



Figure II.24
Values of median monthly outgoing longwave radiation over the central (long 120°W–180°W) and eastern (long 60°W–120°W) Pacific Ocean and an index of monthly precipitation over the coastal region of Ecuador during 1997–98.
[Cornejo (personal communication) based on data from INAMHI, Ecuador]

longwave radiation confirm the presence of anomalous deep atmospheric convection through the period to May 1998. However, it was after the coastal sea surface temperatures exceeded the threshold for tropical deep atmospheric convection and the intertropical convergence zone moved south of the equator during the Southern Hemisphere summer that torrential rainfalls were experienced over southern Ecuador and northern Peru. These normally dry regions received from 10 to nearly 50 times normal rainfall between September 1997 and May 1998.

Because the intertropical convergence zone was further south than normal, rainfall over northern Colombia and Panama was very much below average during December 1997 and January 1998. However, as the very active intertropical convergence zone began to retreat northward following the annual cycle, very much above average rainfall was received over Colombia and Panama in February 1998.

The summertime pattern of positive anomalies of outgoing longwave radiation over tropical South America (Figure II.23d) was not as strong nor coherent as during the earlier spring period (Figure II.22d). The seasonal southward travel of the intertropical convergence zone was, to some extent, countering the subsidence from the anomalous convection over the eastern equatorial Pacific Ocean. However, very dry conditions persisted along the northeast Atlantic Coast from Brazil to Venezuela.

The anomalous subtropical westerly winds in the upper atmosphere weakened between September and December 1997. However, atmospheric teleconnection processes associated with the still stronger than normal upper atmosphere jetstream continued to be favourable for active weather systems across the mid-latitudes of the continent. Very heavy rains during April 1998 compounded the effects of earlier storms and many river levels of northern

Argentina, Paraguay and Uruguay exceeded critical levels and were comparable to the floods of 1983 and 1992, also during El Niño events. The below average outgoing longwave radiation was an indicator of the teleconnection influence on the subtropical regions east of the Andes Mountains.

Impacts

The El Niño phenomenon originally came to notice because of its significant negative impact on the biological productivity and marine resources along the Pacific Coast of South America. The cessation of upwelling cold water and the cut-off of the supply of nutrients after the marine environment and the capacity of ecosystems to maintain the marine food chain and fish populations.

During 1997 and 1998 the abnormal warming off the coast of Ecuador exceeded 5°C in the water column from the surface to 100 metres for a period exceeding 10 months. An abundance of wild shrimp larvae to seed fish ponds meant that commercial hatchery products were in low demand. This led to a collapse of the shrimp hatchery industry (made up of approximately 300 hatcheries employing 6 000 people). However, shrimp export revenues from Ecuador increased by 40 per cent in 1997. There was, however, a migration of pelagic species away from the warmer waters, resulting in a virtual collapse of the pelagic fisheries of Ecuador, Peru and Chile.

Despite several decades of research and the implementation of improved monitoring systems there are still many unknown factors relating to the various fish populations and their sensitivity and vulnerability to the El Niño phenomenon. These need to be resolved if the marine resources are to be managed as a sustainable industry. Systematic monitoring from a network of offshore observing systems is required to generate necessary data to better understand sensitivity of species to temperature and salinity changes, species migration and changing fertility during El Niño events. Collection, ongoing archival and analysis of the data in standard formats will assist multidisciplinary studies that are needed to reduce the economic and environmental risks and underpin sustainable development of the marine resources.

The El Niño event had a direct influence on weather systems along the Pacific coast from Panama to southern Chile, with periods of flood or drought