMBER BRIDGE	3EHZ5
K. GARNET	3EVU4
KAMBOS	3ESY5
LEGEND OF THE SEAS	C6SL5
OCEAN GRACIOUS	3EUP5
ONEGO CAPRI	V2ED7
PARAMOUNT HAMILTON	2CWB2
PATRIOT	WAIU
SAGA WIND	VRUR7
SALLY RIDE	WSAF
SAVITA NAREE	9V5030
SEAFREEZE AMERICA	WDH8281
STAR MINERVA	V7GR8
THUNDER BAY	CFN6288

VOS Program
Cooperative Ship Report:
July 1, 2016 through October 31, 2016

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ADVENTURE OF THE SEAS	C6SA3	A	Miami	0	0	0	0	0	0	0	33	68	28			129
ALASKA MARINER	WSM5364	A	Anchorage	29	8	15	0	3	16	3	68	19	63			224
ALASKA TITAN	WDE4789	A	Anchorage	40	1	15	20	7	19	27	23	18	11			181
ALASKAN EXPLORER	WDB9918	A	Anchorage	39	29	39	84	63	53	34	15	55	59			470
ALASKAN FRONTIER	WDB7815	A	Anchorage	42	58	40	47	46	31	0	11	67	40			384
ALASKAN LEADER	WDB7198	A	Anchorage	2	1	0	0	1	1	0	1	5	8			19
ALASKAN LEGEND	WDD2074	A	Anchorage	53	71	81	83	10	0	0	0	73	35			406
ALASKAN NAVIGATOR	WDC6644	A	Anchorage	25	174	126	153	97	58	65	122	200	83			1103
ALBEMARLE ISLAND	C6LU3	A	Miami	12	15	2	3	0	5	6	5	21	18			87
ALERT	WCZ7335	A	Anchorage	0	4	0	2	2	3	5	1	0	0			17
ALGOLAKE	VCPX	A	Duluth	1	0	0	0	48	75	51	9	34	57			275
ALGOMA DISCOVERY	CFK9796	A	Duluth	0	0	0	0	0	0	0	0	0	7			7
ALGOMA GUARDIAN	CFK9698	A	Duluth	0	0	0	0	3	22	39	38	41	24			167
ALGOMA MARINER	CFN5517	A	Duluth	7	0	15	0	0	0	0	0	1	32			55
ALGORAIL	VYNG	A	Duluth	0	0	0	0	0	0	0	0	2	16			18
ALLIANCE FAIRFAX	WLMQ	A	Jacksonville	31	11	33	13	34	46	50	51	48	69			386
ALLIANCE NORFOLK	WGAH	A	Jacksonville	0	0	0	0	0	0	0	0	3	0			3
ALLIANCE ST LOUIS	WGAE	A	Charleston	0	19	2	8	17	2	10	14	20	17			109
ALLURE OF THE SEAS	C6XS8	A	Miami	35	42	56	79	59	56	59	66	60	71			583
ALPENA	WAV4647	A	Duluth	0	0	0	0	4	16	20	2	25	33			100
AMALTHEA	CQDE	A	New York City	0	0	1	43	8	33	56	8	0	0			149
AMERICAN CENTURY	WDD2876	A	Duluth	91	0	7	259	325	331	245	143	128	172			1701
AMERICAN INTEGRITY	WDD2875	A	Duluth	6	0	0	11	22	28	20	16	43	43			189
AMERICAN MARINER	WQZ7791	A	Duluth	0	0	0	55	91	54	55	67	47	27			396
AMERICAN NO. 1	WCD7842	A	Anchorage	0	0	1	1	0	0	3	1	10	12			28
AMERICAN SPIRIT	WCX2417	A	Duluth	0	0	0	1	14	23	7	2	11	7			65
AMSTERDAM	PBAD	A	Anchorage	165	79	74	191	205	142	101	72	59	100			1188
ANDROMEDA VOYAGER	C6FZ6	A	Anchorage	50	37	62	48	0	0	18	53	28	35			331
ANTHEM OF THE SEAS	C6BI7	A	New York City	0	0	0	0	0	0	0	7	27	2			36
ANTWERPEN	VRBK6	A	Anchorage	0	0	1	0	0	0	0	0	0	15			16
APL AGATE	WDE8265	A	Charleston	28	29	35	26	48	42	46	35	34	55			378
APL BELGIUM	WDG8555	A	Los Angeles	65	54	39	50	35	34	40	46	31	46			440
APL CHINA	WDB3161	A	Los Angeles	0	28	110	190	141	78	77	74	60	160			918
APL CORAL	WDF6832	A	Charleston	33	10	6	0	0	0	10	3	0	0			62
APL GUAM	WAPU	A	Anchorage	0	0	0	0	0	0	0	19	85	76			180
APL HOUSTON	9V9921	A	Los Angeles	0	0	0	0	0	0	0	16	23	17			56
APL KOREA	WCX8883	A	Los Angeles	26	52	72	69	80	31	66	65	87	70			618
APL PHILIPPINES	WCX8884	A	Los Angeles	30	19	22	52	81	61	59	2	45	43			414
APL PHOENIX	9V9918	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
APL SCOTLAND	9VDD3	A	New York City	38	28	0	28	23	28	40	35	37	0			256
APL SINGAPORE	WCX8812	A	Los Angeles	76	81	98	33	55	71	57	85	68	80			704
APL THAILAND	WCX8882	A	Los Angeles	11	41	19	41	39	43	23	79	74	245			615
AQUARIUS VOYAGER	C6UC3	A	Jacksonville	5	7	28	18	9	10	5	5	10	19			116
ARCTIC BEAR	WBP3396	A	Anchorage	0	0	0	0	7	0	13	49	34	48			92
ARCTIC TITAN	WDG2803	A	Anchorage	21	3	7	7	14	4	4	4	9	19			92
ARCTURUS VOYAGER	C6YA7	A	Anchorage	40	37	47	45	72	45	76	75	62	38			537
ARI CRUZ	WDG9588	A	Anchorage	0	0	0	0	0	0	0	8	1	7			16
ARIES VOYAGER	C6UK7	A	Anchorage	39	9	24	25	14	31	62	36	55	72			367
ARNOLD MAERSK	OXES2	A	Seattle	0	37	49	15	45	14	21	22	0	72			275
ARTHUR M. ANDERSON	WDH7563	A	Duluth	0	0	2	21	53	50	20	33	40	33			252
ATLANTIC BRAVE	D5LQ8	A	New Orleans	0	0	0	0	0	0	0	0	0	16			16
ATLANTIC BREEZE	VRDC6	A	Anchorage	0	0	0	0	0	0	0	0	0	12			12
ATLANTIC CARTIER	SCKB	A	Norfolk	35	35	14	20	16	23	24	18	21	25			231
ATLANTIC EXPLORER (AWS)	WDC9417	A	Anchorage	32	0	76	211	46	0	0	185	101	262			913
ATLANTIC GRACE	VRDT7	A	Anchorage	0	0	47	32	60	29	0	0	0	0			168
ATLANTIC GRACE	V7UX9	A	New Orleans	0	0	0	0	6	0	0	0	4	17			27
ATLANTIC HOPE	VRDT5	A	Baltimore	54	26	34	43	28	37	9	1	17	11			260
ATLANTIC SAIL	2JCC5	A	New York City	0	0	0	0	0	0	1	0	1	32			34
ATLANTIS (AWS)	KAQP	A	Anchorage	0	10	598	372	731	308	421	591	692	691			4414
ATTENTIVE	WCZ7337	A	Anchorage	16	5	0	8	1	0	0	4	0	0			34
AUGUSTA KONTOR	V7HG7	A	Charleston	0	0	0	0	0	0	68	7	0	0			75
AURORA	WYM9567	A	Anchorage	75	0	0	17	77	136	309	140	87	0			841
AURORA TAURUS	V7EX3	A	Anchorage	9	14	27	11	11	9	0	0	0	0			81
AVIK	WDB7888	A	Anchorage	0	0	0	0	2	1	6	8	4	0			22
AWARE	WCZ7336	A	Anchorage	22	7	0	0	5	0	4	5	5	1			49
AZAMARA JOURNEY	9HOB8	A	Anchorage	0	0	0	0	0	0	0	0	5	28			33
BADGER	WBD4889	A	Duluth	0	0	0	0	28	130	119	127	92	33			529
BAIE COMEAU	CFN6357	A	Duluth	0	0	0	0	0	15	0	0	0	0			15
BARBARA FOSS	WYL4318	A	Anchorage	0	0	0	0	0	0	1	0	0	1			2
BARRINGTON ISLAND	C6QK	A	Miami	26	28	33	29	26	32	42	35	23	7			281
BELL M. SHIMADA (AWS)	WTED	A	Seattle	440	479	419	506	317	255	563	516	584	138			4215
BERGE NINGBO	VRBQ2	A	Anchorage	0	17	21	5	23	2	0	0	0	0			68
BEARING LEADER	WDC7227	A	Anchorage	0	1	0	0	1	0	1	4	11	1			19
BERLIAN EKUATOR	HPYK	A	Anchorage	0	0	0	0	0	0	0	0	0	1			1
BERNARDO QUINTANA A.	C6KJ5	A	New Orleans	77	71	69	63	72	83	86	79	79	74			753
BILLIE H.	WCY4992	A	Anchorage	0	0	0	2	11	19	1	0	0	1			34
BISMARCK SEA	WDE5016	A	Anchorage	4	3	2	1	2	0	1	5	3	3			24
BLS LIWA	VREF5	A	Anchorage	61	34	163	162	9	0	0	0	0	5			434
BLUEFIN	WDC7379	A	Seattle	0	0	105	74	99	94	83	81	74	85			695
BRILLIANCE OF THE SEAS	C6SJ5	A	Miami	0	0	0	5	9	0	0	43	73	8			138
BUFFALO	WXS6134	A	Duluth	3	0	3	10	69	37	47	39	30	65			303
BUFFALO HUNTER	VROJ5	A	New York City	62	61	31	74	30	56	39	20	58	27			458

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BULWARK	WBN4113	A	Anchorage	6	5	7	16	10	4	11	4	12	14			89
BURNS HARBOR	WDC6027	A	Duluth	35	0	1	20	20	45	46	48	34	10			259
CALIFORNIA VOYAGER	WDE5381	A	New Orleans	17	7	13	13	28	30	3	1	2	51			165
CALUMET	WDE3568	A	Duluth	0	0	0	32	97	108	57	77	104	123			598
CAPE INSCRIPTION	WSCJ	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
CAPITAINE TASMAN	S6SS	A	Anchorage	0	0	0	0	0	0	0	2	1	0			3
CAPRICORN VOYAGER	C6UZ5	A	Anchorage	28	65	35	38	40	45	48	23	54	52			428
CAPT. HENRY JACKMAN	VCTV	A	Duluth	0	0	0	1	0	0	4	2	1	28			36
CARNIVAL BREEZE	3FZO8	A	Miami	3	0	0	0	0	5	3	40	45	56			152
CARNIVAL CONQUEST	3FPQ9	A	Miami	0	0	0	0	0	32	26	27	17	72			174
CARNIVAL DREAM	3ETA7	A	New Orleans	59	94	66	66	67	83	47	18	61	25			586
CARNIVAL ECSTASY	H3GR	A	Miami	48	58	136	95	60	23	21	53	140	129			763
CARNIVAL ELATION	3FOC5	A	Jacksonville	28	9	6	1	11	2	11	34	14	1			117
CARNIVAL FANTASY	H3GS	A	Miami	35	9	35	20	12	10	13	37	44	15			230
CARNIVAL FASCINATION	C6FM9	A	Jacksonville	7	11	27	55	10	1	0	0	0	0			111
CARNIVAL FREEDOM	3EBL5	A	Miami	10	11	16	11	5	20	0	0	0	0			73
CARNIVAL GLORY	3FPS9	A	Miami	53	37	33	37	12	64	64	85	97	120			602
CARNIVAL INSPIRATION	C6FM5	A	Los Angeles	30	0	0	0	55	87	62	14	2	0			250
CARNIVAL LEGEND	H3VT	A	Miami	225	372	400	416	124	172	124	166	89	440			2528
CARNIVAL LIBERTY	HPYE	A	Houston	0	0	0	0	0	0	0	0	53	39			92
CARNIVAL MAGIC	3ETA8	A	Jacksonville	19	9	31	55	20	7	57	86	107	107			498
CARNIVAL MIRACLE	H3VS	A	Seattle	0	22	61	49	40	38	9	30	57	68			374
CARNIVAL PARADISE	3FOB5	A	Miami	34	0	0	0	0	0	0	85	52	23			194
CARNIVAL PRIDE	H3VU	A	Jacksonville	8	8	5	14	18	10	3	28	35	26			155
CARNIVAL SENSATION	C6FM8	A	Miami	0	0	0	1	20	13	6	5	27	31			103
CARNIVAL SPLENDOR	3EUS	A	Anchorage	3	18	6	0	0	0	0	2	0	15			44
CARNIVAL SUNSHINE	C6FN4	A	Jacksonville	34	27	48	14	0	18	99	80	44	19			383
CARNIVAL TRIUMPH	C6FN5	A	New Orleans	0	10	0	44	64	30	45	35	26	18			272
CARNIVAL VALOR	H3VR	A	Jacksonville	30	5	6	4	16	64	48	42	13	19			247
CARNIVAL VICTORY	3FFL8	A	Jacksonville	9	21	6	14	0	4	9	92	109	168			432
CAROLINE MAERSK	OZWA2	A	Seattle	25	15	36	27	18	45	41	32	48	31			318
CASON J. CALLAWAY	WDH7556	A	Duluth	2	0	2	65	52	44	20	29	18	58			290
CASTOR VOYAGER	C6UZ6	A	Anchorage	38	33	31	27	37	27	0	86	28	2			309
CELEBRITY CONSTELLATION	9HJI9	A	Miami	316	170	92	72	65	55	393	489	342	300			2294
CELEBRITY ECLIPSE	9HXC9	A	Miami	300	261	248	216	135	166	162	159	205	177			2029
CELEBRITY EQUINOX	9HXD9	A	Miami	0	0	0	0	0	191	157	79	66	81			574
CELEBRITY INFINITY	9HJD9	A	Miami	81	27	81	32	5	106	0	0	0	0			332
CELEBRITY MILLENNIUM	9HJF9	A	Anchorage	235	159	87	20	8	112	204	287	174	82			1368
CELEBRITY REFLECTION	9HA3047	A	Miami	85	78	104	105	86	111	129	100	52	103			953
CELEBRITY SILHOUETTE	9HA2583	A	Miami	132	106	137	150	117	304	194	186	157	179			1662
CELEBRITY SOLSTICE	9HRJ9	A	Seattle	194	150	169	174	124	112	70	29	53	42			1117
CELEBRITY SUMMIT	9HJC9	A	Miami	24	28	15	20	2	136	60	83	58	50			476
CHARLES ISLAND	C6JT	A	Miami	45	28	20	43	26	24	25	35	19	17			282
CHARLESTON EXPRESS	WDD6126	A	Houston	66	50	102	56	40	74	61	59	60	49			617
CHUKCHI SEA	WDE2281	A	Anchorage	0	0	0	0	0	0	1	1	5	3			10

