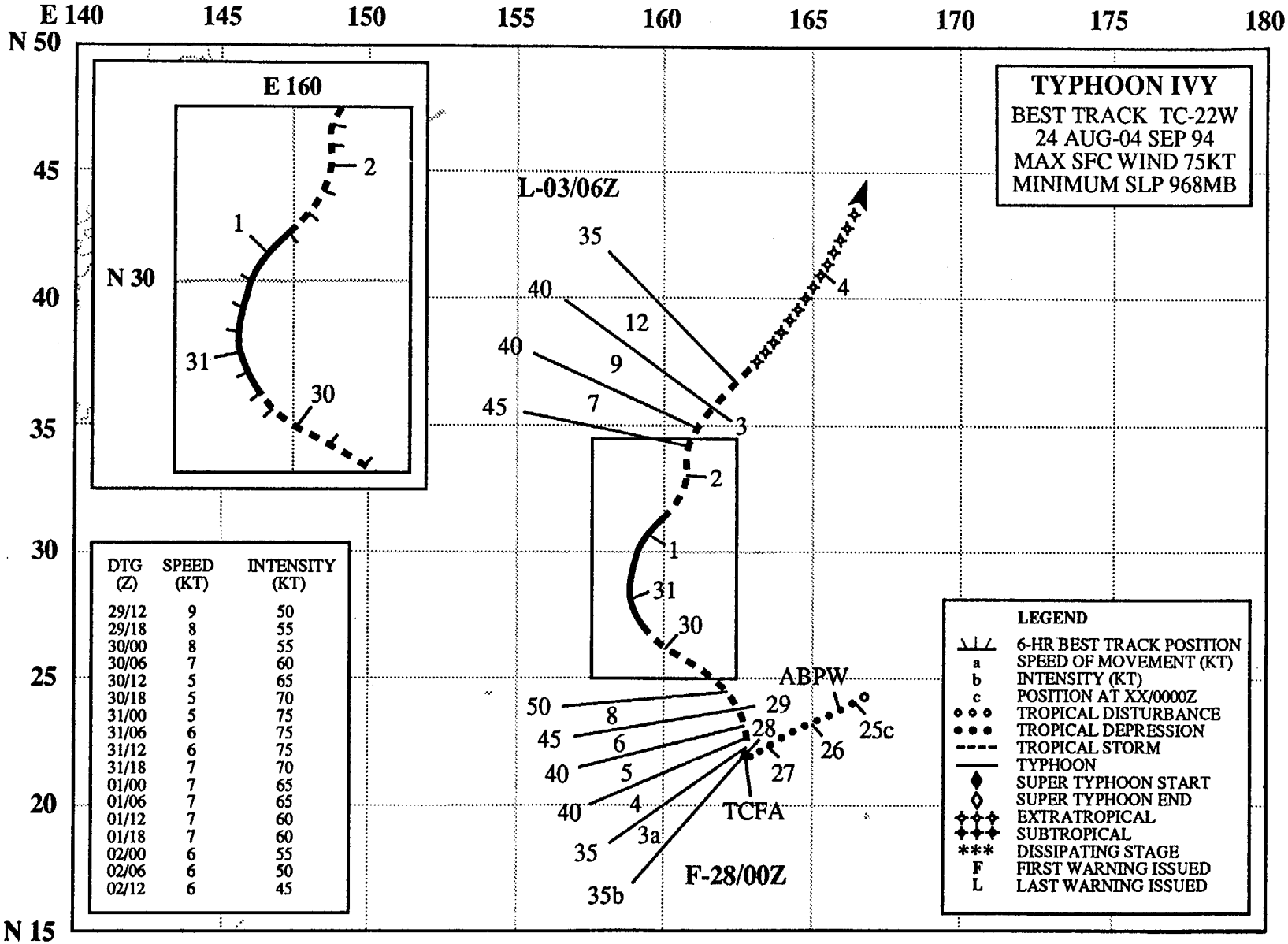
E 140
145
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N 30
TYPHOON IVY
BEST TRACK TC-22W
24 AUG-04 SEP 94
MAX SFC WIND 75KT
MINIMUM SLP 968MB
L-03/06Z
F-28/00Z
TCFA
ABPW
DTG (Z) SPEED (KT) INTENSITY (KT)
29/12 9 50
29/18 8 55
30/00 8 55
30/06 7 60
30/12 5 65
30/18 5 70
31/00 5 75
31/06 6 75
31/12 6 75
31/18 7 70
01/00 7 65
01/06 7 65
01/12 7 60
01/18 7 60
02/00 6 55
02/06 6 50
02/12 6 45
LEGEND
6-HR BEST TRACK POSITION
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

