IGAD CLIMATE PREDICTION AND APPLICATIONS CENTRE

CLIMATE WATCH FOR THE PERIOD MARCH-MAY 2015

REF: ICPAC/CW/No.30 MAY 2015

Contents

SUMMARY

IGAD Climate Prediction and Applications Centre (ICPAC)Mission is to foster climate information, prediction, timely early warning and applications for disaster risk reduction and sustainable development in the Greater Horn of Africa (GHA). ICPAC also supports all relevant IGAD's disaster risk reduction programmes and activities including those related to the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI) Strategy. IDDRIS strategy which is being implemented in the GHA region follows the Summit of the Heads of States and Government of the East African Community (EAC) and the Inter-Governmental Authority on Development (IGAD) that was held in Nairobi, Kenya in September 2011, to address regional challenges triggered by the impacts of the severe regional scale drought of 2009-2011. The

Summitcalled for the needs for effective early actions from climate early warning systems. Useful details of IDDRSI are freely available at http://resilience.igad.int/.

ICPAC produces regular regional 10 day, monthly and seasonal climate early warning updates. ICPAC also releases a special early warning bulletin known as **climate watch** to provide among others any new or evolving global and/ or regional phenomenon that may have profound impacts on regional climate conditions, for example increased potential of high impacts extremes such as floods and droughts with far reaching socio-economic in large parts of the region. Climate watch is therefore intended to be a proactive climate impacts advisory. Among the ocean-atmosphere phenomenon that cause greatest disruption of the normal climatic conditions round the earth is the El Niño-Southern Oscillation (ENSO) events. Impacts of ENSO on climatic conditions world-wide are only second to the succession of seasons following the shifts of surface heating by the sun between the southern and northern hemispheres. The major climate centers worldwide are currently indicating steady warming of the tropical eastern Pacific Ocean with ocean surface temperatures reaching weak El Niño levels(http***://www. wmo.int/pages/prog/wcp/wcasp/enso_ update_latest.html.).***

El Niño advisory by *NOAA indicate that*there is an approximately 90% chance that the El Niño will continue through NorthernHemisphere summer 2015, and a greater than 80% chanceit will lastthrough 2015(***http://www.cpc. ncep.noaa .gov/products/ analysis_monitoring/enso_ advisory/ensodisc).***

El Niño is characterized by unusually warm ocean surface temperatures in the central and eastern tropical Pacific. The opposite phenomena often referred to as La Niña is associated with coolingof the ocean surface temperatures in the central and eastern tropical Pacific. El Niño and La Niña have significant impacts on general circulation and climate in many parts of the world.The regional impacts of El-Niño phenomenon are often modulated by regional scale processes. For the GHA climate impact during June to August season, of importance is the phase of the Indian Ocean Dipole (IOD) as well as likely influence of the Eastern Atlantic. This climate watch provides a summary of regional climate stresses that was observed over GHA during the months of March – May 2015 as well as a brief on the ongoing El Niño event. The potential

impacts of El-Niño over GHA during June-December 2015 period is also highlighted. A brief review of El-Niño is first provided in the following section.

1. WHAT ARE EL NIÑO, LA NIÑA AND EL NIÑO – SOUTHERN OSCILLATION (ENSO) EVENTS?

The term El Niño (Spanish word for *"the Christ-child"*), refers to the periodic building up of a large pool of unusually warm waters in the eastern and central equatorial Pacific Ocean.La Niñaon the other hand is used to describe the periodic building up of unusually *cold waters* in the same ocean basin(**Figure 1**). Thus, La Niña and El Niño are mutual exclusive phenomena that periodically occur in the equatorial Pacific Ocean region. In general, most of El Niño events are immediately followed by LaNiñaevents that have often resulted into floods following droughts or vice versa in many parts of the world.

When large pools of warm/cold waters are observed in any parts of the global oceans, the atmosphere and the neighbouring oceans respond to cooling and warming in various ways**(Figure 2)**. The atmosphere, for example, may respond to strong El Niño and La Niña events by shifting the east-west air circulation cells commonly referred to as the Southern Oscillation (SO). The close linkages between La Niña / El Niño events and the atmospheric circulation response (SO) have made many scientists to often refer to the two systems simply as El Niño / Southern Oscillation (ENSO). In such cases, El Niño and La Niña phenomena are simply referred to as the *warm* and *cold ENSO* phases respectively. The *warm* and *cold ENSO phases* (El Niño / La Niña events) are known to trigger worldwide anomalies in ocean currents and atmospheric air circulation that consequently have various impacts on rainfall and temperature in specific areas around the world.

