

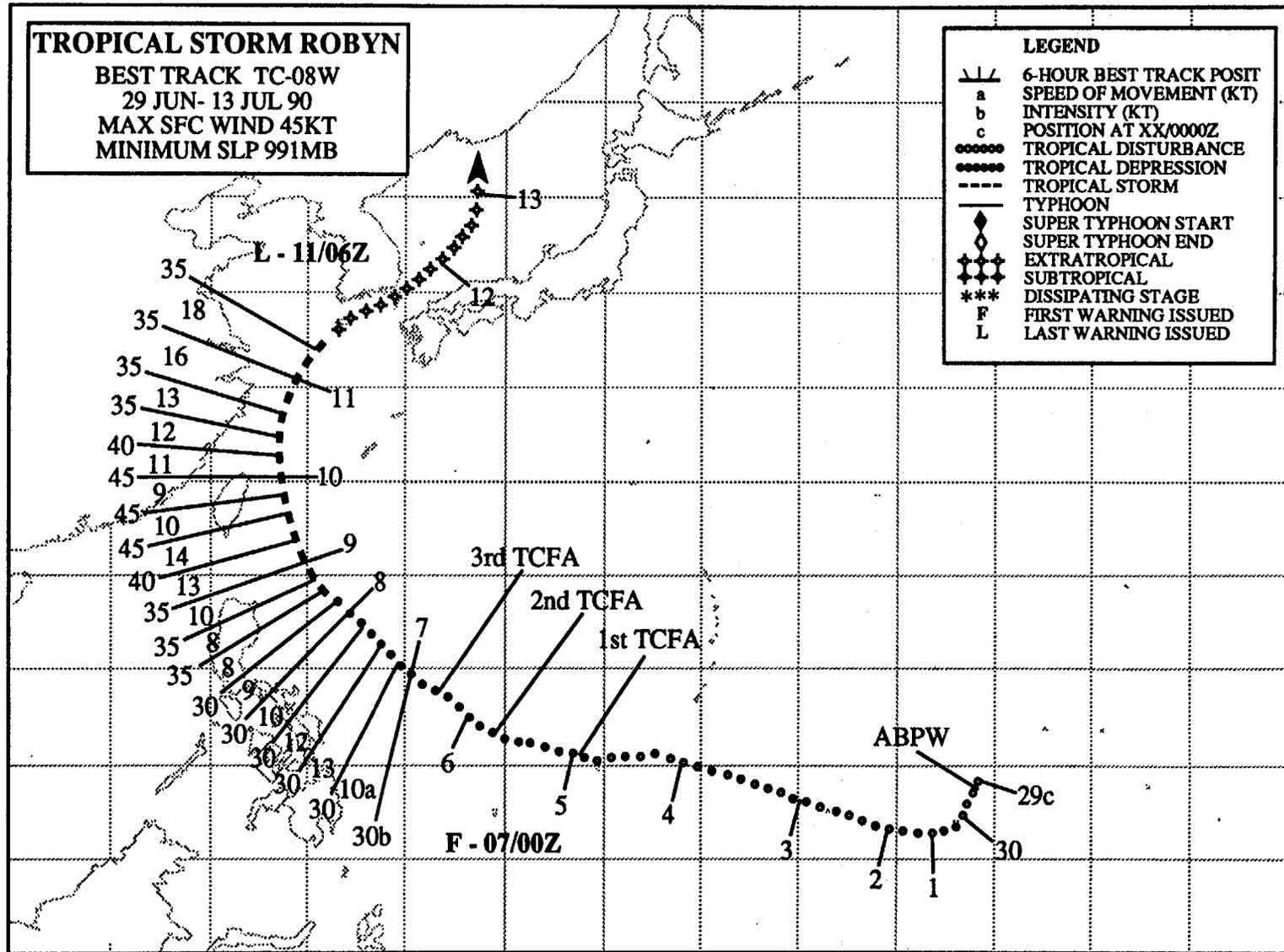
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TROPICAL STORM ROBYN
 BEST TRACK TC-08W
 29 JUN- 13 JUL 90
 MAX SFC WIND 45KT
 MINIMUM SLP 991MB

LEGEND

- /—/— 6-HOUR BEST TRACK POSIT
- a SPEED OF MOVEMENT (KT)
- b INTENSITY (KT)
- 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



TROPICAL STORM ROBYN (08W)

I. HIGHLIGHTS

Robyn, the first significant tropical cyclone of July, followed what at first glance might appear to be a typical recurvature track. However, Robyn's motion was actually a classic example of the response of a tropical cyclone to the establishment of an omega block, and thus is significant as a case study of an infrequent, but complex, synoptic influence on tropical cyclone motion.

