

**January 3-6, 2008 Storm Summary/Case Study**  
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## **1. Overview**

Beginning on Thursday, January 3<sup>rd</sup> and continuing through Sunday, January 6<sup>th</sup>, 2008, a series of storm systems moved across the North Eastern Pacific Ocean, affecting northwestern California. On Thursday, a previously stalled cold front off the Pacific Northwest coast pushed onshore, and brought breezy conditions and light to moderate rainfall accumulations. High winds, copious rainfall, and heavy mountain snowfall accompanied a second and much stronger cold front that passed through the region on Friday. Heavy rain and snow showers, thunderstorms, and hail occurred across the region behind the second cold front through Sunday (see figures 3-18 for surface and upper air analysis).

In addition to the extreme weather conditions experienced over land, dangerous weather conditions existed over the northwest California coastal waters. High and hazardous seas along with very windy conditions were recorded by area coastal buoys during this event.

## **2. Storm Data**

### **2.1 Rainfall, Thunderstorms, and Hail**

Heavy rainfall was observed across northwestern California during this event. The first cold frontal passage through the region on Thursday brought light amounts of rain to the region. The majority of the heavy rainfall occurred on Friday as the second, and much more potent cold front moved through the region. Scattered rain showers occurred Saturday and Sunday following the frontal passage (see figure 1 for storm total rainfall).

Scattered thunderstorms also occurred with the cold frontal passage on Friday through the early morning hours of Saturday. Thunderstorms were reported in Ferndale, Eureka, Redway, Crescent City, Laytonville, and Forest Glen. Many of these thunderstorms brought light accumulations of small hail that remained on roadways for up to an hour before melting.

The heavy rainfall also resulted in significant rises of several area rivers, as well as smaller streams and creeks. Two major rivers reached, and briefly surpassed flood stage, before quickly receding.

### **2.2 Snowfall**

Temperatures were too warm for snow to occur at coastal locations however, cold air was in place across interior sections of northwest California, which caused heavy snowfall to occur throughout the event. Many interior high elevations received snow amounts greater than 1 foot, with some locations seeing over 2 feet of snow by Sunday. Snow was

reported as low as 400 feet on Saturday and Sunday, but accumulations never exceeded ½ inch as surface temperatures rose above freezing after each snow shower (see figure 1 for storm total snowfall).

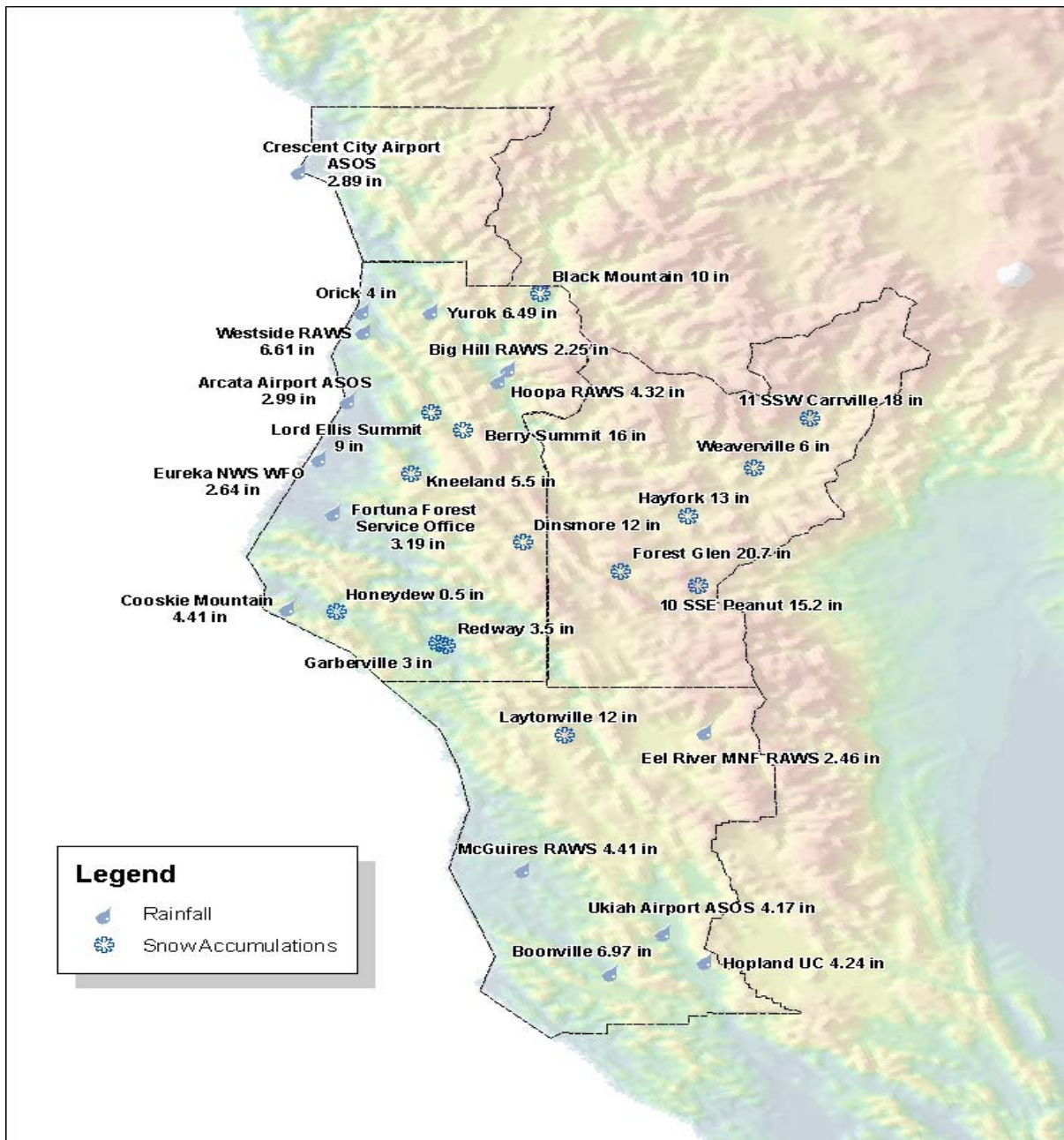


Figure 1. Storm total rainfall and snowfall amounts: January 3-6, 2008.

### 2.3 High Winds

Breezy conditions began during the evening hours of Thursday ahead of the first cold front. Surface winds quickly accelerated after midnight on Friday as the second, stronger cold front approached the coast. A pressure drop of 15 millibars in only 6 hours was

reported at the Eureka Weather Forecast Office just before, and during the onset of the strongest winds across the area. Winds diminished during the afternoon hours on Friday, however breezy conditions prevailed through the weekend (see figure 2 for peak winds over land).



Figure 2. Peak wind gusts over land: January 3-6, 2008.

High winds also occurred over the northern California coastal waters for many hours during the event. As with the winds over land, the strongest winds were observed overnight Thursday through Friday morning as the cold front moved towards the coastal waters (see table 1 for peak winds over water).

<u>Location</u>	<u>Peak Wind (knots)</u>
Buoy 46022, 17nm SW of Eureka	62
Buoy 46014, 19nm N of Point Arena	50

Table 1. Peak wind gusts over water: January 3-6, 2008.

## 2.4 Ocean Waves

Large and dangerous seas also developed during the event. The strong winds that occurred over the coastal waters generated large, steep, and short period waves on Friday. The larger and longer period swell, generated as the storm moved out over the open waters, arrived late in the day on Friday and continued to impact coastal locations through the day on Saturday (see table 2 for peak wave heights, and figures 19-26 for observed buoy data).

<u>Location</u>	<u>Peak Wave Height, Period</u>
Buoy 46022, 17nm SW of Eureka	35.4 ft. @ 17 sec.
Buoy 46212, Humboldt Bay South Spit	29.2 ft. @ 17 sec.
Buoy 46213, Cape Mendocino	32.2 ft. @ 18 sec.
Buoy 46014, 19nm N of Point Arena	30.5 ft. @ 19 sec.

Table 2. Peak wave heights: January 3-6, 2008.

## 3. Results and Conclusion

A wind advisory was issued for all of Del Norte County, most of Humboldt County, coastal sections of Mendocino County, and for extreme southwestern Trinity County for shortly after midnight on Friday through Friday afternoon. The wind advisory was quickly upgraded to a High Wind Warning shortly after midnight on Friday after the rapid surface pressure fall was reported (a high wind warning is issued when sustained winds are greater or equal to 40 mph and/or wind gusts of greater or equally to 58 mph are expected). The high wind warning remained in effect until 10 am Friday, before being downgraded to a wind advisory for the remainder of Friday.

Numerous reports of damage due to the high winds from this storm were received. The high winds did cause some damage, with many trees being blown down. A NWS trained spotter located in Honeydew reported that several spruce trees had blown down and crossed his driveway and a couple of oak trees had fallen on some nearby power lines. Another NWS trained spotter located in Briceland also reported several large branches and small trees blown down. Multiple power and communication outages were reported as a result of the strong winds. Over 27,000 homes in Mendocino County and nearly 100,000 homes in Humboldt and Del Norte Counties lost power during the storm. Power outages also occurred in the vicinity of the KBHX NWS Doppler radar on Saturday causing the radar to operate on generator power. A local power company reported that crews from Kansas, Nevada, Washington, Oregon and Montana were brought in to assist with repairs following the storm. Several remote areas of Humboldt and Mendocino counties still were without power as of the following Wednesday. A roof was reported to have been blown off of the Pro Shop at the Blue River Inn and Golf

Course in Fort Bragg. Del Norte County declared a local emergency due to \$500,000 in public damages. Crescent City Harbor reported \$300,000 in damages, all attributed to the strong winds.

The high winds also resulted in the cancellation of nearly all flights from San Francisco International airport to the Arcata/Eureka airport in McKinleyville, with the high winds affecting all of northern California. No bridges were closed as a result of the high winds in the Humboldt Bay area but San Francisco bay area bridges were temporarily blocked off due to near hurricane force winds occurring on Friday morning.

The high winds also occurred over the coastal waters, with a gale warning (for sustained winds and/or frequent wind gusts of 34 to 47 knots) first having been issued for the northwest California coastal waters beginning on early Thursday. The gale warning was upgraded to a storm warning (for sustained winds and or frequent wind gusts of 48 to 63 knots) across the northern coastal waters from late Thursday night through Friday morning. The gale warning across the southern coastal waters was also upgraded to a storm warning early Friday morning through late Friday morning. Gale force winds continued over the waters Friday afternoon through early Saturday.

