3.4.2 Tropical Storm and Super Typhoon Striking The Visayas

Tropical Storm Thelma, 27 October–08 November 1991

TS Thelma is described to emphasize that tropical cyclones that do not attain typhoon intensity can still be deadly. Tropical Storm Thelma caused the worst loss of life due to natural disaster in the western North Pacific during 1991. An estimated 6000 people perished and 20,000 people were left homeless resulting from the passage of the tropical storm.

After persisting for four days as a tropical disturbance, Thelma was made the subject of a Tropical Cyclone Formation Alert (TCFA) at 311900Z October 1991 (see Fig. 3.12). Following a satellite-derived intensity report of 25 kt, Thelma became the 27th tropical cyclone of the western North Pacific for 1991, as a Tropical Depression Warning was issued at 1200Z on 1 November 1991. Approximately one week after being detected as a disturbance, Thelma was upgraded to a Tropical Storm (35 kt) at 031200Z. Simultaneously, the tropical cyclone commenced a track toward the west-southwest. Thelma made landfall on the island of Samar at approximately 041800Z, and continued on a course toward the southwest until 051200Z. As recalled by the author, the satellite imagery depicting Thelma was unimpressive, i.e., a forecaster might mistakenly expect no serious results from its passage. However, torrential rains dumped an estimated 6 inches of water in 24 hours, as the tropical storm passed over the island of Leyte. It is noted that the estimated winds had decreased to 40 kt over Leyte (see Fig. 3.12), just six hours after making landfall on Samar, and the maximum sustained winds remained at 35 kt as it finally departed the PI, moving westward from central Palawan.

The catastrophic events resulting from the passage of Tropical Storm Thelma—despite its never attaining typhoon strength—were attributed to widespread logging (stripping the hills bare of vegetation) in recent years above the port city of Ormoc on Leyte Island. Ormoc, lying approximately 25 nm southwest of Tacloban (see Fig. 1.1) experienced the effects of a dam failure, landslides and extensive flash flooding (U. S. NOCC/JTWC 1992)

