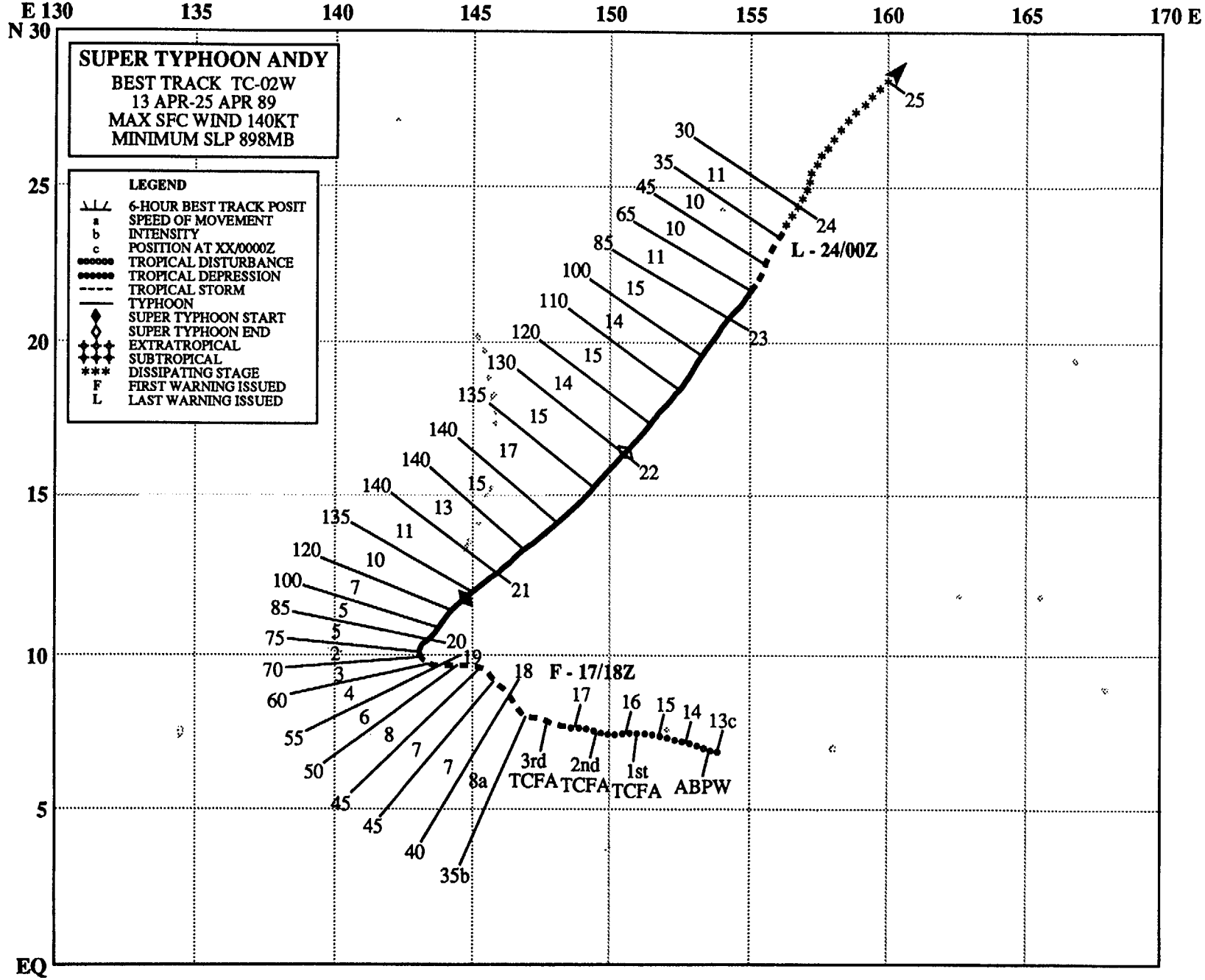

SUPER TYPHOON ANDY
BEST TRACK TC-02W
13 APR-25 APR 89
MAX SFC WIND 140KT
MINIMUM SLP 898MB
LEGEND
6-HOUR BEST TRACK POSIT
a SPEED OF MOVEMENT
b INTENSITY
c POSITION AT XX/0000Z
TROPICAL DISTURBANCE
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON
SUPER TYPHOON START
SUPER TYPHOON END
EXTRATROPICAL
SUBTROPICAL
*** DISSIPATING STAGE
F FIRST WARNING ISSUED
L LAST WARNING ISSUED
E 130
135
140
145
150
155
160
165
170 E
N 30
25
20
15
10
5
EQ
L - 24/00Z
F - 17/18Z
3rd TCFA
2nd TCFA
1st TCFA
ABPW

SUPER TYPHOON ANDY (02W)

For the western North Pacific, Andy was the second typhoon in the past nine years to form in April, the first super typhoon of 1989 and the first typhoon of the year to seriously threaten Guam.