The large ocean waves experienced during the event resulted in damage and erosion along the coast. A hazardous seas warning (for wind waves of 10 feet or greater and/or ocean swell heights of 18 feet or greater) was issued and in effect from late Thursday night through late Saturday night. A ship moored off of Trinidad, California experienced hull damage as a result of the large and battering waves. A high surf warning (for breaking waves of greater than 24 feet) was in effect for the coast of Del Norte, Humboldt, and Mendocino counties from Friday night through Saturday morning. The high surf warning was downgraded to a high surf advisory during the day on Saturday as breaking waves fell below 24 feet, yet remained above 18 feet.

The heavy snowfall experienced during the event led to several days of hazardous road conditions across the region. A Winter Storm Watch was issued in the early morning hours of Thursday for interior sections and elevations above 3000 feet of Del Norte and Humboldt counties, as well as for all of Trinity County, for Friday evening through Saturday night. The Winter Storm Watch was upgraded to a Winter Storm Warning on Thursday afternoon with a Snow and Blowing Snow Advisory being issued for interior sections of Mendocino County. By early Saturday morning snow accumulations had started to diminish to below warning criteria, and thus the warning was replaced with a Snow Advisory through Sunday afternoon. The combination of high wind and heavy snow reduced visibilities to less than a ¼ of a mile at times, creating dangerous driving conditions. Area snow plows were out trying to keep up with the heavy snow but snow did still manage to accumulate, at times, on US highway 101 and California state highways 299, 199, 96, 36, and 20. Snow accumulation was reported as low as 1700 feet on US 101 near Laytonville, California by a NWS employee just after midnight on Saturday.

The heavy rainfall, over a relatively short period of time, resulted in rapid rises across area mainstream rivers and streams. A hydrologic outlook was issued on Wednesday out ahead of the event to inform the public of the potential for significant rainfall over the next several days and the possibility of some rivers and streams to reach flood stage by Saturday morning. Due to the intense rainfall that had occurred since midnight Thursday flood warnings were issued midday Friday for the Eel River at Fernbridge and the Navarro River at Navarro (see table 3 for peak river heights). Flooding also resulted in the closure of SR 128 for most of the day Friday. SR 1 north of Point Arena was closed due to downed trees and power lines, and flooding. SR 36 was closed due to the flooding of Cummings Creek on Friday. US 101 between Klamath and Crescent City was temporarily closed due to a fallen tree. Many smaller roads also were closed due to localized flooding.

<b><u>River/Location</u></b>	<b><u>Peak Height and Date/Time</u></b>
Navarro River at Navarro	29.48 ft. @ 500pm on Jan. 4
Eel River at Fernbridge	18.79 ft. @ 245am on Jan. 5
Russian River at Hopland	16.55 ft. @ 600pm on Jan. 4
Mad River at Arcata	16.37 ft. @ 430pm on Jan. 4
Van Duzen River at Bridgeville	12.54 ft. @ 100pm on Jan. 4

Table 3. Peak river heights: January 3-6, 2008.

Historically speaking, this event produced very high winds across the coastal waters. National Data Buoy Center (NDBC) Buoy 46022 located 17 nautical miles southwest of Eureka reported a wind gust to 62 knots which was the highest recorded wind gust for at least the past 25 years at Buoy 46022. The only wind gust greater or equal to 60 knots to have previously occurred at this buoy was in November 1983 when a wind gust of 60.5 knots occurred for 1 hour. The peak wave height observed at this same buoy was 35.4 feet. The last time a wave height of this magnitude was observed was in October of 1999 when a wave height of 35.0 feet was observed for 1 hour. The only other time a wave height of 35 feet or greater had previously occurred at this buoy was in February of 1984 when wave heights of this magnitude occurred for 5 hours with a peak wave height of 39.4 feet occurring for 2 of those 5 hours.

A low pressure of 28.96 inches of mercury was recorded at the Eureka Weather Forecast Office on Friday. This set a new all-time station record for lowest pressure for the month of January. This pressure value came extremely close to the all-time station record for lowest pressure, 28.91 inches of mercury, which occurred on February 22<sup>nd</sup>, 1891. More recently, a strong storm affected northwestern California on December 31<sup>st</sup>, 2005, with a recorded low pressure of 29.11 inches of mercury.

The combination of heavy rainfall and snowfall, high winds, and large ocean swell made the January 3<sup>rd</sup>-6<sup>th</sup>, 2008 storm a significant meteorological event, with northern Californians experiencing many delays, minor damage and power outages as a result of the extreme weather. Thankfully the NWS products that were issued prior to and during the event were taken seriously by local emergency managers and the general public, which kept most people safe during the event.



4. Appendix

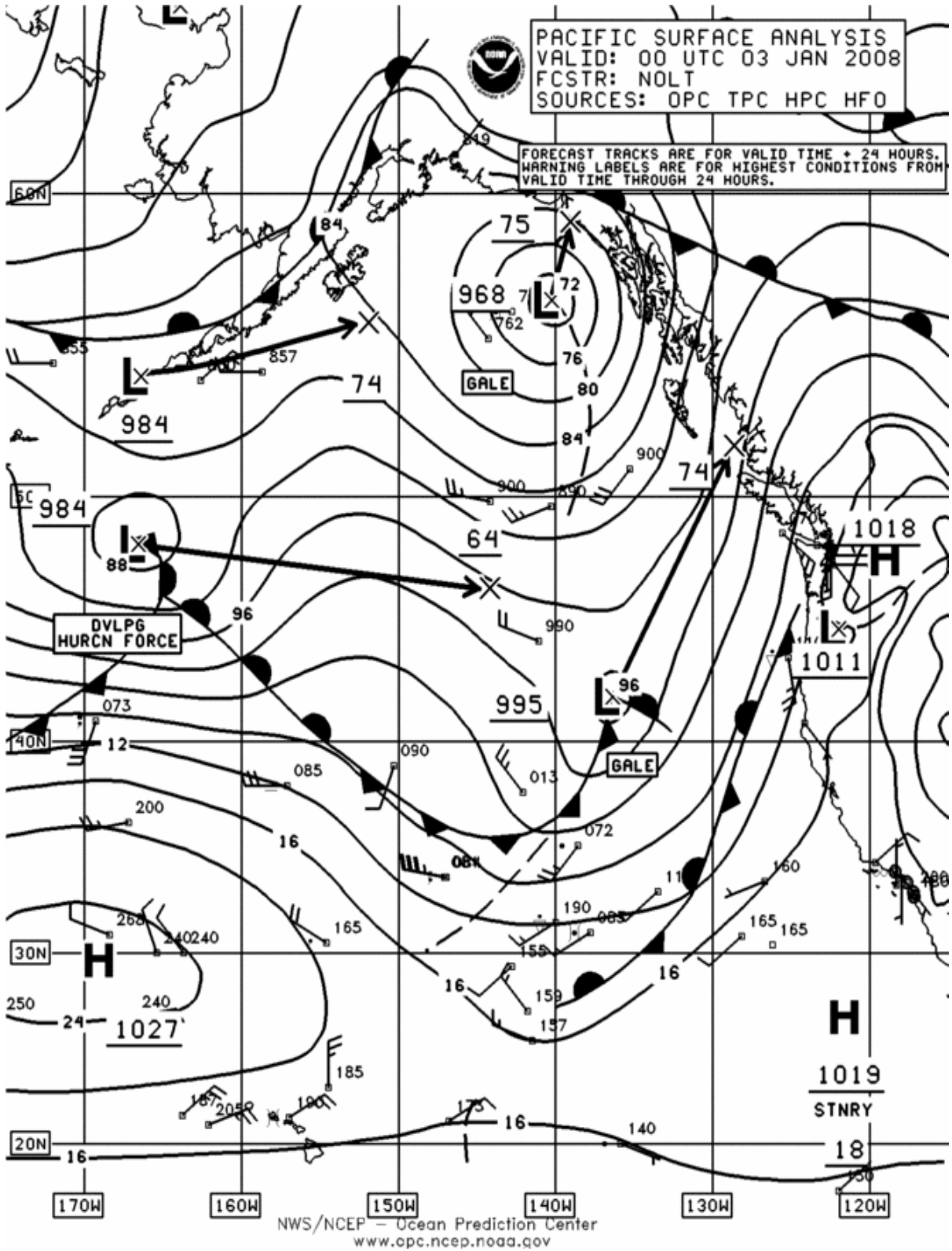


Figure 3. OPC Pacific Surface Analysis: 00z January 3, 2008.

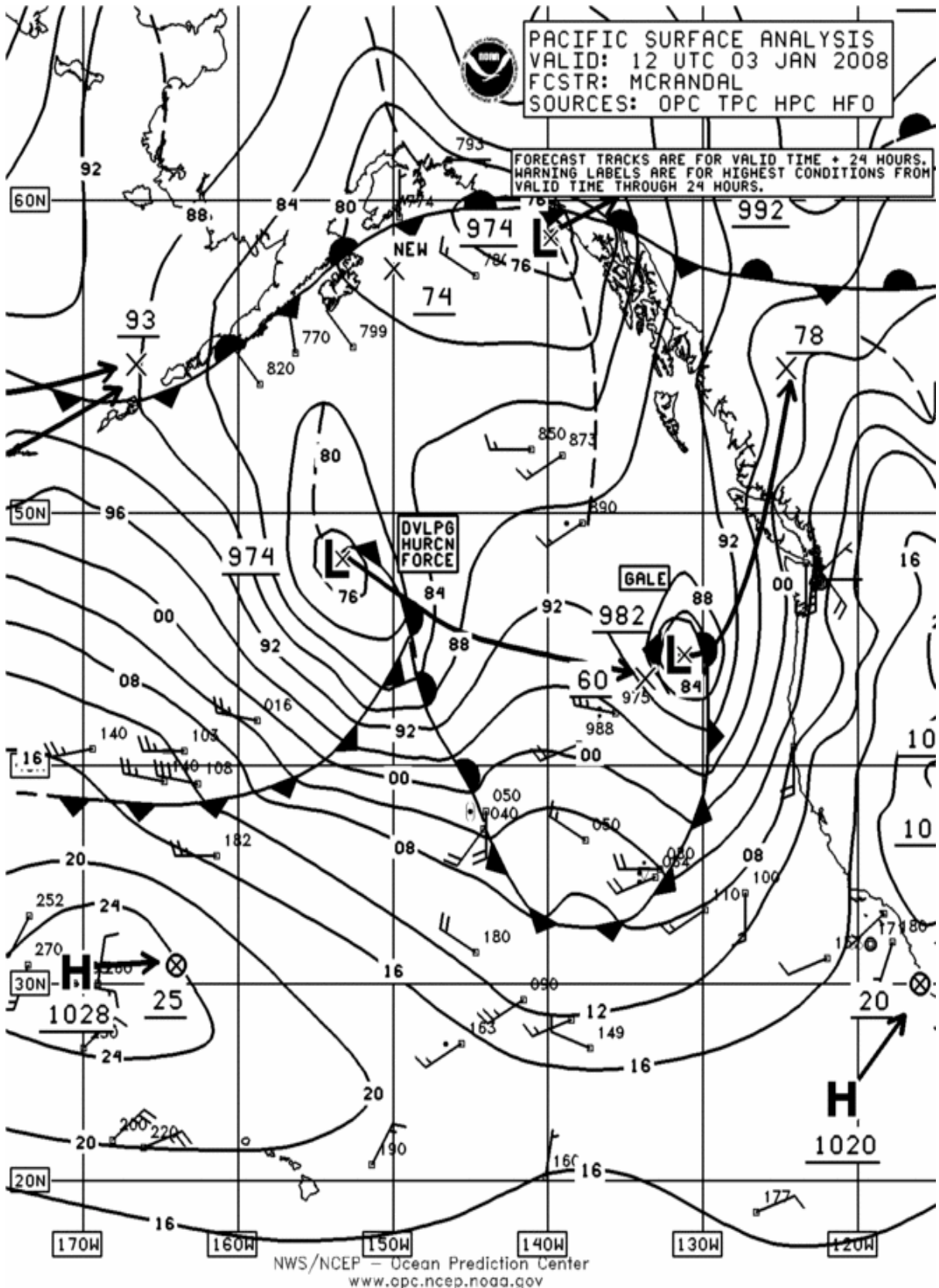


Figure 4. OPC Pacific Surface Analysis: 12z January 3, 2008.



