Mariners Weather Log

Vol. 46, No. 2 **Fall/Winter 2002**

Midshipman Jeff Musk conducting a map discussion using the surface and 500 mb maps of the North Atlantic.
(See Marine Weather Reporting at Maine Maritime Academy p. 8)

Articles, Photographs, and Letters should be sent to:

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From The Editorial Supervisor

Hello, and welcome to another issue of the Mariners Weather Log (MWL). It has been some time since we last chatted, and a lot of things have happened. In the past issue, we talked about a pillar of the VOS program, Mr. Jim Nelson, retiring as Port Meteorological Officer (PMO) in Houston. Since then, we have welcomed aboard a new family member, Mr. Chris Fakes, who signed on to take over the daunting tasks left in the wake of Jim's departure. Chris comes to us with nearly 30 years of experience as a Navy Meteorologist, so he should fit in nicely into this rogues' gallery. Although he was too shy to record his life story in this issue, perhaps he can be persuaded to provide his biography for the next issue.

And while we are on the topic of departing and arriving personnel, we need to say goodbye to Mr. Lynn Chrystal, who did a stellar job as a part-time PMO up in Kodiak, AK. But, we did not leave this vital duty vacant. No-Siree! I want to welcome Ms. Debra Russell as our new PMO in Kodiak. Debra comes to us from King Salmon, AK and has already been doing an outstanding job in support of VOS. (See story on p. 7)

Speaking of change, it is time for you to help us make the MWL better. Please take the time to fill out the questionnaire found on p. 3 and mail it back in to us. We look forward to hearing from you to see what course you want the MWL to steer.

Other offerings this issue include a great but tragic story of the recent events onboard the GALAXY in the Bering Sea, a new training technique at the Maine Maritime Academy, and some noteworthy analysis reports from the Marine Prediction Center. You will also see the return of the Cooperative Ship Report on page 90. This National Climatic Data Center (NCDC) statistical report has been modified and tested, and is once again operational.

So, please grab a cup of coffee, find a comfy place to sit, and enjoy our offering of the MWL.

Happy Holidays! - *Luke*

Some Important Web Page Addresses

NOAA	http://www.noaa.gov
National Weather Service	http://www.nws.noaa.gov
National Data Buoy Center	http://www.ndbc.noaa.gov
AMVER Program	http://www.amver.com
VOS Program	http://www.vos.noaa.gov
SEAS Program	http://seas.nos.noaa.gov/seas/
Mariners Weather Log	http://www.nws.noaa.gov/om/mwl/mwl.htm
Marine Dissemination	http://www.nws.noaa.gov/om/marine/home.htm
U.S. Coast Guard Navigation Center	http://www.navcen.uscg.gov/marcomms/

See these Web pages for further links.

2002 Mariners Weather Log (MWL) Reader's Questionnaire

We want to hear from you!

So we can better serve you in the future, please let us know how we are doing by completing this short questionnaire. Thank you for your feedback.

Please rate the MWL on the following features:

1. What is your favorite column or type of article?
   ☐ I like them all. ☐ It would have to be this one:_______________
2. What's your least favorite article in the MWL?
   ☐ They are all good. ☐ It would have to be this one:_______________
3. Is the content of the MWL relevant and useful?
   ☐ Strongly Agree ☐ Agree ☐ Disagree ☐ Strongly Disagree ☐ No Opinion
4. Ease of Reading the articles: (1 = poor, 5 = excellent)

1	2	3	4	5
☐	☐	☐	☐	☐

5. Organization/layout:(1 = poor, 5 = excellent)

1	2	3	4	5
☐	☐	☐	☐	☐

6. How did you first hear about the MWL?
   ☐ Word of Mouth ☐ Library
   ☐ Port Meteorological Officer (PMO) ☐ Search Engine or Web
   ☐ Saw it aboard Ship or other place of business ☐ Article in newspaper/magazine
   ☐ Conference/Trade Show ☐ Other: _______________
7. Please rank the MWL departments or topics in order of importance: (1 = poor, 5 = excellent)

	1	2	3	4	5
Great Lakes Wrecks	☐	☐	☐	☐	☐
Physical Oceanography	☐	☐	☐	☐	☐
Marine Biology	☐	☐	☐	☐	☐
VOS Cooperative Ship Reports	☐	☐	☐	☐	☐
VOS New Recruit List	☐	☐	☐	☐	☐
VOS Award Photos	☐	☐	☐	☐	☐
Marine Weather Review	☐	☐	☐	☐	☐
Climate Predication Center Charts	☐	☐	☐	☐	☐
Historical Articles	☐	☐	☐	☐	☐
Special Feature Articles	☐	☐	☐	☐	☐
Coastal Forecast Office News	☐	☐	☐	☐	☐

8. Would an electronic version of the MWL be useful to you?
   ☐ Strongly Agree ☐ Agree ☐ Disagree ☐ Strongly Disagree ☐ No Opinion
9. Do you currently have internet capability to access an online MWL?
   ☐ Yes ☐ No ☐ No, but I will soon
10. What electronic format would best fit your needs? :(1 = Strongly Disagree, 5 = Strongly Agree)

	1	2	3	4	5
Single downloadable PDF file	☐	☐	☐	☐	☐
Multiple downloadable PDF file (per article)	☐	☐	☐	☐	☐
Fully Integrated HTML Webazine	☐	☐	☐	☐	☐
No electronic version - Keep the hard copy	☐	☐	☐	☐	☐

11. Overall, how satisfied are you with the MWL? (1 = poor, 5 = excellent)

1	2	3	4	5
☐	☐	☐	☐	☐

12. Is you mailing address correct? If changes needed, please let us know.
13. Comments:

____
____
____

Thank you for taking the time to complete this questionnaire. - Luke

Fold Here and Seal with Tape at Bottom

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Departments:

"Galaxy" Explodes, Weather Fights Rescue

Tony Castelluci and
USCG Public Affairs Office, Kodiak, Alaska

On 20 October 2002, the large fishing vessel **Galaxy** sent a mayday reporting that the ship had exploded while sailing in the Bering Sea.

The **U.S. Coast Guard (USCG) Kodiak Station** received the call at 4:30 pm AST that Sunday in which a **Galaxy** crewmember reported that the vessel exploded and caught fire, forcing the crew to prepare to abandon ship.

Three **Galaxy** crew members became trapped in the wheelhouse, and three others couldn't escape from the bow, prompting a USCG helicopter crew to hoist the six people to safety, but the rest of the crew jumped into the cold water. Many of the men who went overboard were not wearing survival suits. Two of the twenty-six men who were aboard the **Galaxy** when it exploded are still missing, and one has been reported dead.

USCG PAO Lt. Jim Zawrotny said, "It was scary, knowing these people were out on a boat [in cold water] where their choice was to freeze or to burn."

The USCG, along with the 210th Rescue Squadron of the Alaska Air National Guard, the U.S. Air Force, and the fishing vessels **Glacier Bay**, **Blue Pacific**, and **Clipper Express**, searched for over 50 hours for the two missing men before the USCG suspended its search at 7 p.m. Tuesday, 22 October 2002.

Tragically, a crewman from the Clipper Express, assisting in the search of the missing **Galaxy** crewmen, had fallen overboard at around 10 a.m. AST that day about 90 miles south of St. Paul Island.

The burnt hull of the Galaxy drifts aimlessly in Alaskan waters. USCG Rescue Squadron Kodiak led the rescue.

(Official U.S. Coast Guard photo courtesy of LT. Dave Wierenga, Air Station Kodiak and Petty Officer Carlene Adams, Long Range Navigation Station, St. Paul Island)

The **Clipper Express** was on its way to Dutch Harbor to off-load two **Galaxy** crewmen they had picked up Sunday evening. At the time that the **Clipper Express** lost a crewman, it was braving 30-foot seas and 50-60 knot winds as it sailed to bring survivors to safety. It is believed Daniel Schmiedt of the **Clipper Express** went missing after being struck by a rogue wave during the rescue.

To help locate the missing **Clipper Express** crewman, U.S. Coast Guard rescue crews diverted one of the two USCG helicopters in the **Galaxy** search area south. The USCG and the **Clipper Express** searched for over 10 hours for Schmiedt, and the Coast Guard suspended its search at 8:15 p.m. AST Tuesday, 22 October 2002.

Chief Petty Officer Marsha Delaney was aboard a Coast Guard C-130 that supported and then took part in the rescue efforts for the **Galaxy**.

"According to initial interviews with the crew [survivors of the **Galaxy**], the fire engulfed the ship so fast that split second decisions had to be made about jumping into cold water without survival suits," Chief Delaney said.

During the rescue, the weather became a problem. "We were getting thrown around pretty bad up there." Delaney said.

To complicate things for the search, there was no fuel available for aircraft at St. Paul Island. The C-130 that Chief Delaney was aboard first had to deliver fuel to St. Paul Island to refuel two H-60, and one H-65 helicopters before continuing to help with the search.

The **USGC Cutter Jarvis** based in Honolulu Hawaii, was in the area and sent its H-65 “Dolphin” helicopter to assist in the rescue. As the weather turned foul during the rescue, it soon became apparent that the helicopter would be unable to return to the Jarvis, so the H-65’s crew landed in St. Paul and spent the night.

Details regarding what caused the explosion had not been released at the time this issue was in production.

The Galaxy still smokes from the fire that engulfed it.

(Official U.S. Coast Guard photo courtesy of LT. Dave Wierenga, Air Station Kodiak and Petty Officer Carlene Adams, Long Range Navigation Station, St. Paul Island)

From Galveston Bay to the Prince William Sound - It’s closer than you think...

By Robert Luke
VOS Program Lead

Okay, so now you are thinking, What do the the beaches of Texas and the rocky shores of Alaska have in common? The latest answer is Debra Russell. Debra recently took over the duties as the Official in Charge and Port Meteorological Officer (PMO) in sunny Valdez, Alaska. Previously, Debra was supporting the folks up in King Salmon with all their weather needs.

Some might think it is a stretch to go from south Texas up to Alaska, but not for Debra. From her early days as a Galveston Ball High School Tornado, Debra was destined to be involved with the weather. Like most young people, Debra searched for a place to fit in and call home. As she put it, “I am not a cowgirl, and I don’t have big hair,” so when the U.S. Navy mailed her an “It’s not just a job. It’s an adventure” brochure, Debra was hooked. It was the lure of those snazzy uniforms and images of ships cutting into the waves with the swell and spray going everywhere that started Debra on her quest for adventure.

After basic training in Florida, Debra joined the fleet in Vallejo, CA on the **Navy Tug Dekaury** (YTM-178). In her spare time between swabbing decks, scraping barnacles and getting to know way too much about Brasso; Debra dreamed of becoming an Aerographer Mate (ok, Navy weather guesser to the civilian folks). Well, she got her wish and was transferred to the “beautiful” corn fields of Rantoul, Illinois for basic weather school. And you thought the Navy adventure was a myth. Debra’s first tour in Navy weather was at a lovely little hideaway called Adak, Alaska. This jewel of a tour is where the Debra got bit by the Alaska bug (among others). Debra felt a sense of home and craved the challenge in the Alaskan environment. The Navy moved her to Guam (talk about climate changes) and then back to the Texas beaches at Corpus Christi.

In 1991, the call of the wild (ok maybe it was the moose or caribou) got the best of Debra, and she left the Navy to strike out on her own. It took over a year atop Stampede Pass, Washington to re-acclimate herself to the northern environment, but then the National Weather Service finally realized that Debra has a lot to offer (she had weather experience and she WANTED to go to Alaska), so they shipped her up to McGrath. Since then, she has been a solid (yet slightly frozen) fixture in Yakutat, Anchorage, King Salmon and now Valdez.

A Texan in Alaska. Debra Russell, Port Meteorological Officer, in sunny Valdez, Alaska.

Life is an adventure, but Debra has been blessed. She has gotten the chance to live out her dreams, surrounded by all her loves: her family, the marine community, and the great Alaskan spirit. Who says you cannot go home again...

Welcome Aboard Debra - *Luke*

Marine Weather Reporting at Maine Maritime Academy, a New Course, a New Approach

Captain G. Andy Chase
Professor of Marine Transportation
Maine Maritime Academy

"We've got strong meridional flow. Basically everything is flowing around this very large High in the mid-Pacific. This large trough will be digging rapidly over the next two or three days. We have the **M/V Eisenhower** going from San Francisco to Yokohama. This system has been building slowly, but looks like it might intensify rapidly now. This storm is forecast to produce nine meter seas, and 50 knot winds. On Wave Watch the storm shows up very well, showing it forming quickly."

"We've been passing under the High, so we've had following winds pretty much the whole way, so far. We'll keep going south for a while. It's basically the sailing ship route, and it's been working well for us so far this trip."

"We're going from Surigao Straits to Los Angeles, on the **M/V Richard T. Matthiesen**, fully loaded. We're going to follow the great circle track for now. We're ahead of schedule so far. We are still well south of the 5640 meter line on the 500 millibar map. We're thinking the 500 millibar flow may be moving back toward zonal flow before long. That would put the storm track farther north by later in the week. In that case we can probably stick to the great circle track."

"We have also had pretty good weather so far, we've been pretty lucky. It was a little dicey when we first started out, but it's good now. We're going from Yokohama to San Francisco. We're on the great circle, and we're already over the top. I think we'll be all right."

You may think that sounds like the operations center of an ocean routing company, but it's not. It is actually coming from a classroom at Maine Maritime Academy, where our future mariners are conducting "virtual voyages."

Midshipman Jeff Musk conducting a map discussion using the surface and 500 mb maps of the North Atlantic.

Every day the students, working in pairs, download a full suite of marine weather fax maps from the National Weather Service's Marine Prediction Center. Studying these maps, they make routing decisions for a chosen ship, or vessel, on a route of their choosing. Twice a week the class meets for two hours, and discussions flow around the room, comparing strategies, successes and failures. When one of these students says "man, did we get hammered last night," they are not referring to a visit to a bar. They are referring to having encountered 30-foot seas and force-10 winds in the Winter North Atlantic.

The idea for this course sprang from a 5-day course I took in the spring of 2001, sponsored by the Sea Education Association of Wood's Hole, Massachusetts, and conducted by the Maritime Institute of Technology and Graduate Studies (MITAGS) of Linthicum Heights, Maryland. In this course, entitled Heavy Weather Avoidance, mariners are taught to avoid severe weather by instructors Michael Carr and Lee Chesneau.

I had been teaching Meteorology at Maine Maritime Academy in Castine, Maine for about nine years, and although I was teaching it to mariners, and I am myself a mariner, I have always known that I was not covering enough material on simply interpreting weather maps. Given the time constraints of the course and the necessity of covering the fundamentals of meteorology in that time frame, I only got to spend about three weeks looking at surface analysis maps, and only about two days looking at the upper level, 500-millibar maps.

After taking the course with Michael and Lee, I knew I had to do something about this. Before the five day course was over, I had a rough outline of the course I wanted to develop at Maine Maritime, and I had developed what would be the key component of that course. The one advantage I would have over the MITAGS course would be that I would have the students for fourteen weeks, and this enabled me to run weather routing exercises in real time, using real weather data. I dubbed the idea a "Virtual Voyage" and decided to prepare the whole course around that concept.

The Virtual Voyage goes like this: The students pair up and choose a ship they would like to operate. Since we have a mix of students who are working toward 200-ton, 500-ton, and unlimited tonnage licenses, some will choose large ships and some will choose smaller vessels including tugs, yachts and even sailing vessels. With the ship chosen, they write up a discussion of the ship's characteristics, including whether or not they have "vulnerable" cargo (such as deck cargo), an approximation of the vessel's stability characteristics, the applicable load line zones they will transit, and any particular issues their ship might have that would affect their routing decisions.

For example, one group is on a car carrier, which is particularly sensitive to seas from ahead or astern, and is most suited to winds and seas on the beam. Another group is routing the Greenpeace ship **Rainbow Warrior**, which is a 160-foot auxiliary sail vessel, so they are looking for favorable sailing conditions. One group is on the **Richard T. Matthiesen**, a tanker, loaded, while another group is on the same ship but in ballast. The latter group will have to consider whether or not to take on storm ballast.

They then choose an ocean. For starters, we are working in the North Pacific and North Atlantic, but I hope someone will venture into the Southern Hemispheric waters. Finally they decide on a departure point and a destination. I assign the departure date, and we all get underway at the same time.

The students work on a Pilot Chart, and they start by laying out the least-distance track, typically the great circle route. They then study any material they can find to plan the route they will actually sail. They use the Sailing Directions; the British Admiralty publication 136, Ocean Passages For The World; various privately published sailing and cruising guides, and any other material they can find. With all of that, they start looking at the real time weather maps about two days prior to departure. On the day of departure they lay down a voyage track that they feel represents the best route for the present conditions.

They then lay down a comparative track. If they are sailing on the great circle track, they use a rhumb line or composite track for comparison. If they decide to sail on a rhumb line, or go well to the south on a "bucket" route, they use the great circle track for comparison. In any event, they must write up a justification for their chosen route. They also prepare an estimated time of arrival (ETA) and a description of the weather they anticipate.

For the next couple of weeks, they will plot their ship's position every day at noon GMT, both on their chosen route and on their comparison route. By transferring their position from the Pilot Chart to the surface analysis map, they evaluate the wind conditions they should be encountering. They also transfer their position to the sea state analysis map and determine the sea condition. With this information, they look at a polar velocity plot for the ship they are on and determine the speed they expect to make good in those conditions.

The polar velocity plot is a circular graph of speed made good in various sea conditions. To prepare these I sit down, (either in person or on the phone) with someone who has a significant amount of experience on a particular vessel and ask what speed they would expect to make good in the given conditions. For example, in force-8 winds and 12-foot seas, the ship might be able to maintain full speed when these conditions are from abaft the beam, but as the wind and seas draw forward of the beam, she might have to reduce from a sea speed of 16 knots to 12 knots. Since this occurs gradually, we will draw a curve that goes from 16 knots to 12 knots as it approaches dead ahead. We do this for various conditions, from calm weather up to force-12 winds and 40-foot seas. These curves look very different for different types of vessels. See figures 1 and 2. (We do not try to quantify the speed reduction due to wind, even though this can be significant. We simply don't have enough data on these ships to quantify everything, so we use an approximation. On ships with a great deal of windage, I do encourage them to approximate the wind factor, but it will be a rough guess at best.

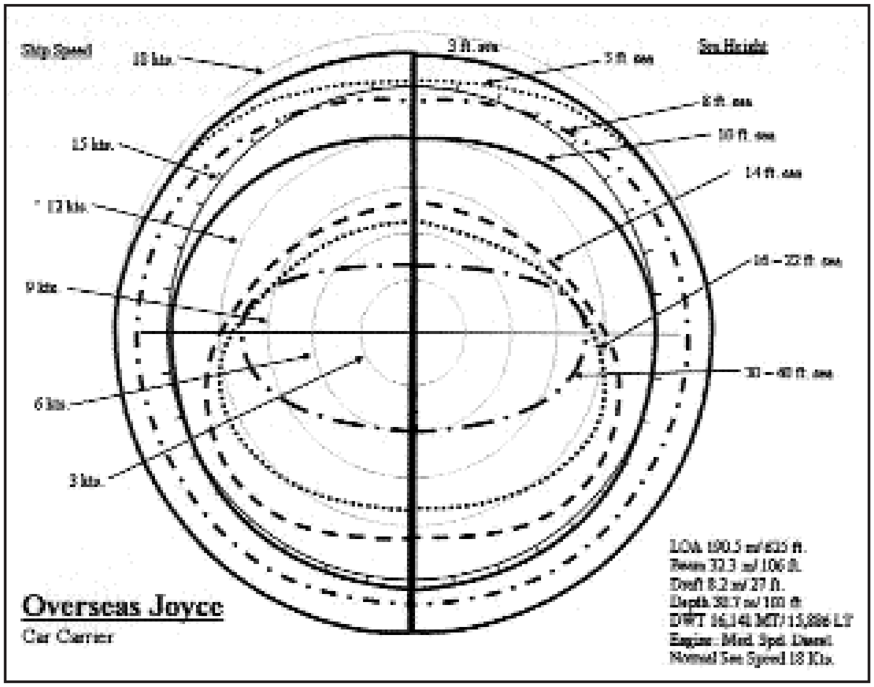


Figure 1: Polar Velocity Plot for the car carrier Overseas Joyce. This was prepared with help from Mr. Chuck Zenter, Second Mate. In this diagram you will note that although her sea speed is 18 knots in good conditions, she slows down substantially in any head seas. She also slows down in following seas, when her rocking horse motion allows her propeller to emerge and race, causing overspeed trip on her main engine. The concentric circles of the plotting sheet represent ship's speed in 3-knot increments, and the plotting sheet is oriented in a ship's head up orientation like a head up radar display. As an example, note that in a 16- to 22-foot sea, her speed varies from about 7 knots for a head sea, to a maximum of about 13 knots when the seas are just abaft the beam, and then back down to about 11 knots when the seas are from astern.

Once the students have determined the speed they expect to make good in the given conditions, they must allow for the current they are encountering. They pick the currents off the pilot chart and estimate the speed reduction based on the angle at which the current is hitting them. This reduction (or addition, if the current is fair) is taken from (or added to) the speed calculated for wind and waves. They now have a speed of advance.

Since these students have a great deal of other homework to do for other courses, I only require them to perform this operation once per day, using the 1200 GMT weather map suite. They presume that the speed of advance just calculated will apply for 24 hours. The next day they repeat the process, and so on for the duration of the voyage. After each day's run is plotted, they make a decision to continue on course or deviate to avoid bad weather, adverse currents, or to get a lift from more favorable conditions.

They must perform the same calculations for their comparative route. They slow down or speed up their ship on the comparative route using the same polar diagrams, but they do not deviate from the comparative route. That ship stays on course unless severe weather requires it to heave to or run before the wind and sea.In this way, they have something to measure their success or failure by. At the end of the trip they can see if their decisions brought them to their destination ahead of their comparison ship, or if the comparison ship encountered severe weather that they avoided by their good judgment.

Once they have made all these calculations for the day, they are allowed to fire up their complimentary copies of the Orion routing software, provided by WNI Ocean Routes Inc., and see what a computer solution for their track looks like. This program digests a daily weather data report from Ocean Routes, and runs numerous track solutions to solve for the best route. They are not allowed to change their route based on this information, but they are encouraged to see what another solution looks like. This way, they have yet another track to which to compare their route. They can also run an animation feature in this program which will project their ship and the weather data ahead in time to see how the wind and wave fields will change and affect them down the road.

For their final report, they compile a day by day discussion of their weather analyses and decisions with an overview of the conditions encountered by both ships (theirs and the one on the comparative route). They must summarize the number of days of weather above force 6, and number of days of reduced speed. If they encountered any severe weather,

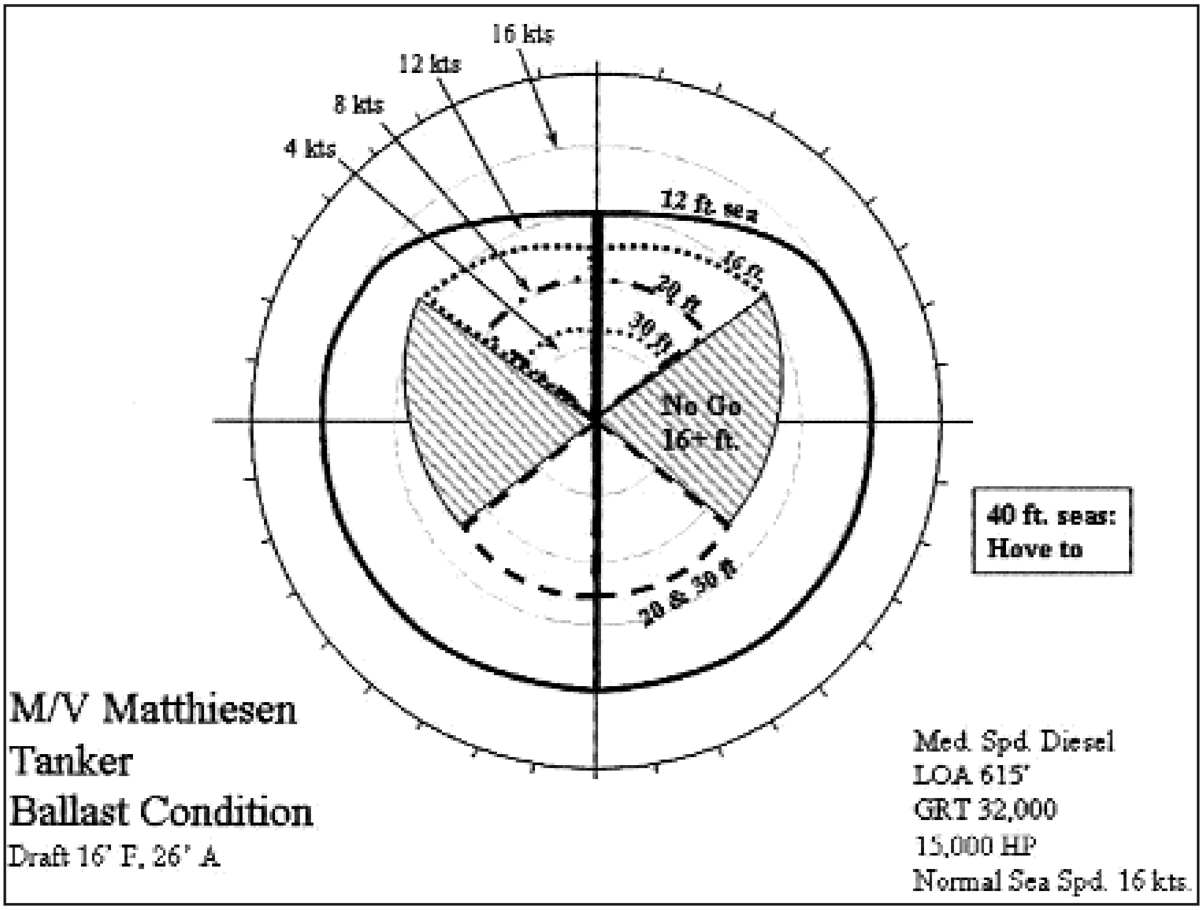


Figure 2: Polar Plot for M/V Richard T. Matthiesen, in this case in ballast. This plot was prepared with help from Captain Ralph Pundt, who served as her master for 6 years. Note that in sea conditions of over 16 feet he would not allow his ship to get beam to the seas, and in seas of over 40 feet he would heave to. We also prepared a plot for this same ship when loaded, and naturally it looks quite different.

they must decide if they might have incurred any cargo damage, ship damage, or personal injury to crew or passengers.

These students have concluded that they don't ever want to make a routing decision without having a 500-millibar map at hand, and preferably not without a full suite of 500-mb, surface, and wind/wave maps, including the analysis, 48- and 96-hour forecasts for each. They have become quite adept at glancing over the various maps and picking out the trends, tying the surface features to the 500-mb features, and considering the ramifications of significant wave height versus maximum wave height potential. They know now that they can use the surface and 500-mb maps to plan for the next 5 days, the 500-mb trend to look a couple of days beyond that, and the Pilot Charts for the rest of the voyage.

The students have also discovered the trove of information available to them on the Internet. While this resource is not available to many ships at sea yet, when it is, these mates will know where to look to find QuickScat Scatterometer derived wind fields, Wave Watch III wave model animations going out 10 days, superstructure ice accretion forecasts, and any number of other valuable additions to the basic weather forecast information.

During this course I have been fortunate to have had first class help from the folks at the Marine Prediction Center, MITAGS, WNI Ocean Routes, Inc., Locus Weather, Marine Computer Systems, and others in the private sector who have come all the way to Castine, Maine to give us guest lectures and materials to work with. They are all contributing to preparing these students to be better mates and masters who will make better decisions and bring the next generation of ships into port faster, with less damage, and with the cargo in better condition.

The Gust Factor During Hurricanes as Measured by NDBC Buoys

Professor S. A. Hsu
Louisiana State University

The gust factor is defined as the ratio of the maximum (or peak) gust speed to the sustained wind speed. This factor is important for mariners to know, particularly during storms. The purpose of this brief note is to synthesize the gust factor recorded by NDBC buoys during hurricanes.

In order to obtain a large sample from as much spatial variability as possible, a ten-year data set has been compiled in Table 1. The period from 1991 through 2000 was used. The area of coverage included the Gulf of Mexico and the U.S. Eastern Seaboard from Florida northward to the Gulf of Maine. Buoy measurements included both deep and shallow water locations. The data sets are based on the "Annual Summaries" for Atlantic hurricane seasons as published in the Monthly Weather Review.

In Table 1, the gust factor is obtained from the ratio of peak gust to the sustained wind. The grand mean from all 67 measurements is 1.29, with a standard deviation of 0.077. The coefficient of variation (or dispersion), defined as the ratio of the standard deviation to the mean, is approximately 6%. Since these deviations are small, the gust factor of 1.3 based on the 3 tropical storms and 16 hurricanes listed in Table 1 should be useful operationally. For example, if only the wind speed is available, the peak gust can be estimated simply by multiplying the speed by 1.3 during storm conditions.

Characteristics of the Gust Factor Measured by Coastal-Marine Automated Network (C-MAN) Stations During Hurricane Georges in 1998

Professor S. A. Hsu
Louisiana State University

The gust factor is the ratio of peak gust to sustained wind speed. Two questions often asked are: "Does the gust factor increase with wind speed?" and "Does it increase with height?" In order to respond, simultaneous measurements from a large number of stations are needed. Such an opportunity arose during Hurricane Georges in September 1998. The measurements are listed in Table 1, along with the anemometer height for each station. It is evident from this table that the gust factor does not increase with either height or sustained speed within approximately 20 to 160 ft and 24 to 81 kts.

Between 1400 and 1500 UTC on 25 September 1998, four C-MAN stations along the Florida Keys provided an interesting sub-data set. These four stations were: Molasses Reef (C-MAN MLRF1), Long Key (LONF1), Sombrero Key (SMKF1), and Sand Key (SANF1). When the wind speed increased from 46 kts at MLRF1 to 81 kts at SMKF1, the gust factor remained virtually the same at both locations, even though the anemometer height at MLRF1 was 52 ft versus 159 ft at SMKF1.

We therefore conclude from the data provided in Table 1 that the gust factor does not increase with either height or speed. Certainly, more data are needed to substantiate this conclusion.

Table 1.
Measured sustained wind and peak gust recorded by NDBC buoys during hurricanes from 1991 through 2000.

Year	Hurricane	Bouy	Peak Gust (kt)	Sustained Wind (kt)	Gust Factor
1991	Bob	44009	54	43	1.26
		44012	56	47	1.19
		44025	62	45	1.38
		44008	56	47	1.19
		44013	58	45	1.29
		44005	54	45	1.20
		44007	52	41	1.27
1992	Andrew	42003	62	45	1.38
		41016	35	29	1.21
		42001	29	23	1.26
		42007	47	29	1.62
1994	T.S. Alberto	42036	35	27	1.30
	T. S. Beryl	42036	37	31	1.19
	Gordon	41002	37	35	1.06
		41001	62	47	1.32
		41004	45	35	1.29
1995	Erin	41009	52	41	1.27
		41010	47	35	1.34
		42036	45	35	1.29
		42007	39	29	1.34
	Opal	42001	66	52	1.27
		42003	54	43	1.26
		42007	68	52	1.31
		42036	43	35	1.23
1996	Fran	41004	64	49	1.31
1997	Danny	42007	89	68	1.31
		42040	81	64	1.27
		44004	81	62	1.31
		44008	72	58	1.24
		44014	105	81	1.30
1998	Bonnie	41002	57	42	1.36
		41004	49	38	1.29
		44004	46	36	1.28
		44014	47	37	1.27
	Earl	42040	55	41	1.34
		42039	63	45	1.40
		42036	47	35	1.34
		42002	34	26	1.31
		42001	52	37	1.41
		42007	37	30	1.23
	Georges	42003	66	51	1.29
		42039	56	43	1.30
		42036	48	34	1.41
		42040	68	54	1.26
		42007	54	44	1.23
	Mitch	42003	44	37	1.19
		41010	45	37	1.22
1999	Bret	42020	73	58	1.26
	Dennis	41001	63	48	1.31
		41002	59	43	1.37
		41004	72	54	1.33
		41008	43	31	1.39
		41009	37	29	1.28
1999	Dennis	41010	72	57	1.26
		44014	53	43	1.23
	Floyd	41004	72	54	1.33
		41009	70	52	1.35
		41008	31	24	1.29
		41010	91	72	1.26
		44009	52	39	1.33
		44014	66	50	1.32
		44025	43	33	1.30
	Irene	41009	60	45	1.33
2000	Gordon	42003	57	43	1.33
		42036	41	37	1.11
	T.S. Helene	42003	39	32	1.22
		42039	41	31	1.32
Grand Mean					1.29
Standard Deviation					0.077
Coefficient of Variation (or dispersion)					6%
Number of Measurements					67

Servicing NOAA Buoys on the Central California Coast

By Jeff Lorens
National Weather Service
Eureka, California

NOAA environmental and oceanographic data buoys provide an invaluable source of data for monitoring weather and wave conditions in the coastal and offshore waters of the United States. The U.S. Coast Guard, in close cooperation with the National Data Buoy Center (NDBC) at Stennis Space Center in Mississippi, maintains responsibility for the servicing of these buoys. In early September 2002, I had an opportunity to ride along on a buoy-servicing trip to see first-hand how the Coast Guard and NDBC accomplish this mission.

San Francisco Bay with the Golden Gate Bridge in the distance.

Early Monday morning, September 9th, I boarded the **USCGC Aspen** (WLB-208) at Coast Guard Base San Francisco Bay, located at Yerba Buena Island in San Francisco Bay. Built by Marinette Marine Corp. in Marinette, Wisconsin, and commissioned on September 28th, 2001, the **Aspen** is one of the Coast Guard's newest cutters. Following a transit down the St. Lawrence River, down the east coast and through the Panama Canal, the **Aspen** arrived at it's new home port on December 18th, 2001. Also aboard on this trip were Chief Warrant Officer (CWO3) John Ward (a Coast Guard liaison officer assigned to NDBC), John Blackmon, and Dave Parrett (SAIC technicians; SAIC is the primary contractor under NOAA responsible for buoy maintenance services).

The U.S. Coast Guard has responsibility for maintaining aids to navigation in coastal and inland waterways throughout the United States. Although not considered "aids to navigation," the servicing of NOAA's environmental data buoys is included in this mission (in close coordination with NDBC). Although a relatively small part of the Coast Guard's overall buoy maintenance mission, it is a vital one. On this trip, the **Aspen** would service three NOAA data buoys off the central California coast, along with two navigational buoys. The three NOAA buoys scheduled for service included Half Moon Bay Buoy (# 46012), Monterey Bay Buoy (# 46042), and Cape San Martin Buoy (# 46028).

Not all buoy servicing missions are alike. In some cases, new buoys are deployed for the first time, while others are re-deployed after having broken their mooring and gone adrift. In both cases, the deployment involves putting a large concrete sinker on the ocean bottom, which serves to anchor the buoy in position. For this trip, each buoy would be replaced on-site with a completely re-conditioned buoy, with one day scheduled for each.

The servicing operation actually begins at NDBC's facility at Stennis Space Center, which schedules periodic (emergency in some cases) data buoy servicing missions with the Coast Guard. It is here that buoys previously delivered from other servicing missions are overhauled, outfitted, and tested. The re-conditioned buoys are then carried across country by flatbed truck to the port, lifted on board Coast Guard buoy tenders by crane and secured to the deck. The **Aspen**, with a beam of 46 feet, can carry three of the 3-meter discus buoys (side by side) to be serviced on this trip. Once on-site at each location, the buoy in the water would be hauled aboard and replaced with a re-conditioned buoy. Although each of these buoys was of the same basic design, each was unique due to some slight (but significant) differences in instrumentation and configuration. Each was therefore designated to replace a specific buoy. In fact, each of the "new" buoys already had it's number painted on before it arrived at the port (e.g. the "old" buoy # 46012 would be replaced by the "new" # 46012).

The first of the NOAA buoys on the schedule was # 46012, located just off the California coast about half way between San Francisco and Monterey Bay. Weather conditions on this day were nearly ideal, with a clear blue sky, northwest winds at 5-10 knots, and a 3-4 foot swell with periods of 17-20 seconds. Weather and sea conditions are absolutely critical to buoy maintenance operations. If the seas become too rough, conditions can quickly turn unsafe for the deck crew. These buoys weigh between 3,500 and 4,000 pounds and provide more than sufficient force (in motion) to cause serious injury.

The **Aspen** proceeded to the buoy's location, guided by its sophisticated "Integrated Ship Control System," which brings together (and displays information from) the cutter's satellite navigation system, radar, and electronic nautical charts. This information is integrated with the maneuvering system, consisting of variable pitch props, rudders, and two thrusters (bow and stern), allowing for very precise navigation and maneuvering.

The NDBC technicians had reason to believe this particular buoy may have had some saltwater intrusion, which can result in a dangerous build up of hydrogen gas (due to interaction of the saltwater with the batteries). Hydrogen is a highly explosive gas, and bringing the buoy on board could have exposed the crew and technicians to an unacceptable risk. For just such an occasion, the SAIC technicians were equipped with sensitive "sniffing" gear. The **Aspen's** crew lowered a small boat and took the two technicians out to the buoy to check for the possible presence of hydrogen. In this case, no dangerous emissions were detected and the buoy was deemed "safe" for taking aboard.

system for just such occasions. The ship's bow and stern thrusters can be manually driven or, using an integrated computer, provide specific maneuvering instructions to be immediately carried out. The ship can be moved in very small increments in all directions until the buoy is in an optimum position for working.

In preparation for this day's operation, the deck crew conducted a briefing to ensure all parties involved intimately knew their specific roles and responsibilities. For this operation, there were eight crew members working on deck, led by a senior petty officer. A safety observer was also present, watching every step from

3-meter discus buoys in a diagonal position along the deck with the Aspen's crane poised overhead.

The **Aspen** then slowly and carefully maneuvered toward the buoy, bringing it closely alongside. The **Aspen** (and other similar Coast Guard cutters) uses a very precise maneuvering

above. On the bridge, Lieutenant Commander Adam Shaw, **Aspen's** Commanding Officer, had overall control of the entire operation, with safety being his primary consideration. The operation would not commence until the Captain decided conditions were safe and the crew was completely ready.

Once the buoy was safely alongside, the deck crew attached a line to prepare it for lifting (not always easy, given less favorable weather conditions). Once the line was in place, the crane hook was securely attached to one of the lifting points on the base of the buoy. Using the **Aspen's** 20-ton hydraulic crane (with a 60-foot boom), lifting began almost immediately, but proceeded slowly and carefully. Rather than hoisting the buoy high up, then rotating the crane to lower it on deck, the buoy was slowly dragged aboard, using the crane in combination with a horizontal cable ("crossdeck") pulled by a separate winch. This procedure minimizes the risk of the buoy swinging and potentially injuring crew members. After the buoy was safely secured on deck, the anchor chain (still attached to a 6,000 pound sinker on the bottom, 259 feet below) was slowly pulled on deck. To prevent the chain from being pulled back into the water and to protect the deck crew, it was secured on deck with a special "chain stop." The crew then proceeded to scrape the buoy's hull of its abundant accumulation of sea life, which had made this particular buoy its home for the past year. Finally, the chain was disconnected from the bottom, inspected for abrasions and other weak points, and subsequently reconnected to the "new" buoy # 46012.

The next phase of the operation involved attaching the crane's hook to the new buoy, releasing the chains securing it on deck, lifting it, and finally putting it in the water. This phase of the operation is easier said than done. With two other buoys on deck to the side and (now) another buoy in the center of the deck (i.e. the "old" # 46012, just out of the water), this would prove to be a delicate maneuver. The buoy would have to be carefully lifted and rotated such that it's sensitive environmental instrumentation (on the top of the buoy) would not impact any obstacles, either on the ship or the other buoys on deck, thus risking damage. Damage to its instrumentation would have meant certain delay, and (if serious), could even have resulted in a long postponement of this particular buoy's replacement.

Operation in action: replacing 3-meter buoy off the coast of California.

After careful planning and discussion by the deck crew, the new buoy was slowly lifted and, using the "crossdeck" cable to control its horizontal movement, was then rotated over the side and slowly lowered into the water. Then, with the crew safely out of the way, the buoy's anchor chain was released from the chain stop and the "new" NOAA data buoy # 46012 was free from the **Aspen** and ready to begin its job of gathering and transmitting vital data. For about the next three hours, NDBC monitored the buoy’s environmental and oceanographic data, transmitted via satellite. The data was compared to data on-site ("ground truth") and, with no significant discrepancies, the operation was deemed a success. The **Aspen** then proceeded on to its next operation.

Over the next two days, the **Aspen's** crew repeated this operation, replacing NOAA data buoys off Monterey Bay (# 46042) and Cape San Martin (# 46028). While similar in most respects, there were a few significant differences. As mentioned previously, no two buoy servicing operations are alike. Weather conditions are never the same and, at times, the configuration of the buoy requires adjustments to handling procedures. Additionally, the buoy's location in itself is significant.

The next day, the **Aspen** proceeded to buoy # 46042, west of Monterey Bay. While again sunny with excellent visibility, the winds were slightly stronger and the seas slightly higher. Additionally, this buoy was located in much deeper water - nearly 7,000 feet. As part of it's design, each buoy is given a certain amount of "room to roam." Due to constantly changing winds and currents, buoys must have a certain amount of slack in the mooring chain so that it is free to move about (within limits). The precise term is "watch circle radius." In the case of the first buoy worked on this trip (# 46012 off Half Moon Bay), the water depth was "only" 259 feet, with a corresponding watch circle radius of about 130 yards, meaning it had freedom of movement within a circle of that size. In the case of the much deeper water at buoy # 46042, however, the watch circle radius increased to more than 1,700 yards. When strong currents are present, the ship may have to "chase" the buoy, making its capture more difficult.

3-meter buoy on station. The vertical bars around the deck of the buoy are called "seal cages" and are placed on buoys to prevent seals from climbing aboard, thus avoiding possible harm to the seal while preventing damage to the buoy.

Buoy # 46042 also had a different mooring chain configuration, including an attached device known as a "flounder plate." NDBC was evaluating the wave data on buoys with and without this device attached.

Buoy # 46028 off Cape San Martin, replaced on the third day of the voyage, also had a directional capability, but had no "flounder plate" attached to it.

Maintaining coastal aids to navigation (and NOAA data buoys) along the California coast is the Aspen's primary mission, but it is certainly not its only mission. The **Aspen** also performs vital search and rescue, law enforcement, and pollution control missions as well. I genuinely appreciate having had the opportunity to experience life aboard the **Aspen** for a few days, and to watch her very professional crew in action.

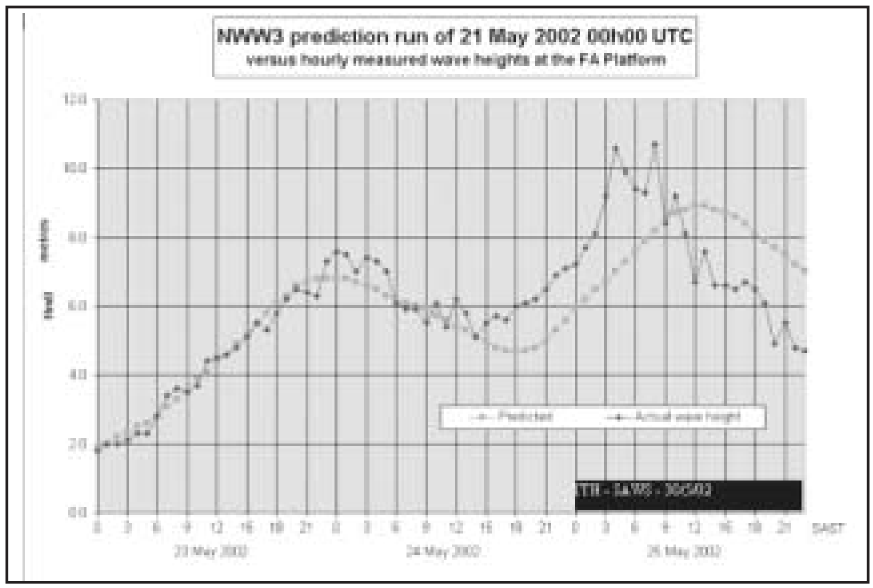
U.S. Coast Guard Cutter Aspen

Wind/Wave Damage Along the SW Cape Coast May 24-25, 2002

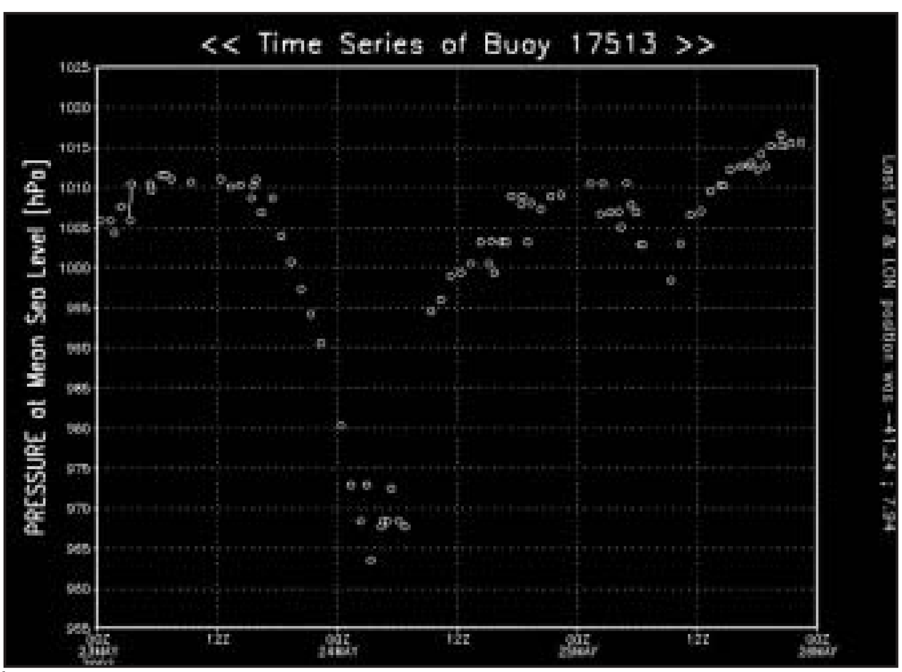
Ian T. Hunter
Deputy Director: Marine Meteorological Services
South African Weather Service

The attached time series of air pressure comes from a drifting weather buoy which was deployed by the **SA Agulhas** on 20 September 2001 during her annual relief voyage to Gough Island. Note that the air pressure at the present location of the buoy (41S 08E) plummeted almost 50 hPa from Thursday afternoon to early Friday morning - a very good example of explosive cyclogenesis.

The cold front associated with this low pressure system passed over Cape Town late on Friday afternoon, with northwesterly winds at the SAWS automatic weather station at Cape Point, gusting up to 120 km/ hr ahead of the front. Places such as Betty's Bay and Hermanus, with their mountainous terrain upwind, experienced very turbulent conditions, and there was much damage to homes in the region.



It was, however, the waves generated by this storm that caused most of the damage to coastal structures around the SW Cape coast. The swell waves generated southwest of Cape Town the previous day arrived in the early hours of Saturday morning and unfortunately, this coincided with a spring high tide. Three, Anchor Bay, Bakhoven, Hermanus, and several other coastal sites again suffered wave damage on the scale of such legendary storms as 17 May 1984 and 5 September 2001. At Bakhoven, the National Sea Rescue Institute, NSRI's rescue craft had to be airlifted off the beach to prevent it being destroyed by the heavy surf.



On the western Agulhas Bank south of Mossel Bay, average wave heights reached almost 11m - not that far off the estimated 1-in-100 year wave height of approximately 12m for this ocean region. The various numerical models available to SA Weather Service forecasters gave very good guidance of what to expect. In fact, the global wave models run by NOAA (US National Weather Service) and the UK Met Office were predicting the extreme waves 4 days ahead of the event!

Shipwreck: MAURICE DESGAGNES

Skip Gillham
Vineland, Ontario, Canada

The small freighter **Maurice Dsegagnes** had a diverse career, mixing deep sea, coastal, Arctic and Great Lakes trading.

This vessel was originally known as **Vaasa Provider**, and it had been built in 1963 at Terneuzen, Holland. The 296-ft long by 44-ft wide general cargo carrier was sold to A/B Rauanhelmo O/Y of Finland in 1966 and sailed as **Lauri-Ragnar**. The ship was renamed **Finnrunner** when acquired by R. Nordstrom & Co. in 1971.

A year later it became the flagship of Desgagnes Navigation and moved to Canadian registry as **Maurice Desgagnes**, where it replaced the ill-fated **Voyageur D**. that had been lost on the St. Lawrence in January 1972.

Maurice Desgagnes initially operated between Montreal and Sept Iles, PQ. Other trips included a voyage to Brazil in 1973, annual excursions in the summer supply run to the Canadian Arctic and occasional trading into the Great Lakes.

On February 26, 1974, the vessel made the news when it caught fire while in Montreal. The fire damaged the interior and resulted in minor burns to the Captain, his wife and infant daughter. Just over a year after that tragedy, the ship collided with the **Skua** at Sorel on April 14, 1975.

Maurice Desgagnes travelled to the Bahamas, Guatemala, and Egypt in 1978, brought steel from Europe in 1979 and had just visited Venezuela prior to heading north to load a cargo of oak railway ties.

The ship loaded the last cargo at New Orleans, LA for Sept Iles when it was caught by a late winter storm in the Atlantic on March 11, 1980. While sailing about 75 miles ESE of Halifax in 50 - 60 mph winds, a monster wave struck the vessel, causing the cargo to shift drastically

Fortunately, the Canadian destroyer **Huron** was nearby and sent helicopters in response to the distress call. They evacuated all 21 sailors from the listing freighter on March 12, 1980.

Maurice Desgagnes sank in the Atlantic about 30 minutes after the last man left the pitching decks.

Freighter Maurice Desgagnes

MARINE WEATHER REVIEW - NORTH ATLANTIC AREA January through April 2002

By George P. Bancroft
Meteorologist
Marine Prediction Center

Introduction

The most active period was through mid-February, when a series of low-pressure systems developed off the U.S. East Coast and tracked northeast. Most of these, with few exceptions, passed between Greenland and Great Britain. The month of January was especially stormy, with many of the lows developing hurricane-force winds. MPC issued 55 high seas warnings for hurricane force winds during January, the most in any month in MPC's North Atlantic high seas area (north of 31N and west of 35W) since 1995, when MPC began keeping a count of its high seas warnings. Only the North Pacific high seas area in January 1998 had more such warnings (60).

The weather pattern became more variable from the second week of February through April, with blocking high pressure becoming frequent over the central North Atlantic. This forced low-pressure systems to move north from the Canadian Maritimes toward Greenland and then turn east; with slow-moving cutoff lows sometimes forming over the southern high seas waters or off Portugal. The last of the events with hurricane-force winds was in late March.

Significant Events of the Period

Central Atlantic Storm of 2-4 January: Figure 1 depicts three low-pressure centers south of Newfoundland which quickly merged into one center and deepened during the following 24-hour period to form the 959-mb central Atlantic storm in the second part of the figure. Even when taking the initial central pressure from the deepest of the three centers (997 mb), the system dropped an impressive 38 mb in the 24-hour period covered by Figure 1, which was the period of most rapid deepening. By 1200 UTC January 3, MPC classified this system as a hurricane-force storm. The QuikScat image of Figure 2 confirms this, showing wind barbs as high as 70 kt south of the center. The valid time of the image is about one hour after the time of the second analysis in Figure 1. The highest wind reported by ships was 60 kt, with the **P&O Nedlloyd Sydney** (PDHY) encountering a southwest wind of 60 kt and 12.2-meter seas (40 feet) near 51N 30W at 1800 UTC January 3. The **Canmar Honour** (ZCBP5) reported a southwest wind of 45 kt and seas of 14.0 meters (46 feet), the highest seas reported in this storm. This system subsequently weakened near the eastern coast of Greenland late on January 4.

