

December 1-4, 2007 Storm Summary/Case Study
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1. Overview

Starting Saturday, December 1 and continuing through Tuesday, December 4, 2007, a series of deep low pressure systems over the eastern Pacific Ocean moved toward the Pacific Northwest coast. Upon arrival these systems produced heavy rainfall, strong sustained winds, and high seas. While the greatest impact of these systems was experienced along the coastlines of Washington and Oregon, the northwest coast of California also was affected by the accompanying high winds, high seas, and heavy rain. The greatest impact along the California coast was felt when the main area of low pressure moved into the Pacific Northwest on Tuesday.

The storms began affecting northwest California on December 1 as a warm front, ahead of the main area of low pressure, moved toward the coast. The main cold front then pushed through the region on December 3 through early December 4.

Rainfall amounts varied across the area, with higher elevations and climatologically favored locations receiving the greatest amount of rain. Significant sustained winds and high wind gusts occurred throughout the event, with ridge tops and other exposed locations experiencing the highest observed winds. Large and long-lasting ocean swells were also observed. Two distinct swell-trains affected the coast; the first having been generated locally by strong, near-shore winds and the second from a distant offshore fetch created during the most intensely developed phase of the low pressure system.

2. Storm Data

2.1 Rainfall

Rainfall amounts were generally light during the passage of the warm front on December 1 through early December 2. Rainfall then increased in amount and intensity as the cold front associated with the system approached the region late in the day on December 2, with heavy rain continuing through December 3. The cold front finally moved through early on December 4. Afterwards, showers lingered behind the cold front through most of the day December 4 (see Figure 1 for Storm Total Rainfall).

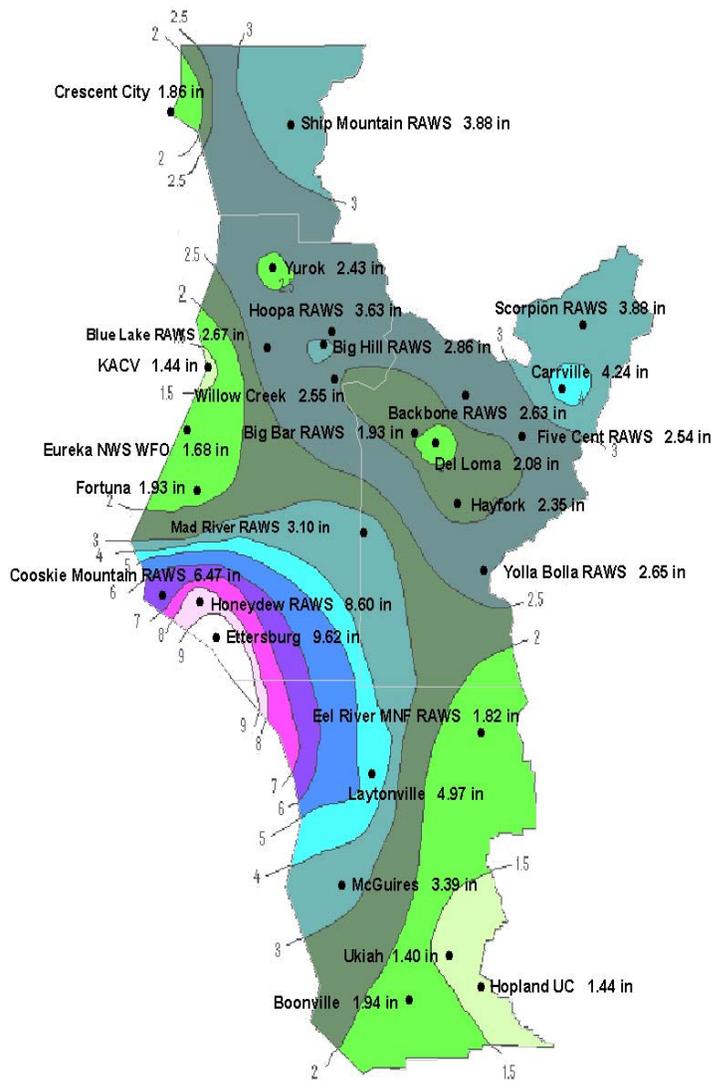


Figure 1. Storm Total Rainfall Amounts: December 1-4, 2007.

2.2 Wind

There were two peak wind events that occurred during the storm. The first occurred on December 2 during the late afternoon and evening hours. This first wind peak was the result of the approach and passage of the warm front. The pressure gradient tightened as the warm front moved closer toward northwest California. The gradient then relaxed behind the warm front. Conditions, however, remained breezy until the pressure gradient tightened once again as the main cold front approached the coast. This resulted in a second occurrence of strong sustained winds and high wind gusts (see Table 1 for Peak Wind Gusts).

<u>Location</u>	<u>Peak Wind (mph)</u>
Ship Mountain RAWS	101
Shoolhouse RAWS	88
5 ENE Capetown	79
Cooskie Mountain RAWS	78
Kneeland RAWS	73
Samoa Coast Guard	68
Arcata Airport ASOS	55
Crescent City Airport ASOS	52
Eureka WFO	39
Ukiah Airport ASOS	29

Table 1. Peak Wind Gusts: December 1-4, 2007.

Strong winds also prevailed over the coastal waters throughout the event. Extended periods of sustained winds equaling 40 knots or greater with gusts of 54 knots or greater were measured for up to 26 hours at some coastal water locations.

2.3 Waves

Two large and hazardous wave swell-trains affected the northwest California coast during the storm. The first was a southerly swell-train which arrived at the coast on December 2, and lasted through the morning of December 3. This was a locally generated, short-period swell-train that resulted from extended duration high winds over the coastal waters (see Table 2 for Peak Wave Heights). A secondary, longer period southwesterly swell-train arrived on the afternoon of December 3, and continued through December 4. (see Table 3 for Peak Wave Heights). This secondary swell-train was generated in the open waters of the eastern Pacific when the main low pressure system was deepening and strengthening into a 952mb low (see Figures 2-16 for Surface and 500 MB Analysis). The swell-train then propagated just out ahead of the low pressure center until it eventually arrived at the coast (see Figures 17-22 for Buoy Wave and Wind data).

<u>Location</u>	<u>Peak Wave Height, Period</u>
Buoy 46022, 17nm SW of Eureka	28.5 ft @ 15 sec.
Buoy 46212, Humboldt Bay South Spit	21 ft @ 14 sec.
Buoy 46213, Cape Mendocino	Not Available
Buoy 46014, 19nm N of Point Arena	21 ft @ 14 sec.

Table 2. Peak Wave Height and Period: December 3, 2007.

<u>Location</u>	<u>Peak Wave Height, Period</u>
Buoy 46022, 17nm SW of Eureka	26 ft @ 19 sec.
Buoy 46212, Humboldt Bay South Spit	23.3 ft @ 17 sec.
Buoy 46213, Cape Mendocino	30.2 ft @ 18 sec.
Buoy 46014, 19nm N of Point Arena	24.6 ft @ 16 sec.

Table 3. Peak Wave Height and Period: December 4, 2007.

3. Conclusion

No major damage was reported as a result of this storm. There were reports of some small trees and limbs being blown down, as well as short-duration power and communication outages during the time of the strongest winds. No major flooding was reported and no significant rises were registered on any of the local rivers. The duration of the high seas and long period swell did result in beach erosion all along the northwest California coastline. On the morning of December 3, as reported by local authorities, several people were swept off the North Jetty of Humboldt Bay, thrown into, and successfully rescued from, the dangerous and frigid waters of the Pacific Ocean.

The strongest winds occurred mainly north of Cape Mendocino, in the region closest to the main area of low pressure. From a historical perspective, this event produced the longest duration sustained winds of 40 knots or greater over the coastal waters within the past 25 years of record. As previously noted, sustained winds of 40 knots or greater with gusts to 54 knots or greater were observed for up to 26 non-consecutive hours at National Data Buoy Center (NDBC) buoy 46022, which is located 17nm southwest of Eureka. The most recent long duration wind event at NDBC buoy 46022, meeting the same speed criteria, occurred in January of 1995, yet this event only recorded these conditions for 6 hours. In fact, the majority of years from 1982 to 2006 show no record of these conditions existing for even 1 hour at NDBC buoy 46022.