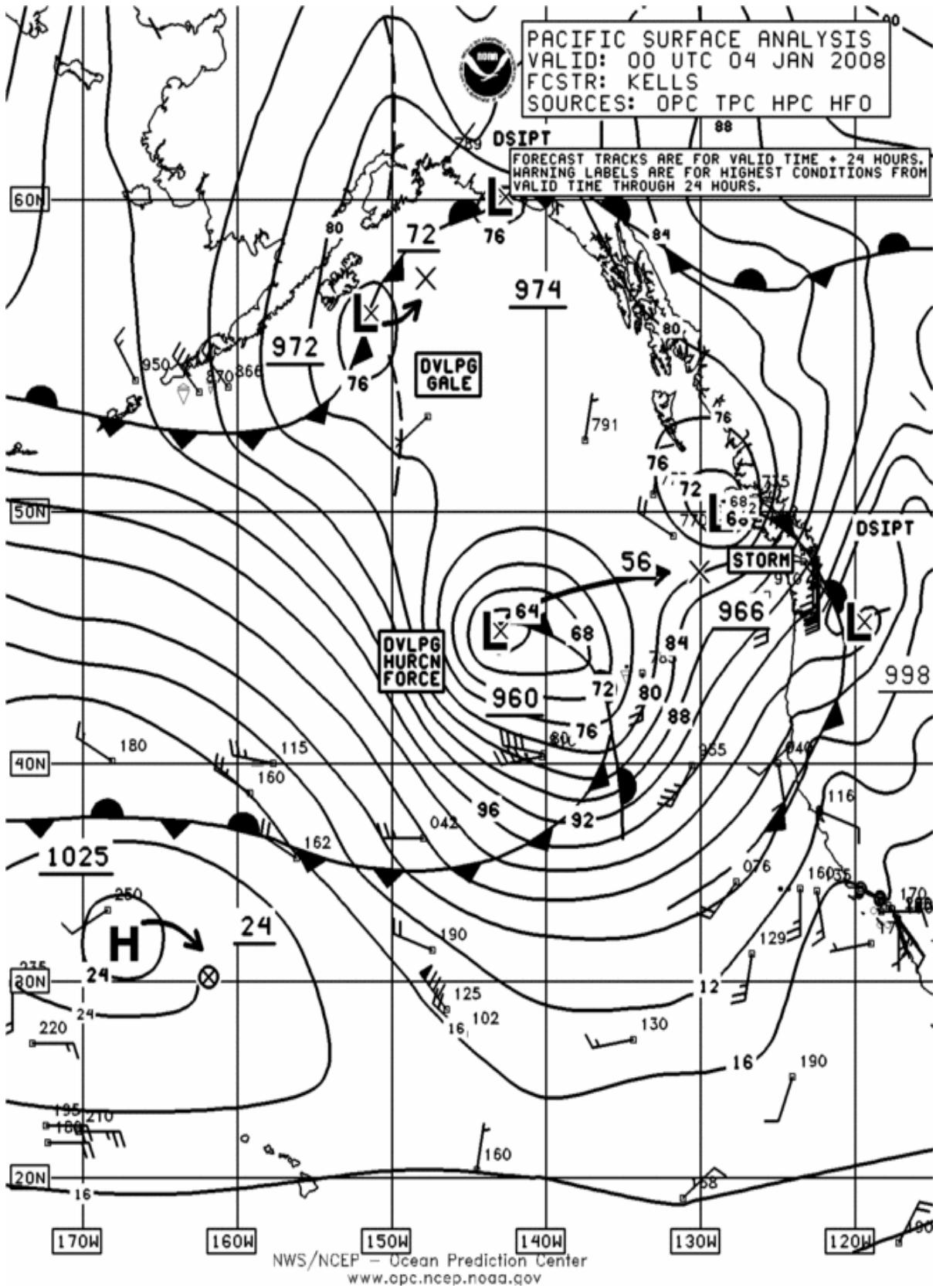


Figure 5. OPC Pacific Surface Analysis: 00z January 4, 2008.

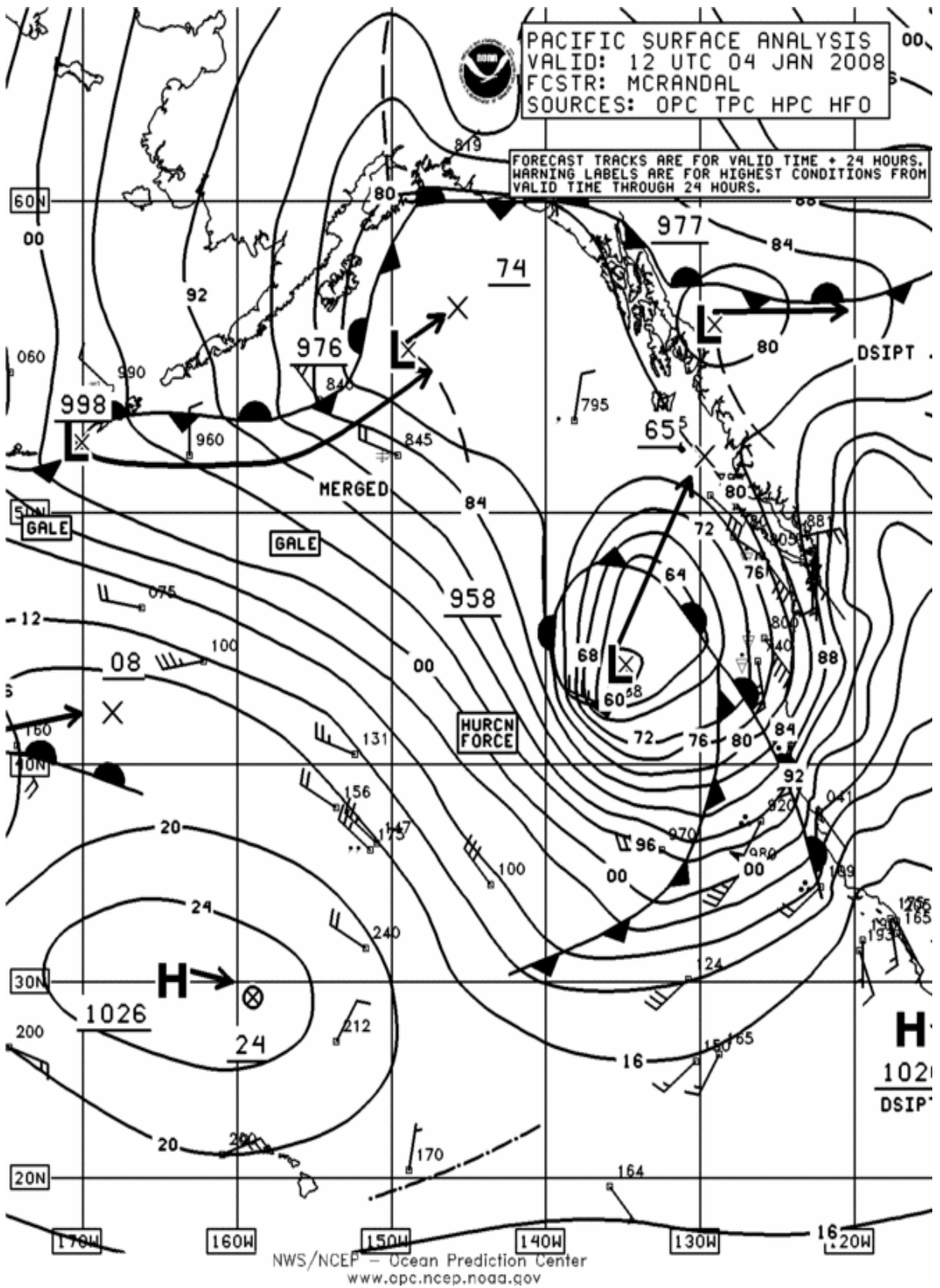


Figure 6. OPC Pacific Surface Analysis: 12z January 4, 2008.