North Atlantic Storm of 4-6 January: This storm originated as a frontal wave of low pressure in the Gulf of Mexico on the first and moved off the U.S. East Coast on the third, developing multiple centers. Figure 3 depicts the primary center as the 993-mb storm near 34N 71W at 1200 UTC January 4, plus two secondary low-pressure centers to the northeast. The easternmost center deepened rapidly in the following 24 hours and became the main center, shown as the hurricane-force storm (943 mb) near Greenland at 1200 UTC January 5. The drop in central pressure was an impressive 47 mb (1.39 inches) during this period, almost 2 mb per hour. The central pressure bottomed out at 942 mb (27.82 inches) as the center reached 62N 39W six hours later. This made the storm the second deepest of the January-to-April period, not only in the North Atlantic, but also in both oceans. The highest winds and seas reported by ship were on the backside of the primary storm center off the U.S. East Coast. The **Sea-Land Performance** (KRPD) reported a north wind of 60 kt and 8.8-meter seas (29 feet) near 37N 62W at 0000 UTC January 5. The **Lykes Liberator** (WGXN) encountered a northwest wind of 55 kt and 13.7-meter seas (45 feet) near 34N 71W at 1800 UTC January 4. The redeveloped stronger system near Greenland was in an area of sparse ship data, but QuikScat data (Figure 4) revealed winds as high as 65 kt southeast of the center. The infrared satellite image (Figure 5) shows the storm near maximum intensity with a well-defined center near 60N 40W and associated frontal bands. The broadening of the frontal band well south of the center is the

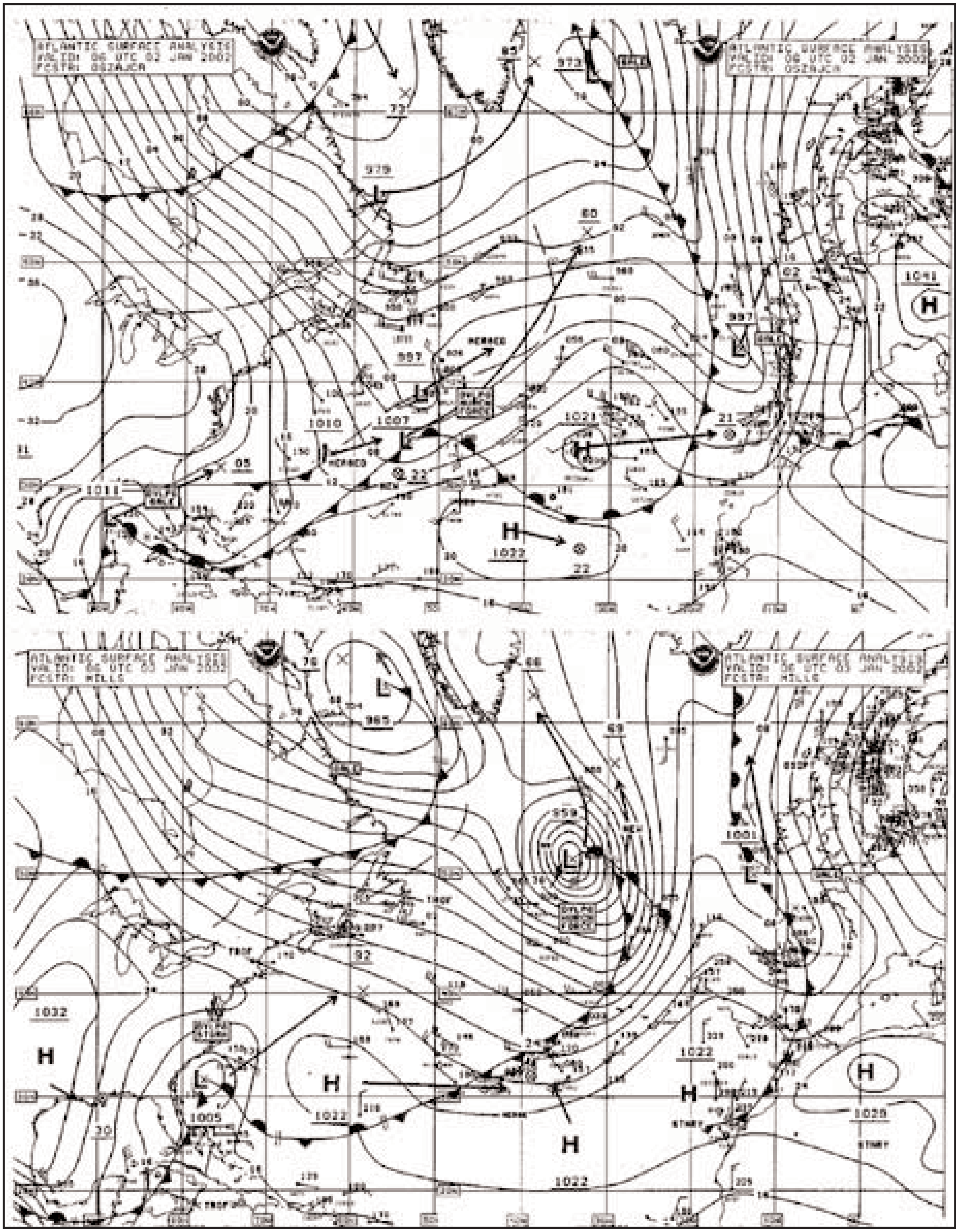


Figure 1. MPC North Atlantic Surface Analysis charts valic 0600 UTC January 2 and 3, 2002.

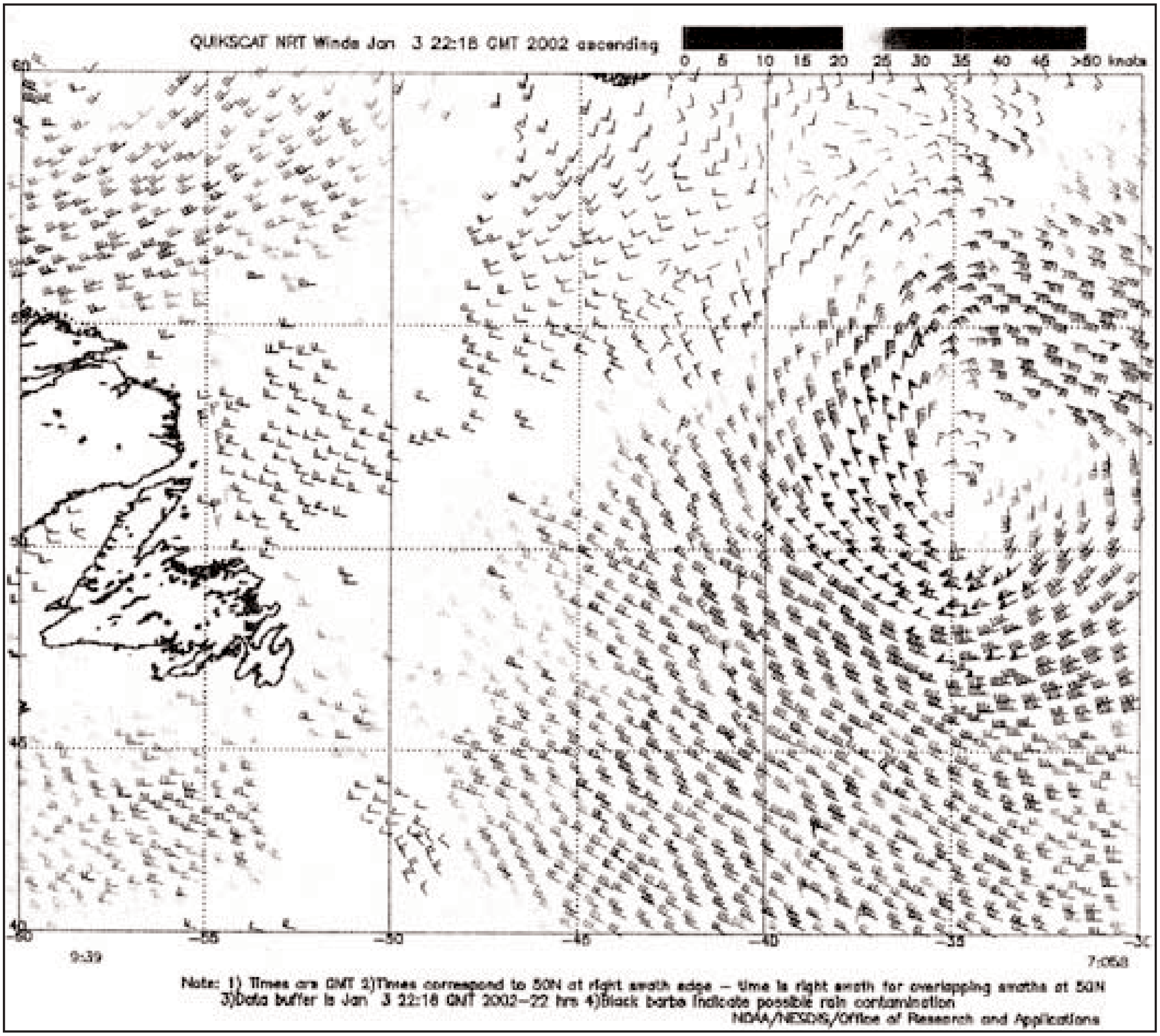


Figure 2. QuikScat scatterometer image of satellite-sensed winds valid approximately 0700 UTC January 3, 2002.
(*Image courtesy of NOAA/NESIDIS Office of Research and Applications)*

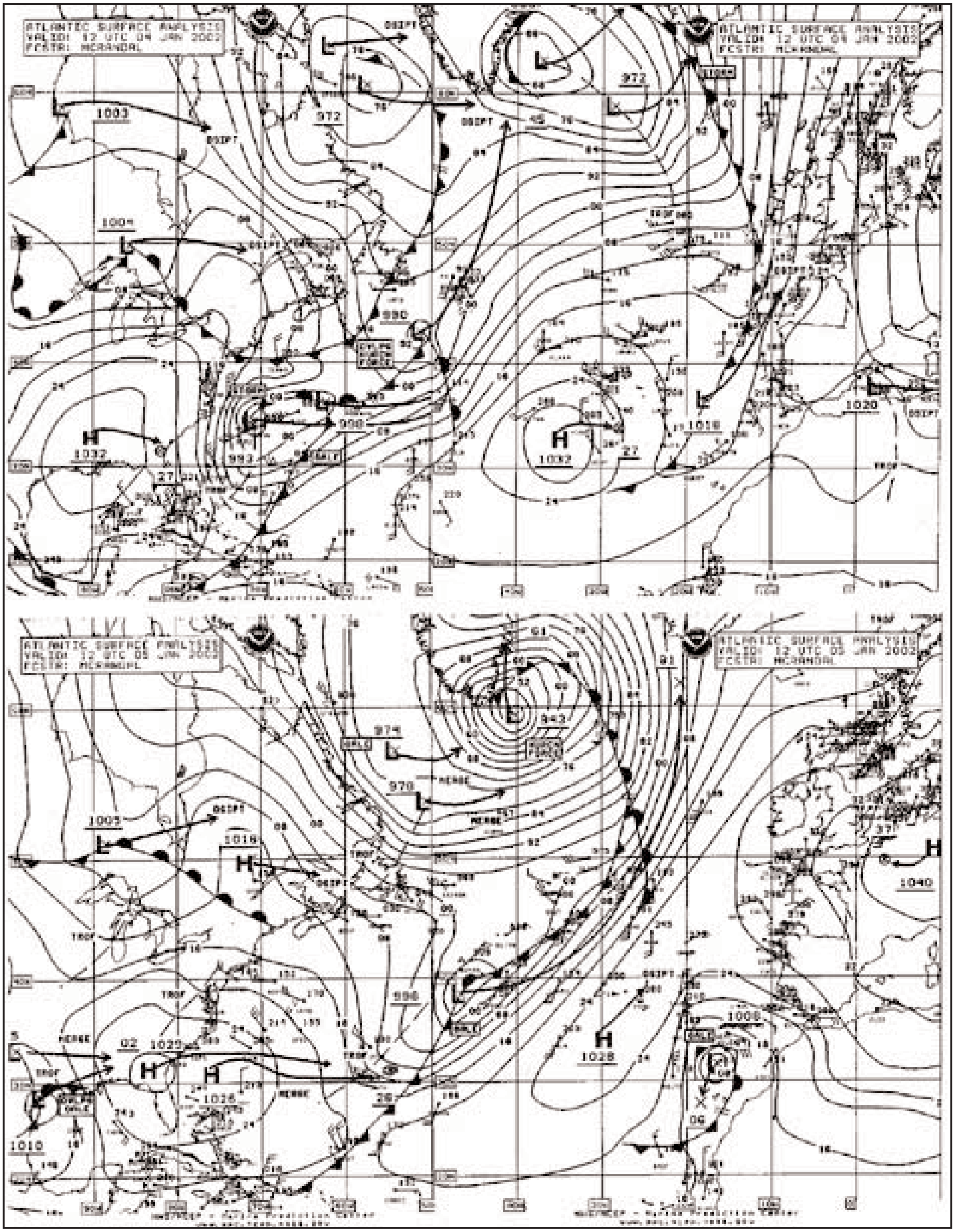


Figure 3. MPC North Atlantic Surface Analysis charts valid 1200 UTC January 4 and 5, 2002.

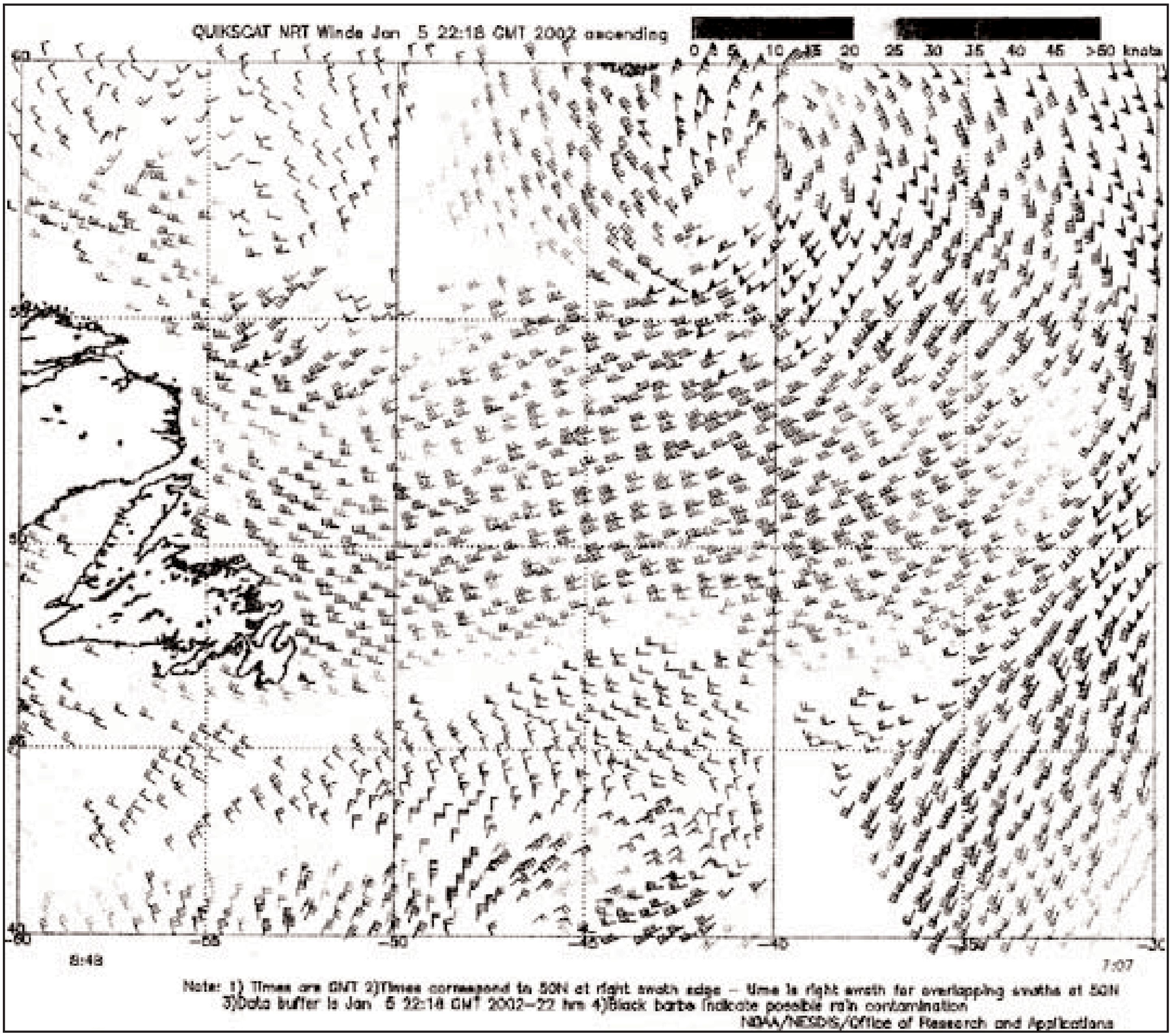


Figure 4. QuikScat scatterometer image of satellite-sensed winds valid approximately 0700 UTC January 3, 2002.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

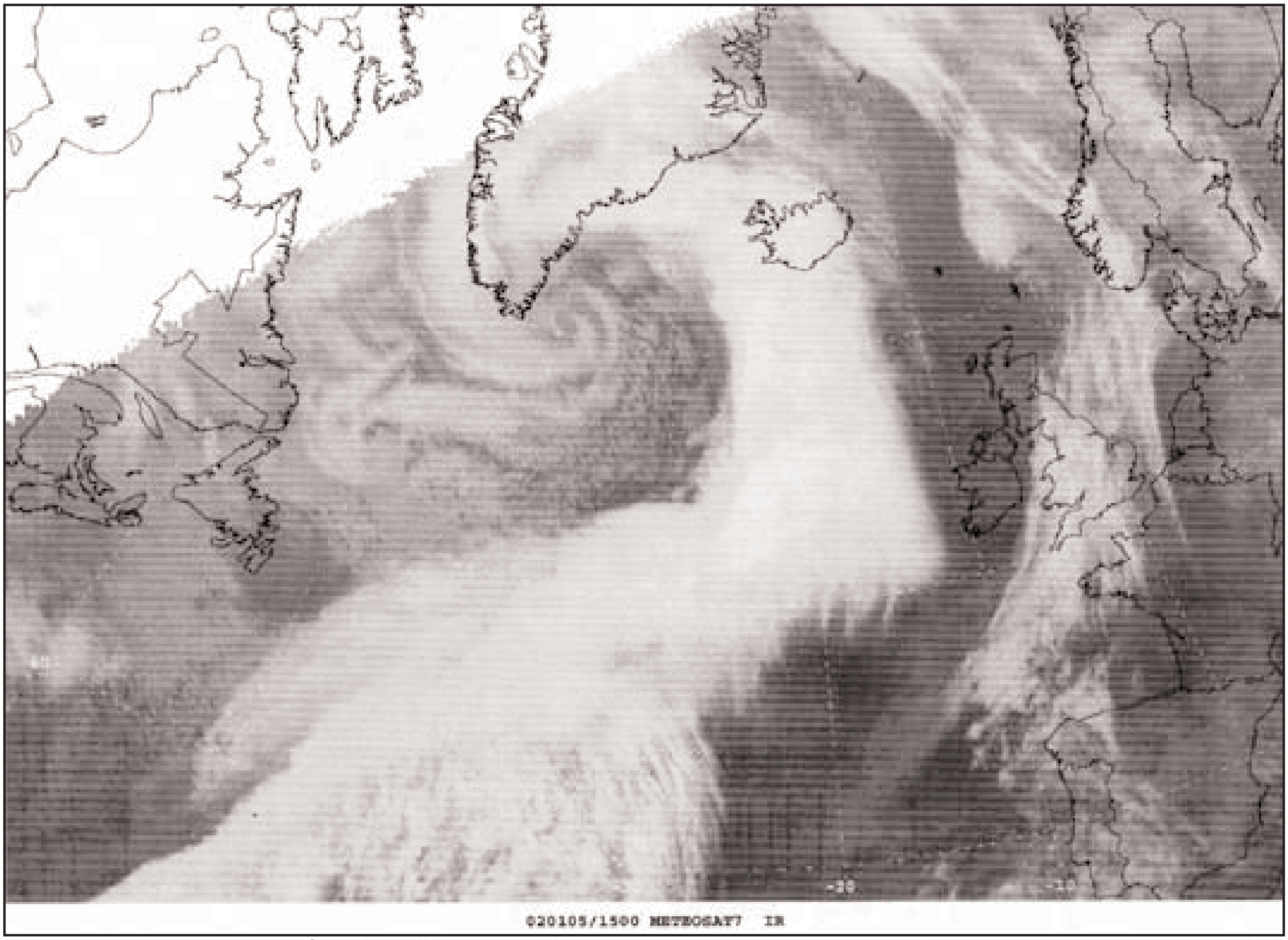


Figure 5. METEOSAT 7 infrared satellite image valid 1500 UTC January 5, 2002. Satellite senses temperature on a scale from warm (black) to cold (white) in this type of image. The valid time is only 3 hours later than that of the second surface analysis in Figure 3.

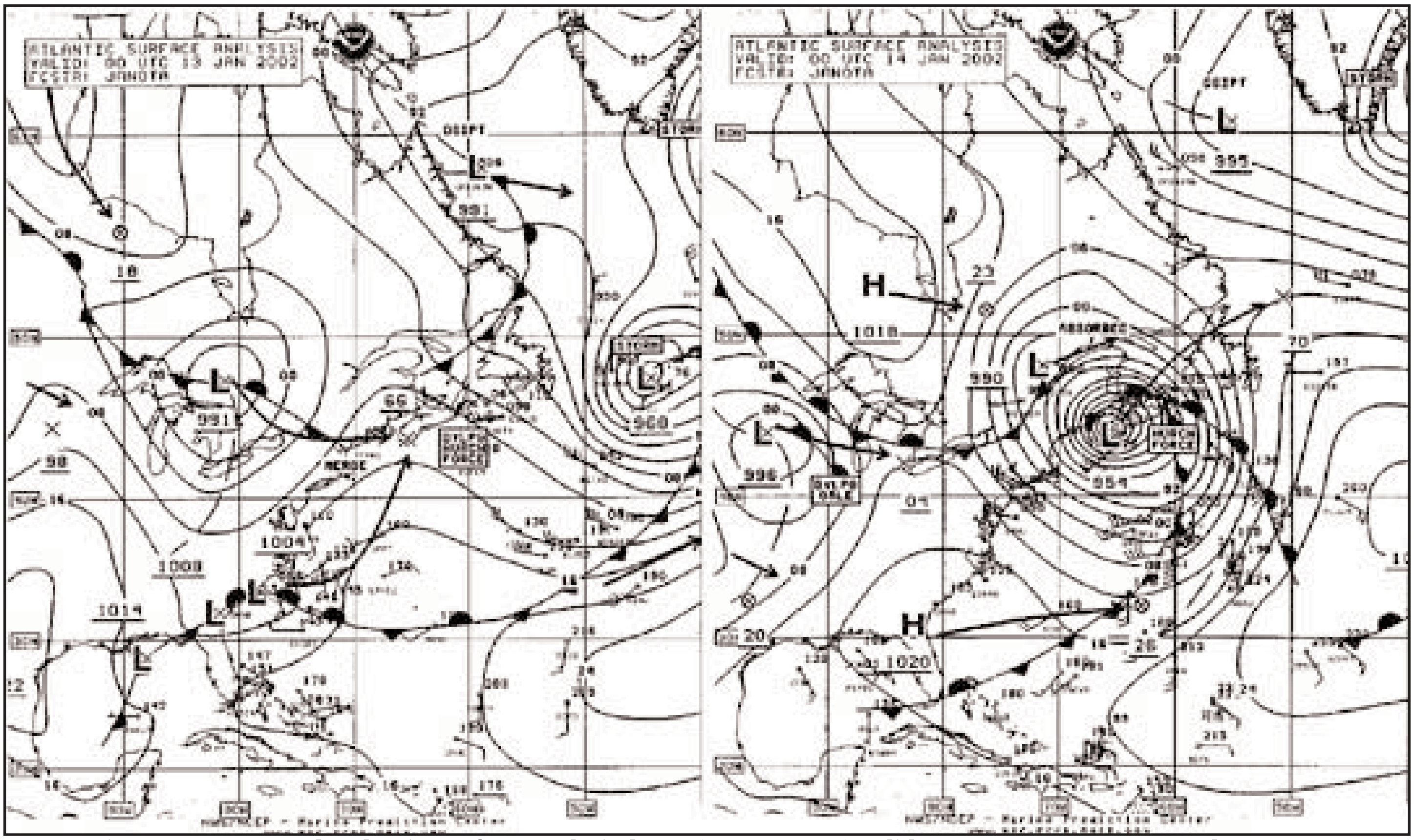


Figure 6. MPC North Atlantic Surface Analysischarts (Part 2 - west) valid 0000 UTC January 13 and 14, 2002.

low on the trailing front, depicted near 39N 47W in the second part of Figure 3, which subsequently moved rapidly northeast past Iceland by 1800 UTC January 6, while the main center weakened near the Greenland coast.

Gulf of Maine “Bomb” - 13-16 January: Originating near the Carolina coast at 0000 UTC January 13, this system developed explosively as it passed east of New England on the afternoon of January 13 Figure 6 depicts the storm during its most rapid development over a 24-hour period. The central pressure dropped 50 mb (1.48 inches) during this period, with 34 mb of that drop occurring in the last 12 hours. The storm reached maximum intensity at 0000 UTC January 14 (954 mb or 28.17 inches), before beginning a slow weakening trend while continuing on a northeastward track across the Canadian Maritimes. The hurricane-force winds in this storm were mainly south and southwest of the center and lasted only 12 to 18 hours, but were quite intense. The **British Harrier** (MZFK4) encountered southwest winds of 80 to 90 kt near 43N 66W in the six hour period ending at 0600 UTC January 14, and seas of 14.9 meters (49 feet) near 43N 65W at 1200 UTC January 14. By comparison, a QuikScat pass taken about 2230 UTC January 13 shows winds of 75 kt in the Gulf of Maine (Figure 7). The **Pharos** (ELTX9) reported west winds of 55 kt and 16.2-meter seas (53 feet) near 41N 56W at 1800 UTC January 14, the maximum seas reported in this storm. **Hibernia Platform** 44145 (46.7N 48.7W) clocked southwest winds of up to 77 kt at 2100 UTC January 14. Canadian buoy 44142 (42.5N 64.0W) reported southwest winds of 49 kt, with gusts to 62 kt, at 0300 UTC January 14, and seas 12.5 meters (41 feet) at 0700 UTC that same day, the highest winds and seas reported from buoys. Among coastal C-MAN stations, **Matinicus Rock** (MDRM1, 43.8N 68.7W) reported the highest winds, with a northwest wind of 55 kt and gusts to 65 kt at 2300 UTC

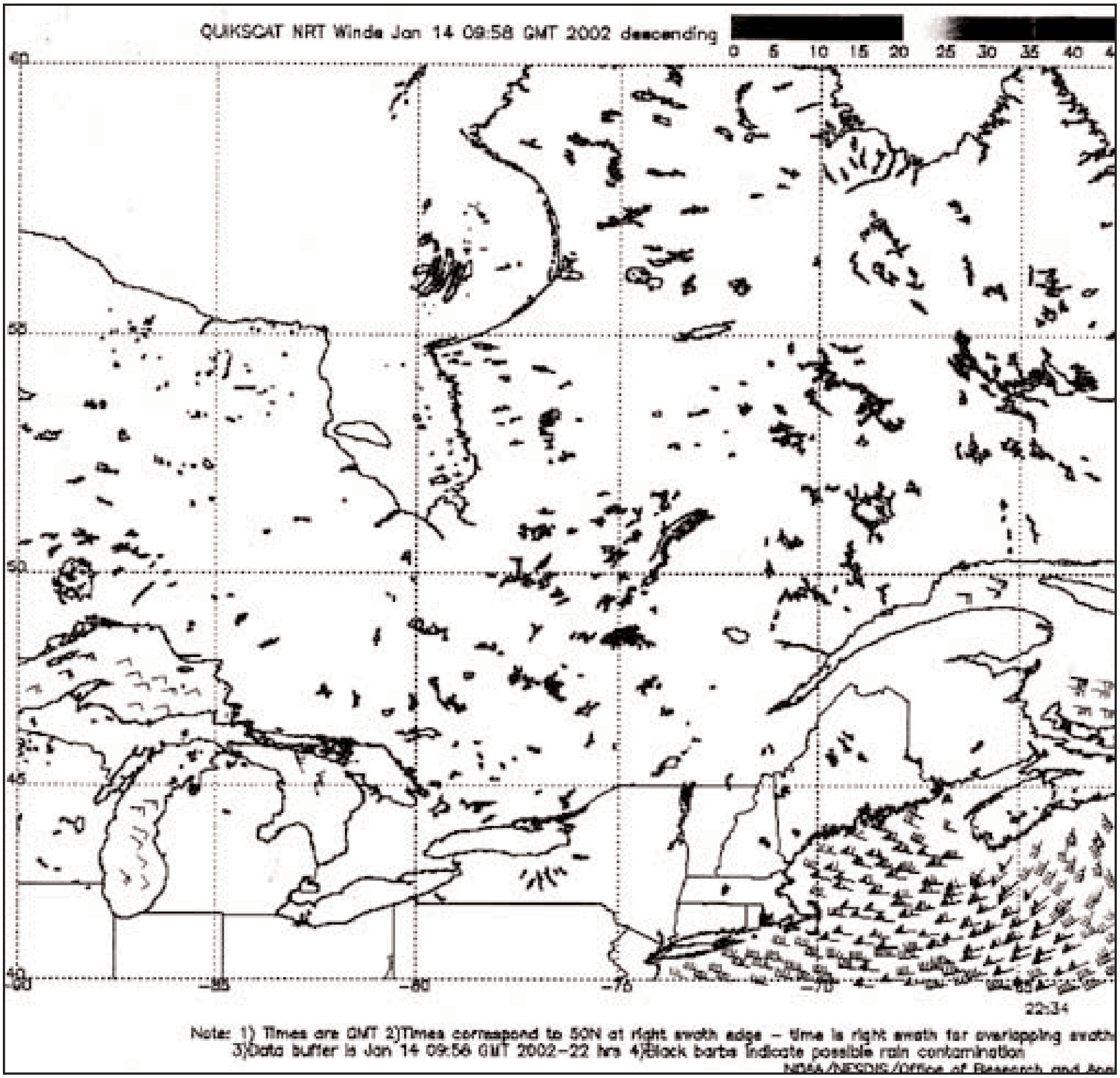


Figure 7. QuikScat scatterometer image of satellite-sensed winds valid approximately 2230 UTC January 13, 2002.

(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

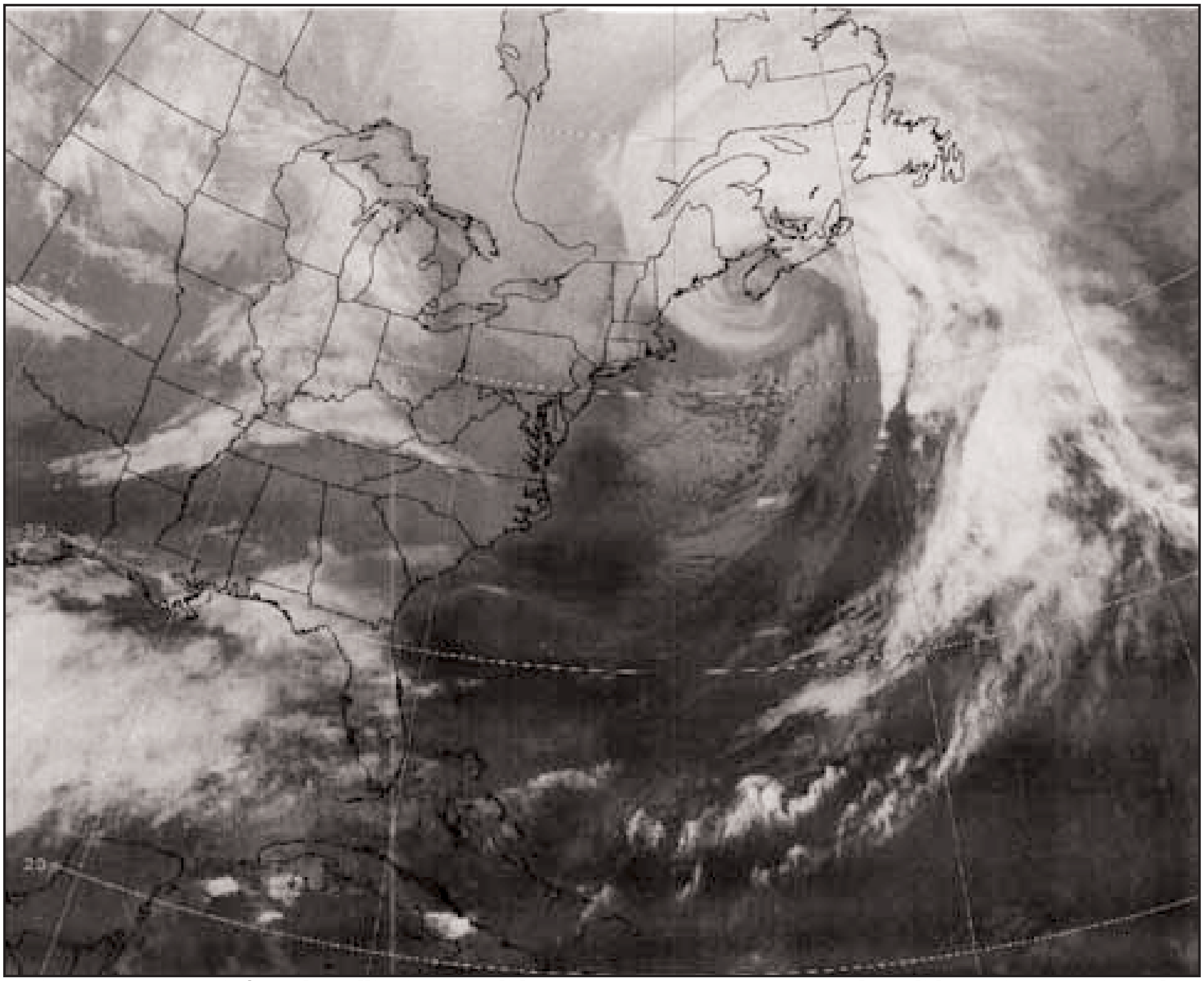


Figure 8. GOES-8 infrared satellite image valid 0015 UTC January 14, 2002. The valid time is approximately that of the second surface analysis of Figure 6.

January 13. The infrared satellite image of Figure 8 shows the storm near maximum intensity with a well-defined center near Cape Sable and strong convection along a portion of the cold front near 59W. The storm subsequently stalled east of Greenland on January 16, where it weakened to a gale by the next day.

North Atlantic Storm of 16-20 January: After passing northeast through MPC's offshore waters on January 15, this system absorbed two other lows to the north, pulled arctic air into its circulation and accomplished much of its intensification in the 24-hour period ending at 0600 UTC January 17. At 0600 UTC January 17, the storm center was at 50N 46W with a central pressure of 972 mb. The **Talisman** (LAOW5) south of the center near 43N 46W reported a southwest wind of 70 kt. The storm's central pressure bottomed out at 960 mb near 57N 29W twenty-four hours later, similar in intensity to the January 2-4 storm. The **Alligator Reliance** (ZCBN5) encountered southwest winds of 70 kt near 48N 31W at 0000 UTC January 18. The **Irving Primrose** (8POI) encountered west winds of 65 kt near 54N 27W at 1200 UTC January 18. Buoy 62108 (53.4N 19.4W) reported 12.2-meter seas (40 feet) six hours later. At 0000 UTC January 19, the ship **ZCBP6** reported west winds of 50 kt and seas of 11.0 meters (36 feet), the highest seas reported by ship in this event.

Eastern Atlantic Storm of 19-22 January: While the aforementioned storm was elongating and weakening

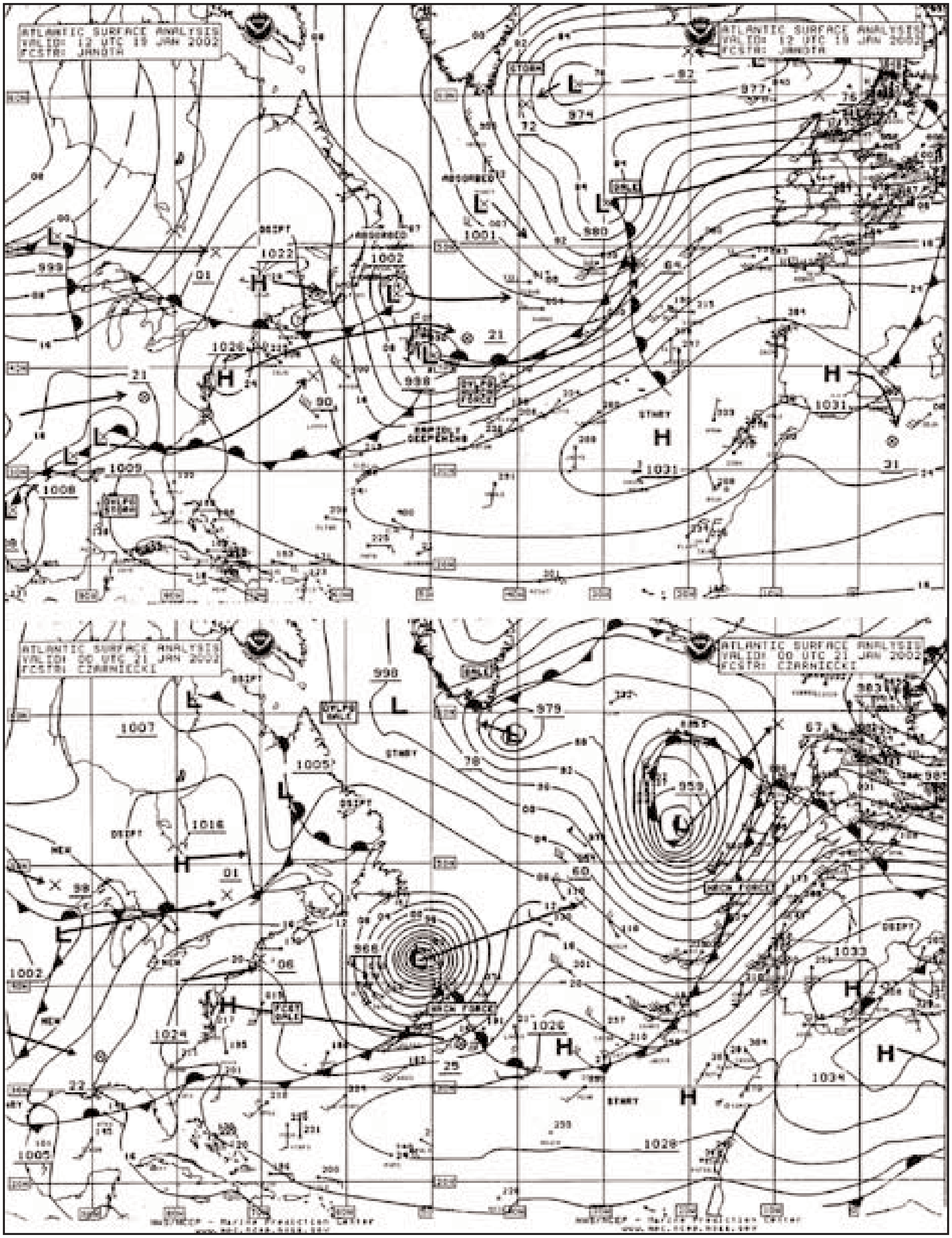


Figure 9. MPC North Atlantic Surface Analysis charts valid 1200 UTC January 19 and 0000 YTC January 21, 2002.

east of Greenland (Figure 9), a storm developed in the eastern North Atlantic with an intensity similar to that of the 2-4 and 16-20 January storms, but tracked farther east. The first part of Figure 9 shows the system passing south of Newfoundland. Rapid intensification followed as the system absorbed the low to the northwest near Cape Race with its trailing arctic front, and the central pressure dropped 35 mb in the 24-hour period ending 0600 UTC January 20. The second part of Figure 9 shows the storm at maximum intensity (959 mb) west of Ireland. At 1200 UTC January 20, the **Leverkusen Express** (DEHY) near 47N 31W, and the **Marchen Maersk** (OWDQ2) near 47N 25W, encountered winds from the northwest and southwest at 60 kt, respectively. The **Lykes Liberator** (WGXN) to the west near 45N 41W reported northwest winds of 45 kt and 11.3-meter seas (37 feet) at this time. QuikScat data (not shown) available around this storm near maximum intensity revealed hurricane-force winds of 65 kt south of the center in an area of no ship data. The storm subsequently weakened to a gale while passing just north of the British Isles on January 22.

North Atlantic Storm of 20-23 January: Again referring to Figure 9, this storm followed immediately in the wake of the preceding event and was unlike most preceding storms in that it developed earlier and farther south after moving off the U.S. East Coast. The period covered by Figure 9 includes the period of most-rapid intensification, the 24-hour period ending at 0000 UTC January 21 when the central pressure dropped 39 mb. The center developed a maximum intensity of 961 mb in the central North Atlantic eighteen hours later. The ship **SLCO** (40N 58W) reported a west wind of 60 kt at 1800 UTC January 20. Six hours later, the ship **ZQYJ6** encountered northwest winds of 60 kt near 39N 56W. At 0600 UTC January 21, the **Nordmax** (P3YS5) near 38N 51W experienced northwest winds of 50 kt and 12.8-meter seas (42 feet). The Canadian buoy 44140 (43.7N 51.7W) reported north winds reaching 49 kt, with gusts to 66 kt, at 0200 UTC January 21 and maximum seas of 7.5 meters (25 feet) two hours later. At 1800 UTC January 22, with the storm center slowly weakening and approaching Great Britain, the **Lykes Liberator** (WGXN) near 47N 19W reported south winds of 50 kt and 13.7-meter seas (45 feet), the highest seas reported in this event. The weakening system subsequently passed east across Great Britain and the North Sea on January 23 and 24.

Northwest Atlantic Storm of 22-30 January: This storm began as multiple low-pressure centers near the northeast coast of the U.S. at 1800 UTC January 2, which moved northeast and merged into one while rapidly intensifying (by 36 mb) in the first 24 hours. At 0600 UTC January 23, with the center east of Newfoundland near 47N 49W (972 mb), MPC classified it as a hurricane-force storm. At 0000 UTC January 23, the **Zim Korea** (4XGU) near 39N 56W reported west winds of 60 kt and 8.5-meter seas (28 feet). Twelve hours later, the vessel **ELVF6** (43N 47W) encountered west winds of 55 kt and 13.4-meter seas (43N 47W). The storm center then moved north while slowly deepening and stalled on January 24, south of Greenland near 55N, blocked by a strong high-pressure ridge over Greenland. Figure 10 depicts the stalled center south of Greenland at 0000 UTC January 26 near maximum intensity. The QuikScat image in Figure 11, valid more than 15 hours prior to the valid time of the first part of Figure 10, shows hurricane-force winds up to 80 kt north of the center, off the southern tip of Greenland. The system subsequently looped back to the northwest and weakened to a gale west of Greenland by January 31. Meanwhile, other significant developments were occurring to the south and east of this persistent system, as indicated below.

Eastern Atlantic Storm of 26-28 January: Low pressure moved off the New England coast at 0000 UTC January 25 and elongated eastward while slowly intensifying. The system formed a new center to the east, which appears in the first part of Figure 10 as the 989-mb center at 42N 42W. This took over as the main center while moving northeast and intensifying, leading to the hurricane-force storm (954 mb) in the second part of Figure 10. With the long fetch of gale to storm-force southwest winds apparent in the eastern Atlantic, seas became quite high. The **Atlantic Concert** (SKOZ) reported a southwest wind of 70 kt and 17.1-meter seas (56 feet) near 48N 21W at 1200 UTC January 27, while the **Sea-Land Motivator** (WAAH) to the southwest encountered southwest winds of 45 kt and 13.7-meter seas (45 feet) near 45N 29W. Later, at 0600 UTC January 28 with the system near maximum intensity, the **Atlantic Companion** (SKPE) reported southwest winds of 65 kt near 55N 12W, while the **Arina Arctica** (OVYA2) north of the center

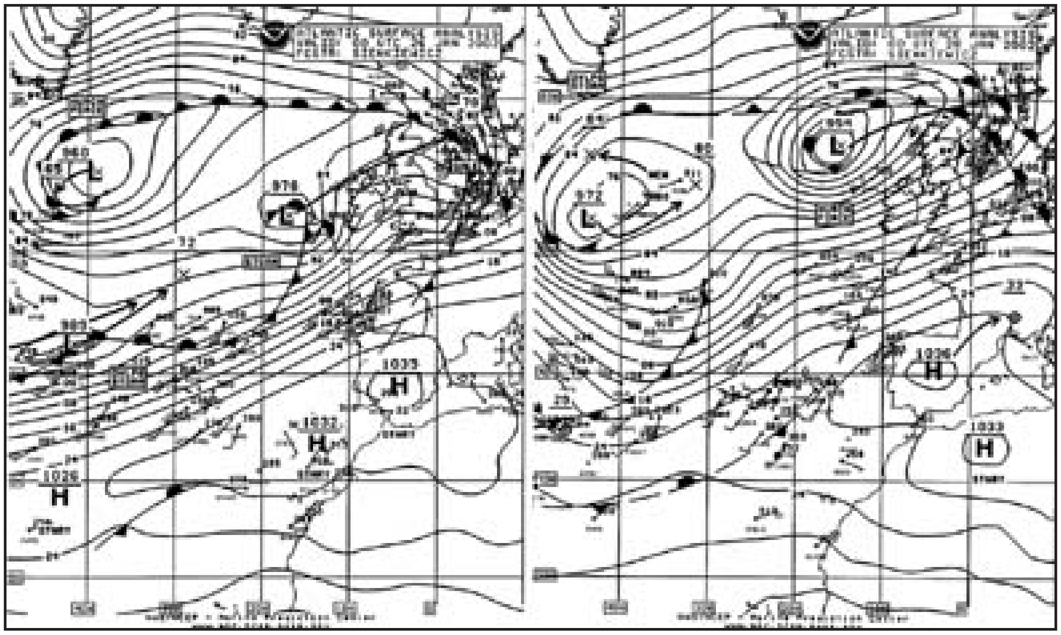


Figure 10. MPC North Atlantic Surface analysis charts (Part 1 - east) valid 0000 UTC January 26 and 28, 2002.

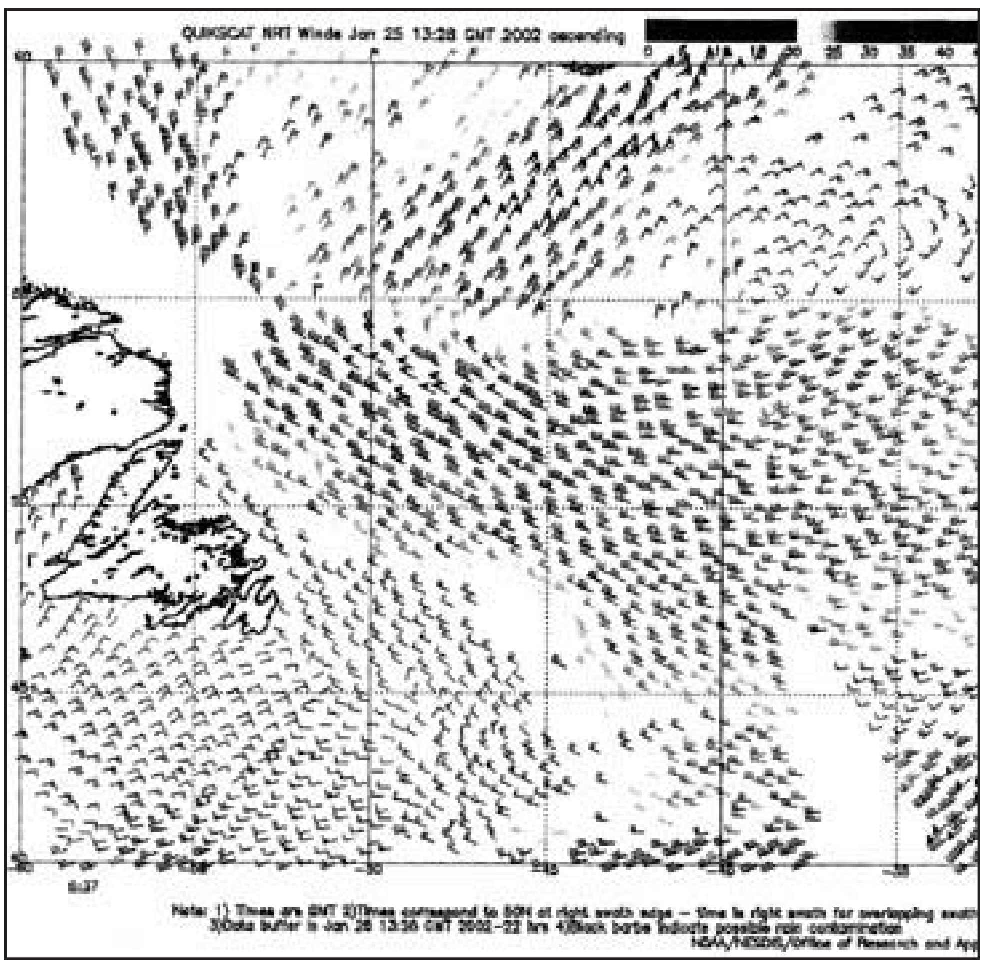


Figure 11. QuikScat scatterometer image of satellite-sensed winds valid approximately 0830 UTC January 25, 2002.
(Image courtesy of NOAA/NESDIS/Office of research and Applications)

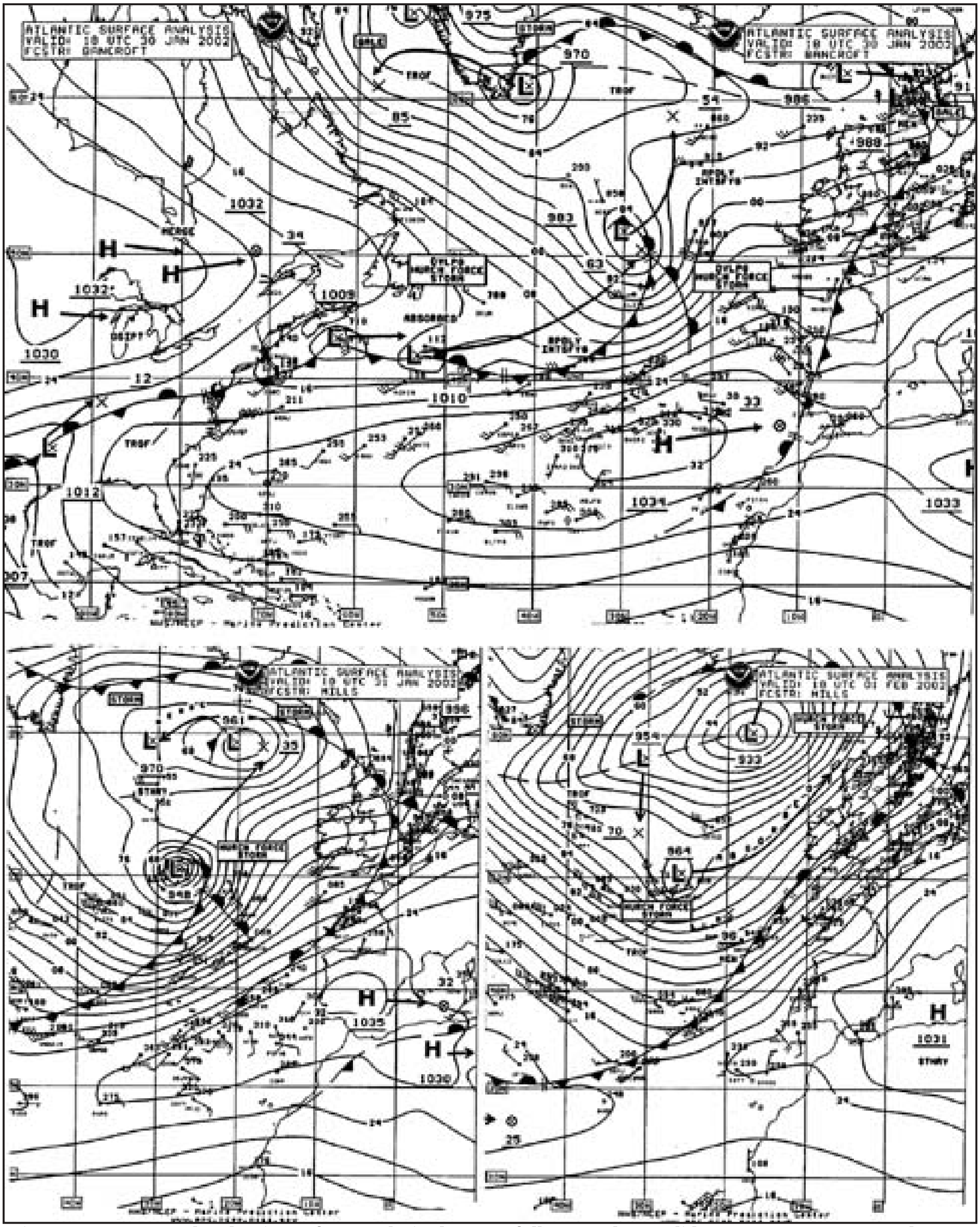


Figure 12. MPC North Atlantic Surface Analysis charts: A full-ocean chart valid 1800 UTC January 30 plus two Part 1 analysis charts valid 1800 UTC January 31 and February 1, 2002.

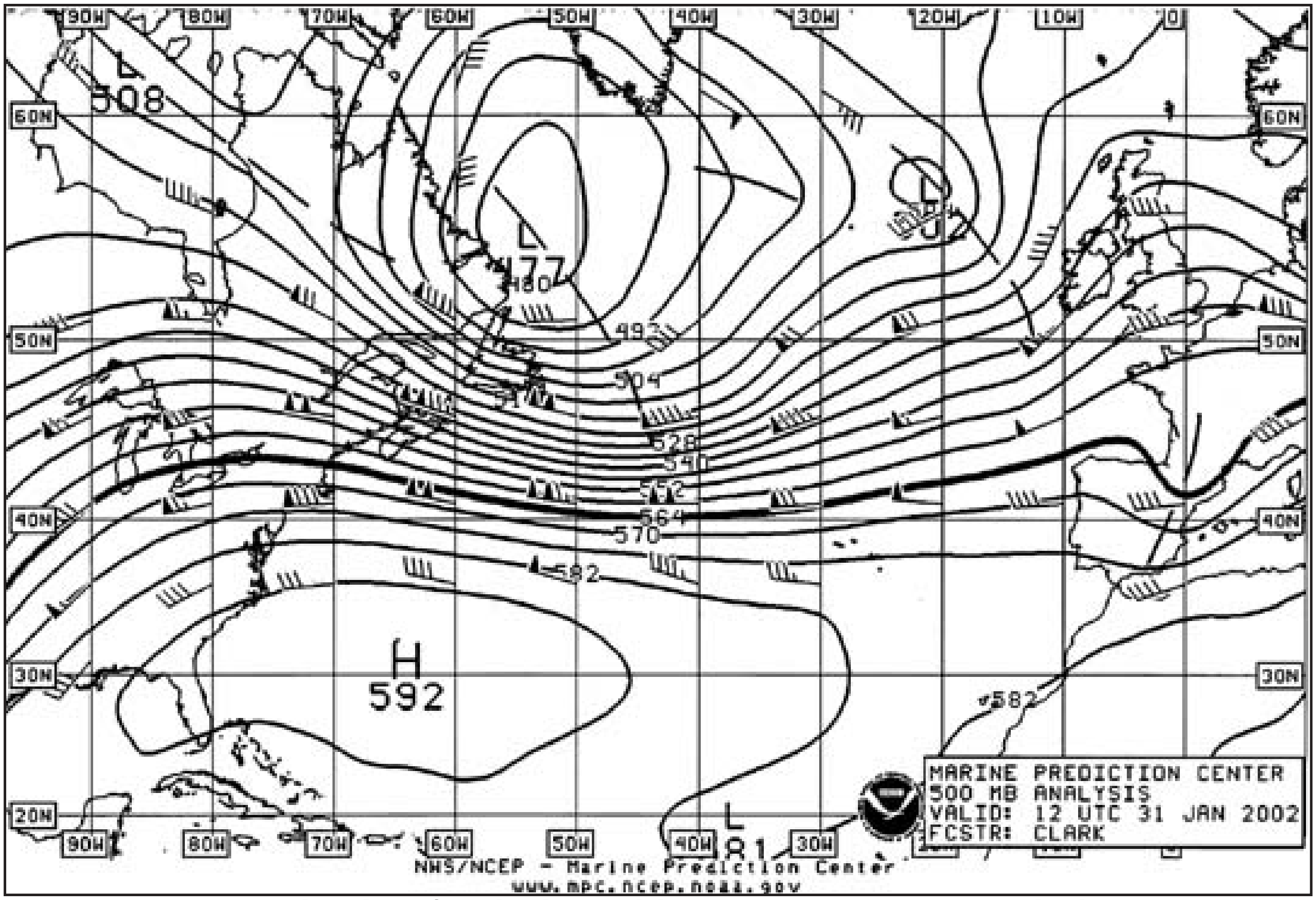


Figure 13. MPC 500-Mb analysis of North Atlantic valid at 1200 UTC January 31, 2002. The chart is computer-generated with short-wave troughs (dashed lines) added by the analyst.

experienced northeast winds of 65 kt near 62N 13W. The storm then weakened while passing north of Great Britain on the 28th before moving inland over Norway by January 29.

