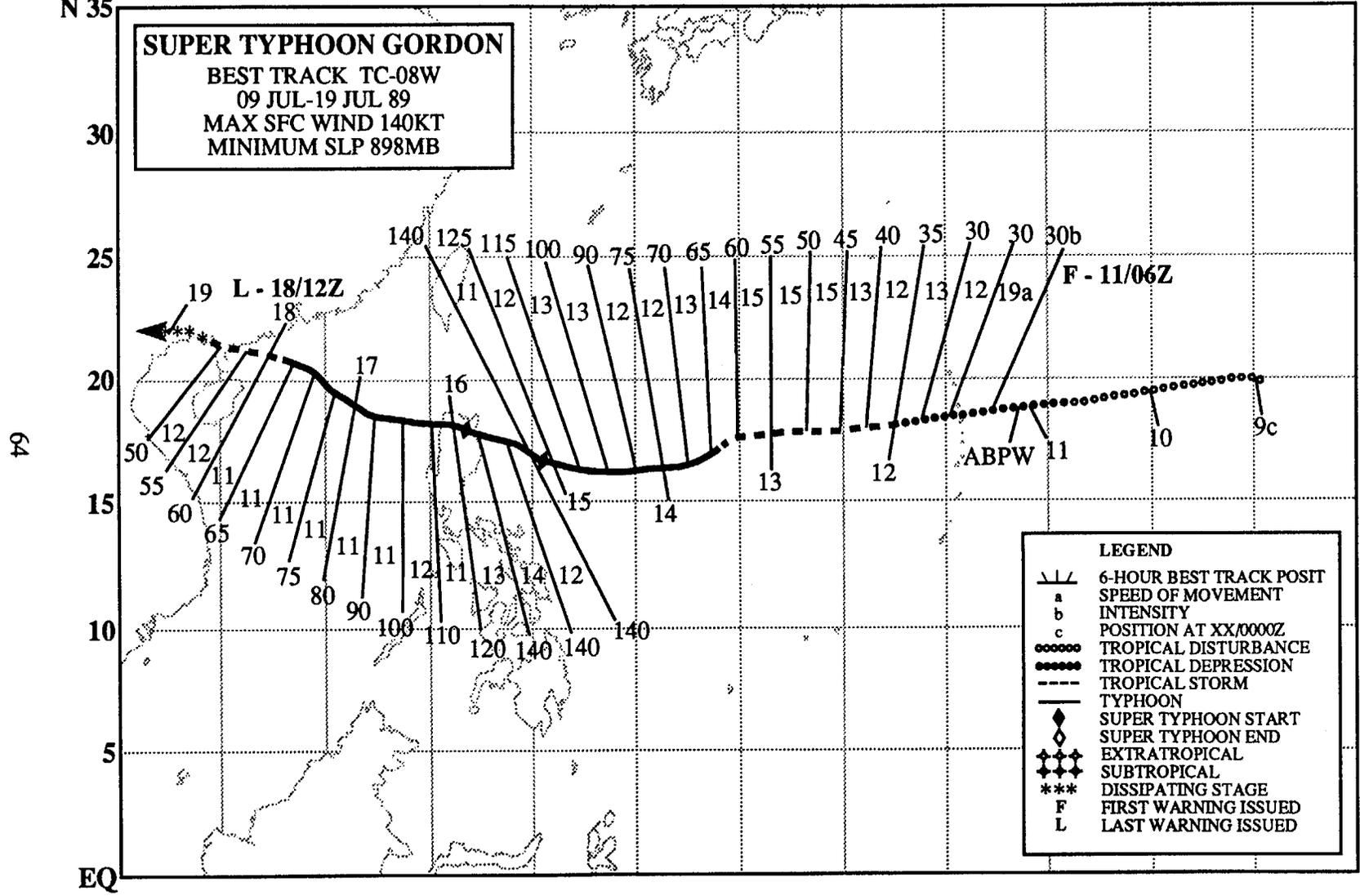


E 105 110 115 120 125 130 135 140 145 150 155 160 165 E
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SUPER TYPHOON GORDON
 BEST TRACK TC-08W
 09 JUL-19 JUL 89
 MAX SFC WIND 140KT
 MINIMUM SLP 898MB



SUPER TYPHOON GORDON (08W)

The second super typhoon in the western North Pacific for 1989, Gordon was also the second of seven significant tropical cyclones to form in July. The system was unique in that it developed from a single cumulonimbus directly beneath a cyclonic cell in the Tropical Upper-Tropospheric Trough (TUTT). The cumulo-

nimbus was initially small, but underwent a dramatic rapid, almost explosive, deepening phase.