The weather pattern the second week of April mirrored climatology with brisk, east-northeast trade winds dominating the low latitudes and only token deep convection. However, by the close of the week, the trade winds became lighter and equatorial westerlies replaced the cross-equatorial flow, or buffer, as Tropical Cyclone 26S (Orson) developed south of the equator in the Arafura Sea. North of the equator increased convection persisted near Truk Atoll in the eastern Caroline Islands. This increased convection was first mentioned in the Significant Tropical Weather Advisory at 130600Z. Continued cloud development prompted the first Tropical Cyclone Formation Alert at 151430Z. Intensification of the system (Figure 3-02-1) was slow, however, and follow-on Alerts were issued at 161430Z and 171430Z.

As this area slowly moved westward and gradually intensified, it was finally upgraded at 171800Z to Tropical Depression 02W. Data from the Automated Meteorological Observing Station (AMOS) installed in 1988 on Faraulep Island (WMO 52005) in the central Carolines became very important as it monitored the

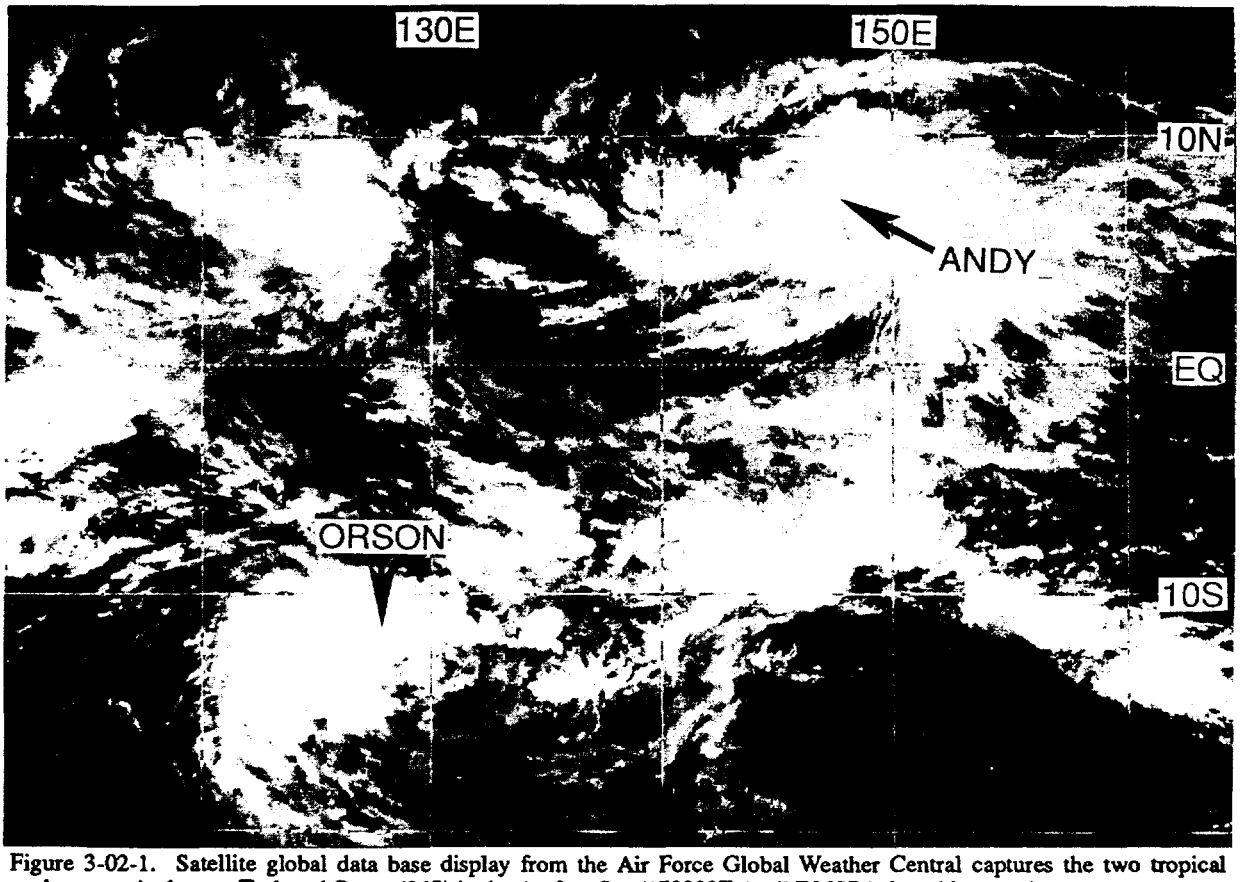


Figure 3-02-1. Satellite global data base display from the Air Force Global Weather Central captures the two tropical cyclones — Andy near Truk and Orson (26S) in the Arafura Sea (170000Z April DMSP infrared imagery).

