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Statement on the Status of Tanzania Climate 2015

TANZANIA METEOROLOGICAL AGENCY
(TMA)

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Tanzania Meteorological Agency (TMA)

FOREWORD

Climate change is one of biggest challenges of the 21st century affecting global climate system. There is now strong and overwhelming evidence that global climate is changing. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as rise in average global sea levels, retreating glaciers and changes to many physical and biological systems. Trend analysis of meteorological parameters in most parts of the world has indicated a significant increase in temperature and a slight decrease in rainfall. In Tanzania, analysis over the last few decades indicates that, most parts of the country have experienced substantial increase in air temperature and slightly decrease in rainfall, which was associated with devastating socio-economic implications.

Efforts are required in monitoring the current state of the climate and establishing communication strategies that ensure the public, policy makers, the government and all stakeholders are well informed about the state of the climate and the associated socio-economic implications on regular basis. Tanzania Meteorological Agency (TMA) issues series of “Statement on the Status of Tanzania Climate” on annual basis to ensure that public awareness on weather, climate and climate change is enhanced and that the Government, policy makers, scientific communities and all stakeholders are provided with up-to-date and reliable information about the status of the country climate. This fifth issue of the statement provides comprehensive information on the status of climate in Tanzania for the year 2015, focusing on spatial distributions of maximum and minimum temperature; rainfall percentages and cumulative rainfall analysis; severe weather and extreme climate events; and their associated socio-economic implications.

TMA would like to encourage all stakeholders, including the general public to continue following up and utilize information from the statement on the status of Tanzania climate and contribute on reporting extreme weather events especially the localized ones. Also TMA is looking forward to receiving comments and suggestions for improvement of this statement.

Dr. Agnes Kijazi

Director General
Tanzania Meteorological Agency

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LIST OF ABREVIATIONS

ITCZ	**Inter-Tropical Convergence Zone**
SSTs	**Sea Surface Temperatures**
TMA	**Tanzania Meteorological Agency**

1.0 INTRODUCTION

Climate change is a global challenge to both sustainable livelihood and economic development. The adverse impacts of climate change are now evident in many parts of the world, including Tanzania. Increasing temperatures, rainfall variability and the frequency of extreme events such as drought, floods, and hurricanes are some of the evidences of climate change in the world. A study by Boko et al (2007) predicts that Africa is likely to warm across all seasons during this century with annual mean surface air temperatures expected to increase between 3°C and 4°C by 2099, approximately 1.5 times the average global temperatures.

Climate change impacts pose serious risks to poverty reduction and threaten development efforts in the country. This is especially true when changes in rainfall and temperatures patterns threaten socioeconomic activities; especially those depended by the majority of Tanzanians. In view of that, monitoring climate variability and change is essential for understanding the extent of climate variability and change in order to properly advice key stakeholders including policy makers to make informed decision when allocating scarce resources. This statement provides and discusses spatial distribution of temperature anomalies and rainfall percentage for the year 2015. It also includes cumulative rainfall analysis for selected stations across climatic zones; incidences of severe weather and extreme climate events; and their socio-economic impacts.

Spatial and temporal temperature distribution are presented in section 2; annual and monthly rainfall percentages and cumulative rainfall analysis in 2015 are presented in section 3; the incidences of severe weather and extreme climatic events, and the associated socio-economic impacts are presented in section 4; Section 5 describes factors associated with severe weather and extreme climate events while conclusions and recommendations on the status of Tanzania climate in 2015 are presented in section 6.

2.0 Spatial and temporal temperature distribution in 2015

2.1. Annual maximum and minimum temperature anomalies

The year 2015 was characterized by above average maximum and minimum temperature anomalies over most parts of the country, except the eastern side of Lake Victoria (Musoma) and southern part of Tanzania (Songea, Lindi, Mtwara and southern Morogoro regions) which were characterized by below average maximum and minimum temperature anomalies. The annual mean temperature anomaly was +0.85 °C of the long-term average (1971–2000). The highest maximum temperature anomalies for the year 2015 were observed at North-Eastern highlands (Arusha, Kilimanjaro and Manyara regions) while, the highest minimum temperature anomalies were observed over the northern coast of Tanzania (Tanga andDar es Salaam regions; and Zanzibar and Pemba islands) Figure 1.

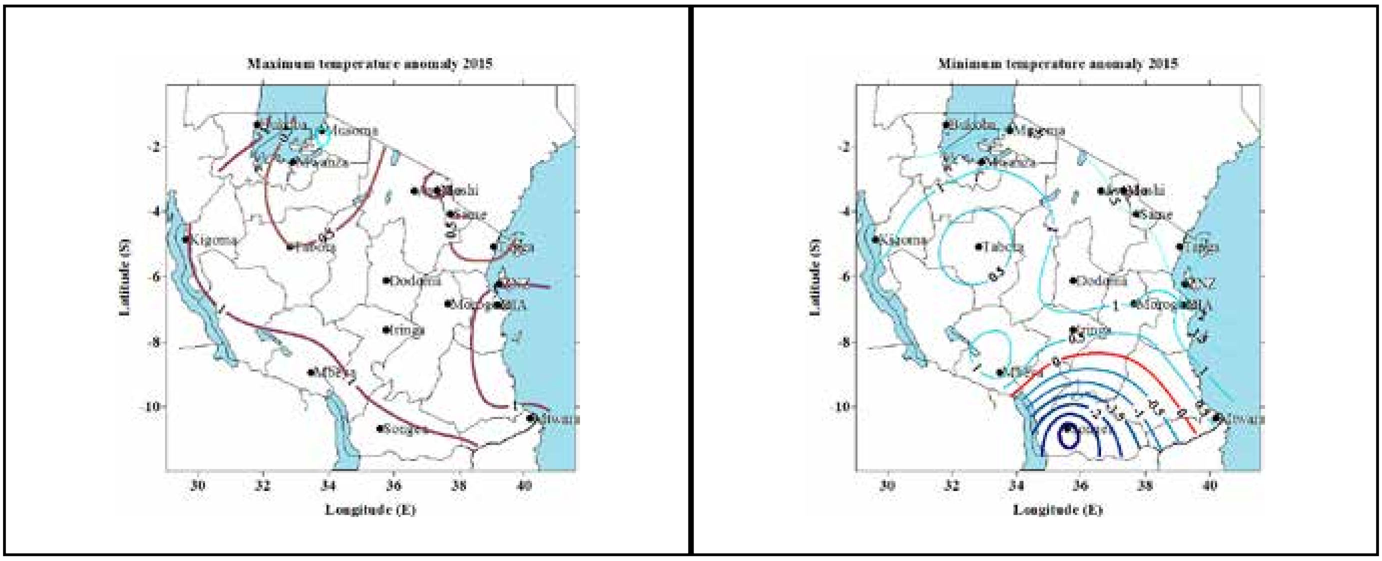

Figure 1:Annual maximum and minimum temperature anomalies (°C) in 2015

2.2 Monthly maximum temperature anomalies

Monthly maximum temperature in 2015 were above long-term average (1971-2000) across the country from January to December except in Iringa, southern part of Morogoro and Singida; and eastern part of Lindi regions during January where below average maximum temperature anomalies were observed, Figures 2a and 2b.