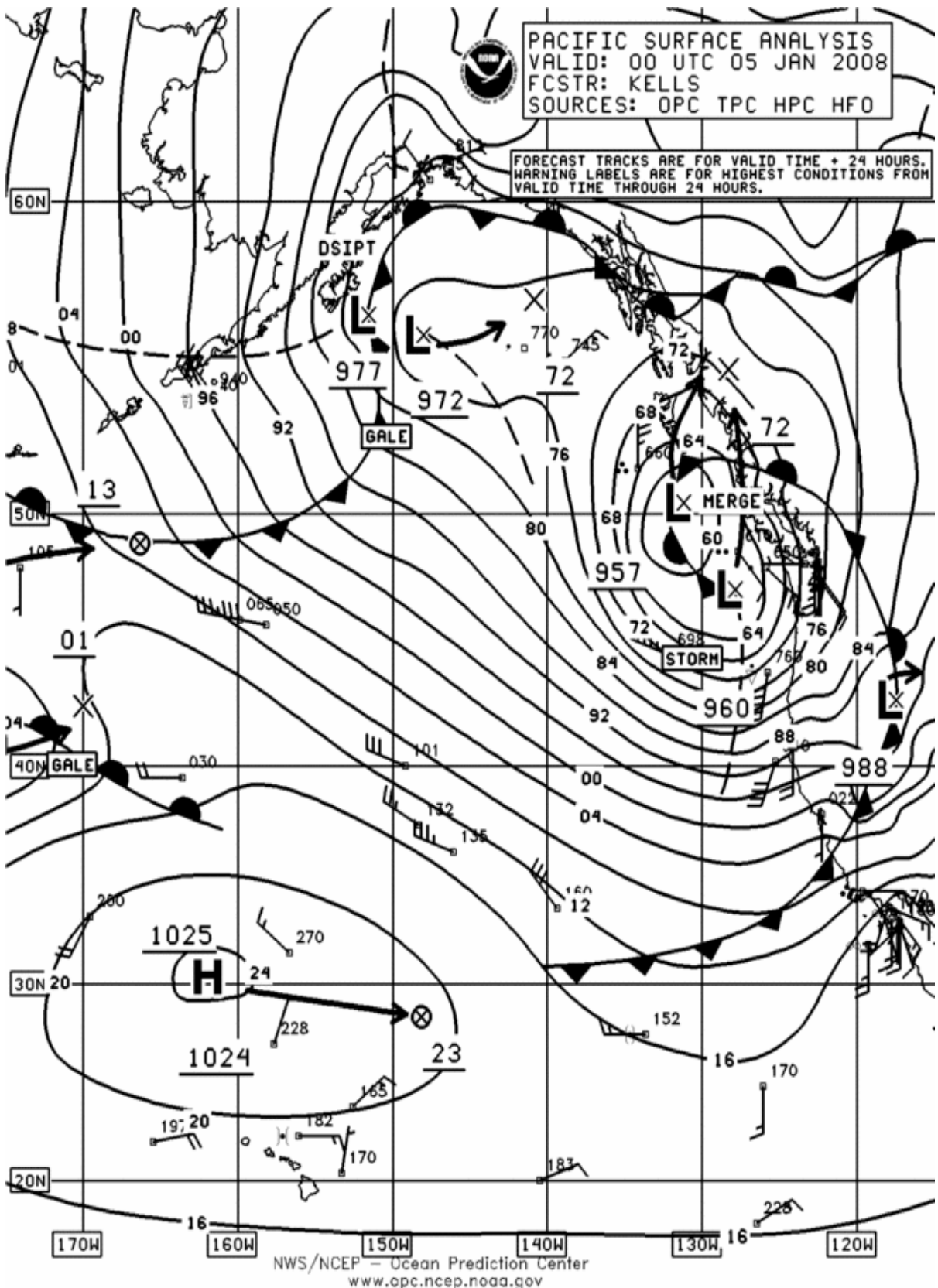


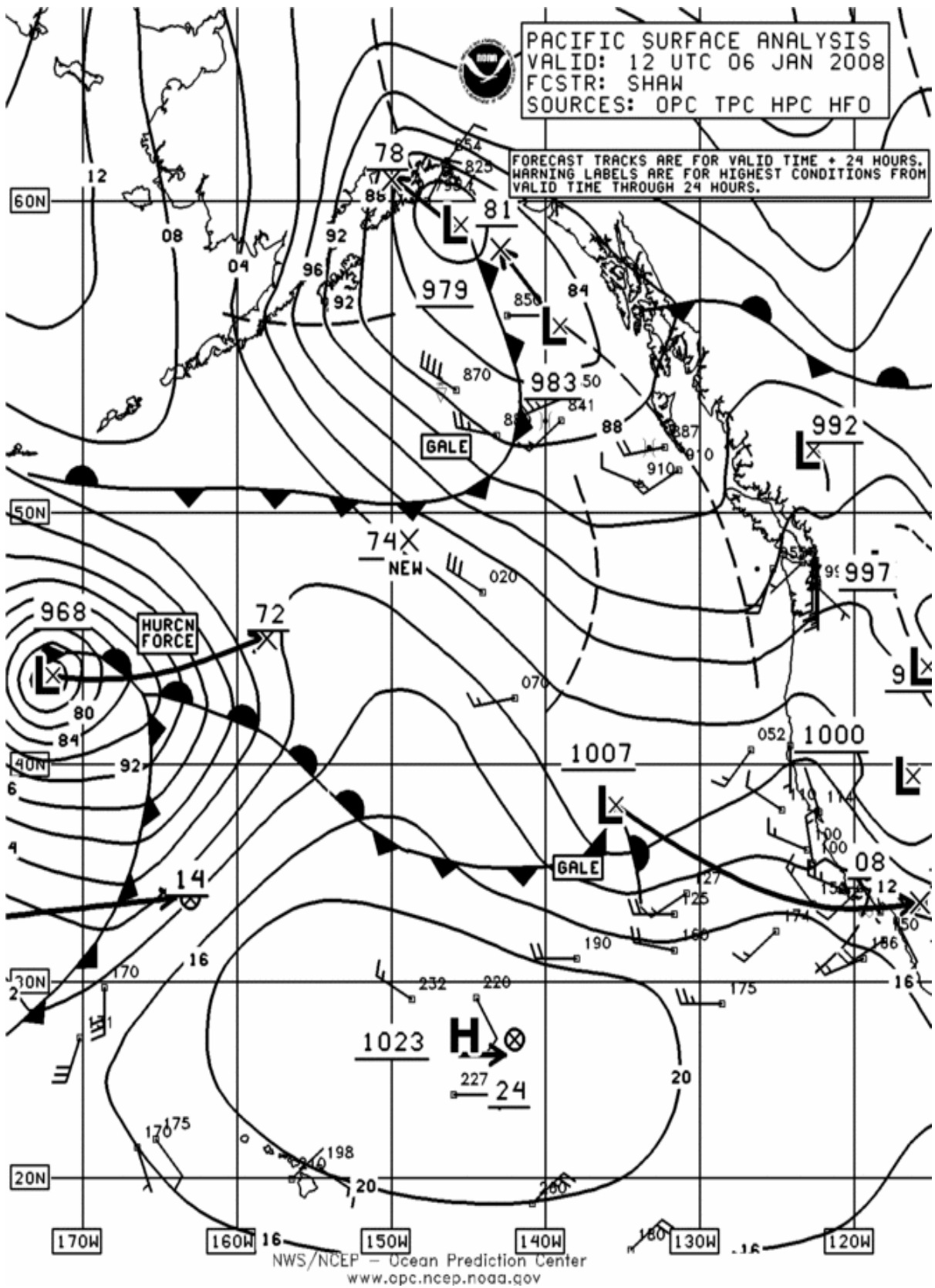
Figure 7. OPC Pacific Surface Analysis: 00z January 5, 2008.











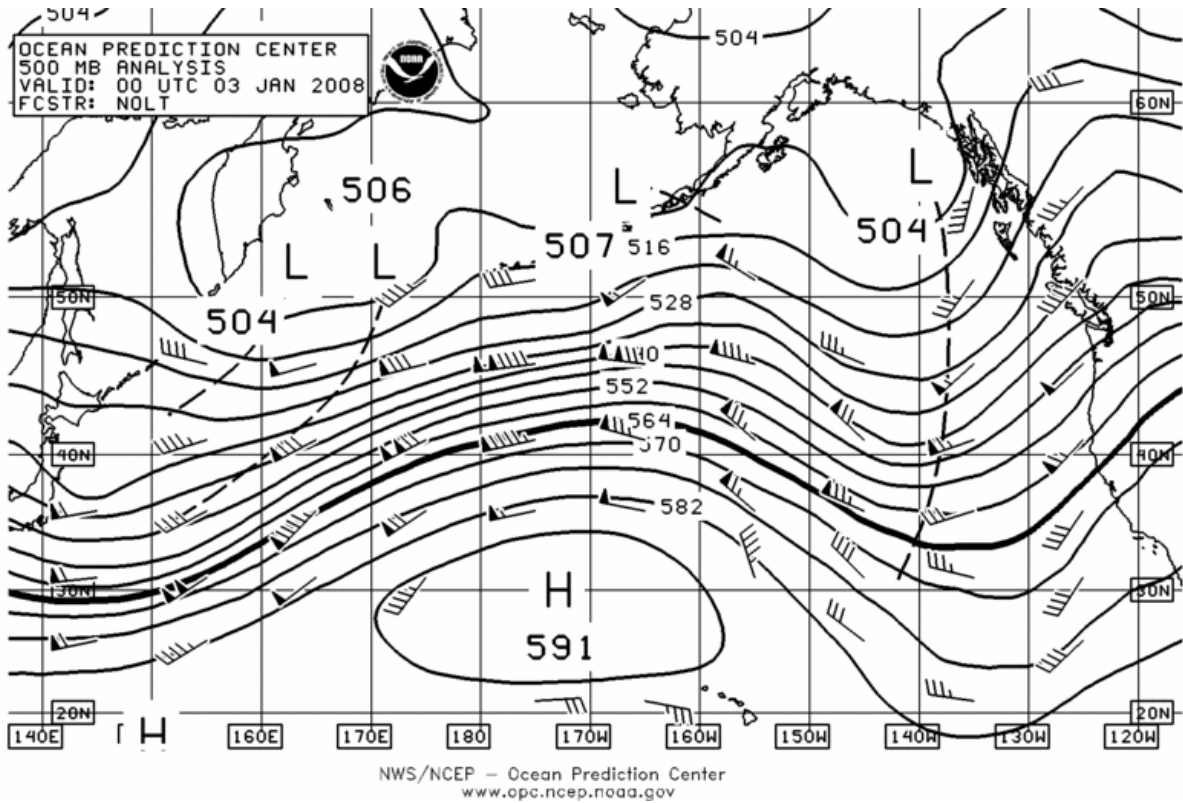


Figure 11. OPC Pacific 500 MB Analysis: 00z January 3, 2008.

