

An ENSO beginning in the year 2000?

C.K. Gopinathan

Physical Oceanography Division, National Institute of Oceanography
Dona Paula, Goa - 403 004, India.

Abstract

Several models have been developed over the last few decades to predict the advent of new ENSO events several months in advance of the actual event. None of the models have predicted a warm event beginning by the year 2000.

Positive SST anomalies of the order of $+2^{\circ}\text{C}$ observed in April and May 2000 in the eastern equatorial Pacific Ocean between longitudes 90°W and 120°W , strongly suggested the possibility of development of a new ENSO warm event during 2000.

A few reasons that support the view that an ENSO warm phase is likely to occur before the end of the year 2000 are indicated.

According to ENSO Advisory for July 2000, by Climate Prediction Centre, Department of Commerce, U.S.A., large scale oceanic and atmospheric circulation pattern over the Pacific Ocean in June 2000 reflected a weakened cold episode (La Nina) conditions. According to the Advisory, the changes in SST, OLR, 850 hPa zonal wind and sea level pressure and their anomalies during the period from January to June 2000 were nearly the same as in 1999.

Besides, all the available model results based on data till June suggest that the cold episode conditions will continue till 2001. It is predicted that normal or slightly cooler than normal conditions will present in the central and eastern equatorial Pacific Ocean by December 2000.

A different opinion is presented in this note. The ENSO warm phase is likely to start before the end of the year 2000. There are a few reasons that support this view.

The first reason is that changes in some of the important oceanic and atmospheric parameters from January to July in 1999 and 2000 are not comparable. As an example the SST and SST anomaly changes in the equatorial Pacific Ocean between January 1999 and the end of July 2000 are shown in Fig. 1. It appears from the figure that both SST and SST anomaly variation patterns showed very large changes during the period May to July 2000 compared to the previous year. The negative SST anomalies, which were present in the west central equatorial Pacific Ocean in 1999 almost disappeared by the end of July 2000.

The Southern Oscillation, an Integral part of ENSO is normally measured by an index based on the 30-day pressure differences between Tahiti and Darwin. The

Troup's Southern Oscillation Index (SOI) values from December 1997 to July 2000 are plotted in Fig. 2. The values were positive throughout the period from June 1998 to May 2000. It dropped to a value of -6 in June 2000. It continues to be below zero in July 2000. The 90-day mean SOI also has changed its phase from positive to negative by the end of July 2000. Though SOI is a highly variable parameter and the negative index changes are relatively small, the changes may be an indication of larger changes to come.

The 850 hPa zonal wind anomalies between 5°N and 5°S in the equatorial Pacific Ocean at three selected areas had been one of the indicators of ENSO phase change during the earlier ENSO events. The 850 hPa zonal wind index in one of the regions between 120°W and 135°W , was negative till February 2000. This has changed to positive value from March 2000. The wind anomaly index had remained negative till June 2000 in the equatorial area between 175°W and 140°W (second area) and also between 180° and 135°E . The index has become nearly zero in the second area and come up to nearer zero in the third area between 135°E and 180° by July 2000.

The wind anomaly changes were conspicuous near the surface layers (not shown). By the middle of July, the entire equatorial Pacific Ocean, west of 140°W had positive wind anomaly. If this persists or extends further east during August-September 2000, it may lead to the development of ENSO warm event before the end of 2000.