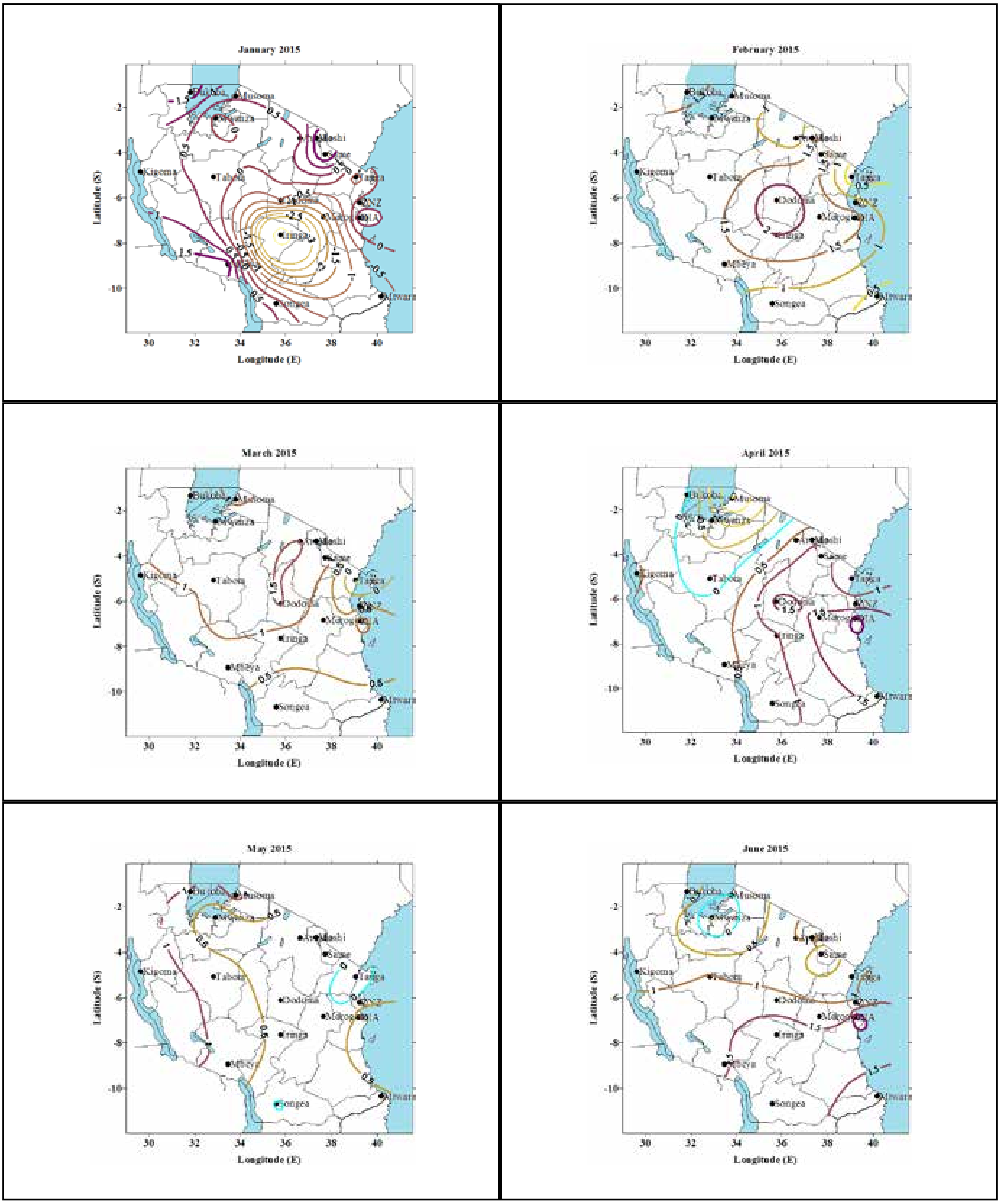

Figure 2a: Monthly maximum temperature anomalies (°C) from January – June, 2015

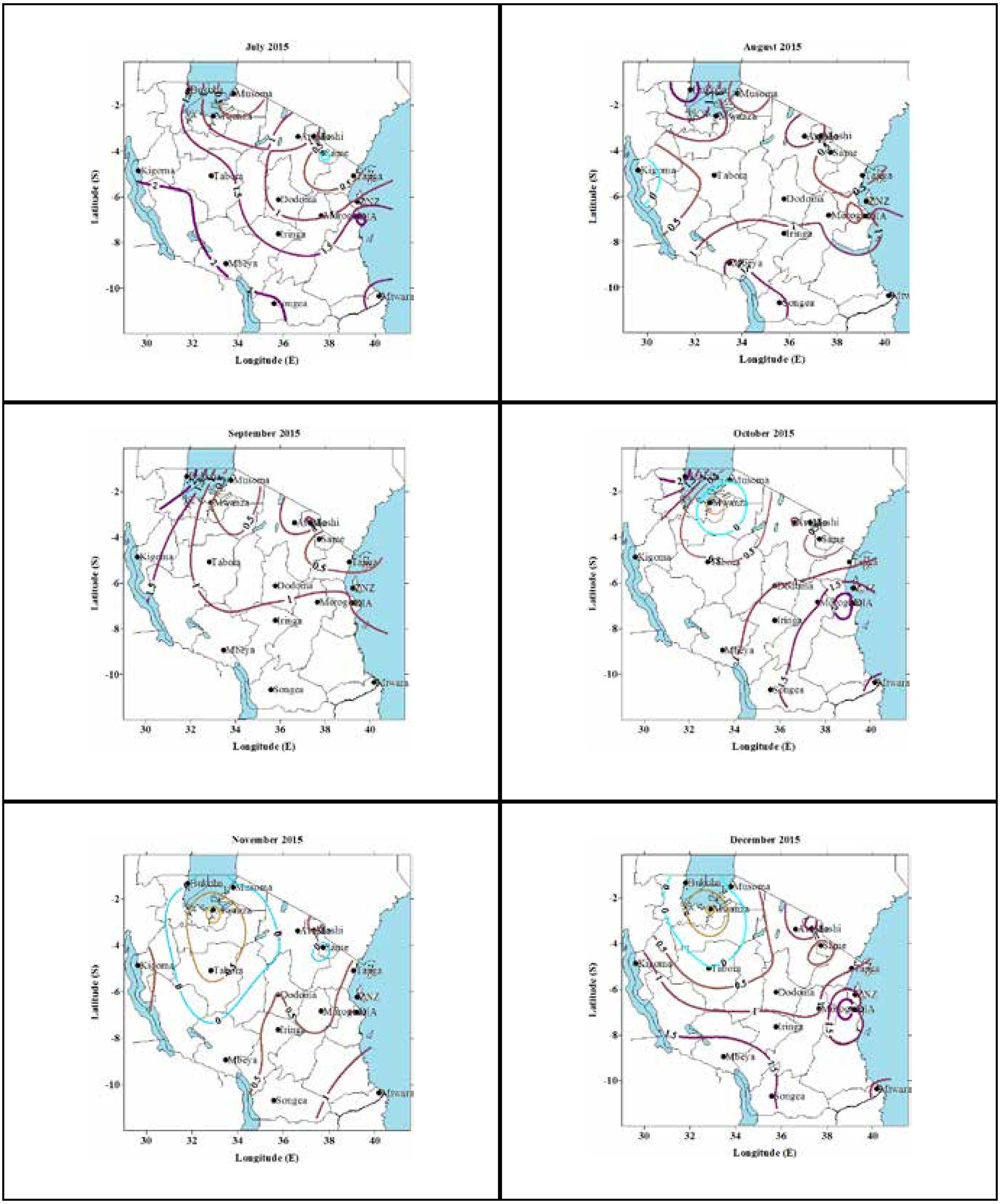

Figure 2b: Monthly maximum temperature anomalies (°C) from July – December, 2015

2.3 Monthly minimum temperature anomalies

Monthly minimum temperatures were above long-term average (1971-2000) over most parts of the country. However, the southern part observed below average minimum temperature anomalies from January to December especially in Mtwara and Ruvuma regions, Figures 3a and 3b.