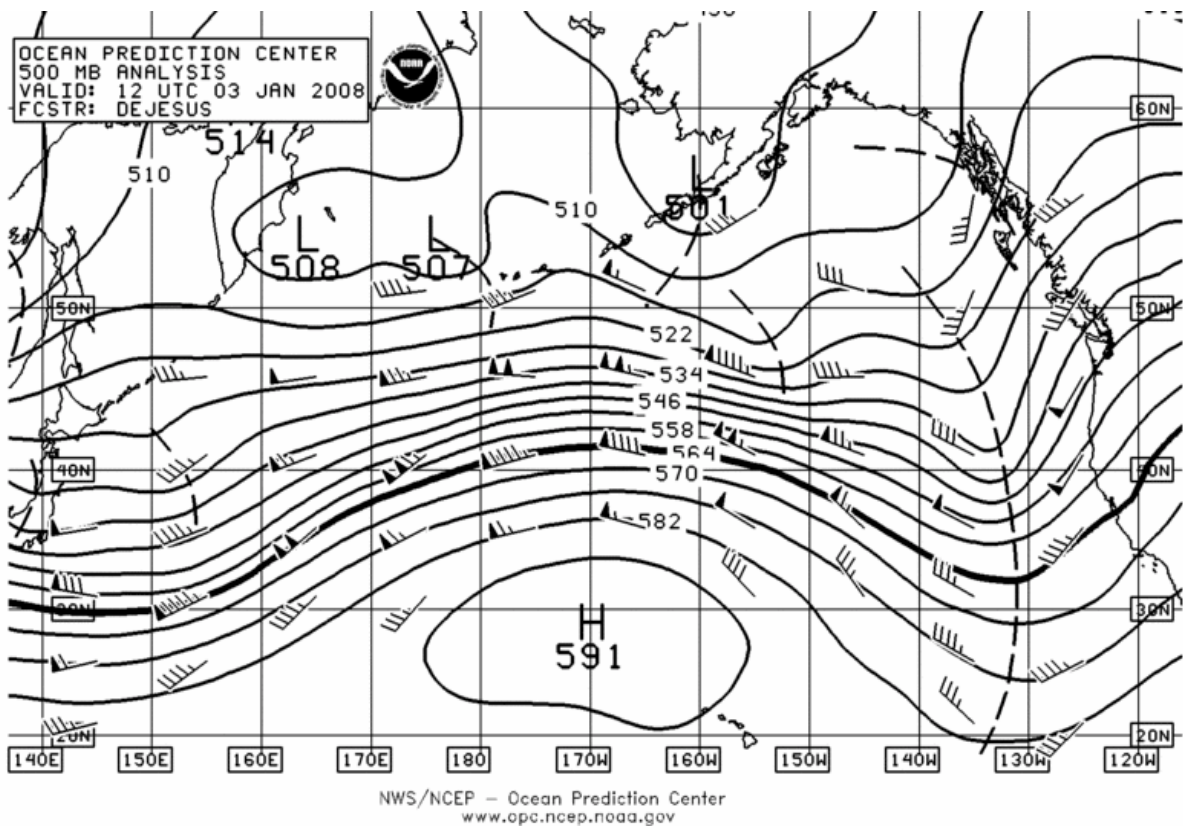


Figure 12. OPC Pacific 500 MB Analysis: 12z January 3, 2008.

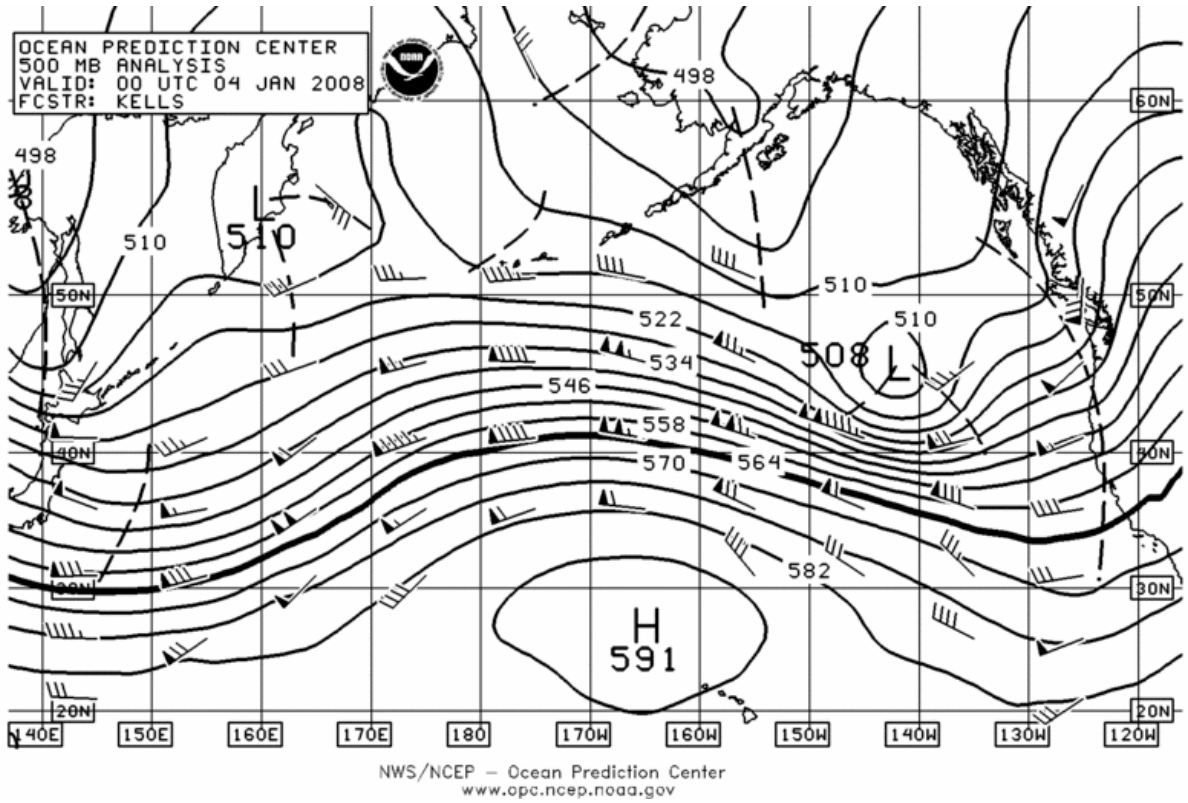


Figure 13. OPC Pacific 500 MB Analysis: 00z January 4, 2008.

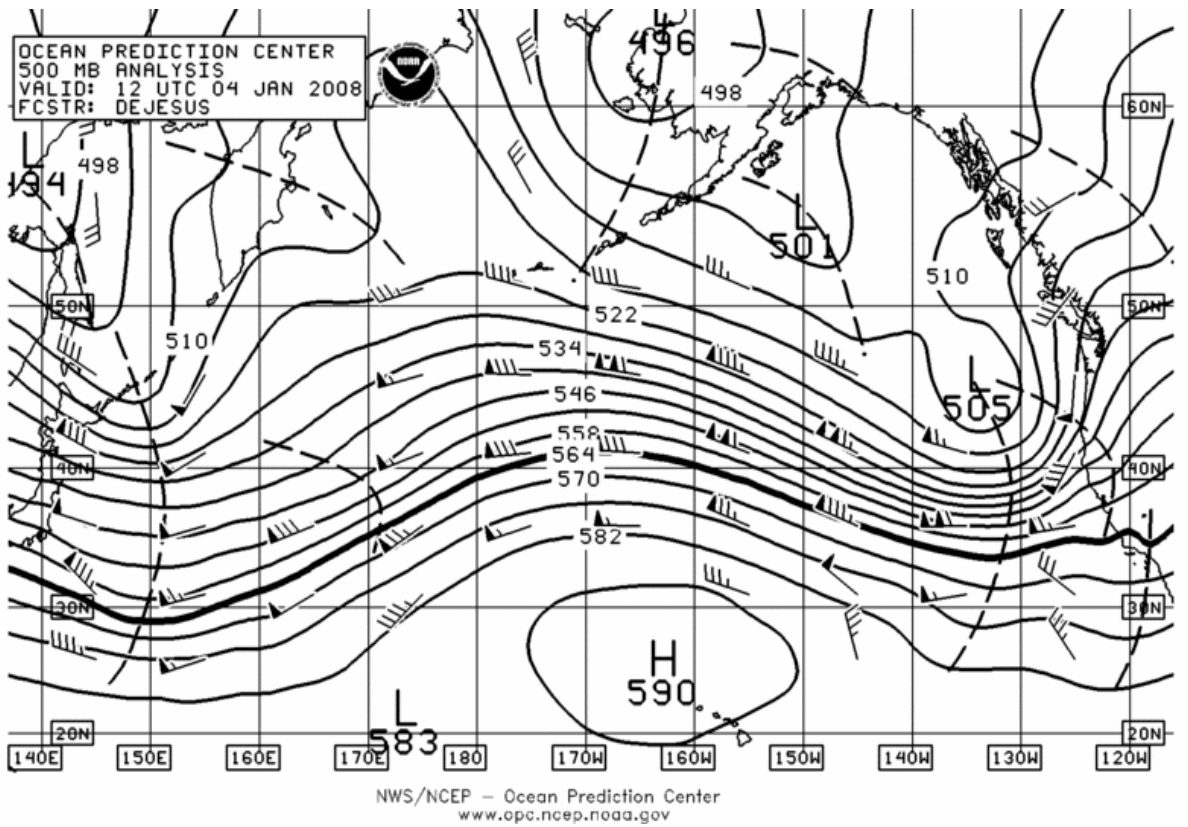


Figure 14. OPC Pacific 500 MB Analysis: 12z January 4, 2008.



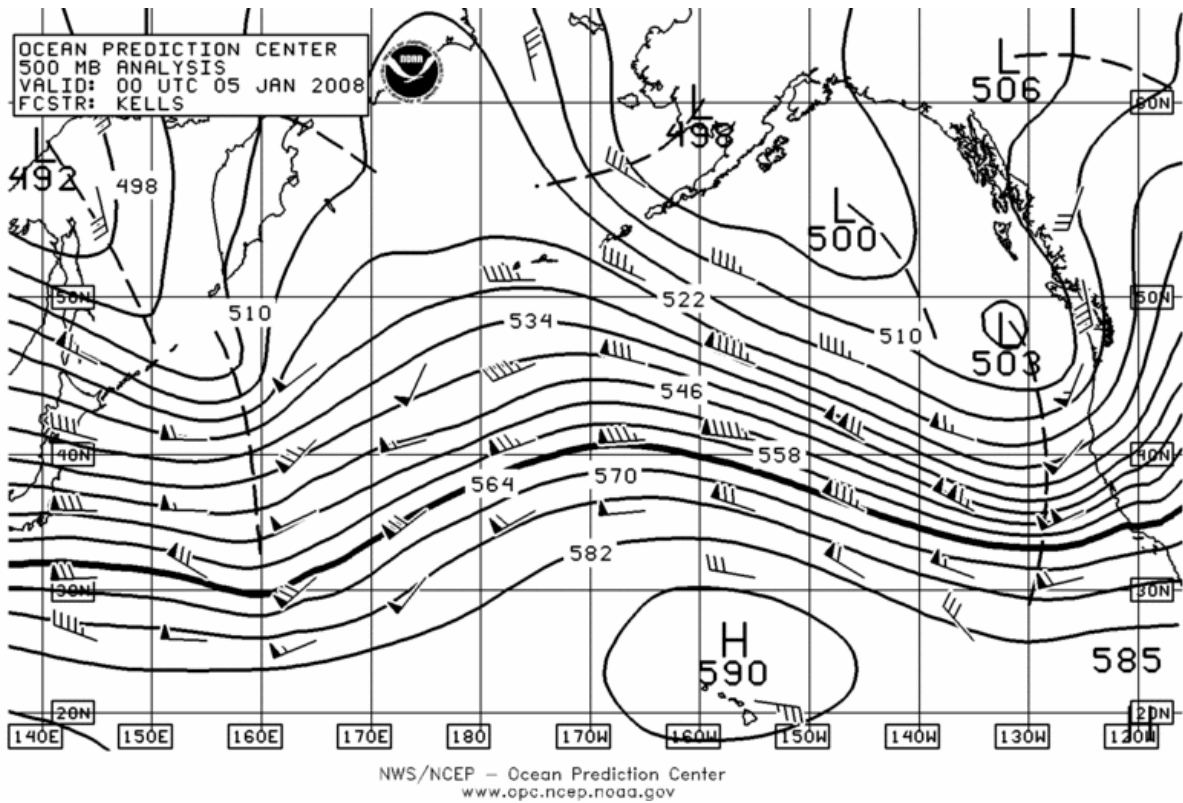


Figure 15. OPC Pacific 500 MB Analysis: 00z January 5, 2008.