II. CHRONOLOGY OF EVENTS

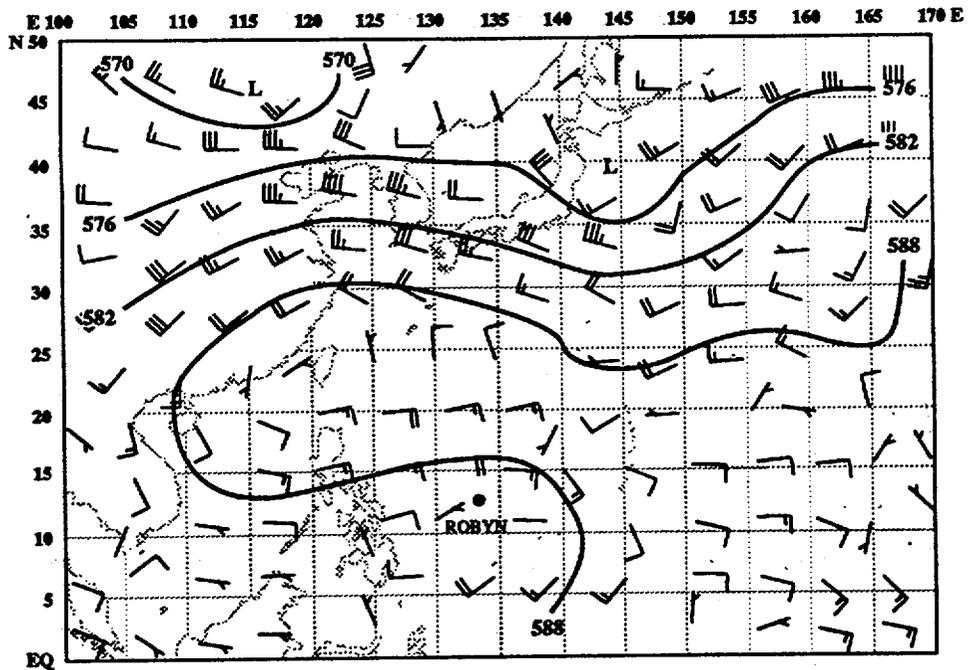
- 290600Z - (June) First mentioned on Significant Tropical Weather Advisory as an area of persistent convection with an estimated minimum sea-level pressure of 1006 mb.
- 042300Z - (July) First Tropical Cyclone Formation Alert based on increased convection, organization, and outflow aloft.
- 051530Z - Second Tropical Cyclone Formation Alert issued. Organization temporarily delayed due to upper-level wind shear.
- 061530Z - Third Tropical Cyclone Formation Alert issued. Convection still consolidating during diurnal fluctuations.
- 070000Z - First warning based on improved outflow to the southeast and anticipated reduction of vertical wind shear.
- 081800Z - Upgraded to tropical storm based on enhanced convection and improved organization.
- 091800Z - Peak intensity of 45 kt (23 m/sec) based on synoptic data.
- 110000Z - Downgraded to tropical depression .
- 110600Z - Final warning - (extratropical) - due to the loss of persistent central convection.

