

TROPICAL STORM FREDA (08W)

Tropical Storm Freda was the first of seven significant tropical cyclones to develop during August. Freda began just as Typhoon Ed was dissipating over eastern China and Typhoon Dinah was completing its extra-tropical transition well to the east of Japan. In the wake of these two typhoons, the atmosphere had not yet returned to its seasonally normal condition before Freda began to show signs of developing. This situation meant that Freda would be slow to develop and take several days to pull together into a tropical cyclone.

On the 1st of August, just prior to the development of Freda, the western Pacific was dominated at the surface by a deep trough extending southwest from Dinah into a disturbance north of Guam and then southwestward into the southern Philippine Sea (Figure 3-08-1). The southwest monsoon, which had re-established itself during the

last week of July, had not yet returned to its climatological position and would not do so for several more days. The low-level convergence at the base of this trough west of Guam, was the primary genesis mechanism for Freda. By 020600Z, enough convection had developed over the area to merit inclusion of the disturbance in the Significant Tropical Weather Advisory (ABEH PGTW). At 021200Z, a closed surface circulation was first analyzed in the Philippine Sea with an estimated MSLP of 1005 mb. The ABEH was reissued shortly thereafter upgrading the potential for significant tropical cyclone development to "fair". An aircraft investigation of the area was requested for the following afternoon. Although at this time it was assumed that the disturbance would progress into a typical tropical cyclone, it would turn out that the most difficult part of warning on this storm would be locating the surface center.

