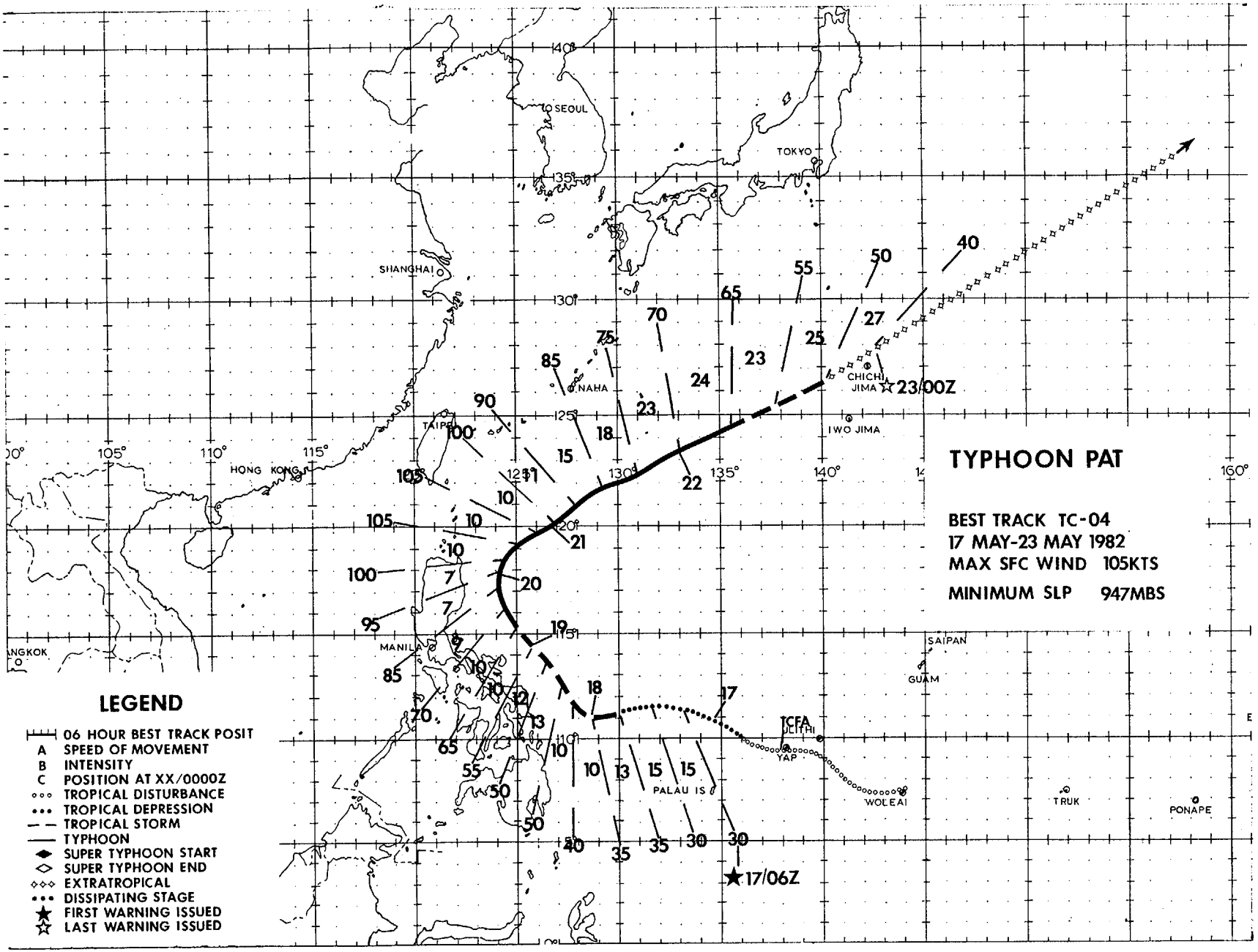
TYPHOON PAT
BEST TRACK TC-04
17 MAY-23 MAY 1982
MAX SFC WIND 105KTS
MINIMUM SLP 947MBS
LEGEND
06 HOUR BEST TRACK POSIT
A SPEED OF MOVEMENT
B INTENSITY
C POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
DISSIPATING STAGE
FIRST WARNING ISSUED
LAST WARNING ISSUED
SEOUL
TOKYO
SHANGHAI
NAHA
TAIPEI
HONG KONG
MANILA
IWO JIMA
CHICHI JIMA
23/00Z
SAIPAN
GUAM
TCFA
YAP
PALAU IS
WOLEAI
TRUK
PONAPE
17/06Z

The transition from the winter to the summer monsoon regime over the tropical western North Pacific can vary greatly from year to year. During this transition time (March through May), tropical cyclone activity can be very strong (six in 1980) or moderate (three in 1981). In May, 1982, there were several disturbances that developed in the near-equatorial trough and then dissipated without producing a significant tropical cyclone. During the third week of May, Typhoon Pat developed and became the only disturbance to reach warning status in the region between early April (Typhoon Odessa (03)) and late June (Typhoon Ruby (05)).

