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ON JOB TRAINING REPORT
CLIMATE AND ENVIRONNEMENT DEPARTMENT
ACMAD

From 28th SEPTEMBER 2012 to 26th JANUARY 2013

By:

Isaias Gabriel António Raiva

Meteorologist

National Meteorological Institute of Mozambique - INAM

Rua da Mukumbura 164 – Maputo - Mozambique

P. O. Box 256 – Maputo; Tel/Fax +258 21491150

Email: isaiasraiva@gmail.com / isaias_r@inam.gov.mz
Cellphone: +258 848167524

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Table of Contents

1.ACKNOWLEDGEMENT

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2.ABSTRACT

The final Report on Job training focuses on job train program activities which started from 28th September 2012 at ACMAD. During this period, theoretical concepts on African climate variability, introduction to climate monitoring tools; introduction to Excel and surfer for statistical analysis of climate data and visualization; Introduction to production of dekadal, monthly climate and climate&health bulletins, general review of climate variability with documents available at ACMAD and Introduction to climate data management, using ACCESS, MYSQL data base management systems and climsoft data base application, for importing climate data from excel to climsoft. The total of ten (10) dekadal climate monitoring bulletins, three (3) monthly climate monitoring bulletin, three (3) climate & health, one (1) long range forecast for January to March/February to April, and one (1) presentation about collecting and creating database for Inter-Tropical Convergence Zone (ITCZ) were produced. A climate database with Min, Max Temperature and precipitation daily data for 31 stations in Mozambique from 1979-2009 was developed. Bulletins were produced by following operational procedures using URLs for data collection. Data generated are processed using operational tool such as surfer to produce maps for analysis and text preparation giving actual unfolding scenarios of dekadal and monthly bulletins. These bulletins have shown the meteorological and climatological evolution over the Africa.

3. INTRODUCTION

The report on the Job training is a requirement of the Memorandum of Understanding (MoU) between African Centre of Meteorological Applications to Development (ACMAD) and National Meteorological Institute of Mozambique (INAM). In keeping with the Memorandum of Understanding No. 014/PROT/ACMAD/2012 signed between ACMAD and INAM, the INAM agreed to make me available to ACMAD on Job Training for the period of four months in the Department of Climate and Environment from 28th September 2012 to 26^{h} January 2013, under the Institutional Support to African Climate Institutions Project (ISACIP/AfriClimServ) funded by the African Development Bank.

ACMAD is a continental institution of reference in meteorology, climate and environment. It aims to serve sustainable development of Africa with weather and climate applications over all geographic scales: continental, sub-regional and national.

There had been concern of the lack of appropriate information on climate and policies to effectively use this information make Africa very vulnerable to the adverse effects of climate change, which hinders the promotion of economic development planning. To address this scenario, the ClimDevAfrica programme is conceive by the African Union Commission (AUC), the Economic Commission of Africa (ECA) and the African Development Bank (ADB). It involves capacity building on climate monitoring in Africa. Initially, the programme envisages strengthening of capacities of regional and sub-regional organizations which are ACMAD, AGRHYMET, ICPAC, DMC, through the project AfriClimServ.

This project, funded by the African Development Bank, is carried out for three years on the proposed programme of activities by the institutions and endorsed by the ADB, ACMAD, with its mandate across the continent, plays the role of implementing agency for this project.

As part of this programme, relating to capacity building project ISAPIC/AfriClimServ, and in effect of contribution to increase the critical mass of meteorologists/climatologists of high level. ACMAD has underscored the importance of capacity building through "Training-Activities" staff of "junior staff" in National Meteorological and Hydrological Services (NMHSs) in Africa. This training activity is already one of the strategies of ACMAD for strengthening human capacities of NMHSs and users. This is one of the comparative advantages of the institution.

The objectives of ACMAD as earlier referenced, "capacity building of National Meteorological and Hydrological Services through on job training " to develop the critical mass of personnel to be capable of integrating new technologies and methods in their production and delivery of services in the field of weather forecasting, climate applications, information technology and telecommunications.

To do this, trainees are introduced and trained in an operational framework that enable them to master techniques, methodologies, tools and practices at the center.

The program for 28th September 2012 to 26th January 2013 includes:

1. Theoretical courses on climate analysis and forecasting:
   a) Climate variability in Africa;
   b) Introduction to Excel and surfer for statistical analysis of climate data and visualization;
   c) Introduction to production of decadal, monthly and climate & health bulletins;
   d) Review on climate variability with documents available at ACMAD.
2. Production and dissemination of climate and climate & health bulletins:
   a) Data collection, archiving and retrieval with Data Base management Systems and related application (Climsoft);
   b) Maps, table, time series and graphs production;
   c) Data analysis and text preparation for different sections of the bulletins;
   d) Review and edit of bulletins;
   e) Dissemination of decadal and monthly bulletins.
3. Visits of computing and weather Department.
4. Introduction to climate data management using climsoft program:
   a) Introduction to Access, MYSQL;
   b) Introduction to climsoft;
   c) Importing Mozambican climate data (from excel to climsoft).

The structure of this report is: overview of the introductory theoretical concepts (Climate of Africa); practical application of concepts and tools used in operational activities; conclusion: recommendations; reference followed by operational procedures including figures and URLs in the annexes.

