WESTERN REGION TECHNICAL ATTACHMENT
NO. 87-02
January 6, 1987

EL NINO SOUTHERN OSCILLATION (ENSO) EVENT OF 1986/87

Surprise! A warm episode is now in progress, as described in the attached diagnostic advisory from the Climate Analysis Center (CAC). Furthermore, according to Dr. Vern Kousky of CAC, the ENSO has already reached a mature phase and is related to the persistent mid-latitude flow pattern we have experienced during the past month or so. That pattern is illustrated by the mean 700mb height field for the past 30 days (Figure 1). It is characterized by strong zonal flow across much of the Pacific and a split in the eastern Pacific. The result is above normal heights over north central and northwestern North America and below normal heights in the Gulf coast and southeastern U.S. areas.

The 500mb mean height anomaly pattern for a typical recent five-day period is shown in Figure 2. Except for some slight and temporary variations, this anomaly pattern has now persisted for several weeks. It also strongly resembles the mean Pacific/North American (PNA) teleconnection pattern associated with previous ENSO events (Figure 3).

Since the most recent and well publicized ENSO of 1982/83, most forecasters are probably familiar with the characteristics of these unusually persistent warming events. To refresh everyone's memory an ENSO has the following traits:

1. Above normal sea-surface temperatures (SSTs) in equatorial regions of the central and eastern Pacific (Figure 4).

2. Westerly low-level wind anomalies in the equatorial Pacific along with easterly anomalies at upper tropospheric levels.

3. An increase in convection over the warmer than normal water, resulting in below normal outgoing longwave radiation (OLR) as measured by satellite. This is typical of the mature phase of the ENSO.

4. A negative Southern Oscillation Index (SOI). In other words the sea-level pressure at Darwin, Australia becomes higher than at Tahiti in the central equatorial Pacific (Figure 5).

All of the above conditions are now met.

So what does this all mean, if anything, in terms of mid-latitude flow patterns over the next couple of months? Persistence of the current pattern is probably the best bet according to Dr. Kousky. In other words, the split flow pattern of recent weeks has a fairly high probability of persisting. No doubt some variations on this theme will occur, especially since this is not a particulary strong ENSO episode. The 90-day forecast for January through March (Figure 6) agrees with this assessment.

~~How does the event compare to other recent ENSOs? It probably won't be as dry~~ over the West as in 1976-77 when no southern branch existed. And it is not shaping up to be anywhere near as wet as the 1982-83 episode when equatorial SST anomalies were much more strongly above normal and farther east (near 135°W),

resulting in stronger westerlies farther east in the Pacific and into the California coast.

Finally, how did we get clear into the mature phase of an ENSO event without a lot of advance notice and fanfare? Simply put, this event threw scientists a curve. They have been watching this one shaping up as reported in past diagnostic advisories (see Western Region Technical Attachments NOs. 86-14, 16, 33). However, last spring most of the necessary conditions for an ENSO weakened. Only recently have all signs for a warming event become favorable.

In summary, the globe is now in the mature phase of an ENSO episode. It is not a particularly strong ENSO event. The response at mid-latitude is most likely to be a continuation of a large scale pattern fairly similar to what has been experienced over the past several weeks.

References:

Horel, J.D. and J.M. Wallace, 1981: Planetary-Scale Atmospheric Phenomena Associated with the Southern Oscillation. Mon. Wea. Rev., 109, 813-829.

Weickmann, K.M., G.R. Lussky, and J.E. Katzback, 1985: Intraseasonal (30-60 Day) Fluctuations of Outgoing Longwave Radiation and 250mb Stream Function During Northern Winter. Mon. Wea. Rev., 113, 941-961.

EL NIÑO SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC ADVISORY 86/6
issued by
THE CLIMATE ANALYSIS CENTER/NMC
December 17, 1986

This is an update of Advisory 86/5 issued November 10 which described the oceanic and atmospheric features associated with the current increase in sea surface temperature anomalies in the Pacific.

During the last month there has been a large drop in the Tahiti-Darwin Southern Oscillation Index (SOI). This resulted from a rather modest increase in the sea level pressure anomaly at Darwin and a large drop in the sea level pressure anomaly at Tahiti. All Pacific atmospheric and oceanic indices now indicate that a warm episode is in progress.

