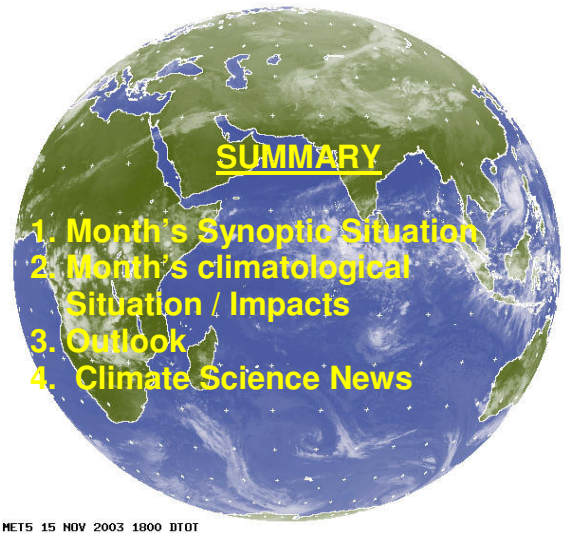
AFRICAN CENTRE OF METEOROLOGICAL APPLICATIONS FOR DEVELOPMENT
CENTRE AFRICAIN POUR LES APPLICATIONS DE LA METEOROLOGIE AU DEVELOPPEMENT

CLIMATE WATCH AFRICA BULLETIN

N° 08
AUGUST 2008



SUMMARY

HIGHLIGHTS: Observed the highest spatial and intensity of rainfall over Gulf of Guinea countries, the Sahel, the northern and western parts of Greater Horn of Africa (GHA) countries. However, the spatial and intensity of rainfall is expected to decrease.

1. SITUATION DURING THE MONTH OF AUGUST, 2008

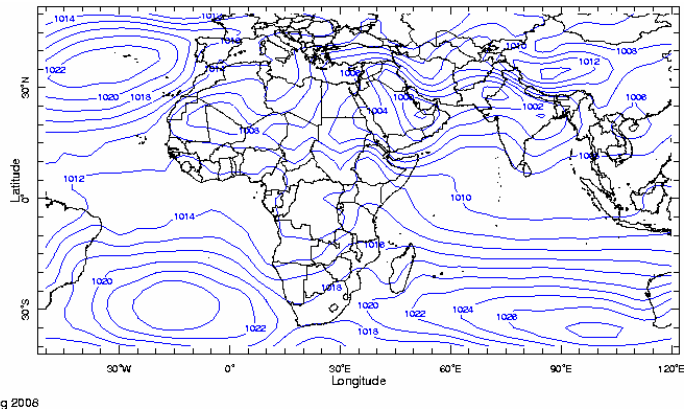
1.1 Centres of Anticyclone

The Azores high pressure at 1022hPa weakened by 2hPa and remained quasi-stationary at 35°N/35°W.

The St Helena high pressure centre at 1024hPa maintained its intensity and shifted southwest at 30°S/15°W.

The Saharan thermal low of 1008hPa maintained its depth covering a limited area over central Chad, eastern Niger, north Mali, south Algeria and east Mauritania.

The Mascarene high pressure at 1028hPa strengthened by 2hPa and shifted its centre to the southeast at 37°S/100°E with a strong ridge over eastern Africa and southern Africa.



Mean surface pressure during the Month of August, 2008 (Source : IRI)

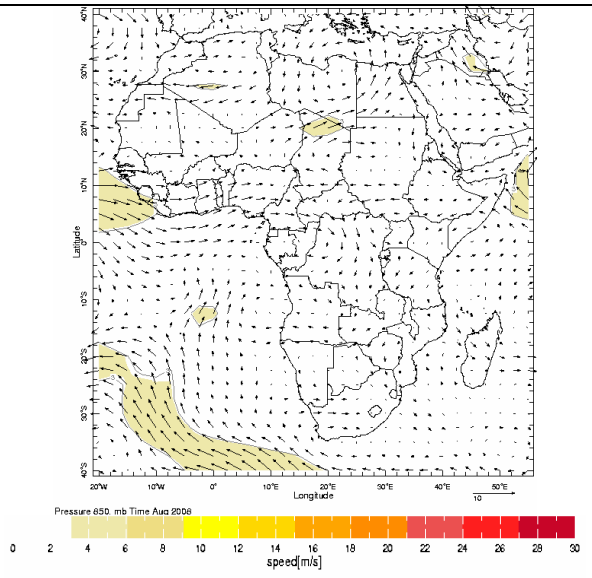
1.2 Low level wind anomaly flow at 850hPa

At 850hPa level, the strong westerly wind anomalies over Gulf of Guinea countries veered over southwest Central African Republic and Democratic Republic of Congo. The continental south-westerly wind anomalies penetrated over north eastern Niger and northern Chad.