This storm also produced one of the more significant long-period swell durations of the past 25 years as observed at NDBC buoy 46022. From the evening of December 3 through the early morning of December 5, there were 30 hours of 16 seconds or longer swell periods. For 7 of those hours the swell reached heights of 26 feet or more. In January of 1990 a somewhat comparable swell event occurred. During that event there were 15 hours of 26 feet or higher swells with corresponding periods of 16 seconds or longer. The peak wave height during that event was 34 feet, which occurred for 2 hours. Prior to the 1990 event, a significant storm occurred in February of 1984 when there were 15 hours of 26 feet or higher swell with periods of 16 seconds or longer. Swell heights reached 39 feet for 2 hours during that historic event. Without a doubt the December 1-4, 2007 storm was a significant weather event. It ranks as one of the most intense, long duration wind events observed at NDBC buoy 46022 and over the coastal waters as a whole, in the past 25 years.

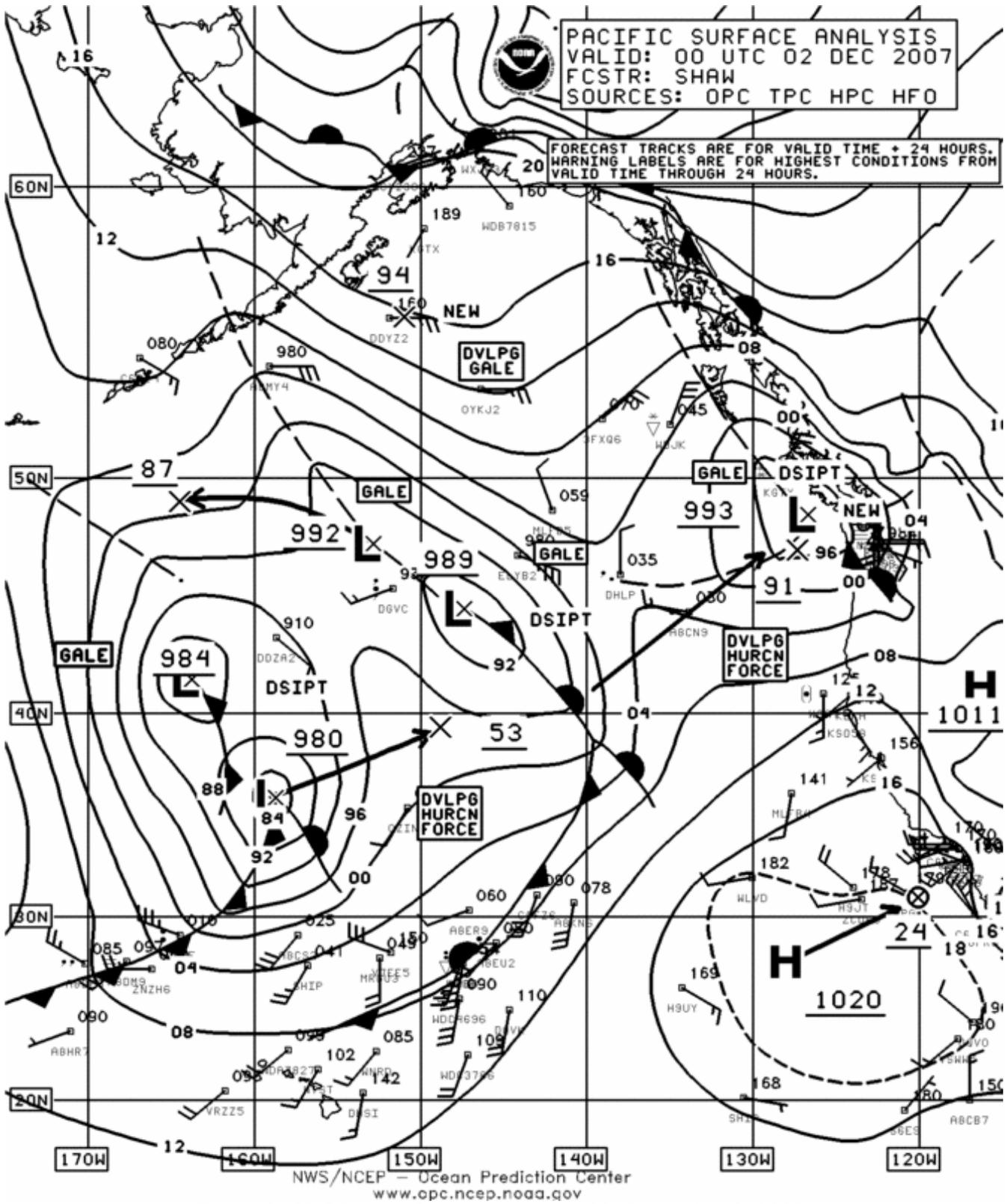


Figure 2. OPC Pacific Surface Analysis: 00z December 2, 2007.

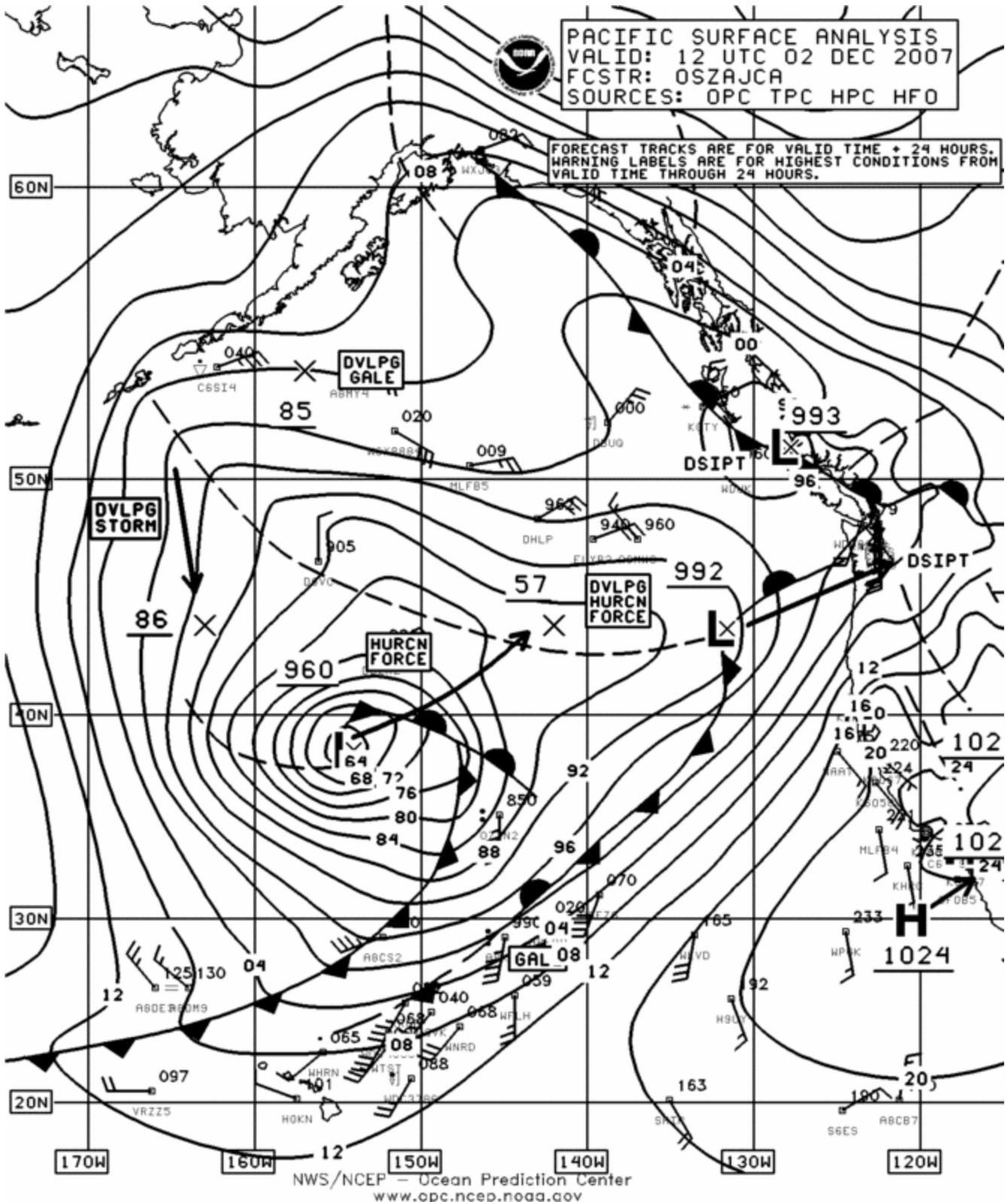


Figure 4. OPC Pacific Surface Analysis: 12z December 2, 2007.