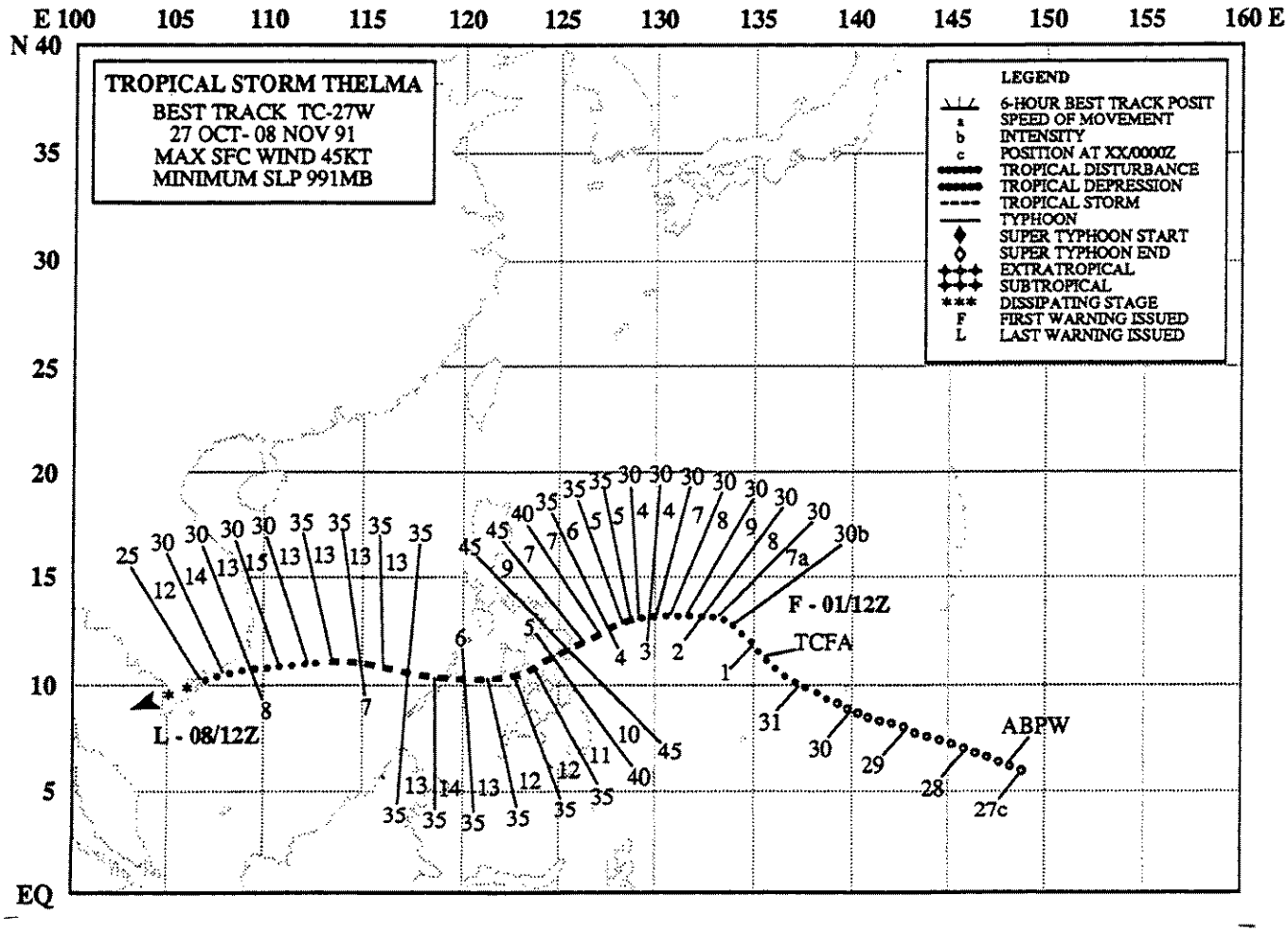

Figure 3.12: Official Best Track of Tropical Storm Thelma (adapted from U.S. NOCC/JTWC 1992)

As depicted in Fig. 3.13, the initial JTWC warnings on Thelma predicted recurvature. Objective aid guidance available to JTWC was split between recurvature and non-recurvature forecasts. A quick inspection of the figure also indicates the predominance of "persistence" forecasts, i.e., forecasting the continuation (or persistence) of the past motion vectors.

In retrospect, Beta advection models (such as FBAM) (not shown) exhibited some limited skill in providing early prognosis of the west-southwestward movement of Thelma that occurred for approximately 48 hours, after 031200Z (U. S. NOCC/JTWC 1992). Note, that Thelma followed the Thumb Rule (Section 2.3.2) that TCs approaching the PI, moving southwestward, tend to move more westward—at least Thelma moved westward, starting at 051200Z. However, Thelma's general west-southwestward track for 48 hours, between 031200Z and 051200Z, exceeded the 18–24 hours expected for a west-southwest track in the Thumb Rules.