The drop in the SOI seems to be related to the continued tendency for equatorial convection to shift eastward over the region of warmest sea surface temperature. During the last several months, the area of highest sea surface temperature has steadily shifted eastward accompanied by a trend towards increasing low level westerly anomalies over the western and central equatorial Pacific. Consistent with the low level westerly anomalies, upper tropospheric zonal wind anomalies are easterly.

During November, equatorial low level zonal wind anomalies in the west Pacific were strongly westerly, and actual westerlies were observed. Westerly low level winds have continued in this region through the first half of December. Although sea surface temperature anomalies decreased in the eastern equatorial Pacific in November, the future course of anomalies in this region depends partly on the magnitude of the response to the November surge in westerlies in the western equatorial Pacific.

The Climate Analysis Center will continue to monitor conditions in the equatorial Pacific and to provide early dissemination of diagnostic information concerning the current warming.

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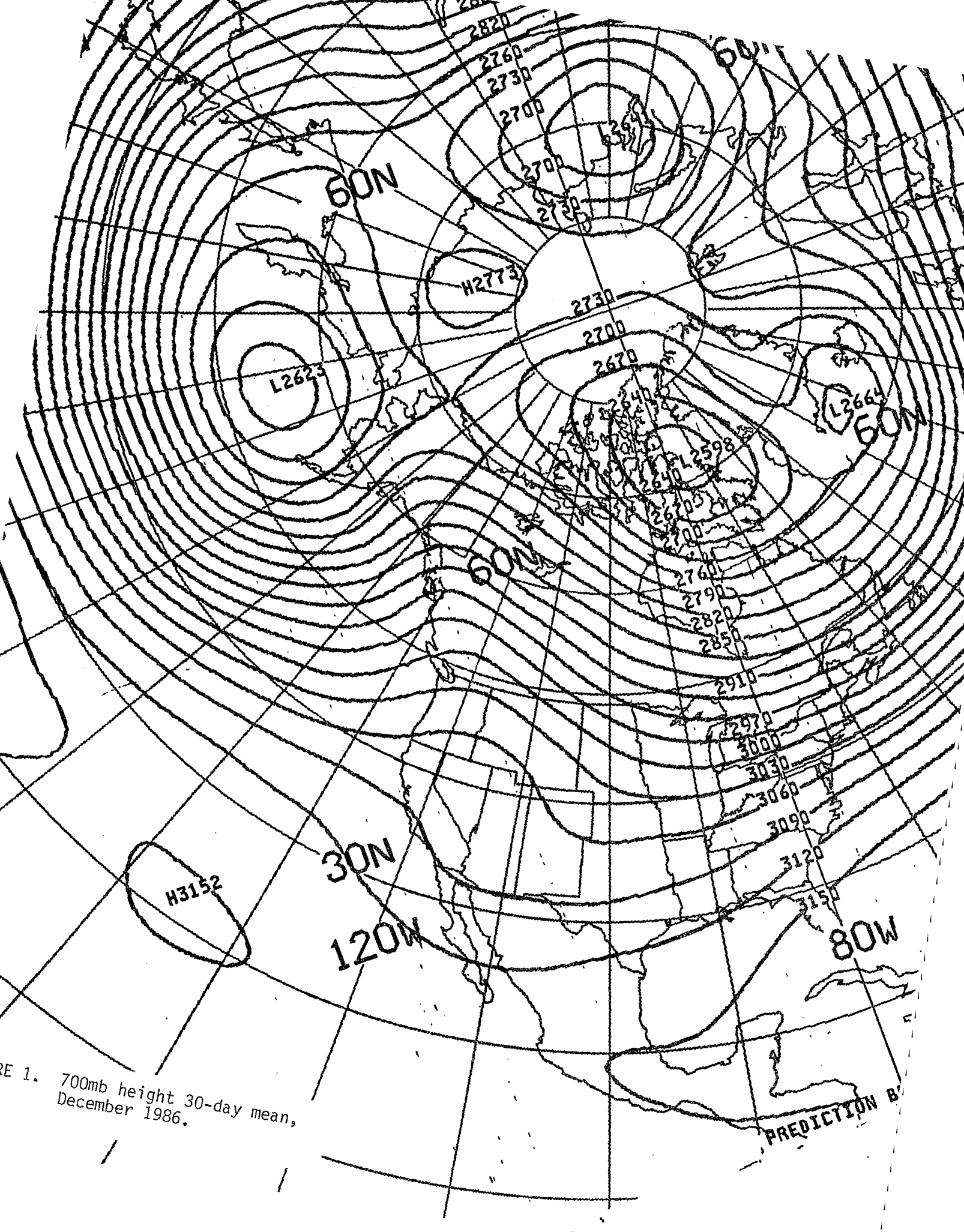


RE 1. 700mb height 30-day mean, December 1986.