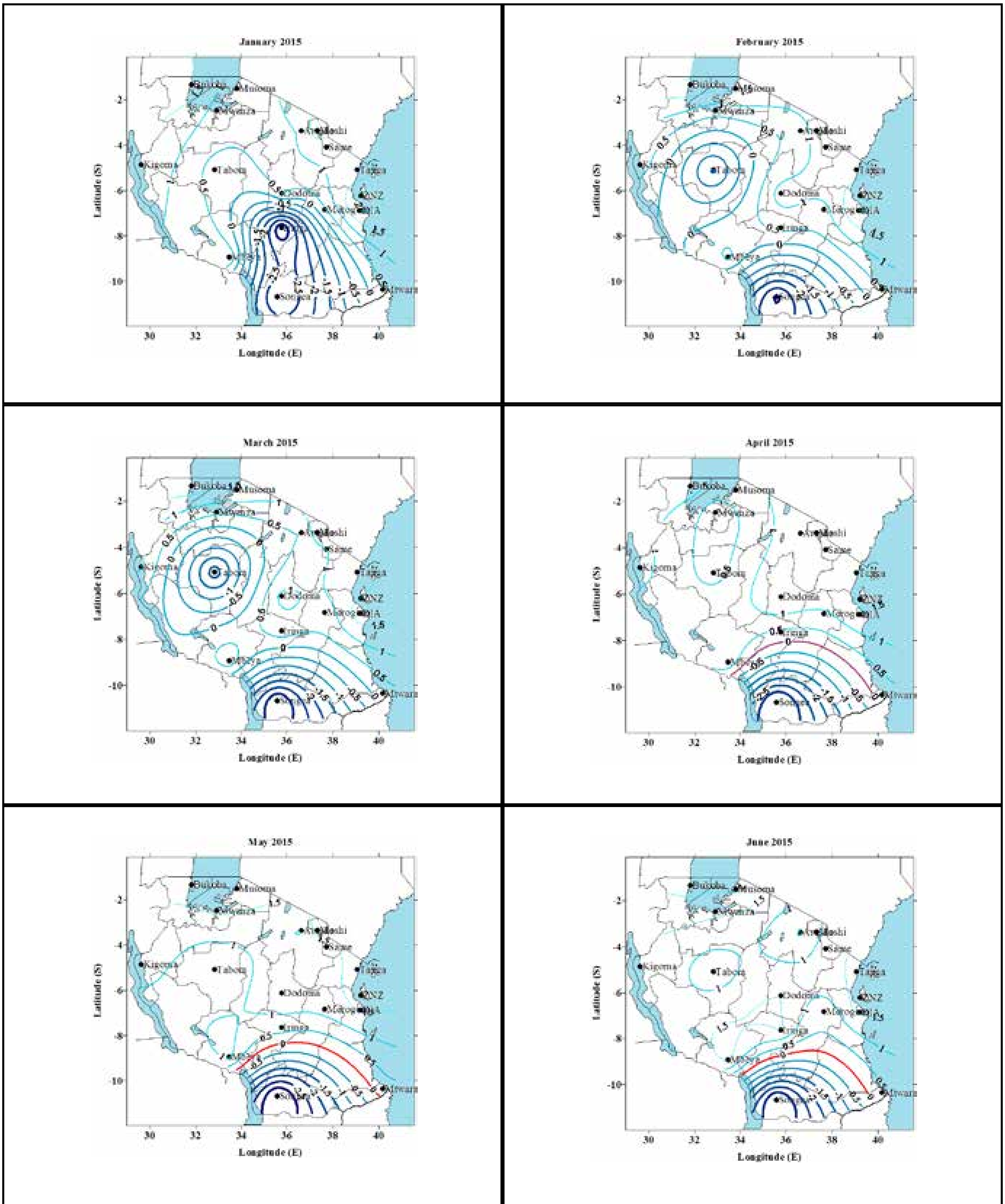

Figure 3a: Monthly minimum temperature anomalies (°C) for January – June, 2015

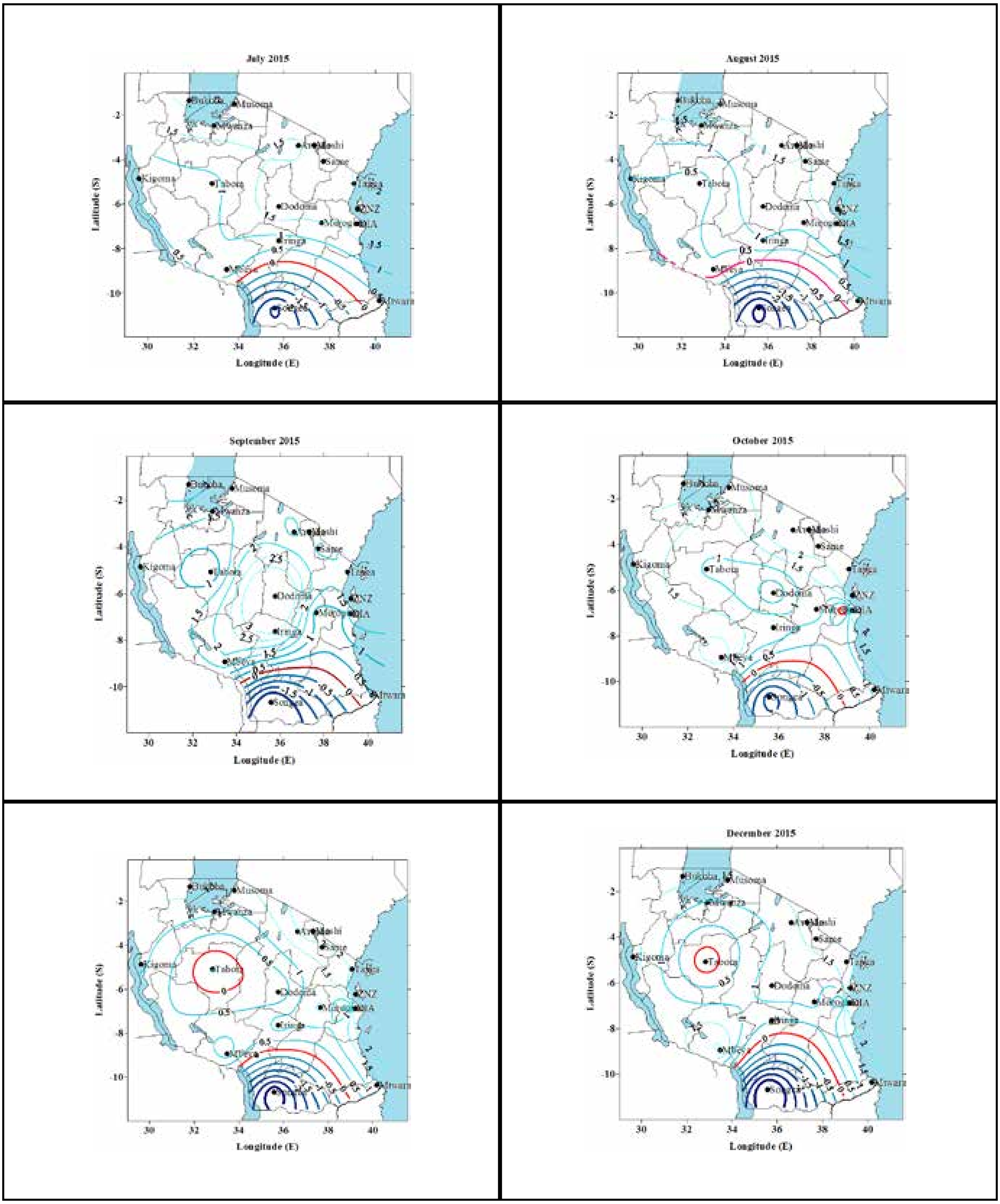

Figure 3b: Monthly minimum temperature anomalies (°C) for July – December, 2015

3.0 Rainfall distribution for 2015

3.1 Annual rainfall distribution as percentage of the long-term average (1971 - 2000)

Rainfall distribution for the year 2015 is presented as a percentage of the long-term average, which was computed from the baseline period of 1971-2000. Percentages between 0 and 50 indicate extremely below average rainfall, 51 and 74 below average rainfall, 75 and 125 average rainfall while percentages greater than 125 indicate above average rainfall.
In 2015, most parts of country experienced average rainfall, except the Northern part of Singida region, which received above average rainfall, Figure 4.