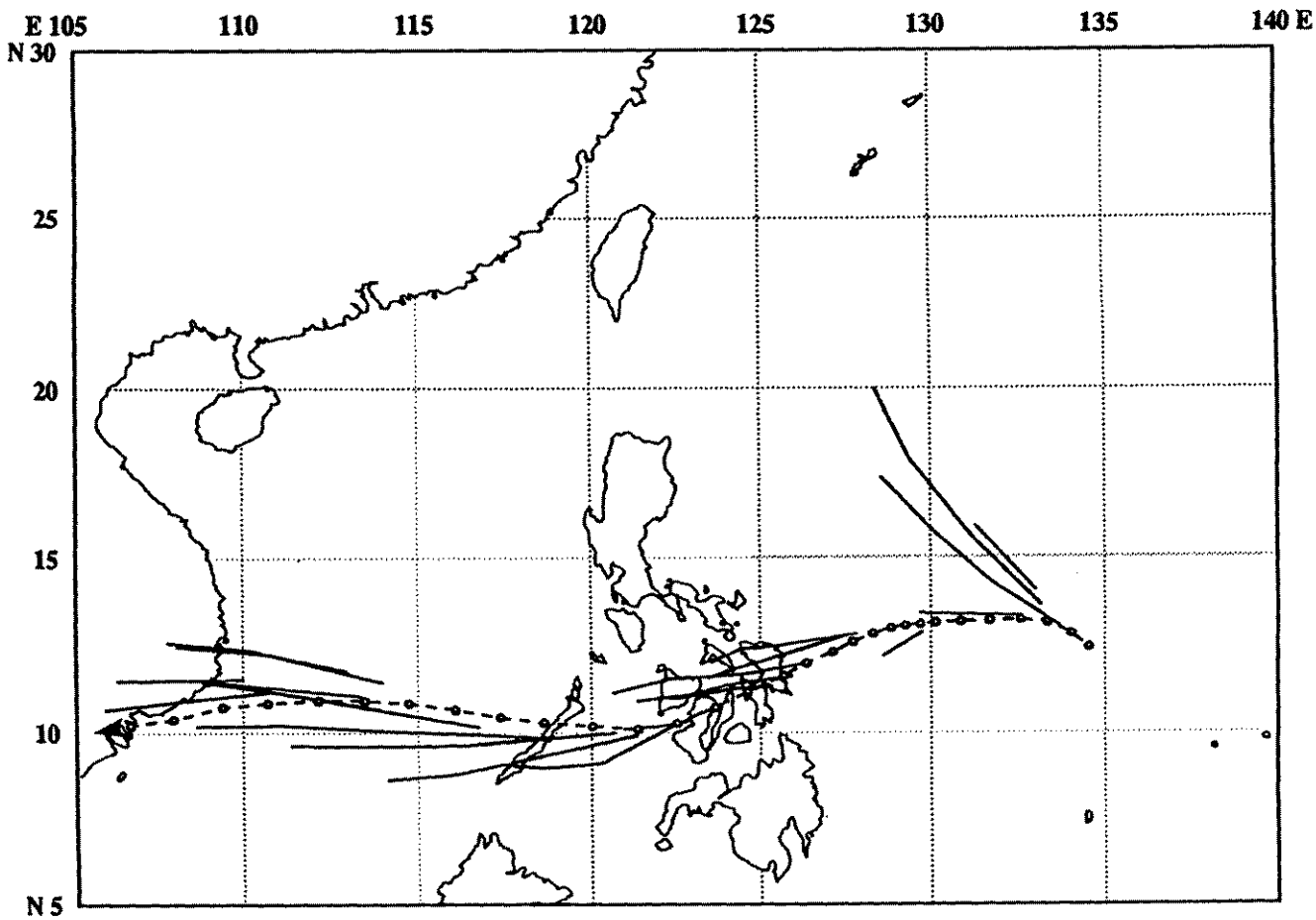

Figure 3.13: Comparison of the JTWC Official Forecasts (solid lines) issued for Thelma superimposed on the Final Best Track (dashed lines)(adapted from U. S. NOCC/JTWC 1992)

Super Typhoon Mike, 6–18 November 1990

The reader must keep in mind that the title of a tropical cyclone indicates the strongest intensity during its history. Thus a tropical cyclone could be *only* a typhoon, tropical storm or less while passing over the Philippine Islands, yet be a super typhoon before or after hitting the PI. As shown in Fig. 3.14 Super Typhoon Mike decreased from a super typhoon to a typhoon at 1200Z on 12 November 1990, just before making landfall in Leyte. Nevertheless, in this instance the commercial and transportation capital of the region, Cebu (see Fig. 1.1)—while appearing to be protected by its interior position—received severe damage.

Mike, which had tracked generally west-northwestward since its first warning at 071200Z, slowed to a speed of motion of only 5 kt, dipped to the southwest, developed a 15 nm eye and intensified rapidly to super typhoon strength at 101200Z. Providing divergence aloft were dual outflow channels carrying mass out of the center of the TC (not shown). One channel led to a 200-mb trough to the northeast, while the other crossed the Equator to the Southern Hemisphere. Resuming its track toward the northwest and passing only to within 45 nm of Koror a couple of hours later, the super typhoon caused extensive damage to this island east of Mindanao near 7.5°N, 134.5°E.

With the increased friction provided by the mountainous island chain in the path of the super typhoon, the weakening of Mike was revealed on satellite imagery by a ragged and cloud-filled eye. This change in the satellite imagery prompted the downgrading of Mike to a typhoon before the TC made landfall on Leyte, with maximum sustained winds of 120 kt winds, shortly before 121800Z. Mike then remained a typhoon while crossing the PI and the South China Sea (see Fig. 3.14).