The disturbance that eventually produced Typhoon Pat was first detected as a mid-level circulation southwest of Guam. The 140000Z May 500 mb streamline analysis depicted a cyclonic circulation center near 8N 143E. Coincident with the analysis, satellite imagery indicated an area of centralized convection associated with the circulation. A Tropical Cyclone Formation Alert (TCFA) was issued at 140305Z when evidence of a strong upper-level circulation center was noticed on satellite imagery. Aircraft reconnaissance at 140600Z reported no evidence of a surface circulation but did observe an area of strong low-level convergence near the convective disturbance.

It wasn't until the disturbance began moving out of the near-equatorial trough that a low-level circulation could be located by reconnaissance aircraft. On 17 May, another aircraft investigation located a closed circulation at 1500 ft (472 m) but surface winds were too light to determine a surface circulation center. The first warning on Pat, as Tropical Depression 04, was issued at 170600Z when sustained increased convective organization was observed on satellite imagery.

The forecast movement for the first six warnings projected Pat to move westward with passage over the Philippines, south of Luzon. This scenario was based on the existence of a mid-level (500 mb) ridge centered over the western portion of the South China Sea which was forecast to build eastward thus blocking northward movement of Typhoon Pat. During the ensuing 24-hour period, little change was evident in the mid-level ridge north and northwest of Pat (Figure 3-04-1). The

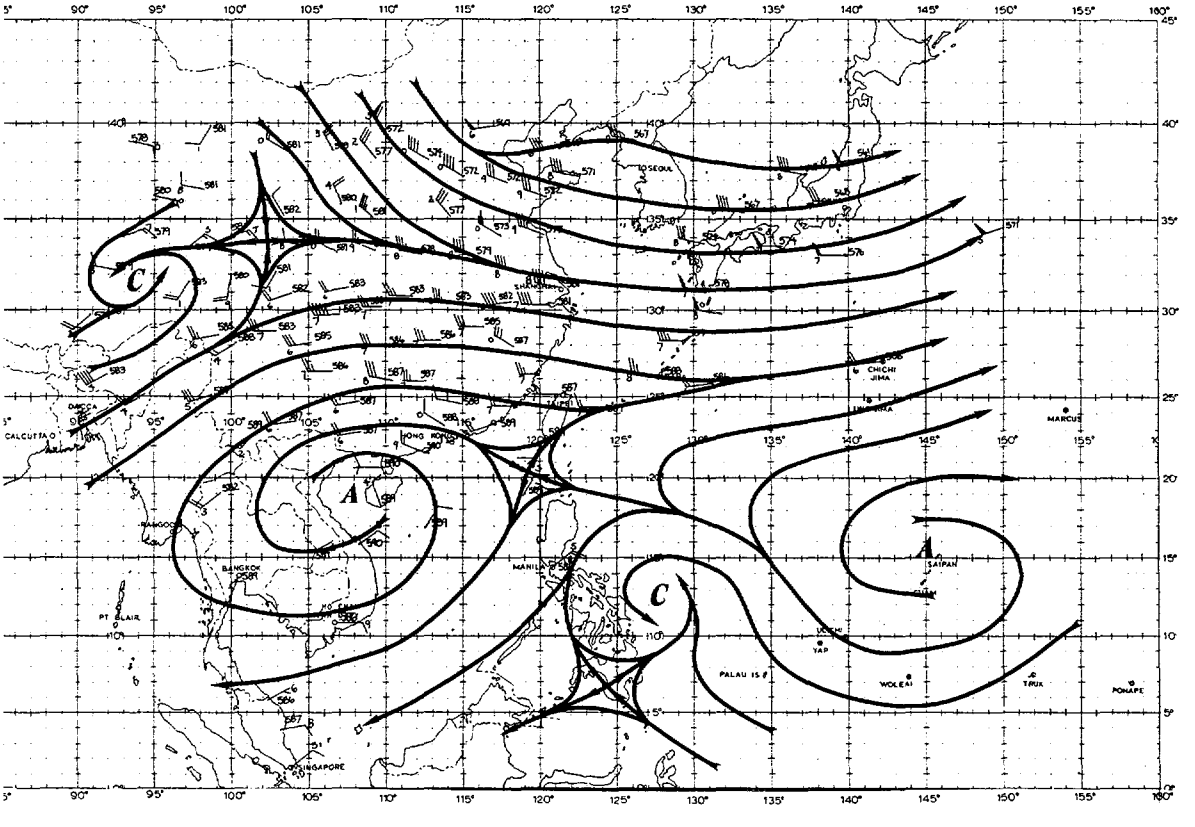


*Figure 3-04-1. 500 mb streamline analysis at 181200Z May which shows Pat just south of an apparent weakness in the subtropical ridge. There had been no appreciable height-fall changes over a 24-hour period when Pat suddenly changed from a westward-moving to northward-moving tropical cyclone.*

expected building of the ridge had not materialized; yet until 18 May, Pat persisted on its westward track. Then abruptly at 180600Z, Pat turned northward and paralleled the eastern portion of the Philippines for two days. Aircraft reconnaissance data at 180940Z provided the first indication of a possible track change, which was later confirmed by satellite fixes from Detachment 1, 1WW, Nimitz Hill, Guam and radar fixes from Cataduanes Island (WMO 98447). At 190000Z, upon evaluation of the fix data and a reevaluation of the westward track forecast scenario, JTWC changed the forecast track northward and toward eventual recurvature. From that point forward, Pat presented no further track forecasting problems.