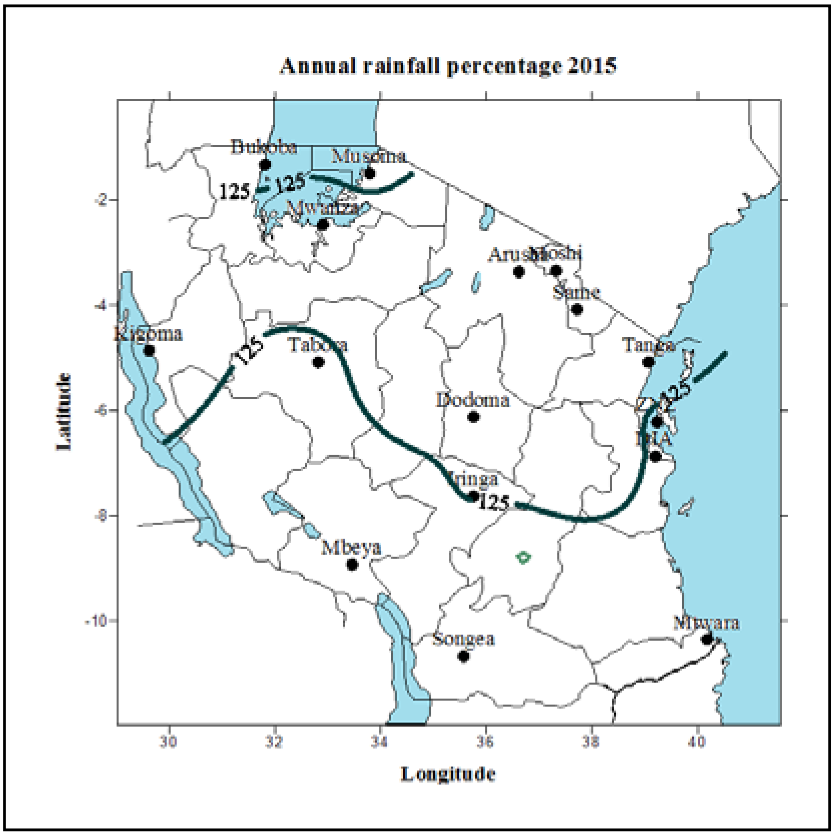

Figure 4: 2015 rainfall distribution as percentage of the long-term average of (1971-2000)

3.2 Monthly rainfall ditribution as percentage of long-term average of (1971-2000)

In 2015 below average monthly rainfall distribution dominated most parts of the country particularly in February, June and August, while April and May experienced average rainfall percentages of 103% and 116% respectively. In contrast, extremely below average monthly rainfall percentages of less than 50 % were observed in February and June all over the country, Figures 5a and 5b.

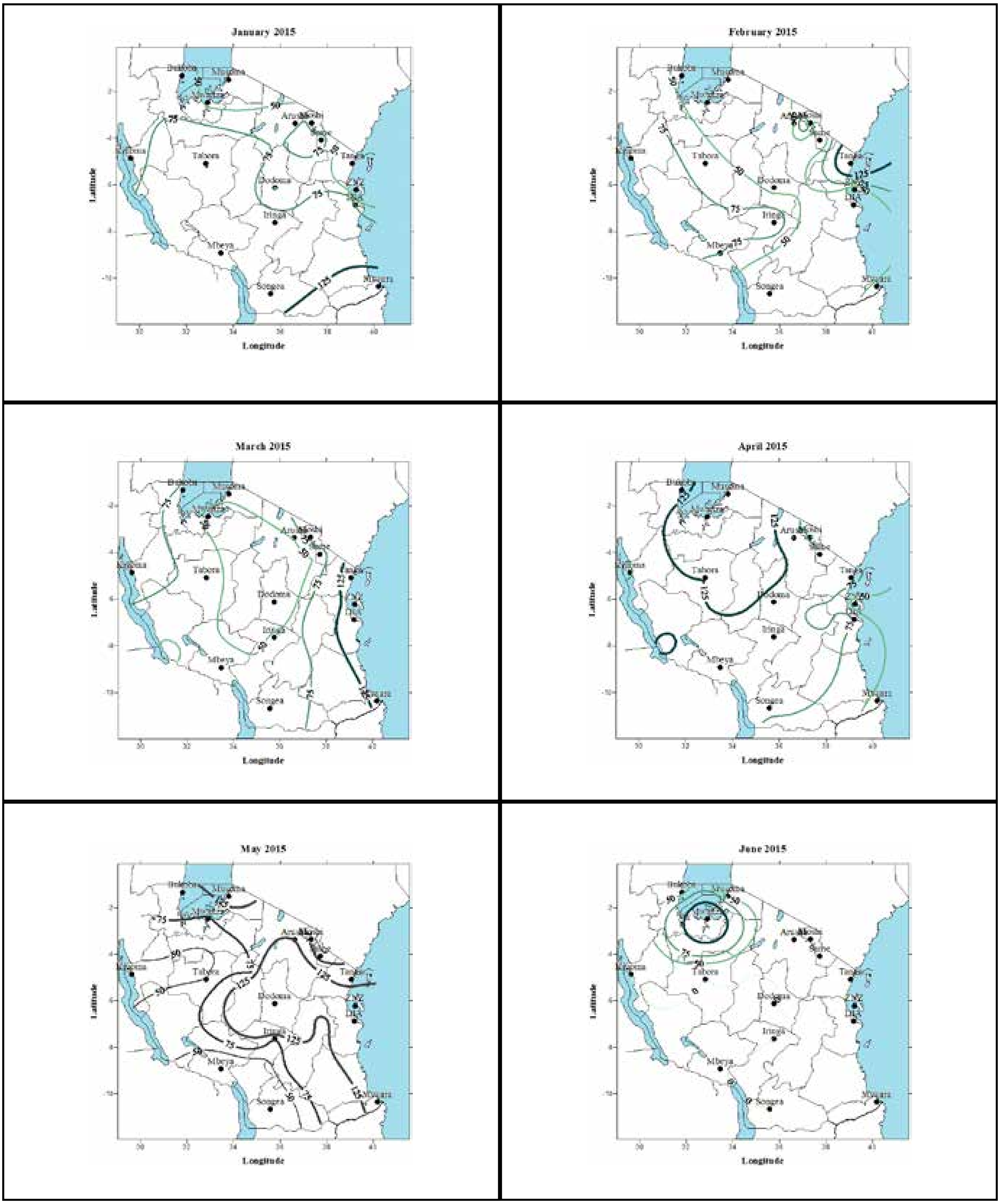

Figure 5a: Monthly rainfall distribution as percentage of long-term average (1971 – 2000), from January – June, 2015