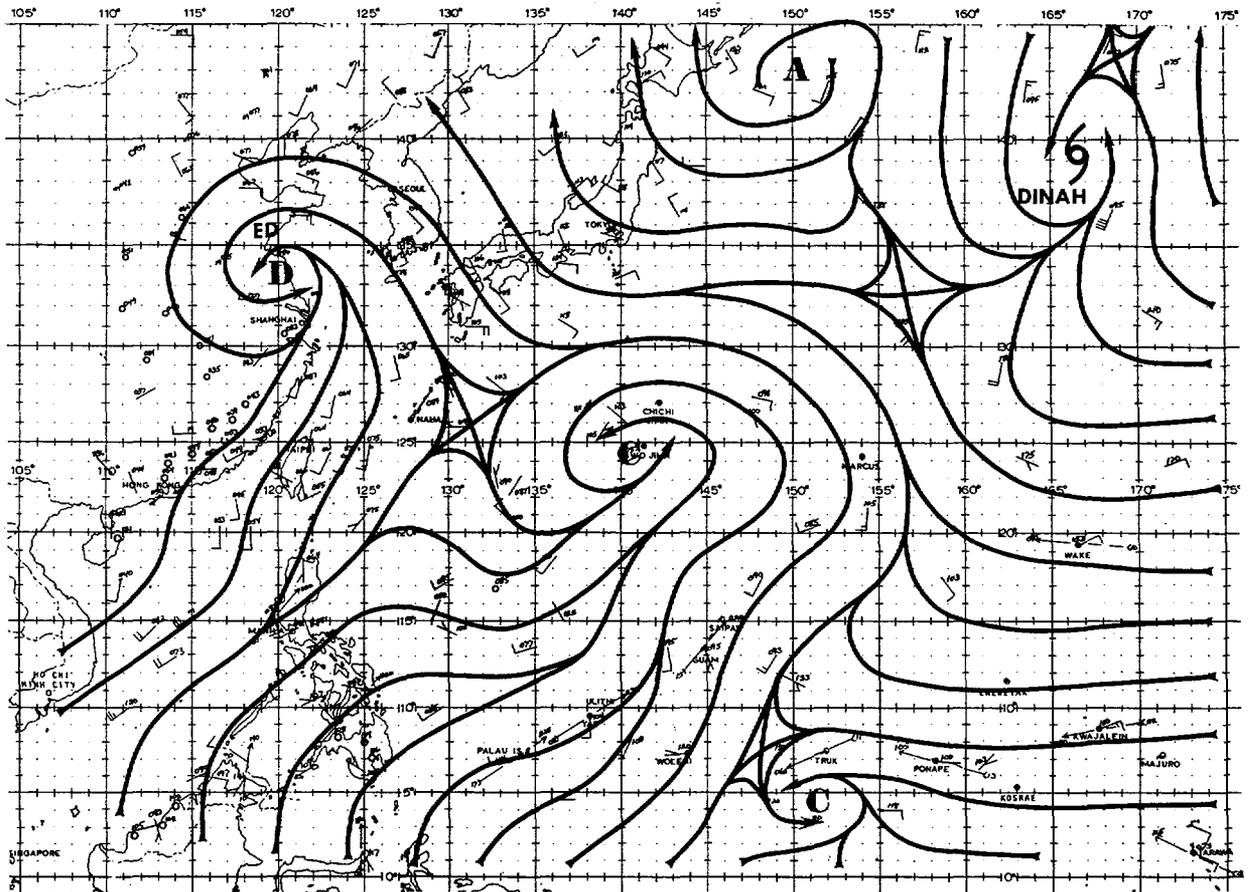


Figure 3-08-1. The 010000Z August 1984 surface/gradient level analysis. Low-level convergence at the base of the trough west of Guam was the primary genesis mechanism for Tropical Storm Freda.

Since the forecast scenario was not very difficult, and Freda followed a general track to the northwest, the remainder of the discussion will focus of Freda's development through aircraft reconnaissance and the subsequent results.

Mission number one was a resources-permitting invest on the afternoon of 3 August. It found a very broad, light and variable wind center but could not locate a definite closed circulation. The MSLP reported by the aircraft was 1003 mb. JTWC continued to watch the area and requested another invest for the following morning with a stand-by fix for later that afternoon. The second invest closed-off a 25 kt (13 m/s) circulation near 11.0N 132.7E. However, satellite imagery at that time revealed that the disturbance was developing very slowly. The MSLP observed on the second flight was 1005 mb or two millibars higher than on the previous day - not a promising sign. Since development was occurring so slowly, the afternoon stand-by fix was cancelled and the metwatch continued.

In anticipation of continued slow development during the next twenty-four hours, a TCFA was issued at 040415Z. Two fix missions were also requested for the following day. Mission number three, originally tasked as a fix mission for the morning of 5 August, could not find the system at the forecast location. Reverting to an invest pattern, the crew was still unable to locate a circulation center, although they did find a broad trough some 5 degrees further north than on the previous day. The lowest surface pressure reported was 999 mb. In rapid succession mission number four, the afternoon fix, was cancelled; the TCFA was reissued and positioned further to the northwest; and another aircraft invest was requested for the next morning with a follow-on afternoon fix. At 050716Z, Dvorak satellite intensity analysis of the imagery in Figure 3-08-2 indicated the disturbance was developing and estimated that surface winds of 30 kt (15 m/s) were now present. Based on the satellite intensity estimates, the lower pressures reported by aircraft and the forecast for continued slow intensification, JTWC issued the first warning on Freda as a tropical depression at 051200Z.