TYPHOON IVY (22W)

I. HIGHLIGHTS

Ivy developed within an area of disturbed weather located in the subtropics (i.e., north of 20°N) at a time when the low-level and upper-level wind patterns throughout the western North Pacific were unusual. Ivy was a small tropical cyclone that moved on a north-oriented track.

II. TRACK AND INTENSITY

The tropical disturbance that would eventually become Ivy formed in the same complex environment within which Gladys (20W) formed. As Ivy was forming, the large-scale distribution of cloudiness (Figure 3-22-1 and Figure 3-22-2) and the large-scale structure of the troposphere over the western North Pacific was quite complex. [For a more complete description of the structure of the atmosphere during this time see the Track and Intensity section of Gladys' (20W) summary.]

During the daylight hours of 25 August, satellite imagery and synoptic data indicated that a low-level circulation center was exposed to the north of an area of deep convection near 24°N 166°E. This disturbance was first mentioned on the 250600Z August Significant Tropical Weather Advisory. For the next 36 hours, this disturbance drifted southwestward and showed signs of gradual intensification. A Tropical Cyclone Formation Alert was issued at 271700Z when satellite imagery depicted an increase in the amount of deep convection near the still-exposed low-level circulation center. The sea-level pressure at Wake Island (WMO 91245), located 200 nm (370 km) east-southeast of the low-level center, fell 3.5 mb over 24 hours. At 280000Z, a tropical depression warning was issued on Tropical Depression 22W. The system intensified more rapidly than anticipated, and on warning number 02, issued at 280600Z, Tropical Depression 22W was upgraded to Tropical Storm Ivy. Ivy then began to track slowly northward while embedded in a complex environment that also featured Gladys (20W) and John (10E). Ivy gradually intensified, and at 310000Z was upgraded to a typhoon. Peak intensity of 75 kt (39 m/sec) was reached at 310000Z (Figure 3-22-3). During the next three days (310000Z August to 030000Z September), Ivy drifted slowly north-northeastward and slowly weakened. After 030000Z, the system accelerated toward the northeast and was absorbed into the frontal cloud band of a midlatitude low. The final warning was issued at 030600Z, as the accelerating Ivy acquired extratropical characteristics.

III. DISCUSSION

a. Formation north of 20°

Ivy was one of five tropical cyclones during 1994 that first attained 25 kt (13 m/sec) (best-track) intensity north of 20°N. Two of these tropical cyclones, Tropical Depression 31W and Yuri (36W), formed in direct association with TUTT cells. The other three, Ellie (18W), Gladys (20W), and Ivy, formed in complex environments that featured TUTT cells and midlatitude troughs which penetrated into subtropical latitudes. Ivy did not form in direct association with the TUTT or a TUTT cell, but rather began as an area of enhanced convection beneath diffluent upper-level northwesterly winds at the base of a midlatitude trough (Figure 3-22-4). As a result, the system was sheared, with the low-level center located northwest of the primary deep convection. As Ivy intensified, a cut-off low formed at the base of the aforementioned midlatitude trough and moved to the west of Ivy. This cut-off low weakened the vertical shear, and contributed to weak, deep, southerly flow over Ivy. Drifting in a general