3. THEORETICAL REVIEW

3.1.Climate of Africa

The climate of Africa have come about mainly as a result of its position, which is almost wholly within tropical and equatorial latitudes of both hemispheres, from 37°N and 35°S. Other conditions emerge from the compactness of this huge continent, particularly the area lying north of about 5°N and its considerable, height above sea level, mainly in the west and the south. There are many considerable factors which influence general climate of the continent as Continentality, Oceans currents, Latitudes and Atmosphere circulation (Fig: 1).

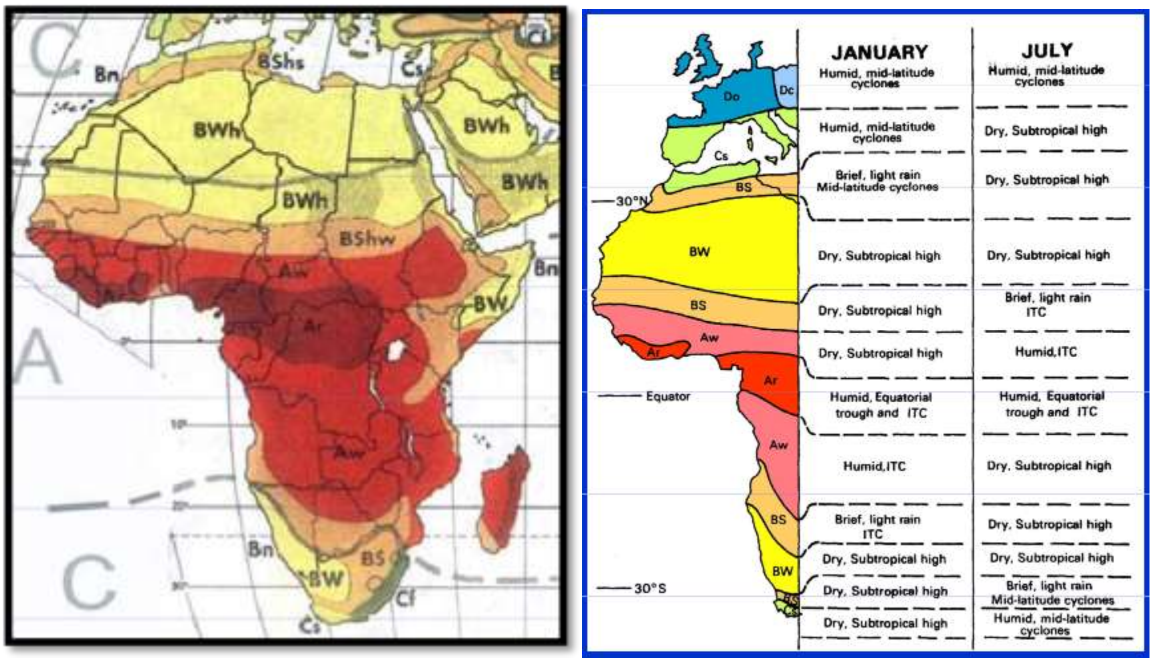

Fig. 1: Climate of Africa; Source: (Wilson, 2002)

3.1.1. Major factors of African climate

3.1.1.1.Continentality

Continentality is favored by the extensiveness of North Africa, that is, the great distance of most of this region from the humidifying influence of the Atlantic, it being sheltered from the north by the Atlas Western Mediterranean coast, and the proximity of Asia East. In the southern half of Africa the same role is played by the mountain chains in the East and South.

The surface cover is tremendous importance in determining climate in Africa as 39% of the continent is desert, 10% is semi-desert, 35% is savanna and only 10% is equatorial rain forest.

3.1.1.2.Ocean Currents

Africa is washed by ocean currents whose influence can be very strong in view of the fact that thermal inversions are maintained over cool currents at certain times of the year. On the Atlantic side there is cold Benguela current, which during the southern winter reaches farther north than in summer, crossing the equator to affect the coast of Ghana, Togo, Benin, and partially Nigeria. The other cold current, the Canary current, flow past the coast of western Sahara as far south as Cape Verde. The remainder of the Atlantic coast in the northern summer is washed by the eastward-flowing Equatorial Countercurrent and then the guinea current, in winter only by the guinea current.

To the monsoon, and where the cool Benguela Current is also an influence. The more air stratification and the inhibition of convection are the reason for the second dry season in the equatorial zone. The Benguela Current (Fig: 2) exerts an even influence on Atlantic coasts as far as Gabon in the north, so July and August are quite dry.