At the start of the second week of July, Tropical Storm Faye (07W) was affecting the Philippine Islands. Aloft, the TUTT, which

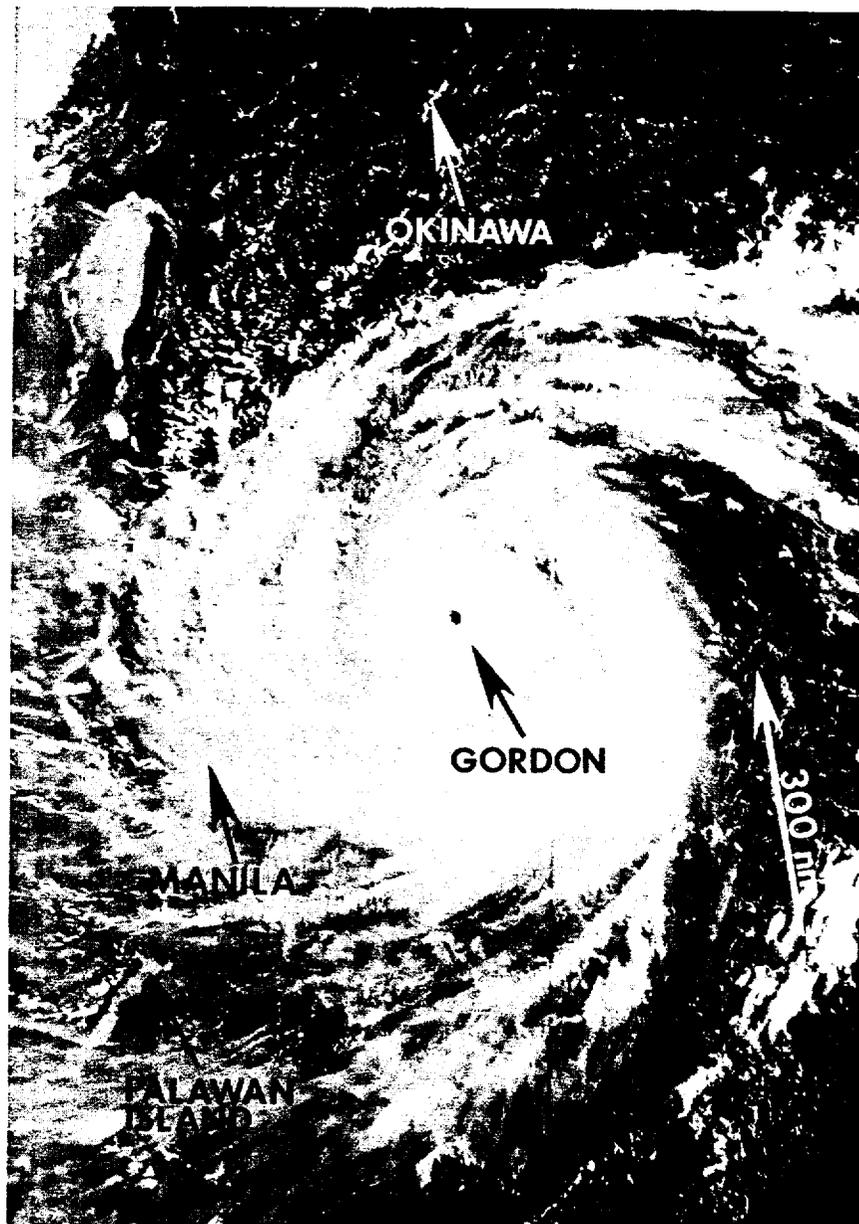


Figure 3-08-1. Typhoon Gordon four hours before reaching super typhoon intensity. The eye diameter is 20 nm (37 km) (142304Z July DMSP visual imagery).

extended eastward, was the major upper-tropospheric feature. It overlaid an extensive cloud minimum area that extended eastward to the date line. Just to the west of Wake Island on 9 July, a discrete cloud system became associated with a deep TUTT low.