III. TRACK AND MOTION

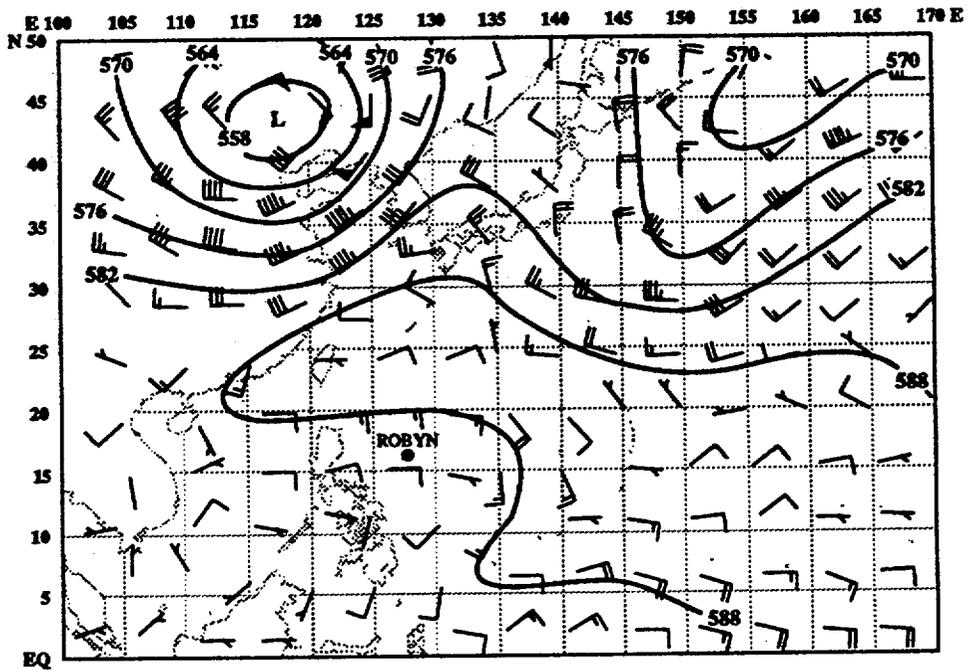
From the initial mention on the Significant Tropical Weather Advisory until the first warning at 070000Z, Robyn tracked essentially west-northwestward under the subtropical ridge. However, on 6 July an omega block began to form with the digging lows located about 49°N 117°E and 51°N 153°E as shown in Figure 3-08-1a. The 5880 meter height contour identified significant ridging poleward of Robyn, which under normal circumstances would imply continued westward movement. As shown in Figure 3-08-1b, the omega block was firmly established at 080000Z, and the digging lows had dramatically eroded the ridge north of Robyn causing the increase in its northward motion component. At 100000Z, the ridge was fully eroded permitting Robyn to pass Taiwan to the east (Figure 3-08-1c). The downwind digging low had penetrated more equatorward than its upwind counterpart causing the omega block to tilt eastward. This shift signaled the beginning of the breakdown of the block. Still, the ridging directly east of Robyn, associated with the central axis of the block, was sufficient to keep Robyn on a northward track, delaying recurvature. At 120000Z, the central ridging of the omega block (Figure 3-08-1d) had broken down sufficiently for Robyn to recurve and significantly accelerate as it moved into the Sea of Japan as an extratropical low.

IV. INTENSITY

The delayed development of Robyn and its subsequent intensification to only a nominal tropical storm (Figure 3-08-2) was due to moderate but persistent vertical wind shear associated with the eastern periphery of the summertime 200-mb easterly jet over southern Asia. In addition, the ridging to the north of Robyn for much of its life-cycle restricted outflow. When the ridge broke down, Robyn briefly intensified to 45 kt (23 m/sec) in response to outflow into the midlatitude westerlies.

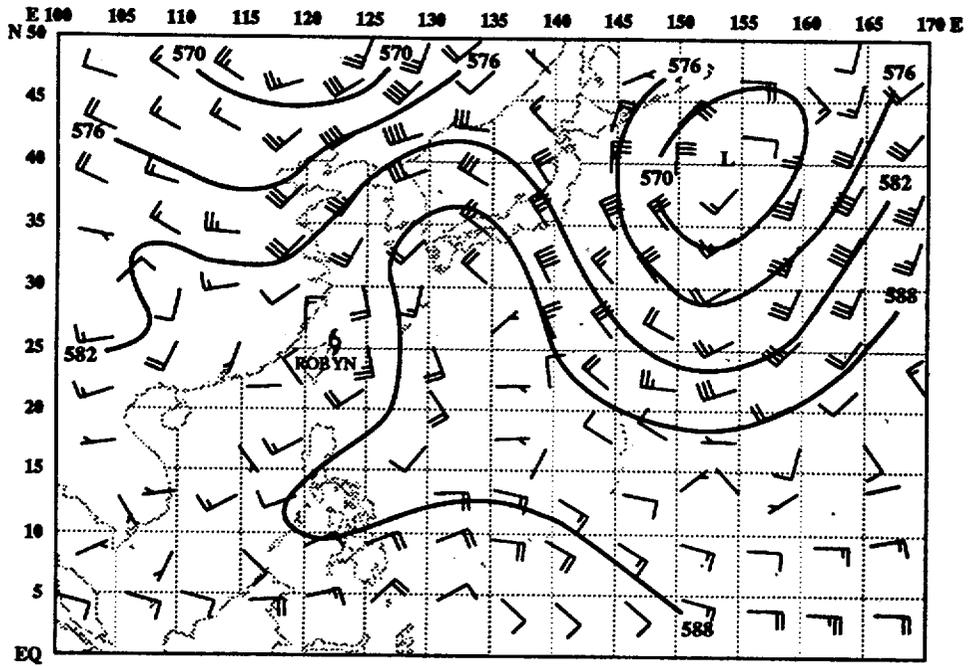


a.