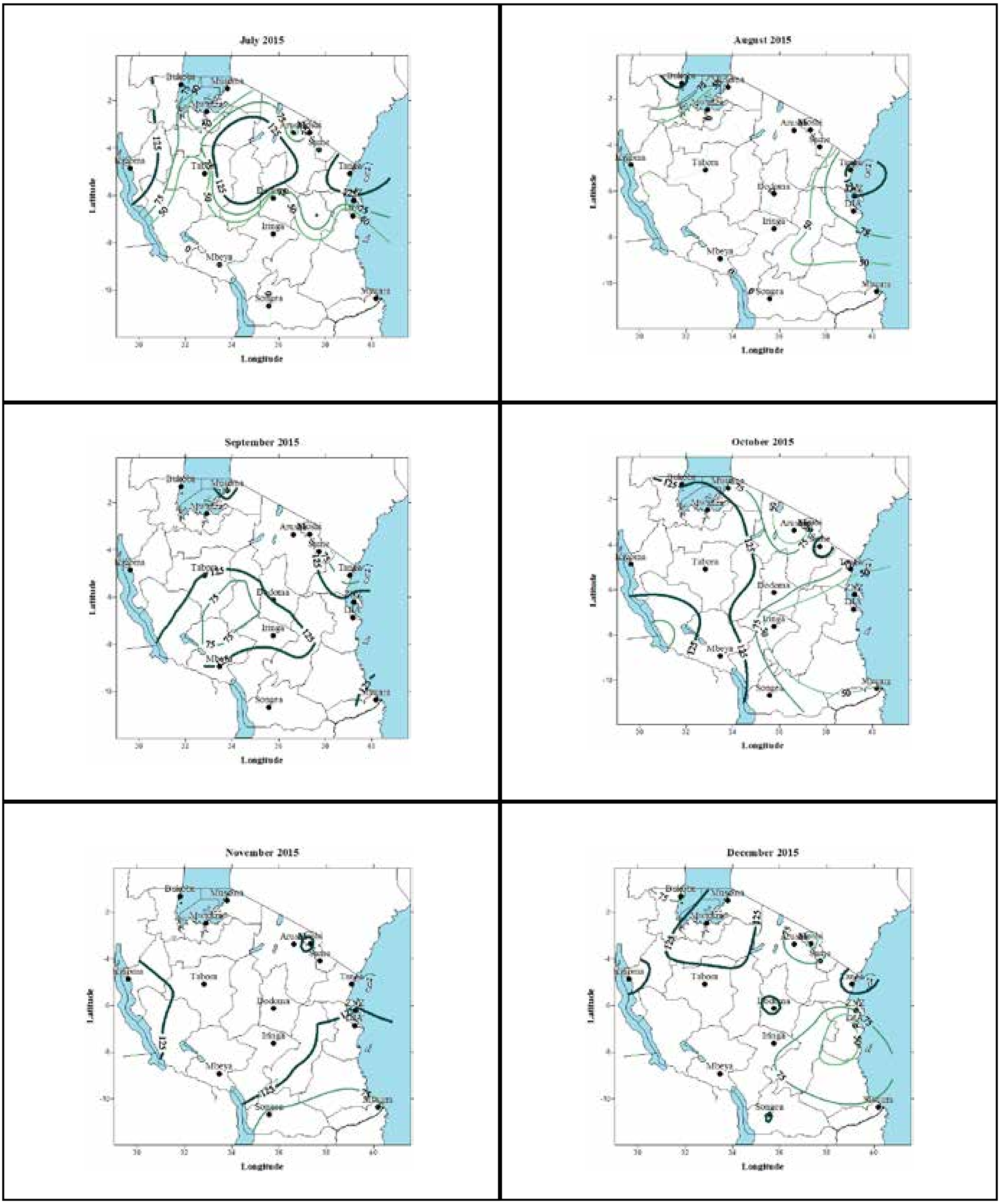

Figure 5b: Monthly rainfall distribution as percentage of long-term average (1971 – 2000), from July – December, 2015

3.3 Cumulative rainfall analysis in 2014/2015

The cumulative rainfall is defined as the rainfall that has accumulated in a given period of time compared to the long term mean this concept in meteorology usually used to characterize rainfall trends. In this statement, areas with below average monthly cumulative rainfall, when compared to long-term average of 1971-2000 are considered to experience meteorological droughts. In 2014/2015 most parts of the country observed below average to average monthly cumulative rainfall, except Lake Victoria Basin (Shinyanga) which experienced above average cumulative rainfall. Generally, in 2015 cumulative rainfall indicated deficiency in rainfall accumulation across the country and that was an indication of drought conditions for the selected stations except Shinyanga region (Figure 6a to 6e).