It has been observed that during *El Niño and La Niña* events, world-wide weather and climate extremes such as droughts, floods, cold/hot spells, tropical cyclones, etc are common, even in some regions that are very far away from the Pacific Ocean basin. Such weather and climate extremes are often associated with far reaching socio-economic impacts including loss of life and property; outbreak of diseases, mass migration of people and animals; lack of water, energy, food and other basic needs of human kind.

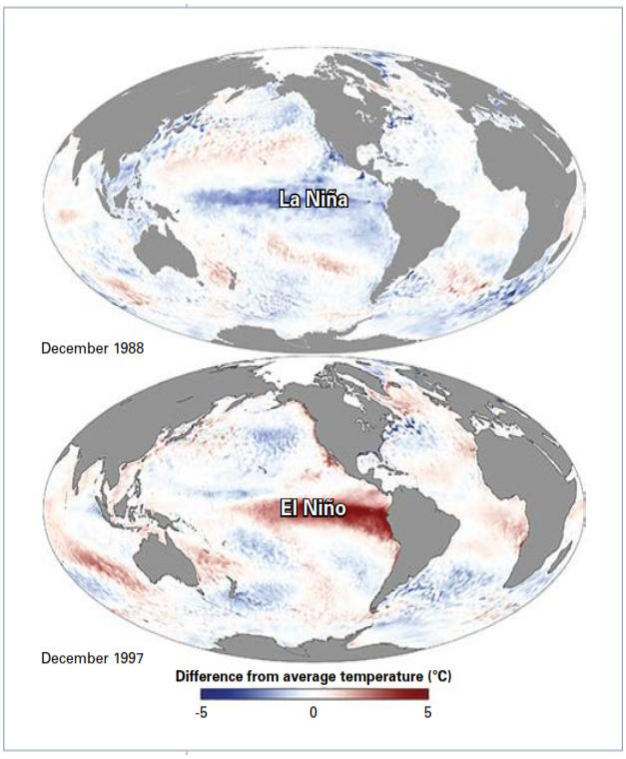

Figure 1: Typical Sea Surface Temperature anomalies over the eastern and central equatorial Pacific Ocean during (a) cold and (b) warm ENSO events (source: WMO Technical Paper No. 1145, 2014 /NOAA Climate.gov)

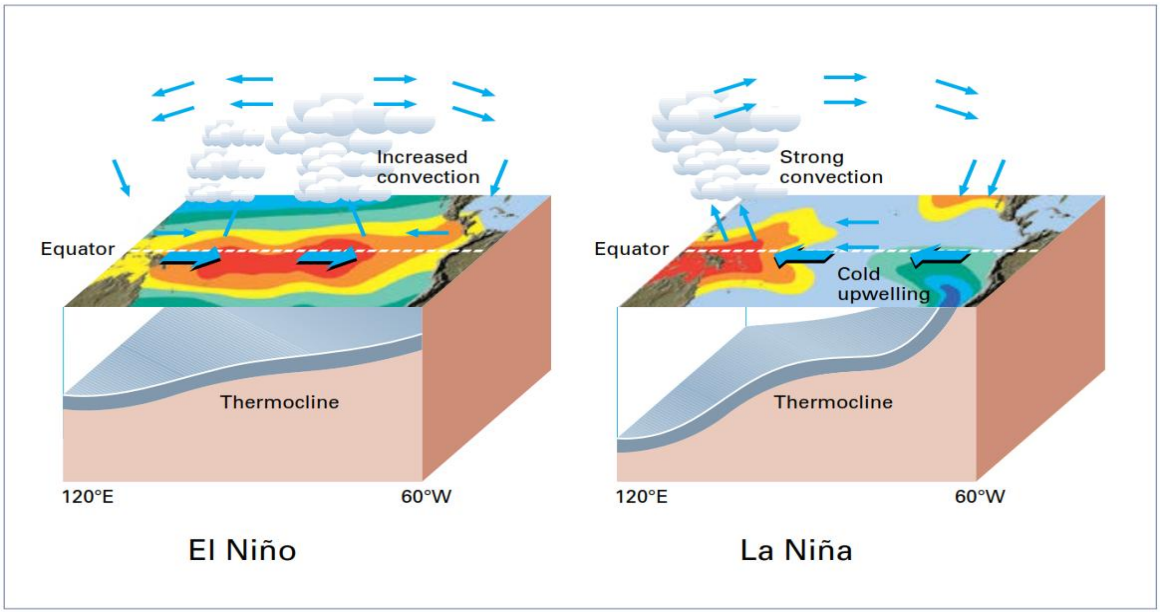

Figure 2: Sea Surface Temperature anomalies and overlying atmospheric circulation cells during warm and cold ENSO events over equatorial Pacific Ocean (source: WMO Technical Paper No. 1145, 2014/NOAA Climate.gov)