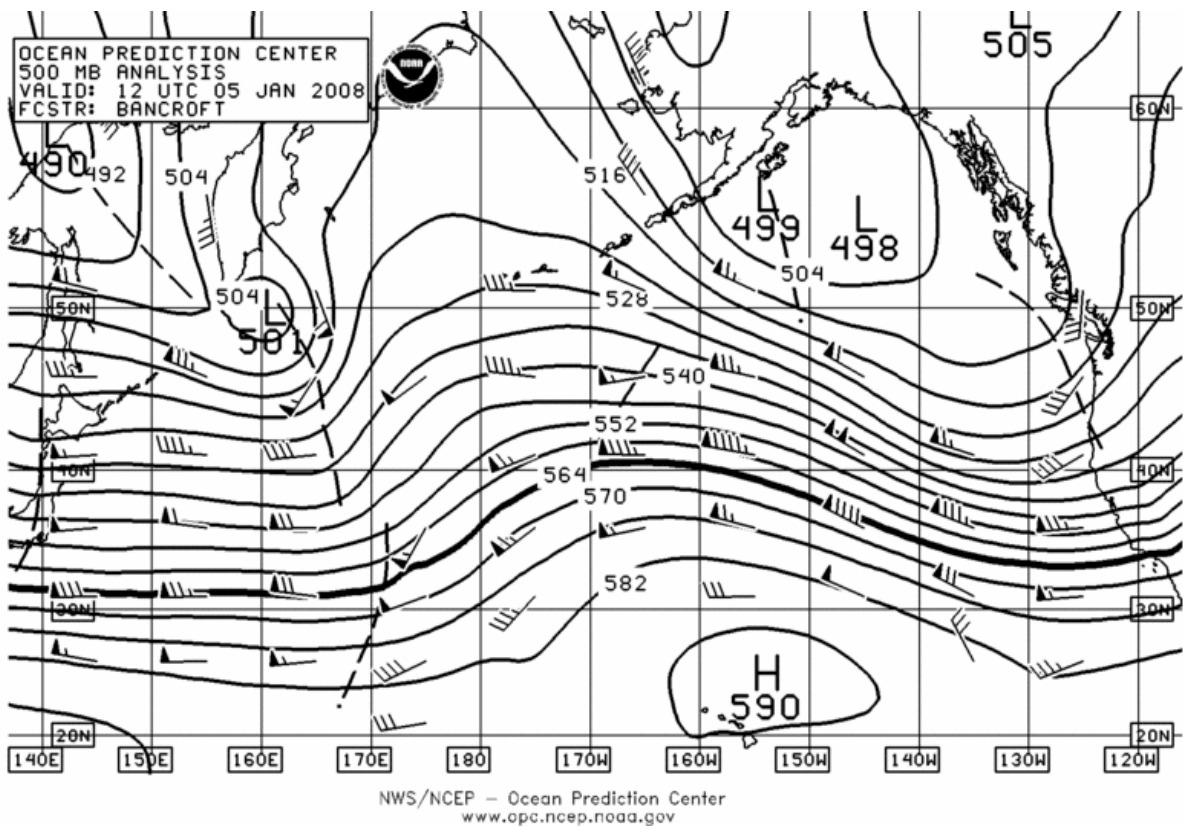


Figure 16. OPC Pacific 500 MB Analysis: 12z January 5, 2008.

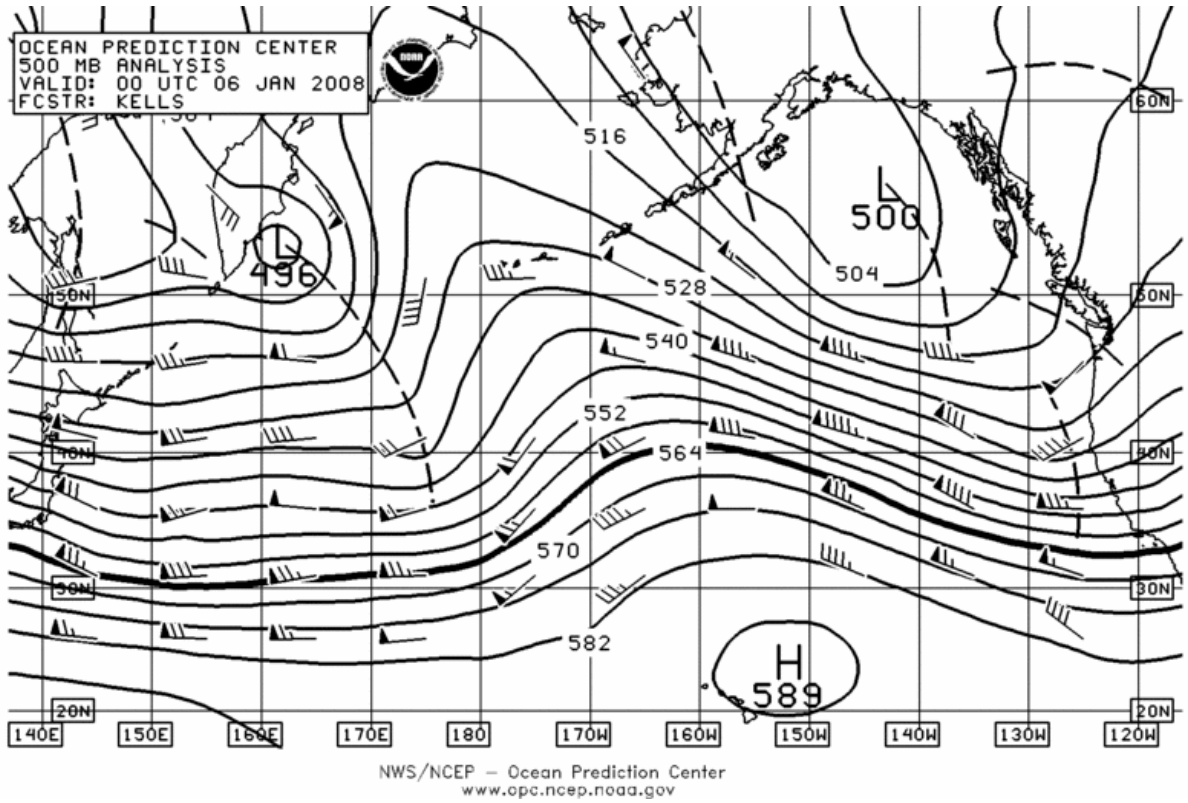


Figure 17. OPC Pacific 500 MB Analysis: 00z January 6, 2008.

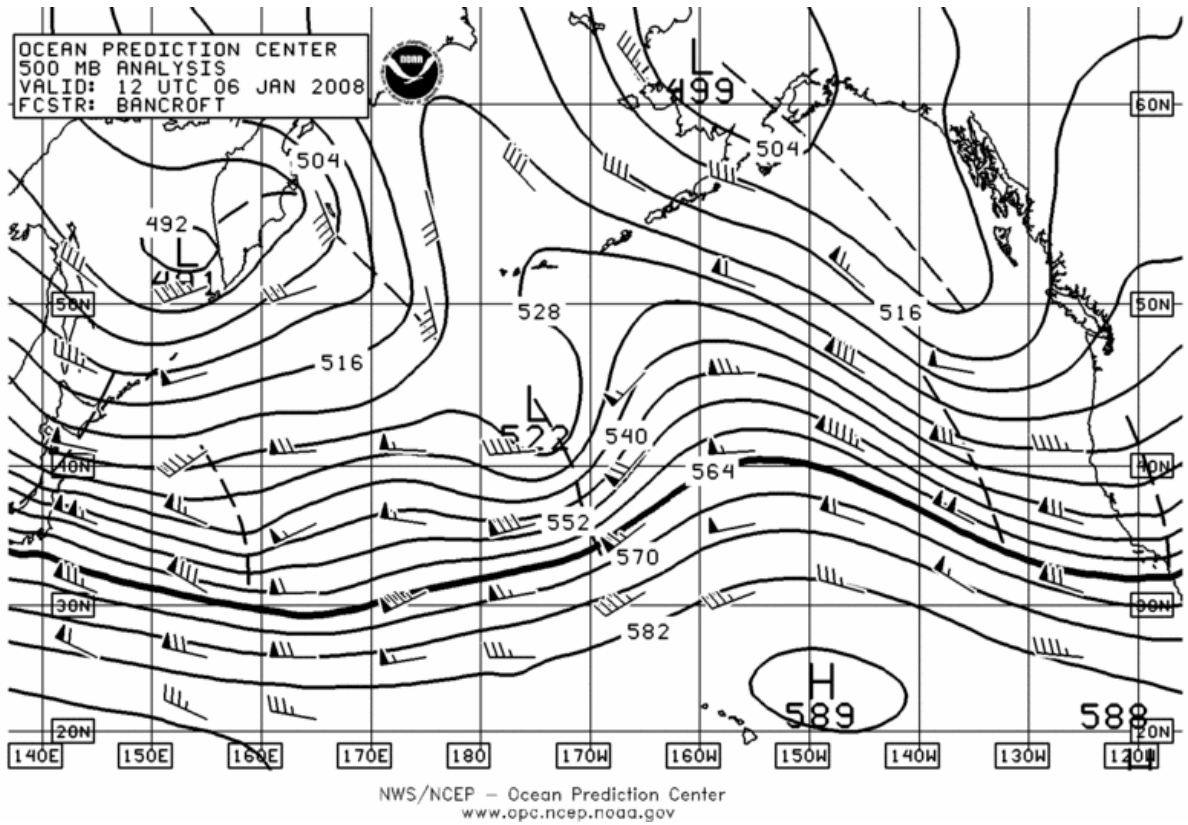


Figure 18. OPC Pacific 500 MB Analysis: 12z January 6, 2008.