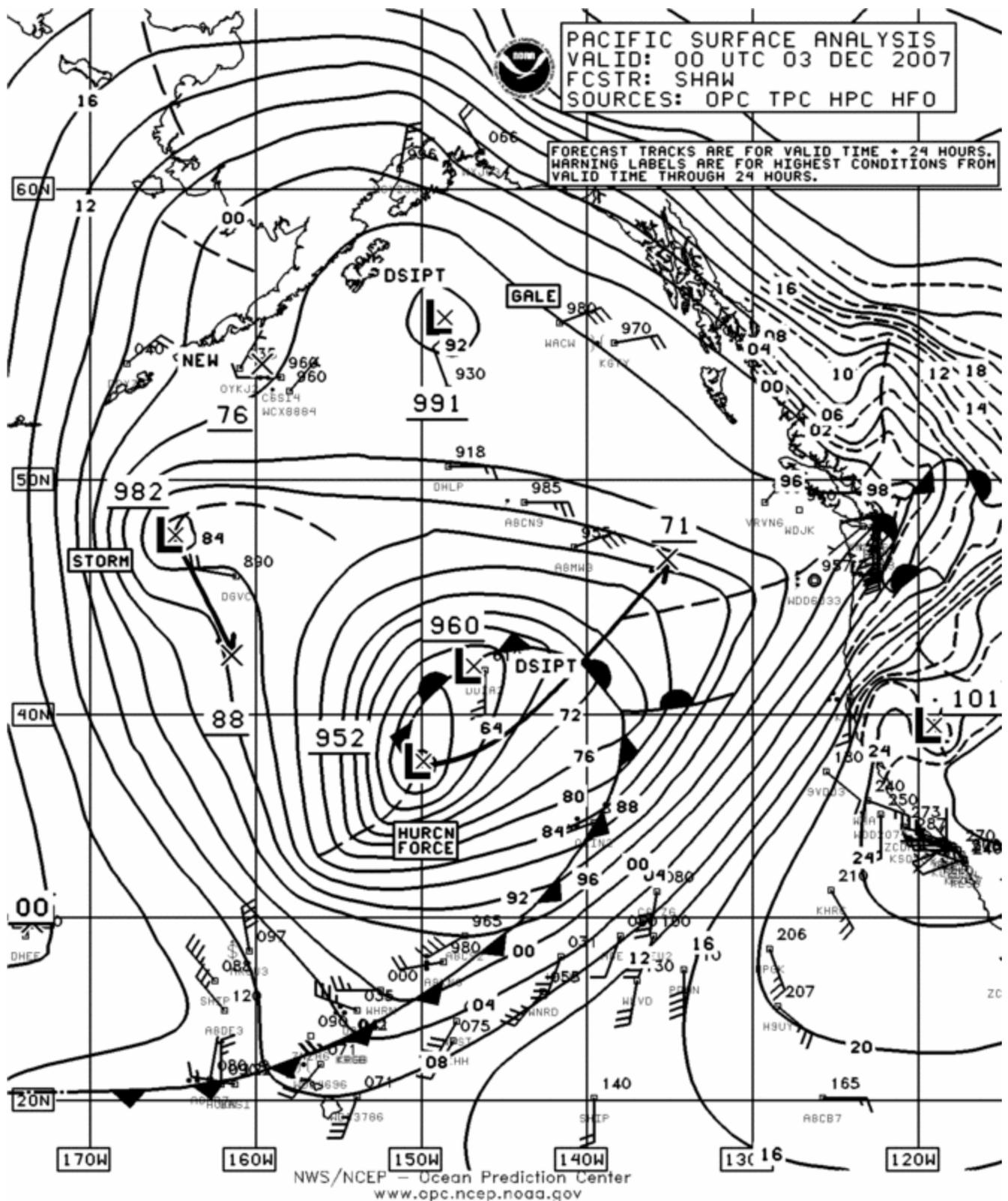


Figure 6. OPC Pacific Surface Analysis: 00z December 3, 2007.

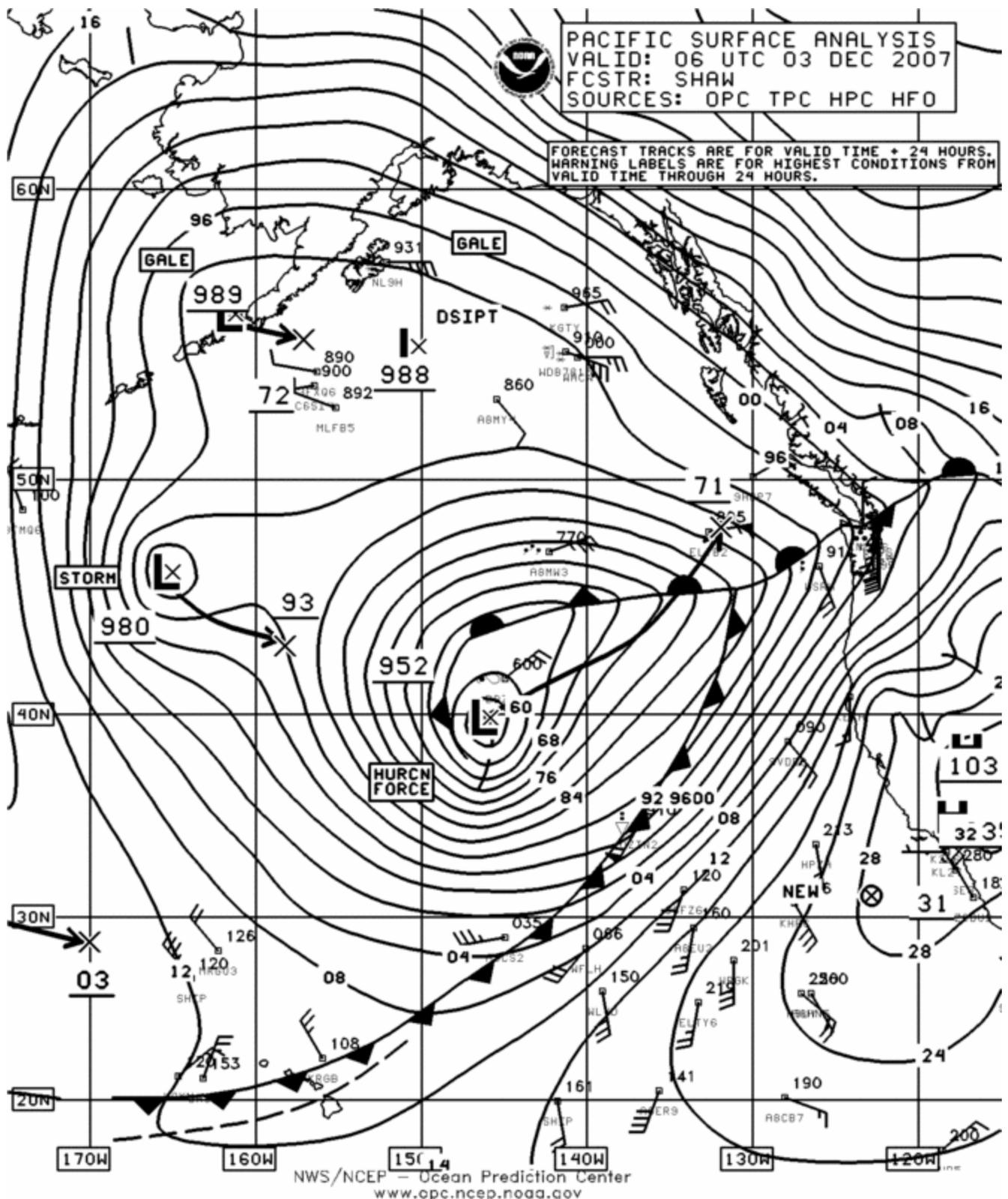


Figure 7. OPC Pacific Surface Analysis: 06z December 3, 2007.