Eastern Atlantic Storm of January 30 to February 1: The next developing storm system moved east of the island of Newfoundland at 1800 UTC January 29 and then moved northeast while rapidly intensifying. The system is shown in the first part of Figure 12 twenty-four hours later as the developing hurricane-force storm near 52N 30W. Twelve hours later, the center was near 55N 23W with a central pressure down to 964 mb, a drop of 31 mb in 24 hours. The **Contship Endeavour** (ZCBE7) encountered west winds of 60 kt and 6.1-meter seas (20 feet) near 50N 24W at 0600 UTC January 31, after the center passed to the north. At the same time, the ship **PFAQ** nearby at 51N 24W reported west winds of 55 kt and seas of 9.1 meters (30 feet). Another ship, **ELZT6** near 47N 31W, experienced west winds of 40 kt and 10.7-meter seas (35 feet), the highest seas reported in this storm. The storm center appears in the second part of Figure 12 just south of Iceland, about to loop back to the southwest and becoming absorbed by a much larger storm system described next.

Eastern Atlantic "Bomb," January 30 to February 2: Following close behind the preceding system, the next major storm developed from the 1010-mb low south of Newfoundland shown in the first part of Figure 12. This low underwent explosive intensification with much of the deepening occurring in the first 24 hours, in which the central pressure fell 62 mb (1.83 inches) in 24 hours. Thirty-two millibars (0.94 inch) or more than half of that drop in pressure occurred in the final six hours, leading to the 948-mb hurricane-force storm shown in the second surface analysis of Figure 12. Figure 13 is a 500-mb analysis valid at a time when the surface low was deepening most rapidly. It shows strong support aloft in the form of an intense short-wave

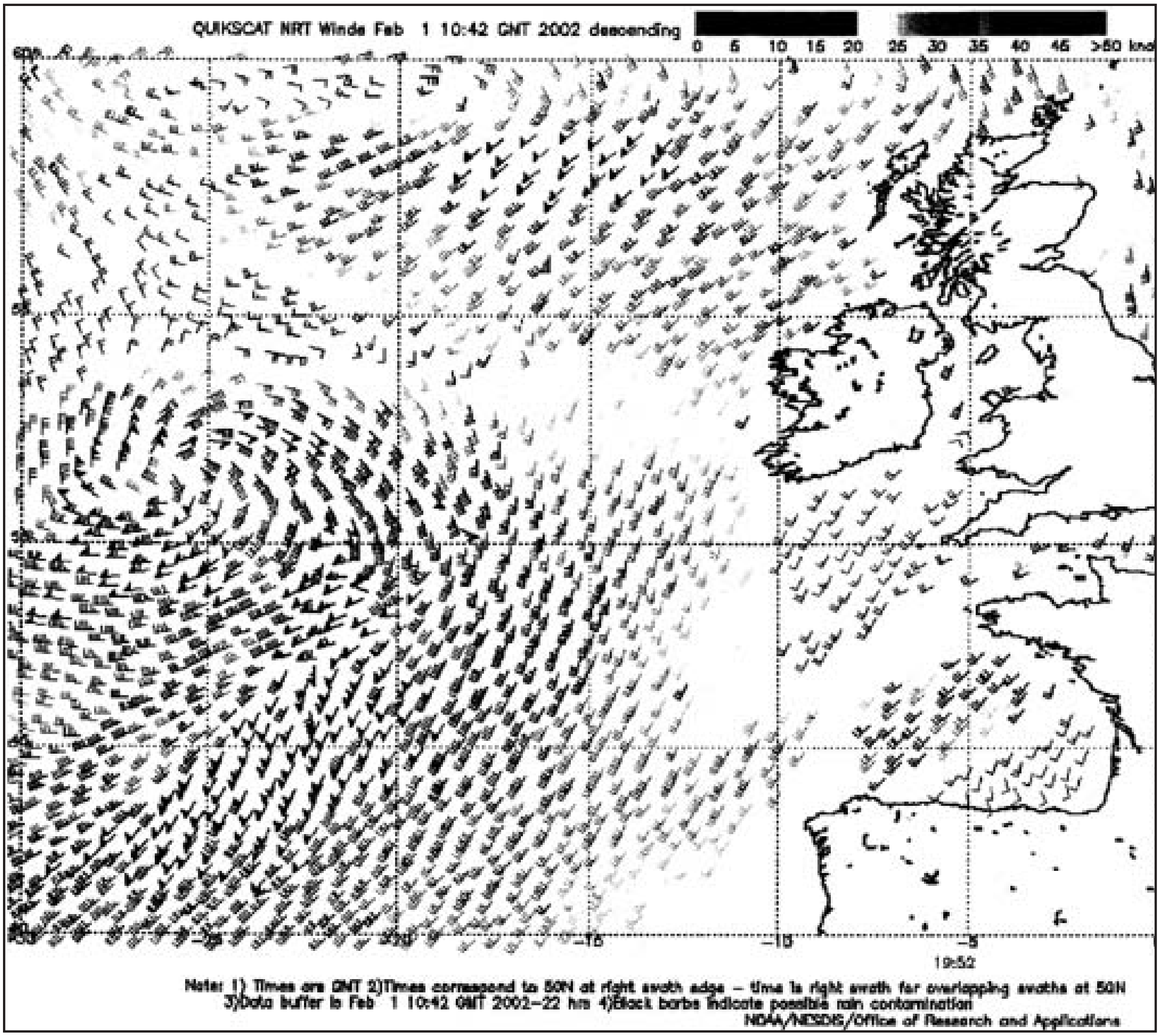


Figure 14. QuikScat scatterometer image of satellite-sensed winds valid approximately 2000 UTC January 31, 2002.
(Image courtesy of NOAA/NESDIS/Office of Research and Application)

trough and jet stream of up to 135 kt coming off the Canadian coast. In the second analysis of Figure 12 the ship **Contship Endeavour** (ZCBE7), reported a 90-kt west wind just south of the 948-mb center. This report looks reasonable when compared to the QuikScat image of Figure 14 valid about two hours later, showing two 80-kt wind barbs just south of the center. The storm center underwent further intensification in the following 24 hours, leading to the 933-mb center approaching Iceland (third part of Figure 12). The center passed over a buoy (62520 at 59.61N 16.02W) which reported pressures as low as 925 mb at 1600 UTC February 1. The infrared satellite image of Figure 15 is valid near the time of maximum intensity, revealing a well-defined main center northwest of Great Britain with cold cloud tops indicating considerable vertical development. The clouds appear more convective in the cold air behind the front, where there is a secondary circulation near 50N 29W corresponding to the new hurricane-force storm center near 50N 26W in Figure 12. The highest winds and seas occurred with this new center after the primary center pulled to the north. This is not surprising, since

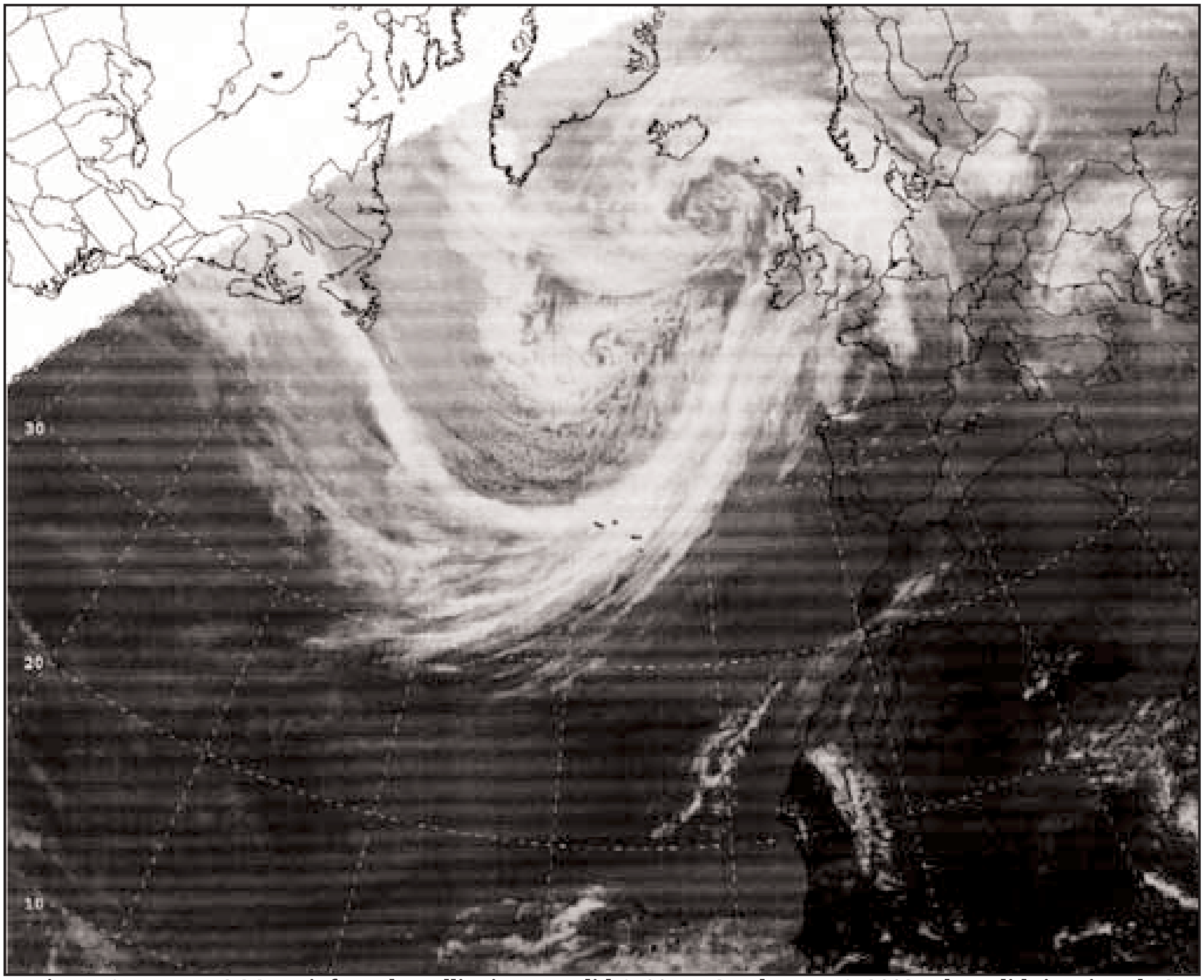


Figure 15. METEOSAT-7 infrared satellite image valid 1500 UTC February 1, 2002. The valid time is only 3 hours prior to that of the third surface analysis in Figure 12.

cold air over the ocean surface produces instability, mixing stronger winds from aloft down to the surface. The cold air also has more "bite" on the sea surface, enhancing waves. The ship **ELZU3** near 46N 47W reported a northwest wind of 70 kt at 0600 UTC February 1, while another vessel (**ELZT6**) encountered west winds of 65 kt and 19.8-meter seas (65 feet) near 47N 39W. At the same time, a buoy to the northeast (62108 near 53.3N 19.3W) reported southwest winds of 55 kt and 13.4-meter seas. Another ship, the **Atlantic Compass** (SKUN) near 49N 29W, experienced southwest winds of 50 kt and 18.0-meter seas (59 feet) six hours later. The storm subsequently passed east of Iceland late on February 2 and began to weaken.

In summary, this was the most significant event of the period, producing maximum reported winds equal to those reported in the January 13-16 storm, plus the highest seas, lowest central pressure and greatest rate of intensification.

North Atlantic Storm of 4-8 February: This system formed off the southeast U.S. coast at 0000 UTC February 4 and tracked northeast to near Sable Island 24 hours later, absorbing another low and arctic front that were over the northeastern U.S. After initially deepening 31 mb in the first 24 hours, the center underwent further intensification after passing northeast of the island of Newfoundland and developed hurricane-force winds (Figure 16). The central pressure bottomed out at 947 mb at 0000 UTC February 7 when the center was near 54N 40W. The **Fidelio** (WQVY) near 50N 43W reported a southwest wind of 65 kt at 1800 UTC February 6 (Figure 16). Also at this time, the ship LAIP5 near 46N 47W encountered a west wind of 60 kt and 11.3-meter seas (37 feet), while the **Canmar Honour** (ZCBP5) near 46N 38W experienced southwest winds of 40 kt and 14.0-meter seas (46 feet). The ship **PFAQ** near 43N 44W reported a southwest wind of 55 kt and 15.2-meter seas (50 feet) at 1200 UTC February 6. The storm system then weakened slowly while tracking east, before dissipating near the British Isles on February 9.

Northwest Atlantic Storm of 14-20 March: Unlike other storms preceding it, this hurricane-force storm developed from a primary low-pressure center which moved through southeastern Canada before exiting the southern Labrador coast and absorbing weaker lows that were south of the Canadian Maritimes (Figure 17). The central pressure dropped 33 mb in the 24-hour period ending at 1200 UTC March 15. The second part of Figure 17 shows the system at maximum intensity (956 mb). The **Newfoundland Otter** (CFD3659) reported a northwest wind of 80 kt near 53N 53W at 1800 UTC March 15. The ship **PDHW** near 46N 44W reported 11.0-meter seas (36 feet) along with west winds of 35 kt at 1200 UTC March 16. Blocked by high pressure over Greenland, the storm then moved southeast and stalled for several days near 52N 35W, weakening to a gale on March 20.

North Atlantic Storm of 17-20 April: This developing storm tracked east-northeast from Nova Scotia at 0000 UTC April 16 and intensified rapidly after passing east of Newfoundland late on April 16. The central pressure fell 26 mb in the 24-hour period ending at 0600 UTC April 18, when the center was near 52N 39W at 963 mb. The center stalled in the vicinity and became as deep as 958 mb thirty-six hours later before beginning a weakening trend. This storm was almost as intense as the March storm in terms of central pressure. The strongest winds and highest seas were southwest and south of the center. The ship **SDBQ** reported the highest wind, a southwest wind of 60 kt near 45N 43W at 0000 UTC April 19. The same ship reported a west wind of 50 kt along with 13.4-meter seas (44 feet) near 45N 44W twelve hours later. At 0000 UTC April 20, the vessel **LART5** near 42N 40W encountered west winds of 55 kt and seas of 15.5 meters (51 feet), the highest seas reported in this storm. The system accelerated toward the northeast late on the April 20, passing northeast of Iceland on April 22.

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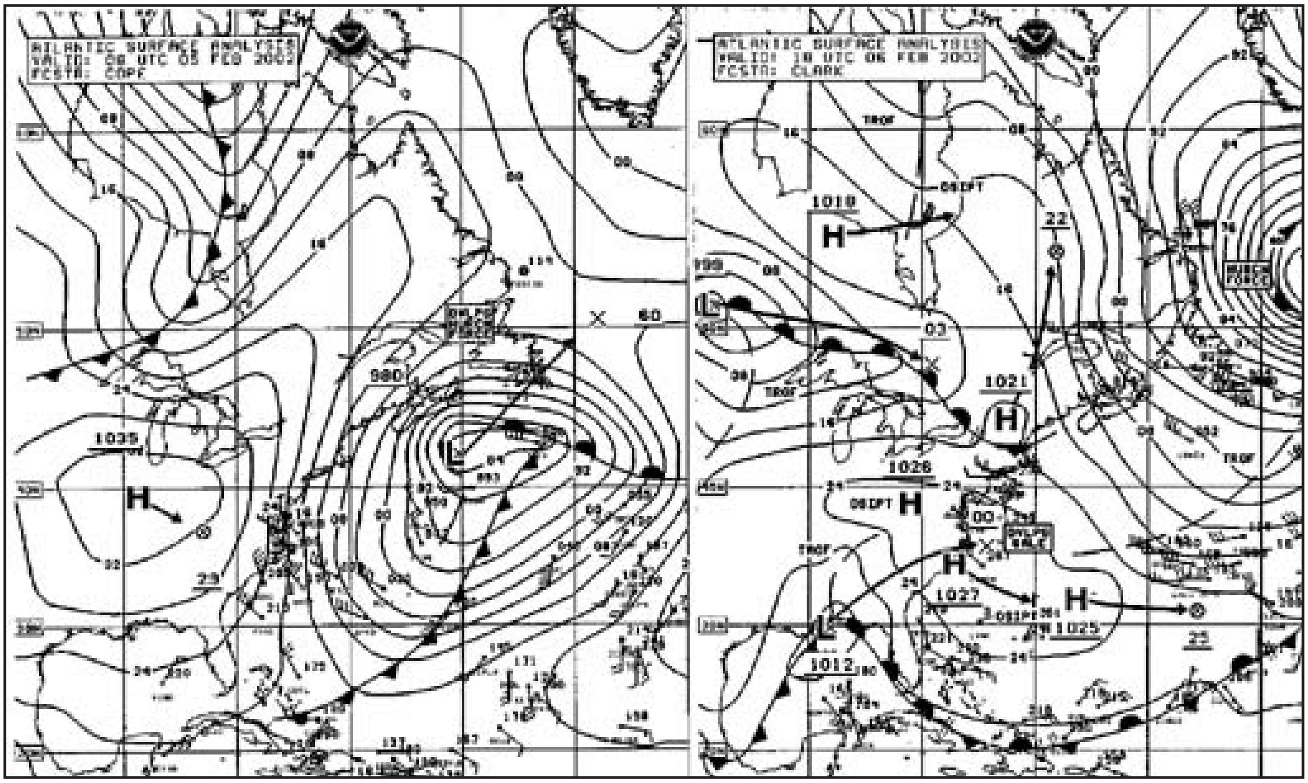

Figure 16. MPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC February 5 and 1800 UTC February 6, 2002.

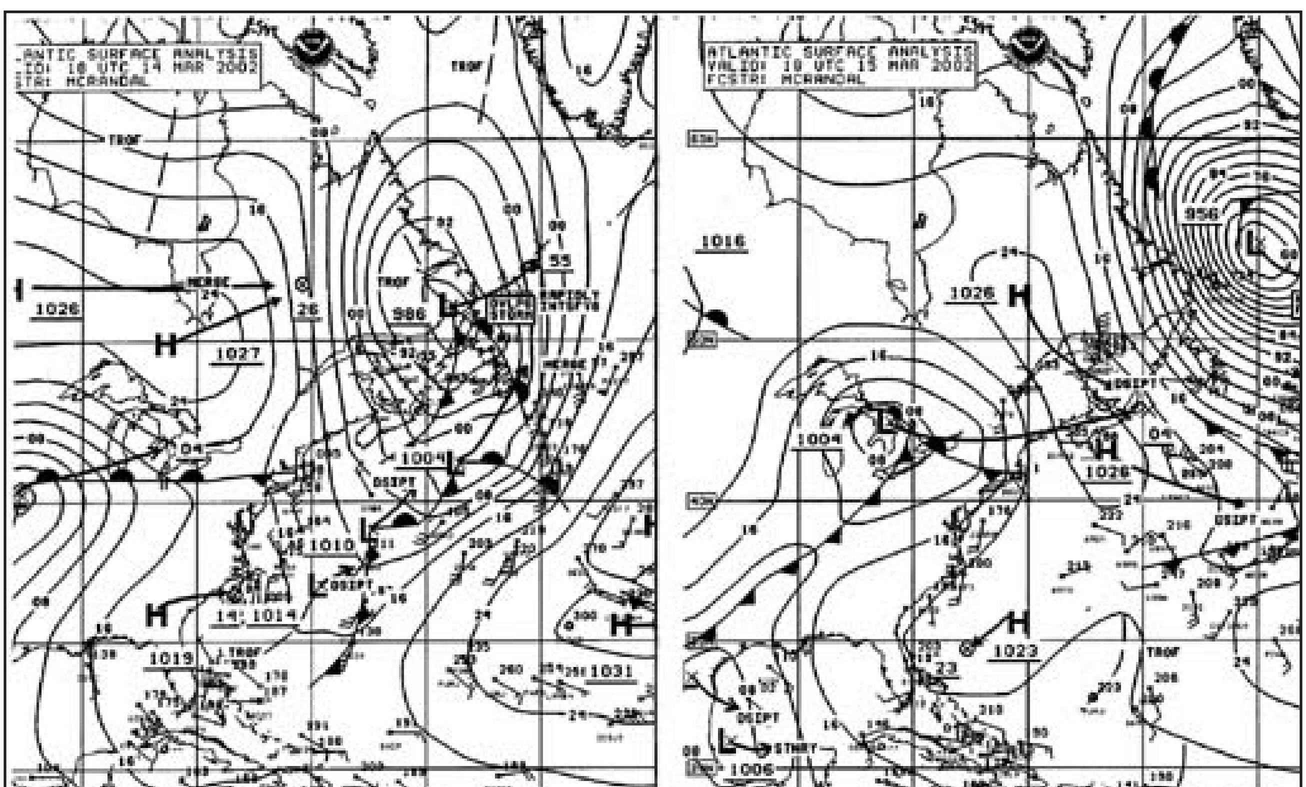

Figure 17. MPC North Atlantic Surface Analysis charts (Part 2) valid 1800 UTC March 14 and 15, 2002.

MARINE WEATHER REVIEW – NORTH PACIFIC AREA January through April 2002

By George P. Bancroft
Meteorologist
Marine Prediction Center

Introduction

The weather pattern began with low-pressure systems tracking east-northeast to the Gulf of Alaska or eastern Aleutians; but, as the season progressed, blocking high pressure became more frequent over Alaska and the eastern North Pacific, especially after mid-February. This caused low-pressure systems over the North Pacific to stall or move erratically, or move north into the Bering Sea. When using numbers of high seas warnings as a means of comparison, it would appear that the weather over the North Pacific was less active than in the Atlantic. MPC issued a January-February combined total of 22 warnings for hurricane-force winds over the North Pacific high seas area, much less than the 55 issued for the North Atlantic in January alone. Also, there were fewer high seas storm warnings issued for the North Pacific than for the North Atlantic in each of the four months.

Tropical Activity

The January-to-April period is the least active (for tropical cyclones) of the four-month periods covered in this publication. Two tropical cyclones made brief appearances near the southwest corner of MPC's oceanic surface analysis chart prepared for HF radiofacsimile transmission. Neither redeveloped into significant extratrpical storms, as described below.

Tropical Storm Mitag: Formerly a typhoon well southwest of Japan, Mitag weakened to a tropical storm upon entering MPC's oceanic surface analysis area near 19N 137E at 0000 UTC March 8, with maximum sustained winds of 50 kt and gusts to 65 kt. Blocked by building high pressure to the north, Mitag became extratropical and drifted south of the area at 1200 UTC March 8.

Tropical Depression 4W: This system formed near 17N 160E at 1800 UTC April 6 with maximum sustained winds of 30 kt and gusts to 40 kt, but it merged with a nearby front and became extratropical six hours later.

Other Significant Events

Complex North Pacific Storm of 3-6 January: A complex or multicentered area of low pressure moved off the coast of Japan on January 1. The storm center near 45N 162E became the primary center (Figure 1) and drifted east, while the old primary center near Sakhalin Island weakened. A secondary storm center emerged off the coast of Japan early on January 2 in the cold air behind the primary system and is depicted in Figure 1 as the 978-mb center at 38N 156E. Passing south of the primary storm center over warm water, this secondary center developed hurricane-force winds, as indicated in the QuikScat imagery of Figure 2, which has a valid time only one and one-half hours later than that of the first surface analysis in Figure 1. There is a 70-kt wind barb near 36N 156E associated with the surge of cold air behind the secondary storm center. The southwest winds of up to 50 kt off to the east near 172E in Figure 2 are associated with the primary storm system to the east and northeast. Thirty-six hours later, the secondary center deepened to 952 mb and became the main center, while the old center lagged behind and weakened (second part of Figure 1). Twelve hours later, the storm system redeveloped to the east as a new center formed on the front and moved toward the Gulf of Alaska. It appears in the first part of Figure 3 as the 950-mb center at 48N 150W. This was the lowest central pressure reached by any of the centers in this complex system and the second lowest pressure in the North Pacific during the January-to-April period. By 5 January, the storm circulation covered much of the North Pacific. The system subsequently lifted slowly to the north and slowly weakened, and moved inland over south central Alaska on January 7. The **Stellar Image** (3FDO6), traveling eastbound

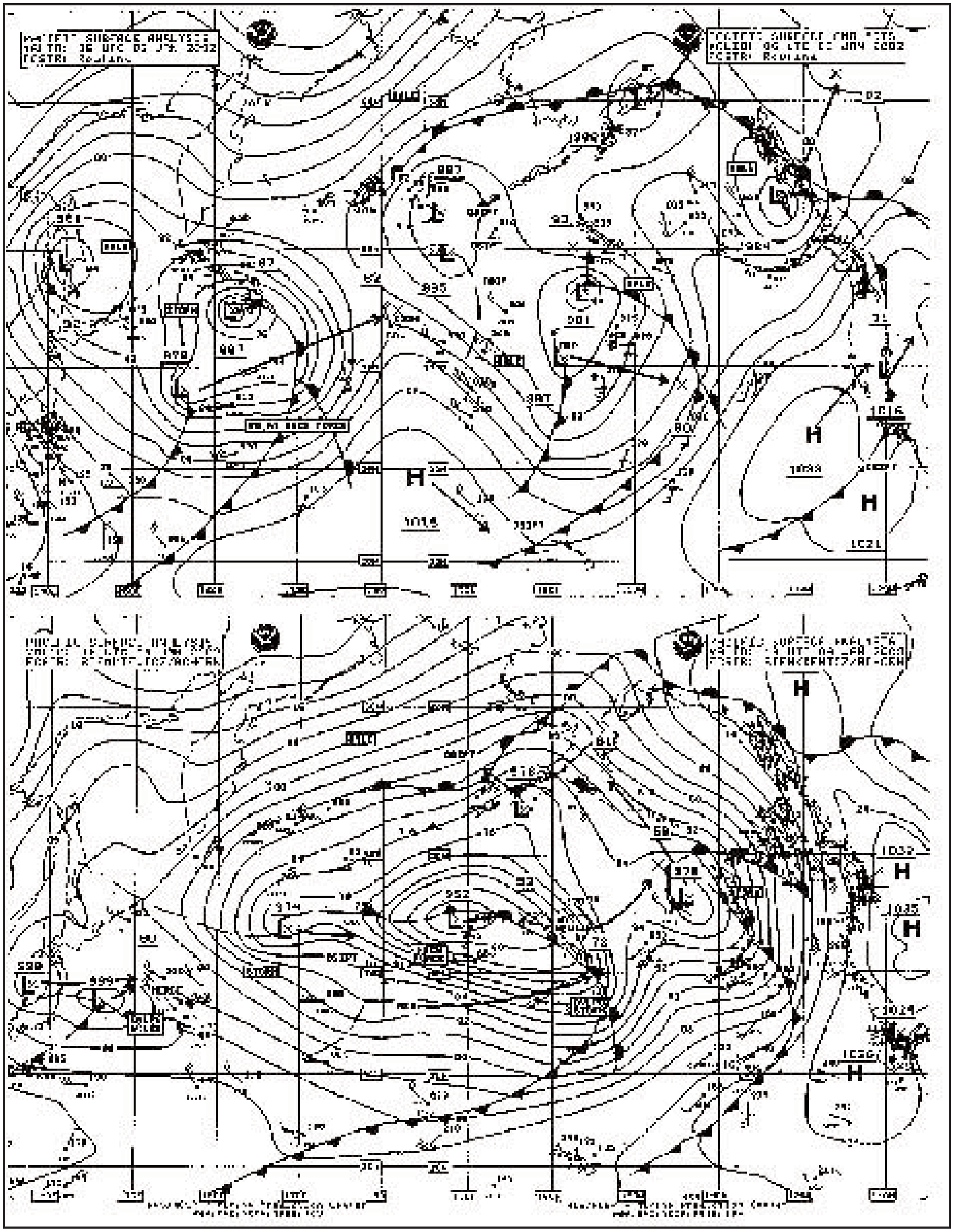

Figure 1. MPC North Pacific Surface Analysis charts valid 0600 UTC January 3 and 1800 UTC January 4, 2002.

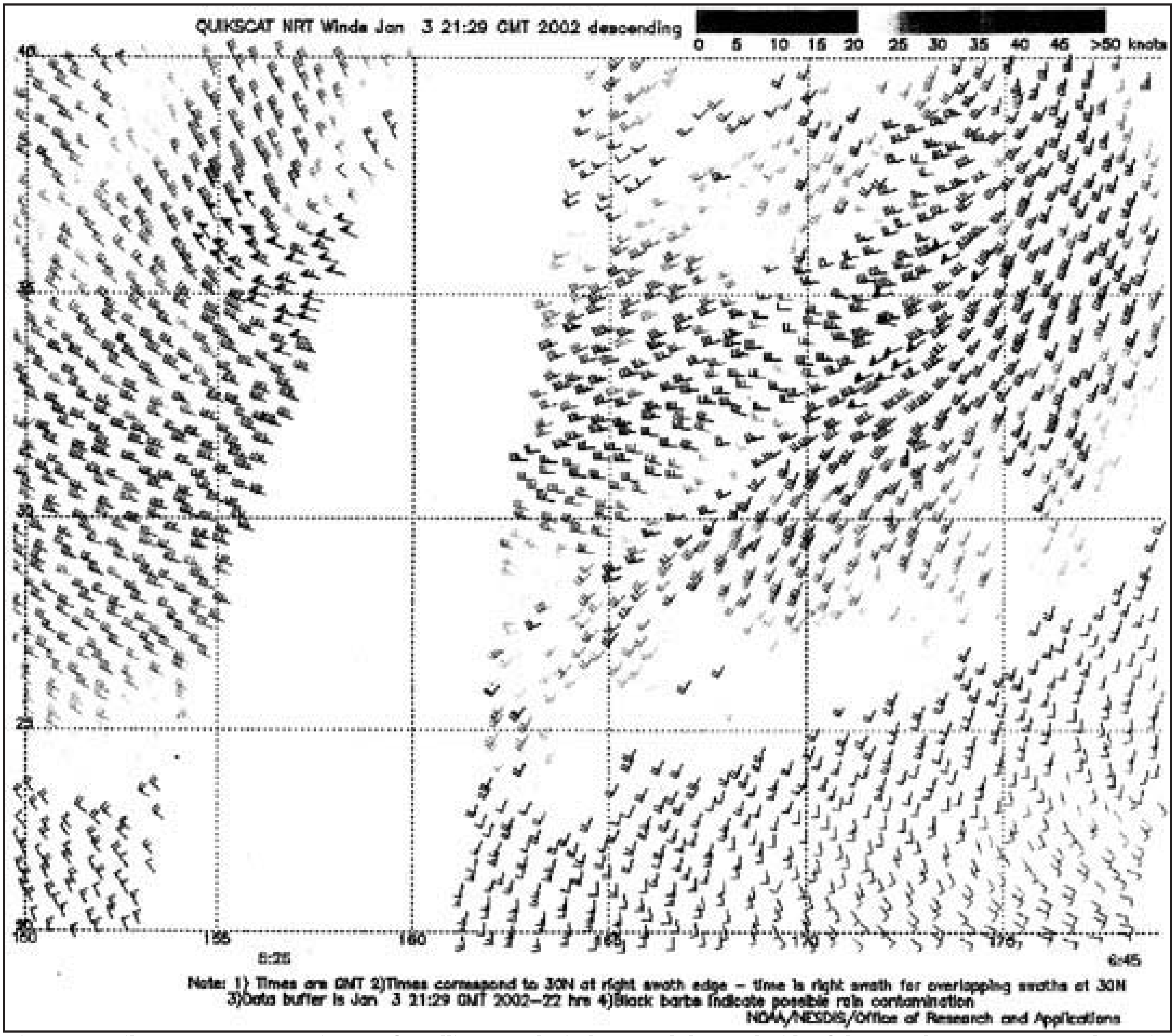

Figure 2. QuikScat scatterometer image of satellite-sensed winds around the south side of the complex storm system shown in Figure 1. The valid time is approximately 0730 UTC January 3, 2002.
(Image courtesy of NOAA/NESDIS/Office of Research and Application)

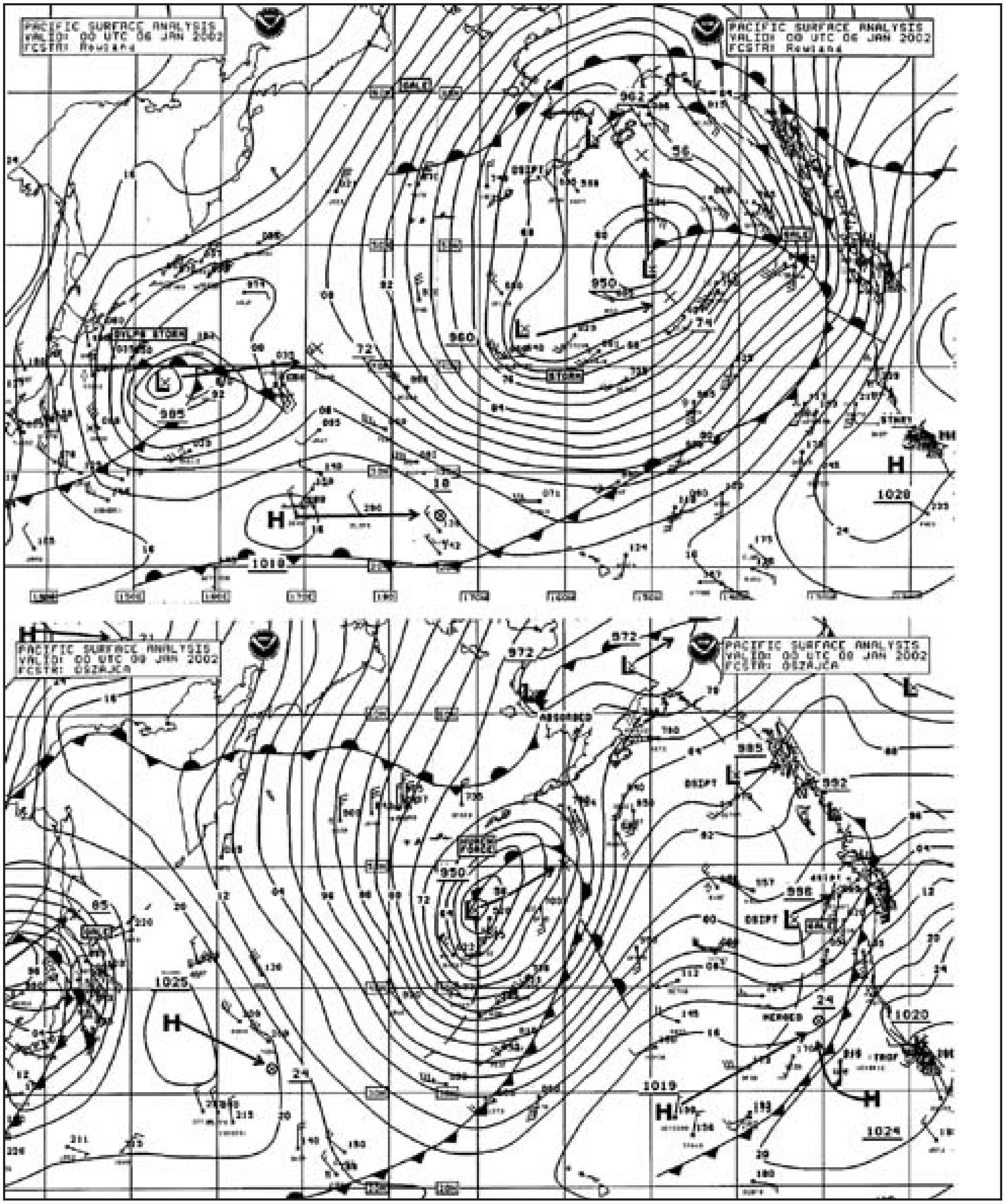

Figure 3. MPC North Pacific Surface Analysis charts valid 0000 UTC January 6 and 8, 2002.

while the storm system passed to the north, transmitted the following reports:

Location	Date/Time (UTC)	Wind (Direction, Speed in Kt)	Combined Seas (meters/feet)
37N 162E	03/0600	SW 45	11.9/39
37N 164E	03/1200	SW 50	10.4/34
37N 166E	03/1800	NW 50	13.7/45
37N 168E	04/0000	W 45	13.4/44
37N 171E	04/1200	W 35	10.7/35
38N 175E	05/0000	W 40	10.7/35
38N 176E	05/0600	W 50	11.6/38
38N 178E	05/1200	W 55	11.9/39
38N 178W	06/0000	NW 40	12.5/41

Among other reports, the **Manoa** (KDBG) encountered south winds of 60 kt near 41N 142W at 0600 UTC January 5, the highest wind reported by ships in this event. The **Rubin Stella** (3FAP5) near 40N 171W reported west winds of 55 kt and 12.8-meter seas (42 feet) at 0000 UTC January 5.

North Pacific Storm of 5-9 January: While the preceding storm system was nearing maximum strength, the next developing storm moved east of Japan at 0000 UTC January 5 and tracked east-northeast. Figure 3 shows the evolution of this system over a 48-hour period, with the second analysis depicting the storm at maximum intensity (950-mb central pressure) with hurricane-force winds. The central pressure fell 24 mb in the 24-hour period ending at 1200 UTC January 7, the most rapid rate of deepening during this event. This storm therefore could be considered a meteorological “bomb” during a portion of this period. The ship **VRWE7** reported a west wind of 50 kt and 9.1-meter seas (30 feet) near 39N 173E at 0600 UTC January 7. Twelve hours later with the storm at maximum intensity, the vessel **MHCQ7** near 43N 173W reported a northwest wind of 65 kt (Figure 3), the highest wind reported by ship in this storm. At 0600 UTC January 8, the **Stellar Image** (3FDO6) encountered southwest winds of 55 kt and 13.1-meter seas (43 feet), the highest seas reported in this event. The system subsequently turned north toward western mainland Alaska and elongated, weakening to a gale by 0000 UTC January 10 and moving inland shortly thereafter.

Western Pacific Storm of 26-31 January: This system rapidly intensified to a storm while passing off the central coast of Japan late on

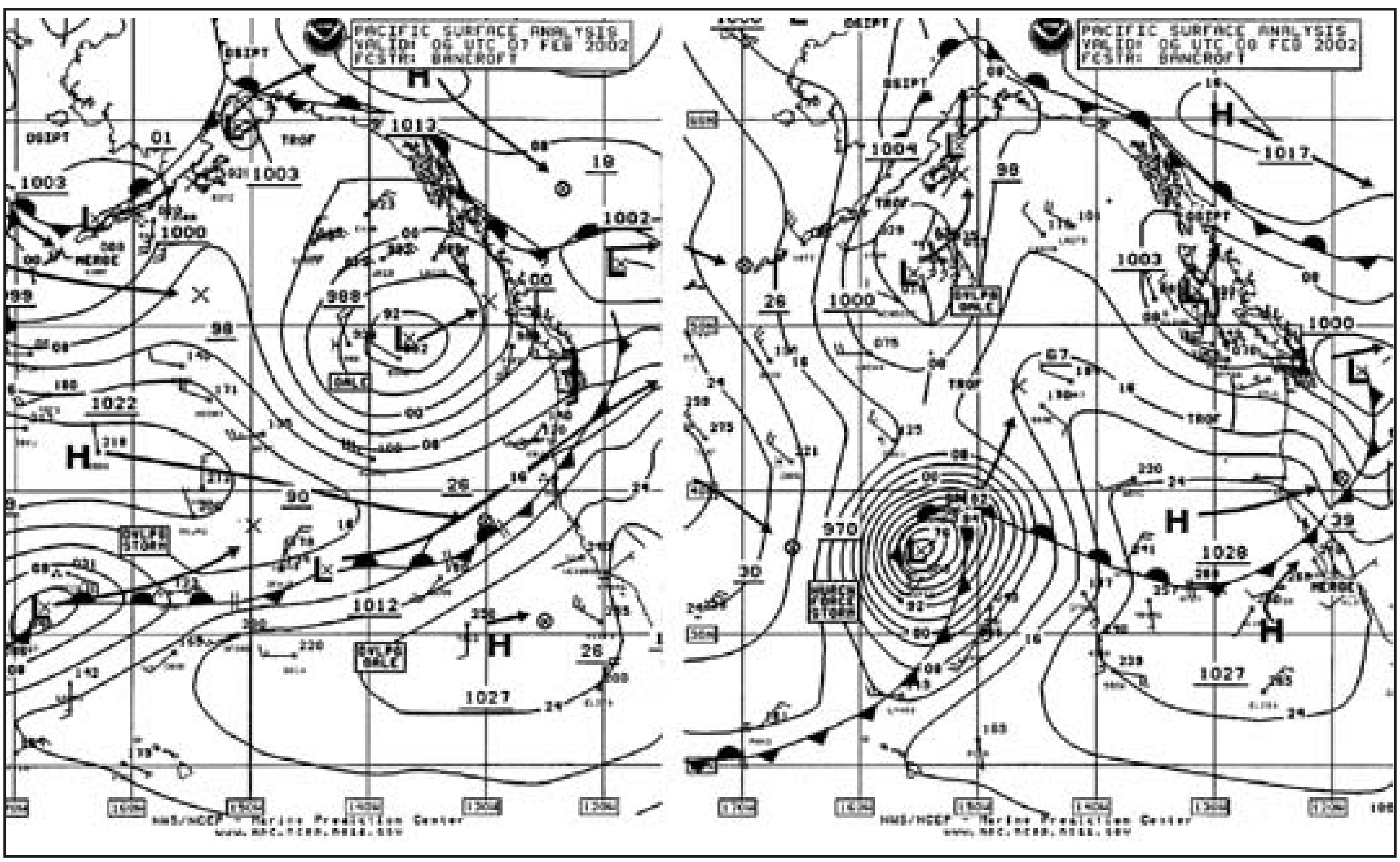

Figure 4. MPC North Pacific Surface Analysis charts (Part 1- east) valid 0600 UTC February 7 and 8, 2002.

January 26, developing a central pressure of 972 mb by 0000 UTC January 28 near 41N 148E. Although this system later was as deep as 964 mb as it moved into the Bering Sea by the 31st, the storm generated the highest winds and seas while over the North Pacific. At 0600 UTC January 27, the **President Grant** (WCY2098) reported a southeast wind of 60 kt near 37N 148E. Twelve hours later, the ship **ELXU2** encountered southwest winds of 60 kt near 34N 148E. These were the highest reported winds in this storm. At 1200 UTC January 29, the vessel **ELYD5** encountered southwest winds of 50 kt and seas of 12.2 meters (42 feet) near 44N 161E, and six hours later the same winds and seas up to 15.2 meters (50 feet), the highest seas reported in this storm. The system later weakened to a gale and turned east after reaching the central Bering Sea late on the January 31.

Eastern Pacific "Bomb," 7-10 February: Low pressure passed south of Japan early on February 3 and tracked about due east with little development until the center crossed 170W on the 7th. Rapid intensification occurred as the center turned toward the northeast (Figure 4). The central pressure fell 32 mb in the 24-hour period ending at 0600 UTC February, with 22 mb of that fall occurring in a six hour period ending at 0000 UTC February 8. The 500-mb analysis of Figure 5 corresponds with this period of most rapid intensification. This development is associated with a short-wave trough in the southern branch of the jet stream at 500 mb. The weaker low in the western Gulf of Alaska is associated with its separate short wave and northern branch of the jet stream. Both systems are well defined in the

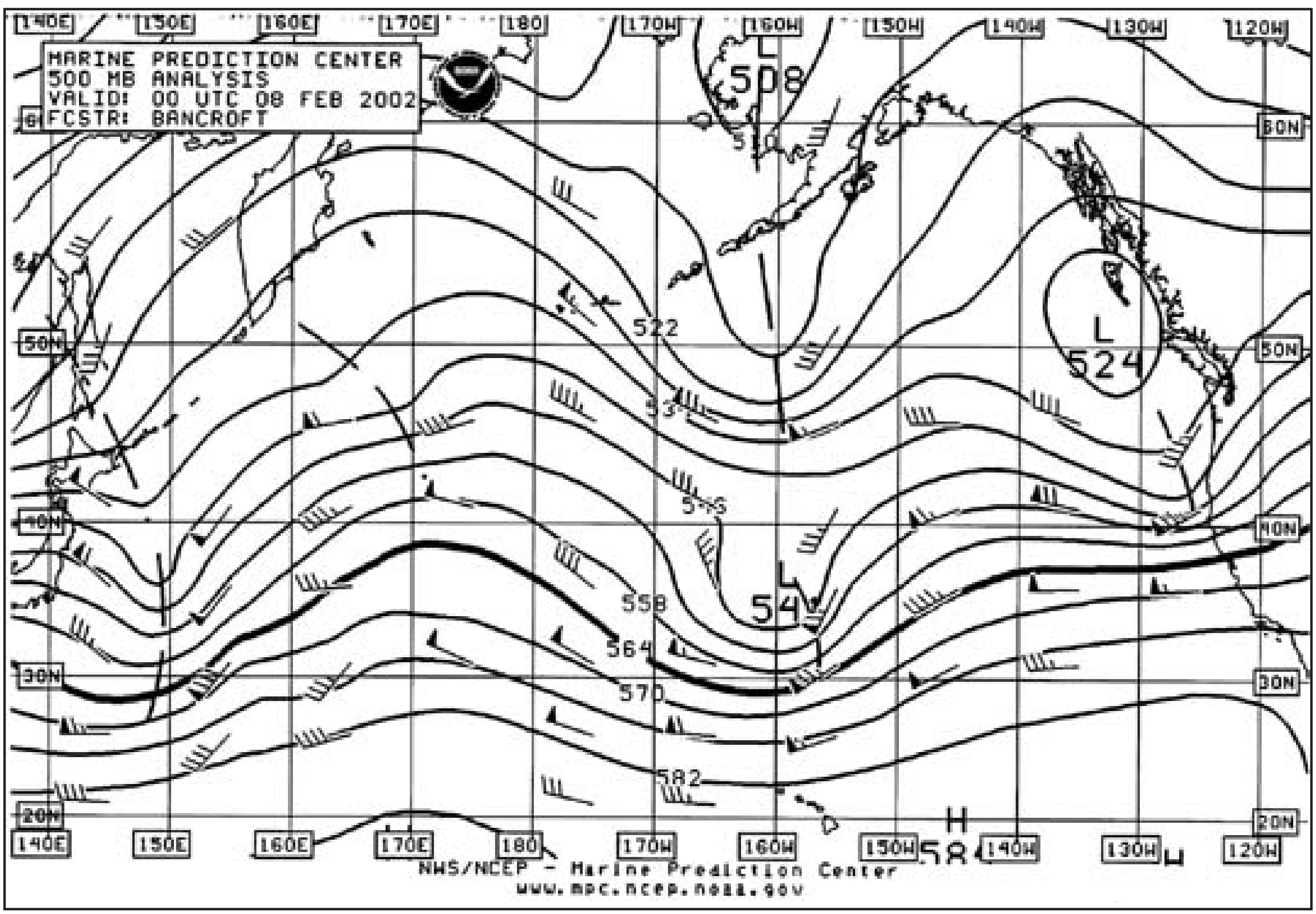

Figure 5. MPC 500-Mb Analysis of North Pacific valid at 0000 UTC February 8, 2002. The chart is computer-generated with short-wave troughs (dashed lines) added by the analyst.

infrared satellite image of Figure 7 and include an occluded southern storm, unusually intense for that latitude. The northern branch short-wave trough came into play later on, causing further intensification of the southern storm as it was pulled north into the Gulf of Alaska on 9 February. The center developed a central pressure of 960 mb near 55N 143W at 0000 UTC February 10 before weakening and moving inland later on that day.

The storm developed hurricane-force winds by 0600 UTC February 8 as revealed by the QuikScat winds shown in Figure 6. The **Manoa** (KDBG) reported a northeast wind of 65 kt and 17.1-meter seas (56 feet) near 39N 154W at 0300 UTC February 8, followed by a report of

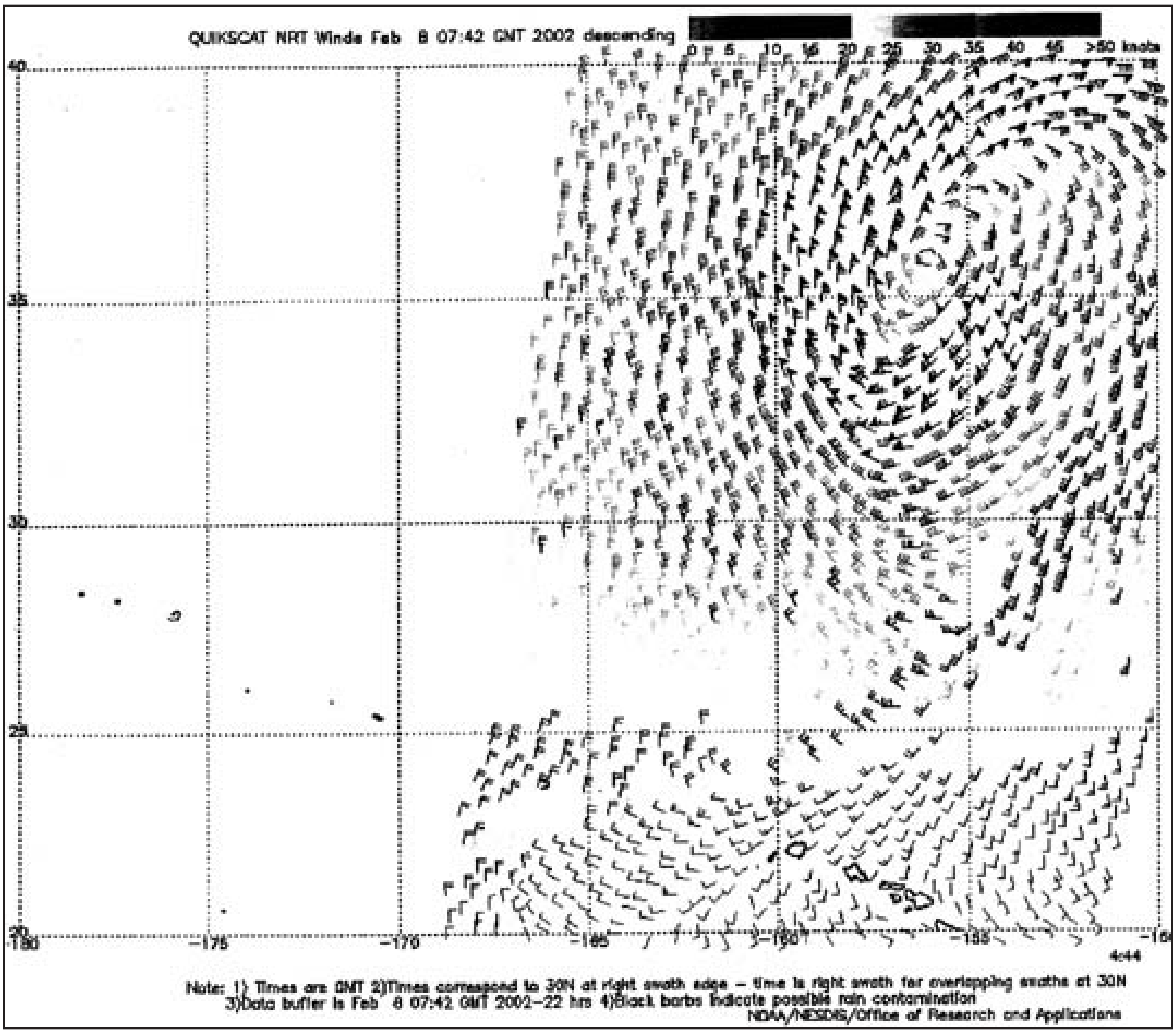

Figure 6. QuikScat scatterometer image of satellite-sensed winds around the storm shown in Figure 4. The valid time of the pass is approximately 0500 UTC February 8, 2002, or close to that of the second surface analysis in Figure 4.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

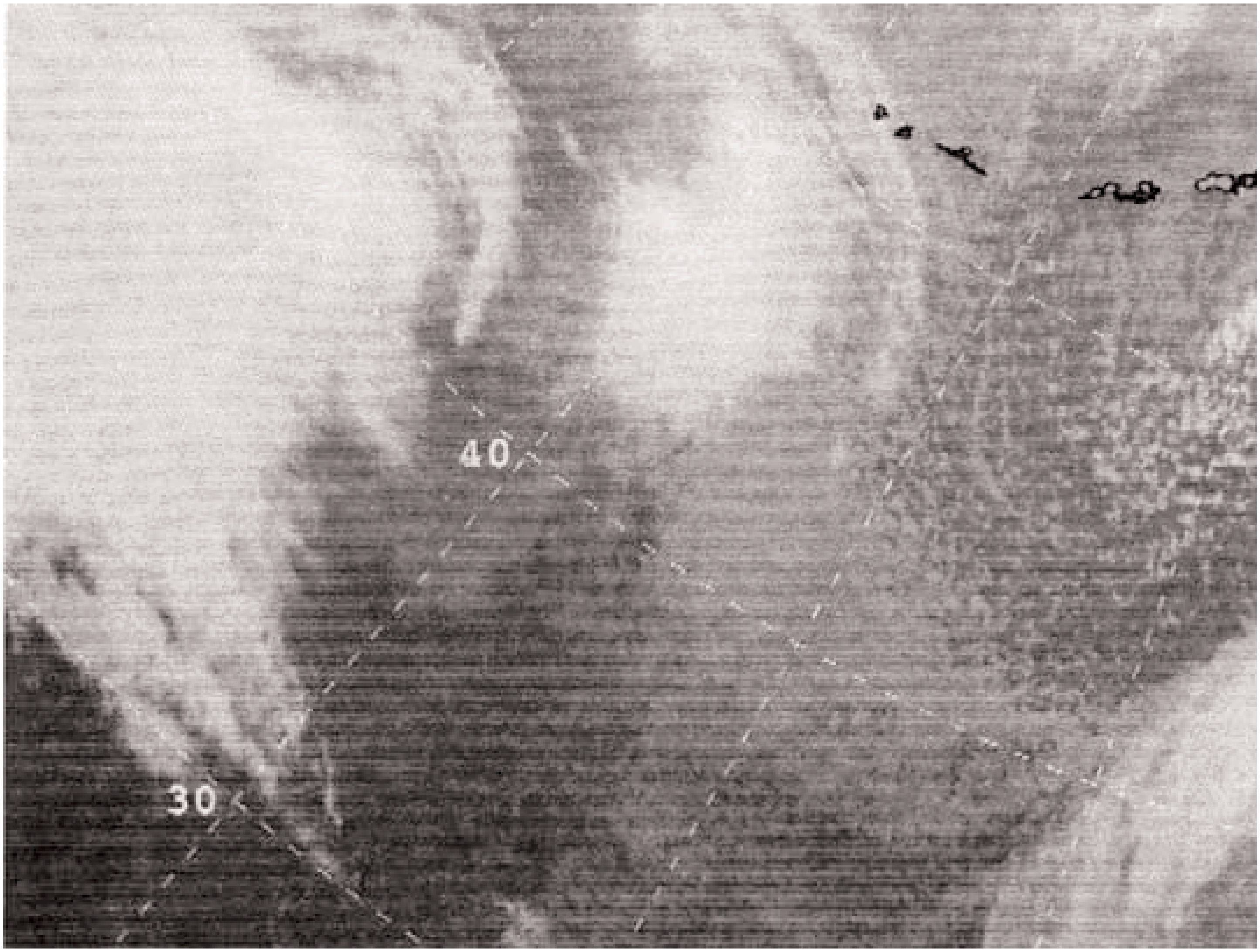

Figure 7. GOES-10 infrared satellite image valid at 0700 UTC February 8, 2002. Satellite senses temperature, which is displayed on a scale from warm (black) to cold (white) in this type of imagery.

seas 18.9 meters (62 feet) three hours later. The same vessel then observed a south wind of 65 kt with 16.5-meter seas (54 feet) near 37N 149W at 1800 UTC February 8. At 1200 UTC February 9, the **John P. Tully** (CG2958) encountered southeast winds of 65 kt near 49N 135W, while the **Daishin Maru** (3FPS6) to the north near 51N 134W reported southeast winds of 50 kt and 14.0-meter seas (46 feet). Later, at 0000 UTC February 10, the **Daishin Maru** experienced south winds of 50 kt and 15.8-meter seas (52 feet).