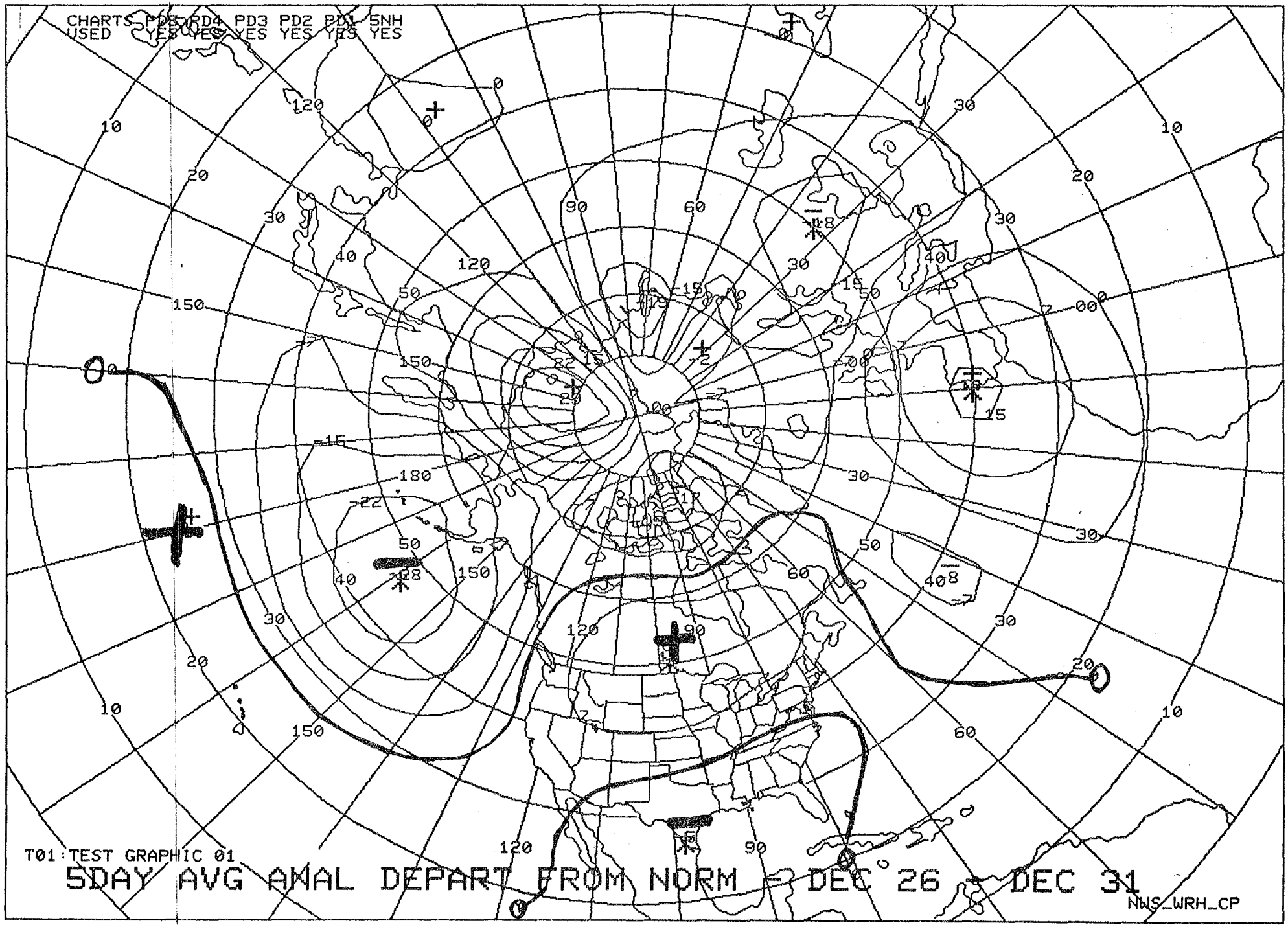
