El Nino and La Nina

El Nino represents a disturbance of ocean and atmospheric conditions. It occurs at intervals of 3 to 8 years. Occurring in the eastern Pacific Ocean, the effect of the El Nino spreads widely over the globe. The disturbance may last for more than a year and it brings droughts, heavy rainfall, spells

of severe heat and cold, a high incidence of cyclonic storms in its wake not only in various parts of eastern Pacific but also in areas as far as Africa, Indonesia and India. The expression El Nino comes from Peruvian fishing industry suffering large-scale damages during the El Nino years. The literal meaning of the term *Corriente del Nino* in the language of the Peruvian fishermen is the Current of Christ Child. It is an invasion of warm surface water occurring once every few years around Christmas time and it depletes the catch of fish.

In normal years a cold current called the Peru Current or the Humboldt Current flows along the western coast of Peru. This current flows from south to north. Turning to west near the equator, the current merges into the South Equatorial Current flowing westward across the Pacific Ocean. The coldness of the Humboldt Current is emphasised by upwelling of cold water and it brings with it large amount of plankton.

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During an El Nino year, the equatorial zone across the entire Pacific Ocean extending from South America to southeastern Asia experiences a major change in the sea surface temperatures and atmospheric pressure conditions. Normally, during the months of November and December (summer season of the Southern Hemisphere), a low pressure prevails over northern Australia, the East Indies and New Guinea–an area having the largest body of warm water. Due to this pool of warm water, a low pressure develops over this area which leads to abundant rainfall in December. On the onset of the El Nino, the low pressure found over northern Australia is replaced by a weak high pressure. This leads to drought conditions over this region. In contrast to the conditions in the tropical zone, the pressure in the equatorial zone of the eastern Pacific becomes lower than normal and the equatorial low pressure trough is intensified. This leads to abundant rains in the low pressure region. This shift in the barometric pressure from the normal is called the *southern oscillation.* The changes in the pressure conditions lead to change in the wind and ocean surface currents. Under normal conditions, the strong trade winds blowing westward push the warm water to the western Pacific causing a pile up of warm water near the western equatorial low. This westward movement of water from the eastern coast of South America causes the normal upwelling of cold water the surface water pushed to the west.

During the El Nino event, the easterly trade winds die due to the changed pressure conditions. It leads often to the onset of a weak westerly wind flow completely reversing the normal wind direction. In the absence of the trade winds which would have pushed the warm surface water to the west, the warm surface water surges eastward raising the sea surface temperatures and actual sea levels off the tropical western coast of the Americas. In the southern Pacific Ocean it effectively means that the warm water from the equatorial regions surges into the tropical regions along the western coast of South America. As a result of this surge of warm water, the cold Humboldt Current becomes a sub-surface current due to the higher density of its cold water. The warm surface water in the tropical area may spread westward up to the far as western Australia thereby warming the entire southern tropical Pacific Ocean.

The changes in the sea-surface temperature accompanying El Nino can change rainfall patterns dramatically in large areas around the globe. Southern and interior northwestern United States,

southeastern South America and the southern tip of India receive more rainfall. Intense rainfall may also occur in southern California coast in winter and in the Andean Highlands of Peru, Bolivia and Columbia, besides causing droughts in western Pacific, northern South America, southeast Africa and northern India.

Recent researches in global weather changes have led to the discovery of a phenomenon called La Nina or La Nino. The literal meaning of the term La Nina is a girl child. The La Nina presents a situation that can be described as roughly opposite of the El Nino. During the occurrence of this condition sea surface temperature in the central and western Pacific falls below the normal and this happens due to the South Pacific Sub-tropical High becoming exceptionally strong during the summer season. As a consequence, the trade winds become extremely strong causing a stronger than normal drag on the warm surface waters in equatorial Pacific Ocean. The strong westward flow of the surface waters leads to rapid upwelling of cold waters off the Peruvian coast. Such conditions were observed during 1988 and they are believed to have been associated with the drought in parts of North America in the summer of that year. Recent analyses using satellite imageries of the South Pacific Ocean indicate that during a La Nina year the upwelling of cold water is much more vigorous and it is reduced significantly during an E1 Nino Year.

The origin of the E1 Nino phenomenon is not fully understood. At first the meteorologists tried to explain the changes in the wind and pressure conditions on the basis of the ocean surface temperature changes while oceanographers tried to explain the changes in the ocean surface current due to the changes in the winds and pressure. The relationship between the two phenomena was recognised only in 1950s.

One view about the El Nino is that this cycle is simply a natural oscillation caused by the mechanism of energy exchange between ocean and the atmosphere. According to geologists, the phenomenon of E1 Nino may be associated with the volcanic activity along the East Pacific Rise, an underwater zone of sea-floor spreading. According to this view the emerging lava from this zone releases large amount of heat and it triggers the El Nino. The exact cause however, is still shrouded in mystery. With the help of the computer models using sea surface and air temperature data along with pressure data, the phenomenon can now be predicted some months in advance. The long-term prediction of the phenomenon, however, is still not reliable. On the basis of the increased frequency during the 1990s. Some scholars have speculated the global warming produced by increased emission of greenhouse gases and volcanic eruptions may also have some relation with the El Nino phenomenon.