In summary, this was the most significant event in the North Pacific, featuring hurricane-force winds and the highest seas observed in the January-to-April period.

North Pacific Storm of 8-12 March: This system followed an east-northeast track across the Pacific, leaving the coast of northern Japan at 0000 UTC March 7 and later making final landfall as a weakening gale at 0600 UTC March 13. The first part of Figure 8 depicts this storm at maximum intensity (962 mb) near 48N 156W at 1800 UTC March 10, and the second and third parts show this system weakening as it approaches the coast of British Columbia. The **Maersk Wind** (S6TY) reported a north wind of 65 kt twelve hours later near 53N 153W. At 0000 UTC March 12, the **Oriental Bay** (MKYJ8) experienced west winds of 50 kt and 15.5-meter seas (51 feet) near 44N 144W, the highest seas observed in this storm.

Northwest Pacific and Bering Sea Storm of 11-13 March: The second and third parts of Figure 8 show the rapid development of this system to maximum intensity over a 24-hour period, with the central pressure dropping 40 mb in this period. This was the most rapid pressure fall over a 24-hour period in the North Pacific in the four-month period. The central pressure of 948 mb reached at 1800 UTC March 12 was the lowest in the North Pacific during this four-month period. The intense center moved through an area of sparse ship reports. The strongest wind reported was from the **Maersk Wind** (S6TY), with a south wind of 50 kt near 54N 176W at 0600 UTC March 13. The system was weakening rapidly and heading northwest at that time.

Western Pacific Storm of 4-6 April: Figure 9 shows the development of this storm east of Japan over a 24-hour period to maximum intensity, 980 mb, at 0600 UTC April 5. Slow weakening followed as the center drifted east, blocked by the high-pressure ridge to the east and north. The **Toba** (LHOE3) near 36N 158E reported a southeast wind of 60 kt at 0600 UTC April 5, while the **CSX Reliance** (WFLH) near 33N 143E encountered north winds of 50 kt and 11.6-meter seas (38 feet), the highest seas observed in this storm. The **CSX Reliance** also reported a northwest wind of 60 kt and 9.8-meter seas (32 feet) near 33N 145E at 1200 UTC April 5. The QuikScat image of Figure 10 shows winds of 50 to 60 kt on the backside of the storm, similar to what ships were reporting. The system subsequently weakened to a gale as it reached 160E early on April 6.

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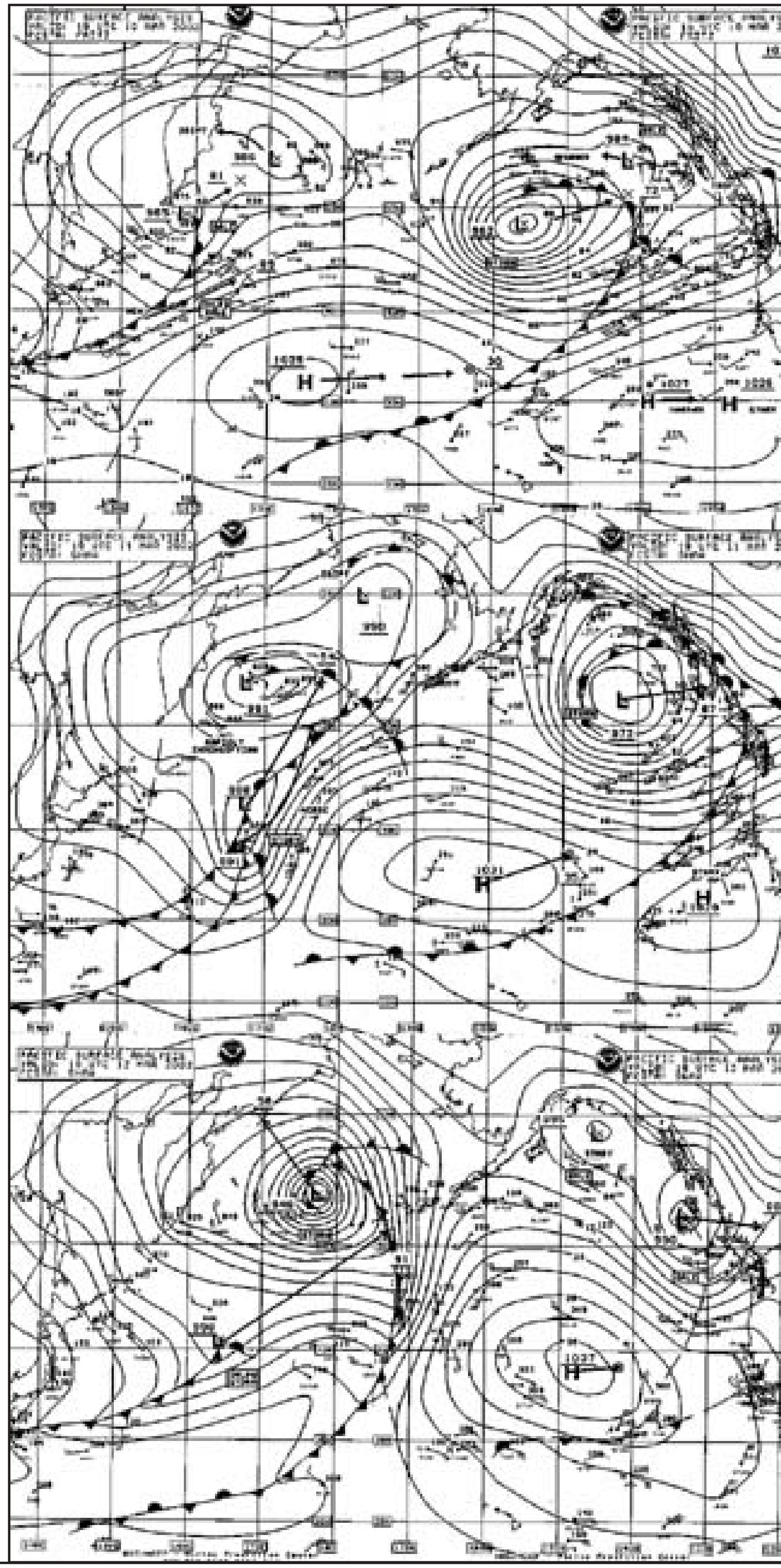

Figure 8. MPC North Pacific Surface analysis charts valid 1800 UTC March 10, 11, and 12, 2002.

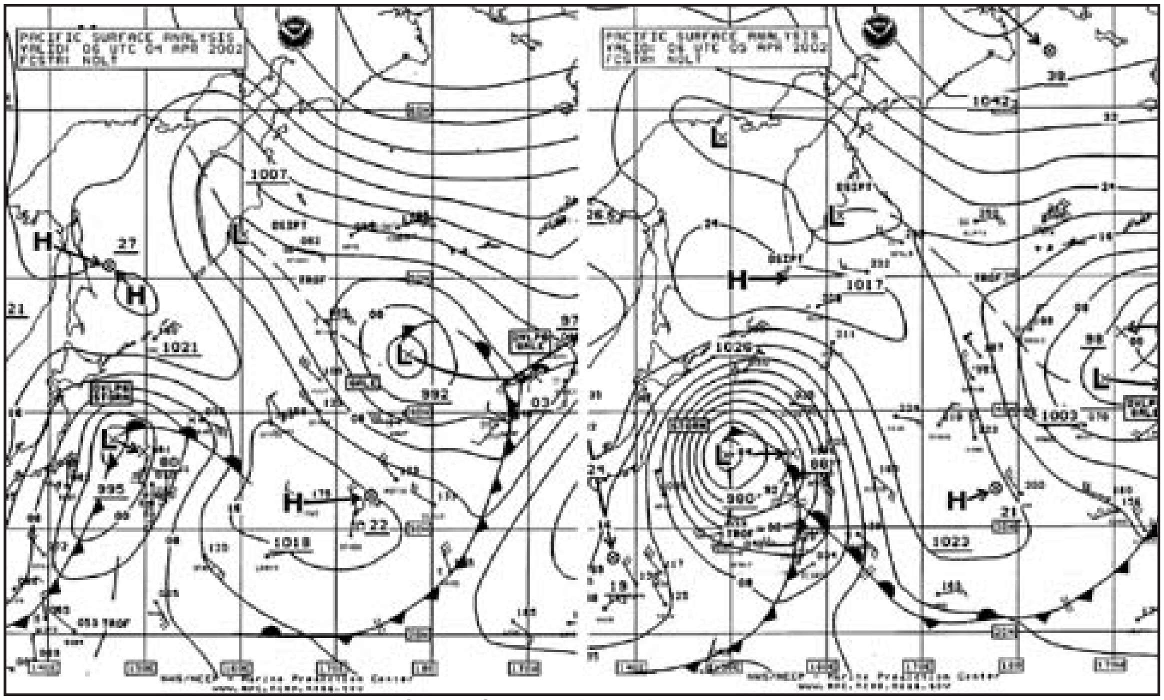

Figure 9. MPC North Pacific Surface Analysis charts (Part 2 - west) valid 0600 UTC April 4 and 5, 2002.

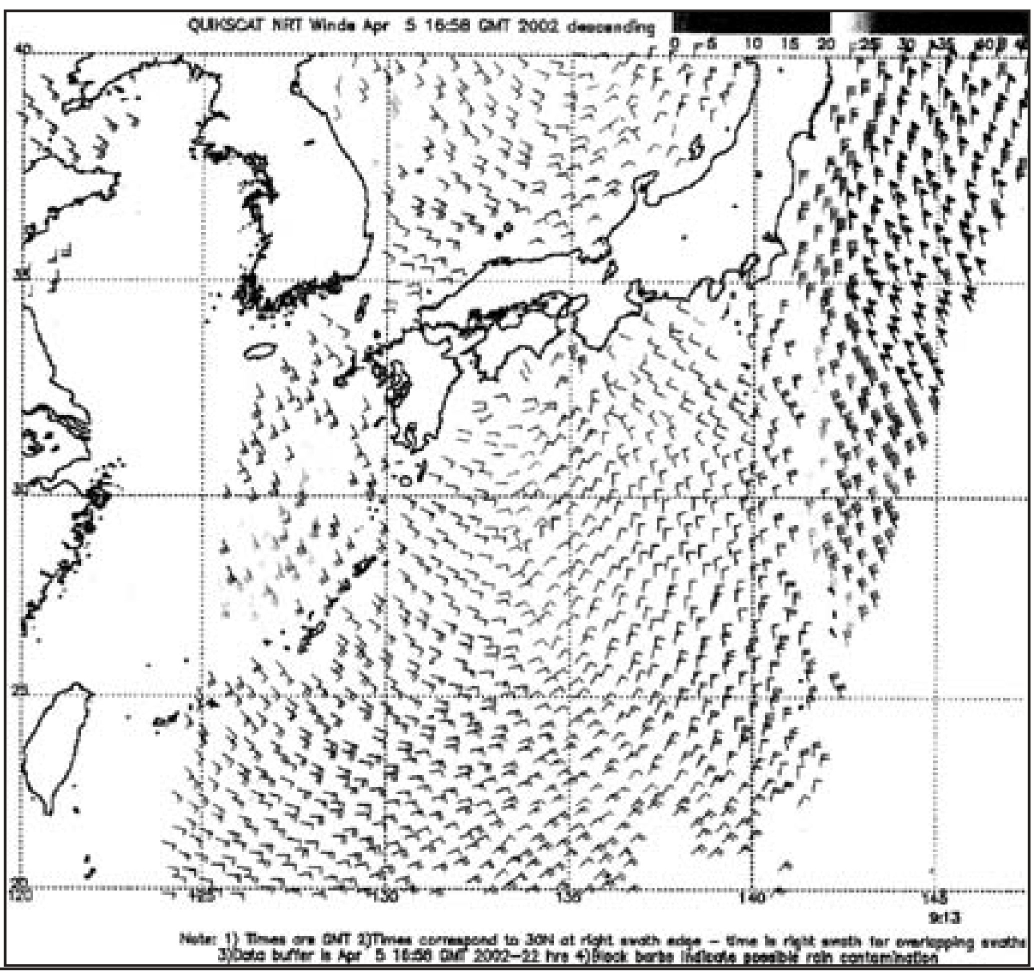

Figure 10. QuikScat scatterometer image of satellite-sensed winds around the back side of the storm shown in Figure 9. The valid time of the pass is approximately 0900 UTC April 5, 2002, or three hours later than the valid time of the second analysis in Figure 9.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

MARINE WEATHER REVIEW – NORTH ATLANTIC AREA
May through August 2002

By George P. Bancroft
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Introduction

With the progression of the season into summer the main track of low-pressure systems shifted north, from the Canadian Maritime Provinces northeast toward Iceland with several turning north into the Davis Strait. Although cyclonic activity is normally in decline with summer approaching, the period from the middle of May through the middle of June was especially active, with several lows developing storm force winds to 60 kt to the west of Great Britain. Also, June 1 marks the start of the Atlantic hurricane season. Two named tropical cyclones affected MPC's waters north of 31N, including the first of the season in mid-July and the third named storm in early August.

Tropical Activity

Tropical Storm Arthur: Arthur, the first tropical cyclone of the 2002 Atlantic hurricane season, originated as a weak low in the Gulf of Mexico on July 9, then emerged off the South Carolina coast early on July 14 and became Tropical Depression 1 at 1800 UTC July 14 with maximum sustained winds of 30 kt with gusts to 40 kt. The system tracked east just south of a stationary front and intensified to a tropical storm eighteen hours later. Figure 1 shows Arthur with a maximum intensity of 50 kt with gusts to 60 kt about to merge with the front to the northwest and becoming an extratropical storm. The ship **LAFQ5** near 36N 64W

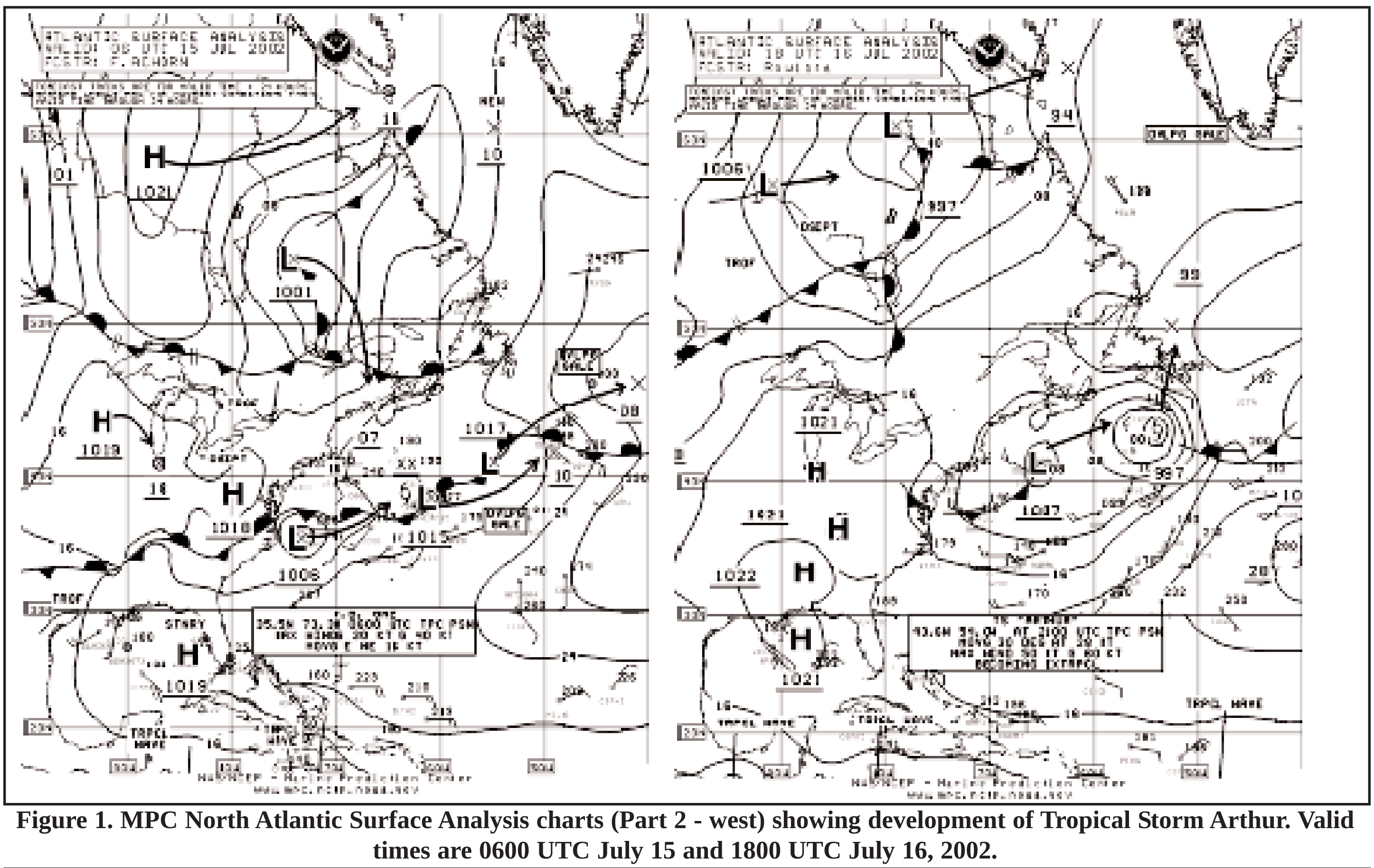

Figure 1. MPC North Atlantic Surface Analysis charts (Part 2 - west) showing development of Tropical Storm Arthur. Valid times are 0600 UTC July 15 and 1800 UTC July 16, 2002.

encountered south winds of 45 kt and 5.5-meter seas (18 feet) at 0000 UTC July 16. Later, at 1800 UTC July 16, the **Choyang Zenith** (DACP) experienced southwest winds of 35 kt and 8.5-meter seas (28 feet) near 40N 53W, following passage of Arthur's center. The Canadian buoy 44141 (42.1N 56.2W) reported a northeast wind at 39 kt with gusts to 52 kt, 3.5-meter seas (11 feet) and a pressure of 997.5 mb at 1500 UTC July 16. Figure 2 is a GOES8 infrared satellite image of Arthur near maximum intensity, revealing a central dense core of cloudcover around the center, a characteristic of tropical cyclones. The remains of Arthur then moved north into the Davis Strait as a gale-force low early on July 19.

Tropical Storm Cristobal: The third tropical cyclone of the season began as a weak non-frontal low near the South Carolina coast early on August 4 which drifted southeast, becoming Tropical Depression 3 near 32N 77W at 2100 UTC August 5. It was named Tropical Storm Cristobal by TPC at 0900 UTC August 7 just south of MPC's waters near 29.5N 76.2W with maximum sustained winds of 40 kt with gusts to 50 kt. The system was subsequently picked up by an approaching cold front and maintained the same intensity, re-entering MPC's waters near 31.5N 76.0W at 2100 UTC August 8 before becoming extratropical. The **Figaro** (S6PI) reported a southwest wind of 35 kt near 38N 57W at 1200 UTC August 9 as the center passed to the west. Twenty-four hours later, the **Ever Reward** (3FYB3) reported 5-meter seas (16 feet) near 45N 45W, along with south winds of 30 kt.

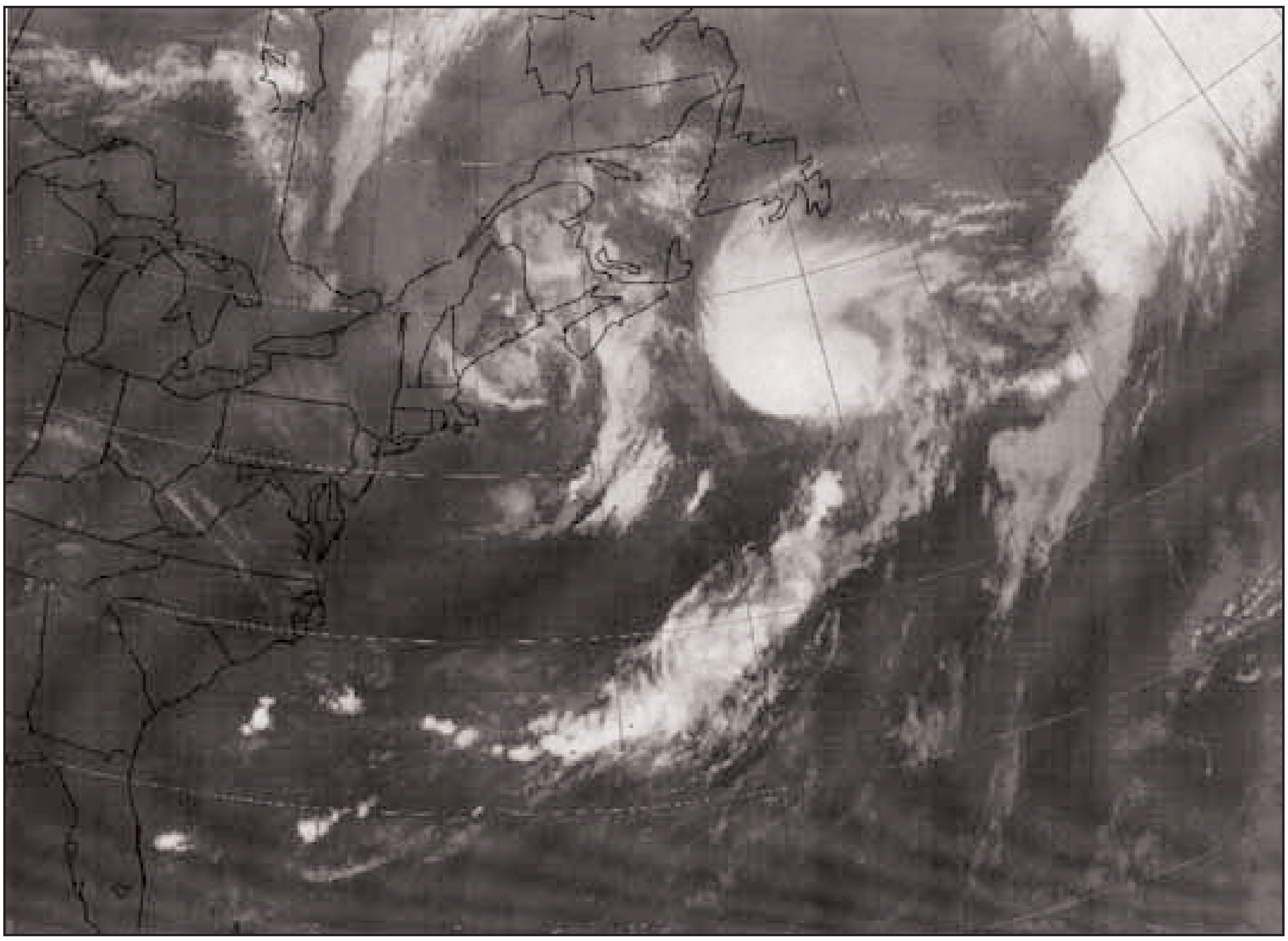

Figure 2. GOES-8 infrared satellite image valid 1145 UTC July 16, 2002. Satellite senses temperature on a scale from warm (black) to cold (white) in this type of image. The valid time is about 6 hours prior to that of the second part of Figure 1.

The remnants of Cristobal then moved northeast past Iceland early on August 14 as a gale-force low.

Other Significant Events of the Period

Western North Atlantic Storm of 4-6 May: Figure 3 shows a low-pressure center moving off the New England coast and intensifying over a 36-hour period to become the 972-mb storm (at maximum intensity), northeast of Newfoundland in the second part of the figure. This was the most intense low (in terms of central pressure) in the western North Atlantic during this four-month period. At 1200 UTC May 4, the **Maersk Wind** (S6TY) reported south winds of 50 kt and 6.5-meter seas (21 feet) near 44N 43W, while the **Alligator Reliance** (ZCBN5) encountered southwest winds of 45 kt and 8.5-meter seas (28 feet) near 46N 43W, the highest seas reported in this storm. Six hours later, the **Kometik** (VCRT) reported southwest winds of 50 kt and 4.5-meter seas (15 feet) at 46N 48W, followed by southwest winds of 40 kt and 8.5-meter seas (28 feet) at 0000 UTC May 5 when the ship was at 47N 48W. This system subsequently lifted northeast and weakened, passing northwest of Iceland late on May 6.

Eastern North Atlantic Storm of 15-16 May: Like the mid-June event to be described below, this storm originated as a secondary development on the southeast side of a parent gale-force low in the central North Atlantic. A 998-mb low formed near 45N 27W at 0000 UTC May 15 and absorbed the parent low to the northwest in the following twenty-four hours while intensifying to 982 mb. The maximum intensity was reached at 0600 UTC May 16 (980 mb) when the center was at 49N 22W. Although not as intense as the mid-June storm and with no ships reporting storm-force winds, reported seas were as high as 11.5 meters (37 feet) from the **Sea-Land Developer** (KHRH) near 45N 24W at 0000 UTC May 16. Reported winds from this ship were southwest 45 kt. This system subsequently began a slow weakening trend while drifting north, then northwest, before merging with a gale coming off the Canadian coast on May 18.

North Atlantic Storm of 19-21 May: This storm, unseasonably strong for late May, originated near the mid-Atlantic coast of the U.S. early on May 18 and followed a northeastward track. Figure 4 depicts the period of most rapid deepening of this system,

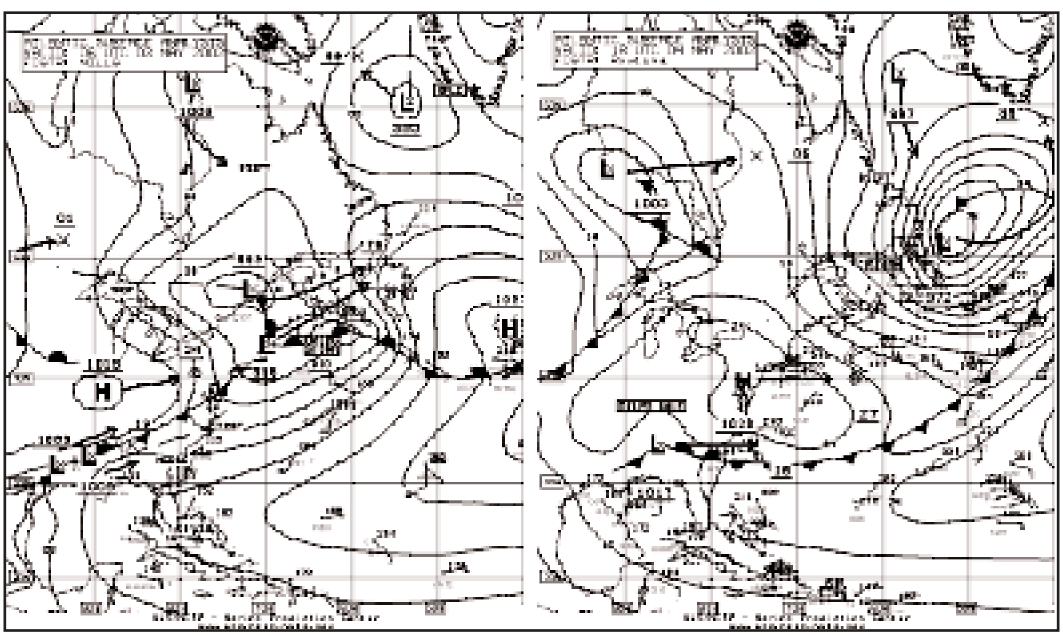

Figure 3. MPC North Atlantic Surface Analysis charts (Part 2) valid 0600 UTC May 3 and 1800 UTC May 4, 2002.

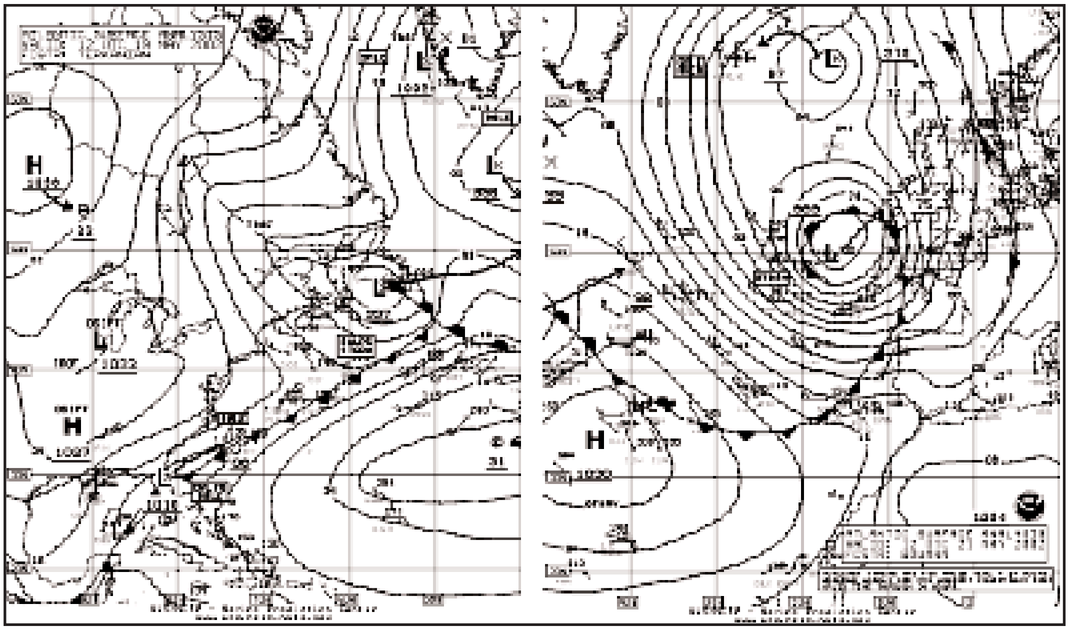

Figure 4. MPC North Atlantic Surface Analysis charts: A Part 2 (west) panel valid 1200 UTC May 19 and a Part 1 (east) panel valid 1200 UTC May 21, 2002.

with the central pressure dropping 28 mb over a 48-hour period. The system is shown near maximum intensity at 969-mb central pressure just west of the British Isles in the second part of Figure 4. Six hours prior to this time, the central pressure was 968 mb, equal to the lowest pressure in the mid-June storm and the most intense (among non-tropical lows) of the May-August period in both the North Atlantic and North Pacific. This system became a storm by 1200 UTC May 20 near 50N 40W, when the vessel **LAFQ5** (47N 36W) reported west winds of 50 kt and 6-meter seas (20 feet). Six hours later, the same ship encountered northwest winds of 60 kt and 8-meter seas (27 feet) near 47N 38W. At 0000 UTC May 21, the **Queen Elizabeth 2** (GBTT) experienced northwest winds of 55 kt and 6-meter seas (19 feet) near 47N 31W. At 1200 UTC May 21 the **Atlantic Cartier** (C6MS4) reported from near 48N 21W with northwest winds of 60 kt and 11.5-meter seas (38 feet), the highest wind and sea conditions reported in this storm. The first part of Figure 5 shows this system weakening early on the May 22 while passing just west of Ireland, and heading toward Iceland.

Northeastern Atlantic Storm of 22-24 May: This storm followed closely behind the aforementioned intense low and originated near the north Florida coast as a gale-force low at 1200 UTC May 19. Figure 5 shows the period of most rapid development over the 36-hour period ending at 1800 UTC May 23 when the central pressure dropped 30 mb. The central pressure bottomed out at 972 mb six hours later, at 0000 UTC May 24. MPC analyzed this system as a hurricane-force storm (maximum winds of at least 64 kt) at 1800 UTC May 23 (second part of Figure 5). A QuikScat image taken at about that time (Figure 6) shows the stronger winds occurring south and southwest of the center, with three 60-kt wind barbs apparent near 51N 20W. Available conventional surface reports were

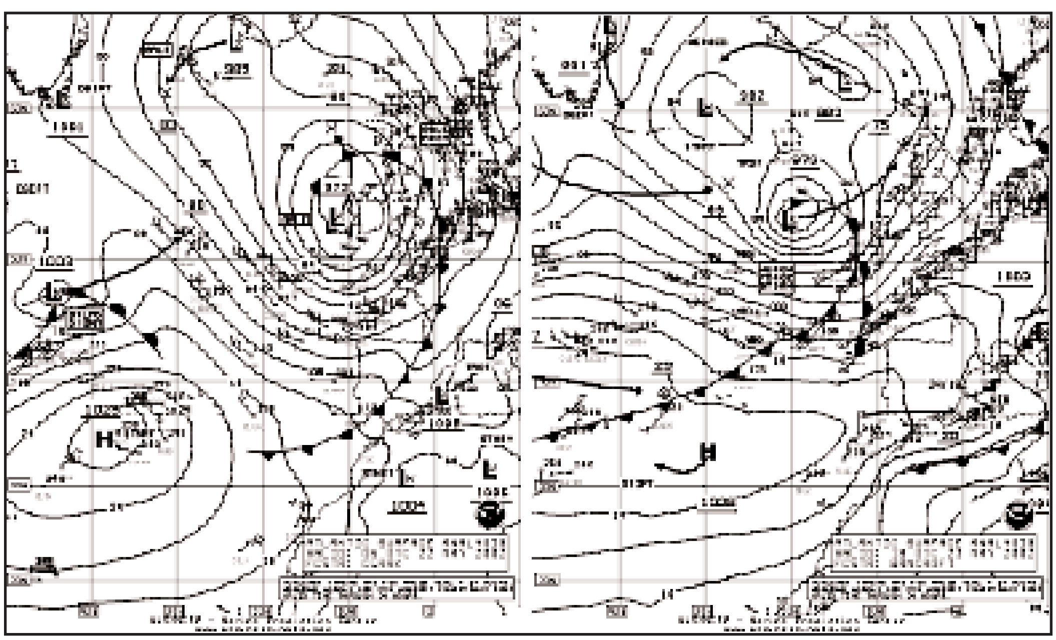

Figure 5. MPC North Atlantic Surface Analysis charts (Part 1) valid 0600 UTC May 22 and 1800 UTC May 23, 2002.

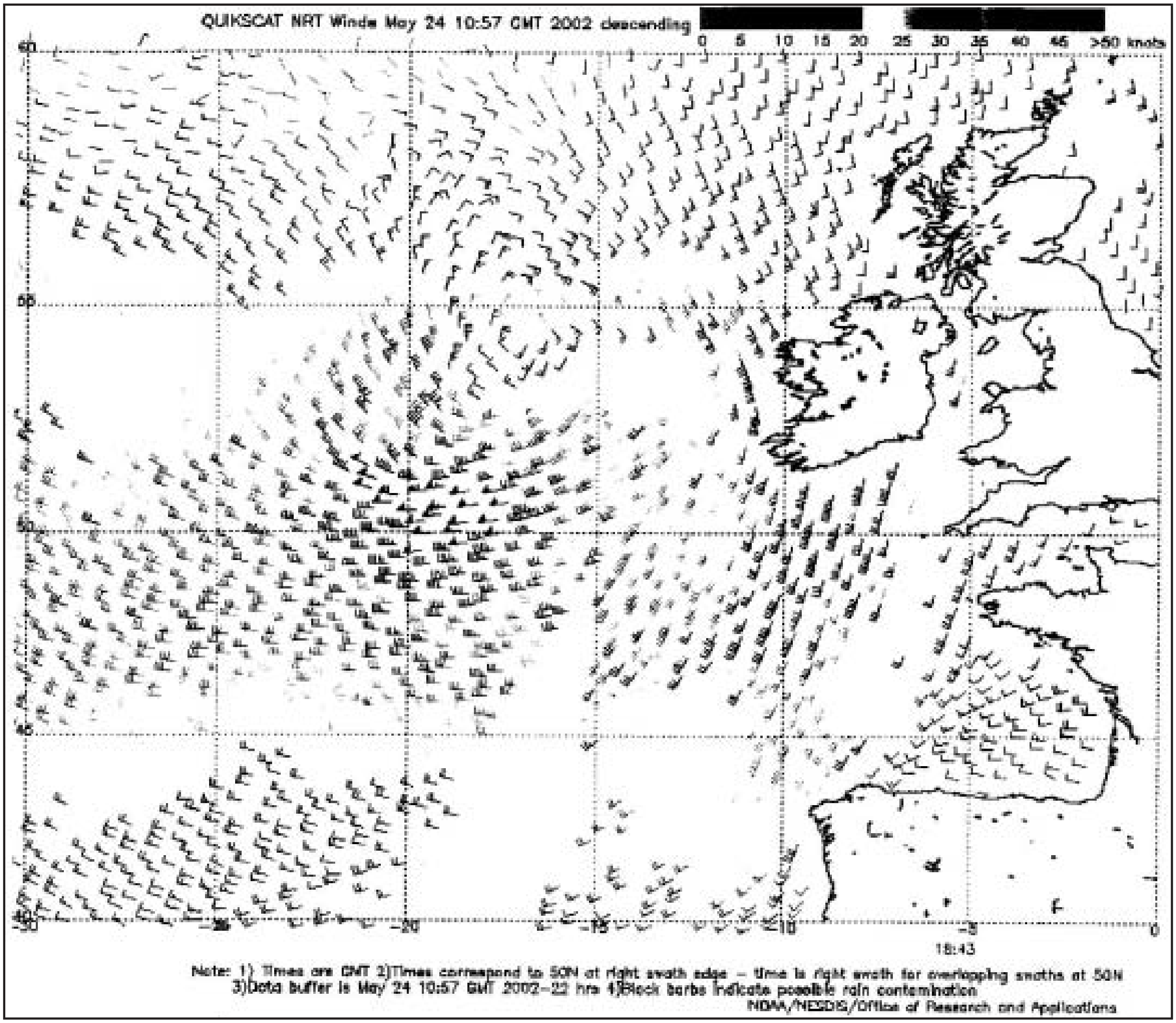

Figure 6. QuikScat scatterineter unage if satekkute-sensed winds valid 1843 UTC May 23, 2002, or approximately the valid time of the second part of Figure 5.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

outside the area of strongest winds. The **Bonn Express** (DGNB) reported the highest wind (a west wind of 45 kt) near 53N 17W at 0600 UTC May 24, a time when the system was beginning to weaken. The **Alligator Reliance** (ZCBN5) sent three reports of seas 9 meters (30 feet) or higher from 1200 UTC May 23 to 0000 UTC May 24, with the highest being 10 meters (33 feet) at 0000 UTC May 24 near 47N 30W (accompanied by a west wind of 30 kt). The system subsequently weakened and became stationary just northwest of Great Britain, where it dissipated on May 26.

Northeastern Atlantic Storm of 8-9 June: This developing storm took a more west-to-east track than preceding systems mentioned above, emerging off the southern Labrador coast at 0000 UTC June 7. Figure 7

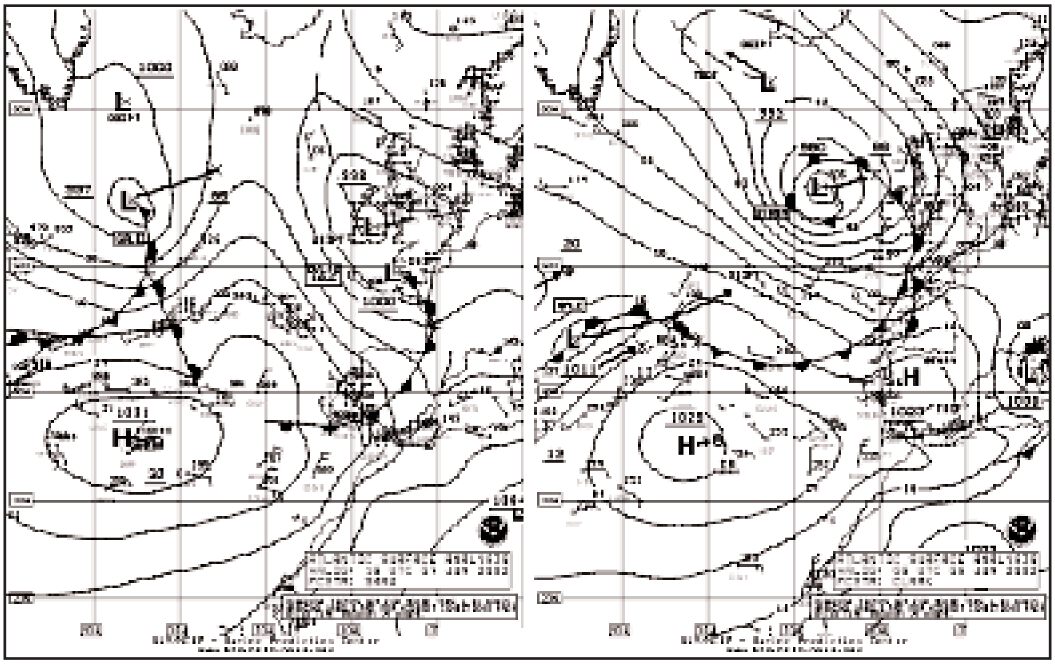

Figure 7. MPC North Atlantic Surface Analysis charts (Part 1) valid 1800 UTC June 7 and 0600 UTC June 9, 2002.

shows this system eighteen hours later, and 36 hours afterwards when the storm was at maximum intensity (980 mb) just west of the British Isles. The ship **ZCBP5** (50N 28W) reported a west wind of 45 kt and 10-meter seas (33 feet) at 1800 UTC June 8. At 0600 UTC June 9, the **Atlantic Cartier** (C6MS4) encountered southwest winds of 50 kt and 5-meter seas (16 feet) near 50N 17W. The high-resolution QuikScat image of Figure 8 valid at this time shows a large area of gale-force or higher winds on the south and southwest sides of the center with some 50-kt flags mixed in. Twelve hours later, the buoy 62029 (48N 12W) reported seas of 7.5 meters (25 feet). This system subsequently turned toward the northeast and weakened northwest of the British Isles on June 10.

Northeastern Atlantic Storm of 15-16 June: This storm developed from a secondary low passing to the southeast of a parent low (Figure 9) in a manner similar to that described in the 15-16 May event. The most rapid period of intensification was the 24-hour period ending at 1800 UTC June 16, when the central pressure dropped 26 mb. The 500-mb analysis (Figure 10) is for 1200 UTC June 16, within this period of rapid development. A short-wave trough and associated jet stream rounding the base of a larger-scale trough support development.

The second part of Figure 9 shows the storm at maximum intensity (968 mb). Along with the 19-21 May storm, this low was the most intense of the four-month period in both oceans, for non-tropical (or extratropical lows). The system in its intense phase passed through an area of sparse ship and buoy data, but a QuikScat pass (Figure 11) shows an area of winds to 60 kt northwest of Ireland about 6 hours prior to the time of the second part of Figure 9. The highest wind reported by ships was 45 kt, from the southwest as reported by the **Naparima (**3FMM6) near 40N 26W at 0600 UTC June 16, and southerly from the **Happy Buccaneer** (PEND) near 52N 11W at 0000 UTC June 17. The **Discovery** (GLNE) reported the highest seas, 10.5 meters (34 feet) along with a south wind of 35 kt, near 64N 5W at 0600 UTC June 18. The buoy 64045 (59N 11W) reported a south wind of 30 kt and 9-meter seas (29 feet) at 1800 UTC June 17. The storm then weakened while moving north, passing east of Iceland late on June 19.

Northeastern Atlantic Cyclonic Activity, 12-19 August: A weak low-pressure center passed east of the island of Newfoundland on August 12 and tracked east-northeast before turning more north while intensifying. The system reached a maximum intensity of 988 mb just west of Ireland near 57N 14W at 0000 UTC

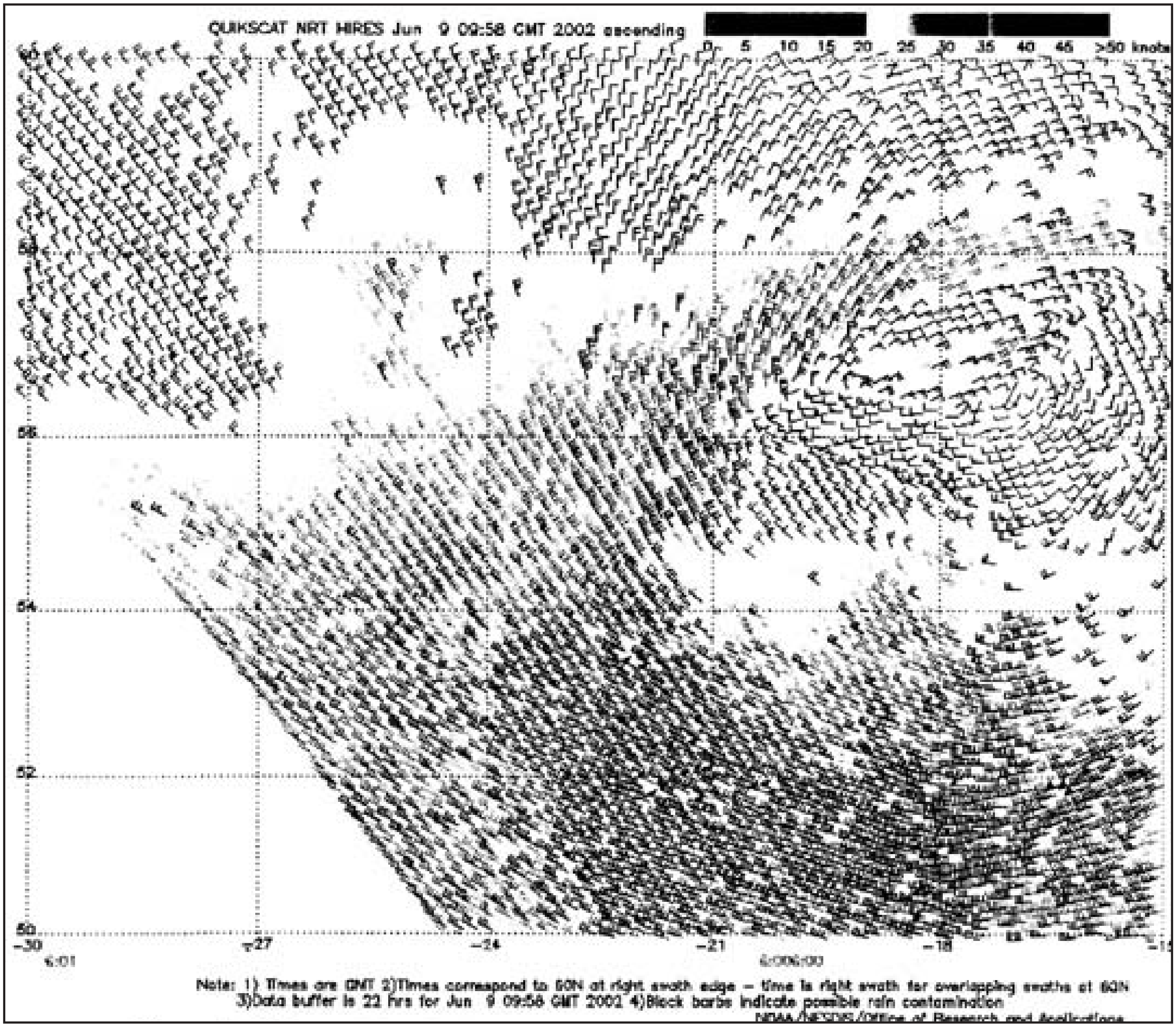

Figure 8. High-resolution QuikScat scatterometer image of satellite-sensed winds valid 0600 UTC June 9, 2002. The resolution is 12.5 km, versus 25 km in regular QuikScat imagery (Figure 6). Wind barbs of 40 kt or higher stand out in this black-and-white reproduction of the original colored image.

(Image courtesy of NOAA/NESCDIS/Office of Research and Application)

August 15, when MPC classified it as a storm at that time and for the following six hours. Ship data was lacking, with the **Norrona** (OZ2000) reporting a southwest wind of 40 kt near 63N 9W at 0000 UTC August 16 as the system was passing just east of Iceland. The low-pressure system which followed originated in the central North Atlantic and attained a similar intensity, 985 mb, near 55N 14W at 1200 UTC August 17 before lifting north and weakening near Iceland on August 19. A ship with callsign **VRVQ9** near 51N 13W encountered south winds of 45 kt at 0000 UTC August 17, with a nearby buoy reporting 5-meter seas (17 feet). The buoy 62106 (56N 10W) reported south winds of 35 kt and 7.5-meter seas (25 feet) at 1800 UTC August 17.

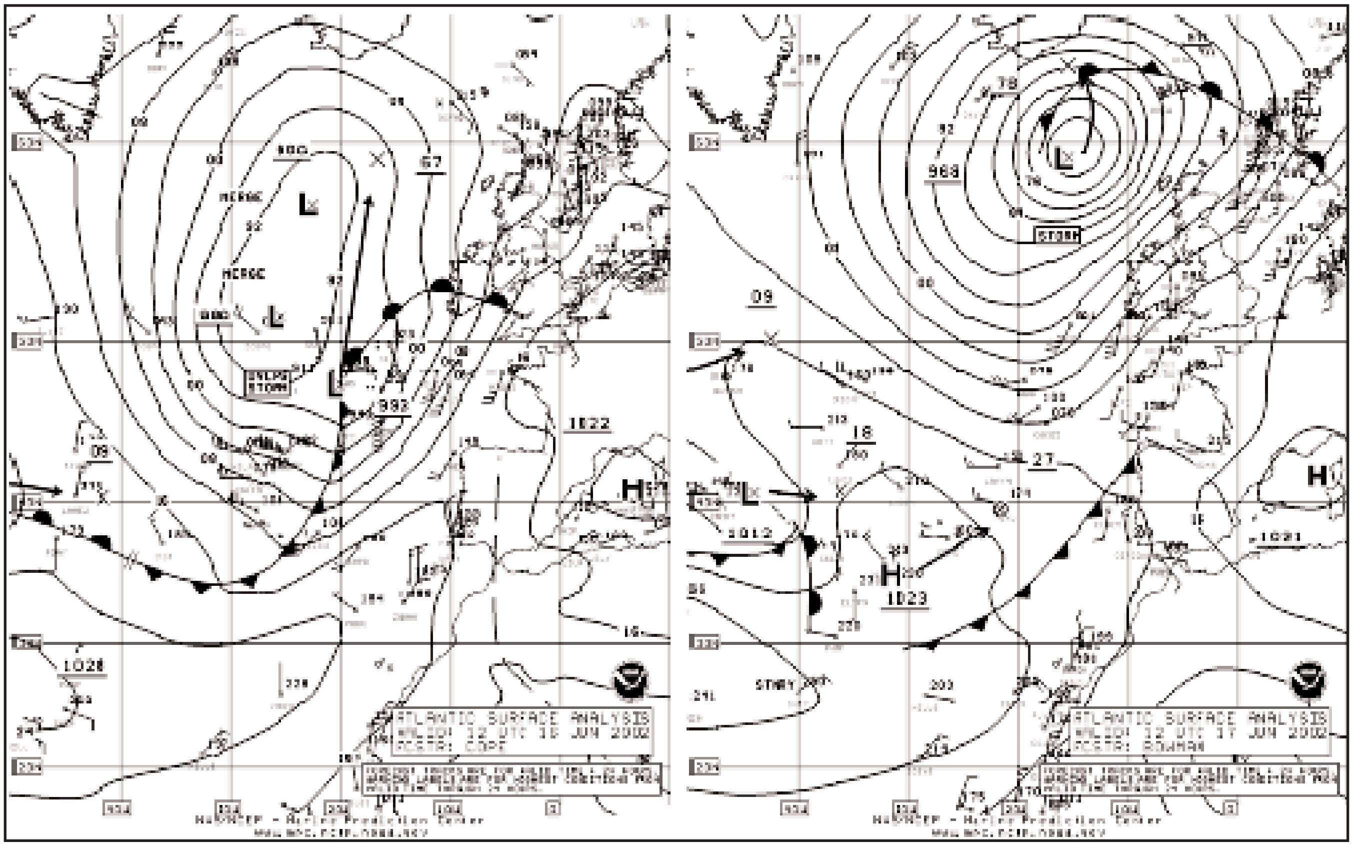

Figure 9. MPC North Atlantic Surface Analysis charts (Part 1) valid 1200 UTC June 16 and 17, 2002.