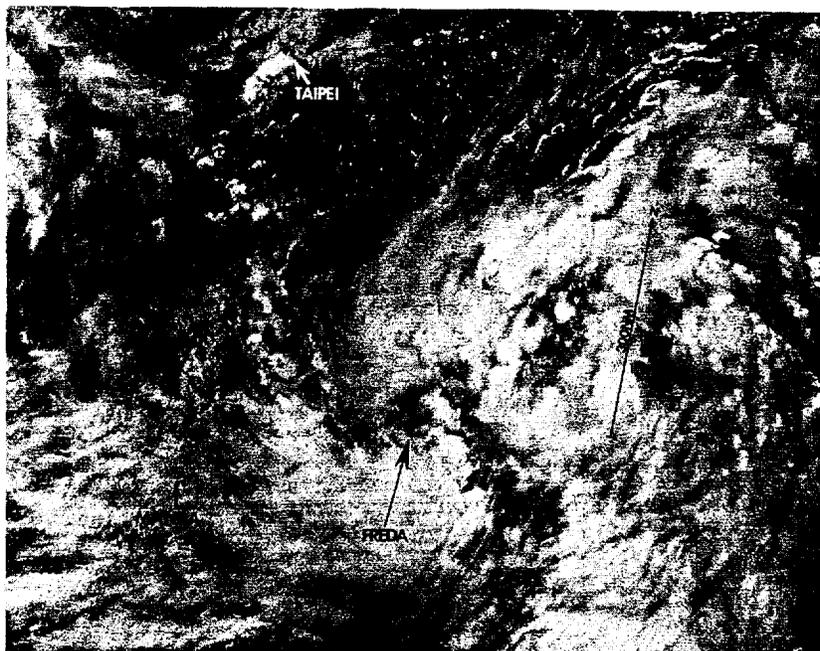


Figure 3-08-2. Dvorak intensity analysis of this imagery indicated 30 kt (15 m/s) winds were present prompting the first warning on Freda (050716Z August NOAA visual imagery).

Mission number five, an invest scheduled for NLT 060000Z, finally found a 993 mb circulation center with winds in excess of 35 kt (18 m/s) after several hours of searching. Mission number six, an afternoon fix mission, had little trouble fixing the circulation center of this now 40 kt (21 m/s) tropical storm. At last Freda was showing signs of cooperating; however, this was not to last long! The ARWO on mission number six commented, " This storm was rather weak and unorganized. It was very large and could very well have multiple centers." Indeed

this was the case. Satellite imagery indicated there were now two centers of activity - the second one developing to the north of the circulation fixed by the aircraft (Figure 3-08-3). Up until this time the fixes from both aircraft and satellite as well as the forecast emphasis had been on the southern center, but the northern area was about to assume dominance. The apparent storm movement from 060600Z to 070000Z was as much a reconsolidation around the northern center as it was a simple translation of the entire storm envelope to the northwest. This

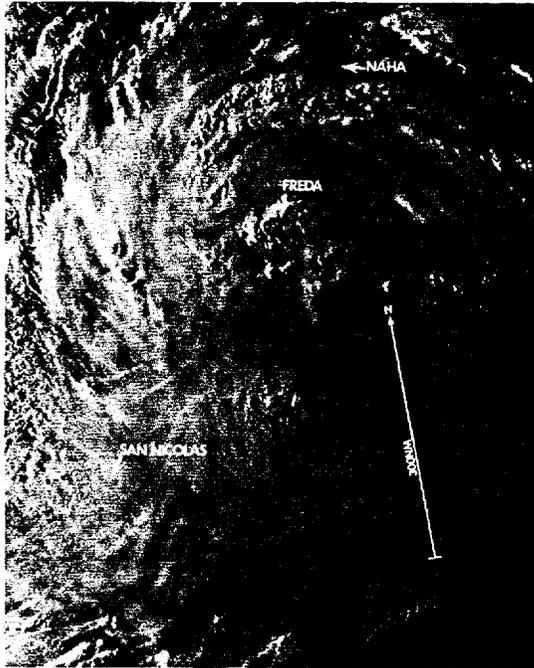


Figure 3-08-3. Tropical Storm Freda when reconsolidation about the northern center was about to commence. Note the southern area of convection, where the aircraft and satellite had been fixing the center and a second area of convection located further to the north where the new center would develop (061010Z August DMSF visual imagery)

reconsolidation was complicated by the fact that it occurred at night when only infrared satellite imagery was available. When mission number seven went into Freda the next morning, it could not find a circulation where the southern center should have been. However, when the pattern was changed to that of an invest mission they found Freda located significantly to the northwest within the northern area of convection. The MSLP had now decreased to 988 mb with maximum surface wind of 45 kt (23 m/s) being reported. Mission number eight, the last one flown into Freda, was unable to penetrate the center since the storm had moved over Taiwan.

Freda quickly transited northern Taiwan and the Formosa Straits before making landfall on the Chinese mainland at approximately 071500Z. Like Typhoon Ed, a week earlier, Freda held together over land for two more days before finally dissipating.

In summary, Tropical Storm Freda was a slow developing system that exhibited two centers of action for a portion of its life. The southern center was more dominant until reconsolidation around the northern center occurred just prior to Freda crossing Taiwan. Freda tracked generally to the northwest and was identifiable over land for several days after it moved ashore.