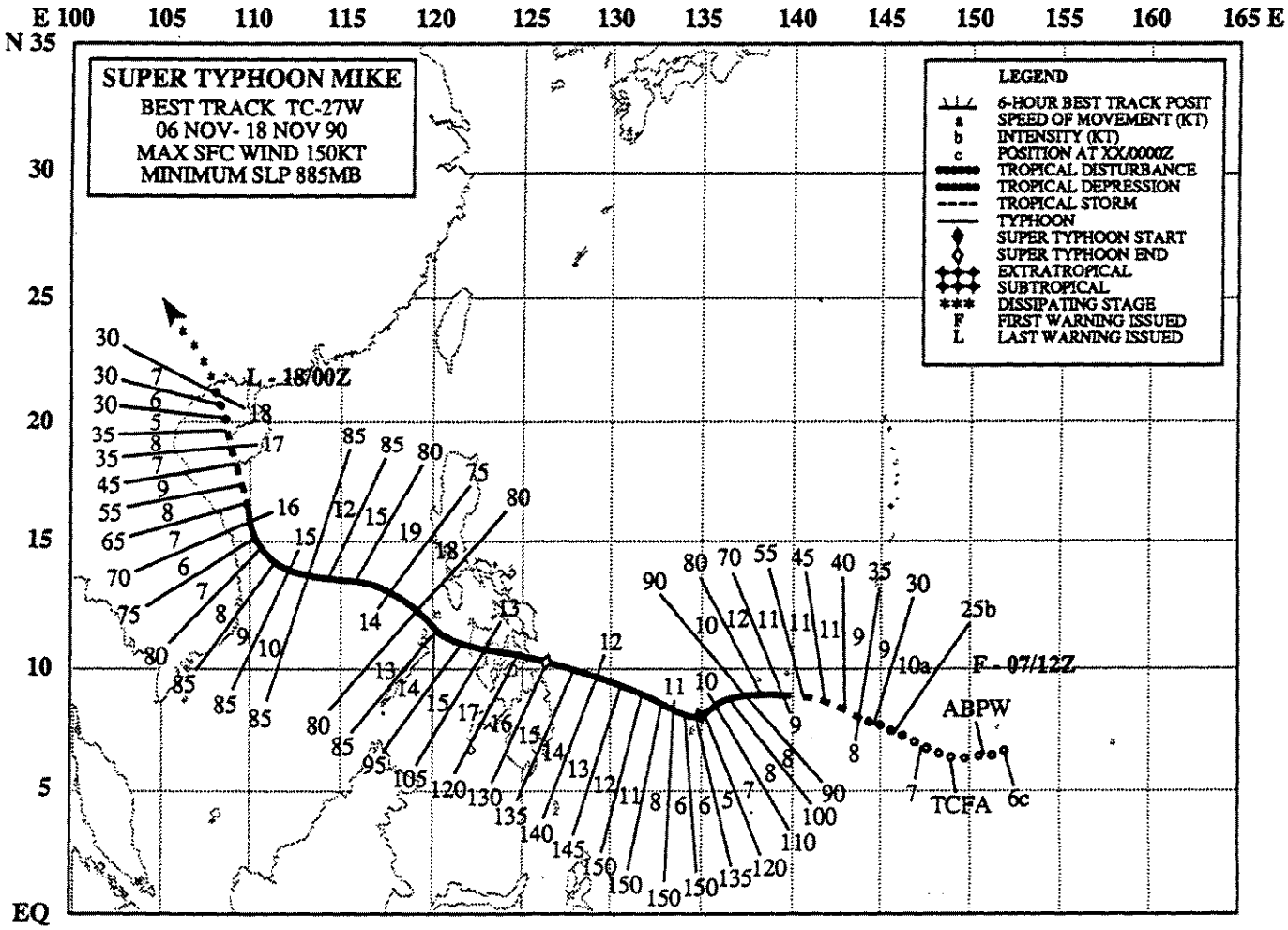

Figure 3.14: Official Best Track of Super Typhoon Mike (adapted from U.S. NOCC/JTWC 1991)

Figure 3.15 displays the JTWC official forecasts in comparison with the eventual best track of Mike. Earlier forecasts that the tropical cyclone would miss the PI, were prompted by objective aids guidance, including NOGAPS, that a weakness would develop in the ridge, just east of the Luzon, permitting a more northwesterly track. Fortunately, at 120000Z, the NOGAPS prognostics changed to predict a stronger subtropical ridge north of Mike. This supported JTWC's west-northwest forecast tracks across the central PI for about 18 hours preceding landfall.