In Indian Ocean strong wind anomalies were observed over north eastern coast of Somalia.

In the southern hemisphere strong southerly wind anomalies were observed over southern Atlantic Ocean.

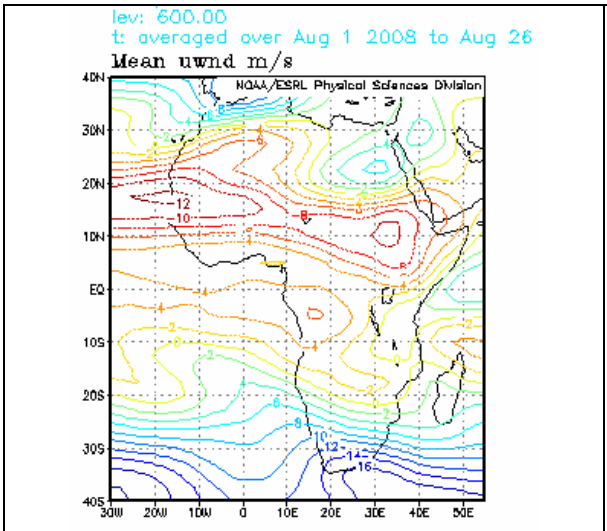
The average wind anomaly speed (shaded) was observed at 08 m/s and above.



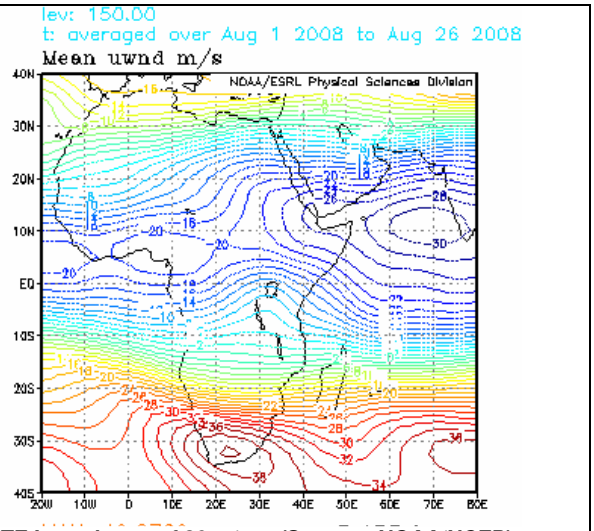
August 2008, Wind Anomalies at 850Hpa (Source : NOAA/NCEP)

1.3 African Easterly Jet (600hPa) and Tropical Easterly Jet (150hPa)

The mean maximum speed of African Easterly Jet (AEJ) at 600hPa was 12 m/s with axis located at about 18°N over Mauritania.
The mean maximum speed of Tropical Easterly Jet (TEJ) at 150hPa was 30 m/s over north Indian Ocean with secondary peaks over Gulf of Guinea countries.



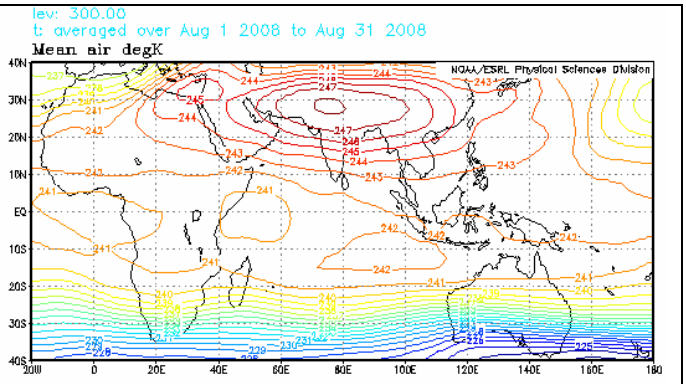
AEJ maximum of 12m/sec. (Source : NOAA/NCEP)



TEJ maximum of 30 m/sec (Source : NOAA/NCEP)