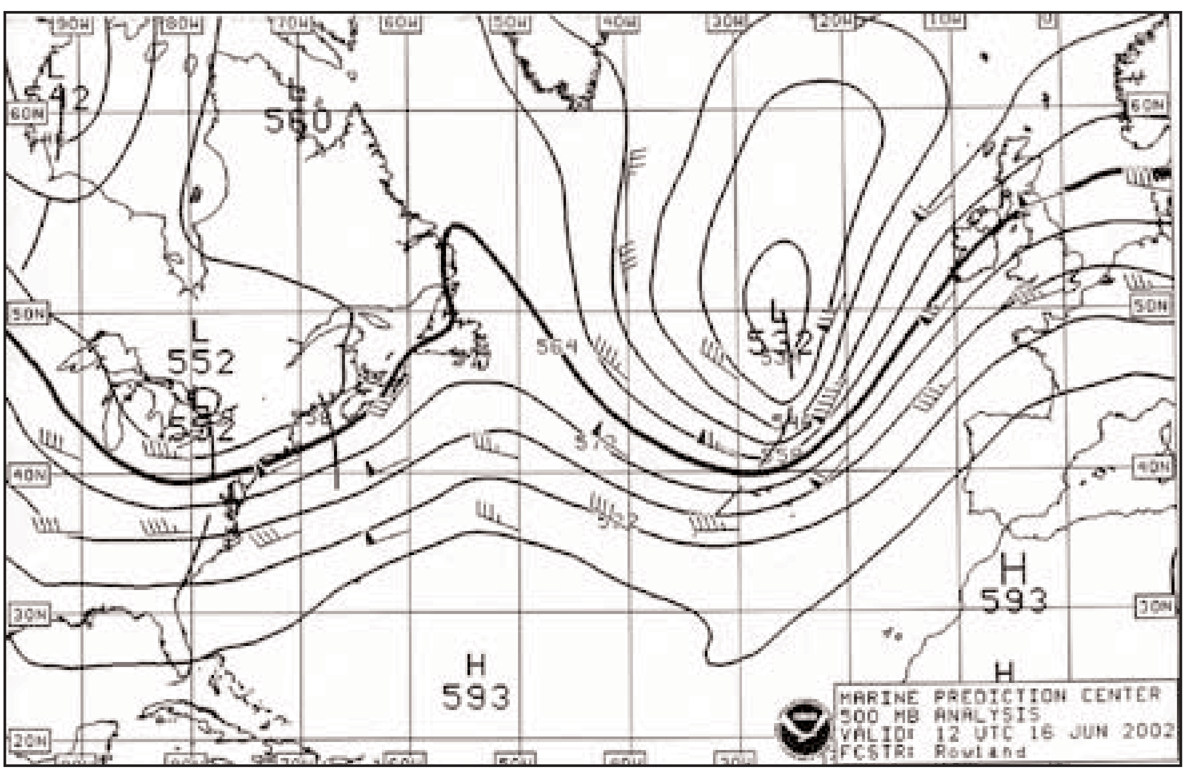

Figure 10. MPC 500-Mb Analysis of North Atlantic valid at 1200 UTC June 16, 2002. The chart is computer-generated with short-wave troughs (dashed lines) manually added.

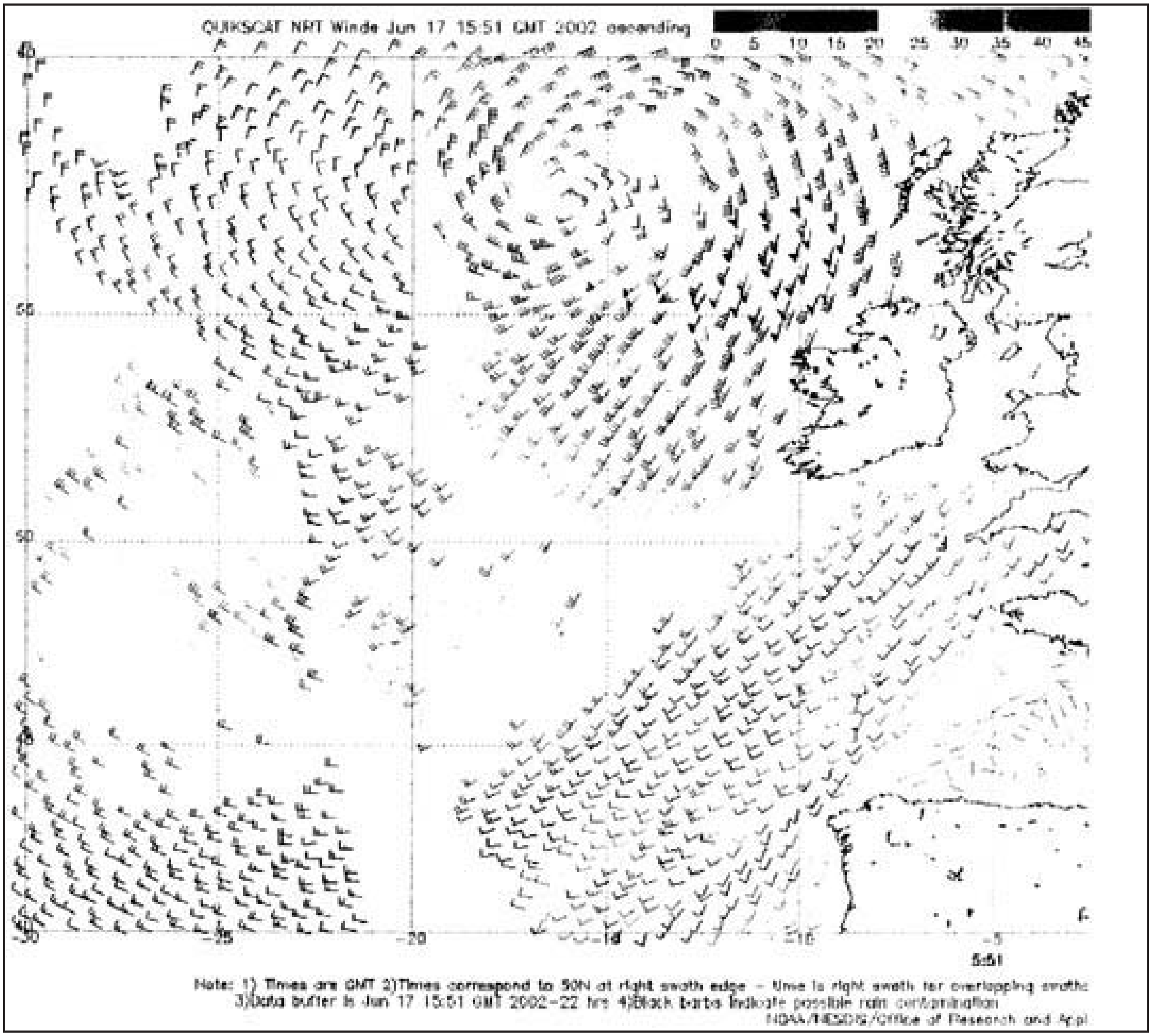

Figure 11. QuikScat scatterometer image of satellite winds valid approximately 0600 UTC June 17, 2002.
(Image courtesy of NOAA/NESDIS/Office of Research and Application)

MARINE WEATHER REVIEW – NORTH PACIFIC AREA May to August 2002

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Introduction

Low-pressure systems often tracked from southwest to northeast during the period, while high pressure prevailed off the west coast of the U.S. Occasionally the high pressure extended into the Bering Sea and Gulf of Alaska, forcing cyclonic systems coming off Japan or eastern Russia to turn more north or northwest or even stall. Several non-tropical lows developed storm-force winds, mainly in May and June. Later in the summer, with weaker cyclonic activity in the mid-latitudes, the tropics became more active. Most of the significant weather events during July and August were associated with tropical cyclones, or extratropical cyclones with tropical origin. Several of the tropical cyclones recurved northeast and became extratropical upon entering the mid-latitude westerlies near the latitude of Japan. Tropical cyclones were also present in the eastern Pacific, but these are covered by the Tropical Prediction Center in Miami.

Tropical Activity

Super Typhoon Hagibis: Hagibis appeared on the southern edge of MPC's oceanic Mercator surface-analysis area as a minimal typhoon at 0000 UTC May 18 near 16N 140E and moved north, with a gradual turn toward the northeast. The **Mokihana** (WNRD) reported a northeast wind of 35 kt and 8-meter seas (27 feet) near 18N 139E at 1200 UTC May 18. Maximum sustained winds increased from 65 kt to 120 kt in the 24-hour period ending at 0000 UTC May 19, when th center reached 17.7N 140.5E. The system was briefly a super-typhoon (maximum sustained winds of 130 kt or higher) from 0600 to 1800 UTC May 19. At 1800 UTC May 19 Hagibis attained a maximum strength of 140-kt (sustained winds), with gusts to 170 kt near 20.7N 143.2E before beginning to weaken. Figure 1 shows Hagibis as a strong tropical storm crossing 160E into MPC's high seas area, the only tropical cyclone to do so during the May-August period, and then merging with the extratropical low (993 mb) at 40N 154E. In the second part of Figure 1, at 0600 UTC May 22, Hagibis has become extratropical and appears as the gale-force low (995 mb) at 41N 179E. At 0000 UTC May 22, the ship 3FQO4 (37N 175E) reported southwest winds of 40 kt and 6.5-meter seas (21 feet). Twelve hours later, the vessel 4XFQ encountered southwest winds of 45 kt near 37N 174W. At 0000 UTC May 24, the **Leo Forest** (3FPH8) encountered southeast winds of 35 kt and 8-meter seas (27 feet) near 51N 158W. Also at that time, the **Arctic Sun** (ELQB8) near the eastern Aleutians (54N 162W) reported east winds of 45 kt. The remnants of Hagibis became a gale-force 985-mb low in the central Aleutians by that time, before drifting northwest and weakening over the Bering Sea by May 26.

Typhoon Chataan: Chataan appeared on MPC's oceanic chart area just south of Japan at 0600 UTC July 10 with maximum sustained winds of 65 kt with gusts to 80 kt. Six hours later, the **Tenaga Dua** (9MSM) near 34N 140E reported south winds of 65 kt. By 1800 UTC July 10, Chataan weakened to a tropical storm near 35.7N 140.9E. The **CSX Defender** (KGJB) at that time encountered southwest winds of 55 kt and 17-meter seas (56 feet). The system became an extratropical gale-force low with central pressure 984 mb near 41N 144E at 0600 UTC and then continued to move north and weaken.

Typhoon Halong: Halong passed across the southwest corner of MPC's oceanic analysis area as a typhoon at 1200 UTC July 12, near 16N 136E, with maximum sustained winds of 110 kt with gusts to 135 kt. After becoming a super typhoon west of the area twelve hours later, Halong recurved toward the northeast and weakened. Halong then followed Chataan on a similar track, re-entering the waters south of Japan at 1800 UTC July 15 as a tropical storm undergoing extratropical transformation (Figure 2). Unlike Chataan, Halong re-intensified into a potent extratropical storm soon after transformation, appearing as the 976-mb storm in the second part of Figure 2, just 12 hours later. At that time, the **Polar Eagle** (ELPT3) reported south winds of 75 kt near 36N 143E. A QuikScat pass valid about three hours

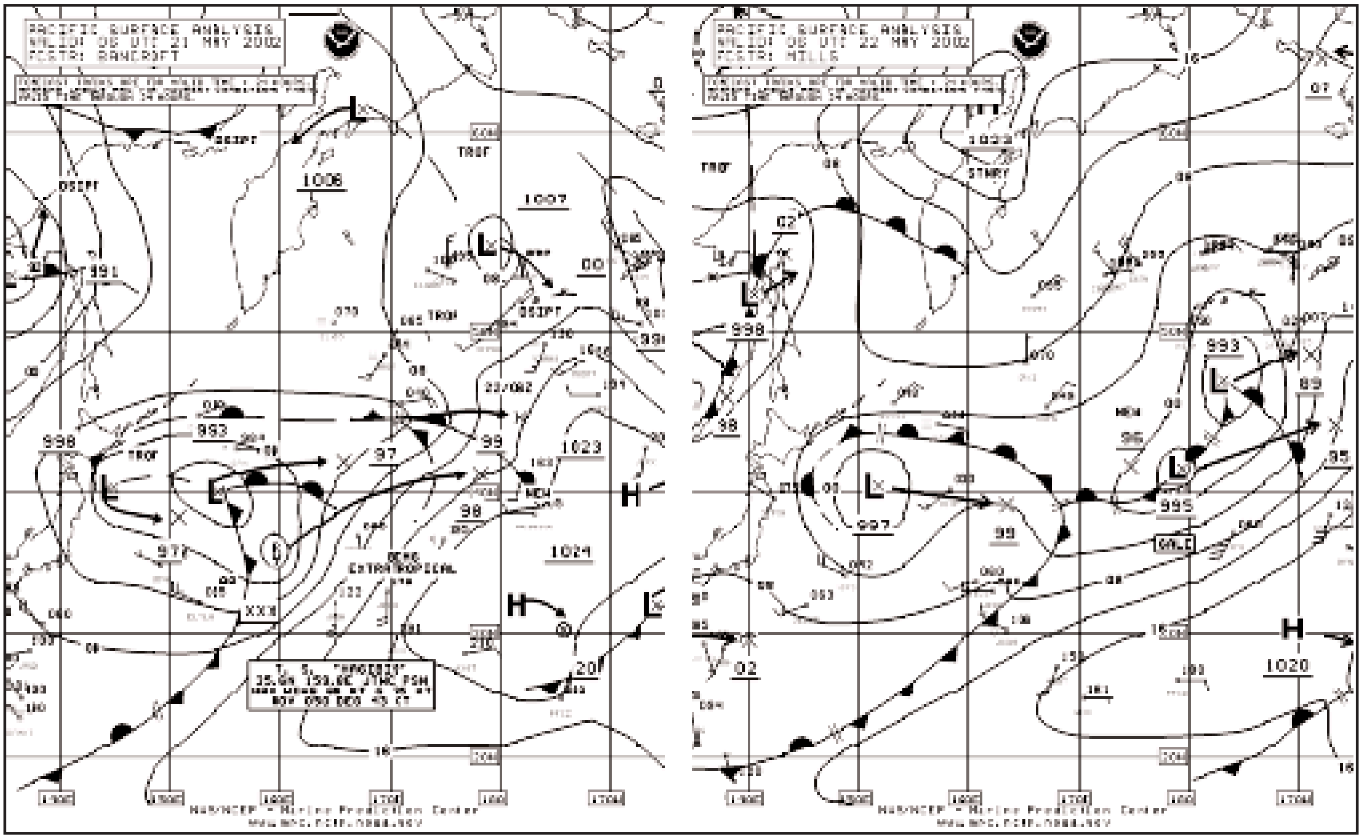

Figure 1. MPC North Pacific Surface Analysis charts (Part 2 - west) valid 0600 UTC May 21 and 22, 2002.

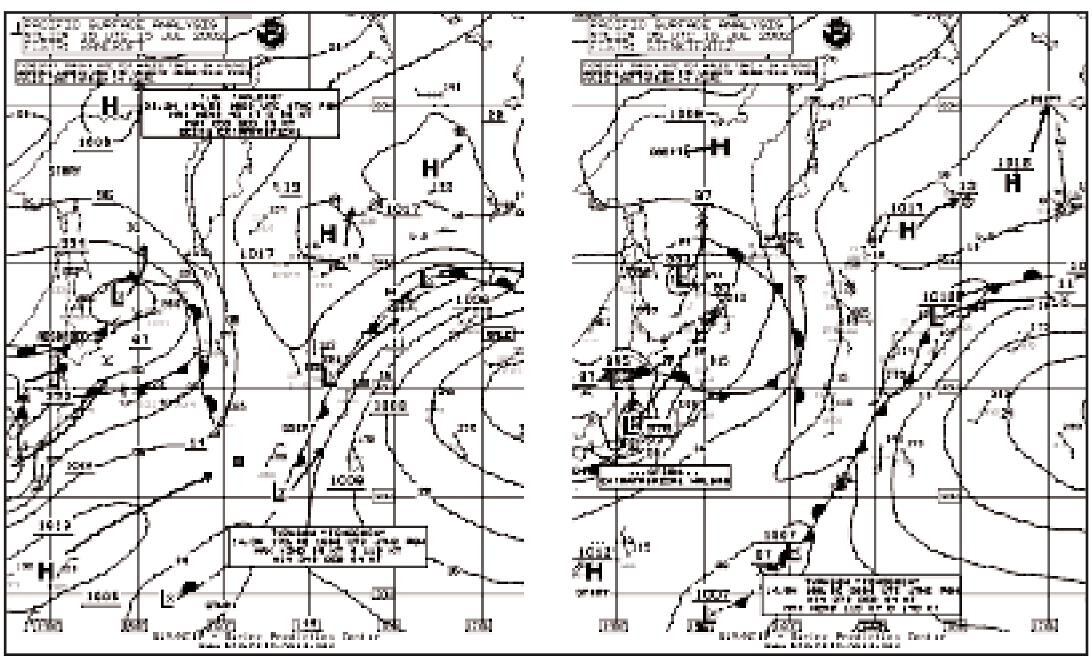

Figure 2. MPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC July 15 and 0600 UTC July 16, 2002.

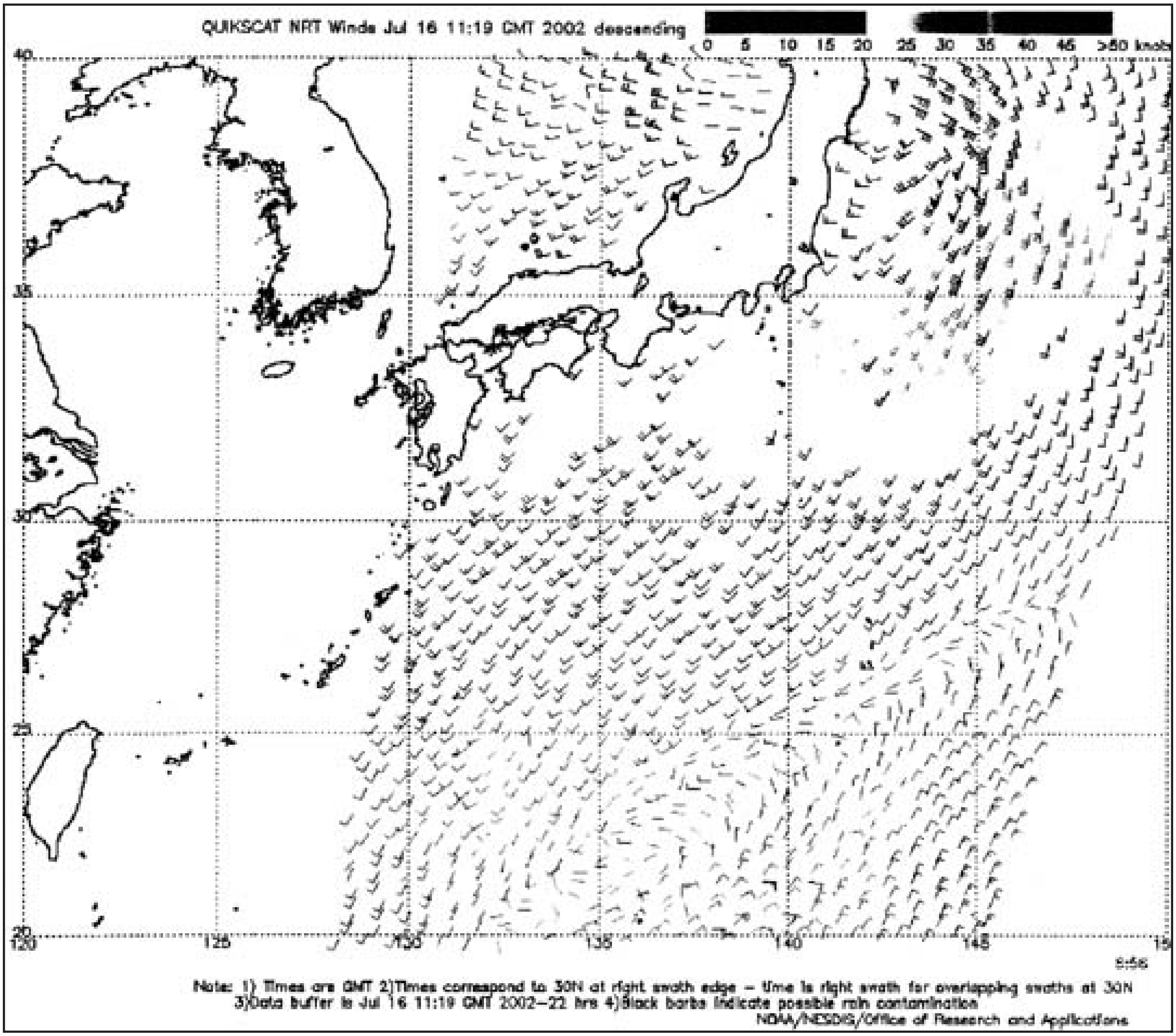

Figure 3. QuikScat scatterometer image of satellite-sensed winds valid approximately 0900 UTC July 16, 2002. The valid time is only three hours later than that of the second part of Figure 2.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

later (Figure 3), reveals a compact system with a small area of 50 to 60 kt winds just southeast of the center. An infrared satellite image of the storm (Figure 4) taken near the time of the second analysis in Figure 2 is suggestive of a hybrid system with some characteristics of a tropical cyclone (central dense cloudcover and compactness) and of an extratropical low (such as becoming associated with a frontal cloud band over eastern Japan). The highest reported seas with this system after passing east of 135W was 12 meters (40 feet) from the **Green Cove** (WCZ9380) near 34N 140E at 0600 UTC July 16. This ship also reported southwest winds of 45 kt at that time. Extratropical "Hagibis" subsequently weakened to a gale-force low near the Kurile islands eighteen hours later before moving into the western Bering Sea on the July 18. After looping to the

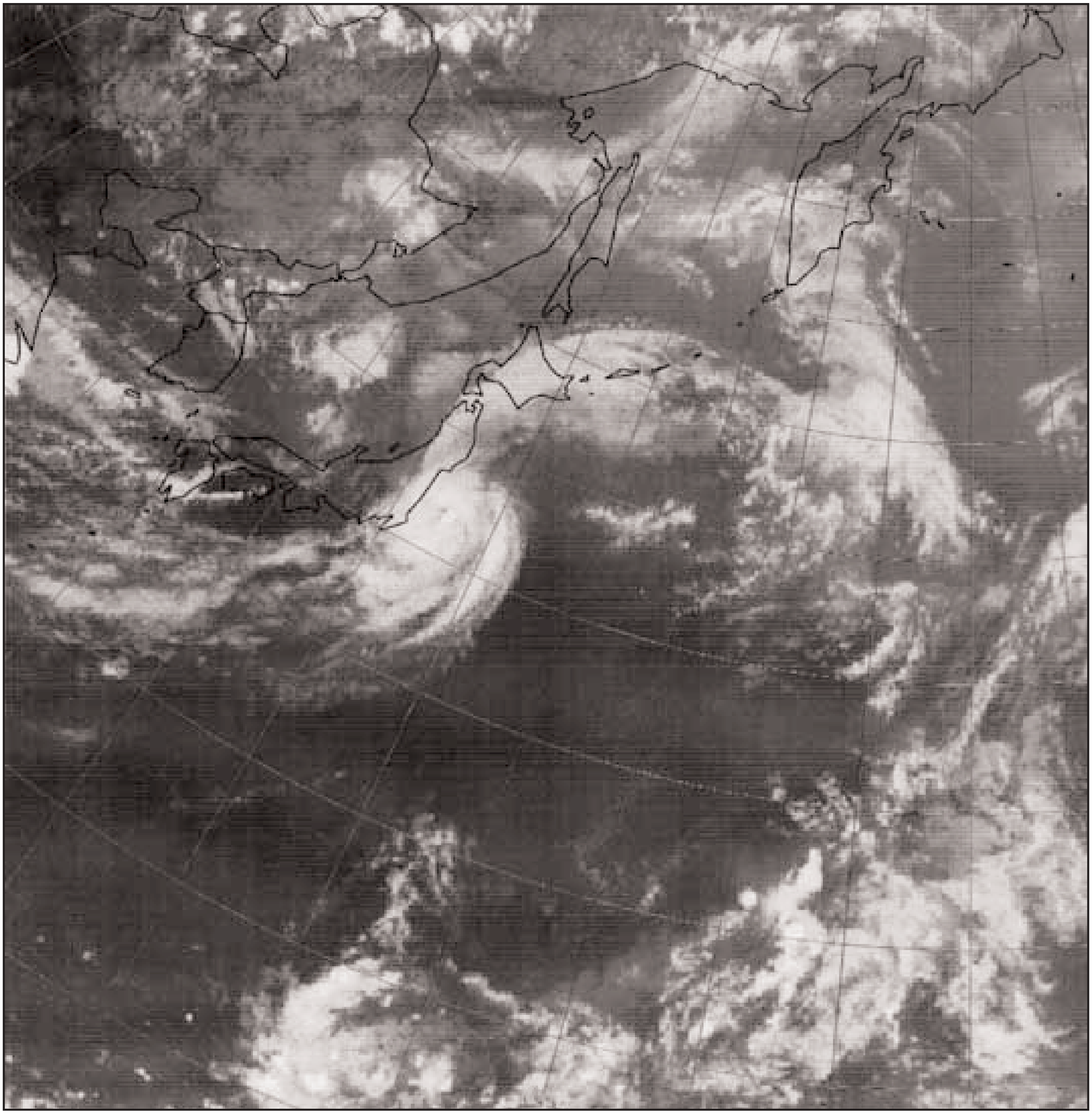

Figure 4. GMS infrared satellite image of extratropical storm "Halong" valid at 0532 UTC July 16, 2002. Satellite senses temperature, which is displayed on a scale from warm (black) to cold (white) in this type of imagery. The valid time is approximately the same as in the second part of Figure 2.

south of the central Aleutians on 20 July, the remnants of Halong became a large gale in the southern Bering Sea on the 22nd before looping to the southeast and then northeast and finally moving inland over mainland Alaska late on July 26.

Super Typhoon Fengshen: Figure 2 shows Typhoon Fengshen which was centered just south of MPC's oceanic chart area and tracking west at the time. At 0000 UTC July 20 Fengshen appeared on the southern edge of the chart area near 16.0N 158.5E as a super-typhoon drifting west-northwest at 6 kt. The intensity peaked at 1200 UTC July 21 near 20.5N 154.3E with maximum sustained winds of 145 kt and gusts to 175 kt. Fengshen subsequently weakened to a minimal typhoon while passing south of Japan and west of MPC's surface-chart area by 0000 UTC July 25.

Tropical Storm Fung-Wong: This system formed as a minimal tropical storm near 24N 140E at 1800 UTC July 20 with maximum sustained winds of 35 kt and gusts to 45 kt and drifted west, passing west of MPC's oceanic analysis area at 0000 UTC July 22.

Tropical Depression 15W (Kalmaegi): This tropical cyclone formed from a tropical disturbance that was near 18N 180 at 1200 UTC July 20, becoming Tropical Depression 15W (Kalmaegi) near 17.2N 178.1E, six hours later with maximum sustained winds of 30 kt with gusts to 40 kt. This system was short-lived, drifting northwest and dissipating at 1800 UTC July 21.

Tropical Depression 17W: This weak western Pacific tropical cyclone formed east of Japan near 34.2N 150.6E at 0600 UTC August 5 and moved east 10 kt but dissipated as a remnant low 34N 152E twelve hours later. The maximum sustained winds were 25 kt with gusts to 35 kt.

Super Typhoon Phanfone: Phanfone entered the far southern waters in MPC's oceanic analysis area near 16.8N 154.8E at 1200 UTC August 13 with maximum sustained winds of 70 kt with gusts to 85 kt. The system tracked northwest and intensified into a super typhoon at 1800 UTC August 15 near 23.9N 143.3E with maximum sustained winds of 135 kt with gusts to 165 kt. Phanfone remained a super typhoon through 1800 UTC August 16 before turning more north and slowly weakening. At 0000 UTC August 18, the **Mirai** (JNSR) encountered north winds of 50 kt and 8-meter seas (26 feet) near 31N 134E. Figure 5 shows Phanfone down to minimal-typhoon strength near the coast of Japan at 1200 UTC August 19, recurving northeast and becoming an extratropical storm within twenty-four hours with developing fronts. The **CSX Defender** (KGJB), appearing north of the storm center near 43N 149E in the second part of Figure 5, reported northeast winds at 40 kt. Extratropical "Phanfone" underwent rapid intensification in the following twelve hours, with the central pressure bottoming out at 972 mb near 44N 152E at 0000 UTC on August 21. This made it the second deepest non-tropical low in the North Pacific during the May-August

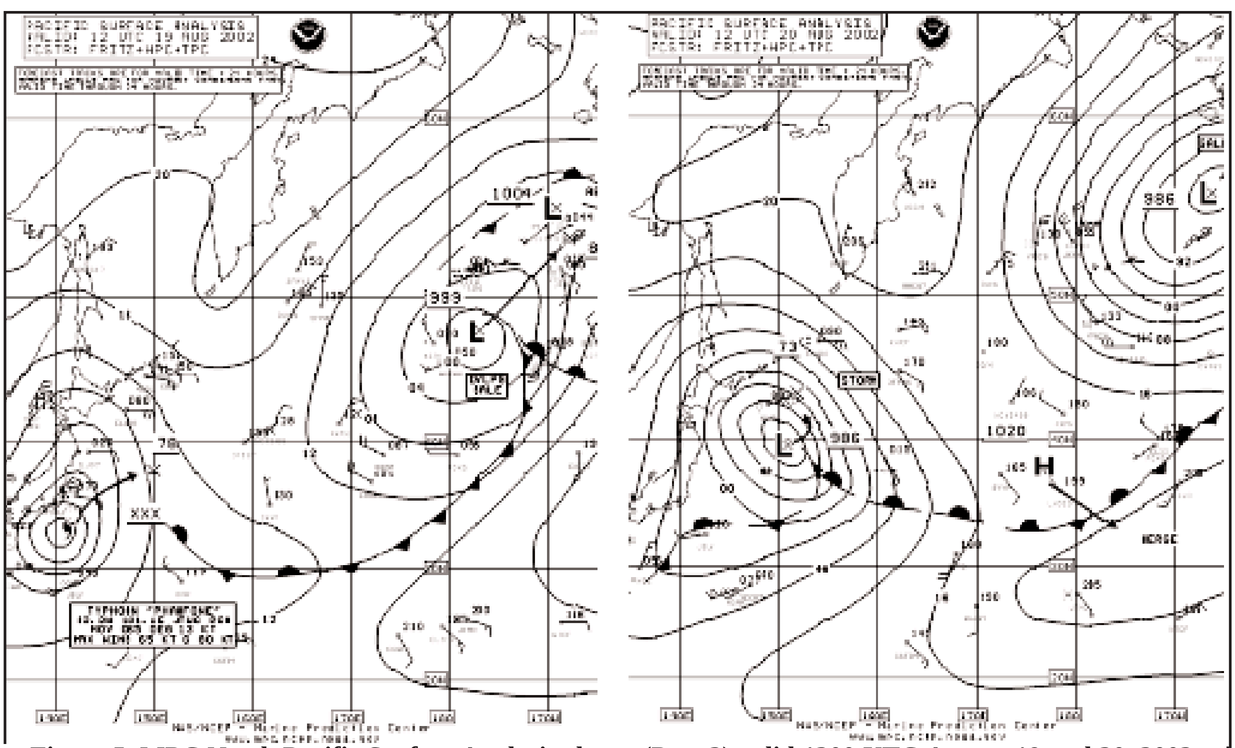

Figure 5. MPC North Pacific Surface Analysis charts (Part 2) valid 1200 UTC August 19 and 20, 2002.

period. The **Nyk Starlight** (3FUX6) reported a southwest wind of 45 kt near 42N 156E six hours later. The system then weakened to a gale at 0000 UTC August 22, then passed south of the Aleutians before becoming absorbed by a gale-force low in the southwest Gulf of Alaska late on August 25.

Typhoon Rusa: Rusa followed a track west-northwest across the waters south and southeast of Japan, entering MPC's chart area at 0000 UTC August 23 near 16N 161E as a tropical storm with maximum sustained winds of 40 kt with gusts to 50 kt. Rusa intensified into a minimal typhoon near 19N 157E twenty-four hours later. The maximum intensity was 115 kt for sustained winds, with gusts to 140 kt, at 0600 UTC August 26 when the center was at 22.5N 145.6E. The **Chubu Maru** (3FBJ7) at that time reported from 22N 142E with a north wind of 35 kt and 5-meter seas (16 feet). Rusa then began a slow weakening trend, but remained a typhoon when passing west of 135W and south of Japan at 0600 UTC August 28.

Tropical Depression Alika: This weak central Pacific tropical cyclone entered MPC's oceanic analysis area near 16N 168W at 0300 UTC August 28 and drifted northwest, dissipating at 1200 UTC that same day. The maximum sustained winds were 25 kt, with gusts to 35 kt.

Typhoon Sinlaku: Tropical Depression 22W formed at 16.7N 154.3E at 1800 UTC August 28 and became Tropical Storm Sinlaku near 20.5N 153.2E twelve hours later, with maximum sustained winds of 35 kt with gusts to 45 kt. Sinlaku became a typhoon near 22.5N 152.6E at 1200 UTC August 30 and developed maximum sustained winds of 110 kt with gusts to 135 kt at 0600 UTC August 31 near 23.7N 149.7E. The system turned more west by the end of the month, passing west of 135W near 25N early on September 3.

Typhoon Ele: Ele was formerly a central-Pacific hurricane which crossed 180W, becoming Typhoon Ele as such cyclones are called in the western North Pacific, on August 31. Further information on this system will be covered in the next issue of Mariners Weather Log.

Other Significant Events

North Pacific Storm of 25-27 May: Figure 6 depicts this storm forming

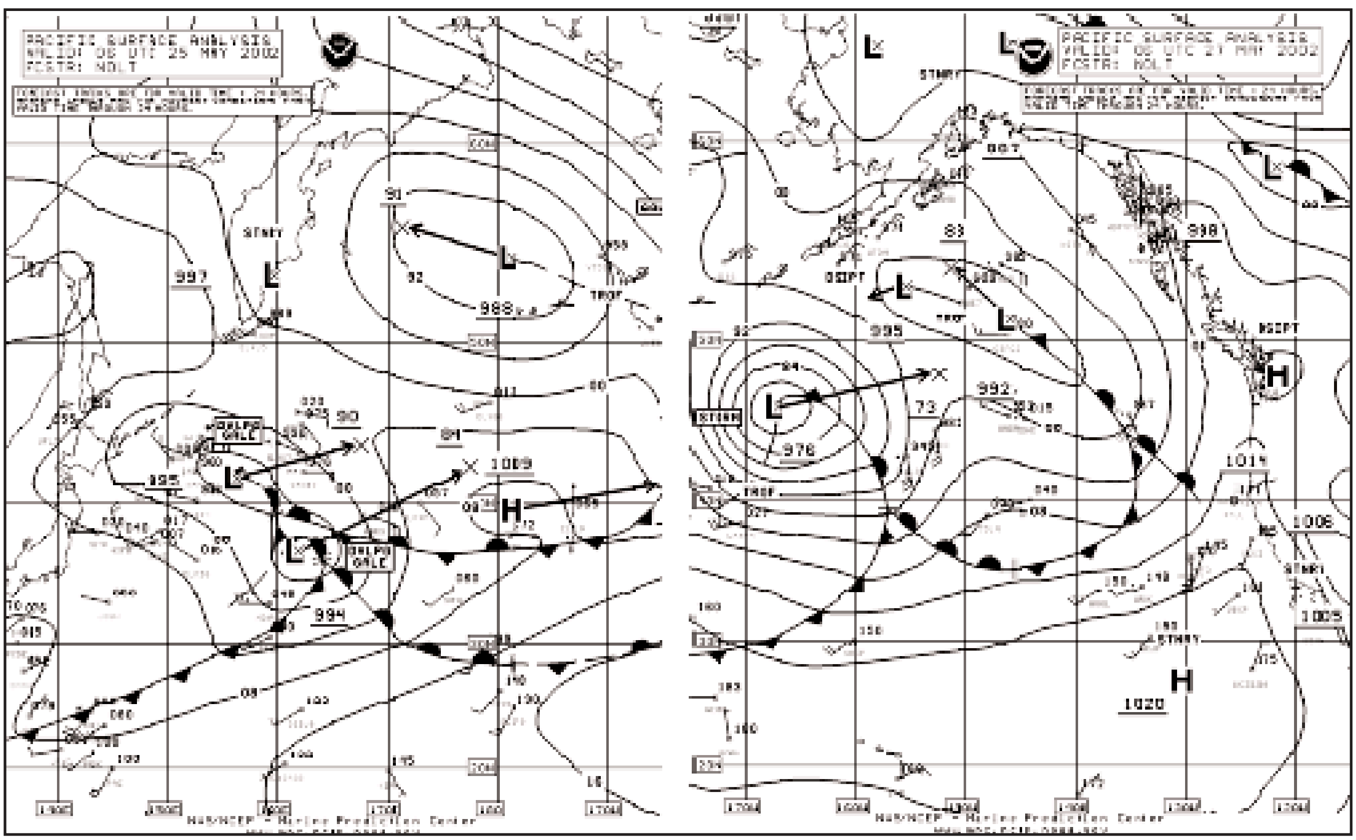

Figure 6. MPC North Pacific Surface Analysis charts: Part 2 (west) valid 0600 UTC May 25 and Part 1 (east) valid 0600 UTC May 27, 2002.

from the consolidation of two western North Pacific lows over a 48-hour period ending at 0600 UTC May 27. In terms of wind and sea conditions, the system was near maximum strength at 0600 UTC May 27 (second part of Figure 6). The central pressure actually dropped to as low as 970 mb at 1200 UTC May 28 when the center was at 49N 149W, but the circulation of this system expanded in area with an associated decrease in winds to gale force. This central pressure was the lowest in the North Pacific during the four-month period among non-tropical lows. The ship **V7CX** reported a southwest wind of 45 kt and 7.5-meter seas (25 feet) near 40N 178W at 1200 UTC May 26. The QuikScat data in Figure 7 reveal a well-defined circulation and storm-force winds of 50 kt south of the center. Later, at 0000 UTC May 28, the vessel **V7DL4** experienced west winds of 35 kt and 8-meter seas (26 feet), the highest seas reported in this event.

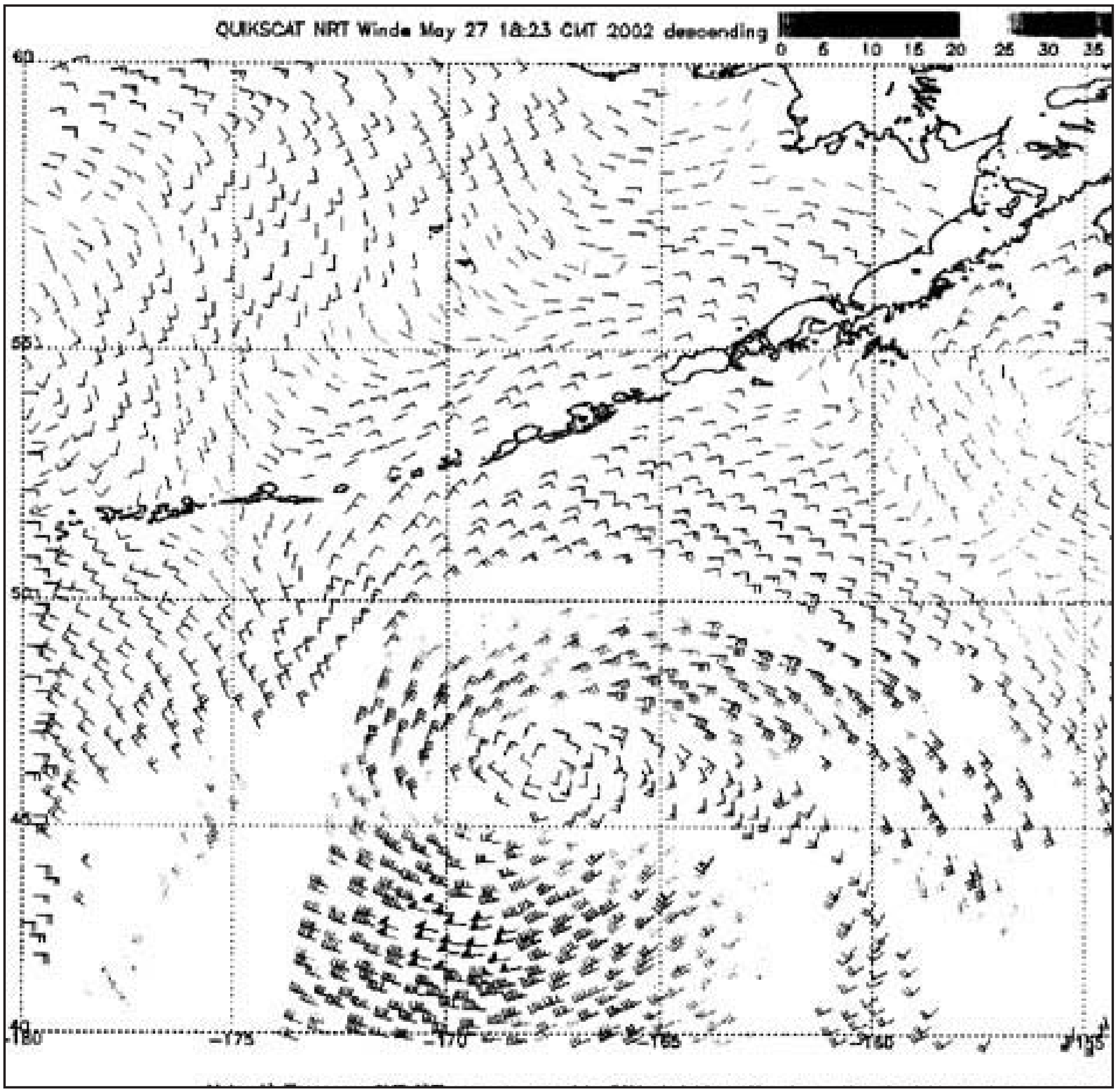

Figure 7. QuikScat scatterometer image of satellite-sensed winds valid about 0600 UTC May 27, 2002, or the same valid time as in the second part of Figure 6.
(Image courtesy of NOAA/NESDIS/Office of Research and Applications)

North Pacific Storm of 7-8 June: This system originated near the Kurile Islands early on June 3 and drifted east, with a new center forming to the east. Figure 8 shows the new center near 45N 169W (995 mb) in the first panel, which curved toward the north and developed a lowest central pressure of 978 mb near the eastern Aleutians twenty-four hours later. The highest winds and seas with this system occurred near the eastern Aleutians early on June 8.

The NOAA ship **Miller Freeman** (WTDM) encountered northeast winds of 52 kt near 55N 160W at 0300 UTC June 8. The same ship reported from 55N 161W three hours later with an east wind of 30 kt and 9-meter seas (30 feet), the highest seas observed in this storm. At that time another NOAA ship, the **Rainier** (WTEF), reported east winds of 45 kt at 56N 158W. The system then began a weakening trend while turning more west into the Bering Sea.

Western Pacific Storm of 9-10 June: The rapid development of this storm is shown in Figure 9, with the 1000 mb low down near 30N 143E at 1800 UTC June 8 absorbing another low to the north (994-mb center just north of Japan) twenty-four hours later. The **United Spirit** (ELYB2) near 42N 157E reported southeast winds of 45 kt and 4.5-meter seas (14 feet) at 1800 UTC June 9, while the ship **H3EP** encountered west winds of 45 kt at 39N 146E. The **CSX Patriot** (KHRF) experienced a southwest wind of 40 kt and 6-meter seas (20 feet) near 43N 155E at 0000 UTC June 11. The system slowed after 1800 UTC June 9 and looped northwest then southeast during the next twenty-four hours before heading northeast and weakening near the western Aleutians on the June 14.

Western Pacific Storm of 18-19 June: Much of the development of this compact system occurred over a twenty-four hour period and was unusually far south for the time of year. A low-pressure center (1000 mb) moved northeast off the southern coast of Japan after 0000 UTC June 18 and developed a 988-mb central pressure at 0000 UTC June 19 near 40N 147E. The strongest winds were reported at this time, with the **Mirai** (JNSR) reporting a northwest wind of 55 kt on the backside of the system near 39N 145E, along with 9.5-meter seas (31 feet). These impressive numbers, if reliable, are likely due to enhancement by the warm Kuroshio Current. The storm center continued a northeastward motion and began to weaken after developing a central pressure of 986 mb at 0600 UTC June 19. The system reached the central Aleutians as a gale-force low on the 22nd, followed by some redevelopment in the Gulf of Alaska on the 25th before weakening near the Alaskan coast on June 26.

Eastern North Pacific Storm of 7-8 July: This storm, while not among the most intense of the period in terms of central pressure, was accompanied by the highest reported winds among non-tropical systems. Figure 10 displays the period of most rapid development of this slow-moving system over the twenty-four hour period ending at 1800 UTC July 7, when the central pressure bottomed out at 992 mb. At 1200 UTC July 7, the **Maersk Sea** (S6CW) reported a southeast wind of 40 kt and 6-meter seas (20 feet) near 43N 147W. At 0000 UTC July 8, or six hours later than the time of the second part of Figure 10, the **Hanjin Amsterdam** (DHDH) encountered a

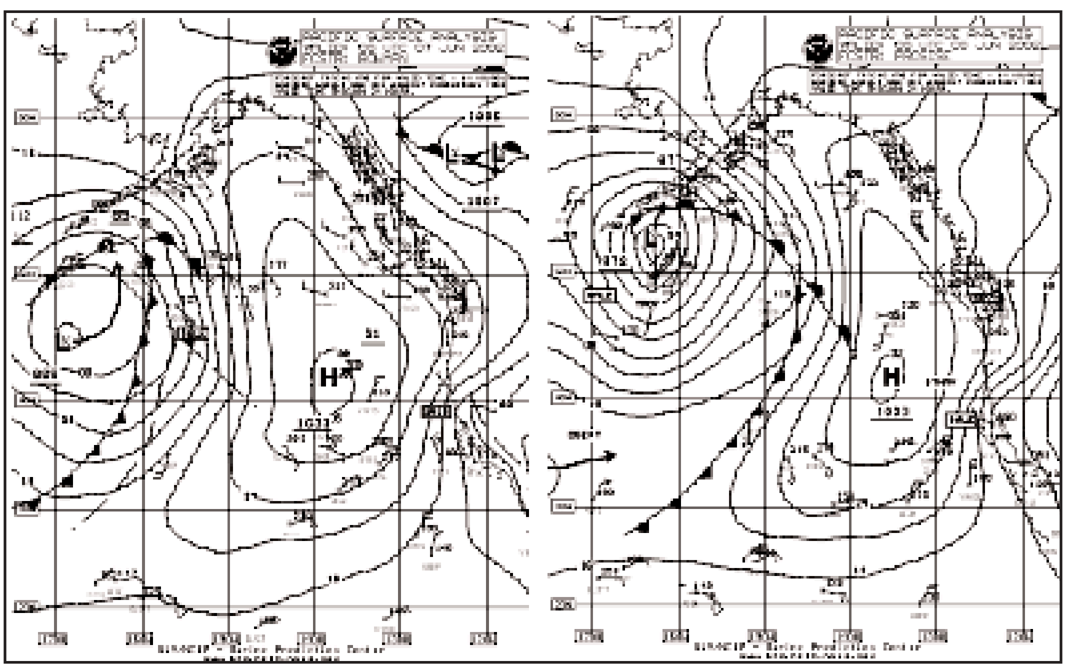

Figure 8. MPC North Pacific Surface Analysis charts)Part 1 - east) valid 0600 UTC June 7 and 8, 2002.

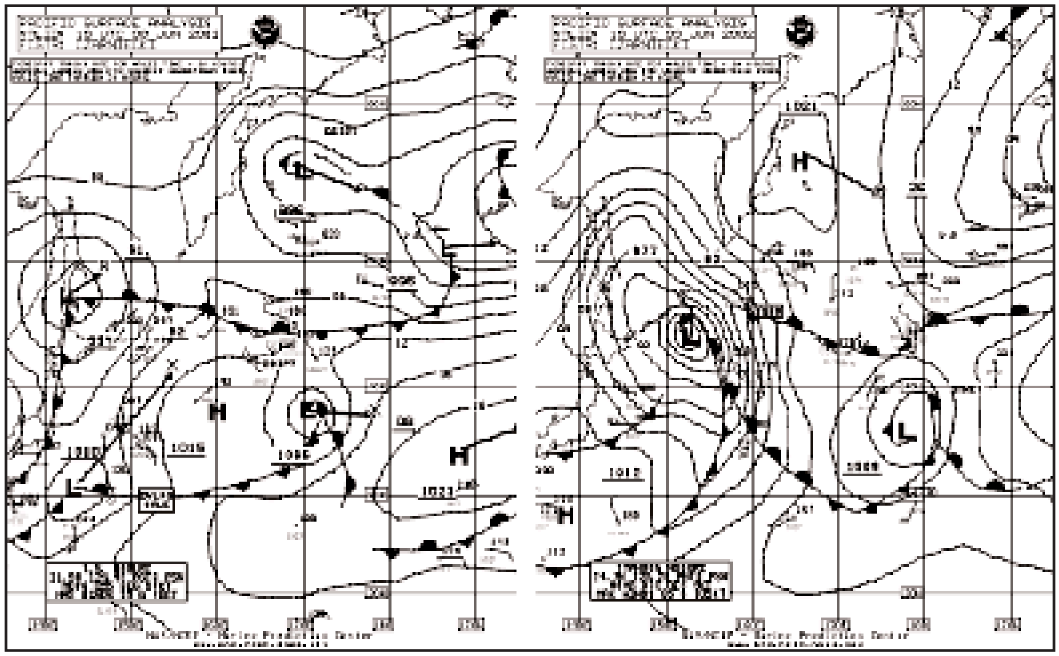

Figure 9. MPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC June 8 and 9, 2002.

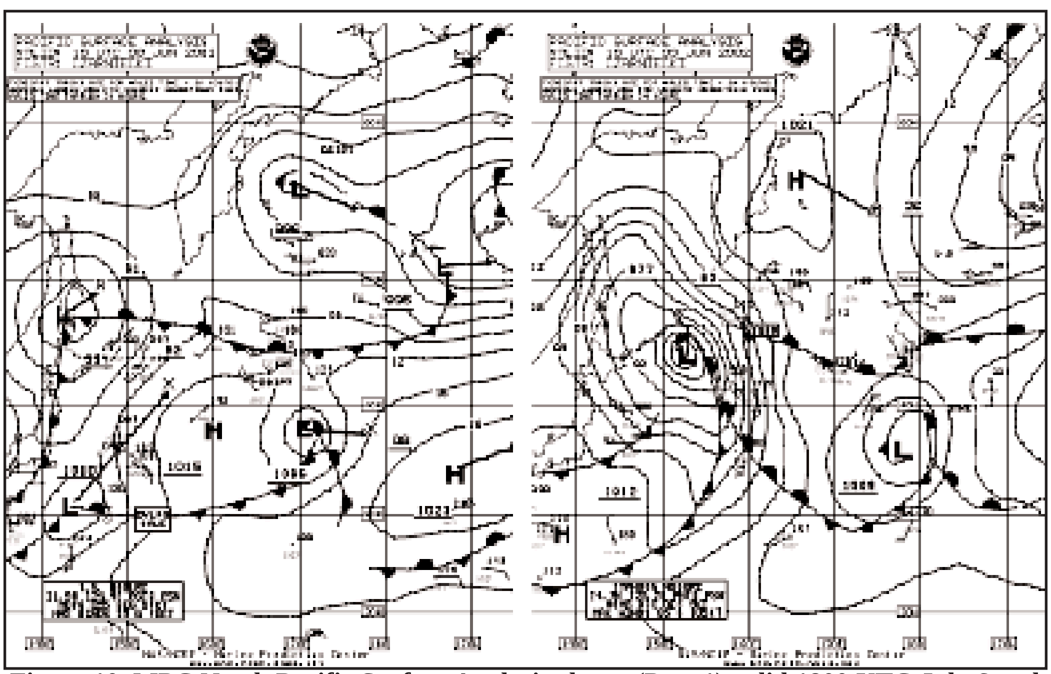

Figure 10. MPC North Pacific Surface Analysis charts (Part 1) valid 1800 UTC July 6 and 7, 2002.

northwest wind of 58 kt and 6.5-meter seas (21 feet). These reported winds appear to be reliable and are supported by QuikScat data (not shown). A satellite image of the storm near maximum intensity is shown in Figure 11 and reveals a well-defined and mature cloud pattern and circulation center. The system subsequently continued an eastward drift and weakened. ⚓

Reference

Sienkiewicz, J. and Chesneau, L., *Mariner's Guide to the 500-Mb Chart* (Mariners Weather Log, Winter 1995).

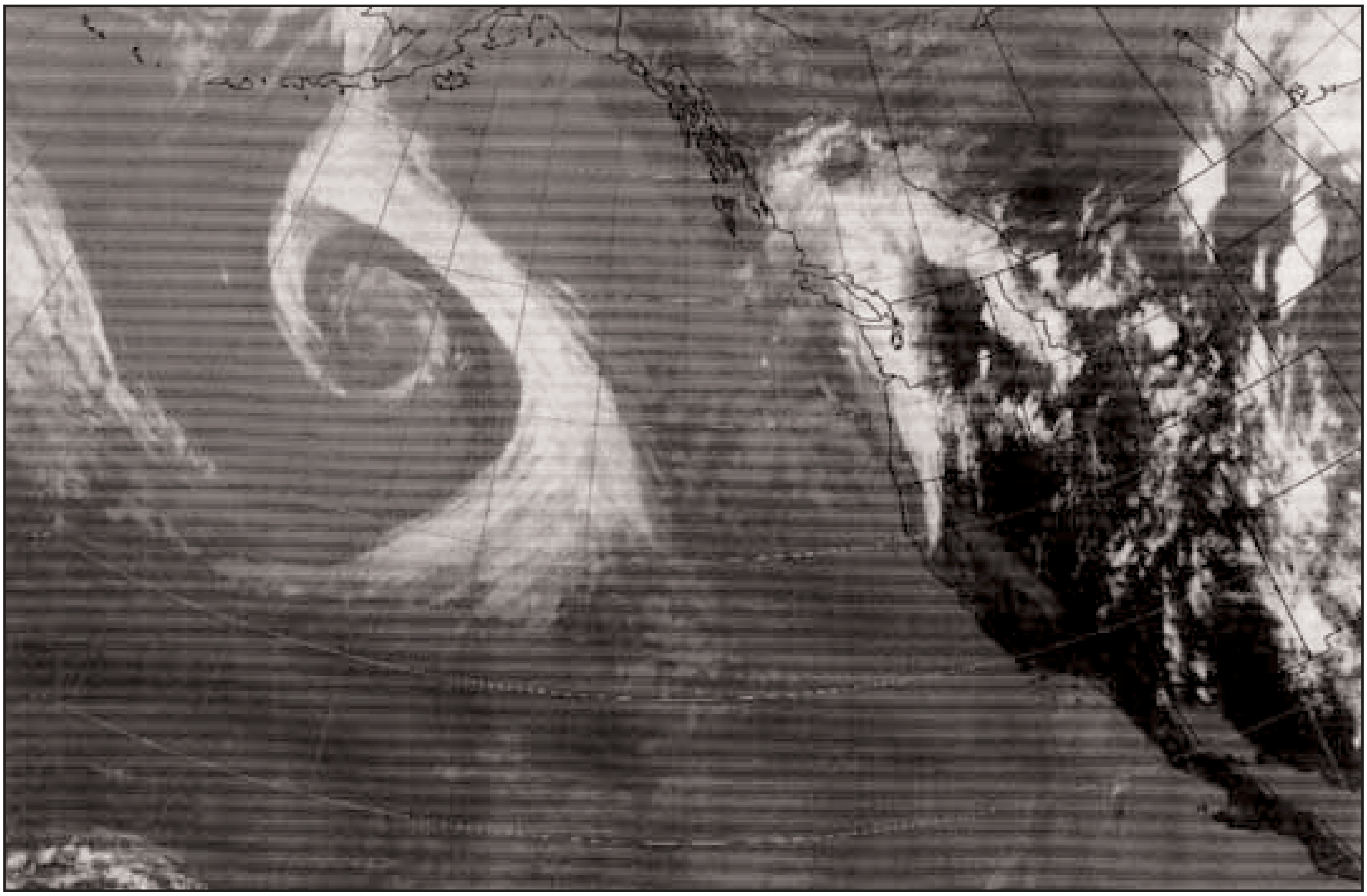

Figure 11. GOES-10 infrared satellite image of the storm in Figure 10, valid 2200 UTC July 7, 2002. The valid time is four hours later than that of the second part of Figure 10.

