African Centre of Meteorological Application for Development
Centre Africain pour les Applications de la Météorologie au Développement

EL NINO BULLETIN SPECIAL

June, 2009

1. El Niño Diagnostics

The evolution of El Niño starts after every 2 to 7 years with warming in western Pacific Ocean around March-June and spreads to the central and eastern Pacific attaining its peak late in November-December. This phenomenon occurs off the coast of Peru and Ecuador (South America coast between the equator and 12°S) when the cool and nutrient rich water which normally upwells from several hundred meters below sea level, is suppressed by the sudden appearance of abnormally warm and less nutrient rich surface waters. The Peruvian anchovy fisherman ruefully christened the phenomenon "El Nino" in English "The Christ Child" because it occurred in late December around Christmas. The El Niño phenomenon has also been explained as an oceanic response to the relaxation of wind stress over equatorial Pacific, which in turn is related to the weakening of the eastern south Pacific anticyclone. El Nino events were recorded in 1877, 1918, 1925, 1940, 1941, 1957-58, 1965, 1969, 1972-73, 1976, 1982-83, 1987, 1991, 1994, 1997-98, 2002, 2004 and 2006.

The monitoring and forecast of the El Niño as one of the most important coupled ocean-atmosphere phenomenon that cause major global climate variability on interannual time scales is of crucial importance due to its impacts on regional rainfall over several parts of the Globe. The global climate anomalies associated with the occurrence of El Niño include the droughts over Northern Australia, Indonesia, India, Southern Africa while wet conditions prevail over central Pacific, eastern Africa and parts of the eastern and western coasts of South America. Studies have confirmed that the rainfall patterns of many parts in Africa respond in a varied manner to different phases of the El Niño cycle forcing.

Studies have shown that the March-April-May (MAM) rainfall over parts of Greater Horn of Africa (GHA) countries is significantly suppressed during evolution (onset phase) of El Niño, but significantly enhanced at its mature phase in October-November-December (OND). The highest rainfall deficits were observed over major part of GHA countries resulting in poor MAM, 2009 seasonal rainfall performance confirming the onset of El Niño.

1.1 Sea Surface Temperature (SST)

In Figure 1 a neutral to warming conditions prevailed in most of the Pacific Ocean except in the extreme southern and northern parts where some cooling conditions prevailed. Neutral to warming conditions were observed in most of the Atlantic Ocean except in the equatorial, northern and south central where there were some pockets of cooling conditions. The neutral to significant warming conditions were observed in most of the Indian Ocean except in the Bay of Bengal and extreme southern Indian Ocean where cooling conditions prevailed.

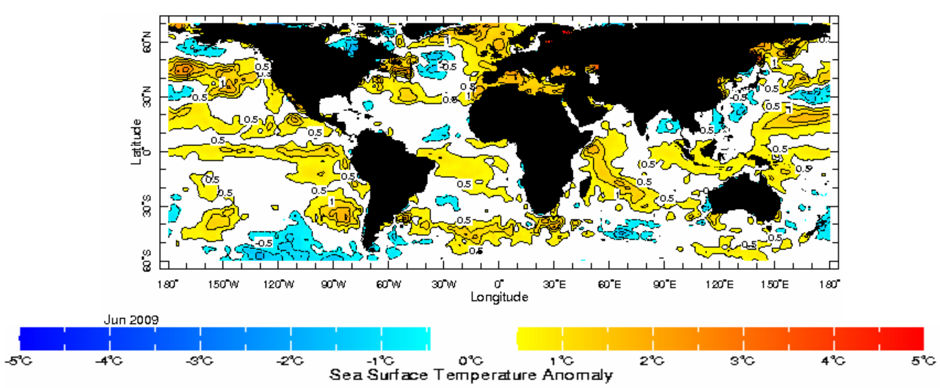

Figure 1: Sea Surface Temperature Anomalies (Source: IRI)

1.2 Thermal Index Regime

The thermal index (TI) regime at 300hPa is currently being used in this analysis as a feedback mechanism on SSTs anomalies. The TI analysis is useful in the determination of the best analogue El Niño event to the 2009 El Niño evolution from the 3 major El Niño events of 1997, 1982 and 1972 .