approach of the tropical cyclone (Figure 3-02-2). In this normally data sparse area the Faraulep AMOS provided needed observations of surface pressure, wind speed and direction which provided the ground truth for the satellite data. These AMOS data (Figure 3-02-3) reflected the change of Andy's track from the west to northwest at 171800Z. After the passage of a mid-latitude trough to the north of the system, the track returned to westward at 181200Z.

Following Andy's passage to the north of Faraulep and south of Guam, satellite fixes from 190530Z through 191730Z indicated it had ceased its westward movement and had

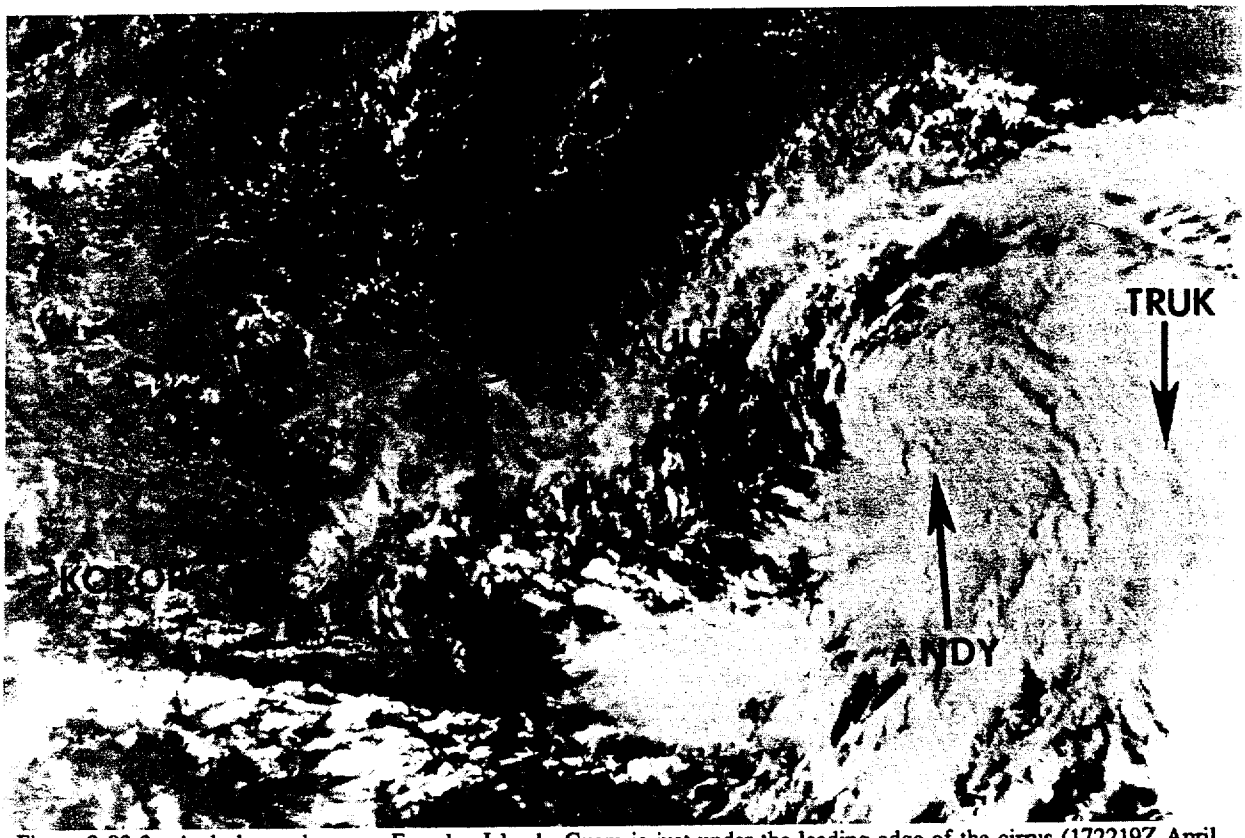


Figure 3-02-2. Andy bears down on Faraulep Island. Guam is just under the leading edge of the cirrus (172219Z April DMSP visual imagery).