DODOMA AND MOROGORO REGIONS OF TANZANIA

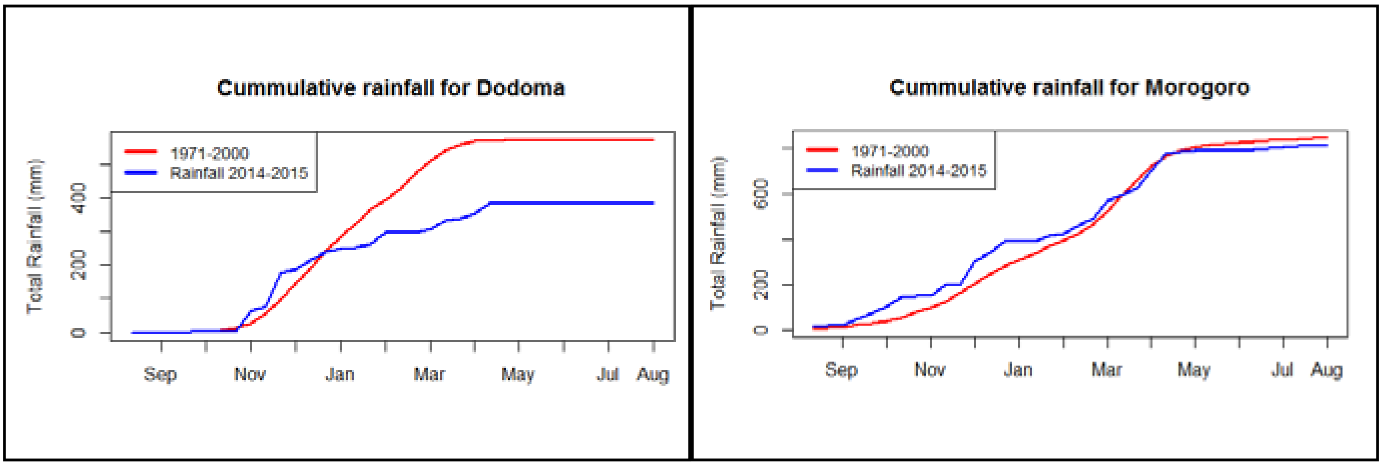

Figure 6a: Monthly cumulative rainfall for Dodoma and Morogoro regions

NORTHERN AND SOUTHERN COAST

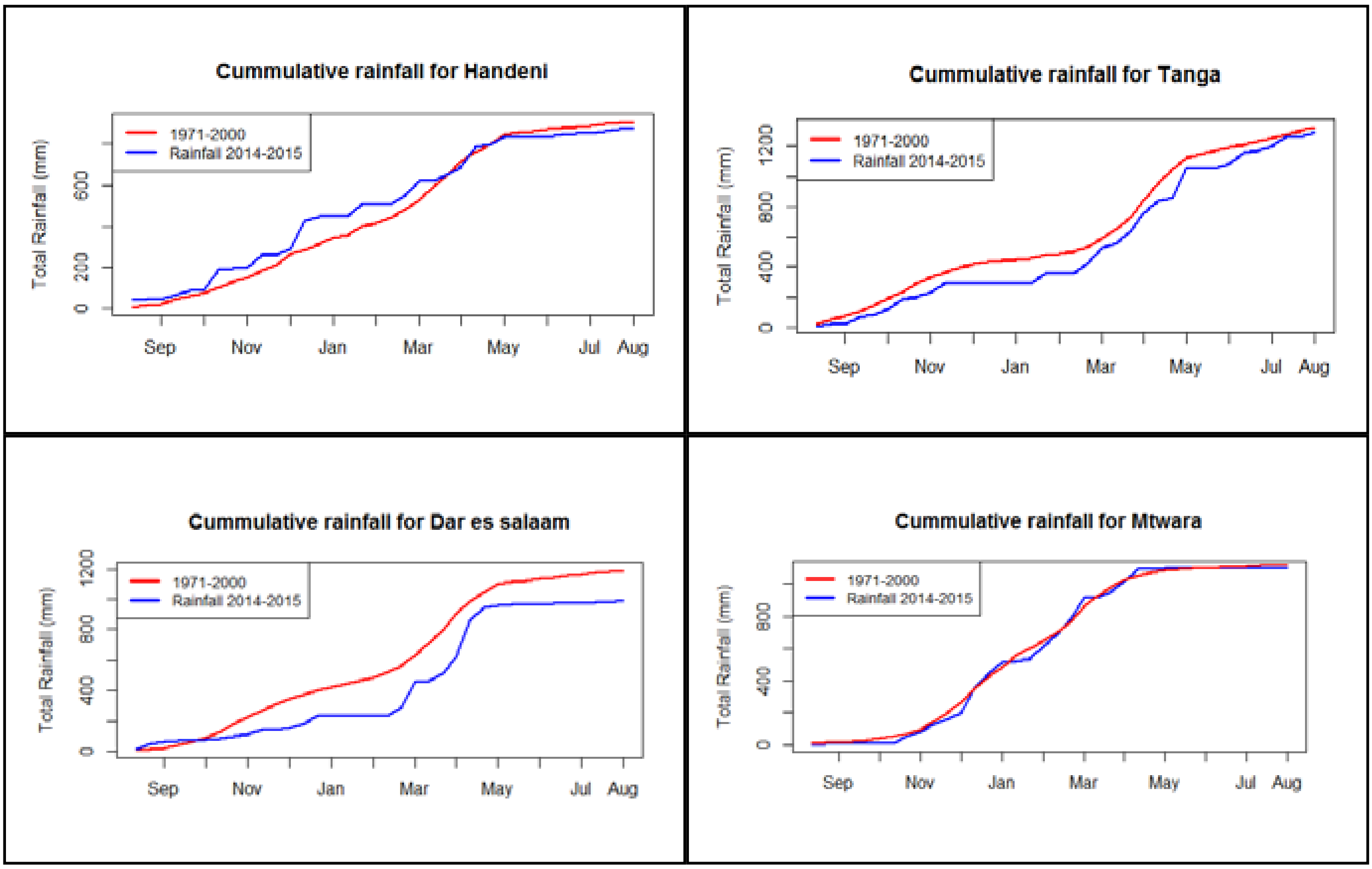

Figure 6b : Montly cumulative rainfall for Northern and southern coast of Tanzania

NORTH - EASTERN HIGHLANDS AND SOUTHERN REGION

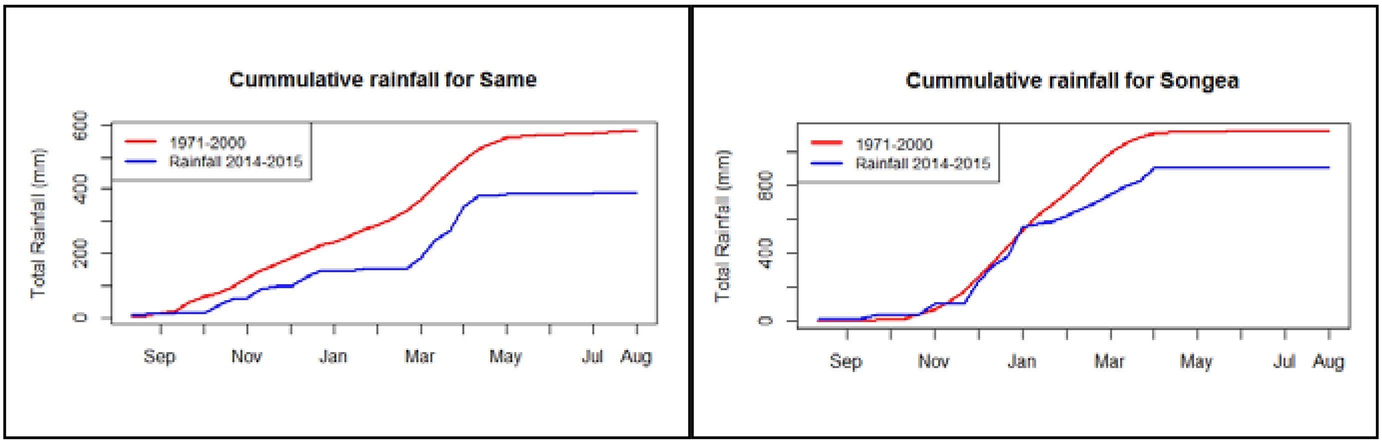

Figure 6c: Monthly cumulative rainfall for North-Eastern Highlands and southern of Tanzania