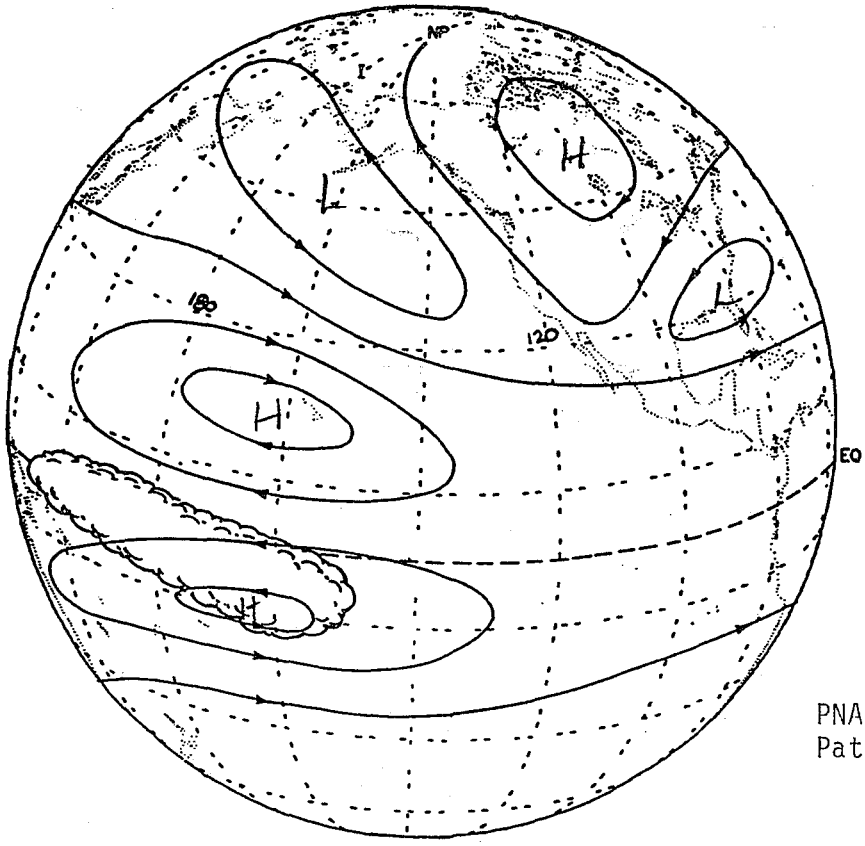