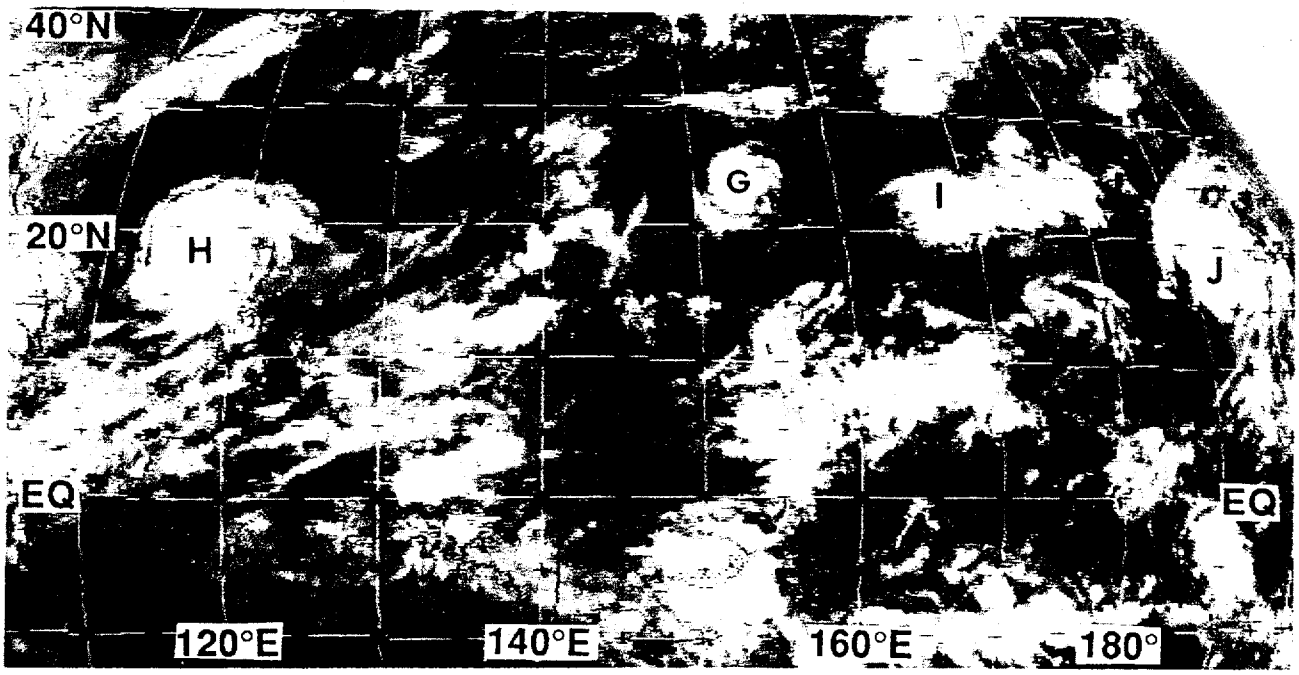

Figure 3-22-1 Ivy formed in a complex environment containing numerous clusters of deep convection and other tropical cyclones. G= Gladys (20W), H = Harry (21W), I = Ivy, and J = John (10E). (260031Z August infrared GMS imagery.)