South of 10°S Indian Ocean coast are affected the whole year round by the southward-flowing warm Mozambique and Agulhas currents. North of 10°S the east coast of Africa is influenced by the Somali current, which is variable in both in temperature and directions (Martyn, 1992)

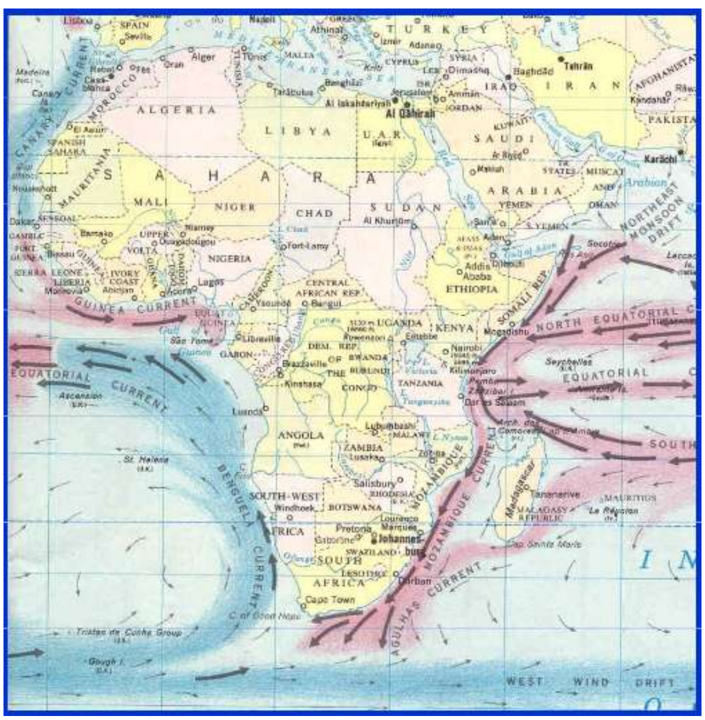

Fig:2 Ocean currents. Cold in blue and warm in red. Source: (Wilson, 2002)

3.1.1.3.Latitudes

African position in low latitudes means that the amount of insolation is very much the same throughout the year, and change a little with distance from the Equator. During the summer (solstice) the length of daylight increases from 12,1 h on the Equator itself to 14,5 h ate 35°N and S . The sun's latitudes at noon at this day is 66,5° at the Equator, 90° at the tropics and 78,5° at 35° N and S. The shortest day, from 12,1h on the Equator, to 9,8 h at 35°N and S; the sun altitude at noon decrease from 66,5° at the Equator to 31,5 at 35°N and S. At the Equator the sun is at the zenith twice during the year, on 21st March and 21st September.

The annual sunshine amounts reflect the great influence of cloudiness. There are over 3600 h of direct sunlight in the central Sahara and over 4000 h where the borders of Libya, Chad, Egypt and Sudan meet. In the south, Namibia is sunniest region with over 3600 h (Martyn, 1992).

The spatial distribution of solar radiation, total is similar in both hemispheres.

3.1.1.4. Atmosphere circulation

Another important regulator of African climates is the atmospheric circulation, which is associated with the annual movement of ITCZ (Inter-Tropical Convergence Zone), whose northern and southern edges are influenced by subtropical circulation in winter (fig:3).

There are areas of elevated pressure in the tropical latitudes of both hemispheres. In the equatorial zone between them, pressure is low over the very warm Gulf of Guinea, towards the Ethiopian Plateau and over the warm Mozambique Channel. The position and activity of these zones depends on the season and the surface cover.

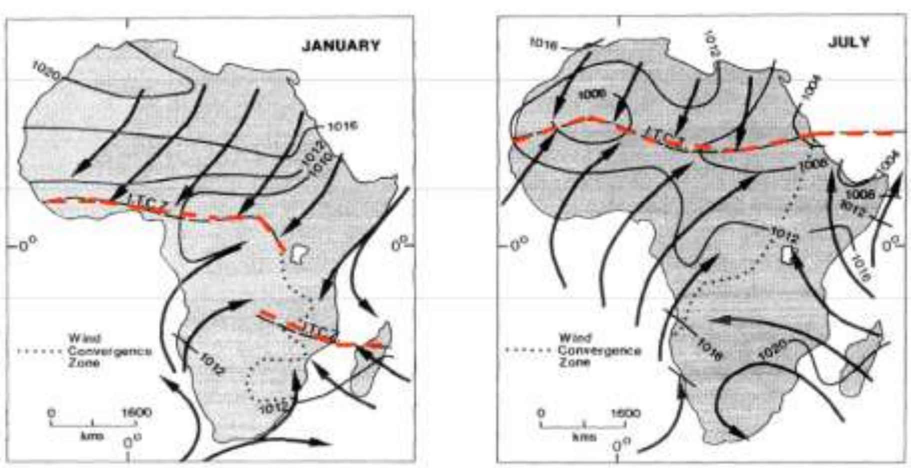

Fig. 3; ITCZ position in summer and winter, source: (Wilson, 2002)

In January, the effect of Mediterranean front lows is felt in the Mediterranean area and the far north of Africa, while high pressure obtains over North Africa (ridges of the Azores High). Because the southern half of the continent has become strongly heated during the summer, the subtropical anticyclone is split and the South African Low comes into being. This pressure system gives rise to the trade wind circulation, which is particularly vigorous over the northern half of Africa, In January the north-east trade winds reach areas down to about 5°N. Over the Sahara and west Africa, these dry, dust-bearing north-easterly and easterly winds (cool in winter, very hot in summer) go by the name of the ***harmattan***, whereas in north-east Africa they are called the ***Egyptian current***. The trade winds blowing all year from the South Atlantic High are of a different nature. The south-easterly, then southerly, winds (carrying stable air masses) are deflected to the right on crossing the Equator to become south-westerly and westerly winds (now containing unstable air masses), monsoons; which bring huge quantities of moisture from the Gulf of Guinea. In January; the ITCZ over West Africa runs parallel to latitude 5°N. Above the eastern edge of the Congo Basin' the topography forces it to become longitudinal, but from 15-18°S it bends east. North-easterly and easterly winds then blow in east Africa.

