China

One of the historical objectives that stimulated climate research was the search for an explanation of recurring drought over northern China. Many of the early studies were critical in assisting scientists develop an understanding of the Southern Oscillation early in the twentieth century.

China extends from the subtropics in the south to the middle latitudes in the north. During the Northern Hemisphere summer the Asian monsoon draws warm moist tropical air over eastern China and generally produces high seasonal rainfall. The winter monsoon generates an outflow of cold dry air from the continent. Thus, changes in the intensity of the monsoon systems associated with the Southern Oscillation (and El Niño) will also affect the rainfall patterns. Year-to-year variability in the accumulation of winter snow over the high Tibetan Plateau to the west has been linked to anomalies in the following summer monsoon and rainfall over agricultural areas.

Significant climate anomalies over China during the 1997–98 El Niño were:

- Reduced rainfall over northern China that lasted from summer of 1997 through to late winter of 1998;
- Very hot temperatures over northern China during summer of 1997 and above normal temperatures continuing through winter;
- Persistent winter rainfall over the southeast that saturated the soils and raised river heights to record levels for that season;
- Exceptionally heavy snowfalls over the Tibetan Plateau during the 1997–98 winter;
- Abnormally high rainfalls following the exceptional winter rains and spring snowmelt produced record floods over the Yangtze Basin after the El Niño event; and
- Abnormally high rainfall over the northeast during the summer of 1998.

In most years the atmospheric convection over Asia during the summer monsoon provides the seasonal focus of the ascending branch of the Walker Circulation. Therefore, disruption to the Walker Circulation by the eastward movement of deep atmospheric convection associated with an El Niño event will also have an effect on the organization of the monsoon and associated rainfall.

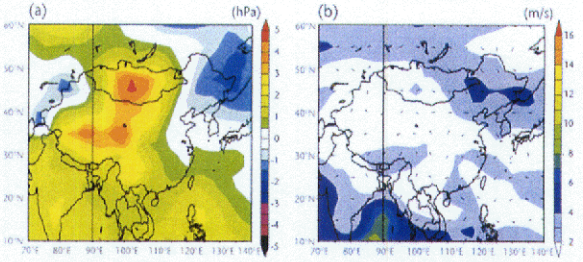

Figure II.37
a) Sea level pressure anomaly; and b) surface vector mean wind at 925 hPa (approximately 750 m altitude) over Asia during August to October 1997.
(NOAA/CDC, USA)

June–November 1997

The El Niño event was associated with a weak summer monsoon circulation over much of Asia during 1997. Above average surface pressure became established over much of tropical Asia, including southern China, with the onset of the El Niño and this was consistent with the strongly negative values of the SOI. As a consequence of the higher than normal surface pressure and weakened monsoon circulation, the inflow of warm moist air from the surrounding oceans was reduced.

The characteristics of the near surface circulation for August to October 1997 can be seen in the composite sea level pressure anomaly map (Figure II.37a) and low level wind flow (Figure II.37b). The consistent, though weak, westerly airflow over North East Asia was a sufficient barrier to the intrusion of warm moist tropical air over north China during this period. The monsoon did not penetrate as far north as normal and most regions north of the Yangtze River received significantly below average rainfall.

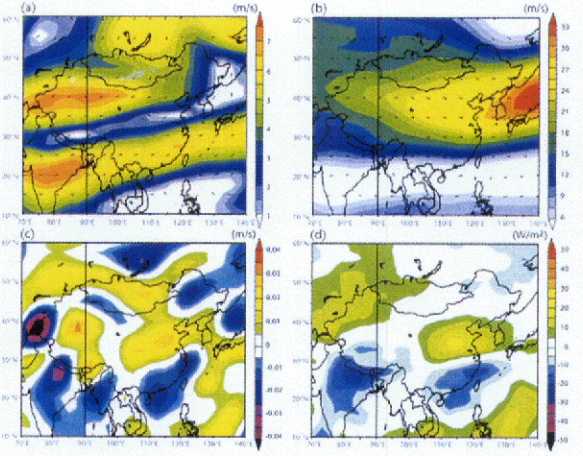

Figure II.38
Montage of climate indicators over Asia during August to October 1997: a) 250 hPa (approximately 10.5 km altitude) anomaly of vector mean wind; b) 250 hPa vector mean wind; c) anomaly of vertical motion at 700 hPa (approximately 3 km altitude); and d) anomaly of outgoing longwave radiation.
(NOAA/CDC, USA)