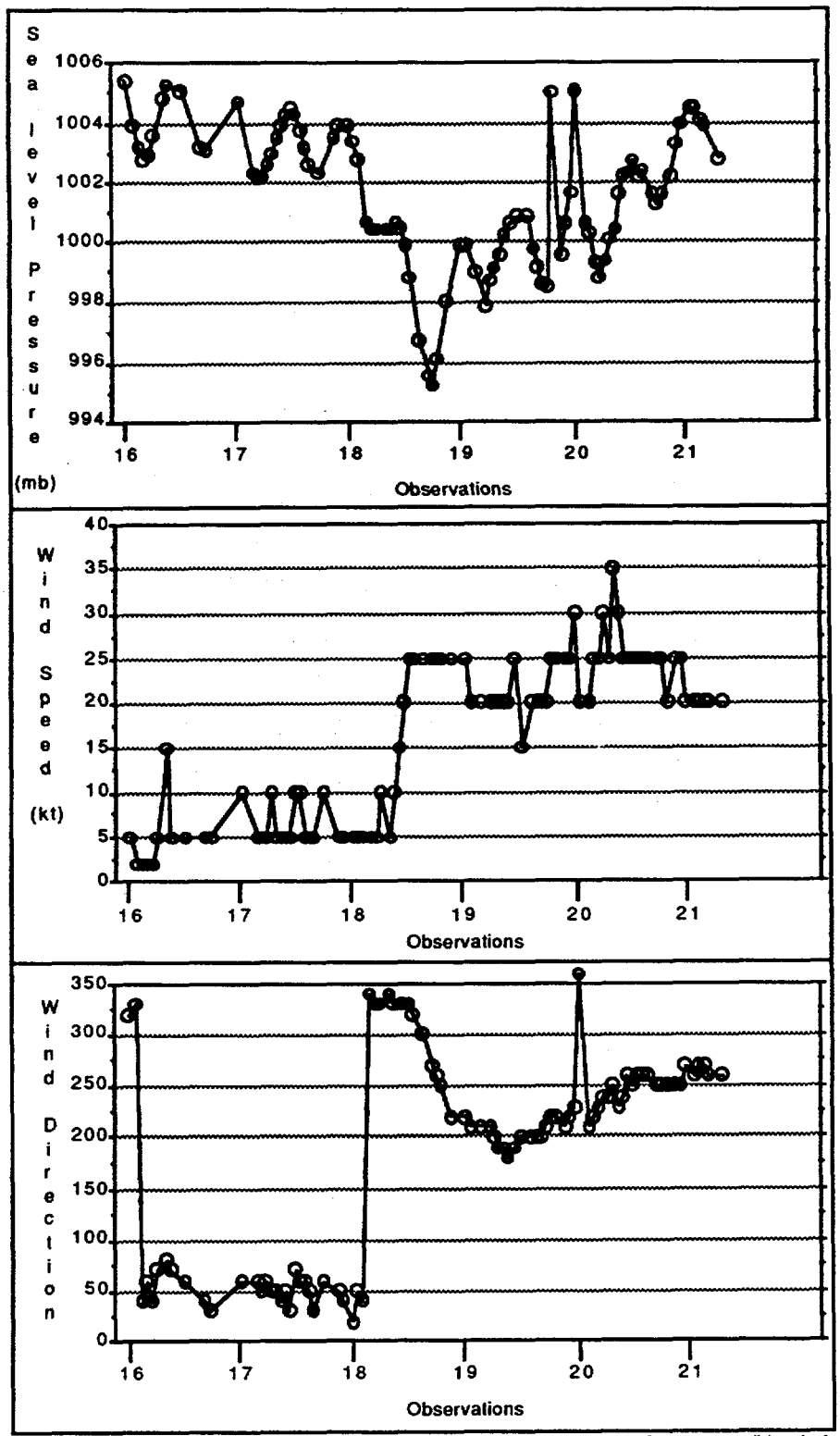


Figure 3-02-3. Faraulep AMOS reports showing: (a) time series of pressure, (b) wind speed and (c) wind direction. Andy's closest point of approach was at 181800Z. Note the major shift of wind direction and increase of wind speed preceded the lowest pressure.

begun to move to the north. Continued intensification (Figure 3-02-4) further aggravated the forecaster's dilemma. With recurvature possible as another mid-latitude trough moved eastward from Asia, there was an increasing threat to life and property in the Marianas. Until 200000Z, it appeared that the track would return to the west-northwest after a mid-latitude trough to the north progressed eastward and the lower tropospheric high pressure reestablished itself north of the cyclone. OTCM supported this synoptic assessment (Figure 3-02-5) in contrast to the climatological techniques, primarily CLIPER, which indicated a track to the north and just to the west of Guam. But Andy's continued slow northward movement required a reassessment of the synoptic situation. The track forecast was changed from west-northwestward to north, just west of Guam, followed by recurvature. The alternate forecast scenario became an early recurvature with passage southeast of Guam.