In the month of June, 2009, the thermal index (TI) regime at 300hPa, Figure 2, had value of 242°K isotherm over equatorial Africa extending about 10°N to 10°S maintaining reasonable conditional instability associated with heavy rainfall over parts with high relative humidity. The threshold value of 243°K and above maintained the highest conditional instability associated with heavy convective rainfall with floods over Asia, north Australia and western Pacific Ocean. The June, 2009 TI pattern compared to the past El Niño evolution of 1997, 1982, and 1972 (Figures 3, 4 and 5) showed the highest degree of similarity to the 1972 El Niño evolution.

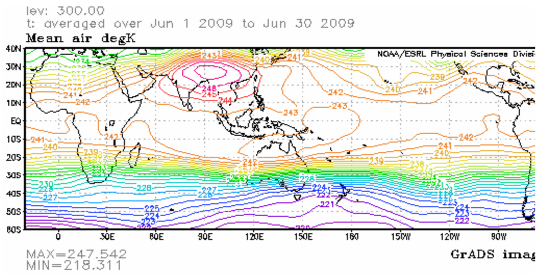

Figure 2: June, 2009 thermal index (TI) regime (Source: IRI)

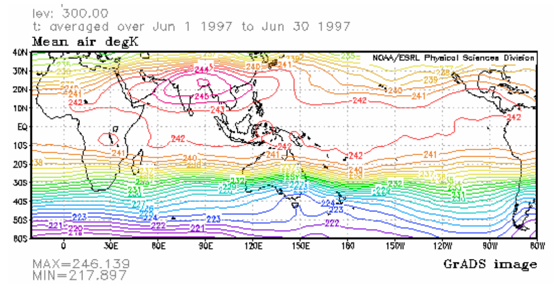

Figure 3: June, 1997 thermal index (TI) regime (Source: IRI)

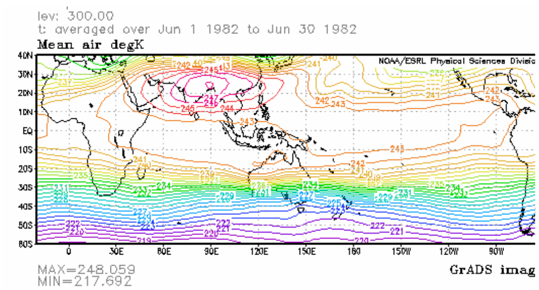

Figure 4: June, 1982 thermal index (TI) regime (Source: IRI)

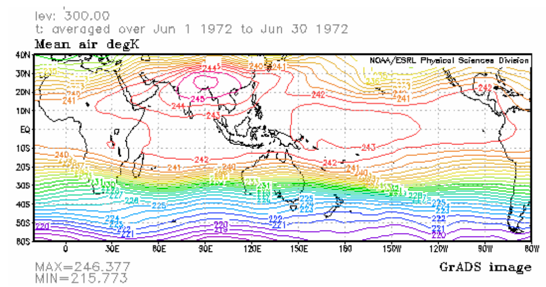

Figure 5: June, 1972 thermal index (TI) regime (Source: IRI)

1.3 Relative Humidity

The mean relative humidity at 700hPa (Figures 6,7,8 and 9) show the month of June, 2009, high relative humidity (RH) ranging from 60% to 100% pattern with highest similarity to 1972. The high relative humidity at 700hPa is a suitable indicator of moisture convergence and areas of enhanced convective activities.

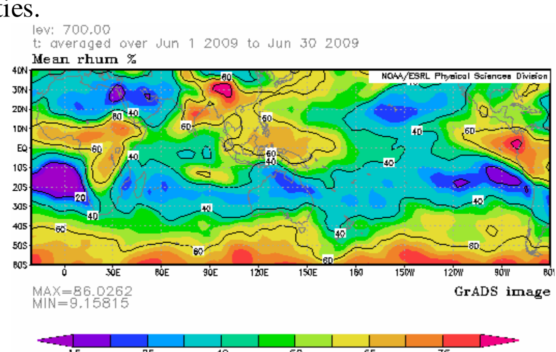

Figure 6: June, 2009 RH at 700hPa (Source: IRI)

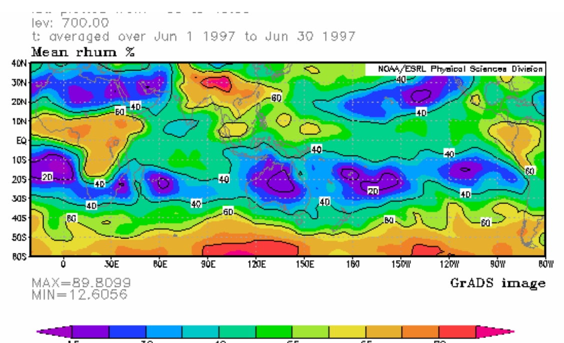

Figure 7: June, 1997 RH at 700hPa (Source: IRI)

