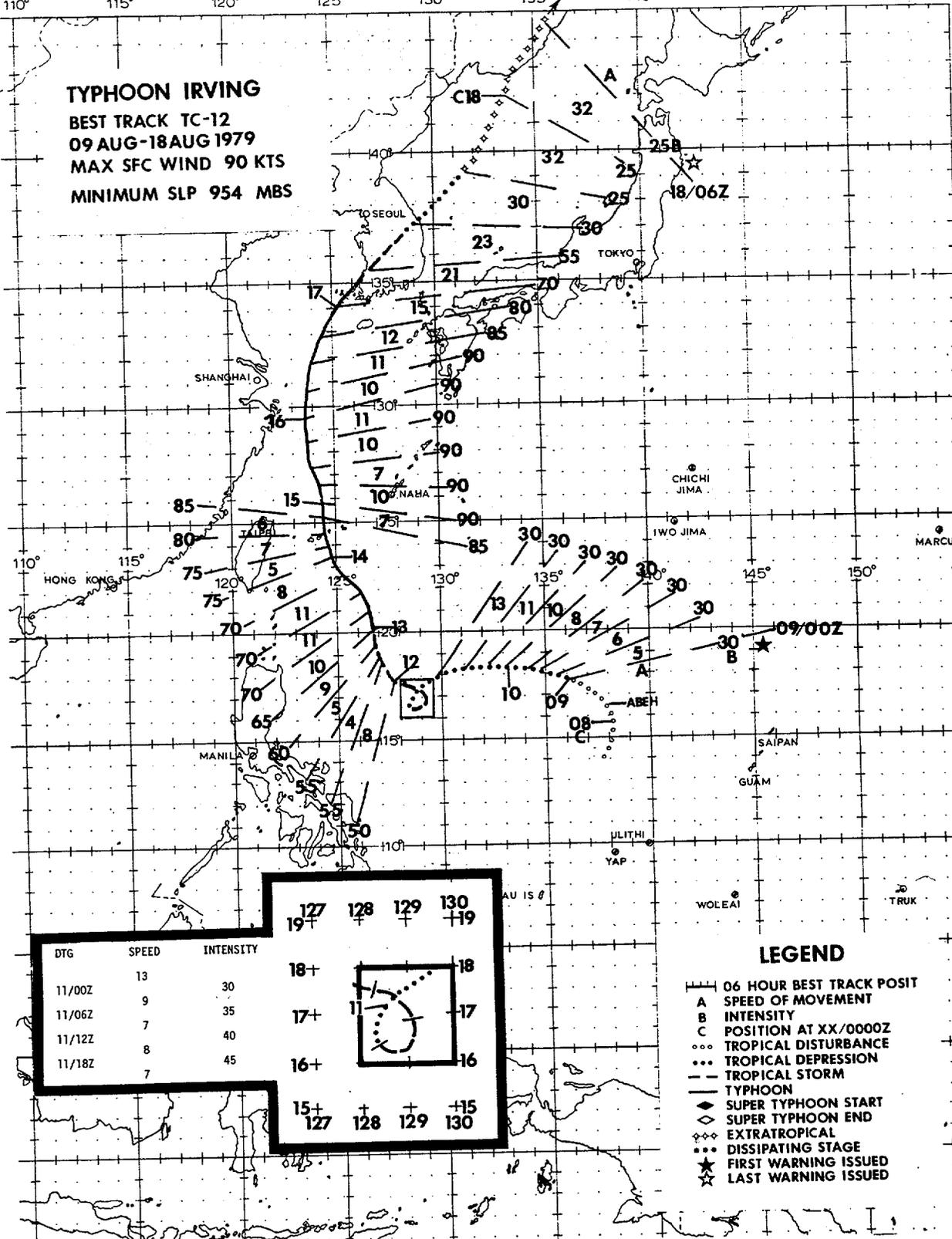


110° 115° 120° 125° 130° 135° 140° 145° 150° 155°

TYPHOON IRVING
BEST TRACK TC-12
09 AUG-18 AUG 1979
MAX SFC WIND 90 KTS
MINIMUM SLP 954 MBS



DTG	SPEED	INTENSITY
11/00Z	13	30
11/06Z	9	35
11/12Z	7	40
11/18Z	8	45

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

Surges in the southwest monsoon frequent the western North Pacific during the early tropical cyclone season and produce widespread convection from the Malay Peninsula to as far east as Guam. During the same period, the 500 mb monsoon trough fluctuates eastward across the South China Sea (SCS) and occasionally into the Philippine Sea. By late July 1979, an eastward extension of the mid-level monsoon trough was the main synoptic feature west of Guam. The 500 mb trough axis extended along 15N from northern Vietnam through the central SCS and then eastward into a quasi-stationary low pressure center over the Philippine Sea.

On 7 August at 1200Z, a developing surface circulation was observed at the eastern end of the monsoon trough near 14.1N 137.7E. This weak circulation tracked cyclonically around the eastern periphery of the broad 500 mb low pressure center in the Philippine Sea. Taking on the characteristics of a monsoon depression (Ramage, 1971), Irving was described in aircraft reconnaissance data received from 9-11 August as a weak depression with poor vertical alignment and maximum surface winds located 150 to 180 nm (278 to 333 km) west of the surface center. At this stage, Irving displayed an