1.4 Thermal index

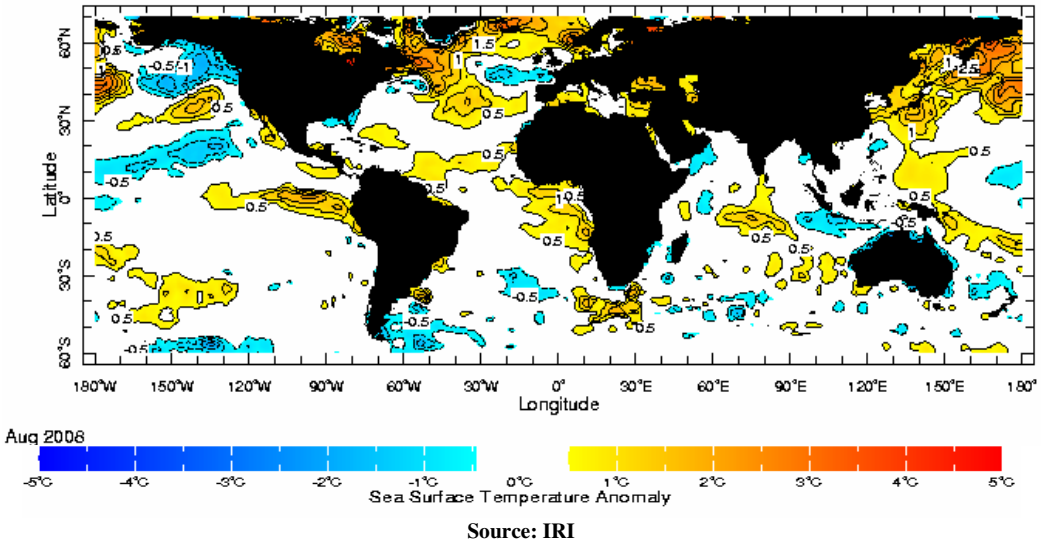
In the month of August, 2008, the thermal index (TI) regime at 300hPa, map show, had a near-threshold value of 242°K isotherm over extreme northern parts of Gulf of Guinea countries and over the Sahel countries that maintained reasonable conditional instability triggering heavy convective rainfall with floods. The threshold value of 243°K over northeast Africa and north GHA extending from the maximum TI value of 248°K maintained the highest conditional instability associated with heavy convective rainfall with severe floods. The low TI regime value of 241°K was associated with rainfall decrease over Gabon, Congo, west Democratic Republic of Congo, eastern Kenya and Somalia.



(Data Source: NOAA/NCEP)

1.5 Sea Surface Temperature (SST) and El Nino/Southern Oscillation (ENSO)

The cooling prevailed in the central equatorial and north eastern Pacific Ocean, while neutral to warming conditions prevailed in central eastern and south western Pacific Ocean. A neutral to warming condition was observed over most of the Atlantic Ocean except its southern part where some cooling conditions were observed. A neutral to warming condition were observed from central Indian Ocean up to western coast of Australia while cooling conditions were observed in its western and eastern parts. The neutral to cooling conditions were observed over Mozambique Channel with warming observed in northern part.



Source: IRI

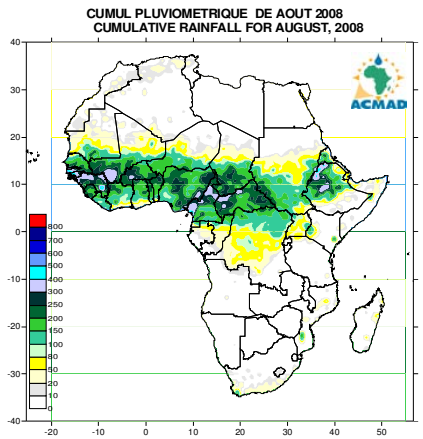
2. CLIMATOLOGICAL SITUATION AND IMPACTS DURING THE MONTH OF JULY, 2008

2.1 Rainfall

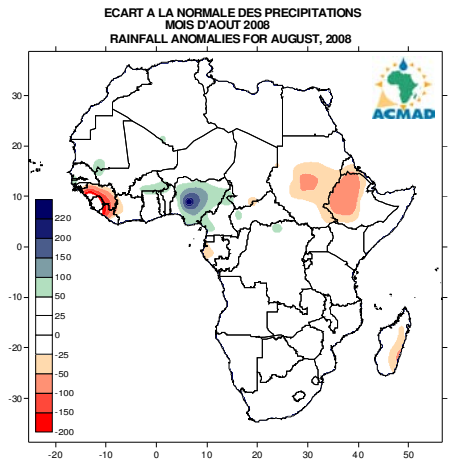
The estimated rainfall map below shows spatial and rainfall intensity increase over Gulf of Guinea countries, the Sahel countries, Central Africa countries and the GHA countries, while northern and southern Africa countries had no significant change. In summary.