SOUTH-WESTERN HIGHLANDS AND WESTERN REGION

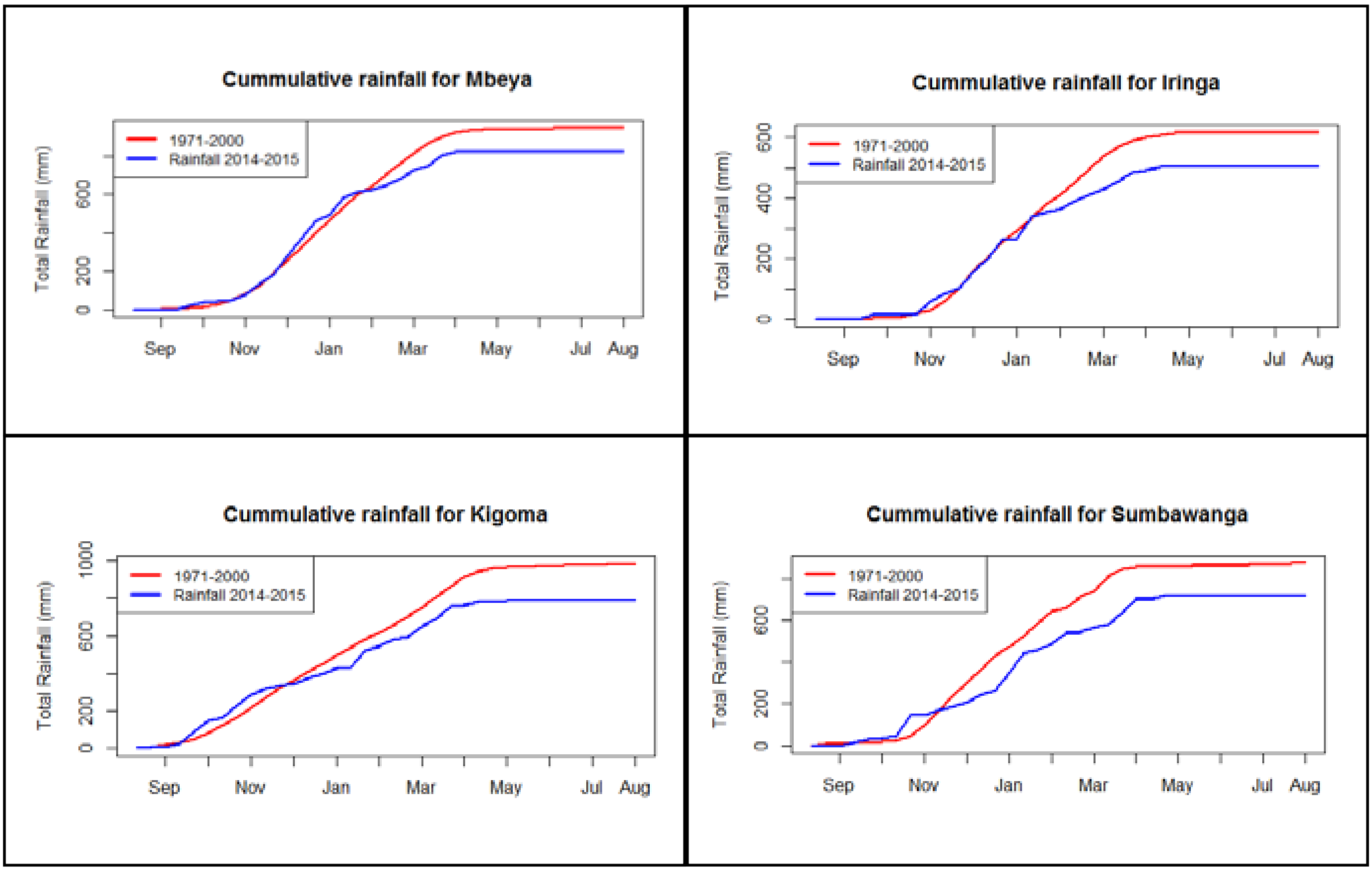

Figure 6d: Monthly cumulative rainfall for South-Western Highlands and Western regions of Tanzania

LAKE ZONE AND TABORA REGION

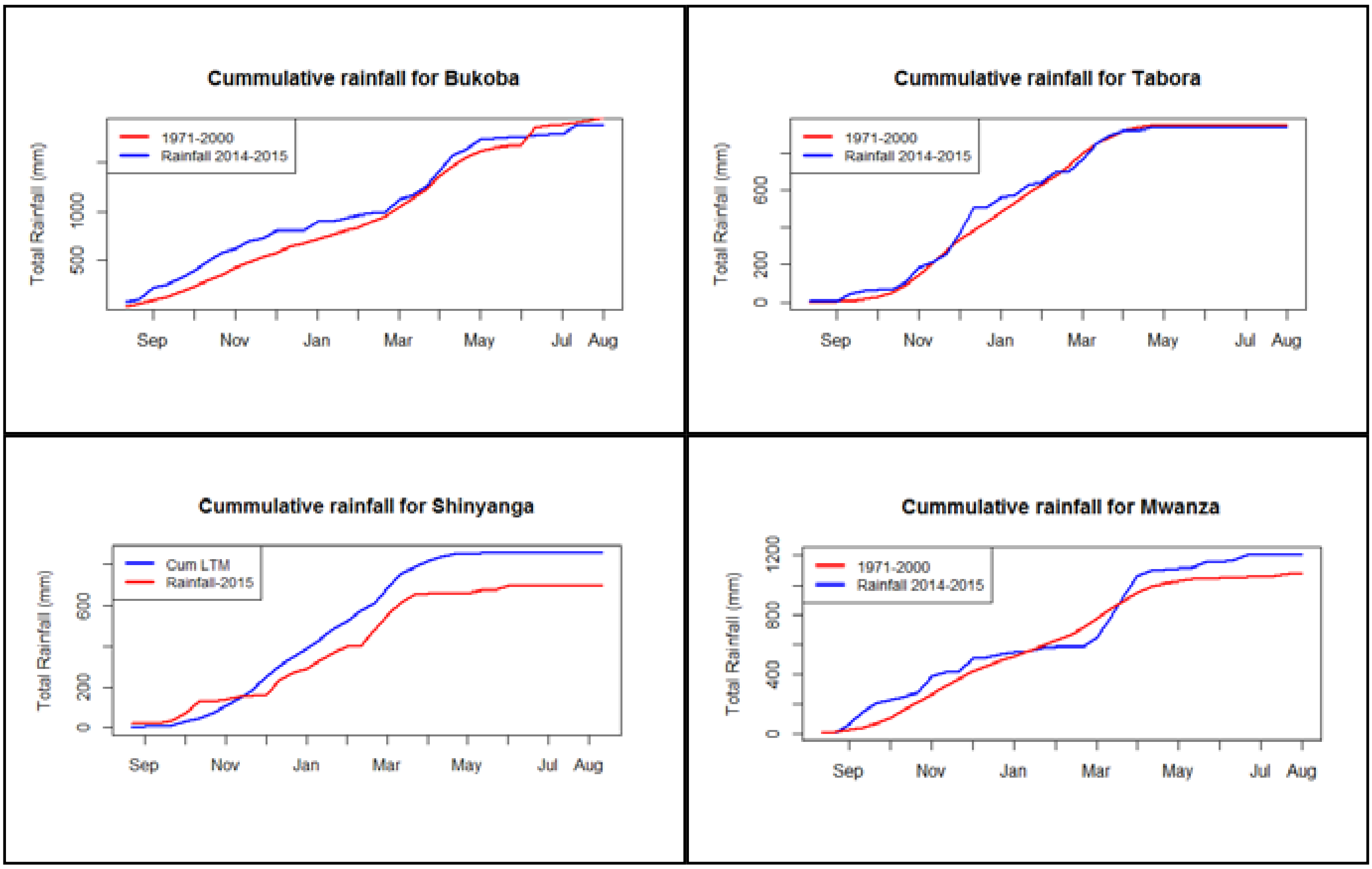

Figure 6e: Monthly cumulative rainfall for Lake zone and Tabora region

4.0 Severe weather and extreme climatic events 2014

In 2015 several incidences of 24 hours extreme rainfall events of more than the threshold values of 50 mm were reported in various parts of the country. The first highest extreme rainfall on record for 2015 was 327.8 mm, which was recorded on 4th November 2015 at Tukuyu meteorological station in South-Western part of Tanzania and is the highest ever-recorded 24 hours highest rainfall in that region, and destroyed houses, infrastructures and several hectares of Banana plants. The second highest was 196.1 mm of rainfall recorded on 3rd May 2015 at Zanzibar meteorological station and ranked sixth highest value on record since 1979 where the highest value was 320 mm. The third highest on record daily extreme rainfall for 2015 was 110.4 mm recorded on 6th May at Dar es Salaam and ranked tenth highest value on record since 1953 where the highest value was 167.4mm.