The subsurface temperature anomaly in the equatorial Pacific has undergone considerable change during January to July 2000. A positive temperature anomaly existed just below the surface of almost the entire Pacific

Five-Day SST 2°S to 2°N Average

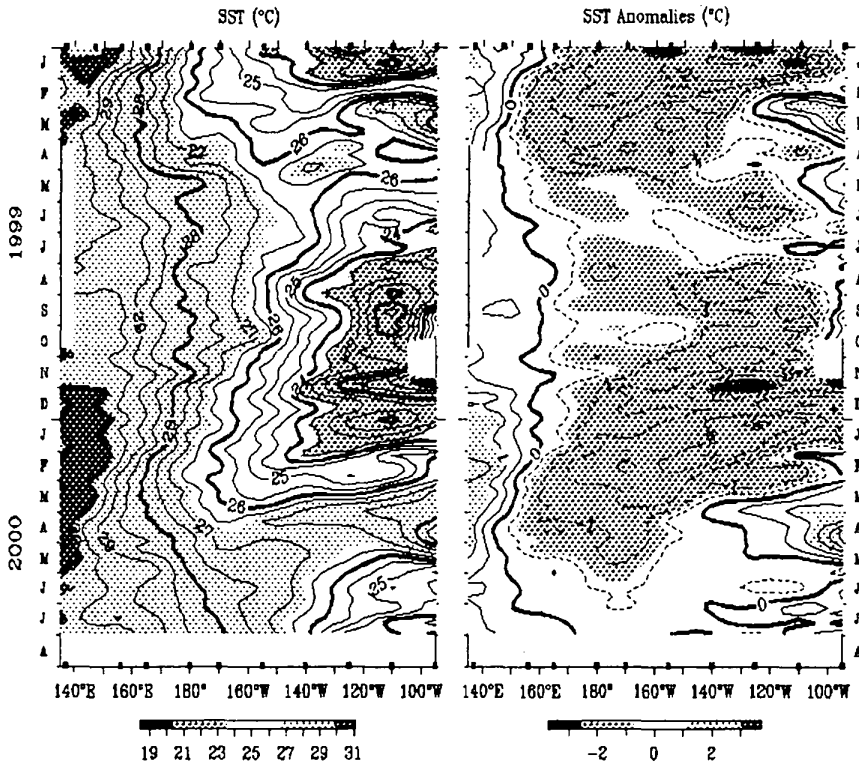


Fig. 1. Time-longitude sections of 5 day average SST and SST anomaly between 2°N-2°S obtained from the moored buoys of TAO/TRITON array between January 1999 to August 2000. Anomalies are relative to Reynolds SST climatologies.

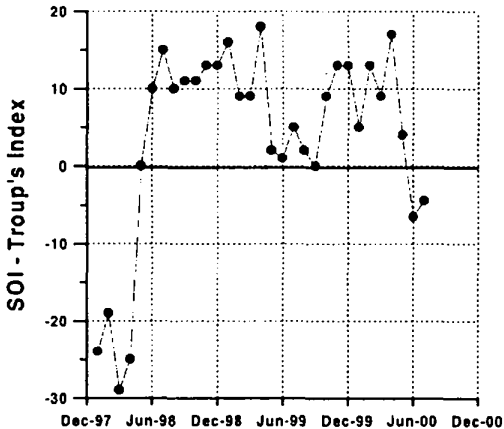


Fig. 2. Time variation of Troup's monthly SOI from December 1997 to July 2000. The index values were positive throughout the period from May 1998 to May 2000. It changed to negative value by June 2000.

Ocean, except small areas in the central and eastern equatorial Pacific Ocean by July 2000. The warm temperature anomaly may surface at any time, probably between September and December of the year 2000.

There is a hypothesis that the Indian southwest monsoon rainfall anomaly is related to the ENSO phase change. The Indian southwest monsoon rainfall season started vigorously by the first week of June. It was 70% above normal by the first week of June. Weekly rainfall showed a steady decline in the month of June and July. It became 2% below normal by the end of July. If the Indian rain anomaly becomes negative (below -10%) by August or September 2000, it may accelerate the phase change of ENSO. Earlier observations have shown that a negative rainfall anomaly in the second half of the Indian rainy season is associated with a concurrent warm anomaly of the NINO-3 region.

Is an ENSO warm event developing in the year 2000? There are some indications of its development as on July 2000. The behavior of the Indian rainfall during August and September will indicate if an ENSO event will develop by the end of the year 2000.