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CIELO DI PALERMO	3FRS8	A	New Orleans	0	0	0	10	10	0	0	0	0	0			20
CIELO DI SAN FRANCISCO	IBKA	A	New Orleans	0	0	0	53	3	0	0	0	0	0			56
CLIPPER ICHIBAN	3FHN7	A	New Orleans	0	0	0	0	0	3	0	0	0	0			3
CLIPPER IYO	3ETM8	A	New Orleans	0	0	0	0	38	34	0	0	0	0			72
CLIPPER KYTHIRA	V7JJ2	A	New Orleans	1	61	36	27	3	0	0	0	0	0			128
CMB PAULE	VRJF3	A	New Orleans	0	0	0	0	0	0	0	0	2	0			2
COASTAL NOMAD	WDC6439	A	Anchorage	13	1	4	3	4	0	1	9	4	4			43
COASTAL PROGRESS	WDC6363	A	Anchorage	4	5	0	0	4	2	0	3	4	3			25
COASTAL TRADER	WSL8560	A	Anchorage	3	10	4	1	0	0	1	6	14	4			43
COASTAL VENTURE	WDF3547	A	Charleston	0	0	0	0	0	0	0	0	0	0			0
COLUMBIA	WYR2092	A	Seattle	0	0	0	0	0	47	41	39	28	0			155
COLUMBINE MAERSK	OUHC2	A	Norfolk	0	0	5	32	26	17	46	63	59	56			304
CORNELIA MAERSK	OWWS2	A	New York City	12	2	0	0	7	1	0	27	28	30			107
CORWITH CRAMER	WTF3319	A	Anchorage	0	0	0	9	7	0	0	0	0	0			16
COSCO VIETNAM	VRID5	A	New York City	0	0	0	0	35	36	61	49	54	47			282
COSTA FORTUNA	IBNY	A	Miami	74	66	77	32	53	20	21	84	84	66			577
CROSS POINT	WDA3423	A	Anchorage	0	0	0	2	4	3	1	6	5	14			35
CRYSTAL SERENITY	C6SY3	A	Anchorage	0	0	0	1	46	56	131	243	219	124			820
CRYSTAL SUNRISE	9V2024	A	Anchorage	20	4	0	0	0	0	0	20	15	31			90
CS GLOBAL SENTINEL	KGSU	A	Seattle	10	0	2	1	1	41	6	14	14	19			108
CS RELIANCE	V7CZ2	A	Baltimore	31	76	128	84	34	19	26	55	15	16			484
CSAV LUMACO	VRFB5	A	Charleston	0	0	0	0	0	0	9	7	0	0			16
CSCL MELBOURNE	VRBI8	A	Anchorage	151	436	0	36	64	15	37	25	27	6			797
CSCL SYDNEY	VRBH9	A	Norfolk	0	11	25	11	12	22	11	0	0	0			92
CSL ASSINIBOINE	VCKQ	A	Duluth	4	0	0	15	57	24	1	0	0	13			114
CSL LAURENTIEN	VCJW	A	Duluth	21	0	0	4	6	27	3	25	20	5			111
CSL ST-LAURENT	CFK5152	A	Duluth	0	0	0	0	0	5	3	4	2	8			22
DANIEL FOSS	WTS3171	A	Anchorage	0	0	0	0	2	0	0	0	0	0			2
DEFENDER	WBN3016	A	Jacksonville	0	0	0	0	2	2	0	0	0	0			4
DIANE H	WUR7250	A	Anchorage	0	0	4	2	0	3	7	37	5	3			61
DISCOVERER CLEAR LEADER	V7MO2	A	Houston	121	114	124	118	124	120	115	124	119	123			1202
DISCOVERER INSPIRATION	V7MO3	A	Houston	24	25	16	4	4	2	0	1	14	24			114
DISNEY DREAM	C6YR6	A	Jacksonville	4	44	46	65	77	54	24	27	73	33			448
DISNEY FANTASY	C6ZL6	A	Jacksonville	10	7	7	1	0	2	0	0	0	0			27
DISNEY MAGIC	C6PT7	A	Jacksonville	41	50	0	12	30	11	0	3	35	95			277
DISNEY WONDER	C6QM8	A	Miami	36	16	7	22	27	8	3	27	42	6			194
DOMINATOR	WBZ4106	A	Anchorage	18	42	39	28	0	24	17	18	0	0			186
DREW FOSS	WYL5718	A	Anchorage	0	0	0	0	0	0	2	21	20	12			55
DUBAI EXPRESS	VRBN8	A	New York City	0	0	0	0	0	6	10	1	0	0			17
DUNCAN ISLAND	C6JS	A	Miami	44	10	27	25	18	15	24	18	19	11			211
EAGLE ATLANTA	S6TE	A	Houston	76	74	75	54	1	0	0	0	0	0			280
EAGLE BALTIMORE	9VHG	A	Houston	28	7	42	65	51	37	0	0	0	0			230
EAGLE KANGAR	9V8472	A	Houston	0	0	0	0	0	0	0	26	14	6			46
EAGLE KLANG	9V8640	A	Houston	0	0	0	0	0	0	64	126	106	49			345
EAGLE STAVANGER	3FNZ5	A	Houston	18	22	13	2	0	0	0	57	70	38			220

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EAGLE SYDNEY	3FUU	A	New York City	0	0	0	0	0	0	4	25	12	20			61
EAGLE TORRANCE	9VMG5	A	Houston	27	0	0	0	0	28	16	8	0	0			79
EDGAR B. SPEER	WDH7562	A	Duluth	128	0	34	191	224	204	74	74	112	86			1127
EDWIN H. GOTT	WDH7558	A	Duluth	77	0	45	245	110	175	185	201	135	267			1440
EMPIRE STATE	KKFW	A	New York City	0	0	0	0	102	124	129	20	0	0			375
ENCHANTMENT OF THE SEAS	C6FZ7	A	Jacksonville	0	0	0	0	0	0	0	54	18	34			106
ENDEAVOR (AWS)	WCE5063	A	New York City	607	650	438	636	435	647	632	695	330	675			5745
ENDURANCE	WDE9586	A	Baltimore	21	58	22	69	22	51	87	3	57	83			473
ENDURANCE	WDF7523	A	Anchorage	16	0	9	10	8	7	24	4	0	1			79
EOT SPAR	WDE9193	A	Jacksonville	44	23	23	27	48	45	41	19	34	23			327
ERNEST N	A8PQ6	A	Anchorage	49	36	43	0	19	3	0	26	12	5			193
EURODAM	PHOS	A	Miami	60	58	74	148	102	71	26	7	146	140			832
EVER DAINTY	9V7951	A	Baltimore	15	10	40	14	13	16	8	14	0	0			130
EVER DECENT	9V7952	A	New York City	45	52	98	74	21	0	78	56	113	83			620
EVER DEVELOP	3FLF8	A	New York City	14	12	4	4	24	28	8	0	0	4			98
EVER DEVOTE	9V7954	A	New York City	0	0	6	0	10	5	2	14	11	9			57
EVER DIADEM	9V7955	A	New York City	0	32	68	75	93	94	81	86	82	81			692
EVER ELITE	VSJG7	A	Los Angeles	0	0	0	0	0	0	37	91	57	71			256
EVER ENVOY	VSQL9	A	Seattle	0	0	0	0	0	3	0	0	0	0			3
EVER LAMBENT	2FRE8	A	New York City	0	0	0	0	0	13	29	47	30	33			152
EVER LASTING	2FRK7	A	New York City	0	0	1	0	0	0	12	36	46	68			168
EVER LAWFULL	9V9288	A	New York City	0	0	0	0	0	0	12	28	41	49			130
EVER LEADING	2FRK8	A	Norfolk	38	8	0	36	34	56	22	2	0	0			196
EVER LEGACY	9V9290	A	New York City	18	33	33	31	36	18	41	29	15	2			256
EVER LEGION	9V9725	A	New York City	0	0	0	0	0	0	0	0	15	0			15
EVER LENIENT	2HDF9	A	Los Angeles	0	0	0	0	15	28	15	22	32	32			144
EVER LIBRA	BKIC	A	New York City	0	0	0	0	0	48	18	4	0	0			70
EVER LIFTING	2ILJ7	A	New York City	0	0	0	0	0	0	0	0	7	10			17
EVER LISSOME	2HDG3	A	New York City	0	0	0	0	0	23	17	0	5	1			46
EVER LOVELY	9V9793	A	Charleston	0	0	0	0	0	0	0	4	11	17			32
EVER LUCKY	3FAE4	A	New York City	6	0	0	0	13	16	19	0	73	61			188
EVER LUNAR	BKKF	A	New York City	0	0	0	0	0	0	0	0	0	1			1
EVER SALUTE	3ENU5	A	Anchorage	0	0	0	0	6	2	19	33	26	5			91
EVER SHINE	MJKZ4	A	Anchorage	13	1	0	0	0	0	0	5	1	0			20
EVER STEADY	3EHT6	A	Anchorage	0	0	0	0	0	5	4	5	0	9			23
EVER STRONG	3EJG3	A	Seattle	0	0	0	19	7	0	7	2	4	0			39
EVER SUMMIT	3EKU3	A	Anchorage	0	1	0	0	0	0	0	0	1	1			3
EVER SUPERB	3EGL5	A	Anchorage	15	0	0	1	0	0	0	3	12	19			50
EVER UBERTY	9V7960	A	Seattle	0	0	10	2	15	16	19	0	0	0			62
EVER UNIFIC	9V7961	A	Anchorage	7	22	16	1	0	0	8	4	1	11			70
EVER UNION	3FFG7	A	Seattle	19	14	75	31	22	18	0	0	0	0			179
EVER UNIQUE	9V7959	A	Seattle	0	0	0	0	0	0	0	0	0	1			1
EVER UNITY	3FCD9	A	New York City	67	66	59	66	60	48	44	54	4	0			468
EVER URBAN	3FXN9	A	Seattle	0	0	0	0	0	0	0	32	22	2			56
EVER URSULA	3FCB9	A	Seattle	0	0	0	0	2	0	9	2	0	0			13

