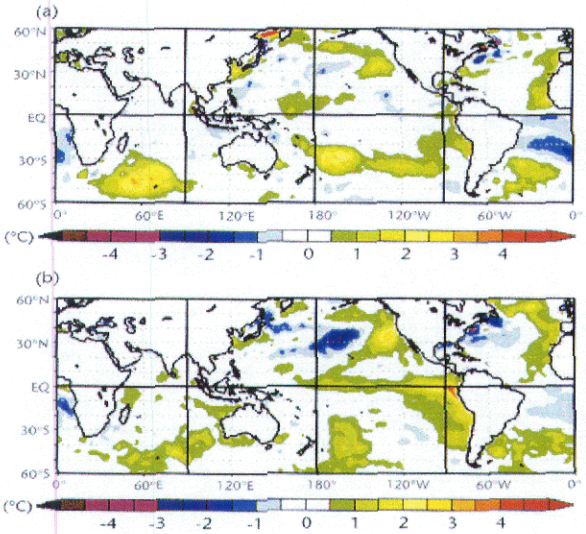

Figure II.9
Monthly mean anomalies of sea surface temperature for a) March 1997; and b) May 1997. Warmer than normal temperatures developed off the Pacific coast of South America during May associated with the deepening thermocline that followed the arrival of the Kelvin waves.
(NOAA/CDC, USA)

eastern equatorial Pacific Ocean, and the southward extension along the coast of South America following the arrival of the Kelvin waves, can be seen in the map of sea surface temperature anomaly for May 1997 in Figure II.9b.

Evolution

The El Niño continued to develop during June. By July, sea surface temperature anomalies had reached from 3°C to 5°C above the seasonal normal in the eastern equatorial Pacific Ocean, the largest recorded during Southern Hemisphere winter months. The montage of characteristic indicators in Figure II.10 outlines the extent of development of the El Niño event by July 1997. Over the eastern equatorial Pacific Ocean the area of above normal sea level expanded (Figure II.10a), the thermocline depth deepened (Figure II.10b) and the area of warm sea surface temperature anomaly also expanded significantly (Figure II.10d).

By July 1997, despite the marked changes that had taken place in the distribution of heat content of the equatorial Pacific Ocean (Figure II.10d), there was no apparent coherent pattern of reorganization of the tropical surface wind field at that time (Figure II.10c). Nevertheless, the development of clear patterns of anomaly of outgoing longwave radiation points to rapid coupling between the developing El Niño event of the Pacific Ocean, through deep atmospheric tropical convection, and the atmospheric circulation.

The outgoing longwave radiation pattern for June 1997 is in Figure II.11. The extensive area of increased outgoing longwave radiation over the tropics, stretching from India through Indo-China, the Philippines and Indonesia to east of Papua New Guinea, indicated there was less deep atmospheric convective cloud and rainfall over the region. However, reduced outgoing longwave radiation over the central and eastern equatorial Pacific Ocean indicated increased tropical deep atmospheric convection and precipitation had shifted eastwards. There was also reduced outgoing longwave radiation, indicating increased cloudiness and

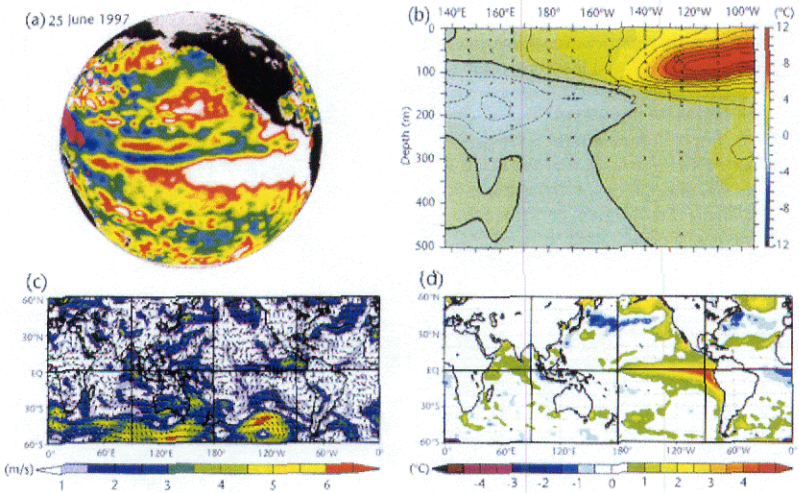

Figure II.10
A montage of characteristic El Niño indicators showing development during July 1997. Sea level has risen across the eastern equatorial Pacific Ocean (white shading more than 12 cm above normal (a). The thermocline of the eastern equatorial Pacific Ocean has deepened (b). Westerly wind anomalies have developed over the western and central equatorial Pacific Ocean (c). The area of warm sea surface temperature anomaly over the eastern equatorial Pacific Ocean has expanded (d). Easterly wind anomalies and cold sea surface temperature anomalies have developed over the eastern equatorial Indian Ocean.
(a) NASA/JPL, USA; b) NOAA/PMEL (TAO Project), USA; c) and d) NOAA/CDC, USA from NCEP/NCAR reanalysis)