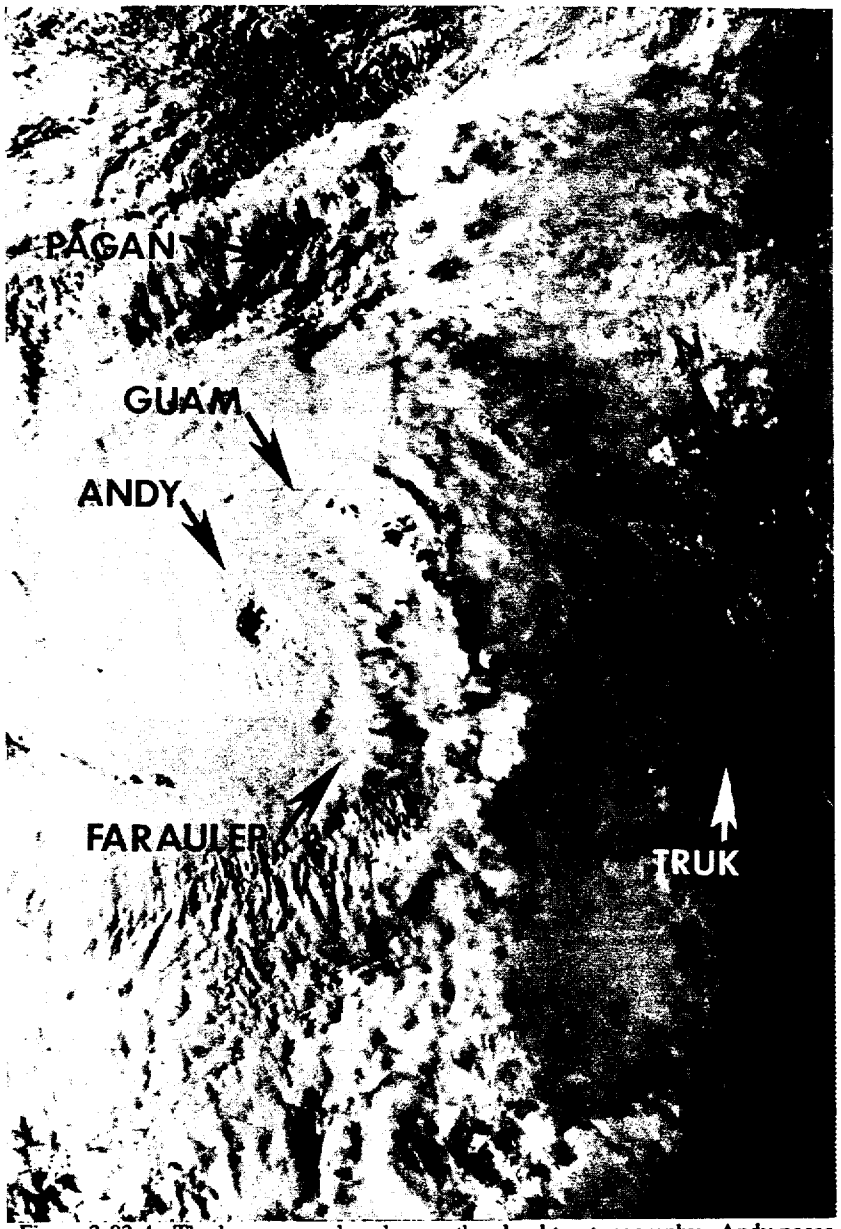


Figure 3-03-4. The low sun angle enhances the cloud top topography. Andy poses an imminent threat to the Marianas (210816Z April DMSP visual imagery).

The primary forecast held until 201700Z at which time it became apparent that recurvature had already taken place. A special tropical cyclone warning was issued with the updated forecast reflecting that Andy (Figure 3-02-6) would pass 45 nm (70 km) southeast of Guam.

Andy's closest point of approach (CPA) to Guam occurred at 202100Z 70 nm (130 km) to the southeast. The island was spared the intense maximum sustained winds near the center estimated to be 135-140 kt (69-72 m/sec). Sustained surface winds recorded on the island were 35-45 kt (18-23 m/sec) with peak gusts to 68 kt (35 m/sec). These resulted in crop damage, power outages and minor property damage, primarily due to fallen trees. In addition, torrential downpours caused localized flooding. At sea, the combat stores ship, **USS San Jose** came to the aid of a disabled fishing vessel in the path of the super typhoon.