- **North Africa** had no significant variation recording rainfall amounts ranging from 10mm to 50 mm over north Algeria.
- **The Sahel** countries had rainfall increase recording amounts ranging from 10mm to 300 mm with peaks of above 300mm to 500mm over west Burkina Faso, south Mali, Gambia, Guinea Bissau and south Senegal.
- **Gulf of Guinea** countries experienced rainfall intensity increase recording heavy amounts ranging from 20mm to 400mm with peaks of 400mm to 500mm over Guinea and southeast Nigeria.
- **Central Africa** countries experienced slight spatial rainfall increase recording amounts ranging from 10 to 300 mm with peaks of 300 mm to 400mm over west Central African Republic.
- **GHA** countries experienced rainfall increase recording amounts ranging from 10mm to 300mm intensifying over western Ethiopia and Djibouti with peaks of 300mm to 400mm recording the highest of about 500mm over northwestern Ethiopia.
- **Southern Africa** countries experienced some localized rainfall amounts ranging from 10mm to 100 mm with a peaks of above 150mm over Cape in south Africa and south Mozambique.

The August 2008, anomaly map show severe rainfall deficits over Djibouti, Ethiopia, Sudan, west Gabon, Liberia, Guinea Sierra Leone and Madagascar, while excessive rainfall were recorded over south Mauritania, south Burkina Faso, Nigeria Cameroon, Central African Republic, north Democratic Republic of Congo and southwestern Senegal.



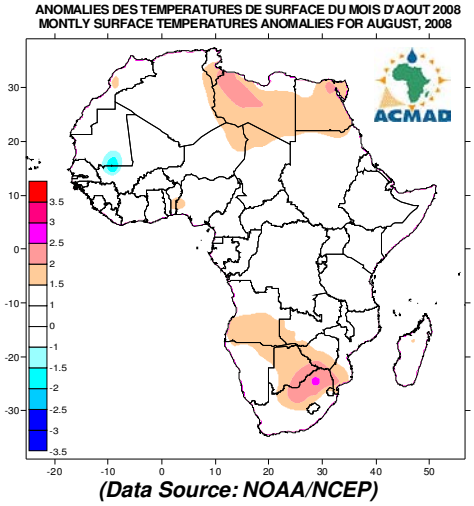
(Data Source: NOAA/NCEP)



(Data Source: NOAA/NCEP)

2.2 Surface Temperature Anomalies

In August, 2008, the temperature anomalies over most of African countries were generally normal (1℃ to –1℃). However, high temperature anomalies above 1.5℃ were observed in east Algeria, south Tunisia, Libya, Egypt, northeast Niger, northwest Chad, west Nigeria/Benin, south Angola, north east Namibia, southwest Zambia, south Zimbabwe, Botswana, south Mozambique with the highest above 2.5℃ in the northeast South Africa, while, negative temperature anomalies below –1.5℃ were observed in south Mauritania/Mali.



(Data Source: NOAA/NCEP)

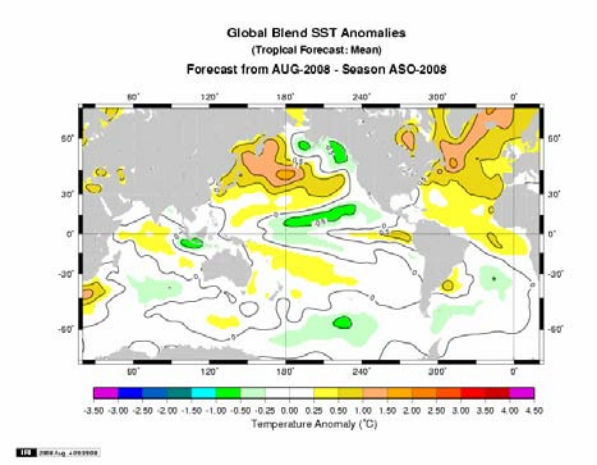
OUTLOOK

3.1 Forecast Sea Surface Temperature (SST)

Pacific Ocean: Neutral to cooling conditions will continue in the central, north eastern and south Pacific Ocean, but warming is expected over its northwestern, south central and central equatorial part. However, the set of dynamical and statistical model forecasts of ENSO over Nino 3.4 domain (5°N – 5°S, 120°W – 170°W) indicated a spread of possible SST anomalies maintaining neutral conditions throughout the forecast period.