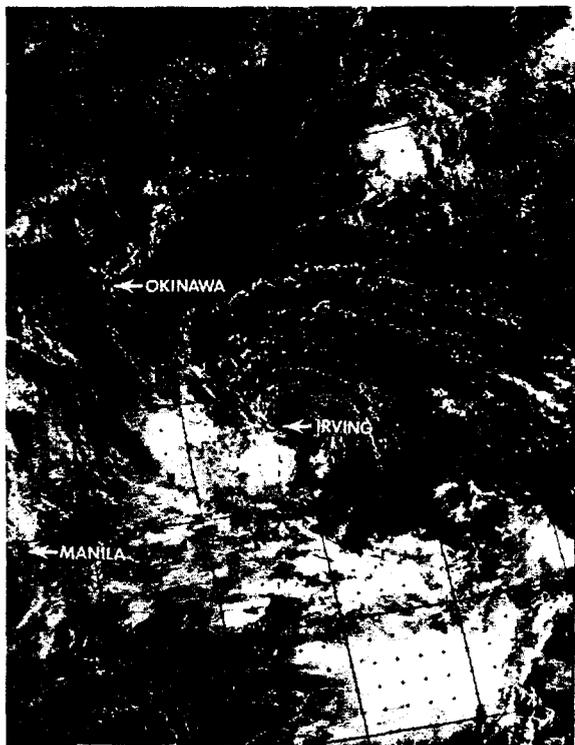


FIGURE 3-12-1. Typhoon Irving as a weak tropical depression with an exposed low-level circulation, 10 August 1979, 0126Z. Prior to intensification, aircraft reconnaissance consistently observed the maximum convection to the west of the surface center. [DMSP imagery]

exposed low-level circulation in satellite imagery with maximum convection located to the west of the surface center (Fig. 3-12-1). Ship synoptic data during the same period indicated that 25-35 kt (13-18 m/sec) winds extended outward 120 nm (222 km) south of the surface center.

By the 11th, the monsoon surge had weakened and receded westward, leaving a cut-off 500 mb low over the Philippine Sea in the vicinity of Irving's surface circulation. Irving executed a small, tight cyclonic loop on the 11th. During the loop, vertical alignment between the surface and the 500 mb center improved, and Irving intensified to tropical storm intensity. Simultaneously, a break developed in the 500 mb subtropical ridge to the north, and Irving tracked north-northwestward towards the Ryukyu Islands while intensifying further to typhoon strength. Although originally forecast to recurve south of Japan, strengthening of the 500 mb ridge southeast of Japan caused Typhoon Irving to track over the western East China Sea and accelerate north-northeastward across Korea before merging with an extratropical frontal boundary north of Japan.