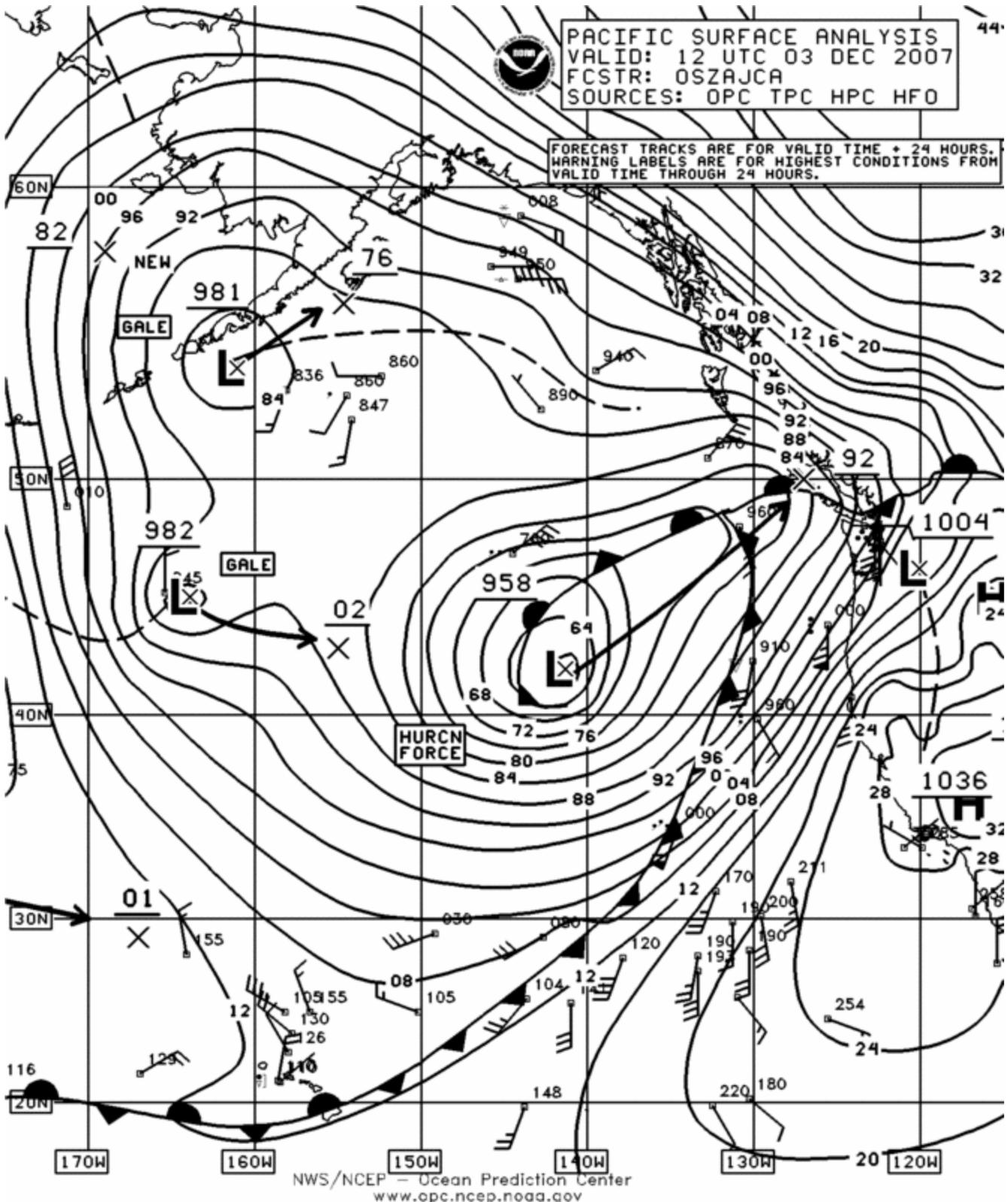


Figure 8. OPC Pacific Surface Analysis: 12z December 3, 2007.

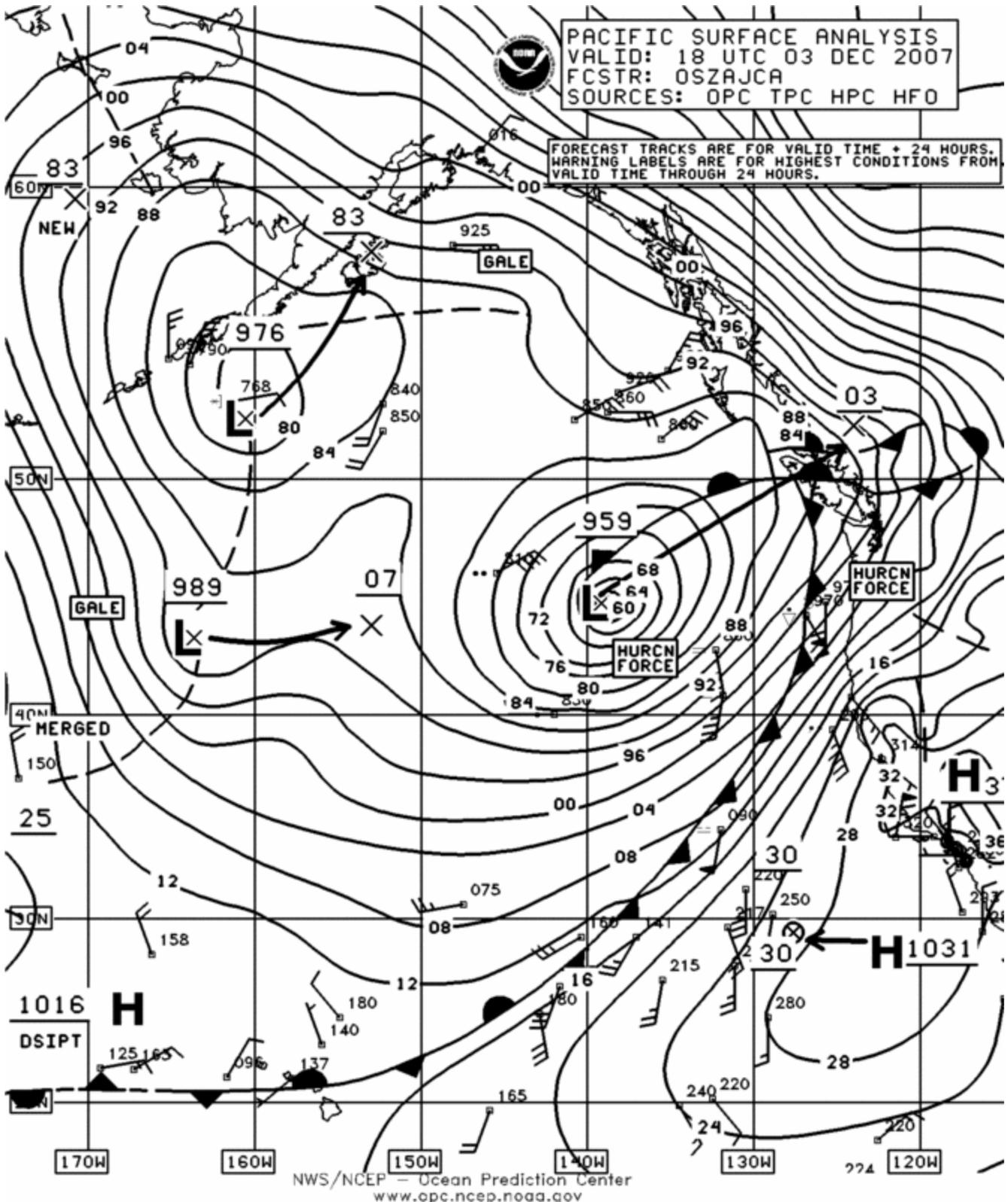


Figure 9. OPC Pacific Surface Analysis: 18z December 3, 2007.

