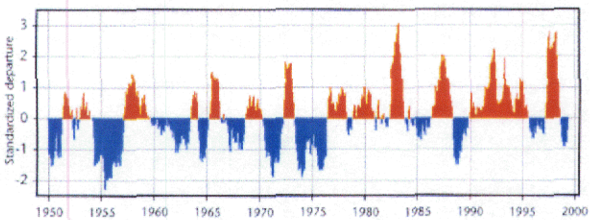
Figure II.16
Anomaly of outgoing longwave radiation for January 1998 during the mature phase of El Niño. There is reduced deep atmospheric convection (positive anomaly — blue to mauve shading) over Indonesia, the Philippines and Mexico and enhanced deep atmospheric convection (negative anomaly — yellow to red shading) over the central equatorial Pacific Ocean and off equatorial East Africa.
(NOAA/CDC, USA)

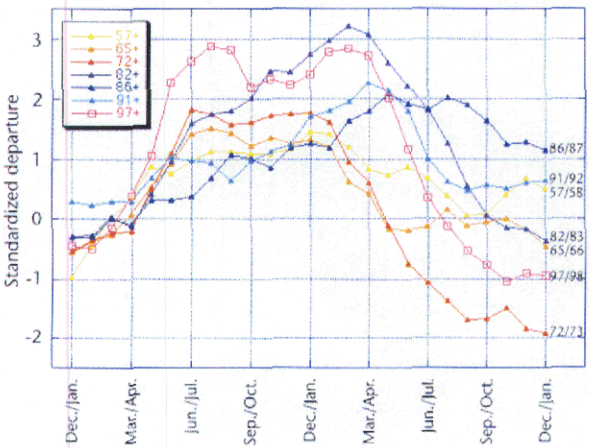
complexity of making objective historical comparisons.

The Multivariate ENSO Index (MEI) has been proposed as one such objective method to combine a set of characteristics in a way to generate a series suitable for comparison of different events. The MEI uses six variables from the tropical Pacific Ocean: sea level atmospheric pressure, zonal and meridional components of the surface wind, sea surface temperature, surface air temperature and cloudiness fraction. These observations have been collected and published for many years. The MEI is computed on a sliding bimonthly time-step that provides a degree of intraseasonal smoothing. In order to keep the MEI comparable, all seasonal values are standardized to the respective seasonal time-step and to 1950–93 as a reference period. The MEI is displayed as a standardized departure.

The historical MEI series from 1950 is graphically displayed in Figure II.18. The positive and negative departures represent the warm and cold ENSO periods respectively. The series shows different characteristics of each event, particularly in terms of magnitude and duration.

Figure II.18
Time series of the standardized departure of the Multivariate ENSO Index (MEI) from 1950 to 1998. The MEI is an objective combination of six atmospheric and ocean variables associated with ENSO.
(Wolter and Timlin, 1998)





The MEI values spanning a two-year duration for seven of the strongest El Niño events since 1950 are shown graphically in Figure II.19. Each event starts from near zero at the beginning of the calendar year and builds strongly during the middle of the year before reaching a plateau. However, there are clear differences in the patterns of development between events. The 1982–83 event had the distinction of achieving the highest MEI departure, and that was early in the second calendar year. The 1997–98 event almost reached the same MEI departure value but in the third quarter of the first calendar year and six months in advance of the 1982–83 event. However, the 1997–98 event remained strong and achieved a second departure maximum early in the second year.

In these comparisons using the MEI as a measure, the 1982–83 and 1997–98 El Niño events are clearly the strongest of the past 50 years. Unfortunately, data are not adequate to make comparisons with earlier events. Even the relatively simple SOI series cannot be reconstructed before the late nineteenth century and there are gaps in the series until the early twentieth century. Many aspects of the 1877–78 event and others during the early period, particularly the socio-economic impacts, have been documented. However, it is a matter for further research as to whether the 1877–78 event was comparable to those of 1982–83 and 1997–98. Nevertheless, El Niño events since 1950, particularly the two major events of 1982–83 and 1997–98, provide valuable data about weather and climate extremes that can be expected to recur and for which mitigation steps should be taken.