On 11 July after the early morning convective maximum, a very small, ragged central dense overcast persisted, and the Significant Tropical Weather Advisory was reissued at 110200Z to include the system. Subsequent satellite imagery indicated the system's vigorous central convection was expanding rapidly, too rapidly to enable JTWC to issue a Tropical Cyclone Formation Alert. As a result, an abbreviated warning was issued on Tropical Depression 08W at 110400Z, followed by the first 72-hour warning at 110600Z. This development was unusual. Gordon appeared to blossom directly beneath the upper cold low. This was in contrast to the normal sympathetic development of convection to the south and east of the upper low (Sadler, 1976). To our knowledge such a distal development has never been documented. Sadler (1974) does discuss a similar development where convection wraps around the TUTT cell, finally converting the cold-core cyclone to a warm-core one. This is generally a slow process. He also alludes to occasional cumulonimbus near the center of TUTT cells as a clue to locating their centers, but does not discuss the development of tropical cyclones from the thunderstorms.

The system's track was west-southwest to westward for two days, becoming west-northwestward as Gordon approached the Philippine Islands. The guidance from the NOGAPS fields correctly foretold that no break in the subtropical ridge would occur, and that Gordon's westward movement would be uninterrupted.

Initially, forecasters expected slow to normal intensification as the TUTT restricted the system's upper-level outflow. However, the depression was quickly upgraded to Tropical

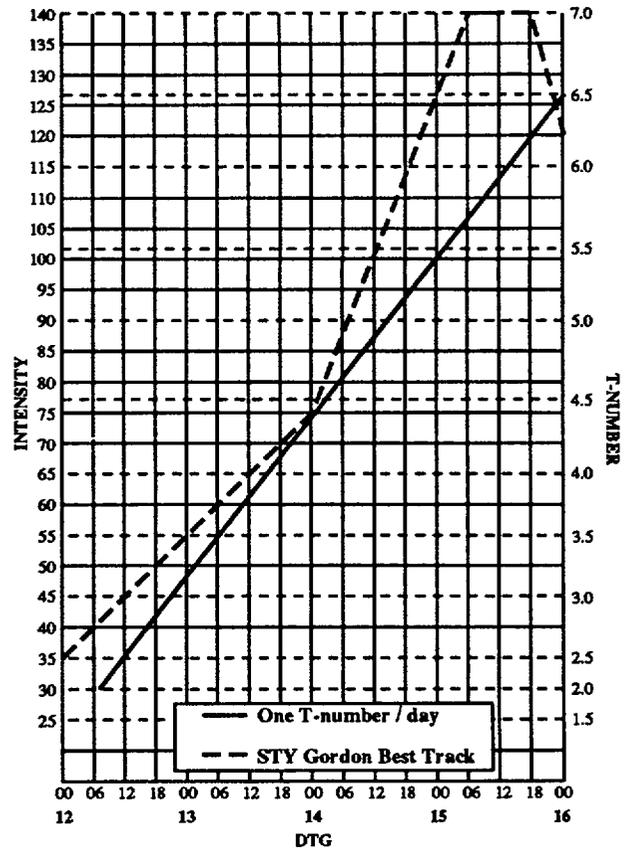


Figure 3-08-2. Gordon's rapid intensification after 140000Z compared with an increase of one "T" number per day.

Storm Gordon 24 hours after the initial warning, to typhoon after 48 hours, and to super typhoon after 96 hours (Figure 3-08-1). In only 30 hours from 140000Z to 150600Z, Gordon intensified rapidly - two-and-one-half "T" numbers (Figure 3-08-2). This represents an estimated 70-mb fall in central pressure over this period, or a deepening rate of 2.3 mb/hr, just short of the 2.5 mb/hr required for explosive deepening (Dunnavan, 1981).

Super Typhoon Gordon slammed into the rice-producing region of northern Luzon with maximum sustained winds of 140 kt (72 m/sec). News reports indicated that 27 people died, 15 were missing, at least 120,000 were evacuated and thousands were left homeless in its wake. To the south, the peak winds reported from US military installations in the Philippines were 68 knots (35 m/sec) at Wallace AS, 54

knots (28 m/s) at John Hay AB, 40 kt (21 m/sec) at Cubi Point NAS (WMO 98426), and 18 kt (9 m/sec) at Clark AB(WMO 98327). John Hay AB also recorded a total of 29.8 inches (747 mm) of rain. The SS OVERSEAS VIVIAN reported 35 kt (18 m/sec) sustained winds as it approached Subic Bay late on 15 July when Gordon was more than 200 nm (370 km) away.