Although not a spectacular typhoon, Irving's apparent sinusoidal motion, unusually large wind radii, failure to rapidly deepen and damage to southern Korea are noteworthy. Sinusoidal motion of tropical cyclones has been observed for many years, especially when short-term movements are observed by accurate fix platforms such as land radar (Fig. 3-12-2) and reconnaissance aircraft. Sinusoidal motion was observed from 131600Z to 151800Z as Irving tracked north-northwestward through the East China Sea. Radar reports from the Ryukyu Islands

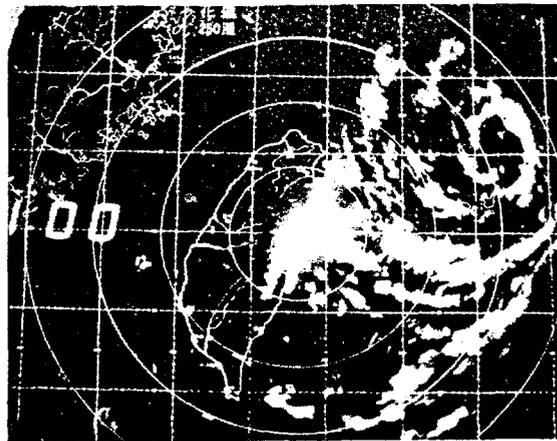


FIGURE 3-12-2. Typhoon Irving as seen by the radar at Haulien, Taiwan. Irving tracked north-northwestward across the southern Ryukyu Islands and was accurately tracked by eight radar sites, 14 August 1979, 1700Z. [Photograph courtesy of the Central Weather Bureau, Taipei, Taiwan]