MEAN CIRCULATION HIGHLIGHTS AND CLIMATE ANOMALIES

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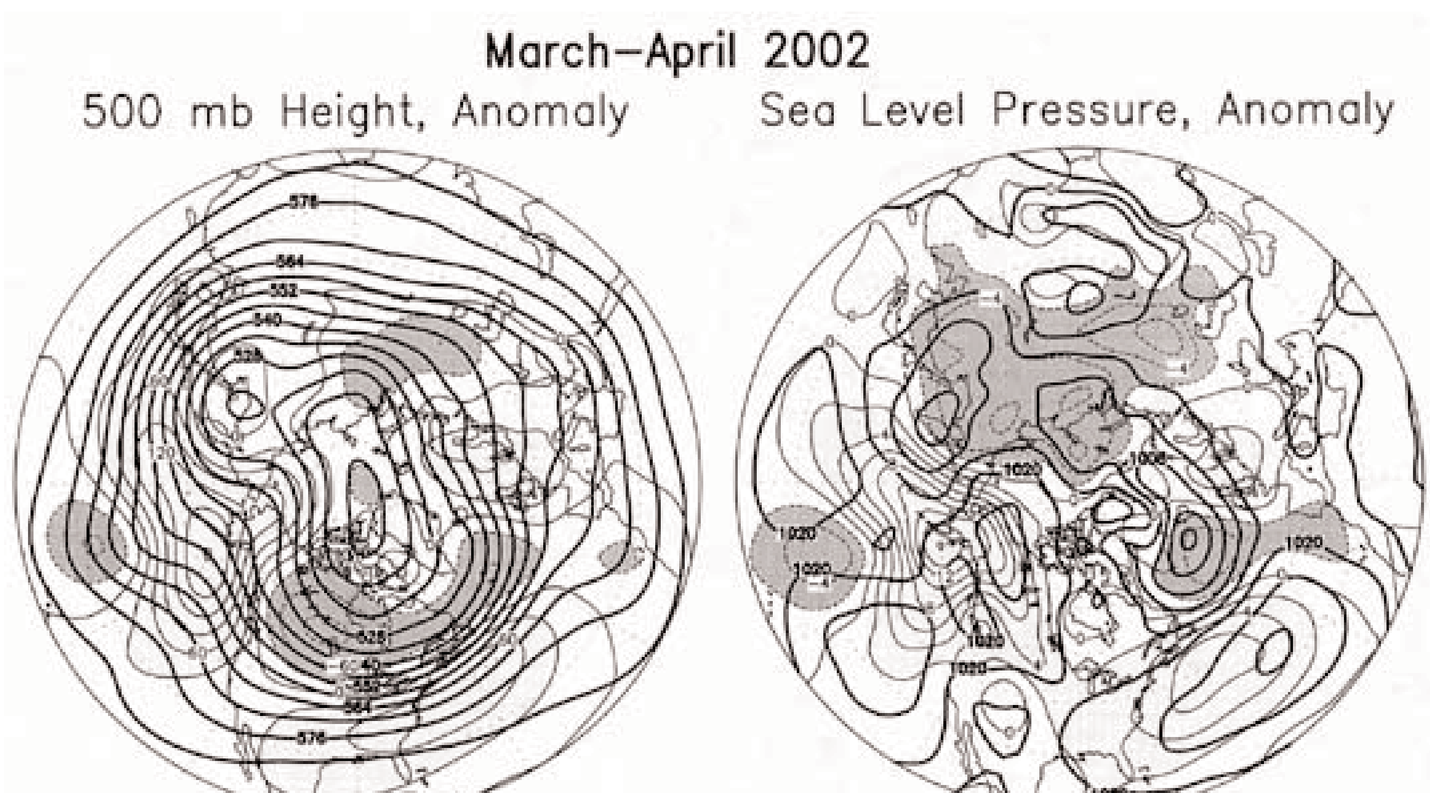
MARCH - APRIL 2002

The map of mean 500-mb height and height anomalies show generally above normal heights over much of the Pacific Basin, except for a stronger than normal trough at low latitudes northwest of Hawaii, mainly during April. A ridge extended north from middle latitudes of the Pacific into the Bering Sea and over Alaska, where surface pressures were well above normal. The Aleutian Low was noteworthy by its virtual absence, appearing only as a tiny 1016 mb contour in the mid-Pacific. The most extensive area of below normal heights in the Northern Hemisphere was over much of Canada, extending out across the North Atlantic, while to the south, above normal mid-tropospheric heights and sea level pressures prevailed across most of the U.S. and middle latitudes of the Atlantic. The circulation was also somewhat more anticyclonic than normal over most of Europe, both at the surface and aloft.

Unusually cold air remained in place over most of Canada and southeastern Alaska, and frequent late-season Arctic outbreaks affected much of the central and northern sections of the Lower 48 States, especially during March. During April, the cold air remained over western Canada most of the time, and the strong Bermuda High expanded its area of influence northwestward, bringing early-season warmth to much of the southern and eastern parts of the U.S.

Over the Eastern Hemisphere, a weak trough was located over central Asia but mid-tropospheric heights were above normal elsewhere. Most areas enjoyed above-normal temperatures, and excessively hot conditions developed over southeastern Asia and parts of the Indian subcontinent during April. Most of the two-month period was dry in Europe, where anticyclonic flow conditions prevailed.

Over the Pacific, La Niña conditions, characterized by below normal SSTs along the equator, were replaced in early March by moderately above



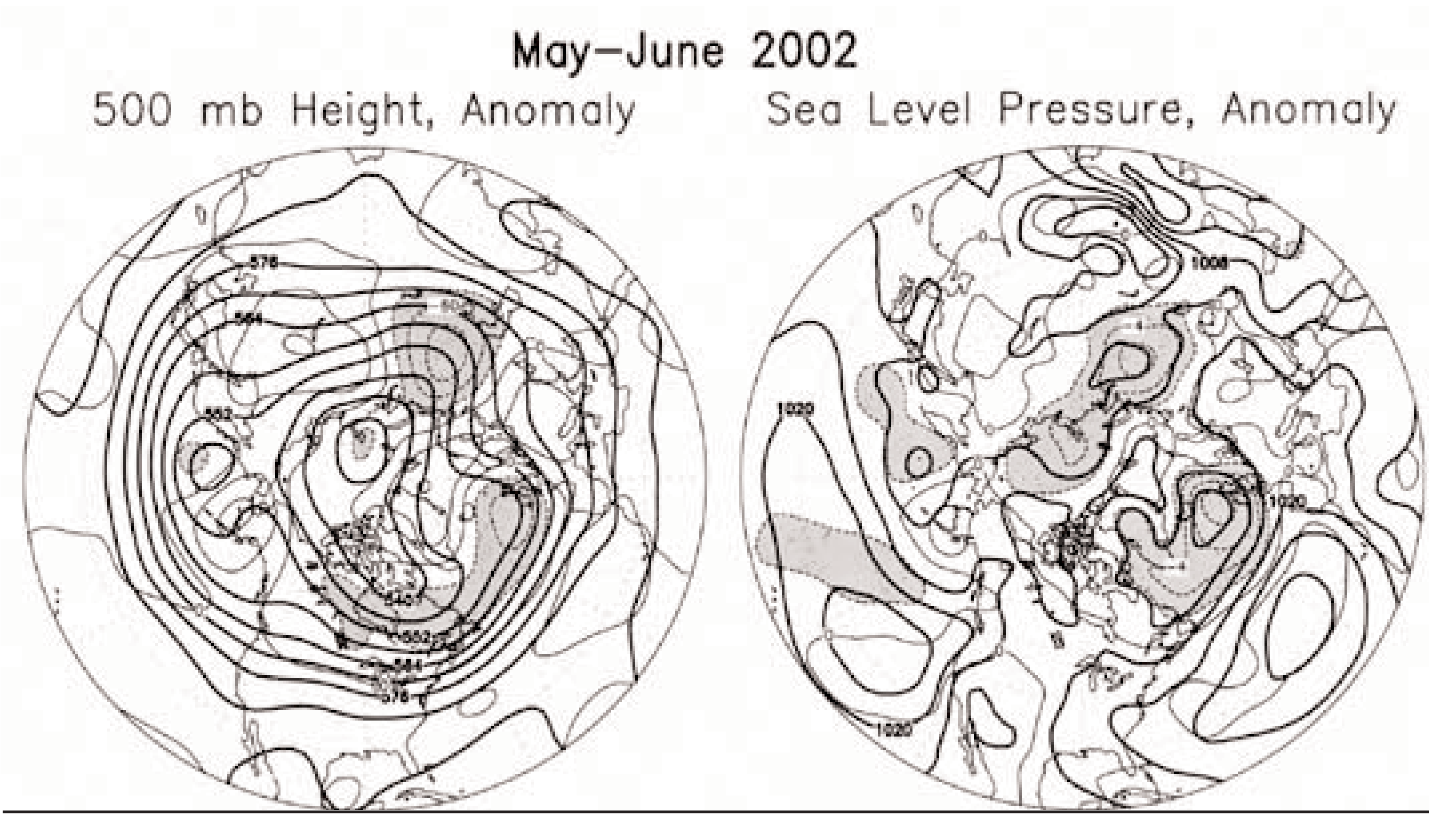
normal SSTs, indicating the early stages of a new El Niño. Atmospheric indices, however, remained in the neutral range, showing that the warming of the SSTs along the equator had not yet had much effect on the overlying atmosphere. Impacts of El Niño on the atmosphere are usually greatest during its mature stage, which is not expected for several months and are most effectively transmitted to the middle latitude circulation during the colder part of the year.

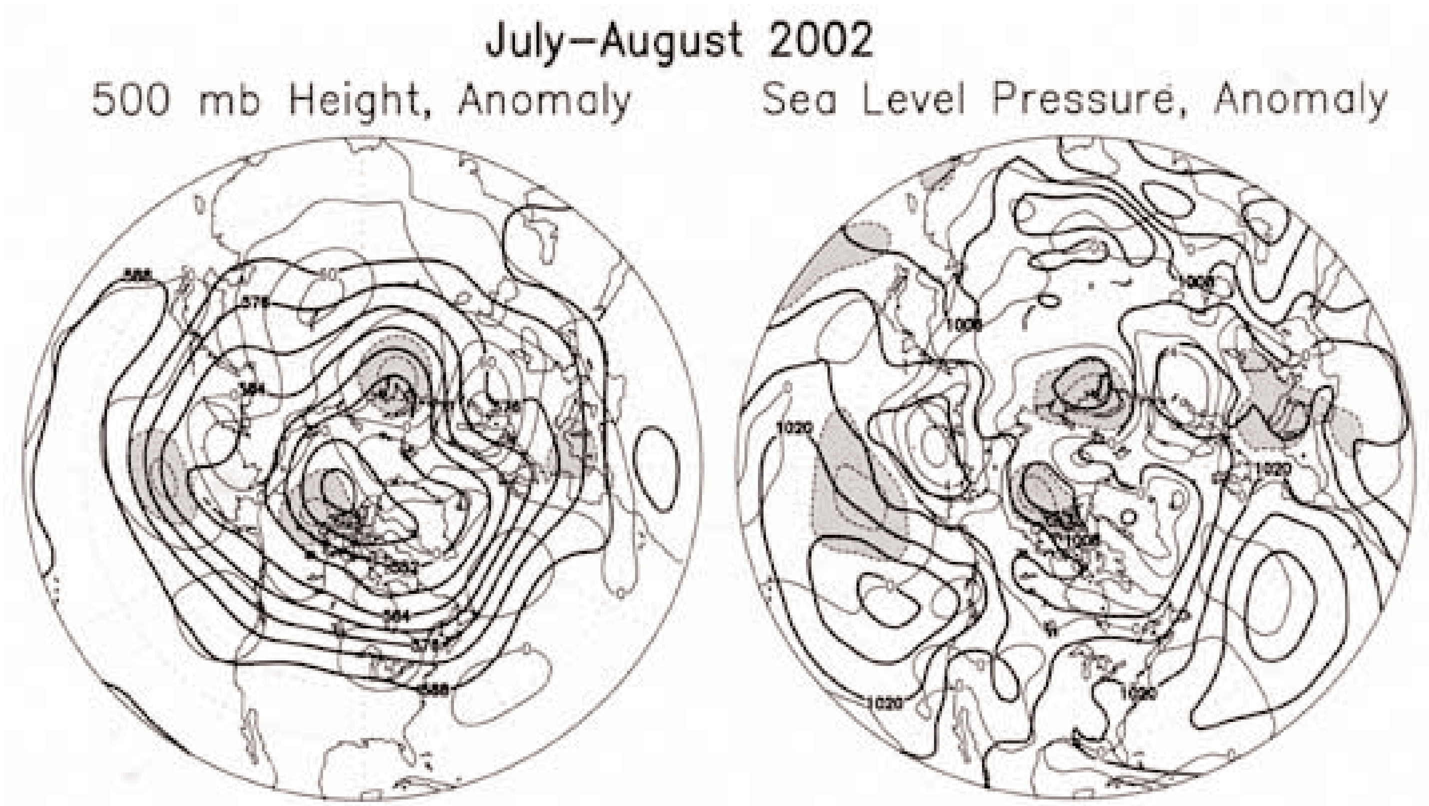
MAY - JUNE 2002

The circulation during the late spring and early summer months was characterized by a band of fast westerlies extending from eastern Canada across the middle latitudes of the Atlantic, with a tendency for storms to stall just west of the British Isles. Higher than normal pressure and generally anticyclonic conditions prevailed both at low latitudes and high latitudes of the Atlantic. Except for a blocking ridge over the west coast of Alaska and the Bering Sea, conditions were close to normal over the Pacific. No strongly anomalous circulation patterns were in evidence over the lower 48 states either, but this was due to highly variable conditions during the two months. May was on the cool side, with record low temperatures occurring in the Midwest and Northeast during the third week of the month, while June was predominantly warm, with hot weather, some of record proportions, developing over both the Southwest and the north-central states by the end of the month.

In Europe, temperatures were above normal much of the time in northern areas, but hot weather developed over much of the southern and central parts of the continent during the latter part of June, where strongly anticyclonic conditions prevailed.

Over the tropical Pacific, El Niño conditions continued to develop. Equatorial SSTs were at least 1 C above normal over a wide area extending from just west of the date line to about 110W longitude. A strengthening of the Humboldt current prevented the warm water from reaching the coast of South America. The Southern Oscillation Index, often taken as a measure of the phase of El Niño conditions, was negative for the fourth consecutive month in June, suggesting that the El Niño was beginning to have an effect on the atmosphere.





JULY - AUGUST 2002

Stronger than normal anticyclonic conditions were in evidence at most mid- latitude locations during July and August, especially over the eastern Pacific, the Great Lakes region, the central Atlantic, and Scandinavia. Vigorous troughs and cyclonic activity were confined to a small area of the central Pacific southwest fo the Aleutians, the Arctic basin just north of the Canadian Archipelago, central Asia, and part of southern Europe and the Mediterranean Basin. The storminess in southern and central Europe was associated with record flooding in some areas during August, and extended into eastern Europe. Above-normal temperatures prevailed primarily over eastern Europe in July and the area of anomalous warmth moved north to Scandinavia in August.

Record and near-record heat and increasing drought plagued many parts of the United States, and the summer as a whole (including June) ranked with the Dust Bowl summers of 1934 and 1936 and the recent hot summer of 1988 as among the hottest on record on a nationwide basis. Drought continued through most of the summer over much of the West and Southwest, where wildfires continued to be a problem. Drought began to develop in the eastern corn belt also under the anticyclonic flow pattern, following a spring that had mostly good rains.

Much of the Middle Atlantic area continued to have worsening drought, and the Northeast began to dry again following fairly normal spring rains in most areas.

El Niño conditions continued to develop over the Pacific, and more atmospheric indices began to show its influence. Although typhoons were active over the western Pacific, dry conditions prevailed over eastern Australia and parts of Indonesia.

Eastern Pacific tropical storms were active also, but tropical activity over the Atlantic was relatively weak and infrequent until the very end of August, when several storms, mostly weak, formed in early September. All of these are typical atmospheric responses to El Niño conditions over the equatorial Pacific.

Marine Weather Review
Tropical Atlantic and Tropical East Pacific Areas
January through April 2002

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Southwest Gulf of Mexico Storm Events February, 2002: Several gale events typically occur over the southwest Gulf of Mexico each winter season. The gales develop when strong high pressure systems over the central United States build southward along the Mexican coast. The strong northerly winds are magnified over the extreme southwest Gulf as they funnel down the eastern slopes of the Sierra Madre Mountains. In Mexico, these events are known as a Achoclatero@ or Achocolate gale@ (American Meteorological Society, 2000) as large amounts of blowing sand and dust produce a brownish or chocolate-colored sky. In February, two such events produced storm force winds on both land and sea.

The first storm event occurred between 10-12 February. It began when a strong cold front entered the Gulf of Mexico shortly after 0600 UTC 10 February. An unusually strong 1052 mb high pressure center was located northwest of the front over the northern Rockies. As the high began to build over the Gulf behind the front winds increased to gale force over the western Gulf of Mexico. By 1200 UTC, the front extended from southeast Louisiana to the Mexican coast near 23EN 98EW. Buoy 42002 in the western Gulf near 26EN 94EW observed 34 kt winds with gusts to 40 kt at 1700 UTC. Wave heights at buoy 42002 quickly rose to 4.5 m (14 ft) by 2300 UTC.

At 0000 UTC 11 February, the front extended from the western Florida Panhandle to the southwest Bay of Campeche. The **Koeln Express** (9VBL) provided extremely useful hourly-observations from the southwest Bay of Campeche during this event (Figure 1). The ship experienced winds above gale force for 24 consecutive hours and encountered storm force winds for 8 hours. The **Koeln Express** observed peak winds of 58 kt at both 0400 and 0500 UTC. Based on the observations a storm warning was issued for the extreme southwest Gulf of Mexico.

By 1800 UTC 11 February, the cold front was located from south-central Florida to the eastern Bay of Campeche. High pressure northwest of the front weakened and moved into eastern Texas. At this time, storm force winds ended over the southwest

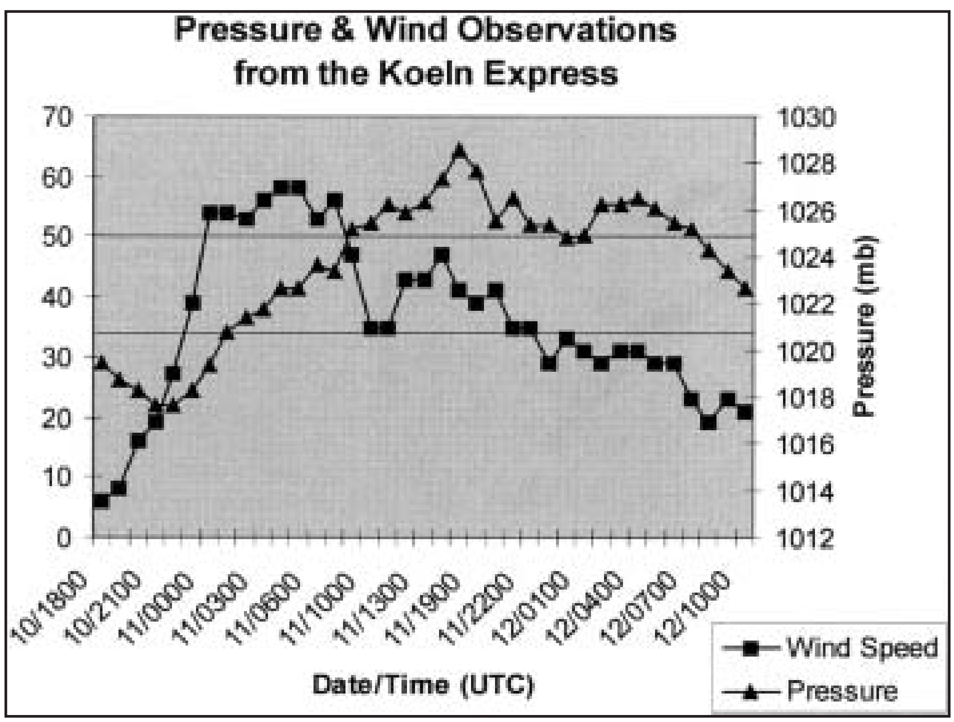


Figure 1. Graph of Pressure and Wind Observations from the Koeln Express from 1800 UTC 10 February through 1000 UTC 12 February 2002. The two horizontal lines represent the 34- and 50-kt wind speeds.

Gulf and by 0600 UTC 12 February winds finally decreased below gale force over the entire Gulf of Mexico. This event also produced strong gales over the Gulf of Tehuantepec. It is suspected that the event reached storm force over the Gulf of Tehuantepec, however no verification of storm force winds was received.

The second storm event began early on 22nd February as a cold front entered the northwest Gulf. The front moved rapidly southeastward as a 1036 mb high over the Rockies built southward. The winds quickly increased to gale force behind the front. At both 1100 and 1200 UTC buoy 42002 reported northerly winds of 36 kt with gusts to 44 kt. Sea heights increased from less than 1 m (2-3 ft) to 3.5 m (11 ft) in 3 hours. Again, the strongest winds occurred over the southwest Gulf of Mexico along the eastern slopes of the Sierra Madre Mountains. An 1137 UTC Quikscat pass detected 40- to 50-kt winds from 21N to 25N west of 95W. At 1145 UTC, Veracruz reported northerly winds of 18 kt. By 1318 UTC the winds at Veracruz increased very dramatically to 50-kt with gusts to 60 kt. At 1609 UTC, Veracruz observed sustained winds of 60 kt with occasionally gusts estimated to an incredible 100 kt (Figure 2). Visibilities dropped to 1 statue mile in blowing sand, which is precisely why these events are referred to as a "chocolate gale." Just offshore, the **Lykes Explorer** (WGLA) near 20.5N 96W experienced northwest winds of 44 kt and combined seas of 5 m (16 ft) at 1800 UTC. By 1200 UTC 23 February, high pressure became established over the western Gulf along the coast of Texas and Mexico. At this time, the strong northerly winds decreased below gale force.

This event also produced storm force winds over the Gulf of Tehuantepec as indicated by a Quikscat pass at 2338 UTC 23 February.

Significant Weather of the Period

Tropical Cyclones:

None.

Other Significant Events of the Period

The January to April time period typically brings several strong cold outbreaks that produce gale force winds over the Gulf of Mexico and western Atlantic. Besides the two southwest Gulf of Mexico storm events featured above, five additional gale events occurred over the western Gulf of Mexico during the period. A couple of these events produced gales over the western Atlantic, while two storm centers north of the TPC forecast area briefly produced gales over the eastern Atlantic south of 31N.

Several Gulf of Tehuantepec gale events occurred in the eastern Pacific.

Atlantic, Caribbean and Gulf of Mexico

Gulf of Mexico and West Atlantic Gales 2-7 January: During the first week of January, two separate lows developed over the Gulf of Mexico and produced gale conditions over portions of the Gulf and west Atlantic. The first low developed early on 1 January, along a stationary front over the southwest Gulf of Mexico. The low moved northeastward into the central Gulf and strengthened into a gale center by 0000 UTC 2 January. Gale force winds occurred over the

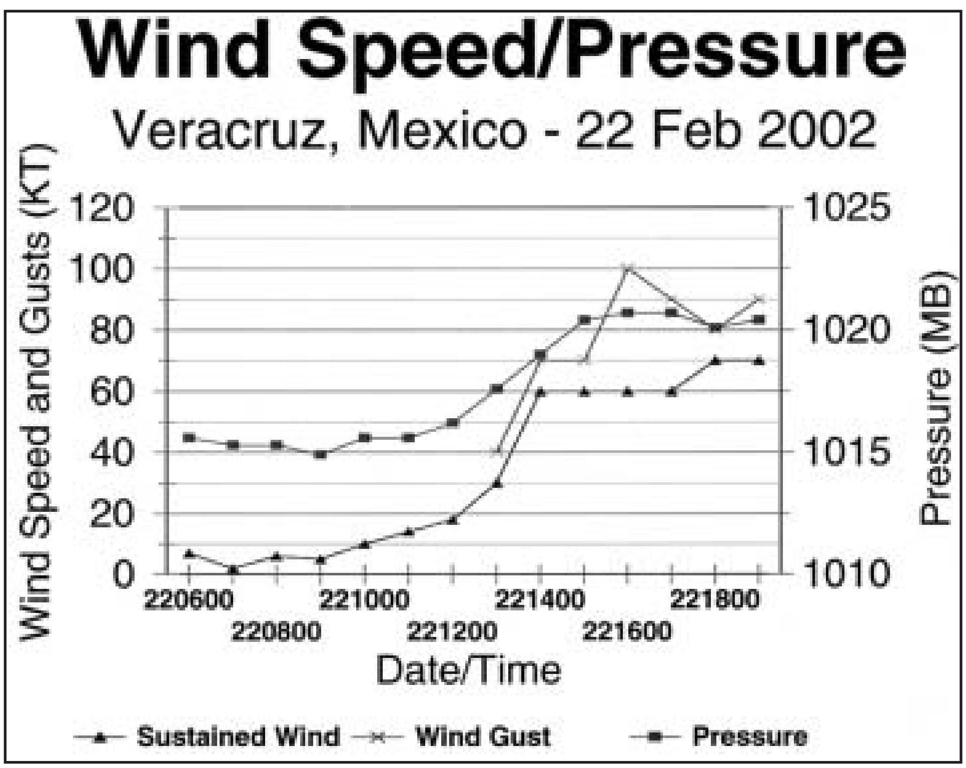


Figure 2. Graph of Pressure and Wind Observations from Veracruz, Mexico from 0600 UTC throuh 1900 UTC 22 February 2002. An estimated peak gust of 100 kt was indicated at 1600 UTC.

north and west semicircles of the system. Buoy 42002 near 26N 93.5W reported northerly winds of 33 kt with gusts to 40 kt, and seas of 4 to 4.5 m (14 ft) around 0600 UTC 2 January. The ship **Pequot** (ELTF6) over the central Gulf of Mexico encountered 35 kt winds at 0600 UTC. Later on the 2nd, the gale moved east-northeastward across the eastern Gulf of Mexico and central Florida. The system brought widespread rain to much of Florida and produced a weak tornado in Homestead (just south of Miami). At 0000 UTC 3 January, the gale was centered over the west Atlantic near 31N 79W. By this time, gale conditions ended over most of the Gulf of Mexico; however, as strong high pressure became established over the Gulf, strong northwest winds continued. Along the coast of Mexico, these winds reached gale force, and the **Koeln Express** reported hourly observations of 35 to 43 kt near Veracruz between 0500 and 1600 UTC. The gales finally ended over the entire Gulf by 0000 UTC 4 January.

Early on 4 January, the gale center strengthened into a storm off the North Carolina coast.

At this time, strong west to northwest gale force winds extended south to 27N west of 65W over the west Atlantic. A 1048 UTC Quikscat pass detected 35 to 40 kt winds. At 1200 UTC the **Arctic Ocean** (C6T2062) observed 37-kt winds near 30N 75W. The gale force winds spread eastward as the storm center moved northeast of Bermuda later on 4th January. Early on the 5th, the ship **Kota Perwira** (DEEU) encountered 41-kt winds and combined seas of 5 to 7.5 m (17 to 25 ft) near 30N 56W.

Shortly after 1200 UTC 5 January, the storm center moved farther north, and winds decreased below gale force south of 31N.

The second low developed along the coast of Texas on the 5th. It tracked farther north than the previous low, and at 0000 UTC 6 January was centered along the coast of southeast Louisiana. Shortly thereafter, several buoys in the northeast Gulf reported gale force winds. At 0200 UTC, buoy 42040 near 29N 88W recorded southeast winds of 36 kt, with gusts to 46 kt, and sea heights near 5 m (16 ft). Buoy 42039 near 29N 86W observed southeast winds of 37 kt with gusts to 44 kt at 0600 UTC. At the same time, the **Chevron South America** (ZCAA2) also encountered 36 kt winds over the northeast Gulf. After the associated cold front moved across the eastern Gulf, strong southwest to west winds continued. Sea heights continue to rise at buoy 42039 and eventually peaked at 5.6m (18 ft) at 1600 UTC. By 1800 UTC, the low was centered over eastern South Carolina with the trailing cold front across south Florida to western Cuba. At this time, winds decreased below gale force over the Gulf of Mexico but increased to gale force over the western Atlantic. At 1800 UTC, drifting buoy 41645 near 30N 78W reported south winds of 40 kt, while buoy 41010 (near 29N 78.5W) observed south winds of 32 kt, with gusts to 41 kt and seas to 4.6 m (15 ft) just east of the front. At 0600 UTC 7 January, the low was located along the coast of New England, with the trailing cold front through 31N 73W to central Cuba. At this time, winds decreased below gale force over the Atlantic south of 31N.

East Atlantic Cold Front 23-24 January: A strong cold front associated with a storm center well north of 31N produced a brief period of gale force winds over the eastern section of the TPC forecast area. At 1800 UTC 23 January, the front extended through 31N 42W to 25N 65W. At 2143 UTC, Quikscat pass indicated gale force winds north of 28N between 35W and 48W. Two ships, the **Douce France** (FNRS) and the **Pavel Vavilov** (UCKG), encountered northwest winds of 40 kt near 30N 45W at 0000 UTC 24 January. The event ended by 1200 UTC as the front reached from 27N 35W to 22N 55W.

Southwest Gulf of Mexico Gale 25-26 January: The next in a series of strong Gulf of Mexico cold fronts moved off the coast of Texas just before 0000 UTC 25 January. A strong 1041-mb high, located over the central plains began building southward over the Gulf behind the front. As the front moved quickly southward across the western Gulf, winds increased to gale force shortly after 0600 UTC. Quikscat data from 1153 UTC detected an area of 30- to 35-kt northerly winds south of 25N west of 95W. Two ships over the southwest gulf, the **Empire State** (KKFW) and the **SIWN** (name unknown), observed north to northwest winds of 37 kt at 0000 UTC 26 January. The high pressure north of the area weakened and moved eastward across the southeast United States, and by 1200 UTC a Quikscat pass indicated that gale force winds had ended.

Southwest Gulf of Mexico Gale 1-2 February: Another gale event occurred on 1-2 February over the southwest Gulf of Mexico. A strong cold front moved off the coast of Texas around 0000 UTC 1 February. By 1200 UTC February 1, the front extend from the western Florida panhandle to the southwest Bay of Campeche. Northwest of the front, a 1036-mb high centered over Colorado began building southeastward. Northerly gale force winds began blowing along the coast of Mexico south of 25N west of 94W. At 1200 UTC Tampico, Mexico observed 35-kt northerly winds. Quikscat data at 0035 UTC 2 February detected gale force winds over the southwest Bay of Campeche. By 1200 UTC 2 February, the pressure gradient had weakened along the coast of Mexico, and winds had decreased below gale force.

Atlantic Cold Front 5-6 February: A combination of a storm center located well off the New England coast and an associated cold front over the west Atlantic produced an area of gale force winds across the northern portion of the TPC forecast waters. At 0000 UTC 5 February, westerly gale force winds began north of 28N west of 60W. The ship **Choyang Zenith** (DACP) experienced 40 kt winds near 31N 75W early on the 5th. The area of gales spread eastward, and a 1031 UTC Quikscat pass detected west to northwest winds of 35 to 45 kt north of 27N between 57W and 73W. The ships **Galveston Bay** (WPKD) and **SWIN** confirmed the Quikscat winds by observing 35- to 40-kt winds between 0600 and 1200 UTC 5 February. Early on the 6th, a high pressure ridge built across the western Atlantic from the South Carolina coast east to 28N 60W. By 0600 UTC 6 February, the winds had decreased below gale force south of 31N.

Atlantic Gale 20-21 February: A gale center located well north of 31N produced a brief period gale force winds north of 29N between 55W and 60W. On the afternoon of 20 February, the gale center moved southeast and was located near 37N 55W. Two ships near 30N 58W, the **Endeavor** (WAUW) and the **Endurance** (WAUU) encountered gale force winds and seas of 5.5 to 7 m (18 to 23 ft) at 1800 UTC that day. On 21 February, the gale center weakened as it continued to move southeastward. Winds decreased below gale force by 0600 UTC. However, large swells of 4 to 6 m (14 to 20 ft) continued across portions of the central Atlantic for the next few days.

West Atlantic Gale and Storm 24-26 February: At 0000 UTC 23 February, a low formed along the strong cold front mentioned in Section I over the southeast Gulf of Mexico. As the low deepened and moved northeastward across south Florida, winds increased over the eastern Gulf and western Atlantic. By 0000 UTC 24 February, the low became a gale center off the east coast of Florida near 29N 78W

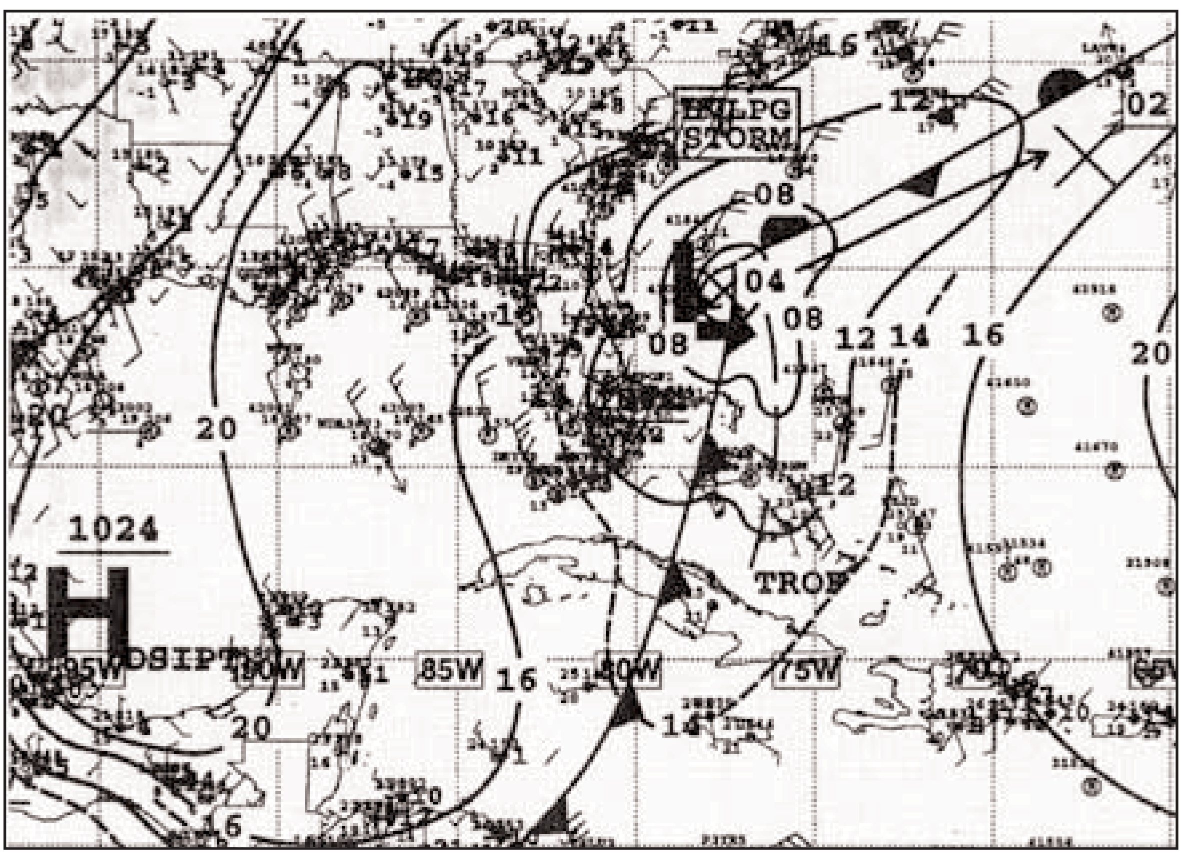


Figure 3. Tropical Analysis and Forecast Branch surface analysis at 0000 UTC 24 February. Solid lines are isobars at 4-mb intervals with intermediate isobars as dashed lines.

(Figure 3). At this time buoy 41010, located 120 nmi east of Cape Canaveral Florida, reported sustained northerly winds of 35 kt with gusts to 46 kt. Sea heights at the buoy rose to a maximum of 5 to 5.5m (16 ft) around 0600 UTC. The gale center moved northeastward, and a Quikscat pass at 1045 UTC placed the center near 30N 75W. The Quikscat data indicated 35 to 40 kt winds within 240 nmi of the center, mainly over the western semicircle.The **Sealand Hawaii** (KIRF) experienced 40 kt winds at 1800 UTC near 29N 71W. By 0000 UTC 25 February, the gale became a storm near 32N 70E. A Quikscat pass from shortly before 0000 UTC clearly detected both the storm force winds and the circulation center (Figure 4), and the storm force winds remained north of 31N. However, as the storm moved slowly eastward on the 25th, it continued to produced gale force winds north of 28N between 65W and 72W. The storm weakened to a gale by 0000 UTC 26 February, and by 1200 UTC 26 February winds decreased below gale force. The low continued to weaken and drift southward, finally dissipating near 27N 57W on 27 February.

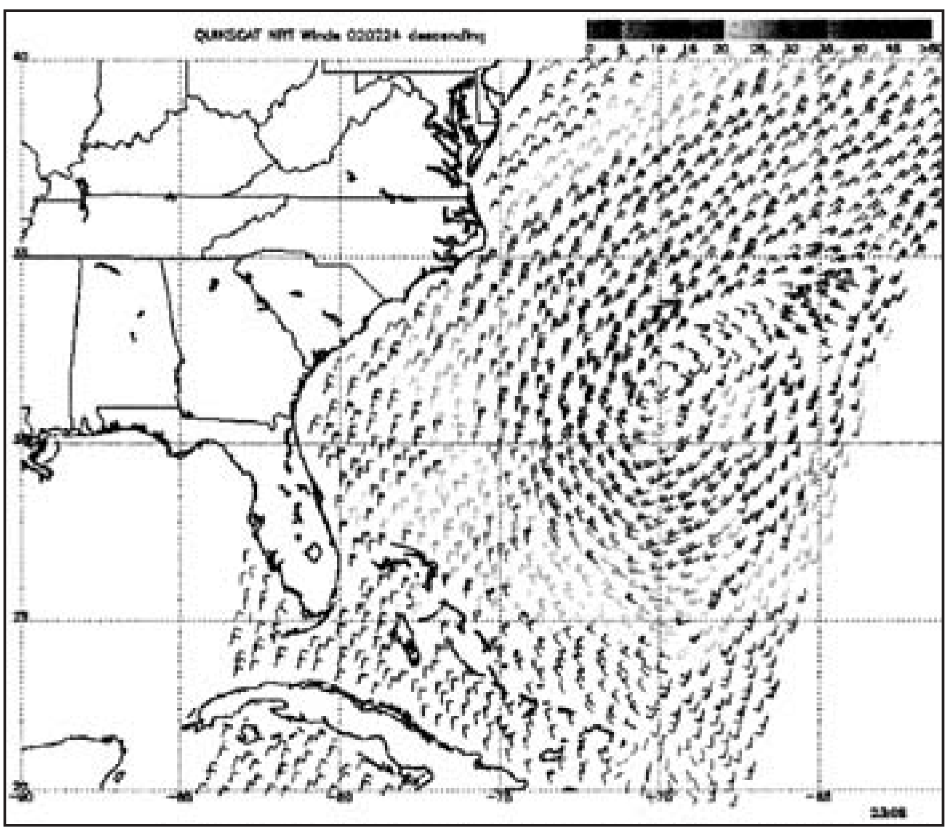


Figure 4. Quikscat data at 2306 UTC, 24 February, 2002.
(Image courtesy of National Environmental Satellite, Data, and Information Service)

Gulf of Mexico Gales 26-27 February and 2-4 March: The last two western Gulf gale events of the 2002 winter season occurred in late February and early March. The first event began as a cold front moved off the Texas coast shortly before 0600 UTC 26 February. The front was followed by a strong 1045-mb high located over the northern Rockies. Winds over the western Gulf quickly increased behind the front. Both western Gulf buoys (42002 and 42020) observed northerly winds around 30 kt, with gusts to 38 kt for several hours beginning just after 1200 UTC. Sea heights at buoy 42002 peaked at 4.5 m (15 ft) around 0200 UTC 27 February. During this event, winds were once again the strongest over the extreme southwest Gulf of Mexico. Quikscat data from 2355 UTC detected 30 to 35 kt winds over the southwest Gulf. By 1200 UTC 27 February, the high pressure center moved over eastern Texas and weakened to 1035 mb. By this time, winds over the western Gulf of Mexico had decreased below gale force.

The last strong gale-producing cold front of the winter season moved off the Texas coast around 1500 UTC 2 March. Once again the winds increased very quickly behind the front. At 1800 UTC, buoy 42020 reported northerly winds of 34 kt, with gusts to 42 kt. At 0000 UTC 3 March, the front extended from New Orleans, Louisiana to just south of Tampico, Mexico. At that time, the **Dusseldorf Express** (S6IG) in the extreme northwest Gulf experienced northwest winds of 35 kt. At 1200 UTC, the ship **Celebration** (H3GQ) observed 34 kt winds near 27N 91.5W. Around the same time, buoy 42002 reported 34 kt winds, with gusts to 42 kt. The buoy later recorded a maximum wave height of 5.5 m (18 ft) at 1600 UTC. By 0000 UTC 4 March, the cold front extended from central Florida to the Yucatan Peninsula. At that time winds decreased below gale force, but winds remained northerly at 25 to 30 kt over the eastern Gulf of Mexico until early on 5 March.

Central Atlantic Gale 3-4 March:

Beginning on 2 March, a tight pressure gradient formed between a strong high pressure ridge over the west Atlantic and a weak stationary front that extended across the central Atlantic from 31N 43W to 20N 55W. The tight pressure gradient produced a large area of strong northeast winds northwest of the front to 65W. By 1200 UTC 3 March, the pressure gradient became strong enough to produce gales over the area north of 25N west of the front to 60W. Several ships in the area, including the **Chiquita Belgie** (C6KD7), the **Kielgracht** (PFJI), and the **Patroit** (KGBQ), encountered 34 to 37 kt winds between 1200 UTC 3 March and 0000 UTC 4 March. The ships observed combined seas of 4 to 6 m (13 to 20 ft). By 1800 UTC 4 March, the stationary front dissipated, while the ridge over the western Atlantic retreated northeastward. At that time, winds decreased below gale force.

East Atlantic Gale 20-21 March: A storm center which moved rapidly east-northeastward across the central and east Atlantic between 32N and 36N produced gale force winds over the northeast portion of the TPC forecast area. The gales began around 1200 UTC 20 March over the area north of 28N east of 48W. At 0000 UTC 21 March, the 980-mb storm was centered near 36N 39W. At that time, the ship **Thorkil Maersk** (MSJX8) observed southwest winds of 33 kt near 30N 35W. Quikscat data from 0824 UTC 21 March confirmed the gale force winds by detecting a large area of 35 to 40 kt west to northwest winds. On 21 March, the storm moved farther north-northeastward away from the TPC forecast area. Gales force winds ended south of 31N around 1200 UTC.

Large northerly swells of 4 to 6 m (12 to 18 ft) continued for another couple days over the eastern portion of the TPC forecast area north of 20N east of 60W.

Eastern Pacific

The eastern North Pacific was affected by twelve Gulf of Tehuantepec gale and storm events, and one gale event that resulted from strong trade winds. The twelve events in the January to April 2002 period far exceeded the number of events in 2000 (6) and 2001 (8). Two of the events reached storm intensity.

The overall synoptic pattern in the January-April period featured a broad, long wave trough over the western and central United States, with frequent surges of polar and arctic air into the Great Plains. These surges were accompanied by strong anticyclones with central pressures exceeding 1040 mb over the southern Rockies. These anticyclones maintained central pressures of 1035 mb or greater into Texas and resulted in significant pressure surges over the western Gulf of Mexico and the Isthmus of Tehuantepec.

Gulf of Tehuantepec: The first two Gulf of Tehuantepec events of 2002 occurred close together in the first week of January. The first event began at 0000 UTC 3 January and ended 1800 UTC 4 January. The ship **Cabo Creus** (ZCBQ8) reported north-northeast winds of 40 kt and seas of 3 m (10 ft) at 0000 UTC 3 January while located near 15N 95W. A Quikscat pass at 1200 UTC 4 January indicated northerly winds of 30 to 35 kt.

The second event began at 0600 UTC 6 January and was rather prolonged in nature, extending into 9 January and ending around 1200 UTC. The **Polar Chile** (ELTN6) reported east-northeast winds of 35 kt and seas of 4.5 m (15 ft) at 1800 UTC 6 January while located near 14.5N 96W. In addition, four Quikscat passes confirmed gale force winds over the course of this event. Thirty-five to 40-kt northerly winds were noted on the 0054 UTC 9 January pass.

The third Gulf of Tehuantepec gale event was a marginal event. The event began around 0000 UTC 16 January and lasted only 18 hours. A 1212 UTC 16 January Quikscat pass indicated an area of 30 kt winds.just under gale force.

The fourth event commenced 10 days later around 0000 UTC 26 January and lasted until 1200 UTC 27 January. The ship **PBBU** (name unknown) located near 14N 95.5W reported north-northeast winds of 37 kt and seas of 5.5 m (18 ft) at 0000 UTC 26 January. Six hours later, the same ship reported northerly winds of 30 kt and seas of 4 m (13 ft) while located near 13.5N 94.5W. A 2354 UTC 25 January Quikscat pass indicated winds of 35 kt in the Gulf of Tehuantepec.

A total of six Gulf of Tehuantepec gale events were noted during the month of February, more than the combined total of events for February in the years 2000 and 2001. The first event in February began near 0000 UTC 2 February and ended at 1800 UTC 3 February. Quikscat passes at 0000 UTC and 1143 UTC 2 February indicated 40 kt northerly winds. The next event followed a week later, commencing at 0000 UTC 8 February and lasting roughly 36 hours. A 1230

UTC 8 February Quikscat pass indicated 35- to 40- kt winds in the Gulf of Tehuantepec.

The seventh gale event of the period began at 0600 UTC 11 February and lasted until 1800 UTC 12 February. A 1222 UTC 12 February Quikscat pass indicated 35 kt northerly winds. This was the first of three events which occurred at an interval of 6 days.

The strongest Gulf of Tehuantepec wind event for February, and one of two storm events of the period, began at 0000 UTC 23 February and lasted until 1200 UTC 24 February. The precursor signature, a much stronger than normal pressure surge along the Sierra Madre in Mexico on 22 February, resulted in 80- to 100-kt wind gusts at Veracruz (*See section Southwest Gulf of Mexico Storm Events February, 2002*).

At 1800 UTC 23 February, the ship **Sunbelt Dixie** (D5BU) reported north-northeast winds of 40 kt while located near 14.5N 95W. Later, a 2338 UTC Quikscat pass (Figure 5) indicated 40- to 50-kt winds in the Gulf of Tehuantepec.

The last gale event for the month began at 0600 UTC 27 February and lasted a little over 30 hours. No Quikscat data was available to verify gale force winds; however, the ship **Maersk Wind** (S6TY) observed 25-kt winds at both 0600 and 1200 UTC 28 February, well south of the Gulf of Tehuantepec. Therefore, it is assumed that gale force winds did occur over the Gulf.

A late season arctic air mass swept into the Gulf of Mexico on 3 March and ushered in the first Gulf of Tehuantepec wind event for March, and the second storm event for the period. The event began at 0600 UTC 4 March and ended around 1200 UTC 6 March. A 1216 UTC 4 March Quikscat pass (Figure 6) indicated 40- to 50-kt winds in the Gulf of Tehuantepec.

The final gale event of the season began at 0600 UTC 21 March and ended at 0000 UTC 24 March. This was the second of two prolonged gale events, lasting nearly 66 hours. A 2347 UTC 22 March Quikscat pass indicated northerly winds of 35 to 40 kt in the Gulf of Tehuantepec.

Strong Trade Winds Event 16-19 January: A strong anticyclone developed over the central Pacific Ocean between 35N and 40N along 140W, with a central pressure near 1040 mb, at 0000 UTC 16 January. Further south, a surface trough was located along 135W between 10N and 20N.

The strong pressure gradient between these features resulted in gale force

Gulf of Tehuantepec Gale and Storm Events (January - April 2002)

Event	Beginning	End
1	0000 UTC 03 January	1800 UTC 04 January
2	0600 UTC 06 January	1200 UTC 09 January
3	0000 UTC 16 January	1800 UTC 16 January
4	0000 UTC 26 January	1200 UTC 27 January
5	0000 UTC 02 February	1800 UTC 03 February
6	0000 UTC 08 February	1200 UTC 09 February
7	0600 UTC 11 February	1800 UTC 12 February
8	0600 UTC 17 February	1800 UTC 17 February
9	0000 UTC 23 February	1200 UTC 24 February
10	0600 UTC 27 February	1200 UTC 28 February
11	0600 UTC 4 March	1200 UTC 6 March
12	0600 UTC 21 March	0000 UTC 24 March

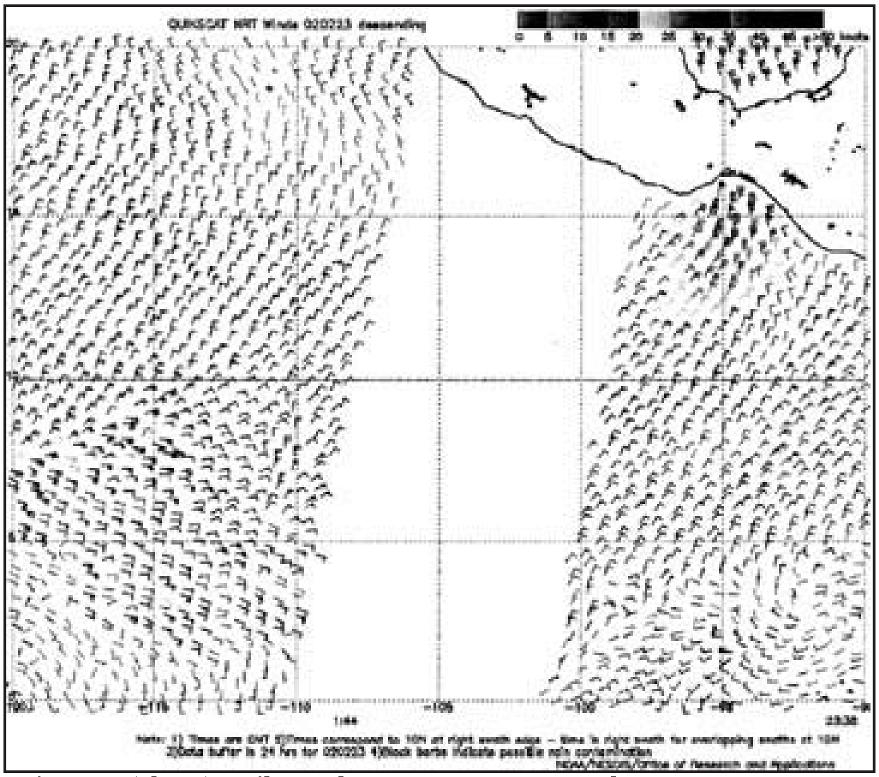


Figure 5. (above) Quikscat data at 2338 UTC, 23 February, 2002. Note 50 kt wind barbs in the Gulf of Tehauntepec.
(Image courtesy of National Environmental Satellite, Data and Information Service)

winds beginning 2230 UTC 16 January in an area extending from 20N to 28N, between 130W and 140W. The area of gales lasted over 60 hours, finally ending around 1630 UTC 19 January. A 1008-mb surface low was indicated along the trough for a 12-hour period beginning 1200 UTC 17 January near 17N 135W.

The surface anticyclone gradually moved westward and weakened along 150W by 1200 UTC 19 January, allowing the surface winds to weaken below gale force.

There were several ship reports of gale force winds during this event. Two ships reported gale force winds at 0000 UTC 17 January.

The ship **Chevron Nagasaki** (C6FD8) located near 26N 140W reported east-northeast winds of 36 kt, with seas of 4 m (13 ft).

The ship **Ocean Spirit** (ELKI8) reported east-northeast winds of 35 kt and seas of 4 m (13 ft) while located near 26.5N 133W.

The ship **Direct Eagle** (9VRA) reported gale force winds for an 18-hour period between 1800 UTC 18 January and 1200 UTC 19 January while traversing the pacific along 21-22N between 140W and 135W. Seas averaged 5 m (16 ft).

Reference

American Meteorological Society (AMS), “Glossary of Meteorology, Second Edition,” 2000.