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
EVER UTILE	3FZA9	A	Seattle	6	5	1	0	0	5	5	6	0	0			28
EXCALIBUR	ONCE	A	Houston	120	106	1	8	53	91	96	121	88	100			784
EXCEL	ONAI	A	Houston	4	54	65	87	74	85	52	26	10	0			457
EXCELLENCE	ONBG	A	Houston	0	0	0	0	0	0	15	20	0	0			35
EXCELSIOR	ONCD	A	Houston	66	68	67	81	37	32	38	44	50	22			505
EXPLORER OF THE SEAS	C6SE4	A	Jacksonville	0	0	0	0	0	0	0	47	86	117			250
FAIRCHEM FRIESIAN	V7PU7	A	Anchorage	0	31	6	2	10	7	0	0	0	0			56
FAIRCHEM MAVERICK	V7EP2	A	Anchorage	27	46	54	1	3	1	15	8	7	0			162
FAIRWEATHER	WDB5604	A	Anchorage	0	0	0	0	1	0	0	0	1	5			7
FAIRWEATHER (AWS)	WTEB	A	Anchorage	0	0	0	0	410	552	469	594	42	399			2466
FEDERAL HUNTER	VRWP2	A	New Orleans	0	0	25	4	2	0	0	0	0	0			31
FEDERAL KIVALINA	V7RF2	A	Anchorage	0	0	0	0	0	0	22	51	1	18			92
FEDERAL YUKINA	VRHN7	A	Anchorage	0	0	13	21	9	27	0	0	0	0			70
FEDERAL YUKON	V7RG8	A	Anchorage	0	0	0	0	0	0	0	0	6	14			20
FERDINAND R. HASSLER	WTEK	A	Norfolk	0	272	494	203	71	0	0	194	350	194			1778
FISH HAWK	WRB5085	A	Anchorage	0	0	0	7	3	1	5	17	13	15			61
FLORIDA	WFAF	A	Houston	1	0	0	0	21	34	7	2	2	14			81
FLORIDA VOYAGER	WDF4764	A	Los Angeles	1	2	5	5	26	0	0	0	0	1			40
FORUM PACIFIC	9VEY2	A	Anchorage	0	0	0	0	0	0	3	21	10	39			73
FREEDOM	WDB5483	A	Jacksonville	58	22	3	5	13	33	34	36	1	0			205
FREEDOM OF THE SEAS	C6UZ7	A	Jacksonville	0	2	10	36	7	3	28	53	17	23			179
G. L. OSTRANDER	WCV7620	A	Duluth	21	0	26	74	87	55	67	89	89	102			610
G3 MARQUIS	XJBO	A	Duluth	0	0	0	36	24	50	46	51	134	143			484
GENCO AUGUSTUS	VRDD2	A	Anchorage	0	0	0	0	0	0	0	0	0	11			11
GENCO CLAUDIUS	V7SY6	A	Anchorage	0	0	0	0	3	30	46	109	5	1			194
GENCO TITUS	VRDI7	A	Anchorage	0	0	0	0	0	0	0	0	0	9			9
GENERAL RUDDER	WTAU	A	Houston	0	0	0	0	1	8	9	5	0	0			23
GLEN CANYON BRIDGE	3EFD9	A	Norfolk	20	23	31	53	72	47	56	57	38	43			440
GOLDEN BEAR	NMRY	A	San Francisco	0	0	0	2	44	56	74	96	0	0			272
GORDON GUNTER (AWS)	WTEO	A	New Orleans	160	0	0	292	504	309	604	433	485	127			2914
GRANDEUR OF THE SEAS	C6SE3	A	Jacksonville	54	14	21	3	12	15	10	4	1	0			134
GREAT REPUBLIC	WDH7561	A	Duluth	2	0	0	33	48	52	29	18	82	37			301
GREEN BAY	WDI3177	A	Jacksonville	0	0	0	0	0	33	21	38	11	7			110
GREEN COVE	WDG5660	A	Baltimore	0	0	0	0	0	15	17	0	0	0			32
GREEN LAKE	WDDI	A	Jacksonville	47	44	36	31	20	5	32	70	45	41			371
GREEN RIDGE	WZZF	A	Jacksonville	0	33	58	28	6	32	20	5	10	22			214
GRETA	WDF3298	A	Anchorage	0	0	0	0	1	0	0	0	0	0			1
GRETCHEN H	WDC9138	A	Anchorage	0	0	0	2	0	0	2	1	0	0			5
GROUSE HUNTER	D5KT4	A	Anchorage	0	0	0	6	34	4	32	7	0	0			83
GUARDIAN	WBO2511	A	Anchorage	14	7	4	9	15	5	0	8	10	7			79
GUARDSMAN	WBN5978	A	Anchorage	0	0	0	0	6	0	9	10	19	0			44
GULF TITAN	WDA5598	A	Anchorage	20	31	27	0	24	15	24	0	0	12			153
GUNDE MAERSK	OUIY2	A	Seattle	0	0	0	14	18	0	0	1	0	0			33
H A SKLENAR	C6CL6	A	Houston	170	129	164	149	161	108	137	75	145	169			1407
H. LEE WHITE	WZD2465	A	Duluth	2	0	0	21	47	55	22	31	13	86			277

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
HALIFAX EXPRESS	VRMW7	A	New Orleans	0	0	0	0	0	0	2	41	26	14			83
HANJIN AMI	VRNF8	A	Los Angeles	34	20	23	12	12	0	0	0	0	0			101
HANJIN CZECH	9HA4003	A	New York City	0	0	0	0	8	15	3	6	3	0			35
HENRY B. BIGELOW (AWS)	WTDF	A	New York City	0	0	0	322	498	207	612	429	438	559			3065
HENRY GOODRICH	YJQN7	A	Houston	0	0	0	0	165	226	151	207	199	215			1163
HERBERT C. JACKSON	WL3972	A	Duluth	0	0	0	0	0	0	0	0	461	740			1201
HHL RHINE	D5AM2	A	New Orleans	0	0	0	0	0	0	0	0	1	0			1
HI'IALAKAI (AWS)	WTEY	A	Honolulu	0	0	0	71	72	162	417	479	705	0			1906
HOEGH CHIBA	LAVD7	A	Jacksonville	0	0	0	0	0	0	0	0	58	17			75
HON. JAMES L. OBERSTAR	WL3108	A	Duluth	46	0	695	719	739	720	731	546	720	454			5370
HONOR	WDC6923	A	Baltimore	24	32	33	25	18	28	13	36	15	0			224
HOOD ISLAND	C6LU4	A	Miami	23	27	28	36	43	35	24	28	32	38			314
HORIZON ANCHORAGE	KGTX	A	Anchorage	54	35	25	36	57	65	65	47	8	0			392
HORIZON CONSUMER	WCHF	A	Seattle	31	53	45	49	12	1	0	24	38	73			326
HORIZON ENTERPRISE	KRGB	A	Seattle	33	67	79	69	50	58	84	62	50	29			581
HORIZON PACIFIC	WSRL	A	Seattle	49	47	55	51	39	31	62	76	71	76			557
HORIZON RELIANCE	WFLH	A	Los Angeles	0	0	0	0	30	60	68	79	82	74			393
HORIZON SPIRIT	WFLG	A	Los Angeles	37	41	61	35	59	78	80	51	66	68			576
HOUSTON	KCDK	A	Miami	0	0	0	0	2	0	1	0	0	0			3
HOUSTON BRIDGE	3FLC7	A	New York City	0	0	0	0	0	0	0	0	0	0			0
HUMBER BRIDGE	3EHZ5	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
HUNTER	WBN3744	A	Anchorage	0	3	6	7	20	9	29	11	1	0			86
HYDRA VOYAGER	C6AB8	A	Anchorage	35	11	3	16	10	1	26	11	0	0			113
IBRAHIM DEDE	V7QW6	A	New York City	15	43	10	21	22	17	22	27	13	16			206
INDEPENDENCE II	WGAX	A	Baltimore	31	28	30	32	59	35	27	25	31	48			346
INDEPENDENCE OF THE SEAS	C6WW4	A	Miami	28	8	5	0	0	13	3	9	74	34			174
INLAND SEAS	WCJ6214	A	Duluth	0	0	0	0	3	0	1	0	1	3			8
INTEGRITY	WDC6925	A	Baltimore	50	62	30	17	6	3	0	21	35	49			273
INTEGRITY	WDD7905	A	Anchorage	31	49	0	27	30	0	7	7	12	12			175
ISLA BELLA	WTOI	A	Jacksonville	37	55	23	18	59	76	54	35	45	68			470
IVER FOSS	WYE6442	A	Anchorage	0	0	0	0	0	3	0	2	0	1			6
JAMES L. KUBER	WDF7020	A	Duluth	0	0	0	120	259	160	109	168	125	122			1063
JAMES R. BARKER	WYP8657	A	Duluth	330	0	0	0	0	201	487	695	658	698			3069
JEAN ANNE	WDC3786	A	Los Angeles	9	1	0	0	0	0	13	1	1	1			26
JENNY N	A8PQ7	A	Anchorage	84	20	0	0	259	223	342	260	209	451			1848
JEWEL OF THE SEAS	C6FW9	A	Miami	0	0	0	0	0	0	0	12	34	10			56
JOHN B. AIRD	VCYP	A	Duluth	0	0	6	16	31	12	0	34	25	3			127
JOHN J. BOLAND	WZE4539	A	Duluth	0	0	0	32	35	13	4	5	23	43			155
JONATHAN SWIFT	A8SN5	A	New York City	155	61	36	83	104	108	54	96	9	44			750
JOSEPH L. BLOCK	WXY6216	A	Duluth	400	0	409	719	602	576	422	408	718	703			4957
JUSTINE FOSS	WYL4978	A	Anchorage	33	37	45	22	0	1	0	0	0	0			138
K. GARNET	3EVU4	A	New Orleans	0	0	0	0	0	0	0	9	19	0			28
KAAN KALKAVAN	TCTX2	A	New York City	53	26	19	51	34	34	62	20	23	65			387
KAMBOS	3ESY5	A	New Orleans	0	0	0	0	0	0	0	0	1	23			24
KAPRIJKE	ONIK	A	Houston	127	56	19	15	0	0	0	42	83	88			430

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
KAREN ANDRIE	WBS5272	A	Duluth	0	0	0	0	0	0	0	0	0	29			29
KAROLINE N	A8PQ8	A	Anchorage	3	1	0	0	0	0	0	98	58	29			189
KAUAI	WSRH	A	San Francisco	0	0	0	0	20	28	11	12	25	15			111
KAYE E. BARKER	WCF3012	A	Duluth	352	0	56	576	707	696	729	695	709	725			5245
KENNICOTT	WCY2920	A	Anchorage	0	0	7	23	7	2	14	19	7	0			79
KESWICK	C6XE5	A	Anchorage	2	5	17	3	1	7	15	15	13	16			94
KILO MOANA	WDA7827	A	Honolulu	2	0	13	68	52	0	0	3	8	0			146
KINGCUP	V2FP8	A	New Orleans	0	0	0	0	1	0	0	0	0	0			1
LAHORE EXPRESS	VRBY8	A	Anchorage	23	16	21	18	7	0	0	0	0	0			85
LAUREN FOSS	WDG8426	A	Anchorage	0	0	0	0	44	37	7	1	2	1			92
LAURENCE M. GOULD (AWS)	WCX7445	A	Seattle	744	696	743	718	741	720	744	741	124	730			6701
LECONTE	WZE4270	A	Anchorage	28	0	0	8	6	2	1	0	1	33			79
LEE A. TREGURTHA	WUR8857	A	Duluth	573	0	0	0	0	201	696	699	708	732			3609
LEGEND OF THE SEAS	C6SL5	A	Anchorage	0	0	0	0	0	0	0	15	0	5			20
LIBERTY EAGLE	WHIA	A	Houston	32	40	97	39	60	29	46	84	102	122			651
LIBERTY GLORY	WADP	A	Houston	34	51	5	12	19	55	22	12	18	5			233
LIBERTY GRACE	WADN	A	Houston	121	11	64	32	18	72	63	8	48	44			481
LIBERTY OF THE SEAS	C6VQ8		Houston	0	0	0	0	0	0	0	10	60	5			75
LIBERTY PRIDE	KRAU	A	Charleston	30	37	53	55	70	45	11	16	49	69			435
LIBERTY PROMISE	WWMZ	A	Jacksonville	0	0	0	0	15	2	8	0	1	22			48
LOIS H	WTD4576	A	Anchorage	0	0	0	0	0	0	0	2	1	0			3
LOWLANDS PHOENIX	9HIY9	A	Anchorage	24	29	21	0	0	14	28	30	20	19			185
MAASDAM	PFRO	A	Miami	130	66	129	93	100	57	73	554	529	233			1964
MAERSK ATLANTA	WNTL	A	Charleston	42	46	20	16	0	50	54	47	5	3			283
MAERSK CAROLINA	WBDS	A	Charleston	47	52	46	8	28	46	64	64	58	59			472
MAERSK CHICAGO	WMCS	A	Norfolk	0	0	0	8	20	17	4	8	25	10			92
MAERSK COLUMBUS	WMCU	A	Norfolk	16	24	5	5	0	8	19	0	1	0			78
MAERSK DANANG	A8PS5	A	Seattle	34	16	16	23	5	0	0	0	11	13			118
MAERSK DENVER	WMDQ	A	New York City	68	28	3	31	36	18	6	0	20	52			262
MAERSK DETROIT	WMDK	A	Norfolk	56	35	31	40	58	54	27	22	49	37			409
MAERSK HARTFORD	WMHA	A	New York City	12	0	32	49	42	36	15	15	5	23			229
MAERSK HEIWA	9V9746	A	Anchorage	2	2	0	0	0	0	0	0	2	55			61
MAERSK IDAHO	WKPM	A	Baltimore	37	30	32	35	16	12	20	32	19	20			253
MAERSK IOWA	KABL	A	Norfolk	30	22	36	29	62	85	69	63	66	62			524
MAERSK KENSINGTON	WMKN	A	Charleston	29	69	73	78	61	56	84	99	73	63			685
MAERSK KENTUCKY	WKPY	A	New York City	10	10	8	7	1	0	0	29	4	1			70
MAERSK KINLOSS	WMKA	A	New York City	0	0	0	0	22	1	3	28	30	32			116
MAERSK MEMPHIS	WMMK	A	Charleston	7	59	36	24	25	30	61	53	29	12			336
MAERSK MISSOURI	WAHV	A	Norfolk	26	51	17	30	67	66	38	14	10	131			450
MAERSK MONTANA	WCDP	A	Norfolk	80	45	26	22	66	32	43	60	48	45			467
MAERSK OHIO	KABP	A	New York City	88	95	50	56	79	71	58	60	80	40			677
MAERSK PEARY	WHKM	A	Houston	104	84	59	65	59	61	96	66	14	46			654
MAERSK PITTSBURGH	WMPP	A	New York City	49	49	72	59	53	54	53	66	39	40			534
MAERSK WESTPORT	VRFO4	A	Charleston	54	55	63	54	7	0	0	0	0	2			235
MAERSK WISCONSIN	WKPN	A	Norfolk	8	18	46	29	21	17	0	9	10	11			169