After CPA, Andy continued to track northeastward and weaken as the vertical shear from the westerly winds aloft increased. Three days later, at 240000Z, when the central convection completely separated from the dissipating low-level circulation center (Figure 3-02-7), the final warning was issued.

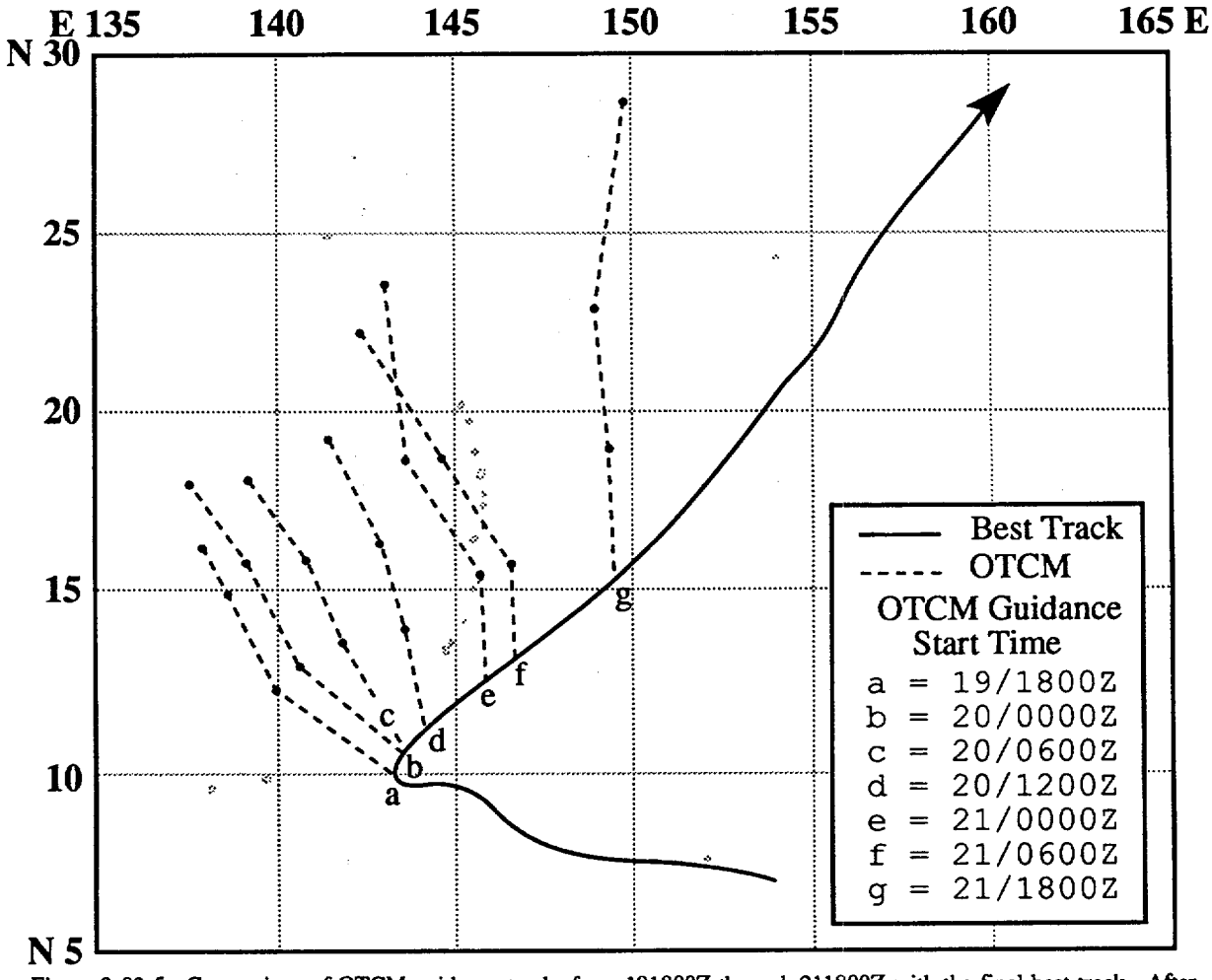


Figure 3-02-5. Comparison of OTCM guidance tracks from 191800Z through 211800Z with the final best track. After the start time for OTCM, the dots embedded in the dashed line indicate the location of the 24, 48 and 72 hour guidance.