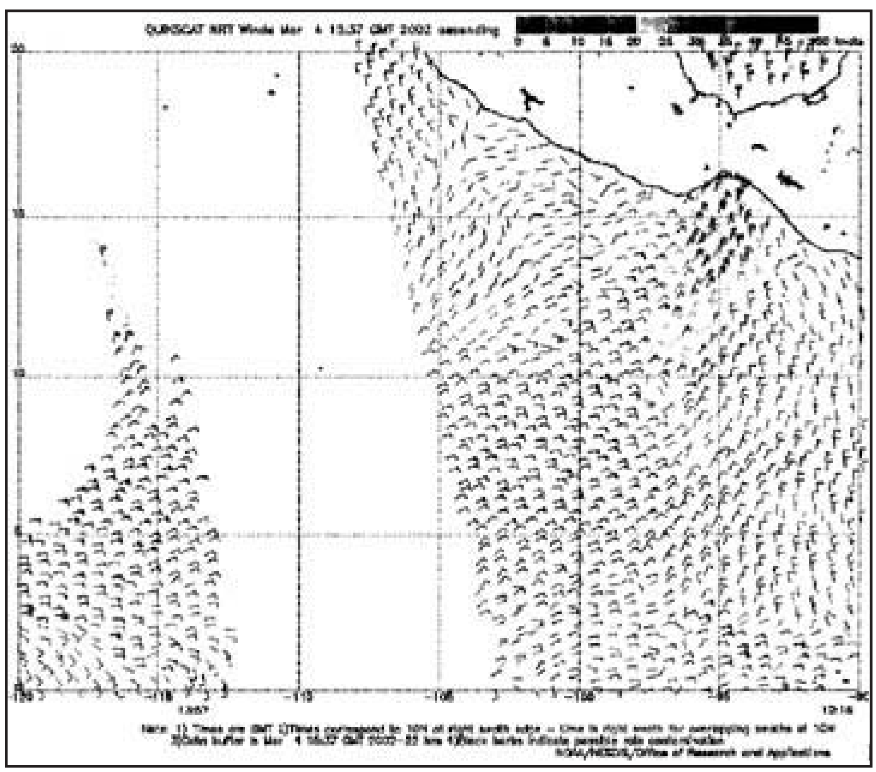


Figure 6. Quikscat data at 1216 UTC, 4 March, 2002. Note 50-kt wind barbs in the Gulf of Tehauntepec.
(Image courtesy of National Environmental Satellite, Data, and Information Service)

Environment Canada

Canadian VOS Program Special Award

Roland Kleer,
PMO Canadian VOS Program

In the Ontario Region of the VOS program, there are approximately 80 participating vessels in the Canadian VOS Program, and the Individual Observer Award is presented to the top 20 observers each year. In 2001, the top observer performed 1,198 voluntary observations.

The award changes from year to year. Each year the PMO office comes up with something unique. The award for 2001 is a hardcover book on Canadian Service ships, Coast Guard, etc. Inside each book is a personalized nameplate from the Government of Canada recognizing the voluntary work done by the observers. The observers look forward to the award each year and compete for the honour of receiving one, which in turn helps the VOS program because it means that there will be more observations reported.

The observers are never told in advance what the award will be for the year, so there is always some anticipation generated among the ships' crews.

If one were to look at the number of shipwrecks on the Great Lakes historically, the importance of these voluntary observations becomes self evident. The Great Lakes can and do whip up some deadly storms, especially in the fall, so I like to hand out last year's award in mid to late summer, in order to encourage the observers to do even more observations for the next award. That is the reason we like to make the award something substantial, something of value.

Roland Kleer PMO Ontario presenting the Individual Observer Award for the Ontario VOS region for the year 2000 to Quartermaster Steve O'Connel on the Canadian Ship Griffon.

Over half the winners are "regulars," meaning they win an award almost every year. They spur each other on to do more observations, which in turn makes marine forecasting much easier.

It's a simple formula: more coverage and observations translates into more accurate forecasts.

Everybody wins.

Alaskan Awards

TOP 10 VOS WEATHER REPORTING VESSELS IN ALASKAN WATERS SEPTEMBER 2002			
VESSEL			NO. OF OBS
1.	SENECA	WBN8469	128
2.	POLAR EAGLE	ELPT3	100
3.	KENNICOTT	WCY2920	97
4.	NAVIGATOR	WBO3345	96
5.	MALOLO	WYH6327	95
6.	SINUK	WCQ8110	89
7.	ARCTIC SUN	ELQB8	88
8.	TUSTUMENA	WNGW	60
9.	SEABULK PRIDE	WCY7052	56
10.	SEA VICTORY	WCY6777	54
TOTAL SEPTEMBER 2002			2016

TOP 10 VOS WEATHER REPORTING VESSELS IN ALASKAN WATERS JANUARY - SEPTEMBER 2002			
VESSEL			NO. OF OBS
1.	ARCTIC SUN	ELQB8	814
2.	POLAR EAGLE	ELPT3	807
3.	CSX ANCHORAGE	KGTX	776
4.	GEMINI	V7BW9	700
5.	KENNICOTT	WCY2920	675
6.	SENECA	WBN8469	675
7.	NAVIGATOR	WBO3345	661
8.	CSX KODIAK	KGTZ	555
9.	CSX TACOMA	KGTY	501
10.	SEABULK MONTANA	WCW9126	456
TOTAL JANUARY-SEPTEMBER 2002			18,795

Pamela Taylor shows off the Alaska Award for the period Jan - Apr 2002. By September 2002, The CSX Anchorage had 776 observations, which surpassed its 2001 total of 729.

Captain Sam Nelson of the Drew Foss received an Outstanding Monthly Performance Award while at the port of Anchorage, Alaska on April 3, 2002. The Drew Foss took 149 observations during the first 3 months of 2002.

Alaska Marine Meterologist Aimee Devaris presenting a Special Company Award to Art Jacobsen who is the Manager of Alaska Marine Operations for Crowley Marine Services, Inc. Crowley has been a big supporter of the Alaska Region shipboard weather observation program. Three of their tugs made the Alaska Top 10 List for 2001: the *Guardian* had 810 observations, the *Seneca* 656 observations, and the *Warrior* had 615. The Crowley fleet of tugs, by far, take the most weather observations in Alaska waters compared to any other company.

1st Mate Jeff Coryell of the *Crowley Tug Navigator* received an Outstanding Peformance Award for June 2002, in which the *Navigator* took 100 observations.

***CSX Kodiak* Captain, Barry Costanzi, received an Outstanding Performance Award while at Anchorage, Alaska on May 21, 2002. During the period January through April 2002, their total of 290 observations put them in 5th place and well ahead of their pace of 2001.**

The crew of the *Manfred Nystrom* left to right: Chief Mate George Nielsen, 2nd Mate Charley Hobbs, and Able Bodied Seaman Rick Reines received an Outstanding Performance Award while at the Port of Anchorage on July 12, 2002. They had 104 observations for April 2002, which was the 2nd highest total in Alaska.

Pictured left to right: Master Lanny Hansen, Chief Mate Charles Tessaro, and 2nd Mate Neil Sandvik of the *Seneca* received an Outstanding Performance Award while in the Port of Anchorage on July 18, 2002. The *Seneca* had the highest total of observations in Alaskan waters for June 2002 with 161.

Pictured left to right - *Pacific Pride* Captain Pete Powlicki, 1st Mate Scott Jacobsen and Tankerman Scott Cooper received an Outstanding Performance Award in Anchorage, Alaska on July 11, 2002.

The P*acific Pride* was ranked among the Top 15 vessels in Alaska waters with 76 observations taken in June 2002.

Chief Mate Tim Knudsen and 1st Mate Amber Best of the *Paragon* received an Outstanding Performance Award while in the Port of Anchorage, AK on July 8th. The *Paragon* was among the Top 15 boats in Alaskan waters for taking ship observations for the month of May.

3rd Mate Fred Koster of the *CSX Tacoma* (right) received an Outstanding Performance Award while in the port of Anchorage Alaska on April 16th, 2002 for being in the top 12 ships in Alaskan waters for the first 3 months of 2002, with 136 observations. Below, he received an Outstanding Performance Award for being in the Top 10 of the most active ships in Alaskan waters for the first 4 months of 2002.

National Weather Service VOS Program New Recruits From 01 May to 31 October 2002

NAME OF SHIP	CALL	AGENT NAME	RECRUITING PMO
AGRIUM	WAB930	AGRIUM-KENAI NIROGEN OPERATIONS	ANCHORAGE, AK
ALISON H	WX9885	BOYER ALASKA BARGE LINE	KODIAK, AK
AURORA	WYM9567	AURORA-ALASKA MARINE HIGHWAY SYSTEM	KODIAK, AK
BRENDA H	WU5171	BOYER-BRENDA H	KODIAK, AK
CHARLOTTE MAERSK	OWLD2	MAERSK PACIFIC LTD	SEATTLE, WA
COASTAL EXPLORER	WCY3172	COASTAL EXPLORER-CHUCK KIEM	KODIAK, AK
COLUMBUS VICTORIA	P3RF8	ISSRIOMAR	NORFOLK, VA
DISCOVERER DEEP SEAS	HP9685	CHEVRON USA	NEW ORLEANS, LA
DISCOVERER ENTERPRISE	3FZQ7	DISCOVERER ENTERPRISE	NEW ORLEANS, LA
E.L. BARTLETT	WY6244	ALASKA MARINE HIGHWAY SYSTEM	KODIAK, AK
GLEN ROSS	ELPV8	TEXICAN STEAM NAVIGATION LTD	HOUSTON, TX
GYR FALCON	WCU6587	GYR FALCON	KODIAK, AK
HATSU EAGLE	ZNZH6	EVERGREEN AMERICA CORP	SEATTLE, WA
HATSU EAGLE	ZNZH8	EVERGREEN AMERICA CORP	SEATTLE, WA
HATSU ENVOY	VSQL9	EVERGREEN AMERICAN GROUP	SEATTLE, WA
HATSU EXCEL	VSXV3	EVERGREEN AMERICA CORP	SEATTLE, WA
HENERI SR.	WTW9260	SAUSE BROS OCEAN TOWING CO	KODIAK, AK
INDAMEX IMPALA	V2AX1	INCHAPE SHIPPING SERVICES	NORFOLK, VA
INDUSTRIAL CHALLENGER	WDHL	PACIFIC GULF MARINE	NORFOLK, VA
ISLAND WARRIOR	WDA9217	ISLAND TUG AND BARGE ISLAND WARRIOR	ANCHORAGE, AK
JUSTINE FOSS	WYL4978	FOSS MARITIME	KODIAK, AK
KASIF KALKAVAN	TCLR	TURKON AMERICA, INC.	NORFOL, VA
KEISHO	3FYN4	WORLD MARINE CO., LTD.	SEATTLE, WA
KEKOA	WCY5542	SAUSE BROS OCEAN TOWING-KEKOA	KODIAK, AK
LIBERTY GRACE	WADN	LIBERTY MARATIMR CO	NEW ORLEANS, LA
LOCHNESS	ELP49	TEXICAN STEAM NAVIGATION LTD	HOUSTON, TX
M/V GEYSIR	WCZ5528	TRANSATLANTIC LINE	NORFOLK, VA
MAERSK CONSTELLATION	WRYJ	MAERSK	HOUSTON, TX
MAERSK GEELONG	S6NW8	STRACHAN AGENCY	NEW YORK CITY, NY
MALISPINA	WI6803	ALASKA MARINE HIGHWAY SYSTEM	KODIAK, AK
MSC INGRID	H0HA	MEDITERRANEAN SHIPPING CO. S.A.	NEW YORK CITY, NY
NORCOASTER	WYP7276	B&C FISHERIES	KODIAK, AK
NORTHERN VICTOR	WCZ6534	F/V NORTHERN VICTOR	KODIAK, AK
OVERSEAS BOSTON	KRDB	ALASKA TANKER CO. OVERSEAS BOSTON	KODIAK, AK
PACIFIC FREEDOM	WDJF	SEA COAST TOWING	KODIAK, AK
PHYLLIS DUNLAP	WDA6552	DUNLAP TOWING INC	KODIAK, AK
POINT BARROW	WBM5088	CROWLEY-POINT BARROW	ANCHORAGE, AK
POLAR RESOLUTION	WDJK	POLAR TANKERS	NEW ORLEANS, LA
PRIMO BRUSCO	WBT4608	PRIMO BRUSCO C/O BRUSCO TUG AND BARGE	KODIAK, AK
ROVER	KCBH	MARINE TRANSPORT LINES	HOUSTON, TX
SAUDI ABHA	HZRX	NSCSA (AMERICA) INC	BALTIMORE, MD
SAUDI DIRIYAH	HZZB	BIEHL & CO	HOUSTON, TX
SEA VICTORY	WCY6777	CROWLEY MARITIME INC	ANCHORAGE, AK
SEABULK PRIDE	WCY7052	ALASKA MARITIME SEABULK PRIDE	KODIAK, AK
SEANA C	WDA4482	SEA COAST TOWING	KODIAK, AK
SHEILA MCDEVITT	WDA 4069	TECO OCEAN SHIPPING	NEW ORLEANS, LA
SIOUX	WBN7617	CROWLEY MARITIME INC	ANCHORAGE, AK
SPIRIT OF OCEANUS	C6PJ8	CRUISE WEST INC	KODIAK, AK
TAMESIS	LAOL5	W.J. BROWNING CO.	NORFOLK, VA
TMM GUADALAJARA	VSXC4	AMERICANA	HOUSTON, TX
TMM TABASCO	VSUA5	AMERICAN SHIPPING & CATERING	HOUSTON, TX
TONSINA	KJDG	ALASKA TANKER CO. TONSINA	KODIAK, AK
TRIDENT	WCZ2913	B&C FISHERIES	KODIAK, AK
TYCOM RESPONDER	V7CY9	TRANSMARINE NAVIGATION	SEATTLE, WA
USCGC JARVIS	NAQD	U.S. COAST GUARD USCGC JARVIS	KODIAK, AK
USCGC SYCAMORE	NTGG	U.S. COAST GUARD USCGC SYCAMORE	KODIAK, AK
USNS BRITTIN	NBVJ		NEW ORLEANS, LA
USNS EFFECTIVE	NCWL		SEATTLE, WA
USNS MARY SEARS (T-AGS-65)	NRFR	NAVOCEANO	HOUSTON, TX
VIKING STAR	WAS4138	VIKING STAR	KODIAK, AK
WESTWOOD RANIER	C6S13	OCEAN AGENCIES, INC	SEATTLE, WA
ZENITH	WBV3237	B&C FISHERIES	KODIAK, AK
ZIM HOUSTON III	V2AX3	ZIM AMERICAN	HOUSTON, TX
ZIM VIRGINIA	9HGC7	ZIM CONTAINER SERVICE	NEW YORK CITY, NY

VOS Program Awards

NOAA Ship *Albatross IV* crewmembers left to right: CDR Peter Celone, LCDR Phil Cruccis, LTJG John Crofts, and 2nd Officer Steve Wagner received the 2001 VOS Outstanding Performance Award.

3rd Mate Pamela Taylor of the *CSX Anchorage* received a National VOS award for 2001 while in Anchorage, Alaska on May 14, 2002. The *CSX Anchorage* had 729 observations in 2001, which was the third highest total in Alakan waters. For the period Jan - Apr 2002, the *CSX Anchorage* was in 1st place in the Alaska rankings with 418 observations. They are well ahead of their excellent pace of 2001.

The *SS Badger* received a 2002 VOS award. Pictured left to right: 1st Mate Mike Miller, CAPT Dean Hobbs, 3rd Mate Mike Steward, CAPT Kevin Fitch, and 2nd Mate Allan Chrenka. This was the first year for the *Badger*, and they took 420 observations. Good work considering they don't sail mid October - mid May. The *SS Badger* is a car ferry that sails from Manitowoc, WI to Ludington, MI.

The *M/V Chesapeake Bay* was presented with a VOS award by Mr. Peter Gibino in Norfolk in late February. Pictured from left to right: CAPT Seth Harris, Master, 2nd Officer Jan W. Waalewyn, 3rd Officer Michael F. Lyons, Chief Officer Bryan C. Byrne, and Radio Officer John L. Shettles, III.

The NOAA ship *Delaware II* received a 2001 VOS Outstanding Performance Award. Pictured left to right: ENS Bryan Wagonseller, LTJG Nick Chrobak, and ENS William Whitmore.

The *Lykes Discover* received a 2001 VOS Outstanding Performance Award. Pictured left to right: Chief Mate Harold Held, CAPT Scott Putty, Chief Mate Robert P. Strobel, Jr., and PMO Chris Fakes.

Pictured on the left is Chief Mate Steve Illige and on the right is CAPT John Emmel of the *Crowley Tug Guardian.* They received their NWS VOS Award for 2001 on May 17, 2002 while in the Port of Anchorage, Alaska. The *Guardian* had the 2nd highest total observations in Alaskan waters for 2001 with 810.

The Captain and crew of the *M/V Indiana* received a 2000 VOS Award. Pictured left to right: 2nd Mate Jon Watson, CAPT James VanDongen, 1st Mate Mark Fraley, and 3rd Mate Dan Franklin.

PMO Chris Fakes, center presents a VOS Award to CAPT Wes Winters (left) and 2nd Mate Doug Vines (right) of the *Sealand Integrity*.

Chief Mate Jeff Cowan received the 2001 VOS Superior Performance Award onboard the *President Kennedy*.

Pictured left to right: Chief Mate Gerald Parlon and CAPT Eric Francen of the *Sealand Commitment* received the 2001 VOS Outstanding Performance Award.

PMO Chris Fakes presented a 2001 VOS Outstanding Award to Master Pete Mitchell (left) and Master James Brennan (right) of the *Sealand Pride*.

Pictured left to right: Chief Mate Charles Tessaro and 2nd Mate Roger Peterson received a National VOS Award for 2001 while at the Port of Anchorage, Alaska on May 24, 2002. This is the 2nd year in a row that the *Crowley Tug Seneca* has won this prestigious National Award.

The *CSX Spirit* received a 2001 VOS Superior Performance Award. From left to right: 2nd Mate Warren Bragg, CAPT Erik Williamson, and 3rd Mate Gary Lightner.

The Crew of the *Susan W. Hannah* received a year 2000 VOS Award. Pictured left to right: 2nd mate John King, CAPT Clark King, and 1st Mate Rich Deichelbor.

VOS Cooperative Ship Report January 1, to November 21, 2002

The values under the monthly columns represent the number of weather reports received at NCDC. The current month plus the previous 3-4 month's numbers reflect real-time observations plus the delayed mode observations as they are received and entered.

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1ST LT BALDOMERO LOPEZ	WJKV	Jacksonville	26	0	0	0	0	0	27	71	0	0	0	0	124
1ST LT JACK LUMMUS	WJLV	NYC	0	17	0	29	0	25	15	16	19	0	0	0	121
2ND LT. JOHN P. BOBO	WJKH	Norfolk	0	0	0	8	21	3	11	7	2	38	31	0	121
A.P. MOLLER	OVYQ2	Seattle	0	36	24	0	0	2	0	28	21	0	21	0	132
ADVANTAGE	WPPO	Norfolk	1	0	2	6	17	28	8	24	5	0	6	0	97
ADVENTURER	WBN3015	Anchorage	0	0	0	0	0	46	72	0	0	0	0	0	118
AGNES FOSS	WYZ3112	Kodiak	0	0	1	26	0	13	18	16	8	3	3	0	88
AGRIUM	WAB930	Anchorage	0	0	0	0	0	0	0	0	0	52	19	0	71
AGULHAS	3ELE9	Baltimore	0	0	0	7	0	0	0	0	0	0	0	0	7
ALBEMARLE ISLAND	C6LU3	NYC	62	63	77	38	88	4	27	28	61	59	46	0	553
ALERT	WCZ7335	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
ALISON H.	WX9885	Kodiak	0	0	0	0	11	25	2	5	0	0	0	0	43
ALLEGIANCE	WSKD	Norfolk	0	44	0	9	0	2	7	0	0	0	0	0	62
ALLIANCA ROTTERDAM	DHGE	Baltimore	0	0	0	18	0	11	11	0	0	0	0	0	40
ALLIGATOR FORTUNE	ELFK7	Seattle	0	0	0	11	0	12	0	0	0	0	0	0	23
ALLIGATOR GLORY	ELJP2	Seattle	0	0	0	32	0	24	16	0	0	0	0	0	72
ALLIGATOR STRENGTH	3FAK5	Oakland	0	0	0	0	26	24	22	41	26	32	28	0	199
ALPENA	WAV4647	Cleveland	0	0	0	0	0	0	0	1	2	0	0	0	3
ALPHA HELIX	WSD7078	Kodiak	0	0	11	22	17	15	10	9	14	3	0	0	101
ALTAIR VOYAGER	C6OK	Baltimore	25	102	107	0	68	37	5	12	1	14	3	0	374
AMBASSADOR BRIDGE	3ETH9	Oakland	61	66	0	97	0	51	41	0	0	0	0	0	316
AMERICAN MARINER	WQZ7791	Cleveland	0	0	0	21	0	0	3	8	5	1	0	0	38
ANASTASIS	9HOZ	Miami	0	0	3	0	0	4	7	0	3	12	13	0	42
ANKERGRACHT	PCQL	Baltimore	0	0	0	30	11	50	39	25	28	57	30	0	270
APACHE	WCY5541	Kodiak	0	0	0	0	0	9	4	0	0	0	0	0	13
APL CHINA	S6TA	Seattle	36	34	30	65	60	70	27	67	52	50	24	0	515
APL GARNET	9VVN	Oakland	0	0	0	0	28	19	19	8	25	0	0	0	99
APL JAPAN	S6TS	Seattle	23	47	25	72	215	31	48	38	33	29	37	0	598
APL KOREA	WCX8883	Seattle	40	20	11	27	32	16	12	30	31	23	14	0	256
APL PHILIPPINES	WCX8884	Seattle	33	4	14	6	27	238	56	0	1	21	7	0	407
APL SINGAPORE	WCX8812	Seattle	42	47	14	45	48	47	61	51	65	52	35	0	507
APL THAILAND	WCX8882	Seattle	31	33	25	32	41	303	31	44	42	42	1	0	625
APL TURQUOISE	9VVY	Oakland	0	16	0	25	20	8	20	21	49	67	31	0	257
APOLLOGRACHT	PCSV	Baltimore	24	2	1	14	0	9	10	24	22	25	21	0	152
ARCTIC BEAR	WBP3396	Kodiak	0	1	0	3	19	20	11	0	2	0	0	0	56
ARCTIC OCEAN	C6T2062	NYC	2	0	0	26	0	0	0	0	3	0	0	0	31
ARCTIC SUN	ELQB8	Anchorage	90	212	96	174	66	76	77	81	72	87	67	0	1098
ARGONAUT	KFDV	NYC	0	0	0	0	7	2	21	24	20	29	35	0	138
ARIES HARMONY	3FEY7	Seattle	8	8	23	7	6	10	6	11	4	5	5	0	93
ARISO	3FHJ6	Seattle	9	31	0	45	0	7	51	38	21	0	1	0	203
ARMCO	WE6279	Cleveland	0	0	0	0	4	4	3	2	0	0	0	0	13
ARTHUR M. ANDERSON	WE4805	Chicago	0	0	0	46	5	71	18	28	8	11	4	0	191
ASTORIA BRIDGE	ELJJ5	Houston	49	61	20	47	40	45	3	0	0	0	0	0	265
ATLANTIC CARTIER	C6MS4	Norfolk	39	42	14	5	46	45	32	29	41	44	25	0	362
ATLANTIC FOREST	ELTN8	New Orleans	32	50	4	14	19	21	13	0	0	0	0	0	153
ATLANTIC OCEAN	C6T2064	NYC	33	25	14	67	24	7	38	44	30	18	24	0	324
ATLANTIS	KAQP	New Orleans	23	12	0	0	10	13	9	12	0	2	0	0	81
AUCKLAND STAR	C6KV2	Baltimore	9	0	0	63	0	17	27	0	0	0	0	0	116
AURORA	WYM9567	Kodiak	0	0	0	0	0	39	22	0	0	1	12	0	74
AWARE	WCZ7336	Anchorage	0	0	0	0	0	2	1	0	0	1	0	0	4
B. T. ALASKA	WFQE	Long Beach	0	0	0	13	4	0	17	0	0	0	0	0	34
BARBARA ANDRIE	WTC9407	Chicago	0	0	0	0	50	9	12	0	0	1	0	0	72
BARRINGTON ISLAND	C6QK	Miami	30	38	22	27	41	8	21	29	36	23	16	0	291
BELLONA	3FEA4	Jacksonville	0	49	16	2	18	26	38	0	0	0	0	0	149
BERING SEA	C6YY	Miami	4	2	0	33	0	12	0	0	0	0	0	0	51
BERNARDO QUINTANA A	C6KJ5	New Orleans	65	62	72	98	85	79	53	0	50	48	45	0	657
BLARNEY	WBP4766	Kodiak	1	2	1	7	36	42	22	7	14	10	28	0	170
BLUE GEMINI	3FPA6	Seattle	17	0	0	15	293	28	73	88	56	86	0	0	656
BOHEME	SIVY	NYC	0	4	0	0	0	23	31	0	0	0	0	0	58
BOWFIN	WSX7318	Kodiak	0	0	0	0	0	0	0	0	1	0	0	0	1
BRIGHT PHOENIX	DXNG	Seattle	0	0	0	0	0	0	0	3	86	60	59	0	208
BRIGHT STATE	3FMY7	Seattle	0	0	0	0	0	0	0	0	0	52	33	0	85
BRIGHT STATE	DXAC	Seattle	0	0	0	28	0	0	0	0	0	0	0	0	28
BRUCE	WMU8	Anchorage	0	0	0	0	31	22	22	33	36	34	18	0	196
BUFFALO	WXS6134	Cleveland	0	0	0	10	0	5	0	0	0	0	0	0	15
BUFFALO SOLDIER	WMXB	Houston	0	0	0	2	19	10	0	0	7	3	6	0	47
BURNS HARBOR	WQZ7049	Chicago	0	0	0	0	0	0	0	0	0	16	5	0	21
C/S GLOBAL MARINER	WMXA	Baltimore	72	327	0	74	0	0	0	0	0	0	0	0	473
CALIFORNIA JUPITER	ELKU8	Long Beach	26	23	11	0	32	31	4	1	44	61	5	0	238
CAPELLA VOYAGER	C6FD4	Baltimore	9	67	1	3	60	58	60	67	47	34	24	0	430
CAPT STEVEN L BENNETT	KAXO	New Orleans	0	6	104	17	66	12	2	0	84	73	34	0	398
CARIBBEAN MERCY	3FFU4	Miami	0	0	0	0	0	11	0	0	20	4	0	0	35
CARIBE CHALLENGER	WDA3588	Kodiak	0	0	0	0	0	3	2	0	0	0	0	0	5
CARNIVAL DESTINY	3FKZ3	Miami	0	16	13	7	10	7	0	0	0	0	0	0	53
CARNIVAL PARADISE	3FOB5	Miami	5	3	0	10	0	1	4	1	7	10	0	0	41
CARNIVAL PRIDE	H3VU	Miami	0	0	0	0	2	1	26	16	9	10	4	0	68

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CARNIVAL SPIRIT	3FPR9	Miami	1	4	4	0	0	0	0	0	7	5	0	0	21
CARNIVAL TRIUMPH	3FFM8	Miami	0	15	0	14	14	8	0	0	0	0	0	0	51
CARNIVAL TRIUMPH	C6FN5	Miami	0	0	0	0	9	7	10	1	6	21	24	0	78
CARNIVAL VICTORY	3FFL8	Miami	11	18	20	51	52	35	45	32	40	27	7	0	338
CAROLINE MAERSK	OZWA2	Seattle	0	46	0	0	0	0	0	0	0	0	0	0	46
CARSTEN MAERSK	OZYB2	Seattle	24	0	0	19	0	17	18	0	23	23	0	0	124
CASON J. CALLAWAY	WE4879	Chicago	26	0	35	13	19	33	3	1	16	92	50	0	288
CAVALIER	WBN5983	Anchorage	0	0	0	0	0	0	2	0	0	0	0	0	2
CELEBRATION	H3GQ	New Orleans	9	9	40	49	52	28	12	0	26	12	14	0	251
CENTURY	ELQX6	Miami	7	4	0	0	0	1	0	1	0	1	0	0	14
CENTURY HIGHWAY #2	3EJB9	Long Beach	15	19	10	26	24	19	15	25	13	17	15	0	198
CF CAMPBELL	WCT3784	Kodiak	22	0	0	0	0	25	6	0	0	0	0	0	53
CGM RENOIR	ELVZ8	Norfolk	25	2	0	0	0	13	4	0	0	0	0	0	44
CHANG JIANG BRIDGE	3EZJ9	Seattle	0	0	0	0	0	0	22	0	0	0	0	0	22
CHARLES ISLAND	C6JT	Miami	12	35	16	33	17	33	23	43	34	36	43	0	325
CHARLES M. BEEGHLEY	WL3108	Cleveland	1	0	0	0	1	0	0	0	0	0	0	0	2
CHARLOTTE MAERSK	OWLD2	Seattle	0	0	0	0	32	0	2	55	0	6	37	0	132
CHASTINE MAERSK	OZZB2	Seattle	0	97	34	0	0	25	0	0	36	0	0	0	192
CHC NO.1	3FSL2	Seattle	0	0	0	0	0	18	3	0	0	0	0	0	21
CHEMICAL EXPLORER	KRGC	Houston	0	0	0	0	0	0	0	0	0	0	6	0	6
CHEMICAL PIONEER	KAFO	Houston	27	85	12	35	36	21	22	23	31	48	22	0	362
CHERRY VALLEY	WIBK	Houston	4	0	0	13	0	3	15	0	0	0	0	0	35
CHESAPEAKE BAY	WMLH	Norfolk	19	477	11	84	44	31	20	41	35	25	12	0	799
CHEVRON ARIZONA	KGBE	Miami	0	0	0	3	0	14	3	3	1	0	0	0	24
CHEVRON ATLANTIC	C6KY3	New Orleans	18	30	30	0	117	0	19	0	0	0	0	0	214
CHEVRON COLORADO	KLHZ	Oakland	24	17	30	0	16	32	17	1	0	0	0	0	137
CHEVRON COPENHAGEN	A8GL	Oakland	0	154	0	0	0	0	0	0	0	0	0	0	154
CHEVRON FELUY	C6FH5	Houston	0	0	0	77	0	0	0	0	0	0	0	0	77
CHEVRON WASHINGTON	KFDB	Oakland	0	0	0	3	0	2	4	1	1	10	5	0	26
CHIEF GADAO	WEZD	Oakland	19	0	53	27	10	21	27	8	15	18	18	0	216
CHIQUITA BELGIE	C6KD7	Baltimore	46	51	26	53	44	37	49	34	36	33	34	0	443
CHIQUITA BREMEN	ZCBC5	Miami	14	16	0	20	10	12	11	11	7	28	11	0	140
CHIQUITA BRENDA	ZCBE9	Miami	36	0	23	1	65	61	56	39	48	3	0	0	332
CHIQUITA DEUTSCHLAND	C6KD8	Baltimore	63	69	26	66	65	74	63	49	64	27	39	0	605
CHIQUITA ELKESCHLAND	ZCBB9	Miami	10	19	0	25	35	47	68	26	58	44	29	0	361
CHIQUITA FRANCES	ZCBD9	Miami	58	65	31	72	52	67	31	50	42	18	0	0	486
CHIQUITA ITALIA	C6KD5	Baltimore	0	0	0	46	42	36	37	0	0	0	0	0	161
CHIQUITA JEAN	ZCBB7	Jacksonville	42	27	9	69	41	63	57	24	37	30	0	0	399
CHIQUITA JOY	ZCBC2	Miami	19	9	0	42	1	1	6	45	28	11	0	0	162
CHIQUITA NEDERLAND	C6KD6	Baltimore	6	35	29	44	59	51	49	0	10	59	49	0	391
CHIQUITA SCANDINAVIA	C6KD4	Baltimore	27	38	20	40	33	51	51	42	40	54	22	0	418
CHIQUITA SCHWEIZ	C6KD9	Baltimore	56	32	27	42	51	42	49	50	49	54	49	0	501
CLEVELAND	KGXA	Houston	42	143	43	97	121	4	21	23	12	39	40	0	585
CLIFFORD MAERSK	OYRO2	Seattle	36	31	4	7	23	0	22	23	0	0	0	0	146
COASTAL EXPLORER	WCY3172	Kodiak	0	0	0	0	4	35	7	23	14	3	0	0	86
COASTAL MERCHANT	WCV8696	Seattle	26	1	0	0	0	3	9	17	6	14	11	0	87
COASTAL NAVIGATOR	WCY9686	Seattle	10	10	11	6	9	10	5	3	0	12	1	0	77
COASTAL PILOT	WBP7281	Kodiak	0	1	0	0	0	4	0	0	0	0	0	0	5
COASTAL SEA	WCA7944	Seattle	0	0	1	0	0	0	0	0	0	0	0	0	1
COASTAL TRADER	WSL8560	Kodiak	1	0	0	0	5	2	3	0	0	1	0	0	12
COLUMBIA	WYR2092	Kodiak	0	0	0	0	0	0	0	0	18	19	0	0	37
COLUMBIA BRIDGE	ELXS4	Seattle	35	22	7	59	0	21	35	0	0	0	0	0	179
COLUMBUS CANADA	P3RD8	Norfolk	100	74	46	33	89	83	98	86	55	50	21	0	735
COLUMBUS VICTORIA	P3RF8	Norfolk	0	0	0	0	0	0	0	0	0	55	67	0	122
CORAL SEA	C6YW	Miami	0	2	30	19	0	0	0	0	0	1	0	0	52
CORMORANT ARROW	C6IO9	Seattle	21	28	6	17	0	24	24	31	0	0	23	0	174
CORNELIUS MAERSK	OYTN2	Seattle	0	39	3	0	55	7	0	55	2	0	0	0	161
COSCO NORFOLK	P3ZY6	Norfolk	18	8	2	16	13	8	9	10	15	27	13	0	139
COURIER	KCBK	Houston	0	0	0	0	0	0	0	0	0	42	20	0	62
COURTNEY BURTON	WE6970	Cleveland	0	0	0	28	0	7	28	33	29	7	12	0	144
COURTNEY L	ZCAQ8	Baltimore	26	29	69	47	35	33	28	24	54	38	35	0	418
CRIMSON GALAXY	3FIQ6	Norfolk	0	0	0	48	0	5	0	0	0	0	0	0	53
CROSS POINT	WCM8728	Anchorage	0	0	0	0	0	0	0	0	0	0	1	0	1
CROWLEY UNIVERSE	ELRU3	Miami	0	10	0	23	12	10	16	0	0	0	0	0	71
CSAV BUSAN	ELMZ3	Long Beach	12	33	17	38	35	4	32	23	37	35	0	0	266
CSL CABO	D5XH	Seattle	0	34	34	32	28	26	34	32	25	36	2	0	283
CSS HUDSON	CGDG	Norfolk	0	0	0	0	0	20	24	0	0	0	0	0	44
CSX DEFENDER	KGJB	Oakland	123	30	7	54	0	45	43	48	39	42	30	0	461
CSX PATRIOT	KHRF	Oakland	25	40	130	39	46	46	20	52	48	10	26	0	482
CSX ANCHORAGE	KGTX	Anchorage	67	65	29	60	62	28	60	73	49	55	44	0	592
CSX CONSUMER	WCHF	Long Beach	33	259	21	69	9	10	5	7	14	28	24	0	479
CSX DISCOVERY	WZJD	Jacksonville	58	51	8	46	52	150	48	31	17	0	40	0	501
CSX ENTERPRISE	KRGB	Oakland	83	74	402	231	83	194	88	73	70	46	46	0	1390
CSX EXPEDITION	WPGJ	Jacksonville	79	113	39	83	40	34	72	29	0	36	29	0	554
CSX HAWAII	KIRF	NYC	73	154	32	62	75	63	65	75	60	66	40	0	765
CSX INNOVATOR	WGKF	Oakland	60	32	180	37	57	40	24	53	25	20	11	0	539
CSX KODIAK	KGTZ	Anchorage	53	54	36	54	27	38	14	29	16	16	101	0	438
CSX LIBERATOR	KHRP	Oakland	40	28	185	72	62	55	53	43	28	48	35	0	649
CSX PACIFIC	WSRL	Long Beach	0	0	0	0	0	0	0	0	0	0	27	0	27
CSX RELIANCE	WFLH	Long Beach	0	0	0	84	71	68	84	86	79	58	54	0	584
CSX SPIRIT	WFLG	Oakland	76	60	42	91	67	295	56	59	76	75	51	0	948
CSX TACOMA	KGTY	Anchorage	26	22	18	21	36	41	44	47	38	34	34	0	361
CSX TRADER	KIRH	Oakland	58	41	98	35	74	43	45	57	52	25	42	0	570
CYNTHIA FAGAN	KSDF	Houston	32	191	16	0	0	29	14	20	7	0	1	0	310

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
DAGNEY	WX8482A	Kodiak	0	0	0	0	19	41	33	3	0	0	0	0	96
DAISHIN MARU	3FPS6	Seattle	66	69	47	98	101	96	104	100	82	92	0	0	855
DEEPWATER MILLENNIUM	3FJA9	Houston	0	0	0	0	59	142	144	105	6	24	19	0	499
DELAWARE BAY	WMLG	Norfolk	32	8	14	26	40	4	9	15	20	15	40	0	223
DENALI	WSVR	Long Beach	26	14	6	16	2	5	23	22	26	34	15	0	189
DENEB VOYAGER	C6KQ8	Oakland	0	0	0	19	0	0	45	0	1	0	0	0	65
DIANE H.	WUR7250	Kodiak	0	0	0	11	0	8	5	4	0	3	0	0	31
DIRCH MAERSK	OXQP2	Long Beach	0	15	6	22	24	13	52	44	12	49	39	0	276
DIRECT JABIRU	ELYJ9	Oakland	56	72	184	71	111	43	77	52	56	39	0	0	761
DIRECT KOOKABURRA	ELWB8	Long Beach	0	0	0	64	0	23	40	0	0	0	0	0	127
DIRECT TUI	ELVZ5	Norfolk	0	15	3	27	40	84	49	46	76	57	25	0	422
DISCOVERER DEEP SEAS	HP9685	New Orleans	0	0	0	0	0	0	0	0	0	0	21	0	21
DISCOVERER ENTERPRISE	3FZQ7	New Orleans	0	0	0	0	0	0	0	0	0	0	25	0	25
DORTHE OLDENDORFF	ELXC4	Seattle	0	0	0	54	0	35	22	0	0	0	0	0	111
DREW FOSS	WYL7518	Kodiak	37	7	0	1	21	12	1	0	0	0	8	0	87
DUNCAN ISLAND	C6JS	Miami	40	53	22	57	43	37	42	40	52	52	39	0	477
E.L. BARTLETT	WY6244	Kodiak	0	0	0	0	5	1	0	0	0	0	0	0	6
EARL W. OGLEBAY	WZE7718	Cleveland	0	0	0	3	0	0	0	0	0	0	0	0	3
EASTERN BRIDGE	C6JY9	Baltimore	0	1	2	0	0	0	1	0	0	0	0	0	4
ECSTASY	H3GR	Miami	0	0	1	40	0	0	0	0	0	0	0	0	41
EDGAR B. SPEER	WQZ9670	Chicago	35	0	99	194	149	128	75	123	69	34	32	0	938
EDWIN H. GOTT	WXQ4511	Chicago	6	0	10	12	2	10	6	22	4	6	9	0	87
EDYTH L	C6YC	Baltimore	0	0	12	37	22	32	27	19	16	13	25	0	203
EL MORRO	KCGH	Miami	0	0	0	4	0	2	1	3	0	0	0	0	10
EL YUNQUE	WGJT	Jacksonville	4	3	0	27	15	16	12	3	15	12	5	0	112
ELATION	3FOC5	Miami	0	0	0	0	0	0	2	0	4	44	27	0	77
EMPIRE STATE	KKFW	NYC	22	42	0	0	9	84	42	0	0	0	0	0	199
ENCHANTMENT OF THE SEAS	LAXA4	Miami	1	1	0	4	0	21	11	0	0	0	0	0	38
ENDEAVOR	WAUW	NYC	0	0	0	0	0	0	0	0	38	0	43	0	81
ENDURANCE	WAUU	NYC	21	42	0	34	23	24	31	38	46	39	4	0	302
ENDURANCE	WDA3359	Anchorage	0	0	0	0	0	49	40	45	52	36	16	0	238
ENERGY ENTERPRISE	WBJF	Baltimore	3	0	0	0	0	0	0	0	0	25	0	0	28
ENIF	9VVI	Houston	12	27	2	5	6	2	12	0	7	0	5	0	78
ENTERPRISE	WAUY	NYC	49	4	28	35	115	35	45	22	29	3	0	0	365
ESSEN EXPRESS	DHEE	Norfolk	18	26	14	0	33	43	41	23	19	0	0	0	217
EVER DECENT	3FUO7	NYC	0	0	0	7	0	7	4	0	0	0	0	0	18
EVER DELIGHT	3FCB8	NYC	6	1	0	5	0	5	7	0	0	0	0	0	24
EVER DELUXE	3FBE8	Norfolk	0	0	0	4	0	0	0	0	0	0	0	0	4
EVER DEVELOP	3FLP8	NYC	11	12	10	2	11	4	9	0	0	0	0	0	59
EVER DEVOTE	3FIF8	NYC	21	14	10	1	17	22	17	17	13	3	11	0	146
EVER DIADEM	3FOF8	NYC	0	0	0	0	0	2	1	0	0	9	4	0	16
EVER DIVINE	3FSA8	Norfolk	11	0	0	11	0	9	0	0	0	0	0	0	31
EVER GENERAL	BKHY	Baltimore	0	0	0	0	0	0	20	0	8	8	13	0	49
EVER GROUP	BKJI	Long Beach	21	13	0	37	0	0	12	0	0	0	0	0	83
EVER LYRIC	BKHI	Long Beach	0	0	0	3	0	0	0	0	0	0	0	0	3
EVER RACER	3FJL4	Norfolk	0	0	0	4	0	1	0	0	0	0	0	0	5
EVER RENOWN	3FFR4	Long Beach	0	0	0	11	0	10	9	0	0	0	0	0	30
EVER RESULT	3FSA4	Norfolk	8	4	0	1	10	11	8	8	0	0	0	0	50
EVER RIGHT	3FML3	Long Beach	0	0	0	0	0	0	1	0	0	0	0	0	1
EVER ROUND	3FQN3	Long Beach	0	0	0	11	0	6	5	0	0	0	0	0	22
EVER ULTRA	3FEJ6	Seattle	0	0	0	12	0	15	1	0	0	0	0	0	28
EVER UNION	3FFG7	Seattle	12	6	3	11	0	6	7	0	0	0	0	0	45
EVER UNIQUE	3FXQ6	Seattle	11	22	25	0	2	0	2	0	0	0	0	0	62
EVER UNISON	3FTL6	Long Beach	15	17	6	0	0	0	7	0	2	0	0	0	47
EVERETT EXPRESS	DPGD	Seattle	0	0	0	38	0	33	21	0	0	0	0	0	92
EWA	WEZM	Long Beach	27	54	91	58	95	48	12	69	54	38	0	0	546
EXPLORER OF THE SEAS	ELWX5	Miami	213	106	233	87	203	364	369	489	371	365	238	0	3038
FANTASY	ELKI6	Miami	0	0	0	0	0	12	0	0	0	0	0	0	12
FASCINATION	C6FM9	Miami	0	0	0	0	0	0	0	0	9	6	5	0	20
FAUST	WRYX	Baltimore	49	32	34	60	38	42	36	43	2	21	23	0	380
FIDELIO	WQVY	Baltimore	40	59	21	35	230	16	39	40	50	45	28	0	603
FIGARO	S6PI	Baltimore	21	43	18	49	26	33	32	31	16	30	32	0	331
FISHHAWK	WRB5085	Kodiak	0	0	0	0	6	1	1	0	0	0	0	0	8
FRANCES L	C6YE	Baltimore	42	197	37	43	139	47	36	36	40	32	22	0	671
FRANK A. SHRONTZ	C6FZ3	Oakland	13	5	0	25	0	61	85	70	54	3	8	0	324
GALE WIND	WAZ9548	Anchorage	0	3	5	7	19	22	19	13	14	12	11	0	125
GEMINI	V7BM9	Kodiak	0	0	0	0	46	50	27	12	1	0	8	0	144
GEORGIA RAINBOW II	VRVS5	Jacksonville	24	19	17	20	38	0	40	44	1	0	0	0	203
GINGA MARU	JFKC	Long Beach	0	0	0	0	0	0	67	0	0	0	0	0	67
GLADIATOR	WBN5982	Anchorage	0	0	0	0	0	12	50	0	0	0	0	0	62
GLOBAL LINK	WWDY	Baltimore	0	0	0	40	0	13	24	0	31	44	0	0	152
GLOBAL SENTINEL	WRZU	Baltimore	0	0	0	1	0	0	3	1	0	0	0	0	5
GLORIOUS SUCCESS	DUHN	Seattle	33	64	117	0	52	51	38	29	46	47	45	0	522
GOLDEN BEAR	NMRY	Oakland	0	0	0	9	74	63	68	59	0	0	0	0	273
GOLDEN GATE	KIOH	Long Beach	0	0	0	43	0	18	51	0	0	0	0	0	112
GOLDEN LAKER	3FNQ6	Norfolk	62	31	0	40	0	37	28	0	0	0	0	0	198
GOLDEN NOVA	3FDV6	Seattle	6	0	0	27	0	27	15	34	0	36	26	0	171
GREAT LAND	WFDP	Seattle	15	23	35	99	36	22	32	32	24	95	31	0	444
GREEN COVE	WCZ9380	Oakland	0	0	0	11	26	10	36	24	4	15	5	0	131
GREEN DALE	WCZ5238	Jacksonville	14	5	21	47	53	10	9	32	36	2	22	0	251
GREEN LAKE	WDDI	Baltimore	0	0	0	0	23	11	30	20	23	51	32	0	190
GREEN POINT	WCY4148	NYC	0	15	19	3	14	50	13	40	16	41	6	0	217
GRETA	WCY2853	Kodiak	0	3	0	0	21	9	0	21	18	20	0	0	92
GRETE MAERSK	OZNF2	NYC	0	0	0	40	0	10	17	26	14	15	0	0	122

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
GUARDIAN	WBO2511	Anchorage	0	0	0	0	49	79	8	0	14	0	0	0	150
GUAYAMA	WZJG	Jacksonville	0	17	0	21	0	5	11	0	0	0	0	0	54
GUDRUN MAERSK	OZFQ2	NYC	39	7	13	24	27	23	13	6	0	36	0	0	188
GUS W. DARNELL	KCDK	Houston	35	145	15	158	31	33	20	23	18	8	6	0	492
GYPSUM KING	ZCAN2	Baltimore	0	0	0	0	0	0	1	54	49	71	54	0	229
GYR FALCON	WCU6587	Kodiak	0	0	0	0	0	8	3	0	0	6	1	0	18
HADERA	ELBX4	Baltimore	0	0	0	28	31	61	68	35	34	74	0	0	331
HANJIN HONG KONG	P3UX7	Long Beach	0	0	0	9	0	0	0	0	0	0	0	0	9
HANJIN KAOHSIUNG	P3BN8	Seattle	0	0	0	36	0	7	12	0	0	0	0	0	55
HARMONY ACE	H3QA	Jacksonville	0	0	0	0	39	0	17	68	18	70	62	0	274
HATSU EAGLE	ZNZH6	Seattle	0	0	0	0	0	0	0	0	19	9	6	0	34
HATSU ENVOY	VSQL9	Seattle	0	0	0	0	0	0	0	0	0	35	37	0	72
HATSU EXCEL	VSXV3	Seattle	0	0	0	0	0	0	0	0	0	38	41	0	79
HENRY HUDSON BRIDGE	JKLS	Seattle	68	78	50	104	67	71	21	0	0	0	0	0	459
HERBERT C. JACKSON	WL3972	Cleveland	0	0	0	0	3	0	0	0	0	0	0	0	3
HOEGH DUKE	ELWP2	Norfolk	11	0	5	53	18	36	20	0	0	0	0	0	143
HOLIDAY	C6FM6	New Orleans	0	0	0	0	0	0	0	0	0	0	4	0	4
HONSHU SILVIA	3EST7	Seattle	15	17	3	18	0	15	2	0	0	0	0	0	70
HOOD ISLAND	C6LU4	Miami	9	33	71	96	45	25	14	0	1	0	1	0	295
HORIZON	ELNG6	Miami	0	0	0	0	0	1	0	0	0	0	0	0	1
HUAL TRANSPORTER	C6QO3	Jacksonville	14	8	24	0	0	0	0	0	0	0	0	0	46
HUMACAO	WZJB	Norfolk	0	0	0	34	0	30	32	0	0	0	0	0	96
HYUNDAI FREEDOM	3FFS6	Seattle	0	0	0	45	0	42	0	0	0	0	0	0	87
IBIS ARROW	C6CU6	Seattle	0	0	0	0	42	41	0	0	0	0	0	0	83
IMAGINATION	C6FN2	Miami	0	4	4	25	6	17	29	2	11	0	0	0	98
INDAMEX IMPALA	V2AX1	Norfolk	0	0	0	0	0	44	55	71	81	55	56	0	362
INDAMEX LIBERTY	ELRJ6	Norfolk	0	0	0	0	2	8	0	0	0	0	0	0	10
INDIAN OCEAN	C6T2063	NYC	35	27	20	43	23	28	19	26	5	20	11	0	257
INDIANA HARBOR	WXN3191	Cleveland	0	0	0	39	117	112	84	89	60	54	41	0	596
INDUSTRIAL CHALLENGER	WDHL	Norfolk	0	0	0	0	0	0	0	0	0	37	1	0	38
INFINITY	ELXX7	Miami	0	0	0	0	1	4	0	0	0	0	0	0	5
INLAND SEAS	WCJ6214	Chicago	0	0	7	0	8	4	3	1	2	1	0	0	26
ISLA DE CEDROS	3FOA6	Seattle	42	65	42	30	13	10	41	0	0	0	0	0	243
ISLA DE CEDROS	VRXU2	Seattle	0	0	0	0	0	0	0	0	0	29	23	0	52
ISLAND CHAMPION	WCZ7046	Anchorage	0	0	0	0	1	2	0	0	3	0	0	0	6
ISLAND WARRIOR	WDA9217	Anchorage	0	0	0	0	0	0	0	0	0	8	8	0	16
ITB BALTIMORE	WXKM	Baltimore	21	49	5	3	19	102	1	0	11	0	0	0	211
ITB GROTON	KMJL	NYC	47	37	30	53	31	20	4	13	58	43	5	0	341
ITB MOBILE	KXDB	NYC	0	0	0	0	0	0	2	0	0	0	0	0	2
ITB NEW YORK	WVDG	Miami	14	15	4	28	12	12	15	7	4	11	13	0	135
IVER FOSS	WCY6442	Kodiak	0	0	0	0	0	21	0	0	0	0	0	0	21
IWANUMA MARU	3ESU8	Seattle	73	202	119	175	91	92	103	106	86	83	59	0	1189
J. BENNETT JOHNSTON	C6QE3	Oakland	4	14	4	20	0	42	0	29	21	0	21	0	155
J.A.W. IGLEHART	WTP4966	Cleveland	2	0	0	0	2	0	0	0	0	5	1	0	10
JACKLYN M.	WCV7620	Chicago	2	0	0	69	13	69	18	36	15	14	6	0	242
JACKSONVILLE	WNDG	Baltimore	3	15	0	2	9	6	0	0	0	15	0	0	50
JADE PACIFIC	ELRY5	Seattle	0	0	0	11	0	9	7	0	0	0	0	0	27
JAMES N. SULLIVAN	C6FD3	Baltimore	12	142	10	0	184	7	26	74	0	0	29	0	484
JAMES R. BARKER	WYP8657	Cleveland	0	0	0	61	0	31	41	50	27	15	6	0	231
JOHN G. MUNSON	WE3806	Chicago	7	0	32	88	49	48	35	8	28	25	12	0	332
JOHN J. BOLAND	WZE4539	Cleveland	0	0	0	4	0	4	3	0	0	0	0	0	11
JOHN PAGE	WPKS	Norfolk	0	352	0	0	0	0	0	0	0	0	0	0	352
JOIDES RESOLUTION	D5BC	Norfolk	0	0	0	0	0	0	0	0	34	0	0	0	34
JOSEPH L. BLOCK	WDA2768	Chicago	0	0	10	33	8	12	3	0	8	12	0	0	86
JUBILEE	3FPM5	Long Beach	0	67	29	0	15	19	0	0	0	0	0	0	130
JUDY LITRICO	KCKB	New Orleans	13	189	13	7	38	52	47	29	8	19	5	0	420
JUSTINE FOSS	WYL4978	Kodiak	0	0	0	0	15	6	0	11	10	10	14	0	66
KANIN	ELEO2	New Orleans	0	0	39	9	0	37	47	0	0	0	0	0	132
KAPITAN AFANASYEV	UFIL	Seattle	12	65	3	0	0	21	29	15	2	1	0	0	148
KAPITAN BYANKIN	UAGK	Seattle	0	3	72	95	41	28	40	9	0	0	0	0	288
KAPITAN KONEV	UAHV	Seattle	0	18	11	41	79	17	11	5	0	28	15	0	225
KAPITAN MASLOV	UBRO	Seattle	15	35	19	2	128	14	0	0	0	0	0	0	213
KAREN ANDRIE	WBS5272	Chicago	0	0	2	11	5	2	9	19	6	9	3	0	66
KAREN MAERSK	OZKN2	Seattle	0	0	0	0	0	10	8	0	0	0	0	0	18
KASIF KALKAVAN	TCLR	Norfolk	0	0	0	0	0	0	39	0	0	0	0	0	39
KAUAI	WSRH	Long Beach	59	50	133	41	30	43	40	44	47	51	26	0	564
KAZIMAH	9KKL	Houston	0	0	0	0	0	0	5	0	0	0	0	0	5
KEE LUNG	BHFN	Seattle	72	33	45	56	0	0	67	57	68	0	0	0	398
KEISHO	3FYN4	Seattle	0	0	0	0	0	0	0	0	0	65	24	0	89
KEN KOKU	3FMN6	Seattle	0	8	0	0	4	8	0	0	7	12	2	0	41
KEN SHIN	YJQS2	Seattle	18	13	12	17	24	11	15	10	8	5	5	0	138
KENAI	WSNB	Houston	9	6	4	27	13	9	3	0	0	0	0	0	71
KENNICOTT	WCY2920	Kodiak	0	30	22	0	82	85	88	85	89	47	34	0	562
KINSMAN INDEPENDENT	WUZ7811	Cleveland	0	0	0	9	11	7	0	0	1	0	0	0	28
KUPARUK RIVER	WBN4379	Anchorage	0	0	0	0	0	16	6	0	0	0	0	0	22
KURE	3FGN3	Seattle	19	19	14	17	19	25	3	2	19	19	10	0	166
LAKE GUARDIAN	WAO9082	Chicago	0	0	0	12	0	0	0	0	0	0	0	0	12
LECONTE	WZE4270	Kodiak	0	1	1	1	19	15	8	4	3	0	0	0	52
LEO FOREST	3FPH8	Seattle	15	10	22	55	27	42	31	46	23	24	23	0	318
LIBERTY GLORY	NBDP	New Orleans	0	0	0	0	0	19	0	0	0	0	0	0	19
LIBERTY GRACE	WADN	New Orleans	0	0	0	0	0	0	0	0	0	0	20	0	20
LIBERTY SEA	KPZH	New Orleans	1	0	0	0	1	13	45	79	37	68	17	0	261
LIBERTY SPIRIT	WCPU	New Orleans	11	35	15	20	17	13	8	4	0	0	3	0	126
LIBERTY STAR	WCBP	New Orleans	11	15	8	46	98	34	71	67	55	39	20	0	464