2. TYPICAL IMPACTS OF EL-NIÑO AND LA NIÑA OVER THE GREATER HORN OF AFRICA (GHA)

The northern/southern sector of GHA receives peak rainfall during the northern/southern hemisphere summer/winter months of June-August / December – February. The equatorial areas of the GHA have two main rainfall peaks centered around March-May and October-December months. Parts of the equatorial sector receive rainfall all year round, like near some of the large water bodies.

2.1 El-Niño Impacts in the Northern Sector of GHA

Warm episodes (El-Niño events) are often, but not always, associated with suppressed (below normal) rainfall over most parts of the northern sector of the GHA region during the peak rainfall season of July to September. On the other hand, cold events (La Niña) tend to enhance (above normal) rainfall amounts over most parts of the sector during the same period.The period May-June-July 2015 is likely to characterized by onset set phase of a El Niño episode and therefore suppressed rainfall is likely over the Northern Sector during June to September 2015.

2.2 El-Niño Impacts in the Equatorial Sector of GHA

Over the equatorial sector, enhanced rainfall is common during October to December of the onset year for El Niño events over most areas. The enhanced rainfall during October to December tends to extend into the following year, making the wet the usually dry months of January and February. On the other hand, rainfall tends to be suppressed during the June to September period in the western parts of the sector.

During a cold event, the rainfall in March to May and October to December tends to be suppressed over most parts of the sector while rainfall is enhanced in June to September in the western areas.

2.3 El-Niño Impacts in the Southern Sector of GHA

Warm/Cold events as well as below/above average rainfall amounts are often observed over most parts of the southern sector of the GHA duringEl-Niño / La Niña events.

It should however be noted that not all El-Niño or La Niña events give the same impacts in the GHA. In other words, no two events are exactly alike so that their impacts on climate patterns will also be dissimilar. In addition, the overall influence on the rainfall patterns is dictated by a number of other factors such as the time of onset, month of peak intensity, seasonal persistence and withdrawal phases as well as strength of the event and the characteristics of the surrounding ocean basins. These ocean basins are the moisture sources for rainfall generation. Indian Ocean Dipole (IOD) is one of the key regional systems over Indian Ocean that has significant impacts on climate over GHA.

3. INDIAN OCEAN DIPOLE (IOD)

The Indian Ocean Dipole (IOD) is a coupled ocean and atmosphere phenomenon in the equatorial Indian Ocean that affects the climate over the surrounding Indian Ocean basin including GHA (Saji*et al*., 1999). A positive IOD period is characterized by cooler than normal water in the tropical eastern Indian Ocean and warmer than normal water in the tropical western Indian Ocean. Owiti*et al*. (2008) observed that ENSOlinkages seemed to be stronger when the large positive IOD indices coincided with El Niño events. In general, above/ below normal rainfall conditions spread over the region during the positive/negative IOD events.