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MAGNOLIA STATE	KGNQ	A	Baltimore	0	0	0	0	0	0	0	0	0	0			0
MAHIMAHI	WHRN	A	Los Angeles	2	1	9	8	1	0	0	5	0	0			26
MAIA H	WYX2079	A	Anchorage	0	0	1	0	3	0	0	1	3	0			8
MAJESTY OF THE SEAS	C6FZ8	A	Jacksonville	29	7	14	29	25	36	15	30	13	23			221
MALASPINA	WI6803	A	Anchorage	2	0	0	0	1	0	0	0	0	0			3
MALOLO	WYH6327	A	Anchorage	2	0	0	0	1	0	0	0	0	0			3
MANITOWOC	WDE3569	A	Duluth	25	0	0	2	34	20	68	23	50	73			295
MANOA	KDBG	A	San Francisco	0	0	0	8	7	10	19	12	17	19			92
MANUKAI	WRGD	A	Los Angeles	81	55	51	60	52	72	53	50	43	25			542
MANULANI	WECH	A	Los Angeles	41	41	29	28	31	26	36	35	30	34			331
MARCUS G. LANGSETH (AWS)	WDC6698	A	Anchorage	715	684	651	658	714	670	742	308	0	640			5782
MARJORIE C	WDH6745	A	Los Angeles	0	0	0	0	0	23	29	23	9	22			106
MATSON KODIAK	KGTZ	A	Anchorage	37	63	55	49	28	15	28	26	31	15			347
MATSON NAVIGATOR	WPGK	A	Los Angeles	0	26	0	0	5	41	37	55	53	26			243
MATSON TACOMA	KGTY	A	Anchorage	30	4	0	0	0	23	42	30	29	36			194
MATSONIA	KHRC	A	Los Angeles	13	10	54	53	35	34	54	44	23	19			339
MAUNALEI	KFMV	A	Baltimore	32	28	28	0	20	25	11	17	14	22			197
MAUNAWILI	WGEB	A	Los Angeles	18	45	31	35	26	28	32	46	42	26			329
MESABI MINER	WYQ4356	A	Duluth	417	0	5	560	638	527	577	561	584	614			4483
METTE MAERSK	OUJK2	A	Los Angeles	0	0	0	0	0	0	13	21	0	0			34
MIDNIGHT SUN	WAHG	A	Seattle	12	21	6	23	45	42	6	3	20	39			217
MIKE O'LEARY	WDC3665	A	Anchorage	0	0	0	0	14	10	9	17	2	4			56
MINERAL BEIJING	ONAR	A	Anchorage	34	40	0	0	20	73	2	33	12	15			229
MINERAL BELGIUM	VRKF5	A	Anchorage	3	0	0	0	0	10	26	17	8	29			93
MINERAL DALIAN	ONFW	A	Anchorage	26	29	29	41	37	7	30	8	51	7			265
MINERAL DRAGON	ONFN	A	Anchorage	25	16	3	4	0	32	22	11	21	8			142
MINERAL FAITH	VRKS4	A	Anchorage	55	42	9	1	4	11	2	13	9	17			163
MINERAL KYOTO	ONFI	A	Anchorage	13	1	89	100	96	26	54	81	178	172			810
MINERAL NEW YORK	ONGI	A	Anchorage	0	14	26	4	8	37	21	4	17	24			155
MINERAL NINGBO	ONGA	A	Anchorage	73	0	0	0	25	39	28	6	0	0			171
MINERAL NOBLE	ONAN	A	Anchorage	0	0	0	0	0	0	0	0	0	3			3
MINERAL TIANJIN	ONBF	A	Anchorage	75	45	69	40	17	15	0	13	27	19			320
MOKIHANA	WNRD	A	Los Angeles	37	19	24	36	33	26	38	36	40	41			330
MOL PARADISE	9V3118	A	Anchorage	24	27	2	18	27	5	0	0	44	0			147
MORNING HARUKA	A8GK7	A	Anchorage	0	3	14	25	57	25	11	0	2	0			137
MSC POESIA	3EPL4	A	Miami	0	0	0	0	0	0	0	0	0	0			0
MUKADDES KALKAVAN	V7AP5	A	New York City	33	9	12	0	0	0	47	36	39	29			205
MV GEYSIR	WDF3296	A	Norfolk	17	0	12	0	0	0	0	47	61	58			196
NACHIK	WDE7904	A	Anchorage	0	0	0	2	1	0	1	5	2	2			13
NANCY FOSTER (AWS)	WTER	A	Charleston	0	0	75	498	421	464	307	327	293	509			2894
NANUQ	WDF2026	A	Anchorage	0	0	0	0	1	0	0	0	0	0			1
NATHANIEL B. PALMER (AWS)	WBP3210	A	Seattle	744	696	743	718	740	720	742	670	389	686			6848
NATIONAL GLORY	WDD4207	A	Houston	33	25	41	39	24	15	25	43	32	29			306
NAVIGATOR OF THE SEAS	C6FU4	A	Miami	2	1	18	16	30	12	8	19	12	5			123
NEPTUNE VOYAGER	C6FU7	A	New Orleans	11	32	29	0	33	42	49	10	4	0			210

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
NEVZAT KALKAVAN	TCMO2	A	New York City	19	0	44	10	7	77	58	51	17	28			311
NIEUW AMSTERDAM	PBWQ	A	Miami	131	131	166	137	125	138	169	80	142	128			1347
NOORDAM	PHET	A	Anchorage	313	129	236	260	173	123	140	251	194	45			1864
NORMAN O	WDC5066	A	Anchorage	0	0	0	0	0	0	0	7	0	0			7
NORTH STAR	KIYI	A	Seattle	12	5	21	10	20	33	23	5	16	25			170
NORTHERN VICTOR	WCZ6534	A	Anchorage	0	0	0	1	0	1	0	0	0	0			2
NORTHWEST SWAN	ZCDJ9	A	Anchorage	33	44	61	47	45	11	28	27	1	3			300
NORWEGIAN BREAKAWAY	C6ZJ3	A	New York City	48	71	48	9	0	0	68	52	29	3			328
NORWEGIAN DAWN	C6FT7	A	New Orleans	421	282	324	417	214	21	56	172	143	126			2176
NORWEGIAN ESCAPE	C6BR3	A	Miami	65	49	16	88	97	58	53	46	69	48			589
NORWEGIAN GEM	C6VG8	A	Jacksonville	43	27	69	204	239	116	52	86	150	173			1159
NORWEGIAN GETAWAY	C6ZJ4	A	Miami	11	14	69	54	69	26	61	76	86	100			566
NORWEGIAN JADE	C6WK7	A	Anchorage	101	116	131	133	87	222	168	105	150	369			1582
NORWEGIAN JEWEL	C6TX6	A	Jacksonville	81	56	37	16	25	105	218	229	96	149			1012
NORWEGIAN PEARL	C6VG7	A	Anchorage	331	219	457	536	429	439	498	584	568	509			4580
NORWEGIAN SKY	C6PZ8	A	Miami	48	35	28	78	70	55	49	153	62	31			609
NORWEGIAN SPIRIT	C6TQ6	A	Jacksonville	75	250	151	140	137	35	53	80	10	1			932
NORWEGIAN STAR	C6FR3	A	Anchorage	101	53	45	68	21	34	163	59	53	62			659
NORWEGIAN SUN	C6RN3	A	Miami	304	309	290	348	112	191	75	18	322	438			2407
NUNANIQ	WRC2049	A	Anchorage	0	0	0	0	3	0	0	1	1	3			5
NYK ARTEMIS	HOVU	A	Los Angeles	0	0	0	55	24	0	0	0	0	0			79
NYK RUMINA	9V7645	A	New York City	24	33	38	20	41	47	50	65	69	98			485
NYK TRITON	3FUL2	A	Los Angeles	35	51	58	47	60	0	7	13	16	6			293
OASIS OF THE SEAS	C6XS7	A	Miami	5	0	6	7	1	1	14	73	89	42			238
OCEAN CRESCENT	WDF4929	A	Houston	18	30	83	88	55	49	53	75	60	38			549
OCEAN EAGLE	WDG8082	A	Anchorage	3	1	0	0	0	0	0	0	0	1			5
OCEAN GIANT	WDG4379	A	Houston	76	94	46	52	2	39	11	1	11	26			358
OCEAN GRACIOUS	3EUP5	A	New Orleans	0	0	0	0	0	0	0	0	8	13			21
OCEAN MARINER	WCF3990	A	Anchorage	0	0	0	0	4	0	0	0	1	0			5
OCEAN NAVIGATOR	WSC2552	A	Anchorage	0	0	0	2	0	0	0	2	0	0			4
OCEAN RANGER	WAM7635	A	Anchorage	0	0	0	0	3	14	35	11	14	4			81
OCEANUS	WXAQ	A	Seattle	0	0	0	19	45	126	78	51	0	22			341
OKEANOS EXPLORER (AWS)	WTDH	A	New York City	167	359	616	544	290	596	312	580	194	0			3658
OLEANDER	V7SX3	A	New York City	25	38	31	34	31	30	32	28	28	32			309
OLIVE L. MOORE	WDF7019	A	Duluth	0	0	0	9	190	237	0	88	121	63			708
ONEGO CAPRI	V2ED7	A	New Orleans	0	0	0	0	0	0	0	39	40	17			96
OOCL AMERICA	VRWE8	A	Seattle	0	0	5	6	7	8	11	13	9	12			71
OOCL VANCOUVER	3EBG2	A	New York City	8	12	23	22	12	29	33	33	3	0			175
OOSTERDAM	PBKH	A	Anchorage	90	197	126	40	98	69	124	206	254	139			1343
ORANGE BLOSSOM 2	D5DS3	A	New York City	0	0	0	50	45	33	39	25	24	21			237
ORANGE OCEAN	D5DS2	A	New York City	12	5	12	22	0	0	0	22	44	85			202
ORANGE SKY	ELZU2	A	New York City	4	15	13	52	42	83	49	52	58	43			411
ORANGE STAR	A8WP6	A	New York City	0	0	28	23	14	4	3	0	0	0			72
ORANGE SUN	A8HY8	A	New York City	36	4	45	16	57	56	32	25	30	29			330
ORANGE WAVE	ELPX7	A	New York City	5	68	26	41	1	0	0	13	9	46			209

