

## TYPHOON FERN (42W)

### I. HIGHLIGHTS

The last typhoon of 1996, Fern formed at low latitude in association with a strong equatorial westerly wind burst (WWB). While passing over Yap, strong winds and torrential rains caused property damage and personal injury. Eight people were rescued at sea when high seas and winds crippled the cargo vessel, "Mister Bill", while it was enroute from Guam to Yap.

### II. TRACK AND INTENSITY

During the second half of December, twin low-latitude monsoon troughs became established between approximately 100°E and 170°E. A band of low-level westerly winds persisted between the two trough axes. A total of five TCs — two in the Northern Hemisphere (Fern and Greg (43W)), and three in the Southern Hemisphere (Ophelia (11S), Phil (12P), and Fergus (13P)) — formed along the respective monsoon trough axis (see Figure 3-43-1 in Greg's (43W) summary).

On 14 December, deep convection began to increase along the equator between approximately 140°E and 160°E in association with an intensifying WWB. A poorly defined LLCC located south-southeast of Guam was noted on the 190600Z December Significant Tropical Weather Advisory. Moving slowly westward, this disturbance remained poorly defined until 21 December when an area of deep convection began to consolidate near a LLCC. Low sea-level pressure (SLP) of 1001 mb and evidence of upper-level divergence over the LLCC (on animated water vapor imagery) prompted the JTWC to issue a TCFA at 211500Z December. The first warning on Tropical Depression (TD) 42W, valid at 211800Z, soon followed based on synoptic data indicating falling SLP in the developing TC (998 mb at 211800Z). Six hours later, on the warning valid at 220000Z, TD 42W was upgraded to Tropical Storm (TS) Fern based on satellite and synoptic data. For the next two days, TS Fern moved slowly westward and remained near minimal TS intensity. On 24 December, the tropical storm turned northward and slowly approached Yap. On Christmas day, Fern passed over Yap (Figure 3-42-1a,b), where SLP fell to 983 mb and a peak wind gust of 63 kt (32 m/sec) was recorded at the Weather Service Office (WMO 91415) (Figure 3-42-2a,b). For several hours peak wind gusts in excess of 50 kt (26 m/sec) on Yap occurred in the westerly flow as Fern moved away to the north. Fern became a typhoon at 251800Z approximately 12 hours after passing over Yap. Continuing to move slowly north for the next three days on the north-oriented portion of its track, Fern reached its peak intensity of 80 kt (41 m/sec) at 261200Z. Reaching peak intensity after turning northward is a common behavior of TCs in north-oriented patterns (see the Discussion). On 28 December, Fern encountered a strong shear line in the low levels and, located within deep-layer westerly steering flow to the north of the subtropical ridge, it began to move toward the east-northeast and weaken. Fern gradually dissipated as it moved eastward along the shear line, and the final warning was issued valid at 300600Z December.

### III. DISCUSSION

#### *Peak intensity after recurvature*

Most typhoons that undergo classical recurvature (i.e., a roughly "<"-shaped track which features initial steady west-northwestward motion, then a northward turn while slowing, followed by an acceleration toward the northeast) reach peak intensity at, or before, the point of recurvature; where the point of recurvature is identified as that point where the typhoon reaches its westernmost longitude (JTWC 1994). Many TCs do not undergo classical recurvature. Some never recurve, while others move on a track type designated by the Japan Meteorological Agency (JMA) (1976) as north-

oriented. North-oriented tracks occur predominantly during July through October. Carr and Elsberry (1996) found that a TC may undergo north-oriented motion for only a portion of its track — even if some, or most, of the track was of some other type (e.g., straight-moving). A behavior commonly exhibited by TCs undergoing north-oriented motion — and Fern provides a good example — is reaching peak intensity after turning northward or northeastward, but before the speed of translation of the TC significantly increases.

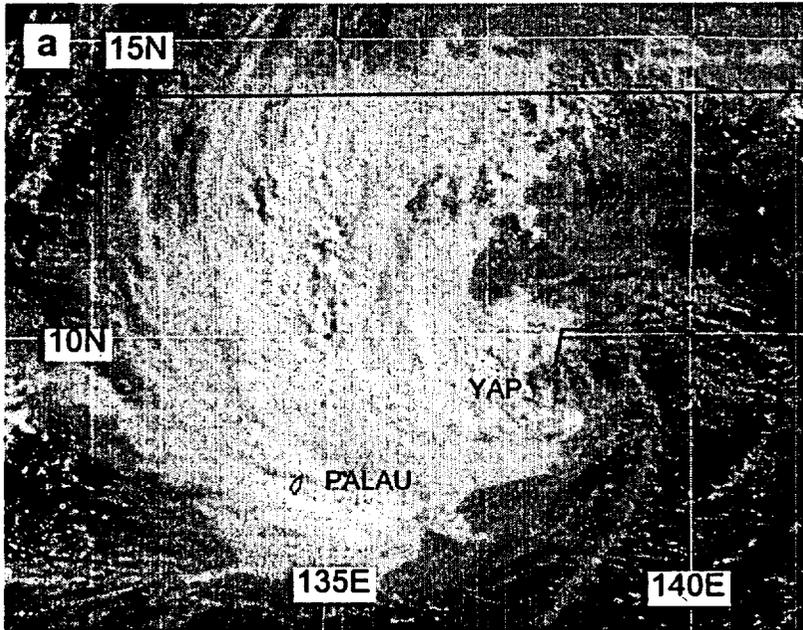
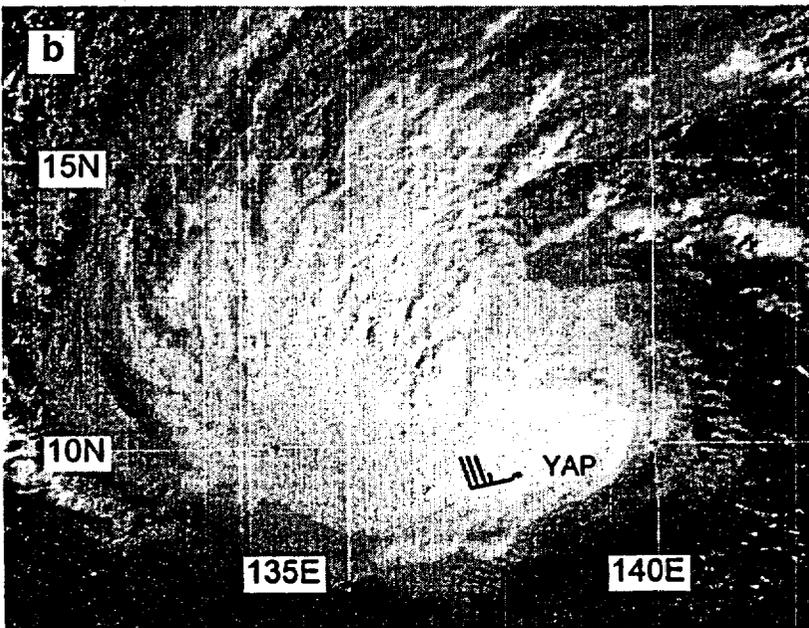