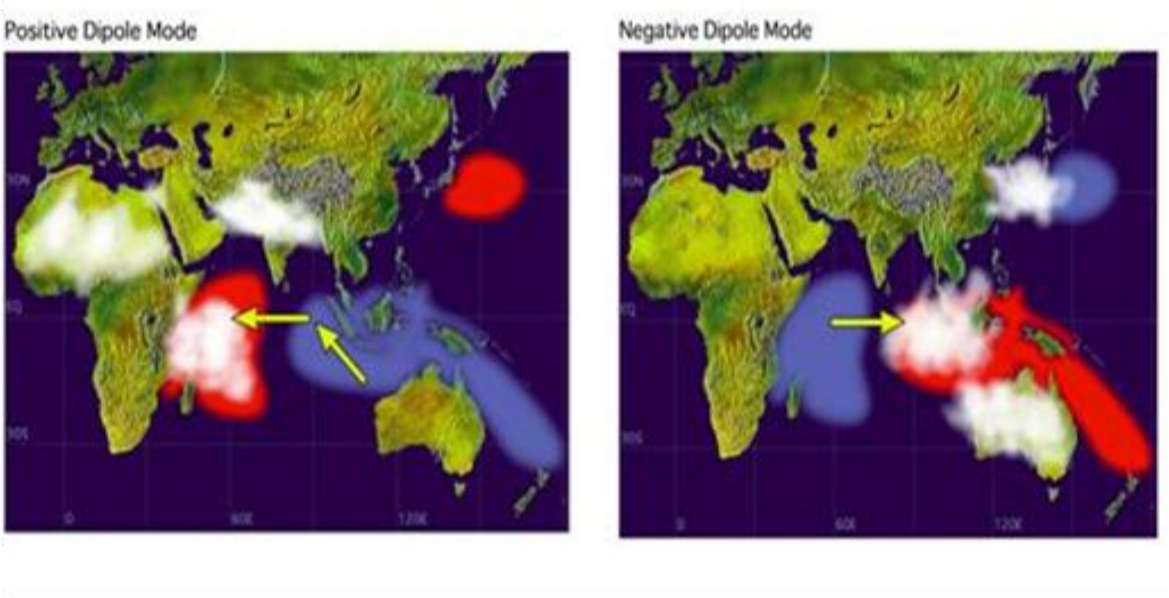

Figure 3: Typical positive and negative modes of the Indian Ocean Dipole (source:http://www.jamstec.go.jp/frsgc/research/d1/iod/IOD1.htmlref)

4. REGIONAL CLIMATE PATTERNS MARCH TO MAY 2015

Over the equatorial rainfall, onset was later, until after mid April. One of the most notable climatic extreme late April to Mid-May 2015, intense episodic events occurred over few areas of Kenya and Uganda, especially over the highland areas causing adverse impacts including flooding, and landslides. These type of episodic events had been anticipated in the regional climate outlook for March-April-May 2015 season and the extend of impacts will be established once the season is over. It is important to note most of the Arid and Semi-Arid areas of the equatorial area of the GHA remained dry during March and April 2015 as indicated in the GHACOF39 outlook.