A regional atmospheric front is formed between the North African and Asian trade winds in the vicinity of the Ethiopian Plateau. In the southern hemisphere the corresponding front is the convergence of winds from the anticyclones over both oceans. South-westerly and westerly winds blow from the South Atlantic High over all of the Congo Basin and the western peripheries of south Africa, whereas easterly winds blow from the South Indian Ocean High on to south-east Africa.

South-western part, over southern Atlantic Ocean there is a high pressure center (Santa Helena High), and eastern part, over southern Indian Ocean there is also

In April wedges of the Azores High stretch across the Mediterranean Sea, and the ITCZ with its accompanying temperature rise over the Sahara moves further north, its eastern section now lying almost whoIly beyond the Equator. Over the Transvaal in the RSA there are the beginnings of a winter anticyclone. The easterlies from the Indian Ocean and those linked directly with the South African High (Santa Helena and Mascarene Highs) cover almost all of southern Africa. See figure 4 below.

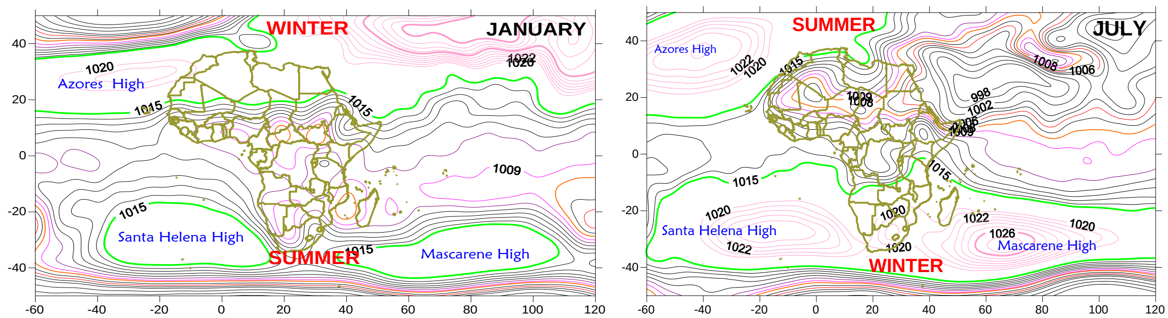

Fig. 4: Centers of action on African Winter and Summer. Mean Sea Level (71-2000); *(source NOAA/NCEP)*

3.1.2. African Climate regions

3.1.2.1. North Africa & Western Sahara

The climate of North Africa is determined principally by its position in sub-tropical and tropical latitudes and the vast area occupied by the Sahara Desert.

The seasonal changes in sunshine here are connected mainly with the annual variation in cloudiness

In winter the atmospheric circulation over North Africa (Griffiths and Soliman, 1972) develops in connection with the Saharan Anticyclone, centered over an area south of the Atlas Mountains, wedges of the Azores High, the Arabian and Balkan Highs, the Mediterranean depressions, and the equatorial lows over central Africa.

Except in the Mediterranean zone, where the prevailing near surface winds are westerlies, the rest of north Africa has northerly and north-easterly trade winds called *harmattan* which blow as far as the ITCZ (along 5°N) in winter. A singular front is formed west of the Ethiopian Plateau.

The cool season in the Mediterranean Basin is affected by polar front depressions arising in or moving across this area. Several depressions pass over Gibraltar, many (60 a year) come into existence over the Eastern Atlantic Basin, and nearly 30% cross north-coast of Tunisia. These depressions regulate the winter weather in northern Morocco, Algeria and Tunisia. 10-20 depressions arise over central Algeria and the large majority of them move eastwards in the direction of Cyrenaica. From time to time there are also depressions which pass across the north over the Saharan Atlas. The most serious atmospheric disturbances are associated with those rare depressions that cross central Libya and the Qattara Depression towards Cyprus; they are accompanied by violent dust storms and the advection of exceptionally hot air. They are responsible for those very strong desert winds, the sirocco and the khamsin, and indeed are called sirocco and khamsin depressions. 50% of these depressions occur in April and May, but they also appear in autumn.

The atmospheric circulation and weather in summer months are determined by the continental depressions over Mesopotamia and the Persian Gulf, over the southern. Sahara and southern Sudan, and by the high pressure areas Iying over central Africa, the wedges of High extending over the Mediterranean, and the Balkan anticyclone.

The. convergence of the *harmattan* and the west african monsoon in July reaches 20°N and the Khartoum region in the east Khartoum is also affected by the Indian monsoon.

The warmest period of the year can occur in any month, from March in southern Sudan through June in the eastern Sahara, to July in Western Sahara and August on Mediterranean and Red Sea coasts. The northward movement of the ITCZ is responsible of the warmest period of the year can occur in any month, from March in southern Sudan, through June in the eastern Sahara, to July in Western Sahara and August on Mediterranean and Red Sea coasts.