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ORE ITALIA	9V9129	A	Anchorage	93	213	351	303	313	136	131	556	452	107			2655
OREGON II (AWS)	WTDO	A	New Orleans	0	0	117	4	23	141	23	0	412	338			1058
OREGON VOYAGER	WDF2960	A	San Francisco	0	1	0	0	0	0	0	1	0	0			2
ORIENTAL QUEEN	VRAC9	A	Anchorage	0	0	0	0	0	4	51	42	85	48			230
OSCAR DYSON (AWS)	WTEP	A	Anchorage	98	413	529	648	575	623	576	615	568	303			4948
OSCAR ELTON SETTE (AWS)	WTEE	A	Honolulu	7	400	546	586	507	237	632	497	344	217			3973
OURO DO BRASIL	ELPP9	A	Baltimore	47	36	0	0	3	5	15	54	41	44			245
OVERSEAS ANACORTES	KCHV	A	Miami	10	21	17	12	17	26	38	27	8	8			184
OVERSEAS BOSTON	WJBU	A	Anchorage	38	56	7	10	9	43	42	65	14	6			290
OVERSEAS CASCADE	WOAG	A	Miami	15	7	1	16	23	7	17	1	1	30			118
OVERSEAS CHINOOK	WNFQ	A	Houston	84	83	61	51	81	86	107	51	34	86			724
OVERSEAS HOUSTON	WWAA	A	Miami	0	2	3	0	0	0	7	58	95	139			304
OVERSEAS LONG BEACH	WAAT	A	Jacksonville	2	17	41	16	12	1	0	5	6	24			124
OVERSEAS LOS ANGELES	WABS	A	Seattle	42	45	73	30	65	51	40	36	23	4			409
OVERSEAS MARTINEZ	WPAJ	A	Anchorage	3	21	17	18	15	16	10	24	3	8			135
OVERSEAS NIKISKI	WDBH	A	Anchorage	26	12	8	31	43	42	2	6	41	19			230
OVERSEAS SANTORINI	WOSI	A	Houston	29	38	27	21	29	9	7	27	18	12			217
OVERSEAS TAMPA	WOTA	A	Baltimore	4	0	2	14	6	3	22	1	1	19			72
OVERSEAS TEXAS CITY	WHED	A	Houston	10	40	12	6	38	90	6	13	16	20			215
PACIFIC FREEDOM	WDD3686	A	Anchorage	1	0	0	0	33	36	2	2	7	0			81
PACIFIC JOURNEY	3FFE	A	New Orleans	0	0	0	0	1	1	0	0	0	0			2
PACIFIC RAVEN	WDD9283	A	Anchorage	0	0	0	0	2	0	1	5	11	5			24
PACIFIC SANTA ANA	A8W13	A	Houston	0	0	0	4	18	19	16	27	24	24			132
PACIFIC SHARAV	D5DY4	A	Houston	9	16	12	27	31	29	25	30	26	30			235
PACIFIC STAR	WDD3686	A	Anchorage	0	0	0	0	0	0	0	0	0	1			1
PACIFIC WARRIOR	WCZ5243	A	Anchorage	0	0	0	0	0	0	0	1	0	0			1
PACIFIC WOLF	WDD9286	A	Anchorage	0	1	1	1	1	0	0	1	5	2			12
PANDALUS	WAV7611	A	Anchorage	0	0	0	0	1	0	0	9	0	0			10
PARAGON	WDD9285	A	Anchorage	0	0	0	0	1	1	3	7	27	13			52
PARAMOUNT HALIFAX	2CWC2	A	Houston	0	0	0	0	0	2	22	16	13	11			64
PARAMOUNT HAMILTON	2CWB2	A	Houston	0	0	0	0	0	0	0	0	65	37			102
PATRIARCH	WBN3014	A	Jacksonville	0	0	0	7	0	0	0	9	0	0			16
PATRIOT	WAIU	A	Charleston	81	46	39	13	42	9	51	22	48	55			406
PAUL GAUGUIN	C6TH9	A	Anchorage	52	0	2	7	1	0	0	6	7	2			77
PAUL R. TREGURTHA	WYR4481	A	Duluth	302	0	160	639	593	515	711	719	653	717			5009
PERLA DEL CARIBE	KPDL	A	Jacksonville	0	0	43	62	62	62	52	51	50	59			441
PERSEVERANCE	WDE5328	A	Anchorage	1	1	1	2	0	0	0	3	0	0			8
PHILADELPHIA EXPRESS	WDC6736	A	Houston	104	113	91	40	130	140	122	132	88	42			1002
PHILIP R CLARKE	WDH7554	A	Duluth	17	0	12	51	87	40	61	58	31	23			380
PISCES (AWS)	WTDL	A	New Orleans	0	0	1	193	99	414	490	413	238	99			1947
POLAR ADVENTURE	WAZV	A	Seattle	45	22	3	2	9	21	10	15	21	11			159
POLAR CLOUD	WDF5296	A	Anchorage	0	0	0	0	0	1	0	4	0	0			5
POLAR DISCOVERY	WACW	A	Seattle	48	42	34	47	48	62	48	48	33	6			416
POLAR ENDEAVOUR	WCAJ	A	Seattle	73	14	14	17	39	29	6	12	27	36			267
POLAR ENDURANCE	WDG2085	A	Anchorage	0	0	0	4	3	1	4	5	0	0			26

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
POLAR ENTERPRISE	WRTF	A	Seattle	30	31	35	40	6	0	0	0	28	10			180
POLAR RANGER	WDC8652	A	Anchorage	0	0	0	2	8	14	10	1	0	0			35
POLAR RESOLUTION	WDJK	A	Seattle	14	54	44	19	48	26	5	4	28	41			283
POLAR STORM	WDE8347	A	Anchorage	0	2	3	1	1	0	0	7	0	0			14
POLAR VIKING	WDD6494	A	Anchorage	0	0	8	0	0	0	1	2	7	17			35
PREMIUM DO BRASIL	A8BL4	A	Baltimore	26	20	60	46	28	38	13	13	1	13			258
PRESQUE ISLE	WDH7560	A	Duluth	0	0	8	39	88	107	75	87	52	51			507
PRIDE OF AMERICA	WNBE	A	Anchorage	0	0	0	0	1	0	0	0	0	0			1
PRIDE OF BALTIMORE II	WUW2120	A	Baltimore	0	0	0	0	14	39	24	18	15	0			110
PRINSENDAM	PBGH	A	Miami	54	41	53	34	33	11	24	11	21	150			432
PRT DREAM	3EXT	A	New Orleans	0	0	0	0	0	7	6	2	0	1			16
PSU EIGHTH	9V6346	A	Anchorage	48	30	39	14	2	0	4	12	37	37			223
QUANTUM OF THE SEAS	C6BH8	A	New York City	0	0	0	0	0	0	0	24	41	60			125
R. J. PFEIFFER	WRJP	A	Los Angeles	25	30	40	30	8	0	0	56	37	49			275
R/V KIYI	KAO107	A	Duluth	0	0	0	0	6	45	29	13	46	0			139
RADIANCE OF THE SEAS	C6SE7	A	Anchorage	0	0	0	0	2	1	0	22	26	32			83
RAINIER (AWS)	WTEF	A	Seattle	50	0	0	0	138	127	35	0	94	95			539
REBECCA LYNN	WCW7977	A	Duluth	0	0	0	0	0	0	1	0	2	1			4
REDOUBT	WDD2451	A	Anchorage	2	0	0	0	31	0	0	12	64	31			140
REGATTA	V7DM3	A	Seattle	114	39	29	60	24	60	42	6	0	0			374
RESOLVE	WCZ5535	A	Baltimore	46	22	19	0	0	0	34	10	36	20			187
REUBEN LASKER (AWS)	WTEG	A	Seattle	568	0	206	512	564	230	601	466	359	409			3915
RHAPSODY OF THE SEAS	C6UA2	A	Anchorage	11	0	8	24	1	0	4	22	63	48			181
ROBERT C. SEAMANS	WDA4486	A	Anchorage	0	0	0	9	7	18	0	0	0	0			34
ROBERT GORDON SPROUL (AWS)	WSQ2674	A	Los Angeles	743	696	682	240	737	720	680	731	472	743			6444
ROBERT BLOUGH	WDH7559	A	Duluth	0	0	82	346	324	66	0	33	51	104			1006
ROGER REVELLE (AWS)	KAOU	A	Los Angeles	591	696	736	714	732	718	742	659	715	705			7008
RONALD H. BROWN (AWS)	WTEC	A	Charleston	499	503	438	584	565	322	287	0	0	152			3350
RONALD N	A8PQ3	A	Anchorage	135	62	25	9	68	47	6	1	0	21			374
RTM DHAMBUL	9V2783	A	Anchorage	0	3	0	0	1	12	11	2	0	0			29
RUFF & REDDY	WY4096	A	Anchorage	0	0	0	0	0	0	1	0	0	0			1
S/R AMERICAN PROGRESS	KAWM	A	Miami	0	1	3	9	12	1	0	0	0	0			26
SAGA ADVENTURE	VRBL4	A	Anchorage	0	0	0	0	2	23	30	17	93	26			191
SAGA ANDORINHA	VRMV6	A	Anchorage	28	30	36	1	2	11	10	1	0	0			119
SAGA CREST	VRWR7	A	Anchorage	0	35	5	0	0	0	0	120	6	0			166
SAGA DISCOVERY	VRBR8	A	Seattle	0	32	12	53	2	21	2	0	18	13			153
0SAGA FRONTIER	VRCP2	A	Anchorage	0	0	24	41	125	3	3	0	0	0			196
SAGA FUTURE	VRKX8	A	Anchorage	0	29	45	64	0	0	21	54	14	33			260
SAGA MONAL	VRZQ9	A	Anchorage	0	0	40	196	13	0	0	0	0	0			249
SAGA NAVIGATOR	VRDA4	A	Anchorage	0	0	3	5	46	74	68	49	6	31			282
SAGA PIONEER	VRED4	A	Anchorage	0	0	0	0	0	0	15	102	25	7			149
SAGA SPRAY	VRWW5	A	Anchorage	24	149	449	591	254	703	683	260	134	167			3414
SAGA TUCANO	VRVP2	A	Anchorage	208	82	419	369	558	217	150	150	107	132			2392
SAGA VIKING	VRXO6	A	Anchorage	39	27	14	58	3	0	0	0	0	0			141
SAGA WIND	VRUR7	A	Anchorage	0	0	0	0	0	0	2	1	13	0			16

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SAIPEM 7000	C6NO5	A	Anchorage	0	0	0	0	0	0	0	13	0	0			13
SAKURA OCEAN	3FRC8	A	New Orleans	0	0	0	0	15	26	4	0	0	0			45
SAM LAUD	WZC7602	A	Duluth	63	0	0	82	105	78	48	69	64	55			564
SAMSON MARINER	WCN3586	A	Anchorage	1	0	1	1	1	0	1	1	4	0			11
SAMUEL DE CHAMPLAIN	WDC8307	A	Duluth	5	0	17	16	28	20	10	6	49	26			177
SAN SABA	V7UT8	A	Anchorage	19	19	19	13	4	0	13	3	0	0			90
SANDRA FOSS	WYL4908	A	Anchorage	0	0	0	0	0	1	0	12	0	1			14
SAVITA NAREE	9V5030	A	New Orleans	0	0	0	0	0	0	0	0	1	0			1
SEA VOYAGER	WCX9106	A	Anchorage	0	1	26	35	30	10	29	19	16	22			188
SEA-LAND CHARGER	9V3589	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
SEA-LAND COMET	9V3292	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
SEA-LAND INTREPID	9V3293	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
SEA-LAND LIGHTNING	9V3291	A	New York City	33	26	4	15	16	43	77	66	58	21			359
SEABOURN QUEST	C6YZ5	A	Miami	34	21	24	8	1	1	0	19	17	16			141
SEABULK ARCTIC	WCY7054	A	Miami	55	13	9	6	28	48	30	7	5	23			224
SEABULK TRADER	KNJK	A	Miami	47	22	34	40	34	39	38	63	33	29			379
SEAFREEZE AMERICA	WDH8281	A	Anchorage	0	0	0	0	0	0	7	25	23	17			72
SEASPAN CHIWAN	VRBH3	A	Anchorage	24	0	8	0	2	31	0	0	0	0			65
SEASPAN FELIXSTOWE	VRBH8	A	Seattle	22	34	11	25	1	31	57	16	33	16			246
SEASPAN SAIGON	VRBT7	A	New York City	8	0	0	12	53	35	30	23	2	3			166
SEOUL TRADER	9HA3782	A	Los Angeles	0	0	0	0	0	0	0	0	0	0			0
SERENADE OF THE SEAS	C6FV8	A	Miami	0	0	0	0	0	0	0	11	26	36			73
SESOK	WDE7899	A	Anchorage	0	0	0	0	1	0	1	12	3	4			21
SEVEN SEAS MARINER	C6VV8	A	Jacksonville	469	292	241	206	341	483	629	188	517	612			3978
SEVEN SEAS NAVIGATOR	C6ZI9	A	Miami	526	450	417	133	111	0	223	105	0	171			2136
SEVEN SEAS VOYAGER	C6SW3	A	Anchorage	2	117	238	124	49	137	318	330	36	9			1360
SHANDONG DA CHENG	9V9131	A	Anchorage	56	43	12	60	72	49	408	620	364	458			2142
SHANDONG DA DE	9V9128	A	Anchorage	8	147	291	147	128	174	107	162	130	89			1383
SIANGTAN	9V9832	A	Seattle	59	5	14	4	35	12	69	45	47	39			329
SIGAS SILVIA	S6ES6	A	Anchorage	466	584	559	399	526	538	419	433	498	316			4738
SIKU	WCQ6174	A	Anchorage	0	0	0	65	136	49	21	144	208	125			748
SIKULIAQ (AWS)	WDG7520	A	Anchorage	0	51	102	408	727	661	696	682	705	742			4774
SILVER DISCOVERER	C6OZ3	A	Anchorage	0	0	0	0	0	0	17	17	0	0			34
SILVER SHADOW	C6FN6	A	Anchorage	0	0	0	0	0	0	1	6	2	0			9
SKYWALKER	D5IB9	A	New Orleans	0	0	0	24	59	18	16	48	38	0			203
SNOHOMISH	WDB9022	A	Anchorage	0	0	0	0	0	0	0	2	4	0			6
SOL DO BRASIL	ELQQ4	A	Baltimore	32	45	17	40	14	29	24	25	40	31			297
SOMBEKE	ONHD	A	Houston	0	0	17	75	138	126	94	103	105	35			693
SPAR	NJAR	A	Anchorage	0	2	0	0	0	1	0	0	0	0			3
SPICA	A8QJ5	A	New Orleans	28	34	28	33	34	40	59	41	45	35			377
SS MAUI	WSLH	A	Seattle	60	49	47	1	3	0	0	0	0	0			160
ST LOUIS EXPRESS	WDD3825	A	Houston	104	42	191	102	86	44	45	106	52	70			842
STACEY FOSS	WYL4909	A	Anchorage	0	0	0	0	0	0	0	1	6	40			47
STAR HERDLA	LAVD4	A	New Orleans	0	8	17	0	29	11	0	27	20	9			121
STAR ISFJORD	LAOX5	A	New Orleans	0	16	22	2	13	8	0	0	0	0			61