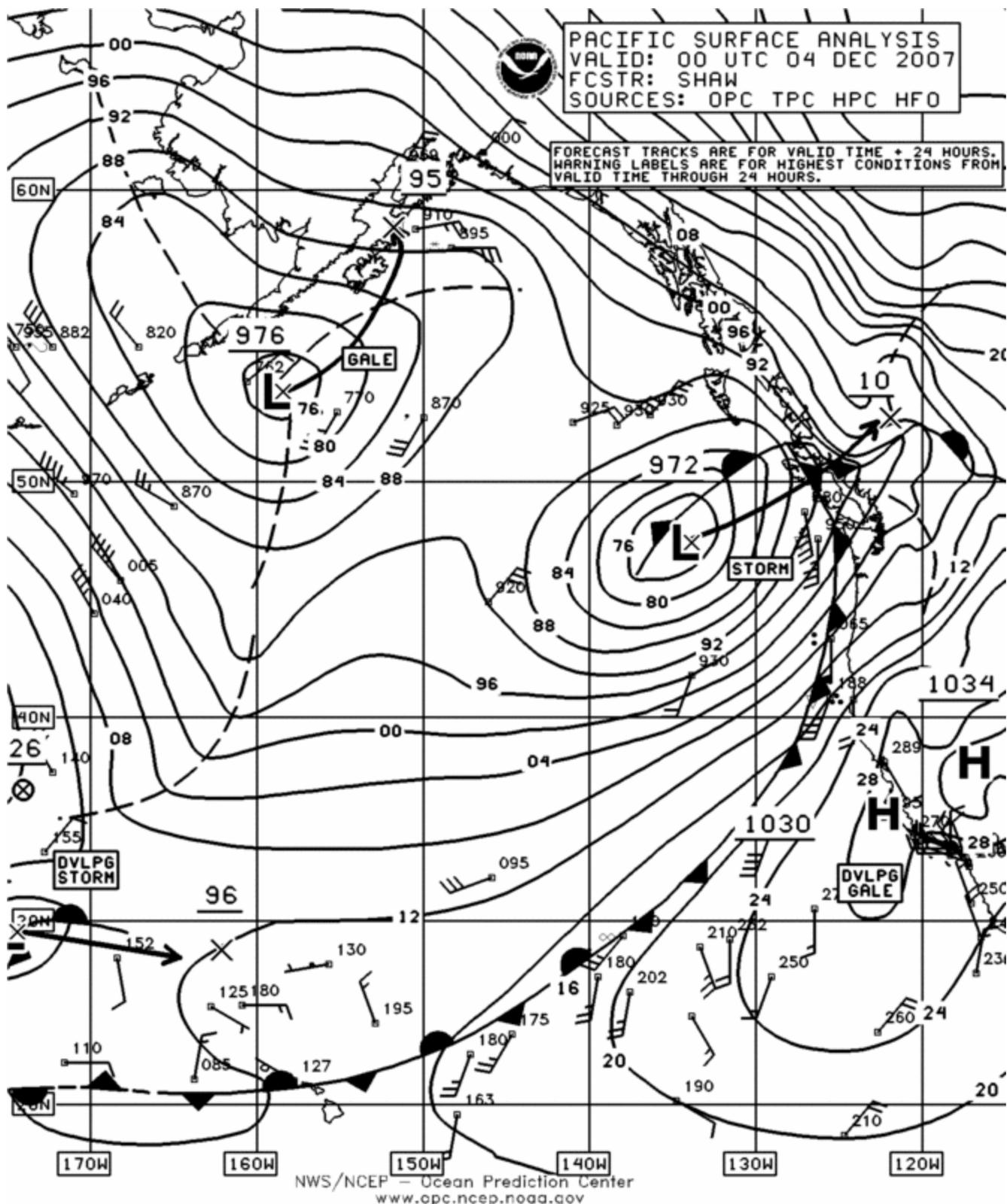


Figure 10. OPC Pacific Surface Analysis: 00z December 4, 2007.

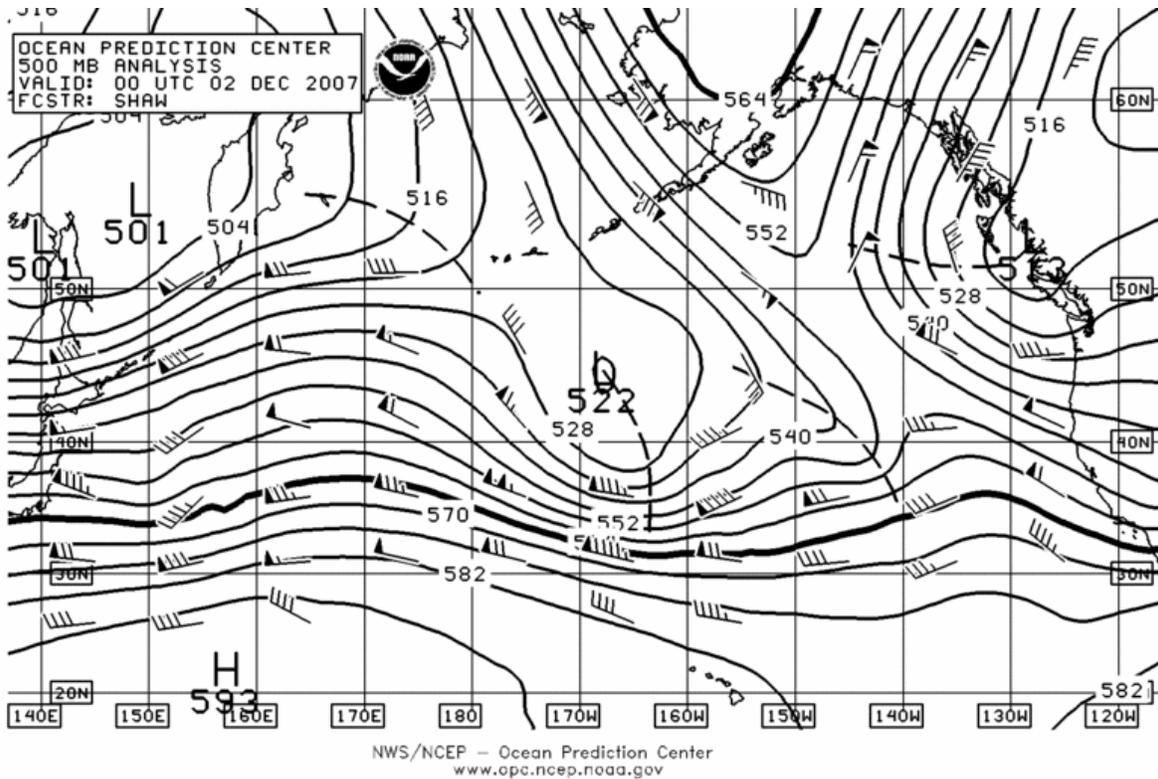


Figure 11. OPC Pacific 500 MB Analysis: 00z December 2, 2007.