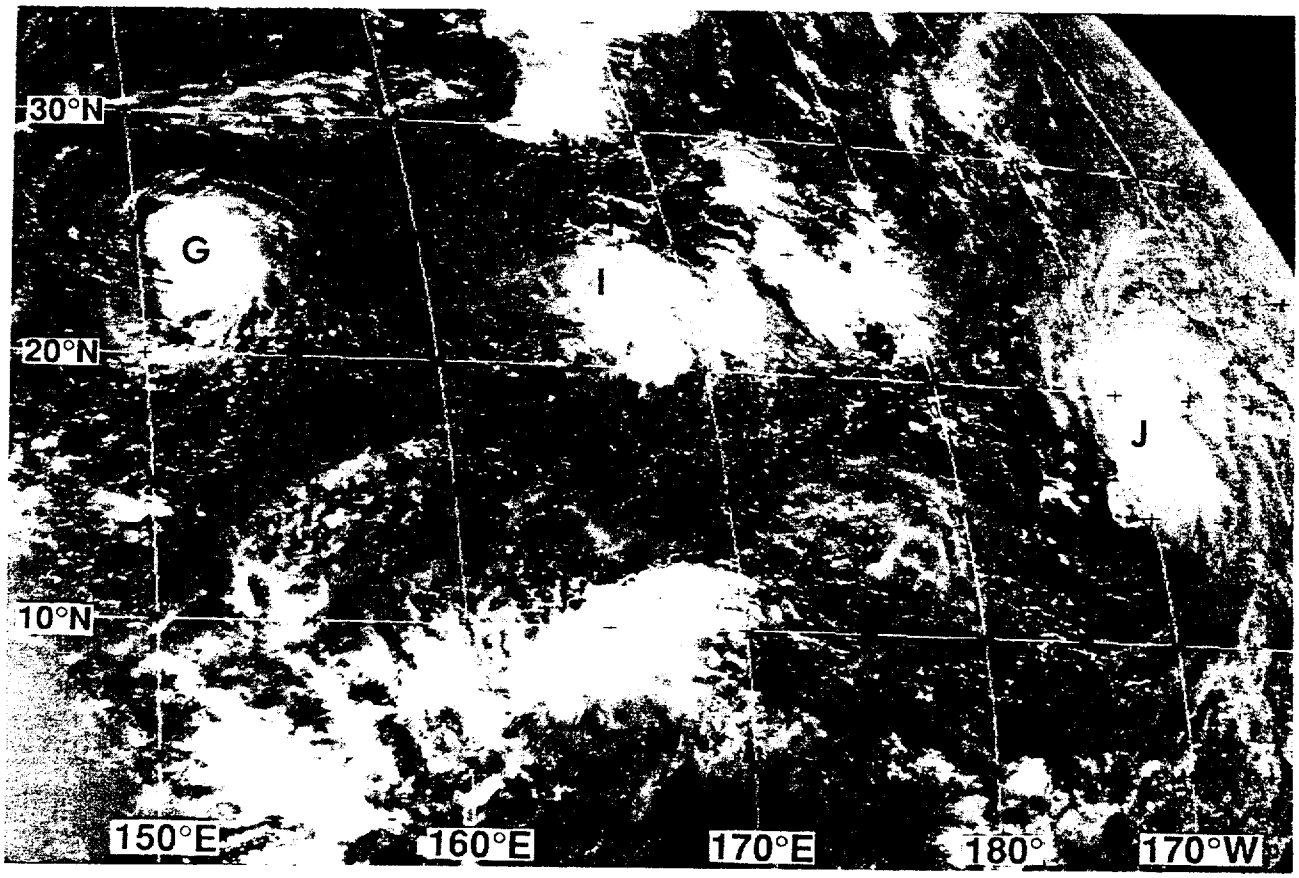

Figure 3-22-2 Ivy developed from a cluster of deep convection located about half way between Gladys (20W) and John (10E) (260231Z August visible GMS imagery). G = Gladys (20W), I = Ivy and J = John (10E)