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
STAR ISMENE	LANT5	A	Baltimore	35	13	36	7	5	11	0	0	0	0			107
STAR ISTIND	LAMP5	A	Seattle	20	0	13	20	4	29	34	15	23	4			162
STAR JAPAN	LAZV5	A	Seattle	0	80	0	29	0	0	0	0	37	0			146
STAR JUVENTAS	LAZU5	A	Baltimore	1	14	0	0	41	0	15	12	0	26			109
STAR KILIMANJARO	LAIG7	A	Anchorage	0	0	0	0	0	0	0	0	0	80			80
STAR KINN	LAJF7	A	Anchorage	0	0	0	0	0	0	0	0	0	2			2
STAR KIRKENES	LAHR7	A	New Orleans	3	4	27	10	11	60	22	2	0	0			139
STAR KVARVEN	LAJK7	A	Seattle	19	37	13	27	5	0	17	5	3	10			136
STAR LIMA	LAPE7	A	Jacksonville	3	0	15	16	18	0	26	3	36	50			167
STAR LINDESNES	LAQJ7	A	Jacksonville	28	28	1	1	5	3	0	0	8	5			79
STAR MINERVA	V7GR8	A	Jacksonville	0	0	0	0	0	0	0	82	7	32			121
STATE OF MAINE	WCAH	A	New York City	0	0	0	0	66	27	22	0	0	0			115
STELLAR VOYAGER	C6FV4	A	Seattle	0	0	1	16	19	30	7	49	32	49			203
STEWART J. CORT	WDC6055	A	Duluth	347	0	115	707	740	719	658	711	561	665			5223
STIKINE	WDC8583	A	Anchorage	0	0	0	1	1	0	0	0	0	0			2
SUNSHINE STATE	WDE4432	A	Miami	0	0	11	26	29	10	20	23	8	5			132
SUPERSTAR GEMINI	C6LG5	A	Anchorage	0	0	0	0	0	0	0	0	1	29			30
SUPERSTAR LIBRA	C6DM2	A	Anchorage	120	105	118	116	118	118	138	118	116	119			1186
SYLVIE	VRCQ2	A	Anchorage	41	22	15	7	9	8	1	0	0	0			103
TAKU	WI9491	A	Anchorage	0	0	0	0	1	0	0	0	0	0			1
TALISMAN	LAOW5	A	Jacksonville	0	0	19	35	21	2	37	43	54	23			234
TANGGUH HIRI	C6XC2	A	Anchorage	90	125	54	115	134	134	143	111	110	94			1110
THOMAS JEFFERSON (AWS)	WTEA	A	Norfolk	0	7	19	0	0	0	0	0	27	275			328
THUNDER BAY	CFN6288	A	Duluth	0	0	0	0	0	0	0	15	1	0			16
TIGLAX	WZ3423	A	Anchorage	0	0	0	0	0	0	0	5	4	0			9
TIM S. DOOL	VGPY	A	Duluth	0	0	0	13	23	21	4	19	19	10			109
TRIUMPH	WDC9555	A	Anchorage	0	0	0	0	2	1	2	7	9	0			21
TROPIC CARIB	J8PE3	A	Miami	61	54	60	78	81	92	105	39	5	69			644
TROPIC EXPRESS	J8QB8	A	Miami	42	50	37	39	48	97	85	119	90	61			668
TROPIC JADE	J8NY	A	Miami	104	62	60	54	59	74	72	76	72	89			722
TROPIC LURE	J8PD	A	Miami	42	31	40	46	51	47	36	51	65	112			521
TROPIC MIST	J8NZ	A	Miami	13	22	31	37	46	52	73	86	108	76			544
TROPIC NIGHT	J8NX	A	Miami	35	38	73	102	95	38	24	15	11	4			435
TROPIC OPAL	J8NW	A	Miami	108	98	102	66	38	39	63	87	103	122			826
TROPIC PALM	J8PB	A	Miami	29	26	24	70	78	83	94	119	124	72			719
TROPIC SUN	J8AZ2	A	Miami	92	51	66	70	62	83	99	105	137	132			897
TROPIC TIDE	J8AZ3	A	Miami	86	92	98	92	50	77	62	12	24	8			601
TROPIC UNITY	J8PE4	A	Miami	84	51	54	115	73	26	31	50	85	100			669
TUG DEFIANCE	WDG2047	A	Duluth	18	0	1	12	38	46	48	60	86	27			336
TUG DOROTHY ANN	WDE8761	A	Duluth	231	33	141	656	533	720	742	741	652	739			5188
TUG MICHIGAN	WDF5344	A	Duluth	17	0	0	0	0	1	10	29	18	12			87
TUG SPARTAN	WDF5483	A	Duluth	0	0	0	19	18	20	19	16	23	11			126
TUSTUMENA	WNGW	A	Anchorage	58	11	8	0	32	37	8	1	1	7			163
TYCO DECISIVE	V7DI7	A	Baltimore	59	28	4	30	9	60	0	0	27	8			225
TYCO RESPONDER	V7CY9	A	Baltimore	39	7	2	0	1	42	69	41	19	0			220

SHIP NAME	CALL	Status	PMO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
U. S. INTREPID	WDE2670	A	Anchorage	0	0	0	0	0	0	0	0	1	2			3
UNIQUE GUARDIAN	VRJM6	A	New Orleans	22	31	10	41	4	2	0	0	0	0			110
USCGC HEALY	NEPP	A	Seattle	0	0	0	0	15	34	77	86	73	32			317
USCGC HEALY (AWS)	NWS0003	A	Seattle	0	0	0	0	0	337	177	0	0	0			514
USCGC MACKINAW	NBGB	A	Duluth	7	2	6	11	5	2	2	0	9	0			44
VALDEZ RESEARCH (AWS)	WXJ63	A	Anchorage	703	684	708	629	721	720	740	736	717	723			7081
VEENDAM	PHEO	A	Miami	213	146	187	69	53	169	78	64	139	269			1387
VENEZIA	VRDI6		Anchorage	25	8	39	21	26	31	20	30	11	40			251
VISION OF THE SEAS	C6SE8	A	Miami	0	0	3	0	0	0	1	16	20	0			30
VOLENDAM	PCHM	A	Anchorage	221	105	180	237	338	386	257	251	287	223			2487
W. H. BLOUNT	C6JT8	A	New Orleans	41	34	18	57	41	24	63	44	41	46			408
WALTER J. MCCARTHY JR.	WXU3434	A	Duluth	0	0	0	81	106	17	45	55	28	39			371
WASHINGTON EXPRESS	WDD3826	A	Houston	64	92	62	10	26	89	57	12	28	36			476
WENDY O.	WDF8784	A	Anchorage	0	0	0	0	0	0	0	0	0	4			4
WESTERDAM	PINX	A	Miami	169	172	101	324	147	75	51	51	135	82			1307
WESTERN RANGER	WBN3008	A	Anchorage	0	0	0	0	1	0	0	0	0	0			1
WESTWOOD COLUMBIA	C6SI4	A	Seattle	23	27	53	34	61	22	20	8	17	12			277
WESTWOOD OLYMPIA	C6UB2	A	Seattle	21	26	26	27	21	21	14	12	17	8			193
WESTWOOD RAINIER	C6SI3	A	Seattle	13	8	34	42	36	46	35	33	27	35			309
WHITTIER RESEARCH (AWS)	KXI29	A	Anchorage	744	684	739	717	737	720	741	739	719	726			7266
WILFRED SYKES	WC5932	A	Duluth	309	0	0	665	740	677	561	642	568	704			4866
XPEDITION	HC2083	A	Anchorage	0	8	29	20	27	14	23	11	25	6			163
YM ANTWERP	VRET5	A	Anchorage	10	23	0	8	6	47	77	51	20	11			253
YORKTOWN EXPRESS	WDD6127	A	Houston	54	35	32	47	32	29	28	35	47	28			367
YUHSAN	H9TE	A	Anchorage	1	0	0	0	0	0	0	0	0	81			82
ZAANDAM	PDAN	A	Anchorage	553	466	271	459	515	387	292	150	107	311			3511
ZIM SAN DIEGO	A8SI7	A	New York City	0	0	0	0	0	0	0	16	92	0			108
ZIM SHANGHAI	VRGA6	A	New York City	17	30	27	19	31	16	29	24	26	22			241
ZIM SHEKOU	A8KX2	A	Baltimore	0	42	36	8	17	1	2	0	0	0			106
ZUIDERDAM	PBIG	A	Anchorage	78	13	62	170	103	80	8	40	88	25			667

Points of Contact

U.S. Port Meteorological Officers

HEADQUARTERS

Louis Quinones
Voluntary Observing Ship Program Manager
1325 East West Highway
Building SSMC2
Silver Spring, MD 20910
Tel: 228-688-1457
Fax: 228-688-3923
Cell: 228-327-3210

Paula Rychtar
Voluntary Observing Ship Deputy Program Manager/Operations
Mailing adress:
National Data Buoy Center
Building 3203, Room 324
Stennis Space Center, MS 39529-6000
Tel: 228-688-1457
Fax: 228-688-3923
Cell: 228-327-3210

ATLANTIC PORTS

David Dellinger, PMO Miami, Florida
National Weather Service, NOAA
2550 Eisenhower Blvd
Suite 312
Port Everglades, FL 33316
Tel: 954-463-4271
Cell: 954-295-2084
Fax: 305-229-4553
pmomia@noaa.gov

Robert Niemeyer, PMO Jacksonville, Florida
National Weather Service, NOAA
13701 Fang Road
Jacksonville, FL 32218-7933
Tel: (904) 741-5186, ext.117
Fax: 904-741-0078
pmojax@noaa.gov

Tim Kenefick, PMO Charleston, South Carolina
NOAA Coastal Services Center
2234 South Hobson Avenue
Charleston, SC 29405-2413
Tel: 843-709-0102
Fax: 843-740-1224
pmochs@noaa.gov

Peter Gibino, PMO Norfolk, Virginia
National Weather Service, NOAA
104 Hemlock Court
Yorktown, VA 23693-4544
Tel: 757-617-0897
pmonor@noaa.gov

Lori Evans, PMO Baltimore, Maryland
National Weather Service, NOAA
P. O. Box 3667
Frederick, MD 21705-3667
For UPS / FEDEX delivery:
5838 Shookstown, Road
Frederick, MD 21702
Tel: 443-642-0760
Fax: 410-633-4713
pmobal@noaa.gov

Jim Luciani, PMO New York, New York
New York / New Jersey
National Weather Service, NOAA
110 Main St., Suite 201
South Amboy NJ 08879
Tel: 908-217-3477
Fax: 732-316-7643
pmonyc@noaa.gov

GREAT LAKES PORTS

Ron Williams, PMO Duluth, Minnesota
National Weather Service, NOAA
5027 Miller Trunk Highway
Duluth, MN 55811-1442
Tel 218-729-0651
Fax 218-729-0690
pmoglakes@noaa.gov

GULF OF MEXICO PORTS

Rusty Albaral
PMO New Orleans, Louisiana
62300 Airport Rd.
Slidell, LA 70460-5243
Tel: 985-649-0469
Cell: 504-289-2294
Fax: 985-649-2907
pmomsy@noaa.gov

Chris Fakes, PMO
National Weather Service, NOAA
1353 FM646, Suite 202
Dickinson, TX 77539
Tel: 281-534-2640 Ext. 277
Fax: 281-534-4308
pmohou@noaa.gov

PACIFIC PORTS

Derek LeeLoy, PMO Honolulu, Hawaii
Ocean Services Program Coordinator
National Weather Service Pacific Region HQ
1845 Wasp Blvd., Bldg. 176
Honolulu, HI 96818
Tel: 808-725-6016
Fax: 808-725-6005
pmohon@noaa.gov

Timothy Harris, PMO Los Angeles, California
National Weather Service, NOAA
501 West Ocean Blvd., Room 4480
Long Beach, CA 90802-4213
Tel: 562-980-4090
Fax: 562-436-1550
pmolax@noaa.gov

VACANT
PMO Oakland/San Francisco, California
National Weather Service, NOAA
1301 Clay Street, Suite 1190N
Oakland, CA 94612-5217
Tel: 510-637-2960
Fax: 510-637-2961
pmooak@noaa.gov

Matt Thompson, PMO Seattle, Washington
National Weather Service, NOAA
7600 Sand Point Way, N.E.,
BIN C15700
Seattle, WA 98115-6349
Tel: 206-526-6100
Fax: 206-526-6904
pmosea@noaa.gov

ALASKA AREA PORT

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

U.S. Coast Guard AMVER Center

Ben Strong
AMVER Maritime Relations Officer,
United States Coast Guard
Battery Park Building
New York, NY 10004
Tel: 212-668-7762
Fax: 212-668-7684

AOML SEAS PROGRAM MANAGER

Dr. Gustavo Goni
AOML
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4339
Fax: 305-361-4412

DRIFTER PROGRAM MANAGER

Dr. Rick Lumpkin
AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4513
Fax: 305-361-4412

ARGO PROGRAM MANAGER

Dr. Claudia Schmid
AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4313
Fax: 305-361-4412

GLOBAL DRIFTER PROGRAM

Shaun Dolk
AOML/PHOD
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4546
Fax: 305-361-4366

NORTHEAST ATLANTIC SEAS REP.