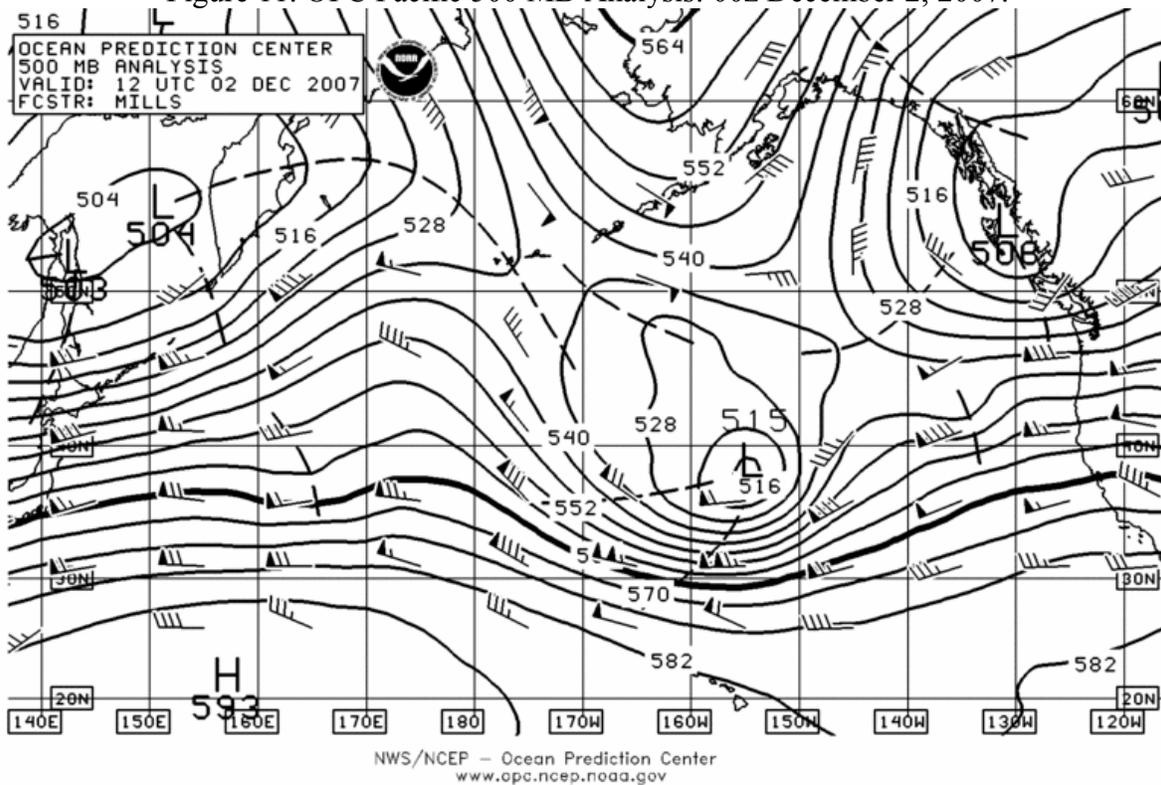


Figure 12. OPC Pacific 500 MB Analysis: 12z December 2, 2007.

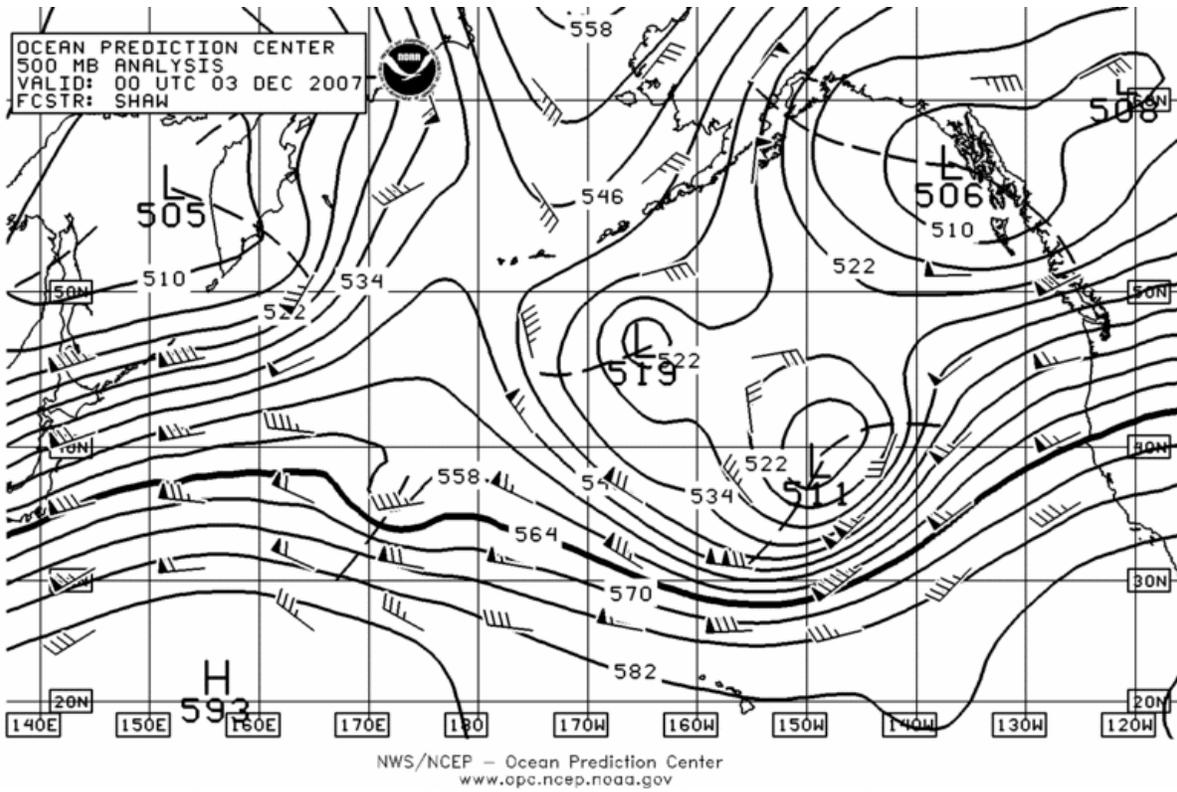


Figure 13. OPC Pacific 500 MB Analysis: 00z December 3, 2007.