After exiting northern Luzon, the

typhoon moved west-northwestward across the South China Sea and passed 100 nm (185 km) to the southwest of Hong Kong at 171800Z (Figure 3-08-3). U.S. Navy ships in port at Hong Kong had sortied 24 hours earlier. Though the system was weakening as it made landfall near the coastal city of Zhanjiang, 215 nm (398 km) west-southwest of Hong Kong, where Gordon inflicted more fatalities and property loss. The final warning was issued at 181200Z, as Gordon left the Leizhou peninsula.

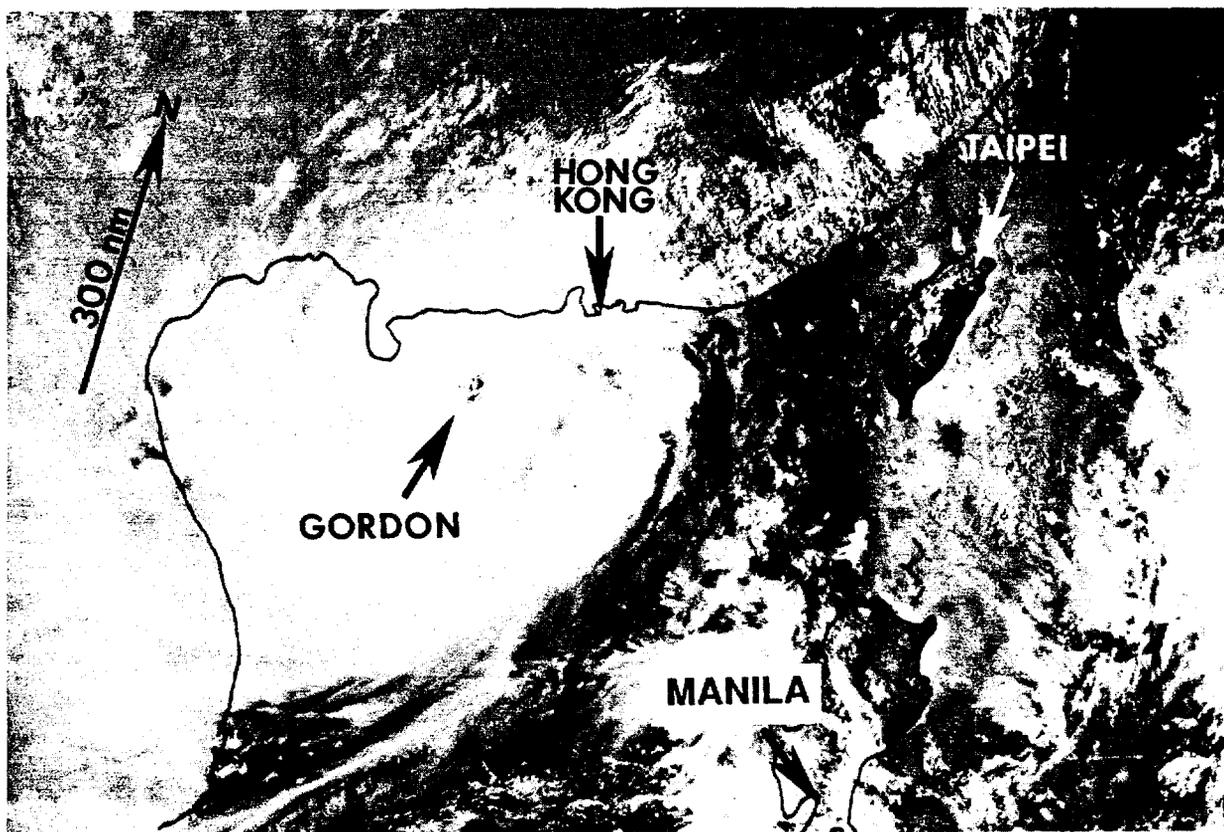


Figure 3-08-3. The large ragged eye is visible as Tropical Storm Gordon moves southwest of Hong Kong (180126Z July DMSP visual imagery).

During the next three hours, Gordon's area of convection (Figure 3-08-4) expanded nearly three times in size as it moved across the shallow, warm waters of the Gulf of Tonkin. Synoptic data indicated continued weakening

during the convective expansion. The remnants of Gordon were identifiable on satellite imagery for the next 24 hours as the dissipating system moved into the mountains of northern Vietnam.



Figure 3-08-4. Tropical Storm Gordon (above) enters northern Gulf of Tonkin (181115Z July DMSP enhanced infrared imagery) and (below) Gordon's area of convection expands rapidly (181407Z July DMSP enhanced infrared imagery).