Atlantic Ocean: A neutral to cooling condition is expected over southern Atlantic Ocean, while warming trend is expected to continue over the rest of Atlantic.

Indian Ocean: Neutral to cooling condition is expected over south and northeastern Indian Ocean, while neutral to warming condition will extend from northwestern up to southwestern around the South Africa coast.

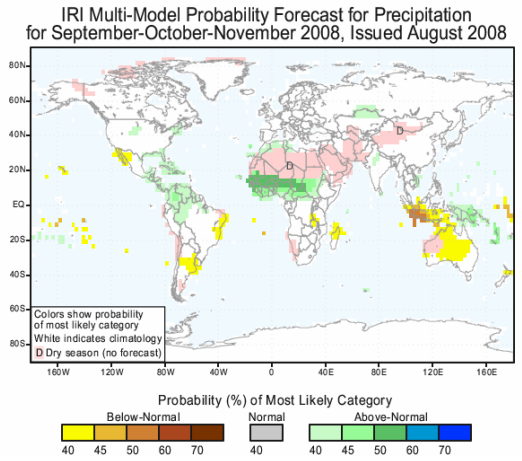


(source IRI)

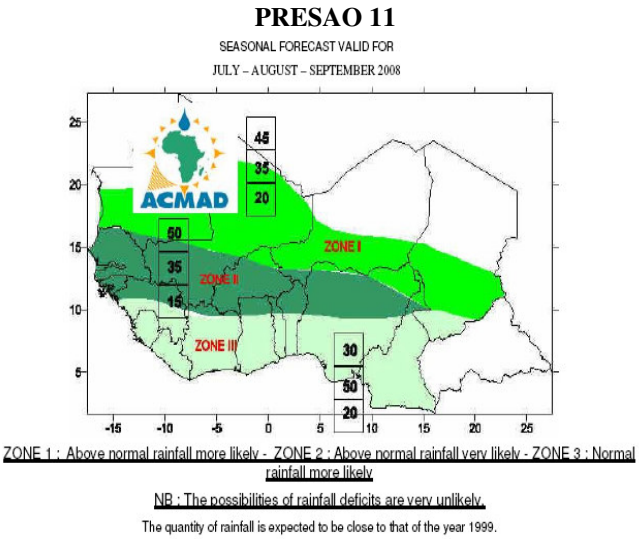
3.3 Rainfall

With the northward ITD displacement over the Sahel observed in August, 2008 leading to high moisture influx associated with heavy rainfall and floods the ITD is expected to start shifting southward causing rainfall reduction over the Sahel and northern parts of the Gulf of Guinea countries.

The IRI forecast shown below indicates above normal rainfall over most of West Africa countries consistent with the consensus rainfall forecast of PRESAO-11 presented below. There is increased probability and confidence for above normal rainfall as predicted by ACMAD as witnessed from the rainfall recorded in August, 2008.



(source IRI)



ZONE 1 : Above normal rainfall more likely - ZONE 2 : Above normal rainfall very likely - ZONE 3 : Normal rainfall more likely

NB : The possibilities of rainfall deficits are very unlikely.

The quantity of rainfall is expected to be close to that of the year 1999.

Climate Science News

Modulation of the Sahel rainfall by the Indian Monsoon Thermal Low

by

Dr. Leonard N. Njau and Tinni H. Seydou

The economies of West Africa countries largely depend on agriculture, which is highly vulnerable to the rainfall onset, amounts, duration and distribution. The occurrence of droughts and floods have continued to affect the subregion especially the Sahel resulting in famine, mulnutrition, diseases, loss of life and property and other socio-economic disruptions.

The rainfall over West Africa is controlled by global climate teleconnections and regional climate systems which include Inter-Tropical Discontinuity (ITD), monsoons, subtropical anticyclones, squall Lines, sea surface temperature anomalies, the Jet streams, wave disturbances, extra tropical frontal weather incursions and upper air troughs. The global teleconnections include those associated with El Nino-Southern Oscillation (ENSO), the Madden Jullian Oscillation (MJO), North Atlantic Oscillation(NAO), Semi-Annual Oscillation (SAO) and 3-years monsoon cycle among others.