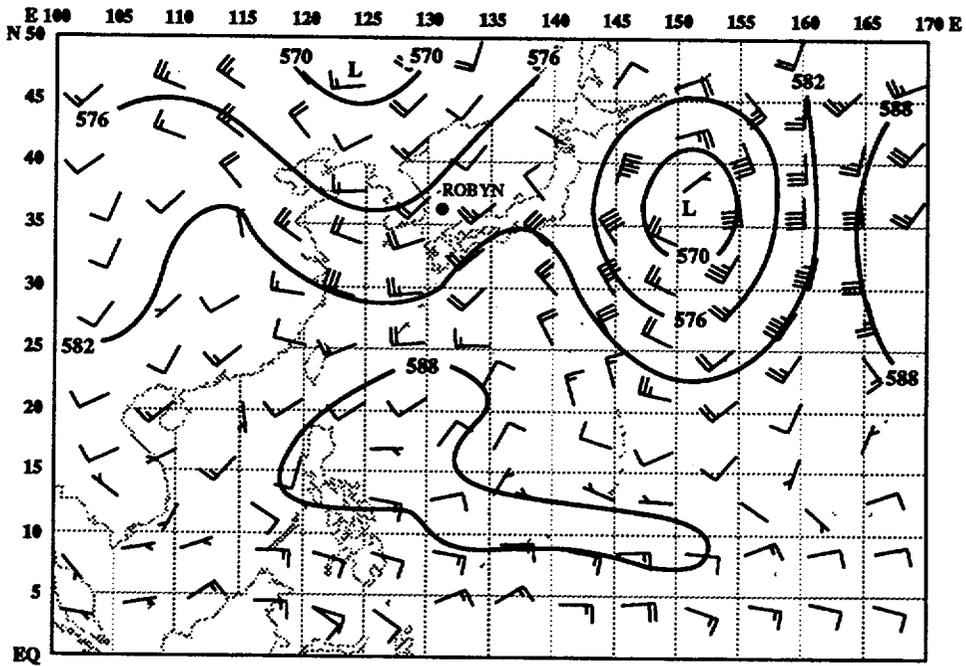


b.

Figure 3-08-1 a, b. NOGAPS 500-mb height analyses (in decameters) with the corresponding positions of Robyn for valid times a.) 060000Z and b.) 080000Z



c.



d.

Figure 3-08-1 c, d. NOGAPS 500-mb height analyses (in decameters) with the corresponding positions of Robyn for valid times c.) 100000Z and d.) 120000Z.

V. FORECASTING PERFORMANCE

The key variable in forecasting the motion of Robyn was the rapidity with which the low upwind of the omega block would break down the mid-level ridge to the north of Robyn. As Figure 3-08-3 illustrates, guidance available to JTWC between 070000Z and 080000Z did not indicate that the breakdown would proceed in time to permit Robyn to recurve east of Taiwan. JTWC relies heavily on the dynamic models OTCM and FBAM, the accuracies of which in turn depend heavily on the accuracy of the NOGAPS prognoses. By comparing Figure 3-08-3 with Figure 3-08-1c, it is evident that the NOGAPS 500-mb 72-hour prognosis for 100000Z had prematurely weakened the upwind low of the omega block. As a result, the NOGAPS 500-mb 72-hour prognoses that verified between 090000Z and 100000Z retained ridging north of Robyn that did not verify. This, in turn, caused NOGAPS-dependent objective techniques such as OTCM and FBAM to forecast continued west-northwestward movement for Robyn, which contributed to JTWC's left-of-track bias during that same period.

VI. IMPACT

No information received.