Mwanza meteorological station located near the Lake Victoria recorded 82.9 mm of rainfall on 1st November 2015, which is the highest ever recorded 24 hours rainfall for Mwanza forthe month of November, the second highest for November is 79.9 mm recorded on 14th November 1997, a strongest El-Nino year.

5.0 Factors contributed to severe weather and extreme climatic events in 2015

The presence and enhancement of Inter Tropical Convergence Zone (ITCZ), and the low level trough coupled by very significant moistures over the coastal belt of Tanzania contributed to significant convection which enhanced precipitation during March-May rainfall season. For example, on 3rd March 2015 low-level convergence at 850hpa and trough at 700hpa triggered strong convergence, which led to the formation of convective clouds that developed into a hail storm in Kahama district (Figures 7 and 8). The clouds reached a temperature of -910C, which caused development of ice particles in the clouds that grew primarily by accretion to large ice particles, which then fell as hail (plates 1 and 2). A hailstorm of the same phenomenon occurred in Isansa village, Mbozi district on 12th February (plates 3 and 4).

Cooling over Angola coast enhanced westerly wind flow from Congo Basin towards most parts of the country resulting into enhanced rainfall in the northern sector of the country during October and November 2015. The cool SSTs over the Angola and Namibia coast influenced the meridional arm of the ITCZ to move slightly east wards and therefore this climate system setting led to wet conditions over regions in the West, Lake Victoria basin, North-Eastern highlands and northern coast of Tanzania, while the remaining parts of the country experiencing dry conditions.

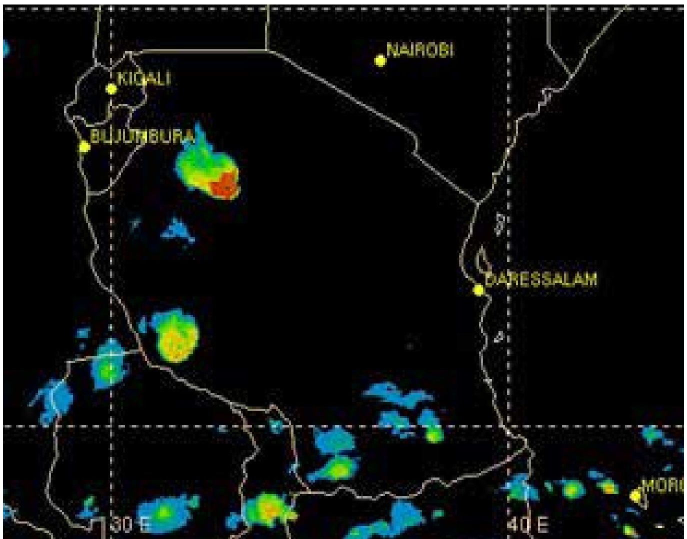

Figure 7: Convective storm as it was captured in precipitation index model at 2100

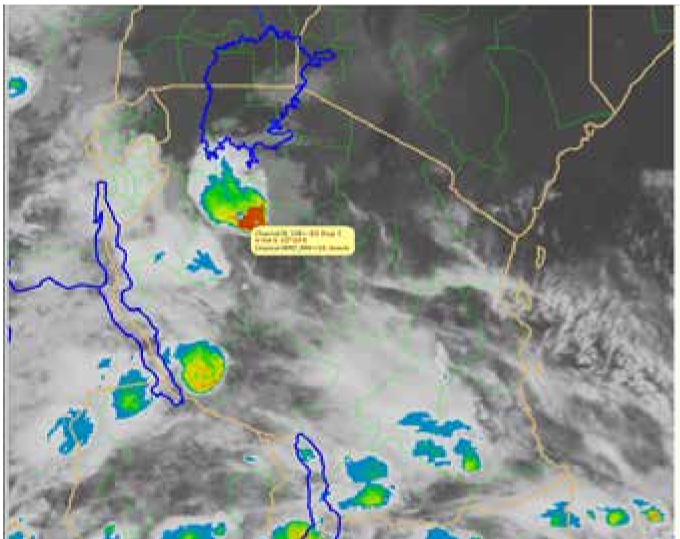

Figure 8: Very cold storm cloud with about -900Cclouds as observed in IR satellite image at 2100

Plate 1: A man holding a fallen hails

Plate 2: Fallen hail stones on the ground

Plate 3: Fallen Hail stones in Isansa village

Plate 4: Banana crop damaged by hail

6.0 Socio-economic implication of severe weather and extreme events

On 3rd of March, 2015 heavy rainfall accompanied by hails and high winds hit Mwakata Ward in Kahama District in Shinyanga region causing loss of life of more than 50 people including seven people from one family and left 82 people injured and several others being homeless. This storm also led to destruction of 160 houses and affected 350 families from Mwangata Village, 100 families from Ngumbi Village and 50 families in Magung'hw Village. On the other hand, hail that fell in Isansa village, Mbozi district on 12th February caused damage of hundreds hectares of cropped fields which affected crop production in the area. The crops that were damaged include maize (134 hectares), beans (62.2 hectares) and coffee (168 hectares). At least 527 households in Isansa village were affected by such an extreme weather event.

On 3rd May 2015 also heavy rainfall hits Zanzibar and destroyed about 354 houses and left 2, 117 people displaced. On 4th May 2015 about 3000 people were displaced in Moshi rural district in Kilimanjaro region after floods destroyed their houses. On 6th May 2015 at least 12 people were reported died due to heavy rainfall and flooding in Dar es Salaam region.

On 1st of November, t rainfall in Mwanza caused severe flooding in the city and the Mwanza Airport leading to temporarily closure of the airport for about six hours. The flooding also claimed the life of six people and left many homeless.

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7.0 Conclusion and recommendation

The state of climate for 2015 was characterized by incidences of severe and extreme weather events with significant socio-economic implications across the country. Most parts of the country were anomalously warmer with a temperature anomaly of 0.85°C above the long-term average of 1971-2000. However, the eastern side of Lake Victoria (Musoma) and southern part of Tanzania (Songea, Lindi, Mtwara and southern Morogoro) experienced relatively lower minimum temperatures anomalies for the entire year; on the other hand in 2015 most parts of the country experienced average rainfall with few areas observed above average rainfall. For instance Tukuyu Meteorological station in South-Western highlands of Tanzania recorded the highest ever 24 hours maximum rainfall of 327.8 mm on 4th November 2015, which is the highest for that station since instrumental records began. Mwanza meteorological station in Lake Victoria Basin also recorded 82.9 mm, which is the highest ever recorded rainfall for the month of November for the station.

These extreme weather events were characterized by severe catastrophic impacts including infrastructural damages, loss of life and properties, which could be much reduced if the public mainstreams the forecast and warning issued by TMA in planning socio-economic activities.