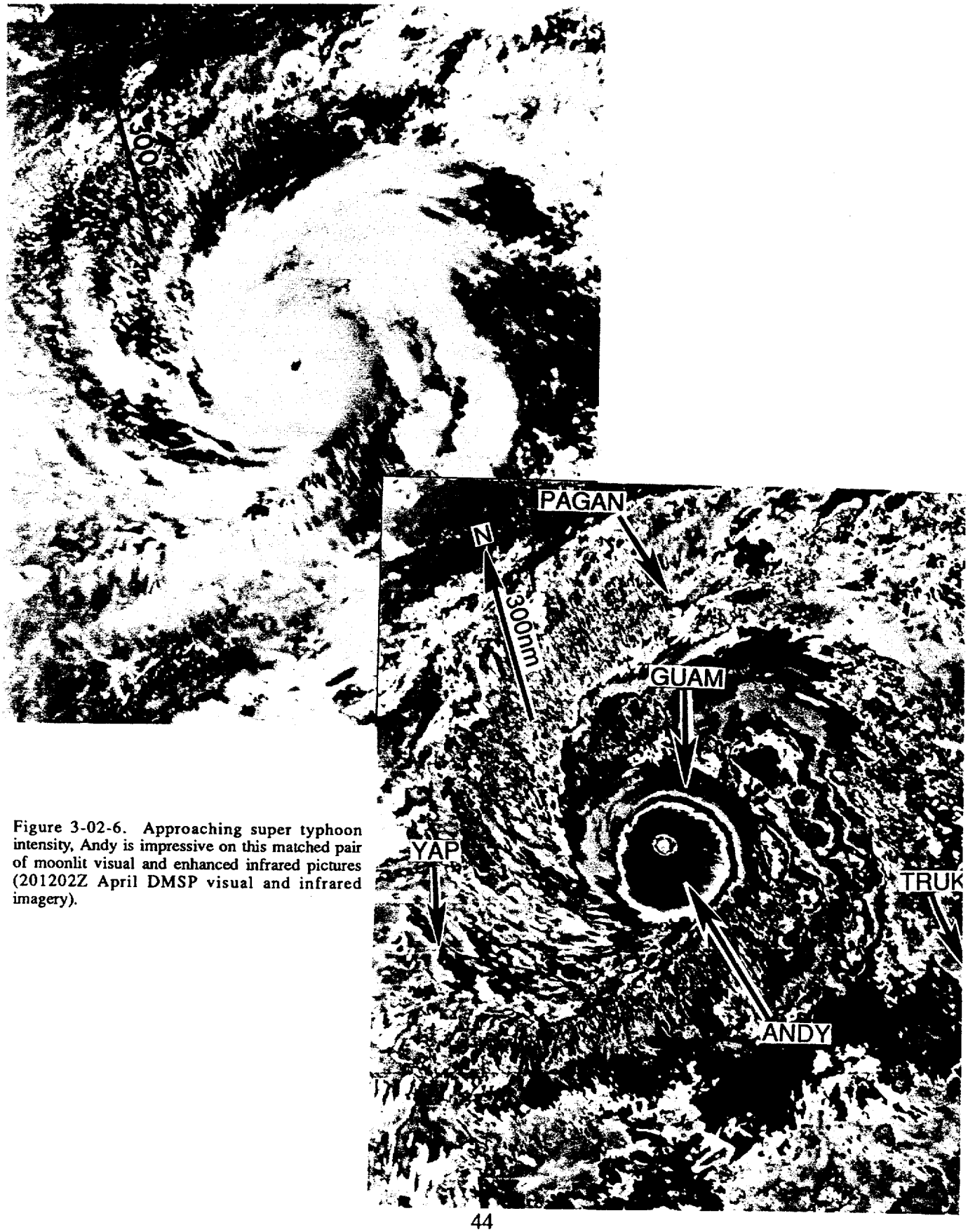


Figure 3-02-6. Approaching super typhoon intensity, Andy is impressive on this matched pair of moonlit visual and enhanced infrared pictures (201202Z April DMSP visual and infrared imagery).

As a point of interest, Figure 3-02-8 is included to deomonstrate the value of multi-spectral imaging. In the visual image the low-level eye is completely obscured; however, a part of it can be seen in the enhanced infrared image.