The coolest month of the year is generally January, but in southern Sudan it 'is July and August (the middle of the rainy season)

3.1.2.2. Central and West Africa in the northern hemisphere

The climate of this part of Africa is determined by its position between about 20°N and the equator. The south coast is washed by the warm Guinea Current, the west coast by the cool Canary Current.

The main factor responsible for climate variability here is the atmospheric circulation which develops under the influence of two anticyclonic systems, namely, the Azores High and the South Atlantic (Saint Helena) High. The ITCZ (a band of convective cloudiness visible on geostationary satellites pictures over the tropics) is of greatest significance, its seasonal migrations and pulsations are the main reason for the diversity of climatic conditions in West Africa.

Tropical Easterly Jet is the meteorological term referring to an upper level easterly wind that starts in late June and continues until early September. It is one of the most intense circulation features over West Africa. This jet lies in the upper troposphere is centered around 15°N, 50-80°E and extends from South-East Asia to West Africa.

There is a rainy period from late February-early March to October-November. The position in the lower troposphere and seasonal migrations of the ITCZ are the reason why there are two major seasons. One dry and the other wet. The length of each season varies northwards as the dry season is prolonged at the expense of the wet season. In April the ITCZ moves north, restricting the range ofthe *harmattan* to 10-13°N and allowing the monsoon to penetrate as far as southern Mali and Niger.

The highest temperatures of the year, usually above 35°C are measured between February and April. In the north of Senegal, Burkina Faso and Nigeria, and also on the Fouta Djalon, Jos and Bauchi Plateaus, where the weather is sunnier and drier, maximum temperatures in April-May exceed 40°C.

Areas lying to the south of the ITCZ are more humid than those north. of it. On the Gulf of Guinea relative humidity is high throughout the year, which is understandable seeing that the south-west monsoon blows aIl the time. Frequent sea breezes keep the relative humidity high on the Senegalese coast as well.

The distribution of precipitation is very varied. There are sheltered from the rain-bearing monsoon, such as the interior lowland of Ivory Coast and Ghana. On the Guinea Coast, the annual rainfallfigure depends largely on the lie of the coastline. It is over 1000-1500 mm in places more exposed to the monsoons and over 3000 mm at the foot or the Adamawa Plateau

3.1.2.3. Central east Africa in the northern hemisphere

The mountainous and highlands character of the landscape and the position of Ethiopia and northern Somalia in central east Africa between 1°S and 18°N, on the very warm Red Sea, Gulf of Aden and Indian Ocean, have left their mark on the climate of these lands.

During the winter, masses of continental tropical air reach Ethiopia. In west and north-west Ethiopia, winds blow off the Sahara from the north and north-east (the Egyptian current) eastern regions receive air masses from the Arabian Peninsula. Both air masses are thus warm and dry, if one does not count the insignificant uptake of water vapour from the Red Sea and the Gulf of Aden. A regional front then comes into being between these two air currents and is the reason why the rainfall in the southern part of the Red Sea is scanty.

Two circulation systems (Asian and Thermal Lows) thus dominate this part of Africa, the trade wind blowing from the north and north-east all the year round, which affect north-east Ethiopia and Djibouti (east of 39.5°E and north of 10°N) and two kinds of monsoon circulation over the rest of this region. In the western Ethiopian Plateau, the dry winter trade wind contrasts starkly with the very moist Guinea monsoon. In south- east Ethiopia and in Somalia the physical characteristics of both air masses are very similar and differ only in the direction from which they blow. Contributing to their dryness is the fact that they blow over continents, parallel to the coast and mountains ridges.

The north-easterly winds in April are limited in range to the rift valley joining Lake Rudolf and northern Somalia. Southern areas are then influenced by moist air masses from the Indian Ocean transformed over central east Africa.

The tropical cyclones entering the Gulf of Aden in May-June and October-November very seldom affect the Somali Peninsula

The annual solar radiation in most of this region is above 6280 MJ/m^2.

The highest mean annual temperatures (≥ 30°C) occur in the Danakil region and on the Eritrea coast. During the three warmest months (May-July) maxima are over 40°C. The lowest maximum temperatures are only 30-36°C. From May to July nights are extremely hot with minima of 27-32°C.

This region of Africa has little cloud. The mean annual cloudiness is only 30- 50%. From June to August there is an exceptional amount of cloud (70-80%) on slopes exposed to the Guinea monsoon. The least cloudy is the area where trade winds blow the whole year round. This is an area cut off from the west and south by the Ethiopian and Somalian Plateaus, where there are two cloudiness maxima, one in the winter and the other in the summer months. The equatonal area has rather more cloud (Jumbo 44--59%), especially in the second half of the year.

From March there is a short rainy resulting from the slackening of the Arabian High. The air humidity distribution in Ethiopia and Somalia is closely dependent on orography and altitude, and also on exposure to moist air masses. The relative humidity generally increases coastwards, and mostly during the hours of daylight.

This region of Africa has little cloud. The mean annual cloudiness is only 30- 50%. In many parts of the Ethiopian Plateau exposed to the Guinea monsoon precipitation is more abundant about 1400 mm per annum. In the annual cycle the rainfall maximum is in July-August.

Same places have a lot of fog.