Super Typhoon Mike was the most powerful typhoon to strike the Philippine Islands during 1990, and the most devastating since 1981. At least 250 people were dead or missing, mostly from landslides, while 2 million people were forced into temporary shelters. Over 37,000 houses were destroyed, and at least $ 14 million damage recorded. More than 57 water craft, mostly in the port of Cebu, sank (U. S. NOCC/JTWC 1991).

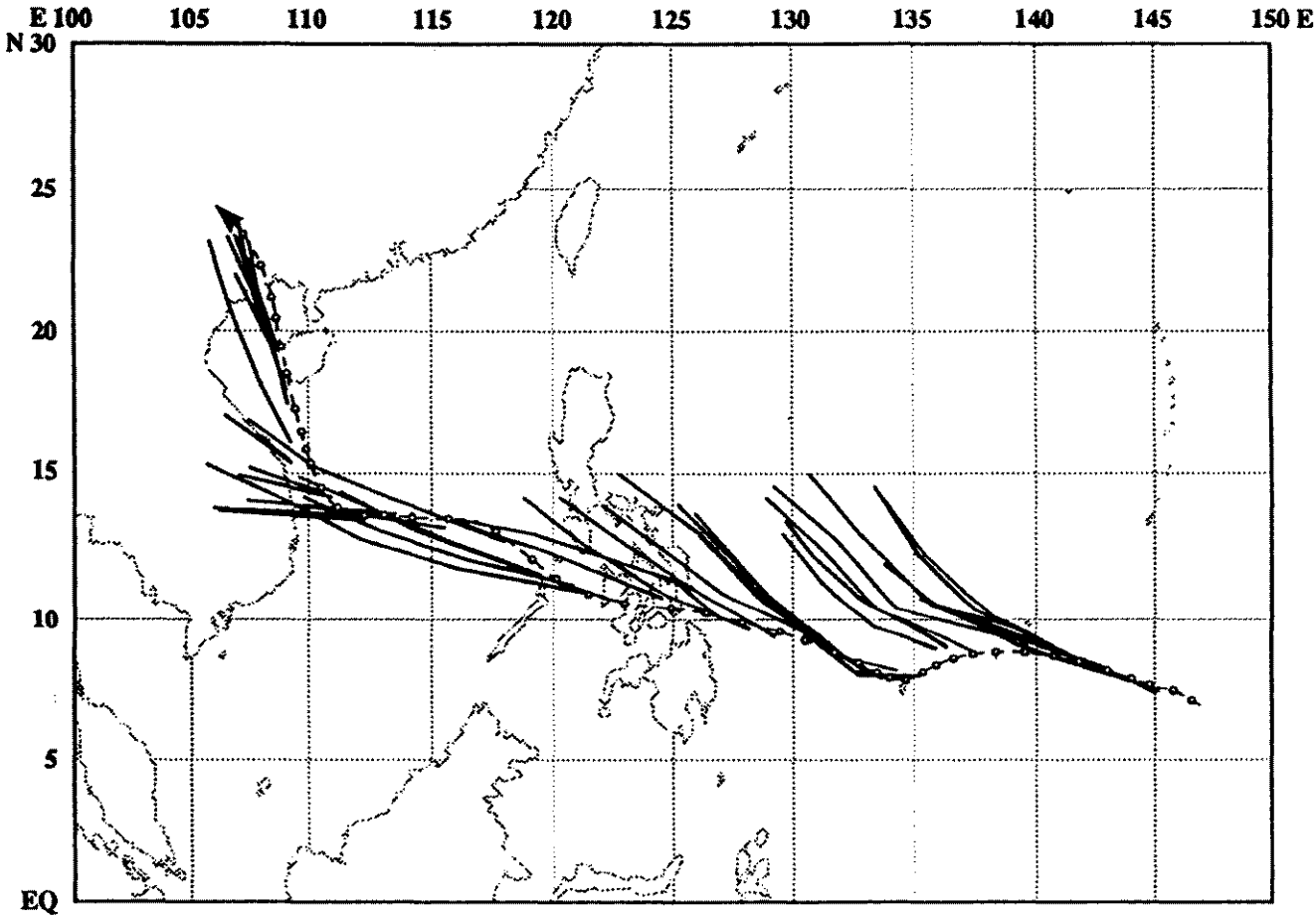

Figure 3.15: Comparison of the JTWC Official Forecasts (solid lines) issued for Mike superimposed on the Final Best Track (dashed lines)(adapted from U. S. NOCC/JTWC 1991)

To date, the forecasting of tropical cyclone intensity remains one of the most difficult tasks. Accordingly, it is encouraging to note that the rapid