Jim Farrington
SEAS Logistics/AMC
439 West York Street
Norfolk, VA 23510
Tel: 757-441-3062
Fax: 757-441-6495

SOUTHEAST ATLANTIC SEAS REP.

Francis Bringas
AOML/GOOS Center
4301 Rickenbacker Causeway
Miami, FL 33149-1026
Tel: 305-361-4316
Fax: 305-361-4412

Other Port Meteorological Officers

ARGENTINA

Ricardo Pedraza
Jefe del Dto. Redes
Servicio Meteorlógico Nacional
25 de Mayo 658
C1002 ABN Buenos Aires
Argentina
Tel: +54-11 4514 1525
Fax: +54-11 4514 1525

AUSTRALIA

Head Office

Joel Cabrie, Technical Officer
Marine Operations Group
Bureau of Meteorology
GPO Box 1289
Melbourne, VIC 3001, Australia
Tel: +61-3 9669 4203
Fax: +61 3 9669 4168
PMO Group email: portmetagents@bom.gov.au

Fremantle

Craig Foster, PMO
Bureau of Meteorology
Port Meteorological Officer Fremantle
PO Box 1370
Perth, WA 6872, Australia
Tel: +61-8 9263 2292
Fax: +61 8 9263 2297
PMO Group email: portmetagents@bom.gov.au

Sydney

Michael Funnell, PMO
Bureau of Meteorology
Port Meteorological Officer, Sydney
Bureau of Meteorology
GPO Box 413
Darlinghurst, NSW
1300, Australia
Tel: +61 2 9296 1553
Fax: +61 2 9296 1648
PMO Group email: portmetagents@bom.gov.au

BRAZIL

Walid Maia PINTO SILVA E SEBA
Head of Meteo-oceanographic
Predictions Division
Brazilian Navy Hydrographic Center,
Directorate of Hydrography and
Navigation
PMO: Niterói - Rio de Janeiro

CANADA

Canadian Headquarters

Gerie Lynn Lavigne, Life Cycle Manager
Marine Networks, Environment Canada
Surface Weather, Climate and Marine Networks
4905 Dufferin Street
Toronto, Ontario
Canada M3H 5T4
Tel: +1-416 739 4561
Fax: +1-416 739 4261

British Columbia

Bruce Lohnes, Monitoring Manager
Environment Canada
Meteorological Service of Canada
140-13160 Vanier Place
Richmond, British Columbia V6V 2J2
Canada
Tel: +1-604-664-9188
Fax: +1604-664-4094

Edmonton

Ben Lemon, PMO
Environment Canada
Office 9345-49 Street
Edmonton, Alberta
T6B 2L8
Canada
Tel: +1-780-495-6442

Newfoundland

Andre Dwyer, PMO
Environment Canada
6 Bruce Street
Mount Pearl, Newfoundland A1N 4T3
Canada
Tel: +1-709-772-4798 Cell: 709-689-5787
Fax: +1 709-772-5097

Manitoba

Ted Gresiuk, Supervisor, A.E. Programs
Environment Canada
Meteorological Service of Canada
123 Main Street, Suite 150
Dartmouth, Nova Scotia
Winnipeg R3C 4W2, Manitoba
Canada
Tel: (204) 984-3477
Fax: (204) 984-2072

Nova Scotia

Martin MacLellan
A/Superintendent Port Meteorology & Data
Buoy Program
Meteorological Service of Canada 16th Floor
45 Aldernay Drive
Dartmouth, Nova Scotia
B2Y 2N6
Canada
Tel: (902) 426-6616
Fax: (902) 426-6404

Ontario

Shawn Ricker, PMO
Environment Canada
Meteorological Service of Canada
North Annex CCIW
867 Lakeshore Road
Burlington ON L7S 1A1 Canada
Tel: +1-905 512 5862

Quebec

Erich Gola, PMO
Meteorological Service of Canada
Quebec Region
Service météorologique du Canada
Environnement Canada
800 rue de la Gauchetière Ouest, bureau 7810
Montréal (Québec)
H5A 1L9
Canada
Tel: +1-514 283-1644

CHILE

Iquique

Lt Carlos Gaete
Iquique Maritime Governature
Meteorological Center
Tel: 56-57-2401971 / 2401946
Iquique
Chile

Magallanes

Lt Jose Melgarejo
Punta Arenas Maritime Governature
Meteorological Center
Avda. Bernardo O´Higgins N°1169
Punta Arenas
Chile
Tel:56-61-203148 / 203149

Puerto Montt

Merle Donoso
Magister in Sciences of Environmental
Centro Meteorologico (P.) Gobernacion
Maritima de Puerto Montt Avenida Angelmo
N°2201
Puerto Montt
Chile
Tel: 56-65-561-174
Fax: 56-65-561-196

Talcahuano

Sebastian Morales
Magister in Sciences of Environmental
Centro Meteorologico (T.) Gobernacion
Maritima de Talcahuano Avenida Almirante
Villarroel N°107
Talcahuano
Chile
Tel: 56-41-226-7136
Fax: 56-41-226-7196

Valparaiso

Sebastian Morales
Head of Iquique Meteorological Center
Head of Valparaiso Meteorological Center
Centro Meteorologico (V.) Gobernacion
Maritima de Valparaíso Leopoldo Carvallo 150,
Playa Ancha
Valparaiso
Chile
Tel: 56-32-2208-947 / Fax: 56-32-2208-914

CHINA

YU Zhaoguo
Shanghai Meteorological Bureau
166 Puxi Road
Shanghai, China

CROATIA

Port of Split

Captain Zeljko Sore, Captain
Ružica Popovic, B.C.E.
Marine Meteorological Office-Split
Glagoljaska 11
HR-21000 Split
Croatia
Tel: +385 21 401 371
Fax: +385 21 401 370 (24 hours)

Capt Zeljko Sore
Glagoljaša 11
21 000 Split
Croatia
sore@cirus.dhz.hr
Tel: +385 21 401 371

DENMARK

Cmdr Roi Jespersen, PMO
Cmdr Harald R. Joensen, PMO
Danish Meteorological Inst., Observation Dept
Surface and Upper Air Observations Division
Lyngbyvej 100,DK-2100
Copenhagen,Denmark
Tel: +45 3915 7337
Fax: +45 3915 7390

ECUADOR

Carlos VITERI
Jefe de Estación
Instituto Oceanográfico de la Armada del Ecuador
Tel: 593 042 2481300 ext 1202

FALKLANDS

Captain R. Gorbutt, Marine Officer
Fishery Protection Office
Port Stanley
Falklands
Tel: +500 27260
Fax: +500 27265

FINLAND

Marja Aarnio-Frisk
Finnish Meteorological Institute
P.O. Box 503, FI00101, Helsinki
Street: Erik Palménin aukio, FI-00560 Helsinki
Helsinki, Finland
Tel: +358 295391000
Fax: +358 295393303

FRANCE

Headquarters

Jean-Baptiste Cohuet
VOS focal point and E-SURFMAR
VOS Coordinator,
Météo France
42, avenue Gaspard Coriolis
F-31057 Toulouse Cedex, France
Tel: +33-5 61 07 98 54
Fax: +33-5 61 07 98 69

E-Surfmar

Pierre Blouch
E-Surfmar Svc Manager Météo France
Centre de Météorologie Marine
13 rue du Chatellier – CS 12804 29228 BREST CEDEX 2
France
Tel: +33 (0)256 31 2665

Boulogne-sur-mer

Gérard Doligez, Station Météorologique
Météo-France DDM62
17, boulevard Sainte-Beuve
62200 Boulogne-Sur-Mer
France
Tel: +33-3 21 10 85 10
Fax: +33-2 21 33 33 12

Britanny- Brest, Lorient, St Malo, Roscoff

Bruno Maze, Station Météorologique
Aéroport - B.P. 54
29490 GUIPAVAS
France
Tel: +33-2 98 44 60 21
Fax: +33-2 98 44 60 21

La Réunion

Jean-Luc Dekussche, Station Météorologique
Météo-France DIRRE
50, Sainte Clotilde CEDEX
97491, Reunion
Tel: 00 33 2 62 92 11 30
Fax: 00 33 2 62 92 11 47

Le Havre – Rouen

Fabien Debray, Station Météorologique
Nouveau Sémaphore
Quai des Abeilles
76600 Le Havre
France
Tel: +33-2 32 74 03 65
Fax: +33 2 32 74 03 61

Marseille, Fos sur Mer, Toulon, La Seyne sur Mer

Michel Perini, PMO
Météo-France / DIR Sud-Est
OBS/RESEAU – Bureau de port
2 Bd Château-Double
Aix en Provence Cédex 02 DIR
Sud-Est
France
Tel: +00 33 4 42 95 90 15
Fax: +00 33 4 42 95 90 19

Bordeaux - Royan

Philippe Gautier
Météo-France
Direction Inter Régionale Sud-Ouest
7, avenue Roland-Garros
33692 MERIGNAC CEDEX
France
Tel: 00 33 5 57 29 12 06

French Polynesia

Ms Victoire Laurent, Météo France
Météo-France DIR Polynésie
Française
BP 6005
98702 FAA AEROPORT
French Polynesia
Tel: 00 689 80 33 61

Gambia

Banjul Harbour

Omar Gaye Cham, PMO
Tel: +220-7729664
Alagie Nyang, PMO
Tel:+220-9951832

7 Marina Parade
Banjul
Gambia

GERMANY

Headquarters

Vacant: **PMO Advisor**
E-mail: pmo@dwd.de

Bremerhaven-Bremerhaven and North Sea

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

Hamburg and the Baltic Sea

Horst von Bargen, PMO
Susanne Ripke
Harald Budweg (E-ASAP and German ASAP)
Deutscher Wetterdienst
Met. Hafendienst
Bernhard-Nocht-Str. 76
D - 20359 Hamburg
Germany
Tel: +49-69 8062 6312/6313/6314
Fax: +49 69 8062 6319
E-mail: pmo@dwd.de

GREECE

All Ports within radius 60km around Piraeus

Michael Myrsilidis, PMO Supervisor
Dionysia Kotta, PMO
Marine Meteorology Section
Hellenic National Meteorological Service (HNMS)
El, Venizelou 14
167 77 Hellinikon
Athens
Greece
Tel: +30-210 9699013
Fax: +30-210 9628952

GRENADA

Hubert Enoch Whyte, Manager
Grenada Airports Authority (Meteorology) (GGA)
St. George
Grenada
Tel: +1 473 444 4142
Fax: +1 473 444 1574

GUADELOUPE

Antoine Mounayar
Service Régional Météorologique de la Guadeloupe
Aéroport du Raizet - BP 451 - 97183 Les Abymes Cedex
97183 Les Abymes Cedex
Guadeloupe

HONG KONG, CHINA

Dickson Dick-Shum Lau
Hong Kong Observatory
134A Nathan Road
Kowloon
Hong Kong, China
Tel: +852 2926 3113
Fax: +852 2311 9448

ICELAND

Odinn Taorarinnson, Icelandic Met. Office
Bústadavegur 9
IS-150 Reykjavik
Iceland
Tel: +354 522 6000
Fax: +354 522 6004