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
LIBERTY SUN	WCOB	New Orleans	45	54	0	33	66	48	16	62	30	45	16	0	415
LIBERTY WAVE	KRHZ	Houston	0	0	0	0	1	0	8	0	28	16	29	0	82
LIHUE	WTST	Oakland	30	51	24	62	30	15	41	46	30	37	22	0	388
LOIS H.	WTD4576	Kodiak	0	0	0	0	0	0	5	2	0	0	0	0	7
LOK PRAGATI	ATZS	Seattle	17	5	0	2	0	2	3	0	0	0	0	0	29
LONG LINES	WATF	Baltimore	0	0	0	12	0	1	3	0	0	0	0	0	16
LT CAMPBELL	WBD5759	Kodiak	3	8	5	16	4	7	4	5	4	1	0	0	57
LURLINE	WLVD	Oakland	0	32	205	48	0	162	21	0	2	19	16	0	505
LYKES AMBASSADOR	VSRL9	Houston	0	0	0	0	0	0	0	0	0	1	7	0	8
LYKES DISCOVERER	WGXO	Houston	96	107	32	80	85	99	73	63	61	148	100	0	944
LYKES EAGLE	ELZE3	Houston	10	8	6	9	0	22	34	0	0	0	0	0	89
LYKES EAGLE	VSUA7	Houston	0	0	0	0	0	0	0	0	0	13	7	0	20
LYKES EXPLORER	WGLA	Houston	83	679	28	45	48	32	39	41	70	35	48	0	1148
LYKES LIBERATOR	WGXN	Houston	55	932	28	46	185	54	46	29	51	59	33	0	1518
LYKES MOTIVATOR	WABU	Houston	58	33	16	30	45	16	31	44	37	39	24	0	373
LYKES NAVIGATOR	WGMJ	Houston	46	384	19	57	45	150	52	41	51	51	23	0	919
M/T MONTAUK	WDCJ	New Orleans	0	0	0	0	32	14	23	42	42	33	35	0	221
M/V GEYSIR	WCZ5528	Norfolk	0	0	0	0	0	0	0	0	0	0	57	0	57
MAASDAM	PFRO	Miami	12	6	7	1	9	14	20	39	25	37	33	0	203
MACKINAC BRIDGE	JKES	Seattle	81	69	40	97	92	61	24	0	0	0	0	0	464
MADISON MAERSK	OVJB2	Oakland	26	11	9	24	0	5	5	20	3	34	37	0	174
MAERSK DUBLIN	V2PW3	Long Beach	0	0	0	0	12	27	1	31	2	44	0	0	117
MAERSK ALASKA	KAKF	Baltimore	0	0	0	0	0	0	0	0	0	0	39	0	39
MAERSK ARIZONA	KAKG	Baltimore	54	21	205	0	51	4	6	18	8	6	0	0	373
MAERSK CALIFORNIA	WCX5083	Miami	74	109	2	56	2	61	5	17	0	0	0	0	326
MAERSK CHARLESTON	ELRO2	NYC	24	16	18	3	13	10	26	10	0	0	0	0	120
MAERSK CONSTELLATION	WRYJ	Houston	0	0	0	0	0	0	0	0	0	31	20	0	51
MAERSK GEELONG	S6MW8	NYC	0	0	0	0	0	0	0	0	0	1	0	0	1
MAERSK SEA	S6CW	Seattle	72	51	34	58	18	2	20	0	0	0	0	0	255
MAERSK SUN	S6ES	Seattle	0	0	0	0	0	45	63	28	0	0	0	0	136
MAERSK TAIKI	9VIG	Baltimore	0	0	0	0	0	0	39	35	8	29	43	0	154
MAERSK TAIYO	9VJO	Jacksonville	0	0	51	0	0	5	30	0	26	20	0	0	132
MAERSK TENNESSEE	WCX3486	Miami	13	27	45	92	36	53	15	9	6	6	0	0	302
MAERSK TEXAS	WCX3249	Miami	0	60	0	6	0	0	0	0	0	0	0	0	66
MAERSK WAVE	S6TV	Baltimore	0	0	0	0	0	21	21	0	0	0	0	0	42
MAERSK WIND	S6TY	Baltimore	42	51	38	51	49	53	34	19	14	57	34	0	442
MAERSK_MAJESTIC	OUJH2	Newark	12	5	7	9	12	15	22	35	24	0	0	0	141
MAGLEBY MAERSK	OUSH2	NYC	33	14	3	6	16	29	19	22	0	0	0	0	142
MAHARASHTRA	VTSQ	Seattle	0	0	5	2	1	4	22	6	2	0	4	0	46
MAHIMAHI	WHRN	Oakland	15	46	28	30	47	41	36	32	22	30	27	0	354
MALOLO	WYH6327	Kodiak	39	23	22	4	0	43	42	39	63	25	5	0	305
MANFRED NYSTROM	WCN3590	Kodiak	0	0	1	24	20	5	18	15	0	0	0	0	83
MANHATTAN BRIDGE	3FML4	Seattle	42	60	33	56	21	25	45	0	0	0	0	0	282
MANOA	KDBG	Oakland	54	58	126	57	47	66	29	48	55	44	8	0	592
MANULANI	KNIJ	Oakland	25	0	0	46	19	22	5	0	7	37	41	0	202
MARCHEN MAERSK	OWDQ2	Long Beach	25	24	121	23	23	24	22	24	24	20	5	0	335
MAREN MAERSK	OWZU2	Long Beach	25	63	2	27	16	22	19	2	23	7	20	0	226
MARGRETHE MAERSK	OYSN2	Long Beach	27	0	11	2	38	5	20	55	33	24	10	0	225
MARIE MAERSK	OULL2	NYC	22	30	25	21	25	44	12	13	1	37	29	0	259
MARINE CHEMIST	KMCB	Houston	42	98	0	108	38	39	48	65	65	44	36	0	583
MARINE COLUMBIA	KLKZ	Oakland	30	74	21	6	54	317	67	49	64	0	0	0	682
MARION GREEN	PIAN	Norfolk	0	0	0	0	67	62	6	32	14	12	4	0	197
MARIT MAERSK	OZFC2	Miami	32	7	7	29	36	6	28	4	8	2	12	0	171
MARK HANNAH	WYZ5243	Chicago	0	0	0	11	0	8	5	0	0	0	0	0	24
MARSTAL MAERSK	OUNO5	Norfolk	8	6	0	23	3	1	20	0	18	5	8	0	92
MATANUSKA	WN4201	Kodiak	0	0	0	0	17	3	8	0	0	6	0	0	34
MATHILDE MAERSK	OUUU2	Long Beach	9	12	0	22	14	4	24	13	27	41	24	0	190
MATSONIA	KHRC	Oakland	3	20	63	62	3	10	21	0	14	6	4	0	206
MAUI	WSLH	Long Beach	1	0	0	52	267	30	27	38	23	6	15	0	459
MAURICE EWING	WLDZ	NYC	77	117	43	40	35	36	13	10	10	29	20	0	430
MAYAGUEZ	WZJE	Jacksonville	1	0	0	36	0	29	26	0	48	72	17	0	229
MAYVIEW MAERSK	OWEB2	Oakland	16	49	7	17	22	16	28	34	18	10	5	0	222
MEKHANIK KALYUZHNIY	UFLO	Seattle	0	0	0	15	0	0	0	0	0	0	0	0	15
MEKHANIK MOLDOVANOV	UIKI	Seattle	0	0	0	77	0	3	0	0	0	0	0	0	80
MEKONG PIONEER	V2JN	Miami	90	75	43	9	422	59	62	78	62	65	43	0	1008
MELVILLE	WECB	Long Beach	72	96	33	19	81	70	39	60	85	85	63	0	703
MERCURY	3FFC7	Miami	0	22	0	34	14	3	0	0	0	0	0	0	73
MERLIN	WBHU	Houston	23	8	4	0	10	7	1	11	23	1	0	0	88
MESABI MINER	WYQ4356	Cleveland	0	0	0	19	59	32	1	2	0	0	2	0	115
METTE MAERSK	OXKT2	Long Beach	54	27	0	0	22	30	31	8	18	34	8	0	232
MI-OI	WTT3606	Kodiak	0	0	0	0	0	0	0	0	0	0	11	0	11
MICHAEL O'LEARY	WCP9556	Kodiak	0	0	0	6	0	0	0	0	0	0	0	0	6
MICHIGAN	WRB4141	Chicago	4	0	12	3	1	4	4	5	1	5	0	0	39
MIDDLETOWN	WR3225	Cleveland	0	0	0	3	0	0	0	0	0	7	4	0	14
MING ASIA	BOEA	NYC	14	11	5	20	0	22	19	0	0	0	0	0	91
MOKIHANA	WNRD	Oakland	70	49	15	40	57	38	39	69	51	33	39	0	500
MOKU PAHU	WBWK	Oakland	1	0	76	20	5	7	17	23	46	62	25	0	282
MOL INNOVATION	9VVP	Oakland	0	0	0	0	19	51	44	53	31	59	43	0	300
MOL BRAVERY	3FXX4	Oakland	61	50	119	56	50	40	30	46	39	27	11	0	529
MOL COLUMBUS	3ETV8	Seattle	45	0	0	45	0	60	67	0	0	0	0	0	217
MOL THAMES	3EFV8	Norfolk	0	0	0	0	0	0	0	27	29	9	18	0	83
MORMACSKY	WMBQ	Houston	0	0	0	0	0	0	1	0	0	0	0	0	1
MORMACSTAR	KGDF	Houston	18	12	0	20	0	19	48	0	0	0	0	0	117
MORMACSUN	WMBK	Houston	34	104	1	37	25	14	13	27	27	33	14	0	329

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MOSEL ORE	ELRE5	Norfolk	84	49	28	26	23	34	31	32	52	73	70	0	502
MSC CALIFORNIA	LAKS5	Seattle	0	0	0	58	0	0	0	0	0	0	0	0	58
MT VIRGO VOYAGER	C6FG8	New Orleans	0	0	0	0	0	0	0	0	0	30	21	0	51
MUNKEBO MAERSK	OUNI5	NYC	7	49	0	56	11	18	23	6	26	0	11	0	207
MV CONTSHIP ROME	ELVZ6	Norfolk	0	0	13	38	4	29	51	0	27	34	0	0	196
NANUQ	WCY8498	Anchorage	0	0	0	0	0	0	2	0	0	0	0	0	2
NATHANIEL B. PALMER	WBP3210	Seattle	29	42	5	23	0	0	0	0	16	52	35	0	202
NATOMA	WBB5799	Kodiak	10	0	0	0	0	0	0	5	10	4	8	0	37
NAVIGATOR	WBO3345	Anchorage	0	0	0	4	69	62	88	67	73	80	19	0	462
NEW HORIZON	WKWB	Long Beach	16	27	52	13	12	18	27	17	36	60	12	0	290
NOAA DAVID STARR JORDAN	WTDK	Long Beach	24	24	53	71	282	50	3	45	78	28	52	0	710
NOAA SHIP ALBATROSS IV	WMVF	Norfolk	766	114	33	72	119	66	61	141	79	93	23	0	1567
NOAA SHIP DELAWARE II	KNBD	NYC	7	12	16	86	12	115	138	103	84	101	55	0	729
NOAA SHIP FERREL	WTEZ	Norfolk	0	4	14	65	38	47	79	41	15	14	7	0	324
NOAA SHIP KA'IMIMOANA	WTEU	Honolulu	0	17	44	98	248	100	84	37	28	78	61	0	795
NOAA SHIP MCARTHUR	WTEJ	Seattle	0	13	14	139	36	43	152	130	79	150	111	0	867
NOAA SHIP MILLER FREEMAN	WTDM	Seattle	7	191	185	32	156	150	169	116	137	74	73	0	1290
NOAA SHIP OREGON II	WTDO	New Orleans	112	191	0	609	385	423	110	183	87	115	72	0	2287
NOAA SHIP RAINIER	WTEF	Seattle	0	0	0	69	8	80	44	65	43	25	0	0	334
NOAA SHIP RONALD H BROWN	WTEC	New Orleans	50	144	81	81	0	50	98	103	142	83	34	0	866
NOAA SHIP T. CROMWELL	WTDF	Honolulu	36	64	188	147	33	91	58	75	60	22	28	0	802
NOAA SHIP WHITING	WTEW	Baltimore	0	0	0	0	0	45	57	0	0	0	0	0	102
NOAAS GORDON GUNTER	WTEO	New Orleans	0	143	194	131	328	60	104	33	54	36	62	0	1145
NOBEL STAR	KRPP	Houston	6	151	0	196	0	0	30	0	55	28	0	0	466
NOORDAM	PGHT	Miami	6	0	0	36	0	2	1	0	16	3	0	0	64
NORCOASTER	WYP7276	Kodiak	0	0	0	0	1	3	0	4	2	0	1	0	11
NORDMAX	P3YS5	Seattle	64	59	49	16	91	48	75	49	57	66	2	0	576
NORDMORITZ	P3YR5	Seattle	58	145	4	55	160	35	0	0	0	0	0	0	457
NORMAN S.	WCW7514	Anchorage	0	0	0	10	0	5	16	5	0	0	2	0	38
NORTHERN LIGHTS	WFJK	Anchorage	0	1	38	66	111	41	19	47	35	9	2	0	369
NORTHERN SPIRIT	WAQ2746	Kodiak	28	8	4	25	22	26	15	18	4	0	1	0	151
NORTHERN VICTOR	WCZ6534	Kodiak	0	0	0	0	0	7	0	0	0	3	0	0	10
NORWAY	C6CM7	Miami	66	45	26	55	37	11	49	61	55	28	10	0	443
NUERNBERG EXPRESS	9VBK	Houston	1	0	0	0	0	0	4	0	0	0	0	0	5
NYK SPRINGTIDE	S6CZ	Seattle	5	59	8	38	0	0	0	0	0	0	0	0	110
OCEAN CAMELLIA	3FTR6	Seattle	0	54	65	62	0	37	53	0	0	0	0	0	271
OCEAN CITY	WCYR	Houston	0	169	0	101	0	0	8	0	0	0	0	0	278
OCEAN CLIPPER	3EXI7	New Orleans	8	5	2	20	0	4	8	0	0	0	0	0	47
OCEAN PALM	3FDO7	Seattle	48	57	30	88	0	57	80	0	0	0	0	0	360
OCEAN RANGER	WAM7635	Anchorage	4	0	0	0	0	0	0	0	0	0	0	0	4
OCEAN SERVICE	WTW9263	Kodiak	0	0	0	0	0	0	0	0	7	0	0	0	7
OGLEBAY NORTON	WAQ3521	Cleveland	0	0	0	0	0	0	3	0	8	7	7	0	25
OLEANDER	PJJU	Newark	47	16	3	27	13	4	13	1	0	0	0	0	124
OOCL AMERICA	ELSM7	Oakland	0	0	121	0	0	0	0	0	0	0	0	0	121
OOCL CALIFORNIA	VRWC8	Seattle	52	33	20	63	88	43	49	67	40	51	26	0	532
OOCL FAIR	VRWB8	Long Beach	19	12	10	5	20	55	53	68	60	67	29	0	398
OOCL FIDELITY	VRWG5	Long Beach	0	0	0	4	13	4	11	2	28	31	23	0	116
OOCL FORTUNE	VRWF2	Norfolk	0	0	0	0	49	47	48	39	20	29	19	0	251
OOCL FRIENDSHIP	VRWD3	Long Beach	0	0	0	0	21	51	41	15	48	56	48	0	280
OOCL HONG KONG	VRVA5	Oakland	0	0	58	72	48	57	78	73	58	41	28	0	513
OOCL NETHERLANDS	VRVN6	Long Beach	28	30	23	58	44	57	58	62	38	38	8	0	444
ORIANA	GVSN	Miami	7	13	26	28	9	8	13	0	0	0	2	0	106
ORIENTE GRACE	3FHT4	Seattle	0	0	0	0	0	0	0	23	25	0	20	0	68
ORIENTE HOPE	3ETH4	Seattle	11	45	6	16	0	6	0	0	0	12	32	0	128
ORIENTE PRIME	3FOU4	Seattle	24	16	23	21	24	8	1	16	13	0	0	0	146
ORIENTE SHINE	H9AL	Seattle	0	0	0	0	34	19	40	23	24	12	26	0	178
ORIENTE VICTORIA	3FVG8	Seattle	13	19	19	24	12	9	15	7	21	0	0	0	139
ORION VOYAGER	C6MC5	Baltimore	0	0	0	5	45	21	28	0	0	1	0	0	100
OURO DO BRASIL	ELPP9	Baltimore	3	127	11	17	82	10	9	22	13	15	4	0	313
OVERSEAS CHICAGO	KBCF	Kodiak	0	0	0	0	0	0	0	0	0	0	2	0	2
OVERSEAS HARRIETTE	WRFJ	Houston	48	113	2	23	20	24	27	31	26	0	0	0	314
OVERSEAS JOYCE	WUQL	Jacksonville	32	22	5	39	23	19	27	55	33	7	10	0	272
OVERSEAS MARILYN	WFQB	Houston	3	223	2	8	1	6	11	13	7	1	0	0	275
OVERSEAS NEW ORLEANS	WFKW	Houston	26	39	51	180	44	44	24	42	0	13	26	0	489
OVERSEAS NEW YORK	WMCK	Kodiak	0	184	0	44	43	0	12	9	9	0	0	0	301
OVERSEAS WASHINGTON	WFGV	Houston	0	127	0	54	0	0	0	0	0	0	0	0	181
P&O NEDLLOYD MARSEILLE	MYSU5	Seattle	20	9	0	44	19	38	38	54	433	0	0	0	655
P&O NEDLLOYD PINTA	LANM4	Houston	0	0	0	0	0	0	0	0	0	5	3	0	8
P&O NEDLLOYD YANTIAN	ELYD5	Long Beach	0	0	0	0	48	48	27	64	40	35	19	0	281
PACDREAM	ELQO6	Seattle	0	0	0	20	0	4	0	0	0	0	0	0	24
PACIFIC FREEDOM	WDJF	Kodiak	0	0	0	0	6	3	4	0	0	10	0	0	23
PACIFIC PRIDE	WCN4995	Kodiak	7	10	12	11	0	36	45	30	21	18	1	0	191
PACKING	ELBX3	Seattle	0	0	0	10	0	13	1	0	0	0	0	0	24
PACPRINCESS	ELED8	Houston	28	7	14	23	3	26	8	2	0	0	0	0	111
PANDALUS	WAV7611	Anchorage	0	0	0	0	7	2	0	3	1	3	0	0	16
PARAGON	WDA2311	Kodiak	0	3	0	0	27	23	17	34	18	10	15	0	147
PAUL BUCK	KDGR	Houston	0	61	9	82	107	1	27	13	30	15	7	0	352
PAUL R. TREGURTHA	WYR4481	Cleveland	0	0	0	14	9	4	4	12	17	25	43	0	128
PEARL ACE	VRUN4	Seattle	26	3	4	38	0	0	51	0	0	0	0	0	122
PENANG SENATOR	DQVH	Seattle	20	58	34	68	9	10	13	45	30	14	29	0	330
PFC EUGENE A. OBREGON	WHAQ	Norfolk	0	0	0	4	0	1	20	0	0	0	0	0	25
PHILIP R. CLARKE	WE3592	Chicago	7	0	0	14	1	9	5	6	0	0	0	0	42
PHYLLIS DUNLAP	WDA6552	Kodiak	0	0	0	0	0	0	0	0	7	0	0	0	7
PISCES EXPLORER	MWQD5	Long Beach	0	0	0	48	0	0	0	0	0	0	0	0	48

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PITTSBURG	ELTQ6	Baltimore	54	49	36	0	24	33	42	82	63	40	34	0	457
POLAR ALASKA	KSBK	Long Beach	11	13	11	15	6	27	11	19	5	17	9	0	144
POLAR CALIFORNIA	WMCV	Long Beach	14	8	11	18	15	14	19	16	20	24	6	0	165
POLAR EAGLE	ELPT3	Anchorage	72	145	88	131	46	88	97	97	96	103	66	0	1029
POLAR ENDEAVOUR	WCAJ	New Orleans	19	14	6	24	27	13	8	16	9	13	10	0	159
POLAR RESOLUTION	WDJK	New Orleans	0	0	0	0	0	0	0	0	2	10	5	0	17
POLAR TEXAS	KNFD	Long Beach	15	25	25	17	0	5	11	3	11	6	7	0	125
POLAR TRADER	WCZ3758	Long Beach	16	12	31	17	12	13	18	17	5	5	0	0	146
POLARIS VOYAGER	ZCAA2	New Orleans	33	52	97	3	72	81	26	25	19	15	27	0	450
POLYNESIA	V2CA2	Oakland	0	0	0	1	0	0	0	0	0	0	0	0	1
POMHATTAN	WTX7883	Kodiak	0	0	0	0	0	0	0	0	8	6	0	0	14
PRESIDENT ADAMS	WRYW	Oakland	58	45	177	46	50	492	69	59	46	59	40	0	1141
PRESIDENT GRANT	WCY2098	Long Beach	71	28	12	57	79	65	66	52	70	64	41	0	605
PRESIDENT JACKSON	WRYC	Oakland	58	55	121	27	638	41	25	26	33	22	31	0	1077
PRESIDENT KENNEDY	WRYE	Oakland	80	46	170	149	96	42	41	57	42	34	44	0	801
PRESIDENT POLK	WRYD	Oakland	65	48	131	29	75	25	12	45	63	43	42	0	578
PRESIDENT TRUMAN	WNDP	Oakland	31	34	77	90	86	57	57	62	43	40	45	0	622
PRESIDENT WILSON	WCY3438	Long Beach	0	0	0	0	0	0	0	0	0	0	25	0	25
PRIDE OF BALTIMORE II	WUW2120	Baltimore	0	0	0	15	35	34	67	44	29	24	14	0	262
PRIMO BRUSCO	WBT4608	Kodiak	0	0	0	0	0	14	1	2	0	0	0	0	17
PRINCE WILLIAM SOUND	WSDX	Long Beach	0	0	0	8	13	1	0	0	0	7	0	0	29
PRIWALL	DQVF	Norfolk	0	0	0	44	0	26	36	0	0	0	0	0	106
PROJECT ARABIA	PJKP	Miami	0	0	0	0	3	21	18	3	17	12	45	0	119
PRUDHOE BAY	KPFD	Long Beach	13	38	0	9	42	18	11	0	0	0	0	0	131
PUDONG SENATOR	DQVI	Seattle	78	67	4	14	16	26	65	47	54	0	0	0	371
PUSAN SENATOR	DQVG	Seattle	42	52	15	52	1433	48	30	14	25	22	8	0	1741
PVT FRANKLIN J. PHILLIPS	WMFW	Norfolk	0	0	0	0	0	7	7	0	0	0	0	0	14
QUEENSLAND STAR	MZBM7	Houston	0	0	0	0	0	0	0	0	0	0	17	0	17
R.J. PFEIFFER	WRJP	Long Beach	51	36	58	23	23	1	10	22	10	19	28	0	281
R.V. DAY	WS6709	Kodiak	0	0	0	0	9	7	2	0	1	0	0	0	19
R/V TIGLAX	WZ3423	Anchorage	0	0	19	15	38	4	18	12	2	0	0	0	108
RAINBOW BRIDGE	3EYX9	Seattle	0	0	0	46	0	77	71	0	0	0	0	0	194
RANGER	WBN5979	Seattle	0	0	0	0	0	1	23	0	1	0	0	0	25
RAYMOND E. GALVIN	C6FD6	Oakland	0	0	7	2	12	10	31	21	3	16	14	0	116
REBECCA LYNN	WCW7977	Chicago	8	0	86	29	25	34	15	22	31	16	9	0	275
REDFIN	WTP2735	Kodiak	0	4	4	0	0	1	0	0	1	3	2	0	15
RHAPSODY OF THE SEAS	LAZK4	Houston	0	0	0	2	12	6	6	5	4	2	2	0	39
RICHARD G MATTHIESEN	WLBV	Jacksonville	7	21	13	1	26	4	47	35	39	39	43	0	275
RICHARD H MATZKE	C6FE5	Oakland	20	13	1	5	71	64	40	0	40	0	0	0	254
RICHARD REISS	WBF2376	Cleveland	0	0	0	1	0	15	15	0	0	0	0	0	31
RIO APURE	ELUG7	Miami	0	0	0	26	0	13	7	0	0	0	0	0	46
ROBERT E. LEE	KCRD	New Orleans	0	36	9	23	0	0	0	0	0	0	0	0	68
ROGER BLOUGH	WZP8164	Chicago	0	0	0	154	73	67	43	73	51	53	32	0	546
ROGER REVELLE	KAOU	New Orleans	48	34	31	56	58	57	85	83	64	69	8	0	593
ROVER	KCBH	Houston	0	0	0	0	0	0	0	0	0	0	34	0	34
RUBIN ARTEMIS	3FAH7	Seattle	0	0	0	0	0	0	0	77	62	75	44	0	258
RUBIN KOBE	DYZM	Seattle	0	0	0	0	9	2	0	15	17	25	0	0	68
RUBIN PEARL	YJQA8	Seattle	33	38	18	36	0	26	53	0	87	28	0	0	319
RUBIN STELLA	3FAP5	Seattle	0	0	0	0	163	40	0	24	21	30	9	0	287
RYNDAM	PHFV	Miami	0	0	0	1	22	0	0	0	0	0	0	0	23
SABINE PHILADELPHIA	WNFJ	New Orleans	0	0	0	0	0	0	6	0	0	0	0	0	6
SAFMARINE TAGALA	ELRR4	Norfolk	0	0	0	0	121	57	85	71	66	44	0	0	444
SAG RIVER	WLDF	Houston	0	0	0	0	0	0	0	0	62	24	11	0	97
SALLY J.	WQZ9646	Kodiak	0	0	0	0	0	2	0	1	0	3	0	0	6
SAM HOUSTON	KDGA	Houston	0	0	0	37	0	1	6	0	0	0	0	0	44
SAMSON MARINER	WCN3586	Kodiak	4	9	4	13	9	9	5	1	16	17	30	0	117
SAMUEL L. COBB	KCDJ	Oakland	0	0	22	0	23	24	0	0	0	0	0	0	69
SANDRA FOSS	WYL4908	Kodiak	0	0	0	0	0	9	0	0	0	2	25	0	36
SANTA MONICA	ELNJ3	Seattle	0	0	0	20	0	10	0	0	0	0	0	0	30
SAUDI ABHA	HZRX	Baltimore	0	0	0	0	0	0	0	0	0	0	24	0	24
SAUDI HOFUF	HZZC	Houston	38	27	29	83	59	85	48	62	76	22	41	0	570
SEA BREEZE	WBN3019	Anchorage	0	0	0	0	1	0	11	3	25	0	0	0	40
SEA CHEETAH	V2PM9	Norfolk	0	0	6	0	5	18	0	0	0	0	0	0	29
SEA FLYER	WBL8673	Anchorage	0	0	4	0	0	1	24	21	0	11	0	0	61
SEA MERCHANT	ELQN2	Norfolk	116	55	33	73	0	64	98	80	104	115	69	0	807
SEA PRINCESS	KRCP	New Orleans	0	114	0	0	0	0	0	0	0	0	0	0	114
SEA RANGER	WBM8733	Anchorage	16	0	0	0	21	16	16	12	0	9	0	0	90
SEA VALOR	WBN9212	Anchorage	0	0	0	0	0	10	0	3	1	0	0	0	14
SEA VENTURE	WCC7684	Anchorage	0	4	0	1	0	6	60	51	45	83	35	0	285
SEA VICTORY	WBH9635	Anchorage	0	0	0	0	0	0	2	0	0	0	0	0	2
SEA VICTORY	WCY6777	Anchorage	0	0	0	0	0	1	88	51	50	67	0	0	257
SEA VIKING	WCE8951	Anchorage	0	0	0	0	0	0	58	49	35	21	14	0	177
SEA-LAND CHARGER	V7AY2	Long Beach	0	0	0	0	0	0	0	0	0	42	30	0	72
SEABULK MONTANA	WCM9126	Anchorage	1	0	0	59	44	20	50	70	37	79	51	0	411
SEABULK PRIDE	WCY7052	Kodiak	0	0	0	0	0	0	0	0	0	24	30	0	54
SEALAND ACHIEVER	WPKD	Houston	63	265	21	15	35	60	51	27	21	61	36	0	655
SEALAND ATLANTIC	KRLZ	Houston	57	150	8	49	82	12	30	49	61	32	15	0	545
SEALAND COMET	V7AP3	Norfolk	0	0	0	2	0	29	20	43	41	42	34	0	211
SEALAND COMMITMENT	KRPB	Houston	63	893	33	63	48	65	60	78	75	67	39	0	1484
SEALAND DEVELOPER	KHRH	Houston	36	75	29	59	46	32	40	61	51	61	33	0	523
SEALAND EAGLE	V7AZ8	Long Beach	0	0	0	0	0	4	38	63	55	56	29	0	245
SEALAND FLORIDA	KRHX	Houston	56	331	23	68	37	42	42	34	53	28	35	0	749
SEALAND HONDURAS	OUQP2	New Orleans	0	0	0	1	0	33	1	8	0	0	0	0	43
SEALAND INDEPENDENCE	WGJC	Long Beach	24	32	206	0	15	0	0	0	0	0	0	0	277

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SEALAND INTEGRITY	WPVD	Houston	29	428	55	121	651	149	98	152	106	81	72	0	1942
SEALAND INTREPID	9VMZ	Norfolk	0	0	0	0	0	21	44	64	62	67	0	0	258
SEALAND MERCURY	V7AP6	Oakland	38	14	13	51	12	47	34	38	31	13	2	0	293
SEALAND MOTIVATOR	WAAH	Houston	74	57	34	0	57	64	57	59	68	51	53	0	574
SEALAND NAVIGATOR	WPGK	Long Beach	26	29	12	66	50	41	39	33	2	1	10	0	309
SEALAND PERFORMANCE	KRPD	Houston	49	866	33	195	58	57	1	8	47	45	26	0	1385
SEALAND PRIDE	WDA3673	Houston	47	110	25	89	44	59	73	64	63	47	23	0	644
SEALAND QUALITY	KRNJ	Houston	55	243	29	159	45	51	42	66	27	76	27	0	820
SEALAND VOYAGER	KHRK	Long Beach	0	0	0	35	59	2	0	0	0	0	0	0	96
SEARIVER GALENA BAY	WGZK	Anchorage	0	384	5	34	0	4	3	0	0	0	0	0	430
SEARIVER NORTH SLOPE	KHLQ	Oakland	0	0	0	11	0	8	0	0	0	0	0	0	19
SEARIVER PUGET SOUND	WXBZ	Anchorage	0	0	0	0	0	425	0	0	0	0	0	0	425
SELMA KALKAVAN	TCSX	Norfolk	0	0	0	28	0	35	28	0	5	1	0	0	97
SENECA	WBN8469	Anchorage	0	0	0	0	76	112	118	118	92	65	0	0	581
SENSATION	C6FM8	Miami	5	0	0	0	48	22	7	13	3	0	0	0	98
SETO BRIDGE	JMQY	Oakland	0	0	0	0	0	0	0	0	0	32	36	0	68
SEVEN SEAS	3FBS9	Seattle	0	0	0	0	0	16	1	0	0	0	0	0	17
SHEILA MCDEVITT	WDA4069	New Orleans	0	0	0	0	0	0	0	0	0	0	19	0	19
SHIRAOI MARU	3ECM7	Seattle	120	101	99	137	110	95	88	93	110	101	76	0	1130
SIDNEY FOSS	WYL5445	Kodiak	0	12	12	1	14	24	17	20	6	27	28	0	161
SIKU	WCQ6174	Anchorage	0	0	0	0	22	36	32	0	0	11	26	0	127
SINE MAERSK	OZOK2	Seattle	35	0	5	50	0	16	35	0	16	11	0	0	168
SINUK	WCQ8110	Anchorage	0	0	0	0	56	45	91	96	87	59	2	0	436
SIOUX	WBN7617	Anchorage	0	0	0	0	0	0	90	37	30	30	35	0	222
SKAGEN MAERSK	OYOS2	Seattle	54	7	0	0	10	0	35	5	0	0	10	0	121
SKAUGRAN	LADB2	Seattle	21	41	14	29	24	265	31	7	38	38	39	0	547
SKODSBORG	OYRJ4	Baltimore	0	0	0	0	28	0	28	0	0	0	0	0	56
SNOHOMISH	WSQ8098	Kodiak	0	0	0	12	0	21	22	0	0	0	0	0	55
SOFIE MAERSK	OZUN2	Seattle	15	17	66	6	59	0	0	0	0	0	0	0	163
SOL DO BRASIL	ELQQ4	Baltimore	0	0	0	28	8	26	14	11	76	64	37	0	264
SOLAR WING	ELJS7	Jacksonville	64	78	40	28	77	88	99	87	97	64	47	0	769
SOROE MAERSK	OYKJ2	Seattle	53	7	0	39	0	6	59	21	0	35	26	0	246
SOUTH FORTUNE	3FJC6	Seattle	7	17	0	19	0	0	10	0	0	0	0	0	53
SOUTHDOWN CHALLENGER	WA4659	Cleveland	2	0	0	19	28	58	35	67	30	24	19	0	282
SOVEREIGN MAERSK	OYGA2	Seattle	0	39	23	0	7	9	0	34	17	0	1	0	130
SS BADGER	WBD4889	Chicago	0	0	0	0	1	33	15	23	4	0	0	0	76
SSGT EDWARD A. CARTER JR	WPWH	Norfolk	0	0	0	156	0	0	0	0	0	0	0	0	156
ST. CLAIR	WZA4027	Cleveland	0	0	0	0	0	2	1	0	0	0	0	0	3
ST. LUCY	ELPO3	Norfolk	0	0	0	3	0	0	0	0	0	0	0	0	3
STACEY FOSS	WYL4909	Kodiak	0	0	0	13	0	16	0	0	0	7	4	0	40
STAR ALABAMA	LAVU4	Baltimore	0	0	0	0	19	5	0	0	25	4	7	0	60
STAR AMERICA	LAVV4	Jacksonville	32	3	13	25	12	0	0	0	19	0	0	0	104
STAR DOVER	LAEP4	Seattle	0	0	0	0	0	0	0	0	13	45	0	0	58
STAR EAGLE	LAWO2	Baltimore	41	33	9	21	0	44	103	42	52	59	0	0	404
STAR EVVIVA	LAHE2	Jacksonville	32	39	33	1	35	28	37	0	37	28	0	0	270
STAR FLORIDA	LAVM4	Houston	60	42	13	50	40	42	43	51	30	41	56	0	468
STAR FRASER	LAVY4	Houston	0	0	0	0	0	0	0	0	0	0	23	0	23
STAR GEIRANGER	LAKQ5	Norfolk	30	0	0	270	0	31	27	5	30	22	26	0	441
STAR GRAN	LADR4	Long Beach	0	25	14	33	31	35	30	32	28	0	0	0	228
STAR GRINDANGER	LAKR5	Norfolk	14	2	30	0	0	30	22	0	0	0	0	0	98
STAR HANSA	LAXP4	Jacksonville	28	7	16	59	35	3	11	3	22	6	0	0	190
STAR HARMONIA	LAGB5	Baltimore	14	21	0	5	51	46	1	34	0	0	43	0	215
STAR HERDLA	LAVD4	Baltimore	25	59	0	0	38	39	26	52	28	17	58	0	342
STAR HIDRA	LAVN4	Baltimore	0	19	0	36	180	34	31	7	29	3	28	0	367
STAR ISMENE	LANT5	Baltimore	24	18	11	0	5	23	17	10	3	18	7	0	136
STAR TRONDANGER	LAQQ2	Baltimore	13	13	0	1	14	15	8	0	0	0	0	0	64
STATENDAM	PHSG	Miami	34	17	5	64	7	20	3	0	0	21	17	0	188
STELLAR KOHINOOR	3FFG8	Seattle	0	0	0	38	10	25	0	0	0	0	0	0	73
STENA CLIPPER	C6MX4	Miami	12	21	13	1	0	18	59	34	36	33	16	0	243
STEWART J. CORT	WYZ3931	Chicago	11	0	26	106	26	54	37	16	41	21	8	0	346
STONEWALL JACKSON	KDDW	New Orleans	0	19	28	20	0	0	26	0	0	0	0	0	93
STRONG PATRIOT	WCZ8589	Norfolk	57	2	0	0	19	10	30	8	12	12	8	0	158
STRONG VIRGINIAN	KSPH	Oakland	0	0	0	0	0	0	0	0	0	0	22	0	22
SUCO DO BRASIL	ELAQ5	Baltimore	0	0	0	0	0	41	22	0	0	0	0	0	63
SUN DANCE	3ETQ8	Seattle	0	0	0	6	56	5	65	0	0	0	0	0	132
SUNBELT DIXIE	D5BU	Baltimore	20	18	0	17	0	12	14	0	0	0	0	0	81
SUPER RUBIN	3FWP5	Seattle	14	0	0	0	0	66	38	0	0	0	0	0	118
SUSAN W. HANNAH	WAH9146	Chicago	0	0	0	15	2	5	3	0	0	16	3	0	44
SVEND MAERSK	OYJS2	Seattle	25	6	4	39	2	16	41	8	9	25	8	0	183
SVENDBORG MAERSK	OZSK2	Seattle	0	7	35	0	0	25	0	14	45	0	0	0	126
T/V STATE OF MAINE	NTNR	Norfolk	0	0	0	0	0	42	2	0	0	0	0	0	44
TAGUS	LAZA2	Long Beach	0	0	0	0	3	13	9	0	0	0	0	0	25
TAI HE	BOAB	Long Beach	57	63	14	57	37	66	32	35	16	0	8	0	385
TAIKO	LAQT4	NYC	1	4	0	0	0	0	7	0	0	0	0	0	12
TAKU	WI9491	Kodiak	0	0	0	0	15	20	0	0	0	0	1	0	36
TALISMAN	LAOW5	Jacksonville	27	0	0	23	19	0	0	1	16	0	0	0	86
TAMESIS	LAOL5	Norfolk	0	0	0	0	0	25	0	0	22	18	23	0	88
TAMPA	LMWO3	Long Beach	0	45	8	12	0	32	17	22	0	0	0	0	136
TAN'ERLIQ	WCY8497	Anchorage	0	0	0	0	0	1	5	0	0	0	0	0	6
TANABATA	WCZ5535	Baltimore	28	73	18	36	134	43	15	13	22	12	6	0	400
TATNUCK	WBY2415	Kodiak	0	0	0	1	0	8	9	0	0	0	0	0	18
TAURUS	WYN6499	Kodiak	0	0	0	1	9	49	38	12	36	7	0	0	152
TAUSALA SAMOA	V2FA2	Long Beach	115	53	29	56	23	32	16	12	1	0	0	0	337
TELLUS	WRYG	Baltimore	60	47	19	64	335	22	21	59	64	44	30	0	765

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TEQUI	3FDZ5	Seattle	33	33	19	42	27	40	9	2	2	4	0	0	211
TEXAS CLIPPER II	KVWA	Houston	0	138	0	0	1	64	64	4	0	0	0	0	271
THOMAS G. THOMPSON	KTDQ	Seattle	0	0	0	0	43	25	9	9	69	20	4	0	179
TIGER	WCE2134	Kodiak	0	0	0	0	0	4	4	0	0	0	0	0	8
TITAN	MAW9232	Kodiak	1	0	0	0	0	0	0	0	0	5	3	0	9
TMM CAMPECHE	VSXC9	Houston	0	0	0	0	0	9	4	0	0	14	20	0	47
TMM NUEVO LEON	3FPA9	Houston	0	0	0	0	0	0	0	0	0	0	10	0	10
TMM TABASCO	VSUA5	Houston	0	0	0	0	0	0	0	0	0	31	13	0	44
TONSINA	KJDG	Kodiak	0	0	0	0	0	0	0	0	0	2	0	0	2
TOWER BRIDGE	ELJL3	Long Beach	15	15	7	12	0	16	16	0	0	1	0	0	82
TOYOSHIMA MARU	9VND	Seattle	0	0	0	0	67	12	0	44	0	66	8	0	197
TRANSWORLD	3FFY3	New Orleans	0	0	0	17	0	0	0	0	0	0	0	0	17
TREIN MAERSK	MSQQ8	Baltimore	36	14	25	9	12	46	21	56	24	47	32	0	322
TRIANON	LAIZ4	Jacksonville	0	0	0	0	0	0	14	5	5	0	0	0	24
TRIDENT	WCZ2913	Kodiak	0	0	0	0	4	3	7	11	13	2	10	0	50
TRINITY	WRGL	Houston	0	0	0	0	0	0	2	0	0	0	0	0	2
TRIUMPH ACE	H3CB	Seattle	24	9	15	10	14	5	21	0	35	0	0	0	133
TROJAN STAR	C6OO7	Baltimore	7	1	27	53	53	64	55	53	49	48	24	0	434
TROPIC KEY	J8PE	Miami	0	5	0	0	0	16	18	22	31	5	0	0	97
TROPIC LURE	J8PD	Miami	2	5	1	0	0	2	4	0	0	2	1	0	17
TROPIC OPAL	J8NW	Miami	117	87	124	105	33	59	2	0	0	0	0	0	527
TUSTUMENA	WNGW	Kodiak	24	0	1	7	18	17	19	16	34	40	2	0	178
TYCOM RELIANCE	V7CZ2	Seattle	0	0	0	0	1	74	99	18	49	21	0	0	262
TYCOM RESPONDER	V7CY9	Seattle	0	0	0	0	0	0	91	54	0	78	62	0	285
TYONEK	WMH8	Anchorage	0	0	0	0	44	28	21	17	17	13	4	0	144
UNITED SPIRIT	ELYB2	Seattle	63	62	42	61	46	74	24	8	11	22	7	0	420
USCGC ACTIVE WMEC 618	NRTF	Seattle	0	0	19	63	0	0	0	0	11	16	0	0	109
USCGC ACUSHNET WMEC 167	NNHA	Kodiak	0	0	0	0	3	0	0	0	0	0	6	0	9
USCGC ALEX HALEY	NZPO	Kodiak	24	26	1	0	3	5	6	4	2	0	0	0	71
USCGC BRAMBLE (WLB 392)	NODK	Chicago	0	0	0	2	0	0	1	0	0	0	0	0	3
USCGC FIREBUSH WLB 393	NODL	Kodiak	0	0	0	1	0	0	0	0	0	3	0	0	4
USCGC GENTIAN	NBHF	Miami	0	0	0	4	0	7	0	0	0	0	5	0	16
USCGC HAMILTON WHEC 715	NMAG	Long Beach	0	0	0	0	0	1	1	4	0	0	1	0	7
USCGC HARRIET LANE	NHNC	Norfolk	0	0	0	0	0	0	0	0	2	3	0	0	5
USCGC HEALY WAGB-20	NEPP	Seattle	0	0	0	0	47	64	41	47	75	26	0	0	300
USCGC KATMAI BAY	NRLX	Chicago	0	0	0	0	0	0	2	0	0	0	0	0	2
USCGC MACKINAW	NRKP	Chicago	0	0	0	0	0	0	18	0	0	0	0	0	18
USCGC MELLON (WHEC 717)	NMEL	Seattle	0	0	0	0	0	0	0	0	0	0	1	0	1
USCGC MIDGETT (WHEC 726)	NHWR	Seattle	0	0	349	0	0	0	0	0	0	0	0	0	349
USCGC NORTHLAND WMEC 904	NLGF	Norfolk	0	0	0	21	0	14	31	1	1	0	0	0	68
USCGC POLAR SEA__(WAGB 1	NRUO	Seattle	111	218	77	113	0	0	24	0	0	0	28	0	571
USCGC POLAR STAR (WAGB 1	NBTM	Seattle	81	69	33	1	0	0	125	116	71	13	0	0	509
USCGC SEDGE (WLB 402)	NODU	Anchorage	0	0	0	0	0	0	1	0	0	0	1	0	2
USCGC SPAR	NJAR	Kodiak	0	0	0	0	6	0	2	5	0	0	2	0	15
USCGC STEADFAST (WMEC 62	NSTF	Seattle	0	0	102	14	0	4	1	0	0	2	0	0	123
USCGC STORIS (WMEC 38)	NRUC	Kodiak	0	0	0	0	0	0	0	0	1	0	0	0	1
USCGC SUNDEW (WLB 404)	NODW	Chicago	0	0	11	13	0	3	0	0	0	0	1	0	28
USCGC WOODRUSH (WLB 407)	NODZ	Seattle	0	0	0	38	0	0	0	0	0	0	0	0	38
USNS 1ST LT. HARRY L. MA	NDFH	Jacksonville	0	3	0	0	2	0	13	0	1	2	22	0	43
USNS ALTAIR	NRZA	Norfolk	0	0	0	8	0	0	0	0	0	0	0	0	8
USNS APACHE (T-ATF 172)	NIGP	Norfolk	0	0	0	31	0	0	0	0	0	0	1	0	32
USNS BRUCE C. HEEZEN	NBID	New Orleans	0	0	0	1	0	31	27	0	0	0	0	0	59
USNS JOHN MCDONNELL (T-A	NJMD	New Orleans	0	0	0	4	0	0	50	0	0	0	0	0	54
USNS MARY SEARS (T-AGS 6	NRFR	Houston	0	0	0	0	0	0	0	0	0	18	22	0	40
USNS MENDONCA	NBMK	New Orleans	0	0	0	0	0	2	3	0	0	0	0	0	5
USNS NAVAJO_(TATF-169)	NOYK	Long Beach	0	0	0	9	2	5	5	0	0	7	9	0	37
USNS REGULUS	NLMA	New Orleans	0	0	0	0	0	0	8	0	0	0	0	0	8
USNS SEAY	NZIN	New Orleans	0	0	0	0	0	28	3	0	0	0	0	0	31
USNS SHASTA TAE-33	NRNC	Seattle	0	0	48	62	304	0	18	0	0	0	0	0	432
USNS SUMNER	NZAU	New Orleans	0	0	0	0	8	8	11	12	9	11	3	0	62
VIKING STAR	WAS4138	Kodiak	0	0	0	0	0	3	2	1	2	9	0	0	17
VLADIVOSTOK	UBXP	Seattle	43	15	26	70	85	253	60	69	61	47	33	0	762
VOYAGER OF THE SEAS	ELWU7	Miami	0	3	0	7	0	0	1	0	0	0	0	0	11
WARRIOR	WBN4383	Anchorage	36	38	9	12	0	74	0	0	0	0	0	0	169
WEATHERBIRD II	WCT6653	Seattle	0	0	0	0	0	0	0	0	0	3	0	0	3
WECOMA	WSD7079	Seattle	0	0	0	143	90	99	22	68	69	95	50	0	636
WESTERN BRIDGE	C6JQ9	Baltimore	100	63	50	79	90	87	86	86	67	0	0	0	708
WESTERN NAVIGATOR	WAX7602	Anchorage	0	0	0	0	0	0	2	0	0	0	0	0	2
WESTERN RANGER	WBN3008	Anchorage	6	0	0	3	0	2	0	0	4	0	0	0	15
WESTWARD VENTURE	KHJB	Seattle	38	25	28	74	38	40	43	39	22	47	35	0	429
WESTWOOD ANETTE	C6QO9	Seattle	45	10	17	63	32	38	33	39	38	22	2	0	339
WESTWOOD BELINDA	H9IM	Seattle	48	48	8	0	32	32	27	31	32	26	29	0	313
WESTWOOD BORG	LAON4	Seattle	51	80	64	24	138	53	61	47	74	46	37	0	675
WESTWOOD BREEZE	LAOT4	Seattle	65	50	801	100	75	67	38	74	41	36	41	0	1388
WESTWOOD CLEO	H9GW	Seattle	41	31	405	33	312	17	25	0	0	29	0	0	893
WESTWOOD JAGO	H9IL	Seattle	0	0	0	0	26	66	31	1	26	22	9	0	181
WESTWOOD MARIANNE	C6QD3	Seattle	42	43	95	49	44	44	43	61	39	49	33	0	542
WESTWOOD RAINIER	C6SI3	Seattle	0	0	0	0	0	0	0	0	0	36	31	0	67
WILFRED SYKES	WDA2769	Chicago	1	0	0	0	0	15	9	0	0	2	2	0	29
WILLIAM E. CRAIN	ELOR2	Oakland	0	0	85	5	0	0	0	0	0	0	0	0	90
WILSON	WNPD	New Orleans	0	13	0	11	36	5	28	7	32	28	14	0	174
WORLD SPIRIT	ELWG7	Seattle	30	45	0	20	4	19	39	50	34	12	24	0	277
YURIY OSTROVSKIY	UAGJ	Seattle	0	0	0	84	0	95	4	0	0	0	0	0	183
ZAANDAM	PDAN	Miami	0	0	0	0	1	0	0	0	0	0	0	0	1

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ZENITH	ELOU5	Miami	24	10	8	4	7	7	12	0	0	0	0	0	72
ZENITH	WBV3237	Kodiak	0	0	0	0	0	0	1	0	1	2	1	0	5
ZIM AMERICA	4XGR	NYC	57	27	37	39	27	43	60	4	0	53	0	0	347
ZIM ASIA	4XFB	New Orleans	47	38	15	44	35	12	16	50	44	14	2	0	317
ZIM ISRAEL	4XGX	New Orleans	23	18	16	29	8	37	48	10	4	45	0	0	238
ZIM ITALIA	4XGT	New Orleans	36	62	18	55	51	35	19	37	52	30	0	0	395
ZIM KOREA	4XGU	Miami	25	37	0	44	43	15	34	20	0	1	0	0	219
ZIM VIRGINIA	9HGC7	NYC	0	0	0	0	0	0	0	0	0	0	3	0	3

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Ships:756 Totals:	12455	21791	13148	18919	21431	20005	17055	14422	13941	13502	9262	0	175931

PMO - Gdynia Port Meteorological Officer, Jozef Kowalewski, Retires after 45 Years of Service

Jozef Kowalewski, the Gdynia, Poland Port Meteorological Officer, retired from service on August 1, 2001.

Jozef Kowalewski began his official government career 45 years ago when, upon graduating from Gdansk University, he began working with the Institute of Meteorology and Water Management (PIM) in Gdynia.

In September 1957, in connection with celebrations of the International Geophysical Year when mandatory observations were introduced on some selected Polish ships, he assumed the duties as PMO in Gdynia.

After introducing the voluntary scheme of observations (VOS) program, the number of participating vessels was grew steadily until it included almost all of polish merchant shipping.

Thanks to Kowalewski's commitment and compassion for the duties of PMO, 428 of 544 vessels that were encouraged by him to join the program responded positively.

During the 45 years of his activity as PMO, 4450 log books were collected with over 762000 observations stored, 90% of which were verified as being sent to appropriate WMO centers

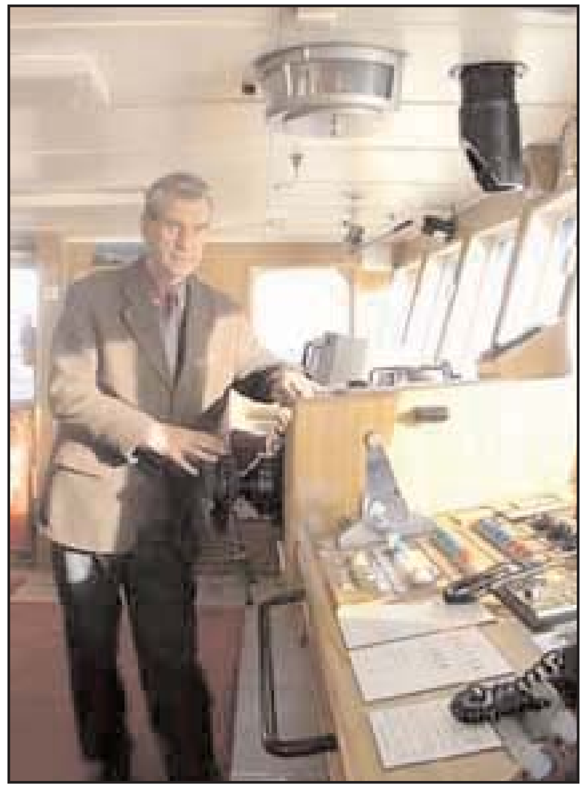
Kowalewski used to conduct about 200 inspections yearly, making over 11000 visits accomplished in the period from 1957 to 2002.

During the course of the routine checking of instruments, and providing instructions and consulting, Kowalewski never missed the opportunity to discuss his shared interest of weather and meteorological phenomena with crew members.

Jozef Kowalewski prepared successive revised issues of meteorological log books and code books for shipping, adequate for changes in WMO standards. He created indispensible documentation for introducing BATHY and TESAC codes for the Polish fleet. He also took part in thepreparation of printing instruction manuals for the TURBO 1 program.

Not one for sitting still, Kowalewski performed PMO duties while also serving as Chief Specialist of Maritime Meteorology in the Meteorological Institute in Gdynia.

Many a time he commanded research expeditions within the Baltic area. He also visited the "exotic" port calls of Antarctica, Iceland, Senegal, and Argentina.



In 1974, Kowalewski participated in a research voyage to the Atlantic equator zone - GARP program. In 1976 he spent one month on board the research vessel of the Gdynia Maritime Academy participating in an educational voyage to Iceland.

It was not the first time that he cooperated with Scientific Institutes contributing to establishing stronger ties between educational sources and the Polish Meteorological Service.

At the turn of 1977/1978, he took part in a research expedition with students to Antarctica and spent three months on Arctowski, the Polish polar station.

From 1978 to 1988, Kowalewski was engaged in a special meteorological research program on the Baltic sea, sailing frequently on board Polish ferry vessels servicing the route between Gdansk and Helsinki.

In the period from 1958 to 1998, Jozef Kowalewski spent over 2000 days at sea, totally fulfilling a teenager's dream of sea adventures and satisfying his deep interest in meteorology.

Presently, though already retired, Kowalewski is still active as PMO. He visits vessels lying in Polish ports as he used to do previously, waiting for the successor who will continue his work.

We wish Jozef and his wife Bronilawa fair winds and following seas. ⚓

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