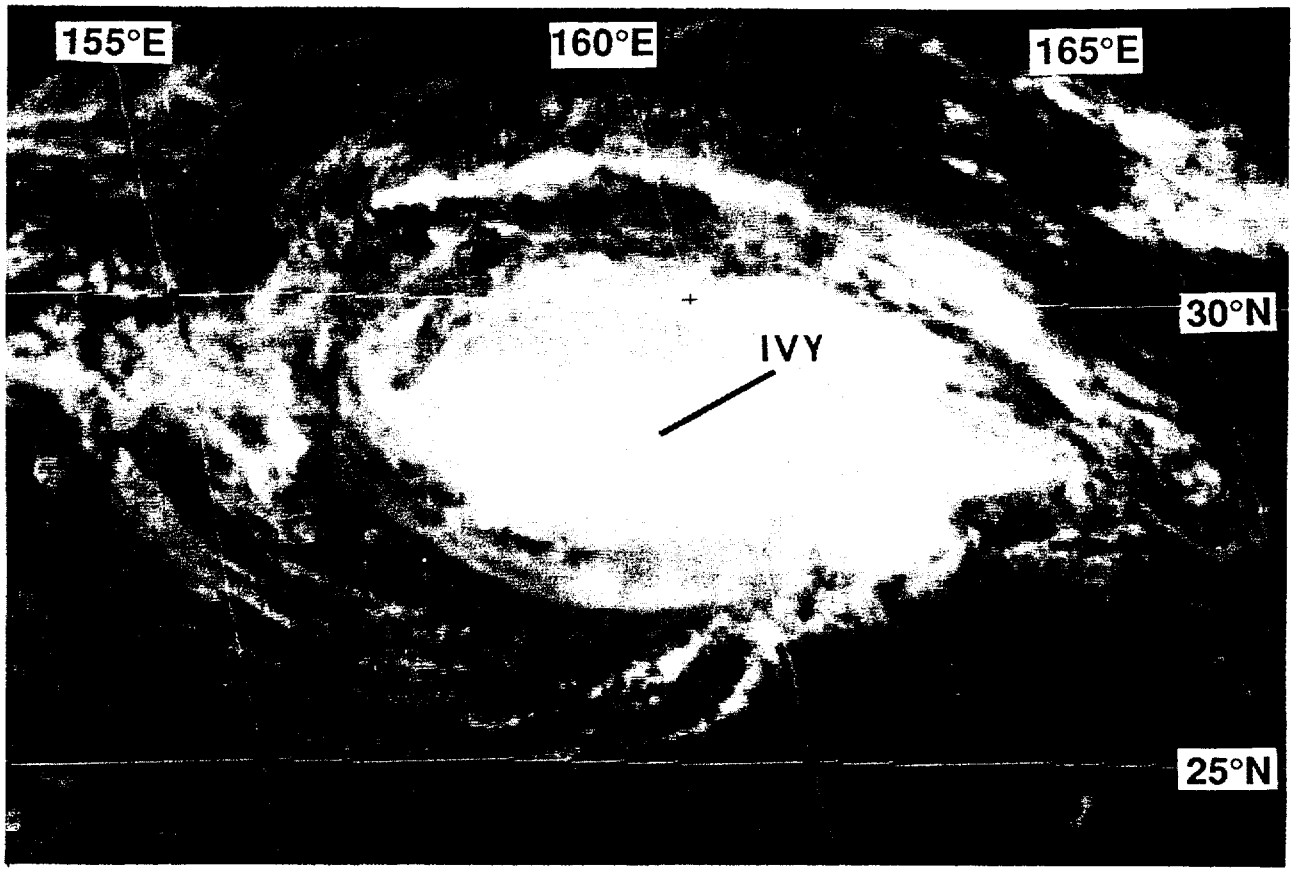

Figure 3-22-3 Ivy reaches its peak intensity of 75 kt (39 m/sec) (302331Z August visible GMS imagery)

northward direction, Ivy became a typhoon at 301200Z August. After moving poleward of 35°N shortly after 021800Z September, Ivy began to accelerate toward the north-northeast ahead of an advancing frontal system.

b. Unusual structure of the low-level wind field

As discussed above, Ivy formed within an area of deep convection associated with the extension into the subtropics of a mid-latitude trough (most tropical cyclones which develop in the western North Pacific form in the monsoon trough). This led to an unusual low-level wind field structure, in which an east-west chain of three tropical cyclones (with Ivy in the center) was positioned well north of a weak monsoon trough (Figure 3-22-5). A zone of light easterly winds separated the monsoon trough from the chain of cyclones.

IV. IMPACT

Ivy spent its entire life over open water. Its only impact was the diverting of shipping around its path.