intensification of Mike—even to the super typhoon stage—was very ably performed by JTWC. Section 3.3.3 introduced the Dvorak technique of analyzing and forecasting TC intensity and discussed the Current Intensity Number (CI). Figure 3.16 shows impressive warning intensities compared to the final best track intensities during the greater than normal rate of intensification of Mike between 081200Z and 101800Z (U. S. NOCC/JTWC 1991).

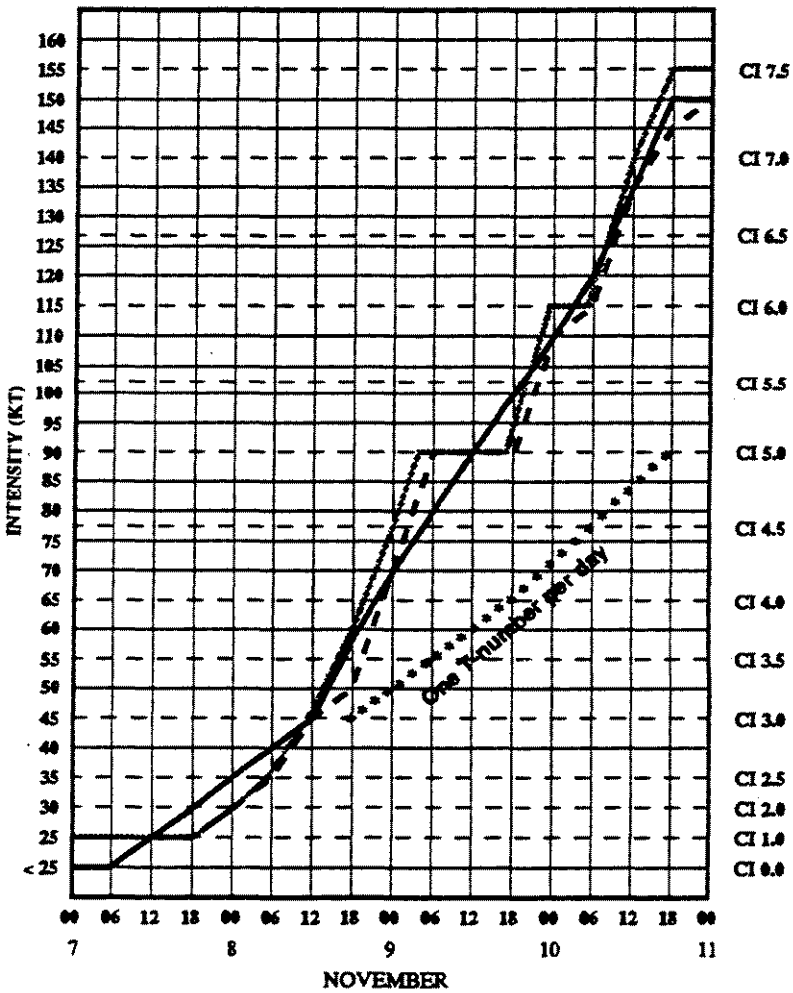

Figure 3.16: Plots of the Satellite Current Intensity Values (dotted line), Actual Warning Intensities (dashed line) and Final Best Track (solid line) on a Time-Intensity Comparison Chart for Mike. The normal development of one T-number per day (starred line) is included as a reference (U. S. NOCC/JTWC 1991).