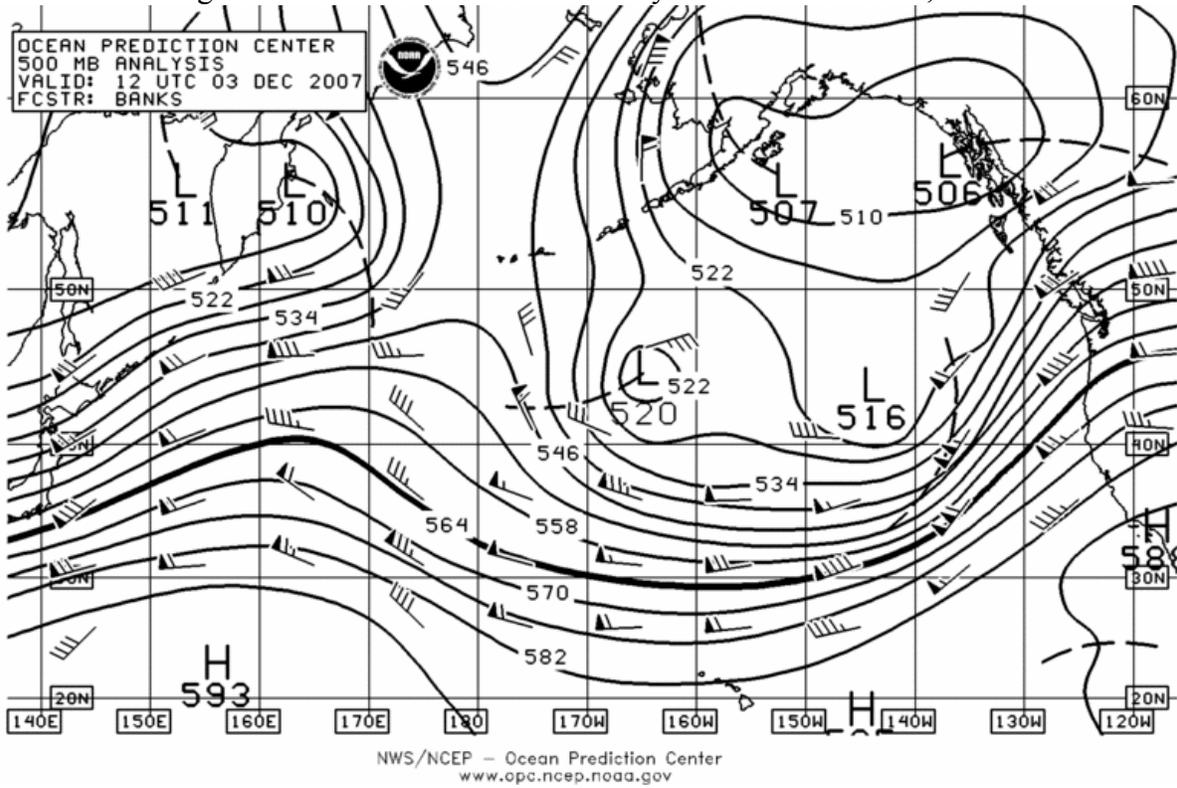
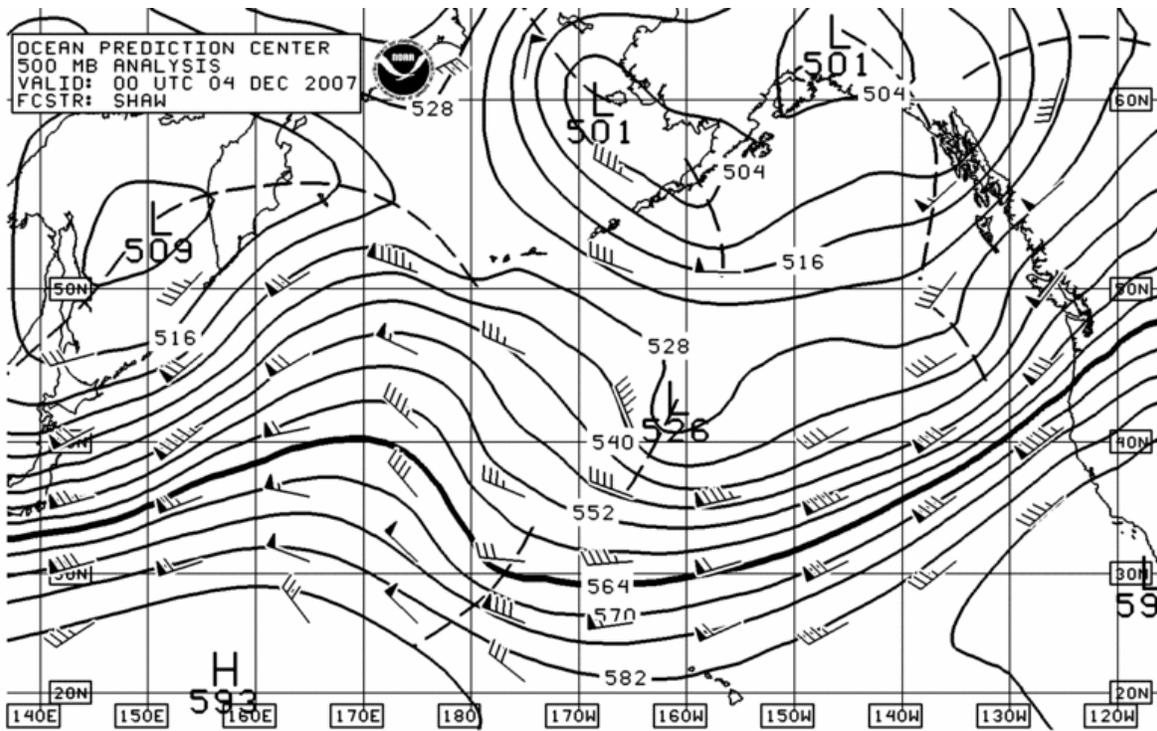
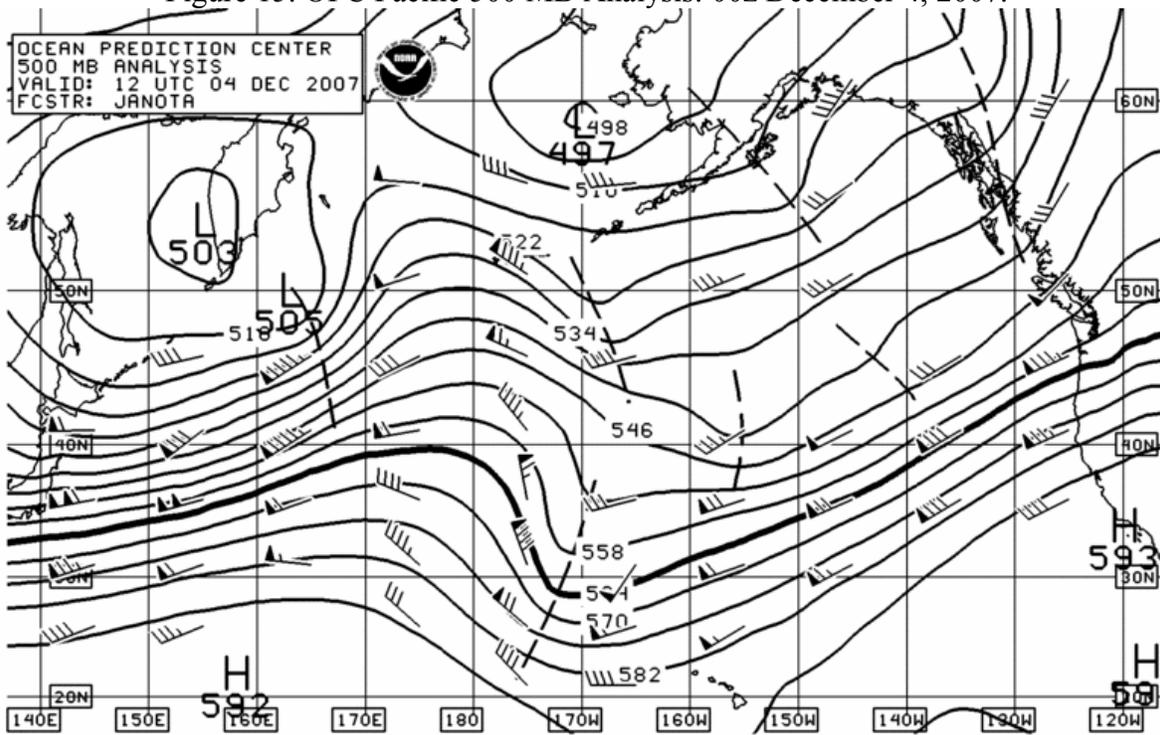


Figure 14. OPC Pacific 500 MB Analysis: 12z December 3, 2007.



NWS/NCEP - Ocean Prediction Center
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Figure 15. OPC Pacific 500 MB Analysis: 00z December 4, 2007.



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Figure 16. OPC Pacific 500 MB Analysis: 12z December 4, 2007.

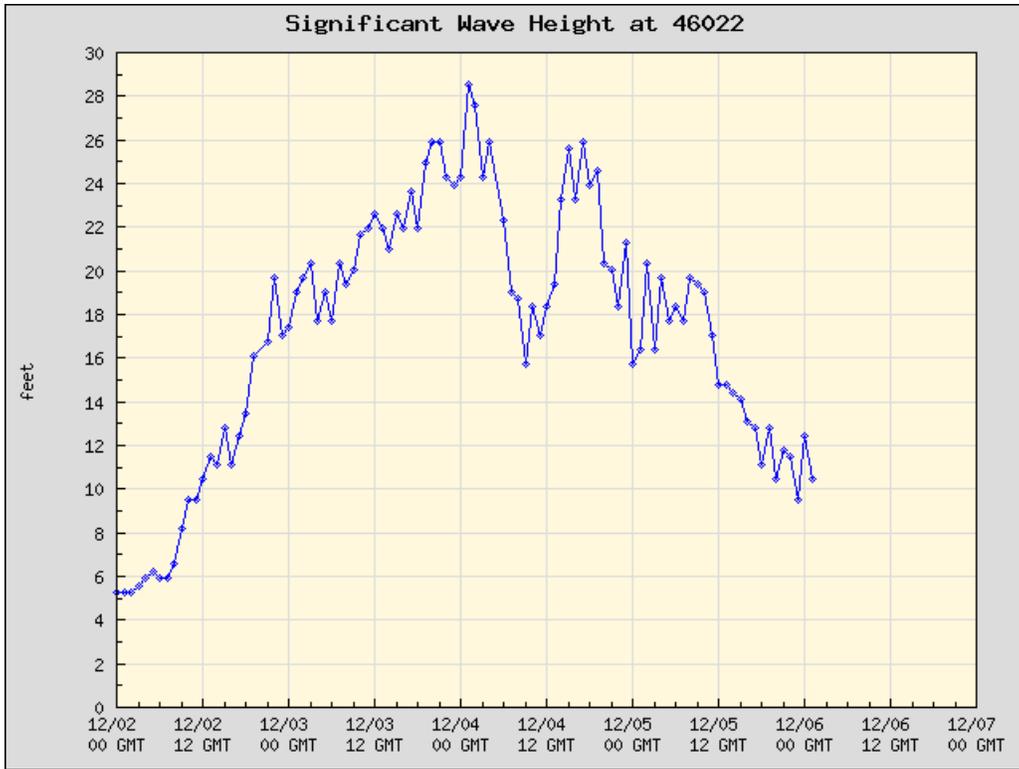


Figure 17. NDBC Buoy 46022 Significant Wave Height: December 2-6, 2007.