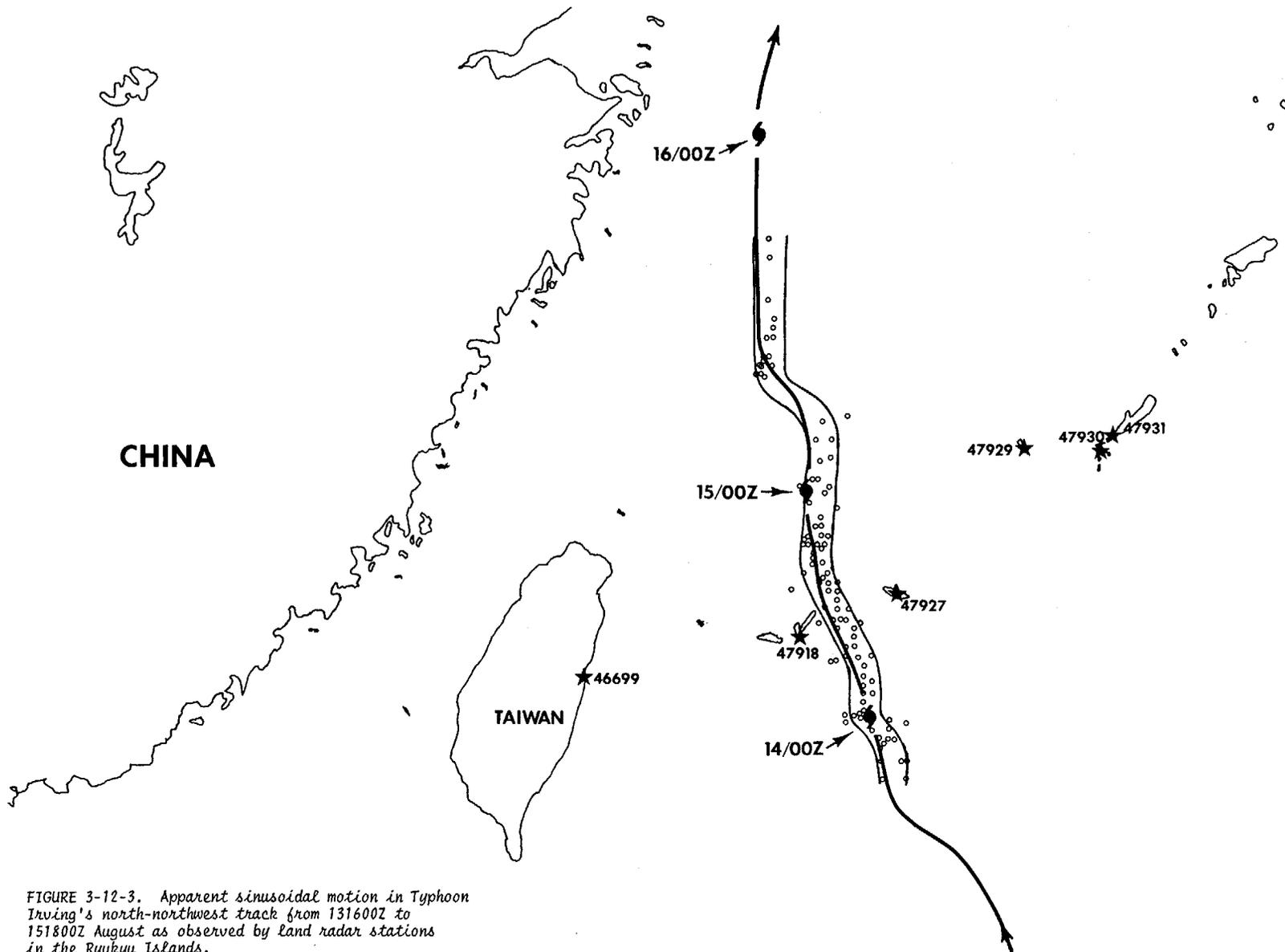


FIGURE 3-12-3. Apparent sinusoidal motion in Typhoon Irving's north-northwest track from 131600Z to 151800Z August as observed by land radar stations in the Ryukyu Islands.

clearly indicate that Irving oscillated about an overall north-northwest track (Fig. 3-12-3).

The relationship between Irving's surface and 500 mb centers during the earlier stages of development produced unusually large surface wind radii. Synoptic and aircraft data between 092000Z and 120000Z indicate that Irving's maximum wind band actually existed 150-200 nm (278-370 km) west of the large, calm-wind surface center. Although the maximum wind bands did eventually migrate towards the surface center, the wind radii remained large for the duration of Irving. The large wind radii may be related to Irving's developmental interaction with the 500 mb monsoon low and its large areal extent. Irving never became a tight, well-developed tropical cyclone. Aircraft reconnaissance during the period of eyewall development indicated that Irving had a large 30 nm (56 km) diameter eye with the radius of over 30 kt (15 m/sec) winds extending outward 400 nm (741 km) in the eastern semi-circle.

Unlike Super Typhoon Hope, Typhoon Irving (Fig. 3-12-4) did not follow the intensification pattern suggested by JTWC's Equivalent Potential Temperature (θ_e)/Minimum Sea-level Pressure Study. This study indicates that sea-level pressure should fall about 44 mb and maximum surface winds should intensify an average of 55 kt from the point where the θ_e and pressure curves intersect (see Super Typhoon Hope, Figure 3-09-2). The reason why Irving failed to intensify further is not known.

Typhoon Irving was the first tropical cyclone to strike Korea in 1979. Rapidly weakening as he made landfall, Irving spared southern Korea from the destructive typhoon force winds he had maintained through most of the East China Sea. Korea did, however, receive torrential rains which produced widespread flooding. The hardest hit area was the island of Cheju Do where 4.3 inches (109.7mm) of rain were reported at Cheju. Official estimates reported 150 dead or missing, 1000-2000 homeless and approximately 10-20 million US dollars damage to food and agriculture.



FIGURE 3-12-4. Although Typhoon Irving did not develop according to intensification studies, Irving did possess good feederband activity and cirrus outflow, 14 August 1979, 0228Z. (DMSP imagery)