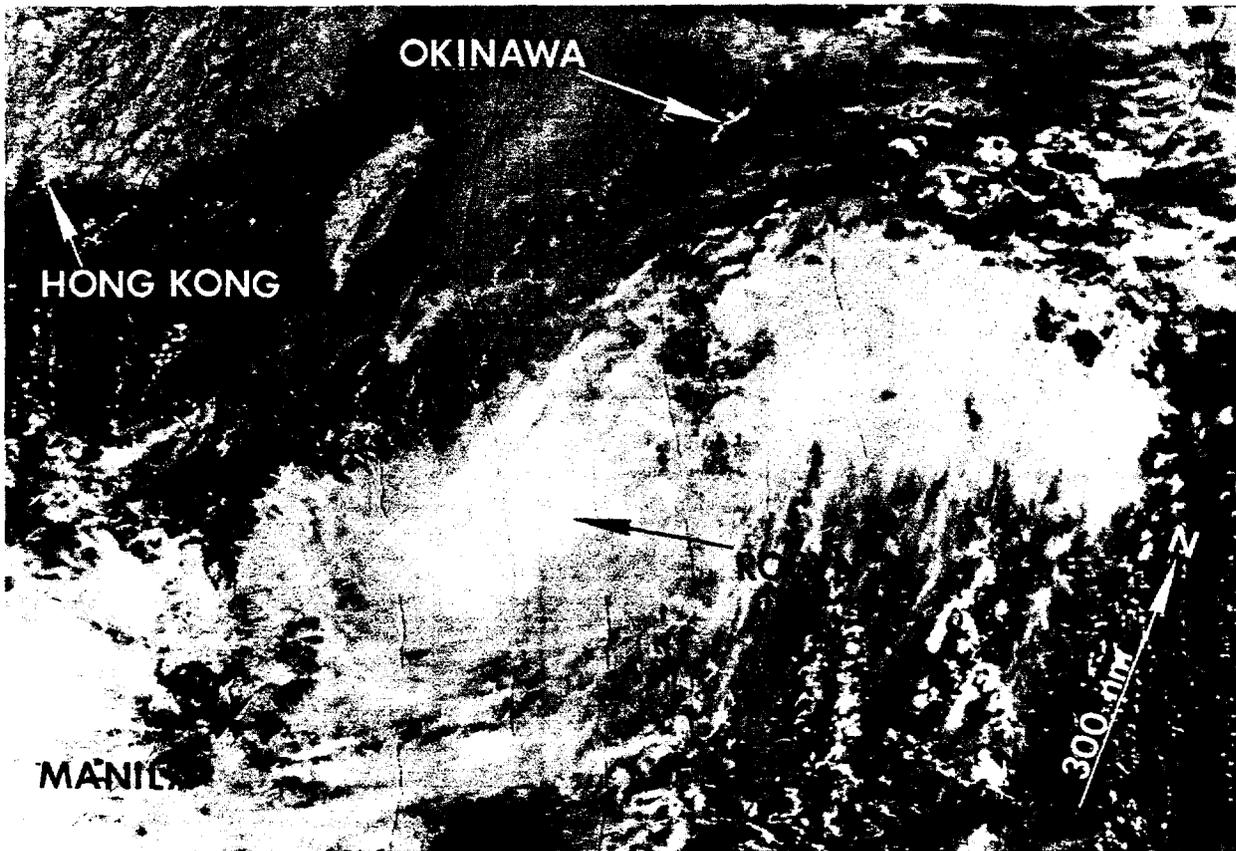


Figure 3-08-2. Robyn just before reaching tropical storm intensity (080514Z July NOAA visual imagery).