The heat sources are centres of convective mesoscale systems that release considerable amounts of latent heat over large areas, which contribute to the tropospheric warming and conditional instability. The study by Njau (2006) on climate predictability using tropospheric parameters emphasized that the temperature is the most important parameter in a moist troposphere as it controls the geopotentials, determines the wind field/circulations, cloud development, amount of latent heat release and the entire atmospheric stability that generates a wide range of spatial and temporal rainfall variability. According to Fink et al, 2006, the changes in latent heat release over the West African monsoon region have great impact on the large scale tropical circulation.

In August, 2006 the warm thermal index (TI) regime at 300hPa prevailed over the Sahel in West Africa causing heavy rainfall resulting in widespread floods. The warm TI regime was explained by a threshold value 243°K isotherm that extended over the Sahel from the centre of a maximum located at 28°N/70°E over Asia, the major heat source associated with monsoonal heavy rainfall with floods. This major heat source over Asia modulates the July-August-September (JAS) rainfall over the Sahel (10º-20ºN, 18ºW-20ºE) in West Africa as shown in Figures 1 and 2. In Niger the period 10-28 August, 2006 experienced floods. In August, 2006, Bilma recorded the highest rainfall since 1923 that left 4 people dead, leaving 46,472 homeless and destroying 675 houses. In the town of Zinder rainfall in last half of August, 2006 was highest recorded in 50 years resulting in extensive loss of crops and domestic animals.

The areas with significantly warm TI regimes (threshold value of 243°K) and above are characterized by heavy rainfall with floods while those with cold TI regimes (threshold value of 241°K) and below experience severe rainfall deficits and droughts as witnessed in the 1984, one of the worst of the Sahel droughts, Figures 1.

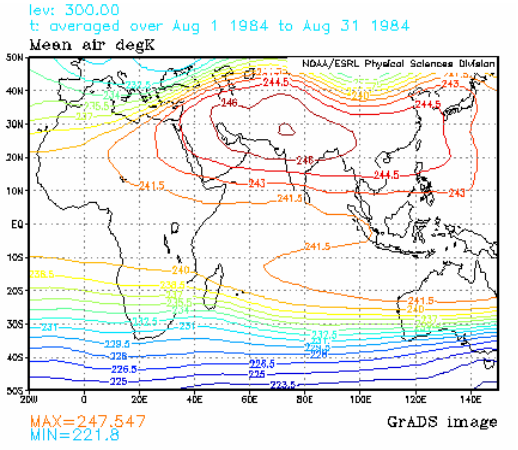


Figure 1 : August, 1984 cold thermal index (TI) regime extending over the Sahel from diabatic heat source.
(*Source: NOAA/NCEP).*

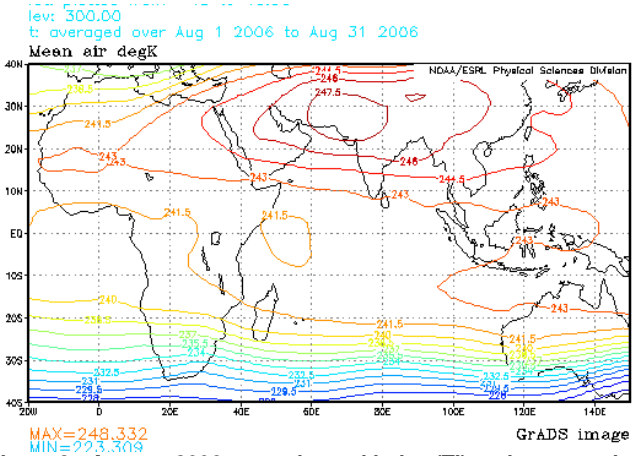


Figure 2 : August, 2006 warm thermal index (TI) regime extended over the Sahel from diabatic heat source.
(Source: NOAA/NCEP).

References

Fink, A. H., D. G. Vincent and V. Ermert, 2006: Rainfall types in the West Africa Sudan Zone during the summer monsoon 2002. ***Mon Wea Rev pp2143-2164.***

Njau, L. N. 2006 **:** Diagnostics and predictability of East Africa rainfall with tropospheric circulation parameters. ***PhD dissertation, University of Nairobi.184pp.***