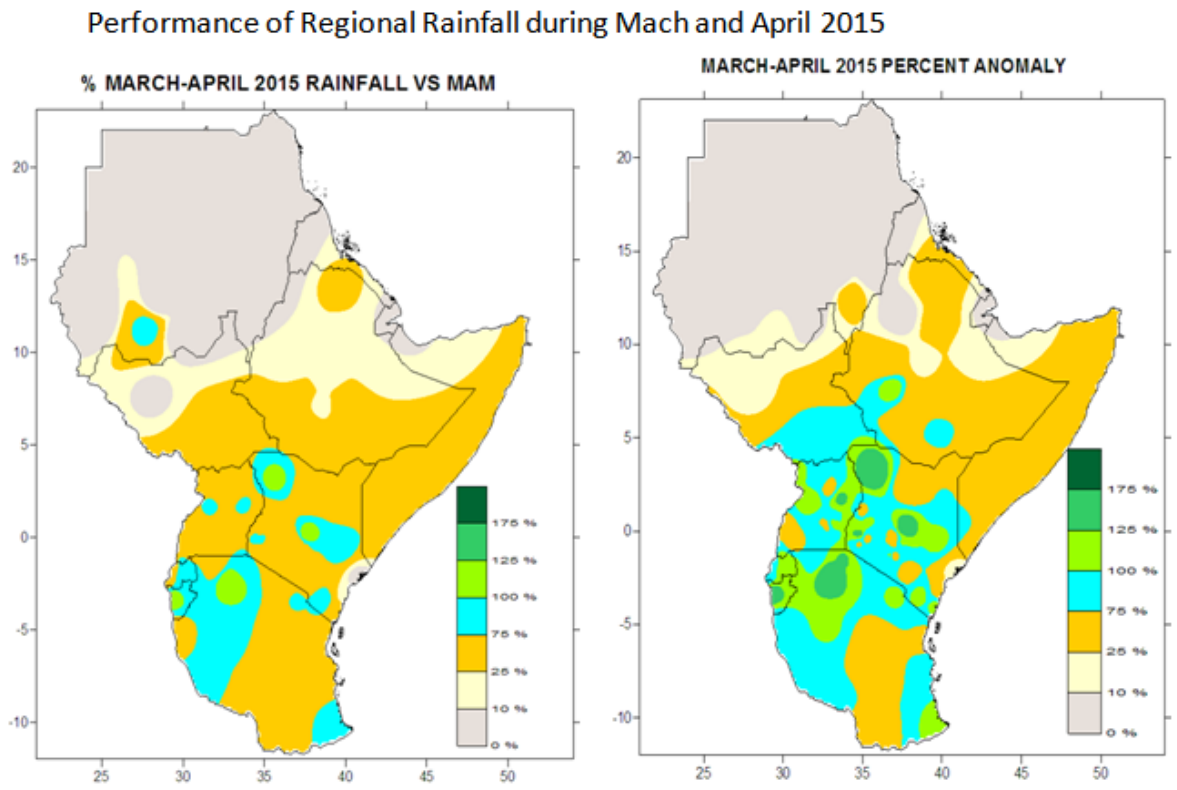

Figure 4: Regional rainfall performance during March and April 2015.

5. CURRENT AND PROJECTED STATE OF EL NINO AND THE GLOBAL AS WELL AS REGIONAL CLIMATE SYSTEMS

The figure5 show the most recent patterns of global ocean sea surface temperatures up to mid May 2015. A weak El Niño condition is evident over eastern equatorial Pacific ocean region.

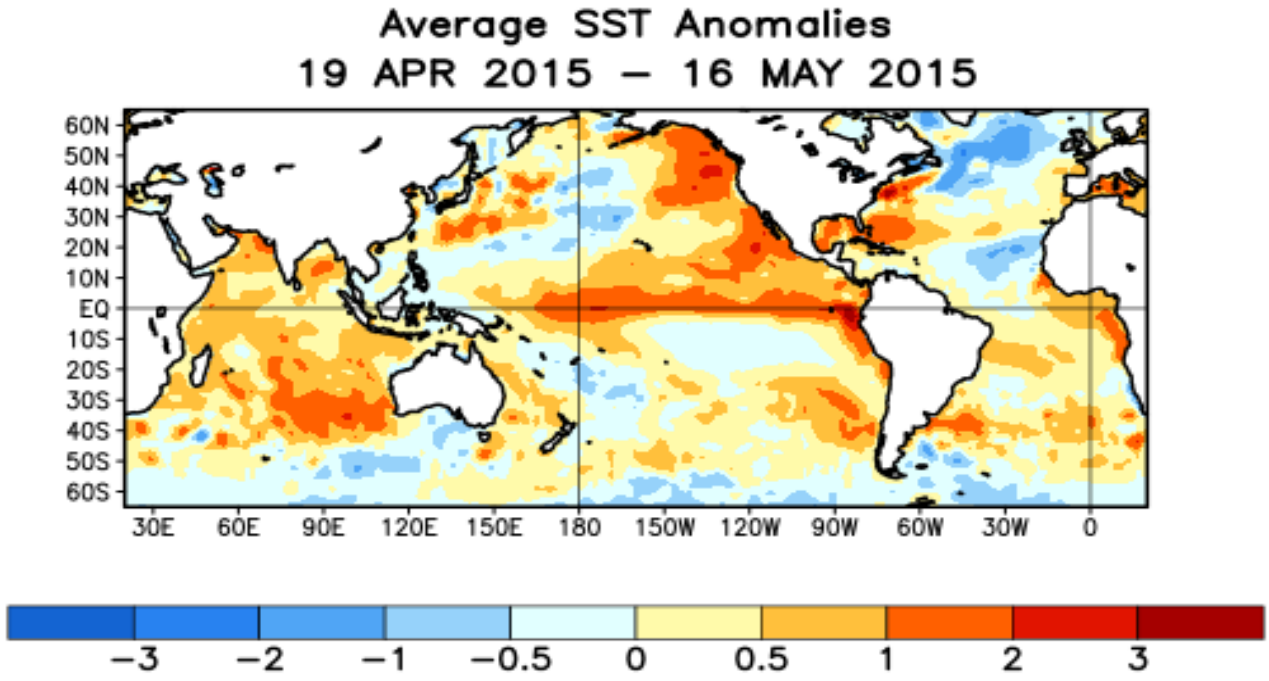

Figure 5: Tropical Ocean Sea Surface Temperature Anomaly Patterns to Mid-May 2015 (Courtesy of NOAA)

5.2 Predicted ENSO Nino3.4 and Indian Ocean Dipole (IOD) May – August 2015

Most of the global climate prediction centre models suggest a likelihood of weak to moderate El Niño conditions are likely to persist throughout the rest of the year.Figure 8 is an example of ensemble prediction from the European Centre for Medium Weather Predictions (ECWMF) and Figure 9 is a corresponding prediction for the Indian Ocean Dipole (IOD) Index.