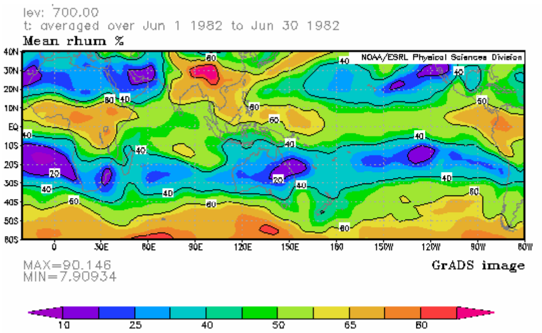

Figure 8: June, 1982 RH at 700hPa (Source: IRI)

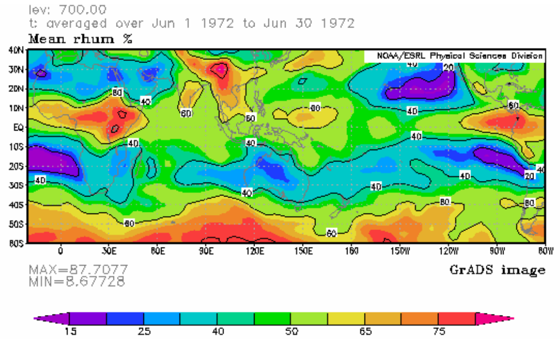

Figure 9: June, 1972 RH at 700hPa (Source: IRI)

1.4 Zonal Wind (U)

The comparison between June, 2009 (Figure 12) and June, 1972 (Figure13) shows reasonable degree of similarity in the zonal wind patterns particularly along the tropical equatorial belt .

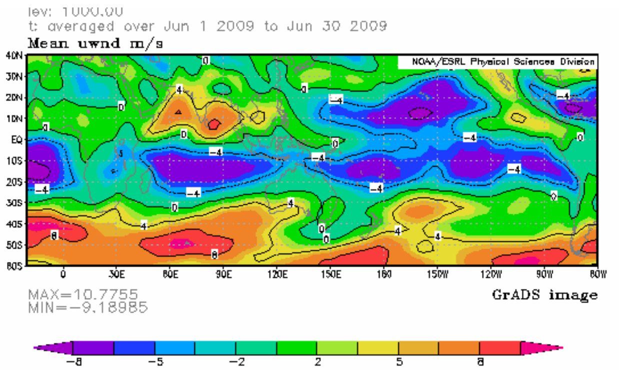

Figure 10: June, 2009 zonal wind (Source: IRI)

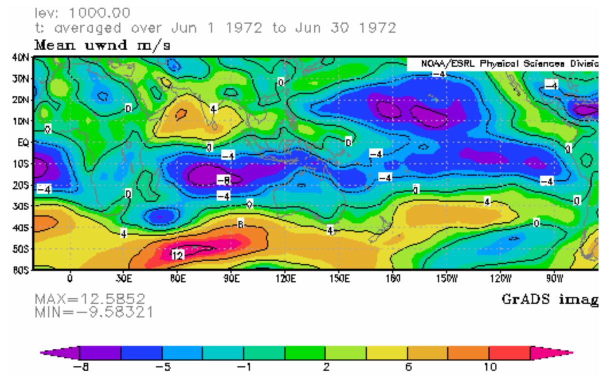

Figure 11: June, 1972 zonal wind (Source: IRI)

3. Forecast

The UK Met Office global SST forecast for JAS, 2009 (Figure 13) shows highest warming anomaly characterized by positive SST anomalies from just west of the dateline in central and eastern Pacific Ocean consistent to the IRI forecast for JJA, 2009 SST anomalies (Figure 14) indicating persisting El Niño condition.