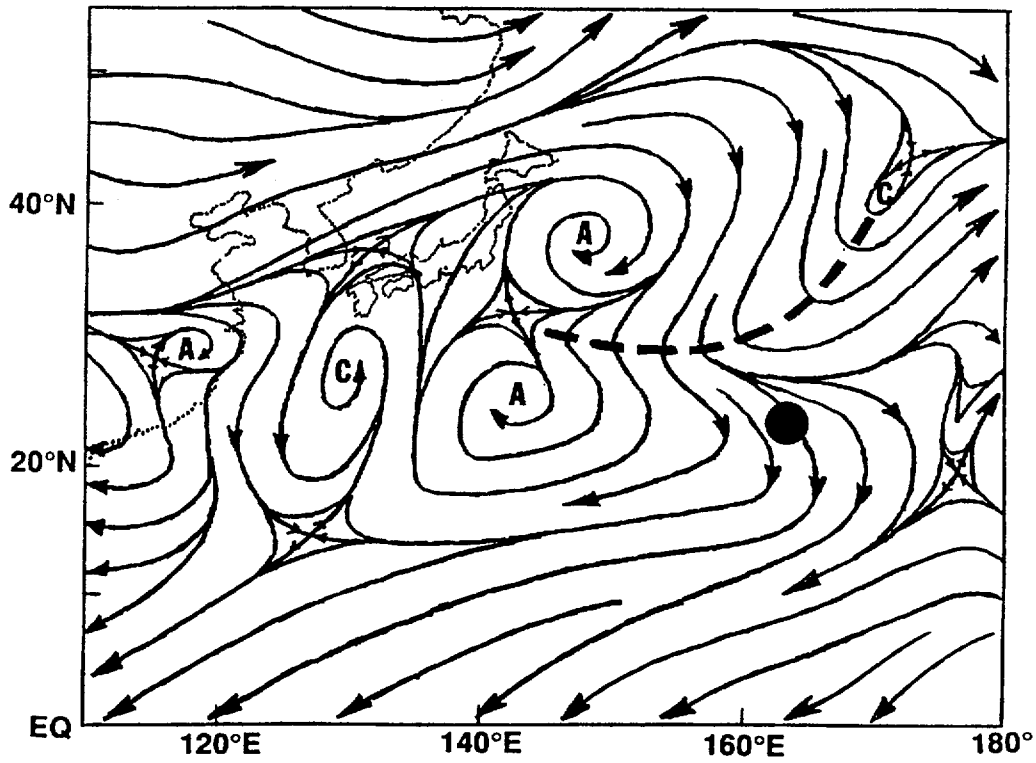

Figure 3-22-4 Streamlines of 200 mb wind (adapted from the 271200Z NOGAPS analysis. Dashed line indicates trough axis, c = cyclonic circulation centers, a = anticyclones, large dot indicates location of the developing Ivy.

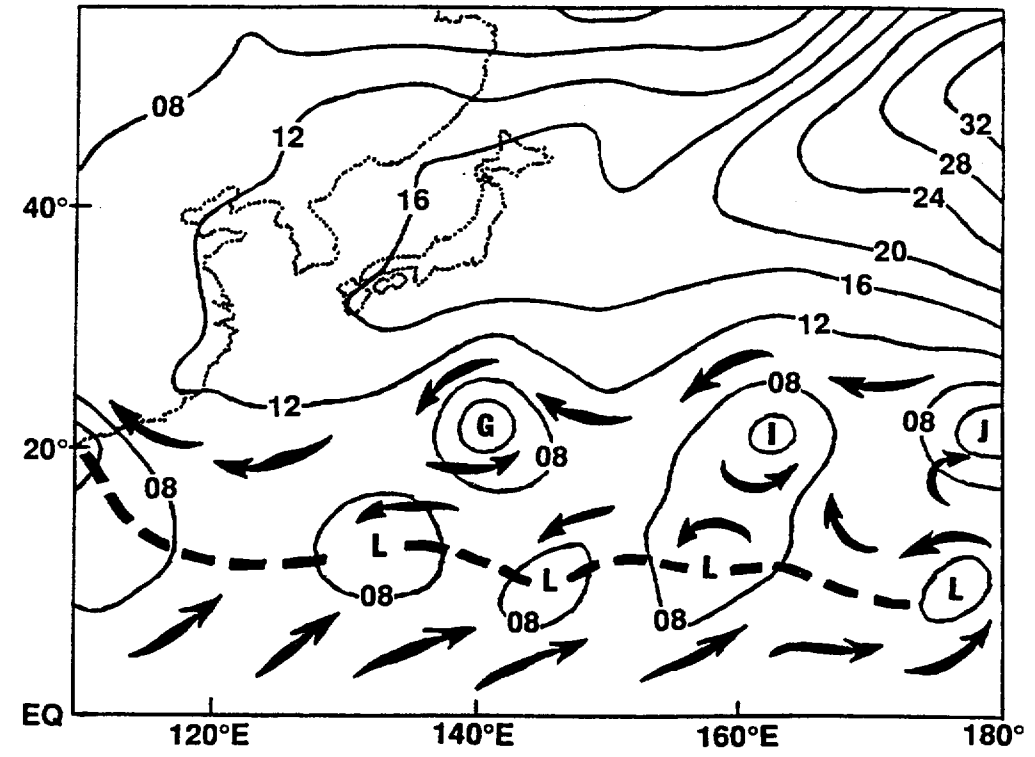

Figure 3-22-5 Contour analysis of the sea-level pressure (adapted from the 281200Z August NOGAPS surface pressure analysis). Dashed line = monsoon trough, C = cyclonic circulation center, G = Gladys (20W), I = Ivy, J = John (10E). Contours are at 4 mb intervals.