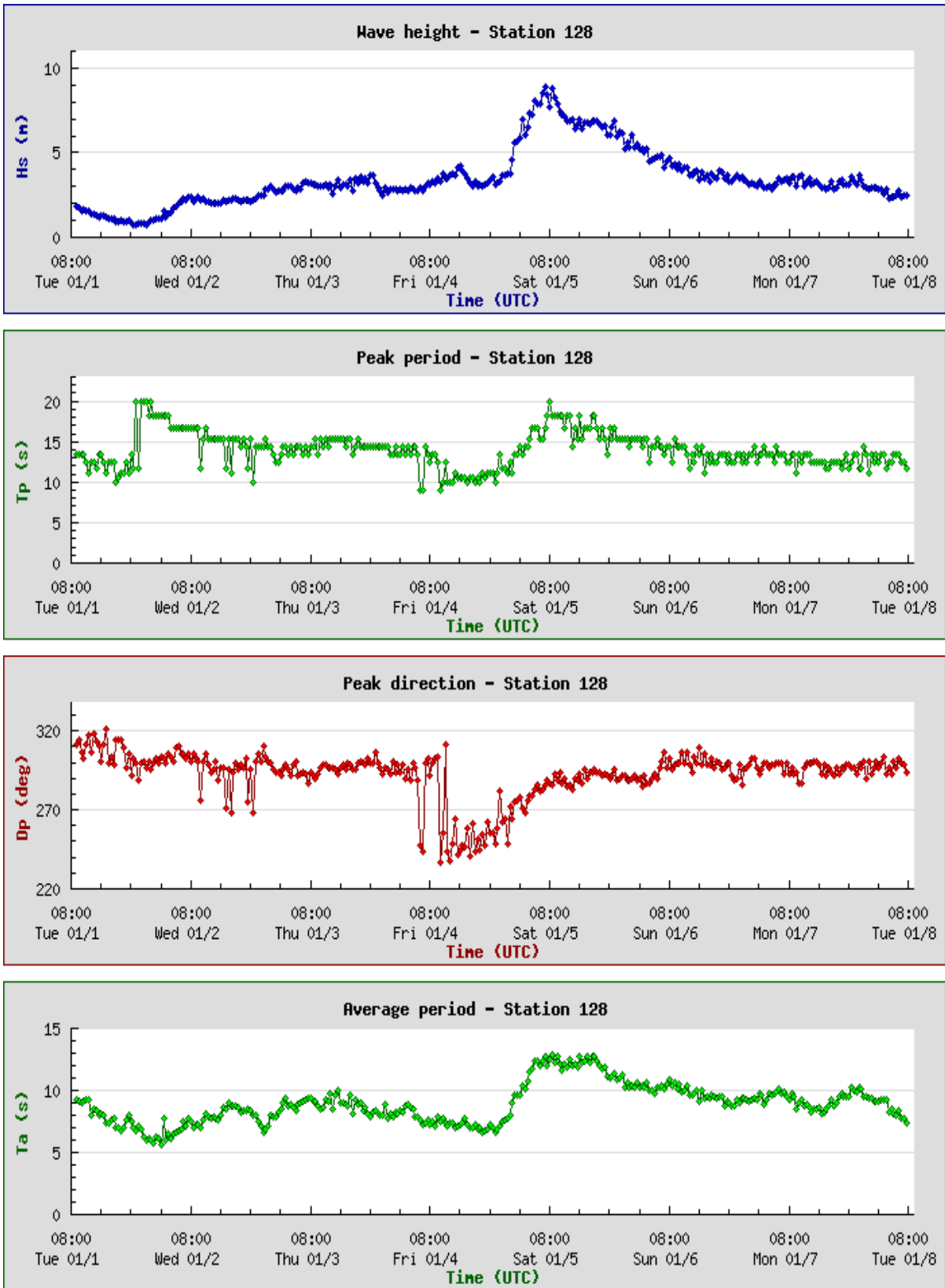


Figure 19. Scripps Institute Buoy 46212, Humboldt Bay Spit, CA: January 1-8, 2008.

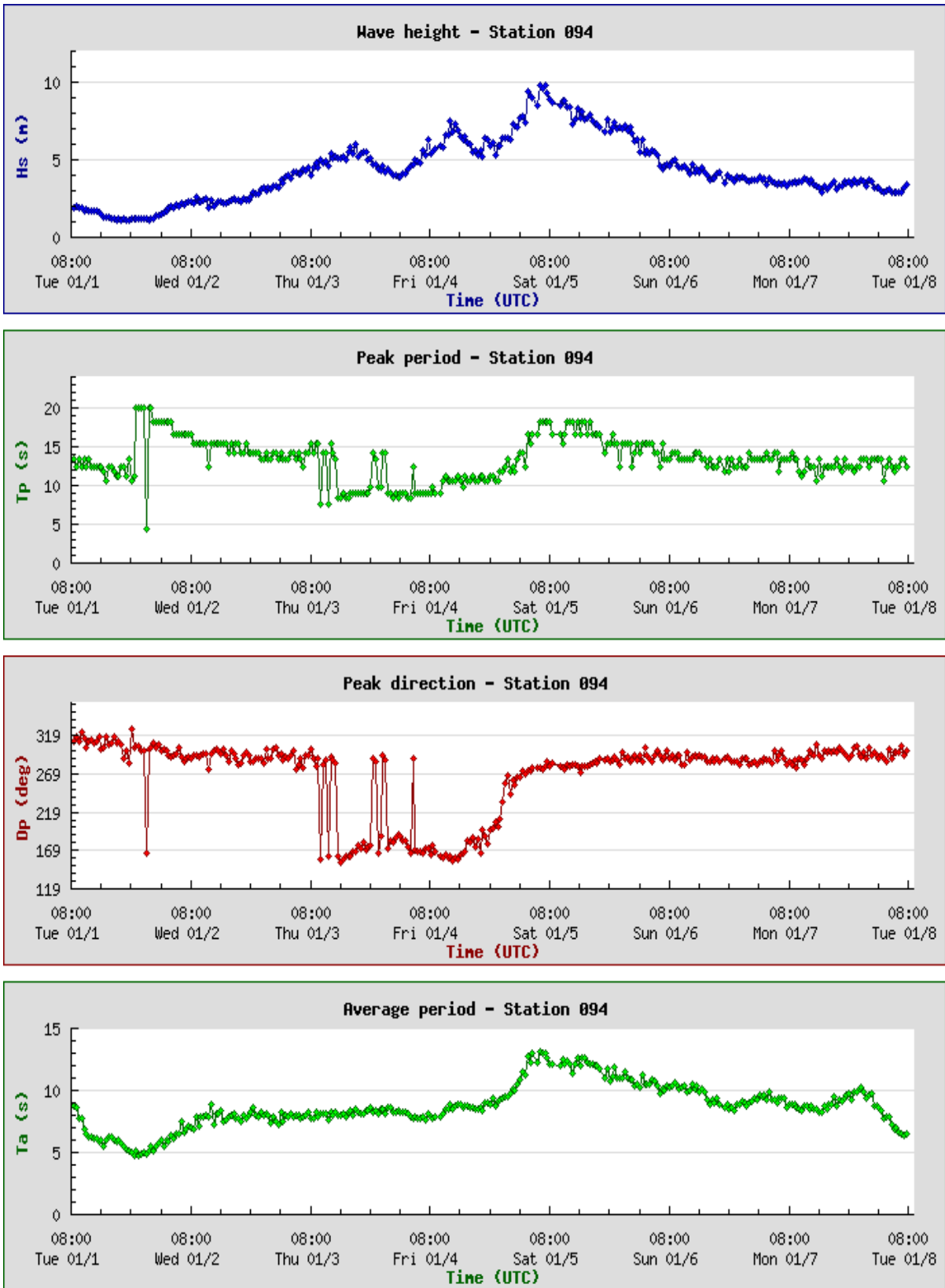


Figure 20. Scripps Institute Buoy 46213, Cape Mendocino, CA: January 1-8, 2008.



Figure 21. NDBC Buoy 46022 Significant Wave Height: January 4-8, 2008.

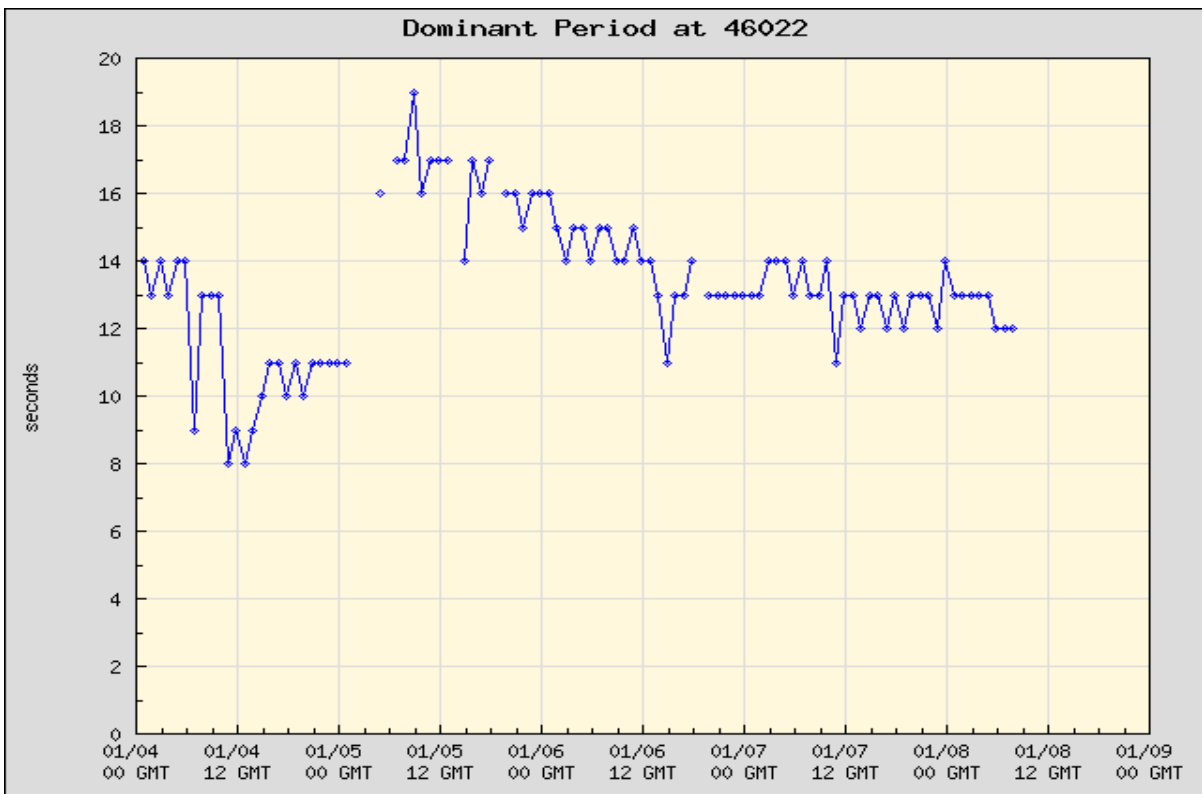


Figure 22. NDBC Buoy 46022 Dominant Wave Period: January 4-8, 2008.