Shortly after turning northward, Pat began to rapidly intensify, aided by a 200 mb wind maximum that had moved north of Pat and had enhanced outflow channels to the northeast. At 211200Z, Typhoon Pat reached its maximum intensity of 105 kt (54 m/sec) (Figure 3-04-2). This rapid intensification was not fully anticipated as Pat was forecast to only attain minimal typhoon strength. When aircraft reconnaissance data at 192233Z reported 95 kt (49 m/sec) surface winds, this new information was factored into the next forecast which then called for Pat to attain maximum intensity within the ensuing 12 to 18 hours. Fortunately, Pat's increased intensity did not bring any destructive winds to the Philippines, previously hit by Tropical Storm Mamie (01) and Typhoon Nelson (02), despite approaches as close as 90 nm (167 km) to Cataduanes Island and eastern Luzon.

As Typhoon Pat approached 20N, a track toward the northeast became increasingly favorable. In recurvature, Pat began to accelerate in response to increasing mid- and upper-level westerly steering currents. A new method for forecasting the acceleration of northward-moving tropical cyclones, developed by JTWC personnel during the past year, was used to predict the point of initial acceleration as well as the rate of acceleration; Typhoon Acceleration Prediction Technique (TAPT) (Weir, 1982), utilizes 200 mb analysis data to determine possible future acceleration. First used on the 191200Z analysis data, TAPT accurately predicted acceleration to begin near 19N and gave excellent guidance on the speed of movement to 24N, where Pat slowed its forward speed and weakened from the effects of vertical wind shear on the system's organization.

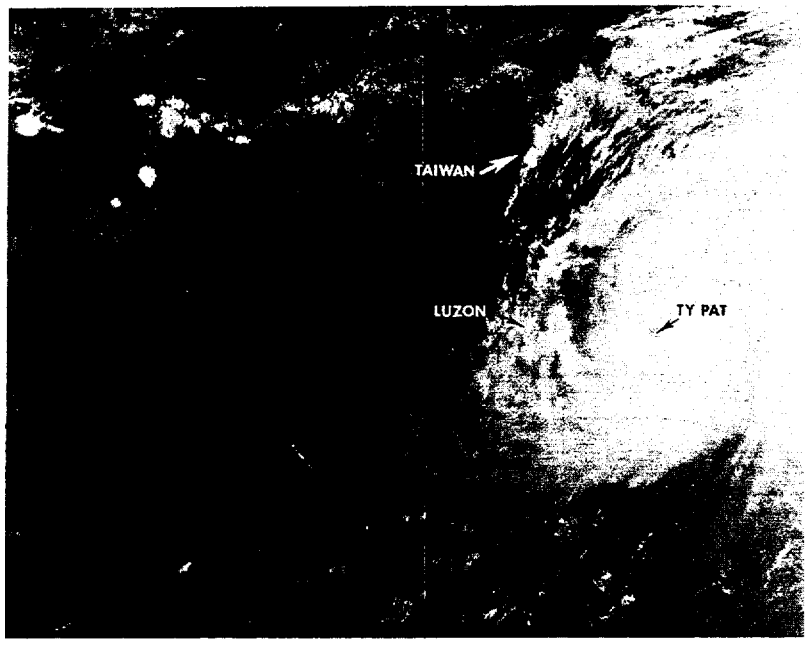


*Figure 3-04-2. Typhoon Pat near maximum intensity of 105 kt (54 m/sec), 150 nm (278 km) east of Luzon, 200641Z May (NOAA 7 visual imagery).*

On 22 May, as Typhoon Pat approached 24N, a weak frontal system (associated with an extratropical low east of Japan) was moving toward Pat and the first indications of Pat's eventual transition to an extratropical low were observed. Since 211600Z, there had been a marked decrease in Pat's deep-layer convection; additionally, aircraft reconnaissance data at 220955Z indicated that the central sea level pressure had risen to 988 mb. Although observed winds were still near typhoon strength, the maximum winds were observed at distances much further from the center than in previous missions. These expanding wind radii are frequently associated with tropical cyclones undergoing extratropical transition as the cyclone's energy source changes from latent heat release to a more baroclinic process. By 221200Z, synoptic data gave evidence of the incursion of cool, dry air into Pat's center and satellite imagery showed the system merging into a weak frontal boundary. Transition to an extratropical low was completed by 230000Z and this low gradually dissipated during the subsequent 24 hours as it was drawn into a stronger extratropical system, east of Japan.