FIGURE 2. 500mb height 5-day mean departure from normal, December 26-31, 1986.



PNA Anomaly Pattern

Schematic illustration of atmospheric conditions during the Northern Hemisphere winter season following the peak of a typical ENSO episode, based on conceptual understanding of the phenomenon prior to the 1982/83 episode. Cloud outline is region of enhanced precipitation (high SSTs, low OLR). Circulation anomalies at the jet stream (~10 km) level. From Horel and Wallace (1981).

Note also the similarity to 28-72 day oscillation pattern with similar location of anomalous cloudiness (low OLR) in the figure below. From Weickmann, Lussky, and Katzback (1985).

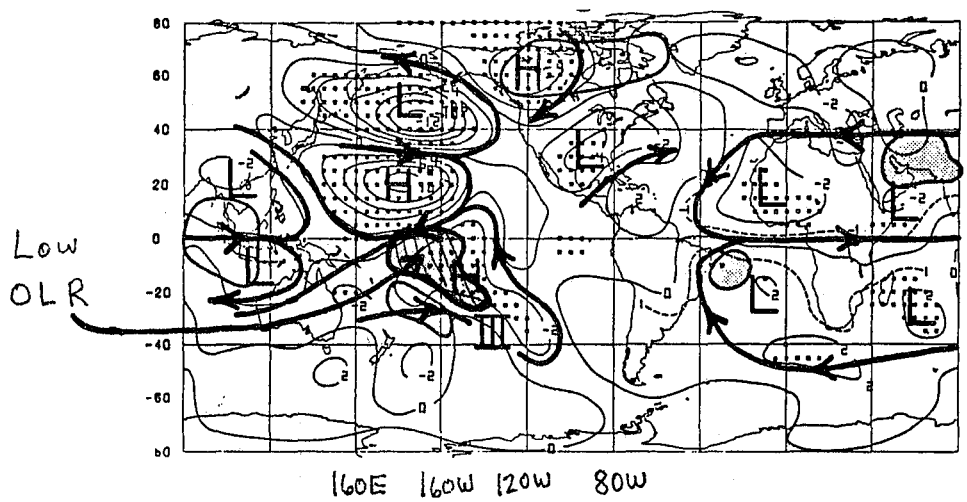
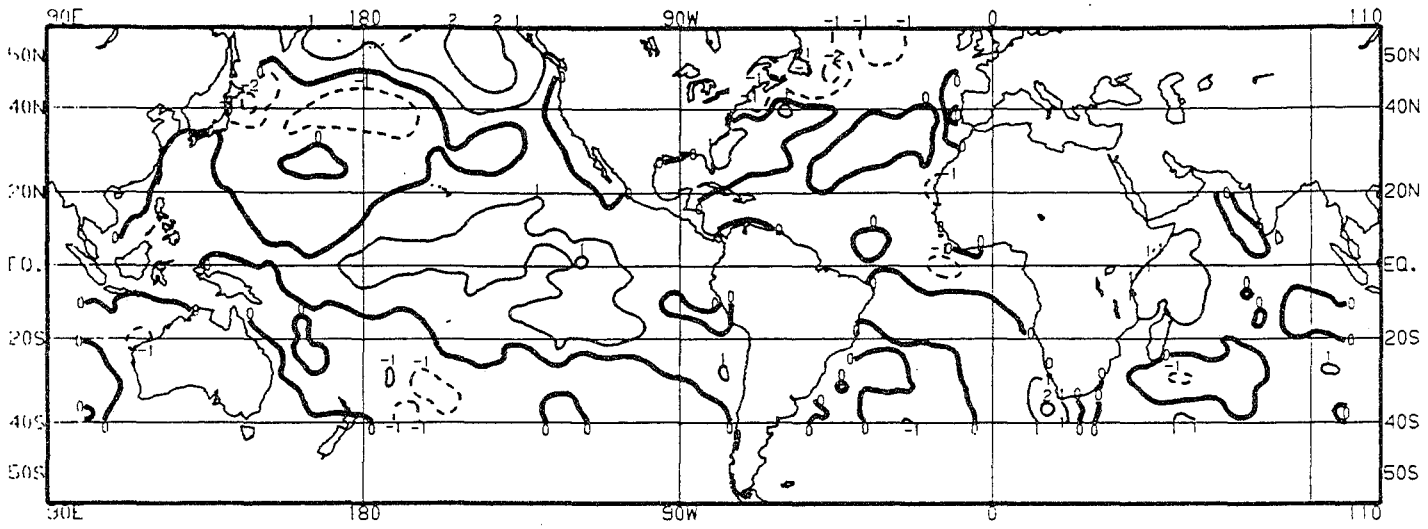


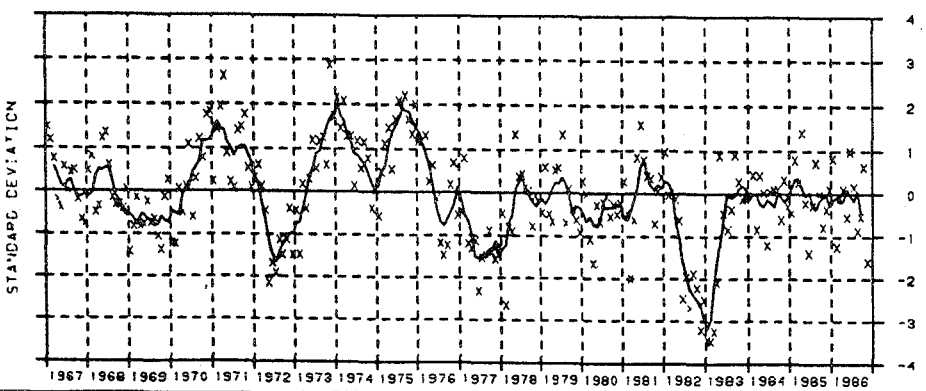
FIGURE 3.



SEA SURFACE TEMPERATURE ANOMALIES, NOV 1986. Anomalies are computed as departures from the CAC climatology (Reynolds, NOAA Tech Report NWS 31, 1982). Contour interval 1°C with negative anomalies dashed.

FIGURE 4.