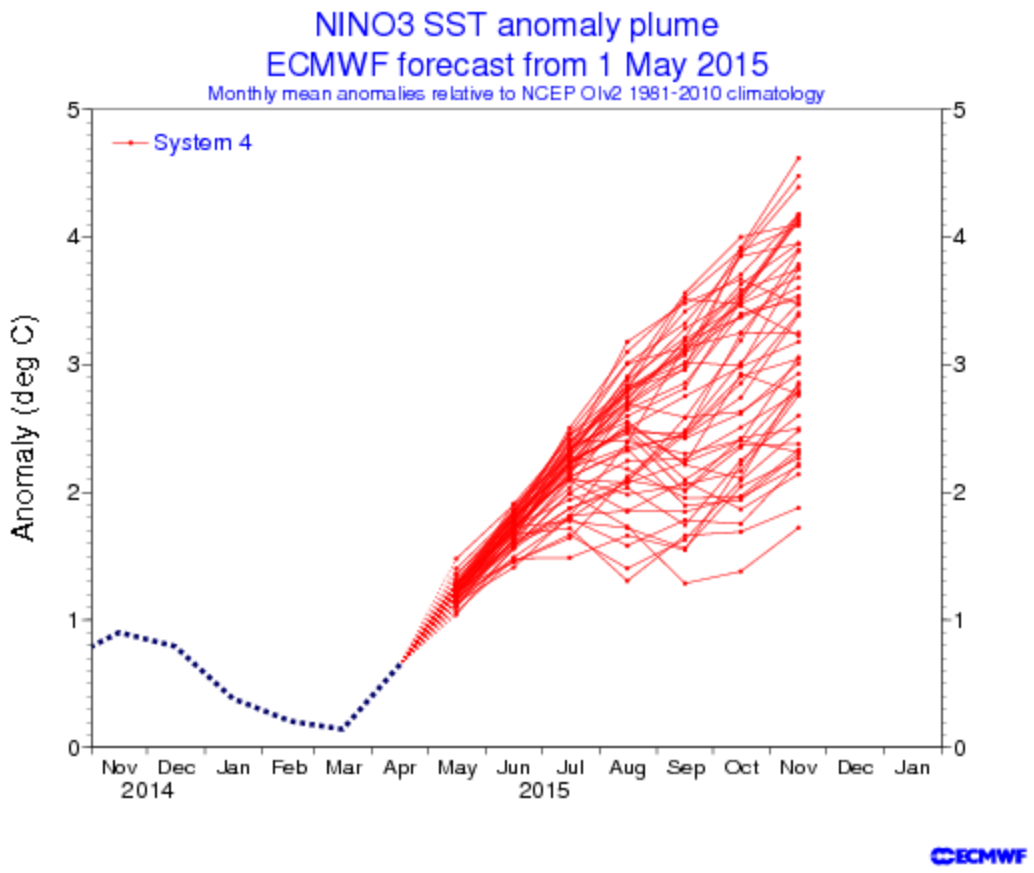

Figure 8: Predicted ENSO Nino3 sea surface temperature conditions during May to August 2015 (Courtesy of ECWMF)