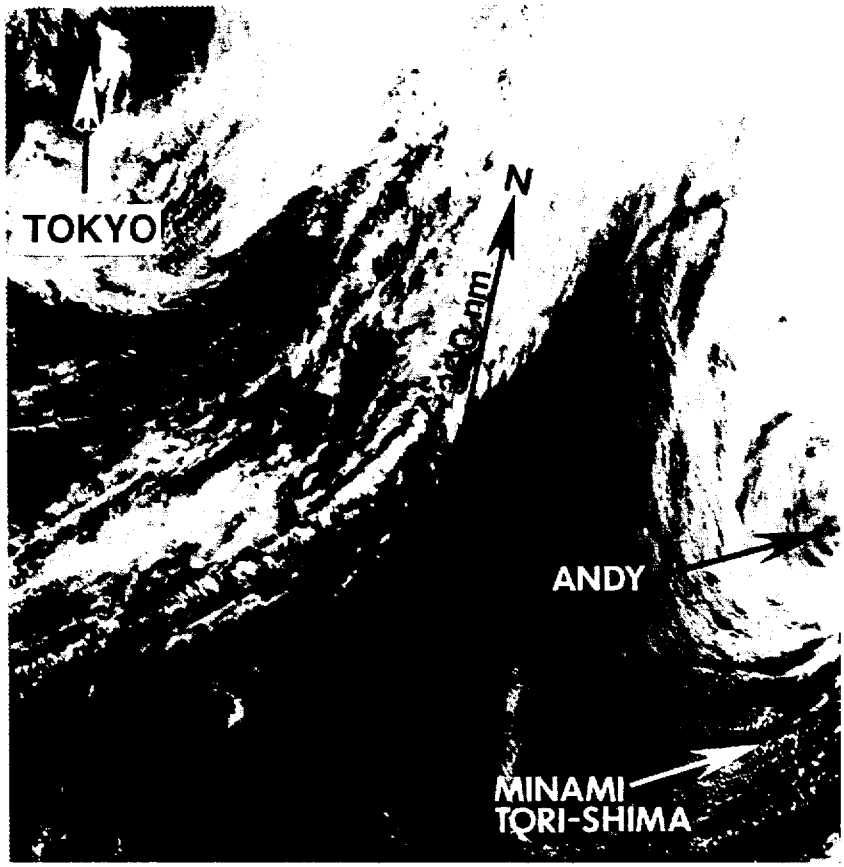
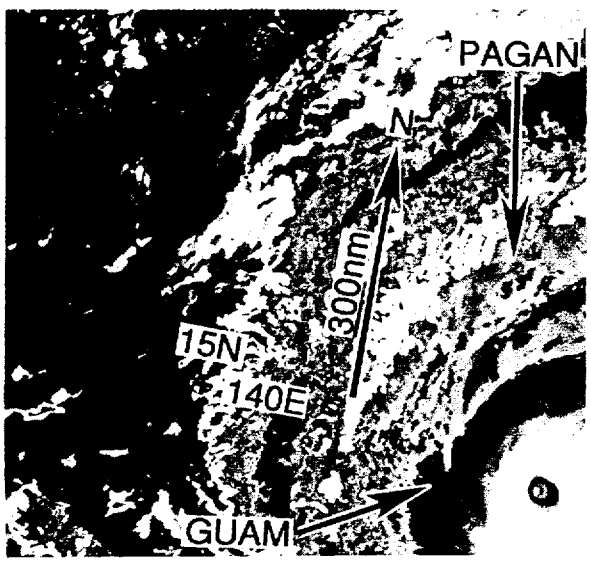


Figure 3-02-7. Remnants of Andy's low-level circulation (242322Z April DMSP visual imagery).



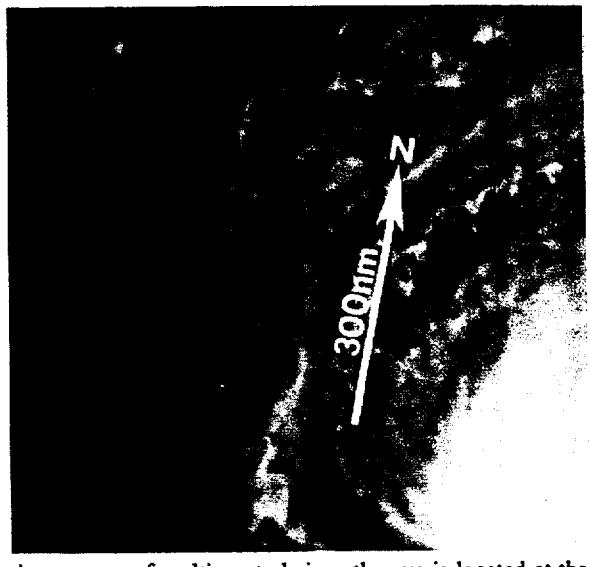


Figure 3-02-8. As Andy moves away from Guam, this picture pair shows the importance of multispectral since the eye is located at the extreme lower right edge of the polar orbiter image. Note a small portion of the low-level eye shows on the enhanced infrared (to the left). On the visual (to the right) the low-level eye is completely masked by the bright sunlight reflected from the eastern side of wall cloud (210434Z April NOAA visual and infrared imagery).