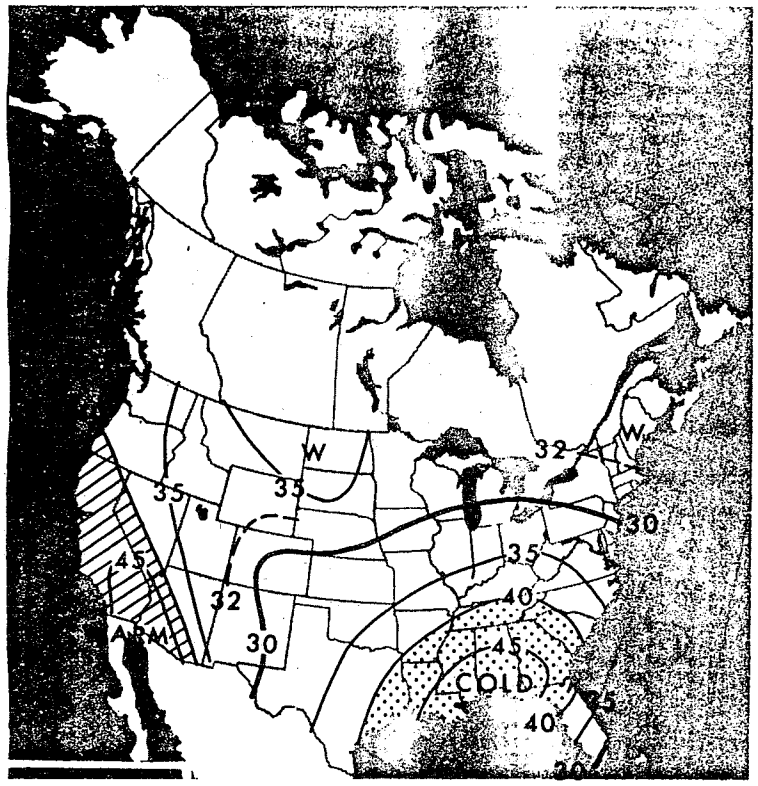
FIGURE 5.



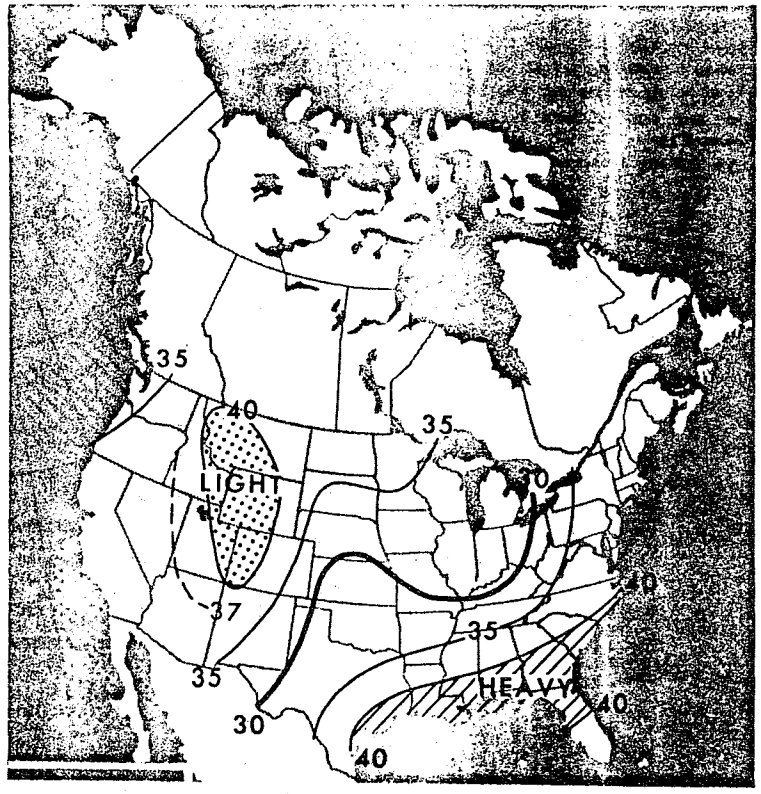
- Five-month running mean of the difference between the standardized sea level pressure anomalies at Tahiti and Darwin (Tahiti-Darwin). Values are standardized by the standard deviation of the appropriate monthly mean. Crosses are individual monthly means.

FIGURE 6.

90-DAY OUTLOOK FOR JANUARY THROUGH MARCH 1987



TEMPERATURE PROBABILITIES



PRECIPITATION PROBABILITIES