Figure 1.8
Patterns of precipitation and temperature anomaly that are relatively consistent between El Niño events a) during the Northern Hemisphere winter and b) during the Southern Hemisphere winter.
(NOAA/PMEL (TAO Project), USA after Ropelewski and Halpert, 1987)

comparing respective events over the period and noting the recurring common features. More data are available from the more recent events, which tend to bias findings, but it is possible to review earlier events in a search for indicators that those same characteristics may have been present. Thus we know from contemporary descriptions of the intensity and global patterns of societal impacts during 1877 and 1878 that the climate anomalies are almost certainly linked to a major El Niño event, despite having only limited scientific data from the period.

A serious concern about the application of knowledge of ENSO constructed from analysis of earlier events relates to potential long-term change of the climate system, whether through natural variability or anthropogenic forcing. Over the past 150 years there has been a small (less than 1°C) increase in the average global temperature at the Earth's surface, both over land and over the oceans. The Intergovernmental Panel on Climate Change (IPCC) has concluded "the balance of evidence suggests that there is a discernible human influence on global climate".

As yet, there is no consensus on how global warming may impose shifts in the seasonal pattern and intensity of weather systems. There is, however, consensus that a changing climate will be reflected in changing patterns of weather and climate extremes. Even a change in the average state of the local climate will be reflected in a profile of higher extremes at one end of the range and lower extremes at the other. Also, during the global warming of the recent past there are parts of the globe that have experienced a cooling trend and this underscores the potential for increased climate variability and extremes.

Warm and cold ENSO events contribute to the pattern of variability of weather systems and to extremes of local and regional climate. As a result of complex non-linear interactions between components of the climate system during ENSO events there are seasonal shifts in the frequency of occurrence and intensity of regional weather systems in many parts of the globe. For example, in some regions the seasonal incidence of tropical cyclones is suppressed during an El Niño event but enhanced during a La Niña event and the seasonal risk of wind damage and flooding changes; in other regions it is the opposite. In some mid-latitude regions, through teleconnections, there is either an enhancement or reduction in the frequency of cyclones and of the seasonal rainfall distribution. If the recurring frequency and/or intensity of El Niño and La Niña events were to change then there would be profound changes to many local and regional climate extremes, with consequent societal impacts.

The available observations indicate that the characteristics of ENSO variability over the second half of the century may have changed. There have been more El Niño events, particularly since the early 1970s, with an almost continuous sequence during the early 1990s and two major events in 1982–83 and 1997–98. Some scientists have suggested that the changed frequency and intensity of recent El Niño events is outside the expected variability of the climate system (based on observations of the past century), and that the changes may be linked to, or evidence of, anthropogenic influence on the climate system. There are other scientists who suggest that a century is too short a period on which to make such judgements, particularly if there is multi-decadal variability in the recurrence of El Niño events. The IPCC is addressing these important issues.

Notwithstanding the continuing scientific discussion on the changed characteristics of El Niño events over the past three decades, and the attribution of cause, there is consensus that issues related to El Niño are inseparable from the broader issues of climate change. ENSO is part of the recurring patterns of extreme weather events and persisting climate anomalies that have enormous societal impacts, especially in developing countries. A concerted effort is required on the part of governments and non-governmental organizations to develop appropriate policies to mitigate climate change, where feasible, and to prepare their communities for periodic impacts of climatic extremes as a basic for sustainable development.