3.1.2.4.Equatorial Africa

The climatic features of the very centre of Africa are established by the symmetrical position of this region either side of the Equator (as far as 13°N) and by the relief and land cover.

The position of this region astride the Equator is reflected in its radiation balance and the atmospheric pressure distribution. The low pressure and its minimal annual variation combined with the topography cause the air to stagnate, and in the Congo Basin this air takes on equatorial features.

Not only the low pressure zone around the Equator, but also the high pressure centre over the south Atlantic (St. Helena High) and the rather smaller one over the Indian Ocean (Mascarene High) in the winter of each hemisphere play a very important part in the atmospheric circulation.

A monsoon circulation comes into play in consequence of the thermal contrast, reinforced by the cool Benguela Current, between the African continent and the Atlantic. Having crossed the Gulf of Guinea, masses of moist air from the south Atlantic move north-eastwards over land, and in the east their path is blocked by mountains. In these air masses travel as far as 18-20°N and so lie over Cameroon and the entire Central African Republic (CAR) at this time of year. In January the ITCZ halts at around 3°N. Dry north-east trade winds (the Egyptian current) limiting rainfall sometimes reach the north and occasionally the centre of the Congo Basin at this time; the much drier *harmattan* blows into Cameroon.

The solar conditions here also reflect the region's equatorial position. The length of daylight during the whole year is around 12 hours a day, which ought to mean an even supply of solar energy, while the Sun's high altitude should contribute a large quantity of solar energy. However, the seasonally and spatially variable amount of cloud and the humidity limit this inflow. The annual amounts of direct sunshine arrange themselves symmetrically on either side of the Equator from 1300h (30% of the possible) on the Gabon and Congo coasts to 2600 h (60%) in northern Cameroun, the Central African Republic, south Katanga and the east.

During the day the highest temperatures reach 28°C throughout the year. In the warmest periods of the year (January-February or March-April), tempera-tures north of 5°N increase to 30-32°C, while in the drier north of Cameroon and the Central African Republic to 35-39°C and even 40°C.

The air over equatorial Africa is very humid. The relative humidity-both in January and July at night in the centre of the Congo Basin is higher than 80% and in the lowest lying places even 95%. In January in the whole of southern Zaire, the relative humidity is over 90%, whereas in the north of this country, it is only 50-55%. In July, the situation is reversed, the driest areas being in the south (50-55%). During the daytime, the relative humidity in January falls to 80-85% in Gabon and Congo, and to 70-75% in the east and south of the whole region. North of the Equator in July it remains at the 95% level, falling to 85-90%on the coast and 55% in Katanga.

The annual precipitation is over 1200 mm; in the Congo Basin, Gabon and western Cameroon it increases to 2000 mm, and in exposed places on the Bight of Biafra coast is well over 3000-4000 mm. This heavy rainfall is caused by a combination of the outline of the coast, constant westerly winds and the warm Guinea Current. There are places in this part of Africa which, because of the orographic raising of the air, may receive over 10000 mm of rain a year. The annual variation in the rainfall is closely connected with the movement of the ITCZ. In this part of Africa, the ITCZ always lies north of 3-5°N. The actual position of the zone also depends on the local convection conditions.

Such conditions are most favorable about a month following the Sun's highest altitude.

There is not much precipitation in the Congo Basin, owing to the considerable continentality and the topography of this territory.

3.1.2.5.East Africa

The climate of east Africa is determined by two main factors: its equatorial position (between 4°N and 12°S), and the location of over half of it on the East African Plateau. The general atmospheric circulation and the very continental character of the air masses also play a significant part.

In January, when the ITCZ is at around 15°S, this part of Africa is within reach of the dry north-easterly winds blowing down from the Arabian Peninsula and Somalia. On crossing the Equator, the winds become north westerly. The ITCZ lies over the depression between the East African Plateau and the Ethiopian Plateau. Moist air masses of great depth then blow off the Indian Ocean at right angles to the Kenyan and Tanzanian coasts and the mountain barriers. In July, when the ITCZ has moved to c. 15°N and an anticyclone has formed over the now .much cooler south of Africa dry, cool southerly and south-easterly winds blow. Over equatorial east Africa, The air masses coming from the Indian Ocean are fairly dry too, as they have deposited most of their moisture on the eastern slopes of Madagascar. In October, as the ITCZ returns south, winds are easterly, becoming southerly over the Tanzanian uplands,

Monsoons over east Africa are relatively dry. The advection of moist air masses giving rise to precipitation takes place in the transition seasons, when the ITCZ is crossing into the other hemisphere.

The highest temperatures of the year are recorded in February in Uganda and the extreme south-west of Kenya, in March in Kenya and part of Tanzania, in November and December in central and southern Tanzania, and in October in the Tabora region. The maximum temperature in these months is 30-35°C at lower altitudes but only 20-22°C in more elevated situations. Absolute maxima do not usually exceed 40°C, and at an altitude of 2600 m are no higher than 25°C. The Lake Rudolf area and north-east Kenya are the warmest. At this time, minimum temperatures around Lake Rudolf, in north-east Kenya and on the Indian Ocean coast are 23-25°C, falling to 10°C at greater altitudes. The coolest month of the year is July, or sometimes August. Maxima in the warmest places then drop to 28-30°C but minima in east and north Kenya remain above 20°C.