INDIA

Chennai

A.P. Prakashan, Director
Section/PMO Unit, New No.6, (Old No. 50),
College Road
Chennai 600 006
India
Tel: +044 28230092/94/91
Ext.No. Inspectorate Section, 230,231,234,332
Fax: 044 28271581

Goa

N. Haridasan, Director
Port Meteorological Liaison Office,
Goa Observatory,
Altinho, Panjim
403 001
GOA
India
Tel: 0832 2425547
Cell: 09833305617 Hours: 0930-1800 5 day week Fax: +022 22154098 / 022 22160824

Mumbai

G Muralidharan, Director
Regional Meteorological Centre,
Near RC Church, Colaba
Mumbai 400 005
India
Tel: +022 22174720 / 022 22151654
Cell: 09833305617 Hours: 0930-1800 5 day week
Fax: +022 22154098 / 022 22160824

Kochi

M. Sethumadhavan, Director
Port Meteorological Office
Cochin Port Trust, Ex-Mahavir Plantation Bldg
Opp. IOC Ltd., Indira Gandhi Road
Willingdon Island, (South)
Kochi, Kerala State 682 003
India
Tel: +0484 2667042
Cell: +09446478262
Hours: 0930-1800 5 day week

Kolkata

Ganesh Kumar Das, Director
Regional Meteorological Centre,
4 Duel Avenue, Alipore
Kolkata (West Bengal) PIN 700027
India
Tel: +033 24492559
Cell: 09836213781
Hours: 0930-1800 5 day week
Fax: +033 24793167

Visakhapatnam

E. N. S. Sagar, Director
Port Meteorological Office,
Cyclone Warning Center, Kirlumpudi,
Opposite Andhra University out gate
Visakhapatnam, 530 017
India
Tel: +0891-2543031/32/34/35/36
Cell: +09885256279 0930-1800 5 day week
Fax: +0891-2543033 / 0891-2543036

INDONESIA

Semarang-Tanjung Emas, Semarang Central Java

Retno Widyaningsih
Jl. Deli No.3
Pelabuhan Tanjung Emas Semarang
Indonesia
Tel: +62-24-3559194
Fax: +62-24-3549050

Jakarta

Yudi Suryadarma
Meteorological and Geophysical Agency
Jl. Padang Marang 4 Pelabuhan Tanjung Priok
Jakarta Utara - 14310
Indonesia
Tel: +62-21-43901650
Fax: +62-21-4351366

Makassar-Paotere Makassar, South Sulawesi

Purwanto
Jl. Sabutung I No. 30 Paotere - Makassar
Bitung - 95524
Makassar
Tel: +62-411-319242
Fax: +62-411-328235

Kendari, SE Sulawesi - Kendari Port

Aris Yunatas
Jl. Jendral Sudirman No. 158 Kendari
93127
Southeast Sulawesi
Indonesia

Bitung, Southeast Sulawesi / Bitung Port

Ivonne Aria Antji Tampi
Jln. Candi No. 53, Kel. Kadoodan, Kec.
Maesa,
Bitung 95513
North Sulawesi
Indonesia
Tel: 62-438-21710

ISRAEL

Ms Lilach LEV
Israel Meteorological Service
P.O.Box 25
50250 Bet Dagan
Israel
Tel: +972-3-9403117
Email: levl@ims.gov.il

IRELAND

Cork and south coast of Ireland

Brian Doyle, PMO
Met Eireann
Old Control Tower
Cork Airport
Cork
Ireland
Tel: +353-21 4917753
Fax: +353-21 4317405

Dublin and All coasts of Ireland

Columba Creamer, Marine Unit
Met Eireann
Glasnevin Hill
Dublin 9
Ireland
Tel: +353 1 8064228
Fax: +353 1 8064247

JAPAN

Headquarters and Port of Tokyo

Ayako Takeuchi, Senior Scientific Officer
Sohei Yoneda, PMO
Office of Marine Protection
Global Environment and Marine Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo, 100-8122
Japan
Tel: +81-3 3212 8341
Fax: +81-3 3211 6908
Email: a_takeuchi@met.kishou.go.jp

Maizuru

Tadayoshi Utsunomiya, PMO
Okinawa Meteorological Observatory
1-15-15, Higawa
900-8517
Naha
Japan
Tel: +81 98 833 4065
Fax: +81 98 833 4292

KENYA

Lydiah Kathuure Inoti, PMO
PO Box 98512
Mombasa
Kenya
Tel: +254 41 433 789
Fax: +254 41 433 689

KOREA REP

Doo Soo Choi, Deputy Director
Climate Division
Chunglyeoldae-ro 237, Dongrae-gu
Busan, 607-804
Korea Rep
Tel: +051-718-0421
Fax: +051-558-9506

MALAYSIA

Port Bintulu

Mohd Azlan Mo'min, PMO
Bintulu Meteorological Station
P.O. Box 285
97007 Bintulu
Sarawak
Malaysia
Tel: +6 086 314 386
Fax: +6 086 334 148

Port Kota Kinabalu

Mr. Ibrahim M.D. Ariff, PMO
Malaysian Meteorological Service
7th Floor, Wisma Dang Bandang
P.O. Box 54
88995 Kota Kinabalu
Sabah
Malaysia
Tell: +6 088 265 719
Fax: +6 088 211 019

Port Klang

Mohd Shawal Darsono, PMO
Malaysian Meteorological Service
Jalan Sultan
Petaling Jaya
46667 Selangor
Malaysia
Tel: +6 03 7967 8084
Fax: +6 03 7957 8046

MOROCCO

Hassan Bouksim, Chief,
Marine Meteorology Service Direction de La Météorologie Nationale
PORT DE MOHAMMEDIA B.P 11
Casablanca Face Préfecture Hay
Hassani Ain Chock B.P. 8106 Oasis
Casablanca
Morocco
Tel: +212 522 65 49 20
Fax: +212 522 9136 98

Hassan Amane, Meteorological Officer
Station Météorologique
JETEE MY.YOUSSEF PORT DE CASABLANCA Casablanca
20000
Morocco
Tel: +212 5 22 450277 Fax: +212 5 22 450301

Jamal Bahri
Station Météorologique
PORT DE MOHAMMEDIA B.P 11
Morocco
Tel: +212 5 23 304128
Fax: +212 5 23 304521

NETHERLANDS

Bert de Vries, PMO
René Rozeboom, PMO
KNMI, PMO-Office
Utrechtseweg 297
Postbus 201
3730 Ae de Bilt
Netherlands
Tel: +31 30 2206851 (de Vries)
Tel: +31 30 206678 (Rozeboom)
E-mail: pmo-office@knmi.nl

NEW CALEDONIA

Nouméa
Mr. Franck Lavaud
Station météorologique
BP 151
98845 NOUMEA PORT
New Caledonia
Tel: 00 687 27 93 12

NEW ZEALAND

Ross Bannister, Network Operations / PMO
Meteorological Service New Zealand Ltd.
30 Salamanca Road, Kelburn,
P.O. Box 722
Wellington
New Zealand
Tel: +64 4 4700 789
Fax: +64 4 4735 231

NORWAY

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

PAKISTAN

Hazrat Mir, Senior Meteorologist
Pakistan Meteorological Department
Meteorological Office
Jinnah International Airport
Karachi, Pakistan
Tel:+ 92-21 45791300, 45791322
Fax: +92-21 9248282

PHILIPPINES

Cagayan de Oro City

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

Davao City

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

Dumaguete City

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

Legaspi City

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

Iloilo City

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

Mactan City

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

Manila

Dr. Juan D. Cordeta & Benjamin Tado, Jr
Pagasa Port Meteorological Office
PPATC Building, Gate 4
South Harbor
Manila 1018
Philippines 1100
Tel: +63-22 527 03 16

POLAND

Józef Kowalewski, PMO
Gdynia and Gdansk Institute of Meteorology and Water Management
Waszyngton 42
PL-81-342 Gdynia
Poland
Tel: +48 58 6288151
Fax: +48 58 6288163

REPUBLIC OF KOREA

Inchon

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

Pusan

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

ROMANIA

Mariana Fratila
Head of Forecast Division Dobrogea
Dobrogea Regional Meteorological Centre
National Meteorological Administration of
Romania Blvd. Mamaia, nr. 300
Constanta
900851
Romania
Tel:+40 727 328 125

RUSSIAN FEDERATION

Murmansk

Irina Pakhomova, PMO Group Chief
Murmansk
Russian Federation
inspector@kolgimet.ru

Saint-Petersburg

Elena Parikova, PMO
Saint-Petersburg
Russian Federation

SAUDI ARABIA

Badee Ali Khayyat
Meteorology and Environmental
Protection Administration (MEPA)
P.O. Box 1358
Jeddah 21431
Saudi Arabia
Tel: +966 2653 6276
Fax: +966 2657 2931

SINGAPORE

Ong Chin Hong, PMO
36 Kim Chuan Road
Singapore
537054
Singapore
Tel: 65 6488 1843
Fax: +65 6289 9381

SOUTH AFRICA

Headquarters

Johan Stander
Regional Manager: Western Cape
Antarctica and Islands
South African Weather Service
P O Box 21 Cape Town International Airport 7525
South Africa
Tel: +27 (0) 21 934 0450
Fax: +27 (0) 21 934 4590
Cell: +27 (0) 82 281 0993
Weatherline: 082 162

Cape Town

Ms Mardene de VILLIERS, PMO
South African Weather Service
Cape Town Regional Weather Office
Cape Town International Airport
Weather Office, P O Box 21,
International Airport
Cape Town 7525
South Africa
Tel: +27-21 934 5700
Fax: +27-21 934 3296
E-mail: Mardene.devilliers@weathersa.co.za

Durban

Gus McKay, PMO
Durban Regional Weather Office
Durban International Airpot
Durban 4029
South Africa
Tel: +27-31 408 1446
Fax: +27-31 408 1445

SRI LANKA

Ajith Weerawardena
Meteorologist in Charge
Department of Meteorology Sri Lanka 83,
Bauddhaloka
Mawatha
Colombo 07
Sri Lanka
Tel: 94-1 1268 2661

SWEDEN

Johan Svalmark, PMO
Folkborgsvägen 1
Norrköping
SE-601 76
Sweden
Tel: + 46 11 4958488
Fax: + 46 11 4958001

TANZANIA, UNITED REPUBLIC OF

Allen B. Mpeta, Senior Met. Officer
P.O. Box 3056
Dar es Salaam
United Republic of Tanzania
Tel: +255 22 2134471

THAILAND

Wittaya Rakkit, Marine Meteorological Officer
Marine and Upper Air Observation Section
Meteorological Observation Division
Thai Meteorological Department
4353 Sukhumvit Road, Bangna
Bangkok 10260
Thailand
Tel: +66 2 3994561
Fax: +66 2 3669375

UGANDA

Kituusa Mohammed, Meteorologist
Department of Meteorology,
Ministry of Water and Environment
P.O.BOX 7025
Kampala
Uganda

UNITED KINGDOM

Headquarters

Sarah C. North, Ship Observations Manager, Met Office
Observations Supply - Marine Networks
FitzRoy Road, Exeter
Devon EX1 3PB
United Kingdom
Tel: +44 (0)1392 88 5617
E-mail: sarah.north@metoffice.gov.uk
Group E-mail: Obsmar@metoffice.gov.uk

David Knott, Marine Meteorological Officer, Met Office
Observations - Marine Networks
FitzRoy Road, Exeter
Devon EX1 3PB
United Kingdom
Tel: +44 1392 88 5714
Group E-mail: Obsmar@metoffice.gov.uk

Scotland

Emma Steventon
Port Meteorological Officer, Met Office
Saughton House
Broomhouse Drive
EDINBURGH EH11 3XQ
United Kingdom
Tel: +44 (0)131 528 7318
Mobile : +44 (0) 7753880209
E-mail: pmoscotland@metoffice.gov.uk

South West England & South Wales

Steve Bond
Port Meteorological Officer, Met Office
c/o Room 342/11
National Oceanography Centre, Southampton
University of Southampton, Waterfront Campus
European Way
SOUTHAMPTON SO14 3ZH
United Kingdom
Tel: +44 238 063 8339
E-mail: pmosouthampton@metoffice.gov.uk

South East England

VACANT
Port Meteorological Officer, Met Office
[Address to be confirmed]
United Kingdom
Tel: [to be confirmed]
E-mail: pmolondon@metoffice.gov.uk

North England & North Wales

Tony Eastham
Port Meteorological Officer, Met Office
Unit 3, Holland Business Park,
Spa Lane,
Lathom, L40 6LN
United Kingdom
Tel: +44 (0)1695 72 6467
Mobile : +44 (0) 7753 880 484
E-mail: pmo.liverpool@metoffice.gov.uk

NOAA Weather Radio Network

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

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

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

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

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

Bull Moose has a go at MAWS unit, just a little something our equipment must endure....
Photo is courtesy of Eddie Zingone, National Weather Service, Anchorage Forecast Office.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Data Buoy Center
Building 3203
Stennis Space Center, MS 39529-6000
Attn: Mariners Weather Log