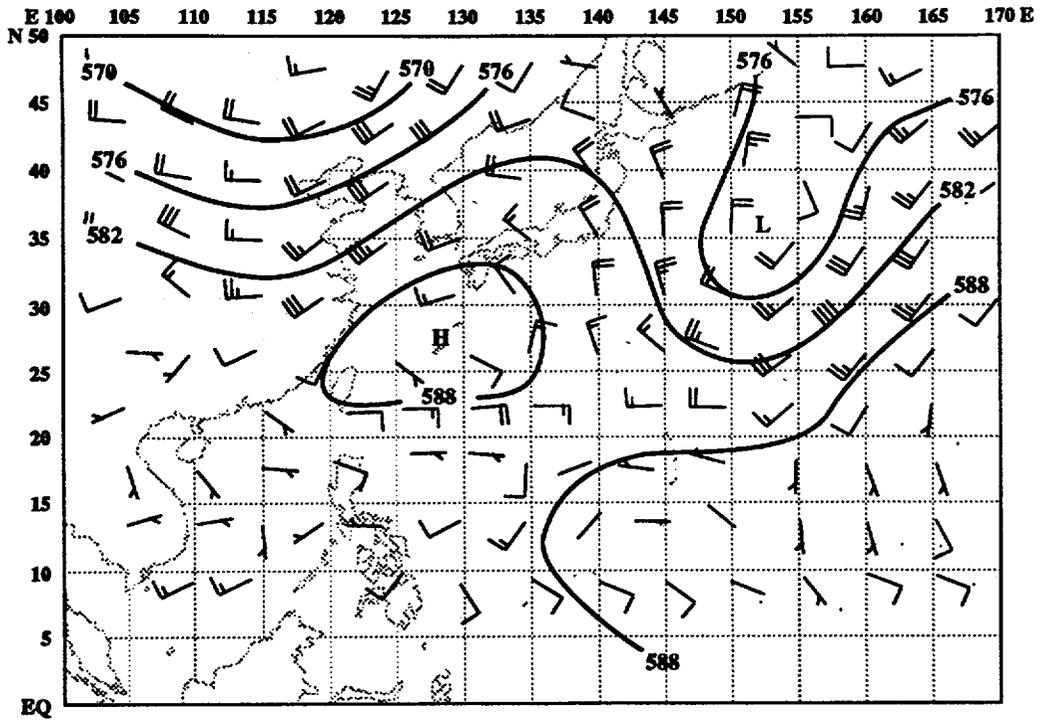


Figure 3-08-3. NOGAPS 500-mb 72-hr prognosis in decameters valid at 100000Z July.

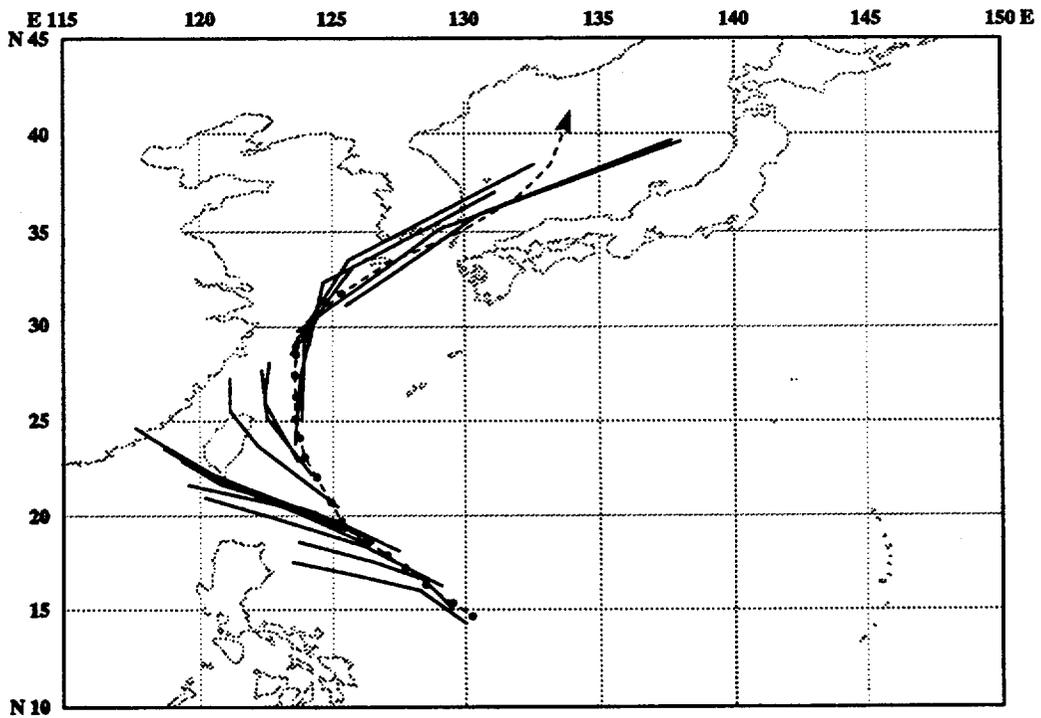


Figure 3-08-4. Summary of JTWC forecasts (solid lines) for Robyn superimposed on the best track (dashed line).