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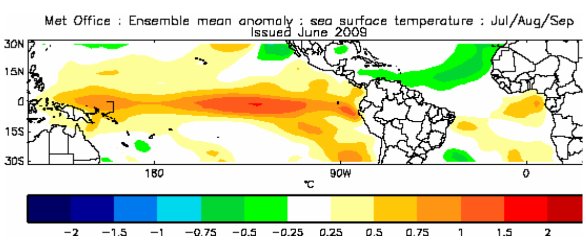

Figure 13 : SST anomalies in Pacific Ocean (Source: UKMO)

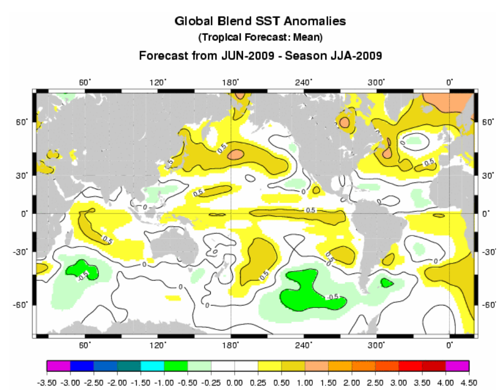

Figure 14 : SST anomalies in Pacific Ocean (Source: IRI)

The model forecast for Pacific Ocean NINO3.4 (5°N – 5°S, 120°W – 170°W) and NINO1+2 in Figure 15 and 16 provided by Meteo-France indicate El Niño condition in line with the IRI set of dynamical and statistical models forecasts of ENSO over Nino 3.4 domain in Figure 17.

The IRI models forecasts indicate that development of weak to moderate El Niño conditions are the most likely scenario through 2009 (with probability just over 60% from JAS to OND seasons), but retention of neutral conditions is also possible with probabilities of approximately 35-40%. The intensity of El Niño in 2009 will be closely monitored using all the available indicators.

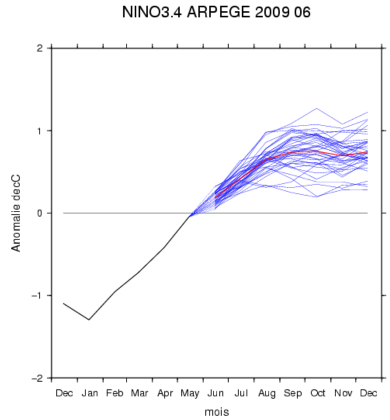

Figure15 : Model forecast (Meteo-France)

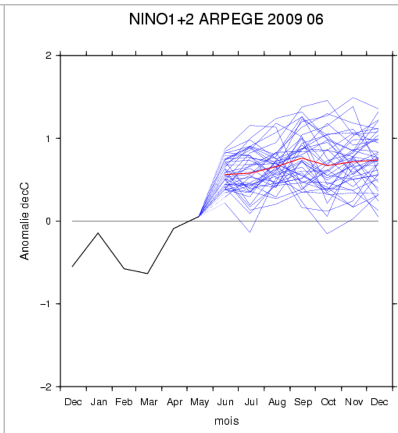

Figure 16 : Model forecast (Meteo-France)

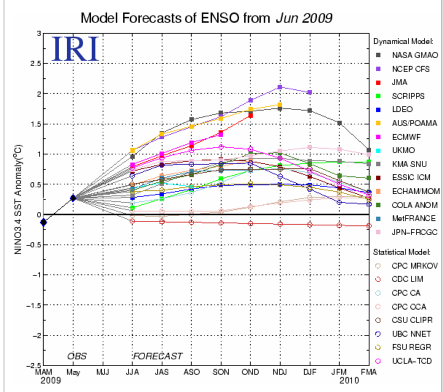

Figure 17 : Models Forecast (IRI)

4. Impacts

The evolution of El Niño in the Pacific Ocean is presently linked to the prevailing global rainfall anomalies over several parts of the globe with expectation of the anomalies magnification as we move to the mature phase of El Niño by November-December, 2009. As observed during other major El Niño years, the following rainfall anomaly patterns are expected in 2009:

a) Heavy rainfall characterized by floods in October-November-December (OND) season over GHA countries.
b) Severe rainfall deficits and drought over southern Africa countries during the peak and post El Niño.
c) The Sahel countries will experience suppressed July-August-September (JAS) rainfall recording below average with post El Niño drought.
d) The Gulf of Guinea countries will experience heavy rainfall with floods over several parts with serious threat to the coastal settlements.

The National Meteorological and Hydrological Services (NMHSs), have documented information on how El Niño impacts on the countries' climate. The NMHSs in Africa have to advise users of climate information and prediction products to guard against risks of climate extremes during the coming months as the phenomenon moves to its maturity.

The users are advised to consult local and sub-regional climate outlooks for information during the coming months which will be characterized by extreme rainfall events such as floods and droughts. ACMAD will maintain Climate Watch and provide regular updates on El Niño evolution and expected intensity (weak, moderate or strong) including impacts as we progresses towards its mature phase by end of December, 2009. The ACMAD El Niño Special Bulletin is dedicated to this activity.