The annual mean relative humidity at sunrise in much of this region is 85-95%, but in the the drier north of Kenya it is 65~75%.

The precipitation regime depends on the atmospheric circulation systems. If we take a of 50 mm as our criterion of a season, we find that in the Ruwenzori region and in a meridional belt going down the middle of there are two rainy seasons with one maximum in April and the other at any time from October to December. Elsewhere there is only one rainy season with the maximum in August in northern Uganda, in May on the Kenya coast, in April on the Tanzanian coast and Lake Victoria, and from December to March in central and southern Tanzania.

The highest annual precipitation (> 1000 mm) is recorded in the area affected by the ITCZ. This crosses northern Uganda and western Kenya, where there is 100- 200 mm of precipitation every month from April to October in Uganda or to September-October in Kenya and western Tanzania, where such heavy rain falls from November December to March-April.. More than 200-300 mm of rain falls at this time: 361 mm at Lamu in May, 277 mm at Dar es-Salaam in April. Diurnal totals can sometimes be as high as 380-400 mm, e.g. at Vanga.

Two rainy periods (Match-May and November-December) are characteristic of the climate of south-west Uganda, eastern Kenya and the Masai Steppe in Tanzania.

3.1.2.6.South-east Africa

The climatic features of this part of Africa are determined by its position between 8 and 27°S in the eastern half of the continent. Of great importance here is the relief and elevation of the land, and also the fact that it is sheltered from the direct influence of the Indian Ocean by Madagascar and the warm Mozambique Channel down which the always-warm Mozambique Current flows southwards (whose effect is stronger in summer), Apart from these factors, there is the atmospheric circulation which develops differently in summer and in winter.

In winter (July) the ITCZ is far away in the northern hemisphere and therefore has no influence whatsoever on the weather in this region

The synoptic situation in summer (January) is More complicated. As the temperature over the continent rises, the pressure falls and a centre of low pressure forms over southern Zambia which draws in air from three sources.

The warmest period of the year in Zambia, Zimbabwe and Mozambique north of the Zambezi Is October, when maximum temperatures in the uplands are 28- 32°C; absolute maxima range from 32°C on Lake Tanganyika to 38°C everywhere else, In interior regions, in the valley of the upper and middle Zambezi, in areas facing the Kalahari Basin, and in western Mozambique, temperatures rise to 35- 38°C with absolute maxima there in excess of 40-48°C (48.9°C at Zumbo). In June and July, the coolest months, maximum temperatures are 21-25°C, and 24 28°C in lowland Mozambique and on the borders with Zaire, Angola and Botswana.

Diurnal temperature ranges are largest during fine winter days, when strong insolation makes for high daytime temperatures, whereas intense nocturnal radiation causes considerable cooling. On the plateaus, the range can vary from 14 to 20°C but on the Mozambique Coastal Plain and in other depressions it is of the order of IO-12°C. The summer is more humid and cloudier, and the diurnal temperature ranges are therefore lower,

There is one wet season and one dry one during the year. The dry season lasts from 5-6 months in northern Zambia (April-May to September-October) to 7 months in southern Zambia and Zimbabwe (April-October), It is shorter in the mountains of Malawi and north Mozambique, and even more so on the coast around Quelimane and Inhambane. It persists for an exceptionally long time (8-10 months) in the Limpopo valley. The dry season is practicaIly rainless. Occasionally there is orographic precipitation in the mountains of Zimbabwe and southern Malawi and in Mozarnbique south of 16°S.

The high precipitation in Zambia, Malawi and northern Mozambique is caused by tropical cyclones wandering down from the north into the Mozambique Channel. Moist air from the Congo Basin then penetrates as far as Malawi. As they travel farther south, the precipitation in Zimbabwe and southern Mozambique subsides.

During the rainy season, the rains are very intense, especially north of 18°S, where, from December to February, and in northern Zimbabwe and northern Malawi to March, there are 200-300 mm of rain per month, because the position of ITCZ (fig.5). Some places get as much as 350-500 mm. The monthly precipitation during the whole rainy season is in excess of 50 mm. The rain usually falls in heavy downpours. Diurnal amounts often exceed 100 mm, and even 200 mm.

This part of Africa straddles two climatic zones, the boundary between them being the northernmost limit of the trade winds in January. The whole of Zambia, Malawi and the northern halves of Zimbabwe and Mozambique belong to the equatorial zone, while the east of Zimbabwe and Mozambique are in the tropical zone. There are monsoon variants whose extents depend on the range of north-easterly winds in January.

The climates of northern Malawi and northern Mozambique display monsoon features, There are humid regions in north-west Zambia, Malawi and on the coast. The rest of Zambia northern Zimbabwe and that part of Mozambique on the middle Zarnbezi have a dry equatorial climate, while the Zimbabwe Highlands and the middle Limpopo region have a tropical climate intermediate between a humid and a dry one.

