Resource 1.a: THE EL NINO SOUTHERN OSCILLATION (ENSO) CYCLE

The processes in the atmosphere are illustrated by the ENSO cycle, which is the large-scale fluctuation of ocean temperatures, rainfall, atmospheric circulation and air pressure across the Pacific Ocean. El Nino episodes are called ‘Pacific warm’ episodes because abnormally warm sea surface temperatures occur in the eastern Pacific ocean from the international dateline eastward to South America. La Nina episodes are called ‘Pacific cold’ episodes because abnormally cold sea-surface temperatures occur across the same area. El Nino and La Nina represents opposite extremes of the ENSO cycle. These temperature fluctuations are accompanied by even larger-scale fluctuations in air pressure, known as the Southern Oscillation. A negative Southern Oscillation index (SOI) occurs during El Nino when abnormally high air pressure covers Indonesia and Australia. In contrast, a positive Southern Oscillation index occurs during La Nina when low air pressure forms over Indonesia and Australia. In Australia, the combination of sea temperature and air pressure means that El Nino brings drought while La Nina means higher than average rainfall. The ENSO cycle has an average period of about four years.

Resource 1.b: LA NINA and EL NINO CONDITIONS
Resource 2: OCCURRENCE OF WARM & COLD EPISODES

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<th>Occurrence (year that the episode began)</th>
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Resource 3: SOUTHERN OSCILLATION INDEX (SOI)

[Graphs showing Southern Oscillation Index (SOI) with El Niño and La Niña events highlighted.]

[Graphs showing temperature (°C) and standard deviation over years.]
Predicting El Niño

The El Niño phenomenon repeats itself about every 3 - 7 years. While this is useful information for researchers, it does not make for very easy predictions of specific El Niño events. This is quite unlike other phenomena in the ocean-atmosphere system. For example, with the seasonal cycle, we can predict that temperatures will be colder during winter and warmer during summer. Similarly, for the diurnal (daily) cycle, we predict that temperatures will be warm during the day and cool at night. The latter are referred to as oscillating or periodic (repeating) phenomena. El Niño, however, is not periodic and shows considerable irregular behavior. Since the ocean-atmosphere models used to forecast El Niño have had only modest success, we need more research to improve forecasts.

Resource 5:

WARM EPISODE RELATIONSHIPS  DECEMBER - FEBRUARY
Resource 6: IMPACT ON FISHING INDUSTRY

Resource 7: ENVIRONMENTAL CONDITIONS OF EL NINO
Resource 8: NEWS ARTICLES ON EL NINO

a.

**El Niño blamed as drought grips Fiji**

By ASHA LAKHAN in Suva
Village food crops are dying and waterborne diseases are on the rise in Fiji as a drought caused by the El Niño weather phenomenon intensifies.
The drought has seen creeks and wells in the rural areas of the north and west dry up, with thousands in villages and settlements reliant on emergency water supplied by the Government.

*Australian, 15 December 1997*

b.

**El Niño body blow to PNG**

By LUCY PALMER, Port Moresby, Sunday
Amid the withered gardens and scorched earth of Papua New Guinea's drought-ravaged Highlands, the weak and elderly are starting to die.
In another month, PNG could be facing its worst famine this century.
The Government has announced emergency funding and has asked Australia to send experts this week to help draft a response plan.
Some Government officials estimate that as many as one million people could be affected by the drought, brought on by the El Niño weather pattern.
Hundreds of schools have closed, and big mining operations such as Ok Tedi and Porgera have been forced to halt production as rivers fall to record lows.

*Age, 15 September 1997*

c.

**El Niño effect lures tropical fish to California**

San Francisco, Thursday
Warm currents from a growing El Niño effect have brought tropical and subtropical fish to the normally cold waters off northern California, the San Francisco Chronicle reported yesterday.
The report said surface water temperatures between Monterey and the Parallon Islands were about 5 degrees above normal.

*Age, 5 September 1997*
On 12 February 1998 the gold mining company, Golden Eagle International learned an update on its activities at Cangalli Gold Mine in Bolivia as follow:

“The company is experiencing the negative impact of the weather phenomenon known as El Nino... This cyclical warming of the ocean temperature causes changes in the water and air currents.... The company's mining and exploration efforts have been forced to maintenance levels by torrential rains.

The company has provided support to the township of Cangalli by using two of its bulldozers to revamp the retaining dyke between the Tipuani river and Cangalli town. In addition, the small hillside gold mining community of Mocotoro experienced a mudslide which killed 40 people and left an unknown number missing. The company’s management has instructed its local personnel to use the company’s equipment and personnel in assisting rescue efforts in Mocotoro.

Canada Newswire
12 February 1998