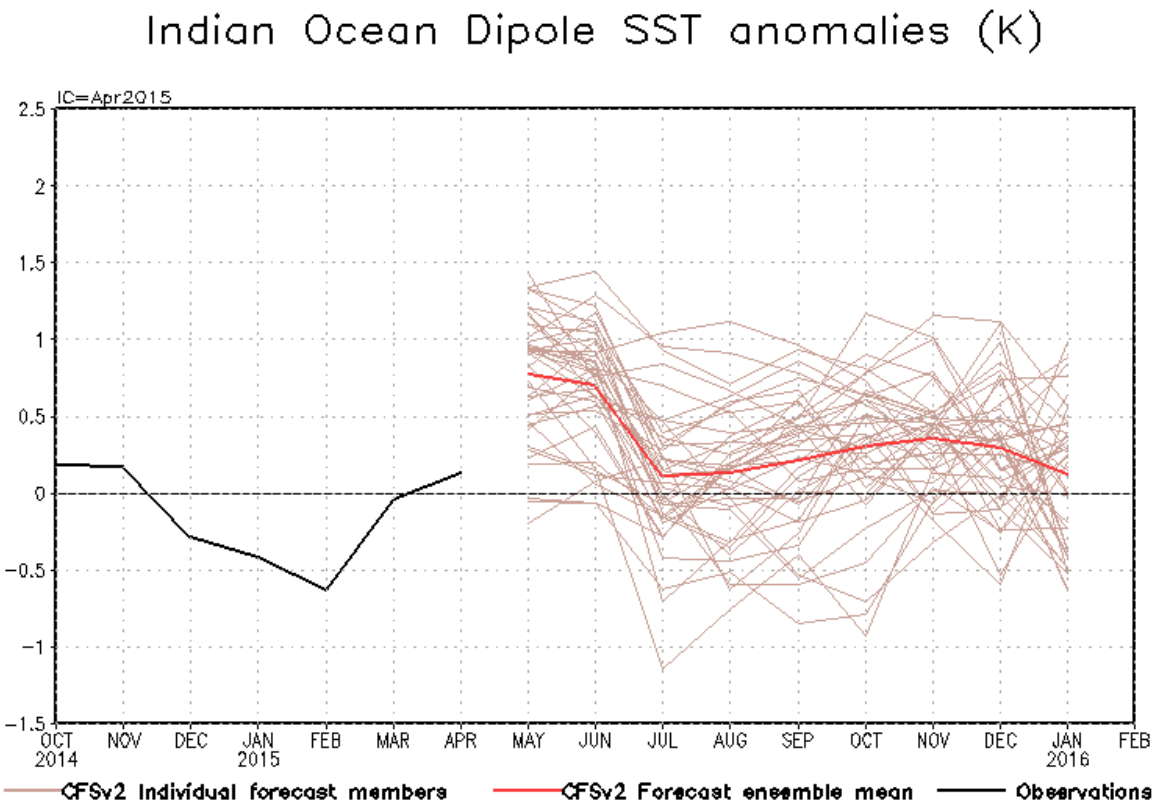

Figure 9: Predicted Indian Ocean Dipole (IOD) index during May to August 2015.

Both the IOD and ENSO conditions are crucial indicators of likely GHA regional climate during the rest of 2015. The implications of these on the regional rainfall during June-July-August 2015 are reflected in the regional expectation that are contained in the GHACOF40 climate outlook released by ICPAC in Djibouti on 26 May 2015. Regional status and update will be provided monthly by ICPAC and Member states NMHSs.

6. CONCLUSION

It should therefore be noted that if the traditional patterns of El-Niño and associated regional climate systems prevail during June-December 2015, suppressed (below normal) rainfall conditions would be dominant over most parts of the northern sector of the GHA region during the peak rainfall season of July to September. The regional expectation for JJA 2015 will be released atGHACOF40 in Djibouti on 26 May 2015. Most of the global climate prediction centre models

suggest persistence of weak to moderate El Niño conditions throughout the rest of the year. Over equatorial parts of GHA enhanced (above normal) rainfall would be dominant during October to December period. El Niño conditions are usually followed by La Niña conditions, with reverse to regional climate conditions observed during El Niño being dominant duringLa Niñas. Thus climate anomalies over many parts of the including GHA will be influence El Niño and any following La Niña event over the next following seasons. Regular forecast updates will be provided by the National Meteorological Services (NMSs) , the IGAD Climate Prediction and Applications Centre (ICPAC), WMO and the major Global Climate Centres. The users are therefore strongly advised to keep in contact with their National Meteorological Services for interpretation of this outlook, finer details, updates and guidance.

7. References

OwitiZ., L. Ogallo, and J. Mutemi, 2008: Linkages between the Indian Ocean Dipole and East African Seasonal Rainfall Anomalies.J.Kenya Meteorol. Soc., 2(1), 3 –17 (2008)

Saji N.H., Goswami B.N., Vinayachandran P.N., and T.Yamagata, 1999: A dipole mode in the tropical Indian Ocean, Nature, 401, 360-363.

WMO, 2014: El-Nino/ Southern Oscillation, Technical paper No. 1145, world meteorological organization.