Figure 3-42-1a,b Fern intensifies as it moves directly over Yap: (a) 250531Z December visible GMS imagery, (b) 260631Z December visible GMS imagery.

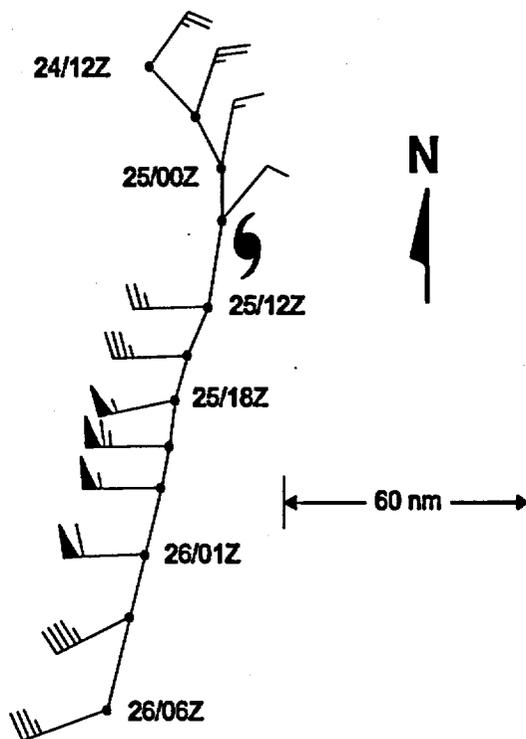


Fern reached peak intensity while moving northward on the north-oriented leg of its track. It weakened when its speed of translation began to climb as it entered the "accelerating westerlies" regime north of the subtropical ridge. Synoptic regimes, such as "poleward oriented" and "accelerating westerlies", associated with specific TC behavior are described in Carr and Elsberry (1996). (See Carlo's (33W) summary for a discussion of a typhoon that underwent similar intensity changes as it moved on a north-oriented track).

#### IV. IMPACT

Fern passed directly over the island of Yap. High wind and heavy rain there caused an estimate of nearly US\$ 3 million in damage and clean-up costs. Damage to roads and bridges of US \$1.5 million was the highest single-item total. One person was reported injured. At sea, a Maltese tanker rescued eight people who abandoned a cargo ship, the "Mister Bill", after it was crippled by high seas while enroute from Guam to Yap. All (including a five-year-old girl) were unharmed. The eight people had entered a life raft which was spotted by a Navy search-and-rescue aircraft.

a



b

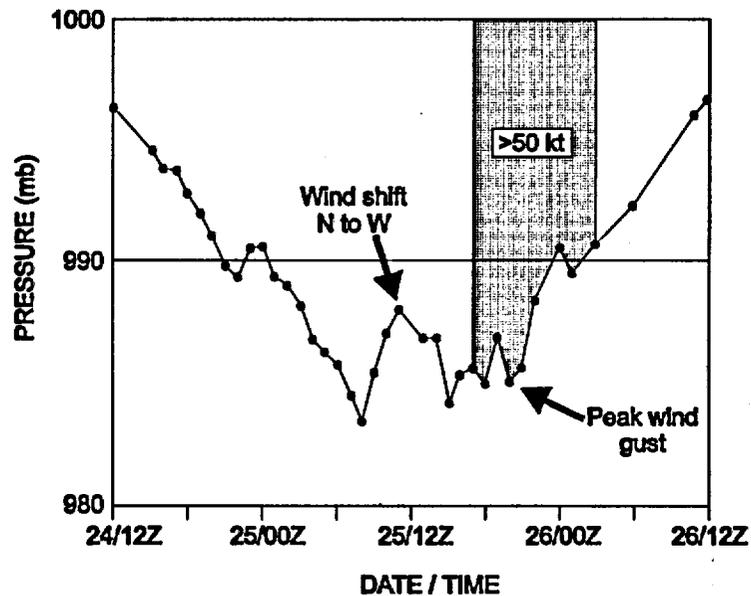


Figure 3-42-2a,b Schematic depiction of (a) peak gusts and (b) sea-level pressure (SLP) recorded at Yap (WMO 91415) during Fern's passage. The peak gust data are recorded with respect to Fern's center. The time series of SLP is based on hourly reports received at the JTWC. Shaded region on SLP diagram indicates wind speeds in excess of 50 kt.