Figure 18. NDBC Buoy 46022 Dominant Wave Period: December 2-6, 2007.

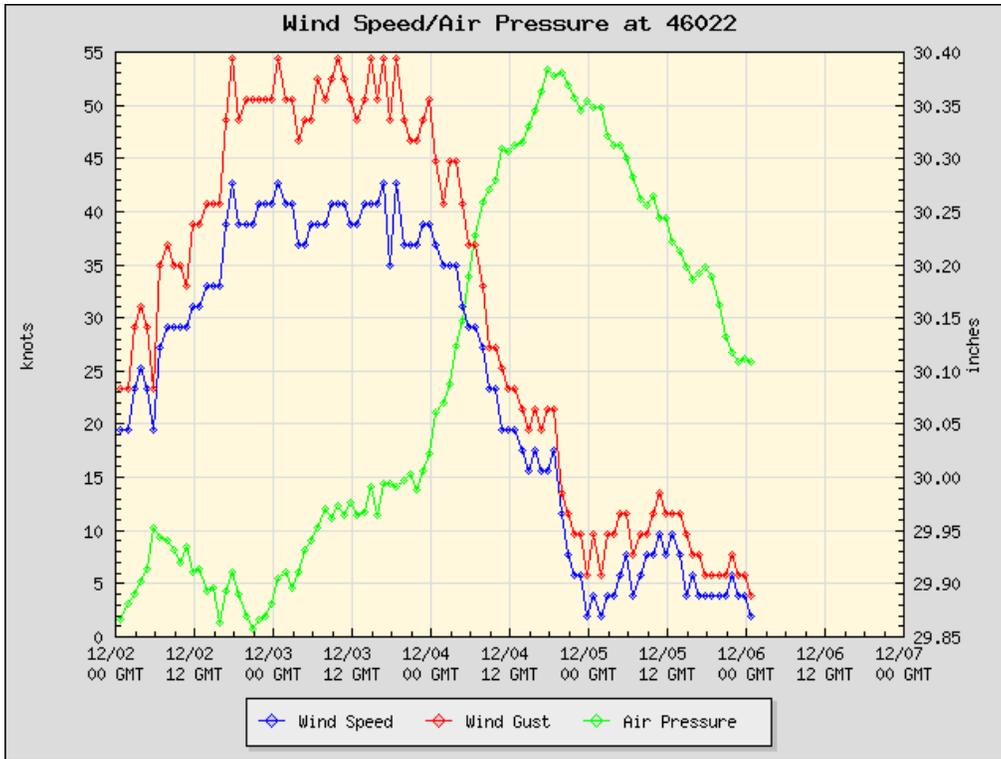


Figure 19. NDBC Buoy 46022 Wind Speed, Gust, Air Pressure: December 2-6, 2007.

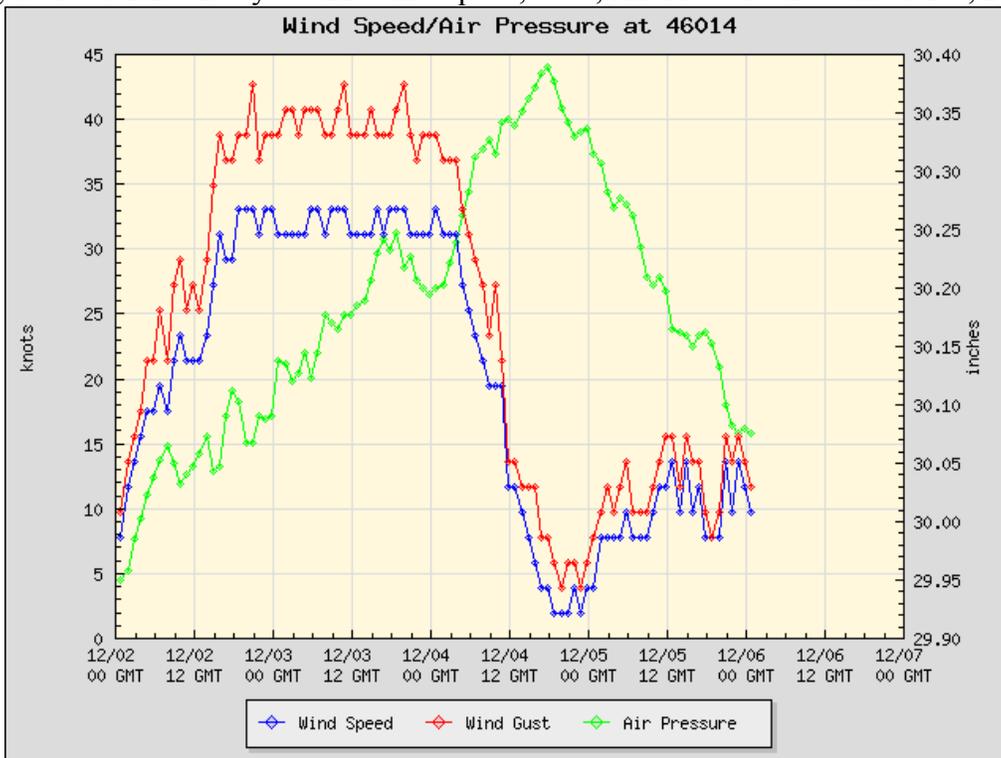


Figure 20. NDBC Buoy 46014 Wind Speed, Gust, Air Pressure: December 2-6, 2007.



Figure 21. NDBC Buoy 46014 Significant Wave Height: December 2-6, 2007.

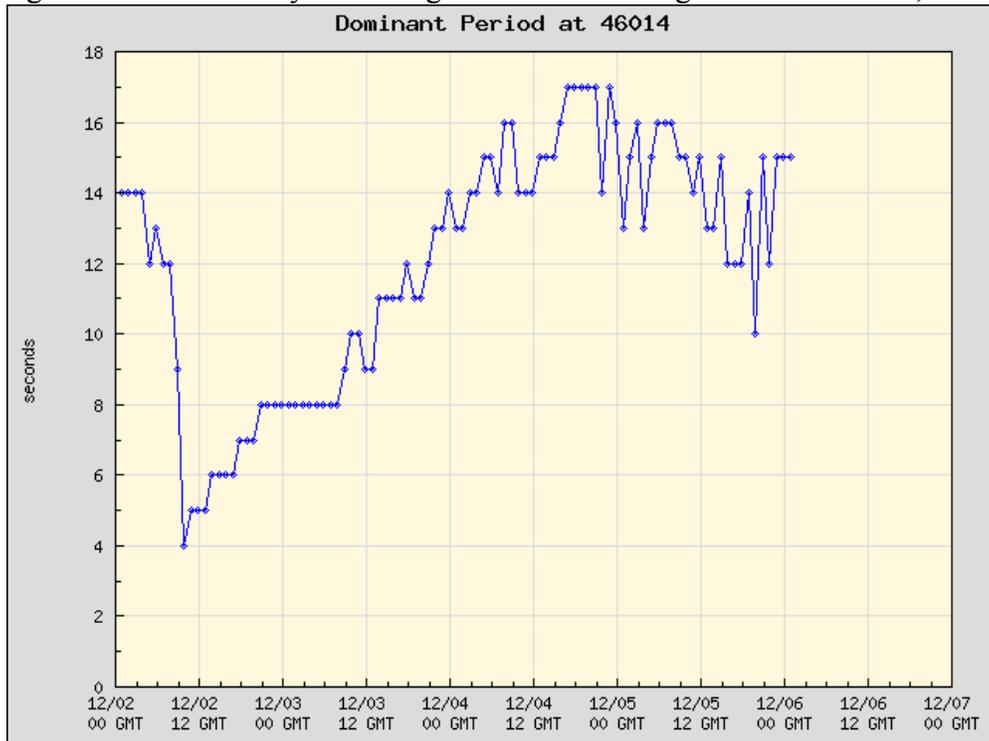


Figure 22. NDBC Buoy 46014 Dominant Wave Period: December 2-6, 2007.