Figure 23. NDBC Buoy 46014 Significant Wave Height: January 4-8, 2008.

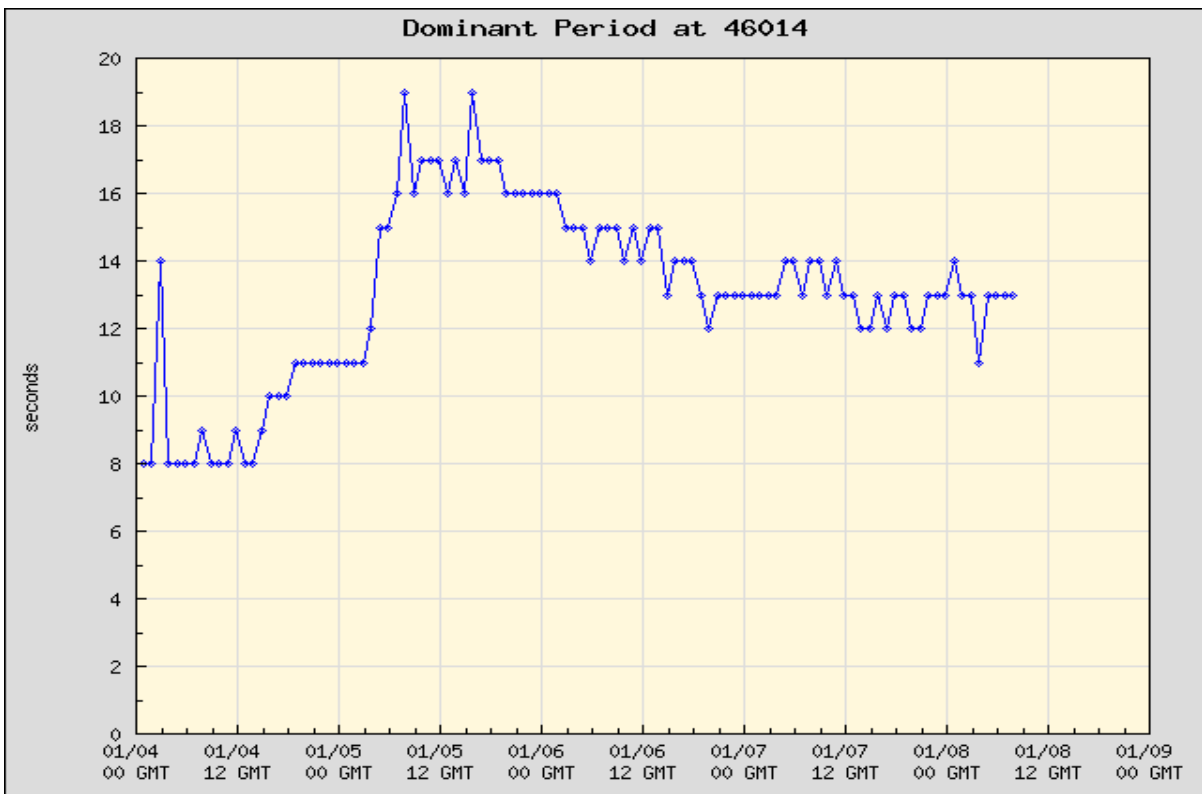


Figure 24. NDBC Buoy 46014 Dominant Wave Period: January 4-8, 2008.

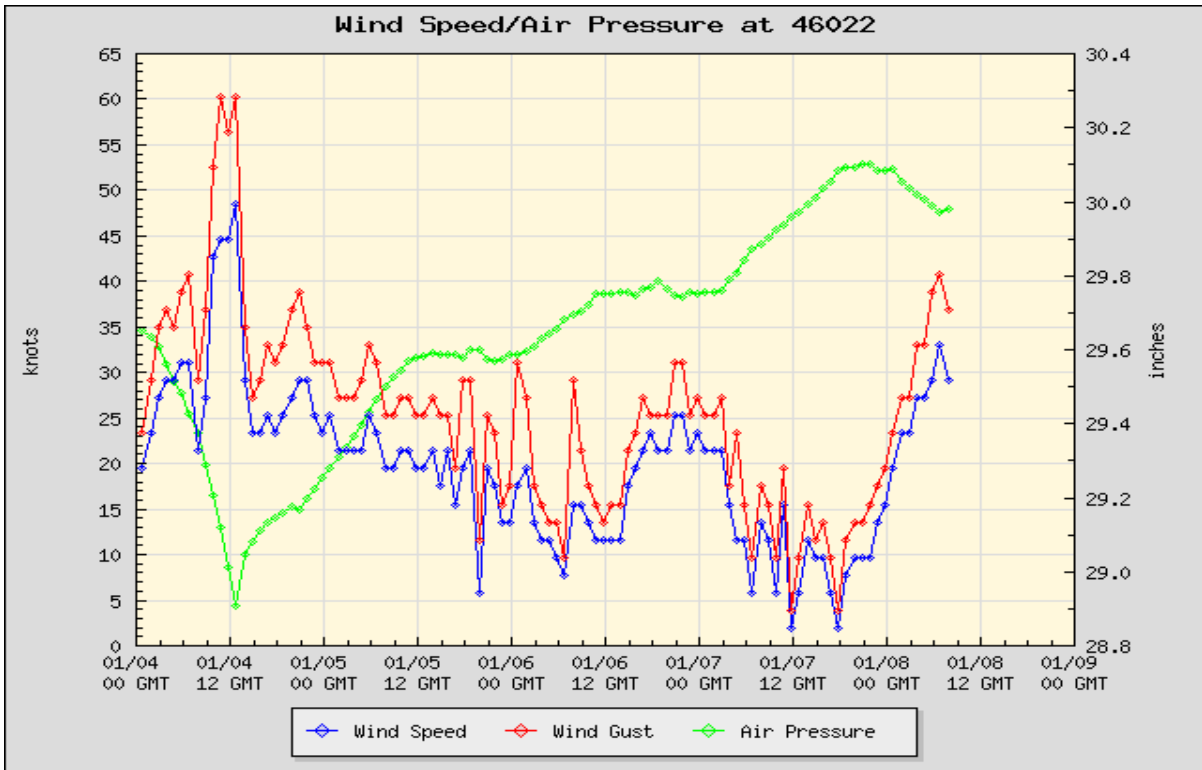


Figure 25. NDBC Buoy 46022 Wind Speed, Gust, Air Pressure: January 4-8, 2008.

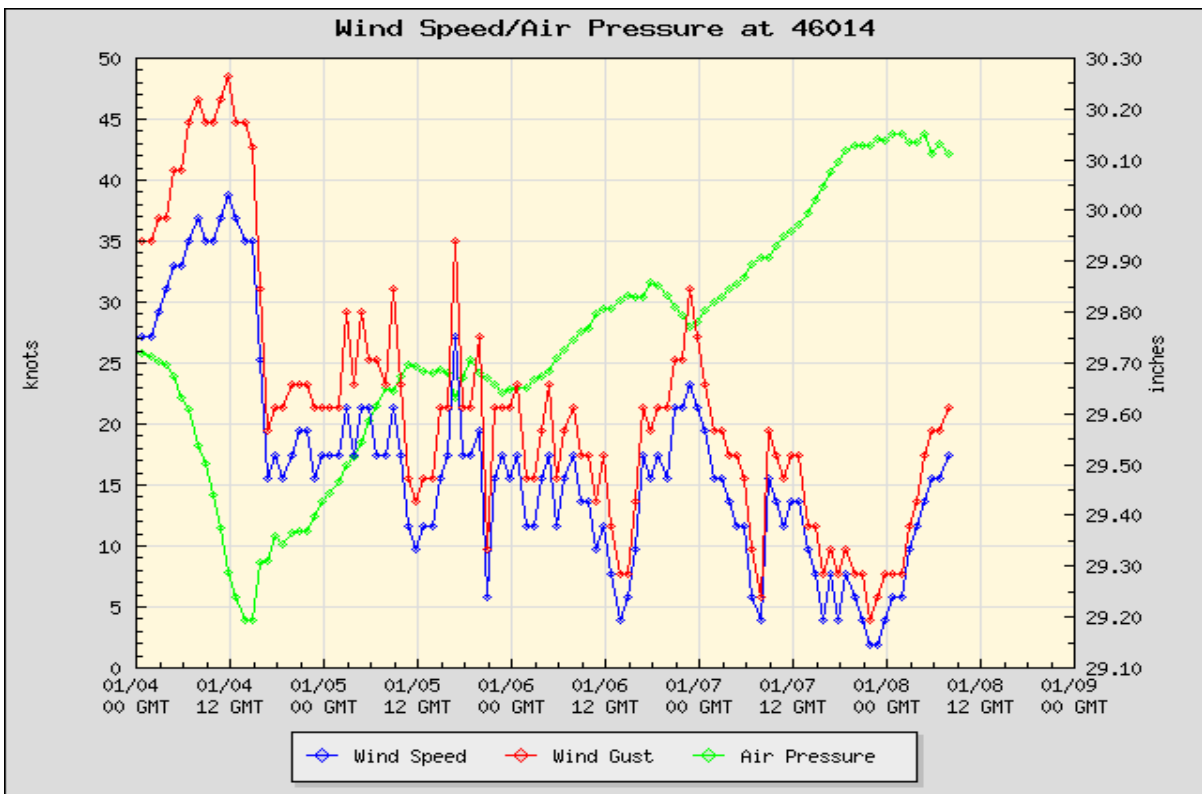


Figure 26. NDBC Buoy 46014 Wind Speed, Gust, Air Pressure: January 4-8, 2008.





Photo 1. Del Norte County, Courtesy of Allen Winogradov.



Photo 2. Del Norte County, Courtesy of Allen Winogradov.





Photo 3. Del Norte County, Courtesy of Allen Winogradov.



Photo 4. Del Norte County, Courtesy of Allen Winogradov.





Photo 5. East of Laytonville, California, Courtesy of Long John.



Photo 6. East of Laytonville, California, Courtesy of Long John.



Photo 7. Samoa Beach, California, Courtesy of Carol Ciliberti.