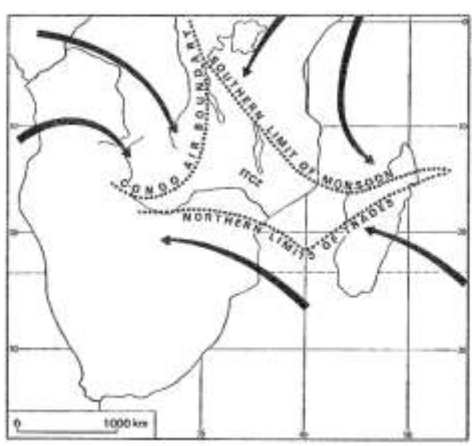

Fig. 5: Mean position of the ITCZ over southern Africa in January. Source (Martyn, 1992)

3.1.2.7.Southern Africa

The climatic conditions of southern Africa are established by its position in the narrowest southernmost, tropical, elevated part of the continent between 17° and 34°52'S The contiguous ocean currents are of great importance: the cool Benguela Current. whose influence is particularly striking in the west, and the warm Mozambique Current, which washes the eastern and southern littorals.

The atmospheric circulation over southern Africa is controlled by the permanent South Atlantic (St. Helena High) and South Indian Ocean (Mascarene) Highs stationed at latitude 30. Their positions vary by only c. 4° from season to season, They lie farthest north in July- August and are in their southernmost situation in February. The constancy of these anticyclones is the reason for the aridity of the southern African climate. On the west coast, the trade wind inversion due to the cool Benguela Current is very strong and reaches the level of the plateau. In the east of this region the inversion lies at an altitude of 2000-2500 m in summer, but drops to 1000 m in winter. Deep polar front depressions from the Atlantic moving eastwards and south- eastwards affect the winter weather in western Cape Province. They draw in strong westerlies and give rise to mainly orographie precipitation, as the inflowing masses of moist air are forced upwards by the rnountain barriers. This air then flows down the lee side of these mountains as foehns-i-here called the berg. Cold fronts rarely pass overland, but when they do, they bring about sudden changes in wind direction in the south-west and equally abrupt fans in temperature. On the west and south- west coasts there is then thick fog and the sky is overcast with Stratus clouds, but in the interior the weather continues fine and dry.

A centre of high pressure establishes itself over the Transvaal in April and remains there all winter. The easterly winds associated with it prevail over Botswana and at first over upland Namibia; by July all of Namibia has easterly winds, However, these winds are northerly over the Kalahari Desert, Cape Province and Bushmanland.

A striking feature of the coastal areas is the high frequency of strong winds blowing parallel to the shoreline, like south-westerlies at Durban, south-westerlies and westerlies at Port Elizabeth, southerlies and south-westerlies or north-westerlies and northerlies at Cape Town, and it is because of the se wind directions that there is little precipitation along the coast

Sea breezes are usual on all the coasts of southern Africa, the circulation being somewhat weaker in summer on the west and south-west coasts, On the east coast, sea breezes blow all the year round.

In spring and summer an atmospheric front forms over central southern Africa between the air masses from the Atlantic and Indian Oceans

The climate of southern Africa is cooler in comparison with that of other areas in similar latitudes. This is because of its fairly high altitude and the cooling that the west coast is subjected to by Atlantic air masses, especially in summer.

The coolest

part of South Africa is the Great Escarpment. The lowest temperature are usually recorded at Belfast in eastern Transvaal and at Sutherland, where the mean annual temperature is I2.SoC. The warmest areas are in the interior, especially the lowest western parts. Temperatures are very high in the Orange River valley and in the eastern and northern parts of the Limpopo depression the highest parts of the mountains are cooler still.

Annual precipitation totals generally decline from east to west, from something over 1000 mm (Durban 1093 mm) to 12-17 mm on the Namib Desert coast (Swakopmund, Lüderitz).

The very dry region includes the Namib Desert, Great Namaqualand, Bushmanland, Little Namaqualarid and the Kalahari Desert; even though the coasts are moister, there is little precipitation there. A notable feature of this coast is the large number of days with fog: Swakopmund has 121, Lüderitz 108, Port Nolloth 157 and Alexander Bay 53. Fog is more common in summer and autumn, on 20-21 days a month.

The climate is dry with occasional rain in summer in the whole interior, from north-east Namibia, central Botswana, the Upper Karroo in the south to the valleys of the Crocodile and Limpopo Rivers.

The humid region, where there is no real dry season, includes the coast down to East: London in the south and the highest parts of Lesotho and Transvaal.

4. OPERATIONAL APPLICATIONS OF CONCEPTS AND TOOLS

This phase of on the job training led to exposure to and application of tools, nature and sources of data, procedures and data analysis methodology for monitoring, maps and text preparation. Several exercises were undertaken for familiarity with the entire scope of the processes to efficient output.

From September 2012 to January 2013, individual bulletins (decadal, monthly and climate & health) were produced which presented the overall situation of Surface Pressure Systems, Inter-Tropical Discontinuity (ITD), (Congo Air Boundary (CAB) and Inter-Tropical Convergence Zone (ITCZ) position, Troposphere - West African Monsoon, Dust loading particles, Dust Surface Concentration, Thermal Index (TI) and Anomaly, Relative Humidity (RH) and Anomaly, Rainfall and near Surface Air Temperatures situation in various parts of Africa and Outlook/forecast for overlapping periods.

These bulletins are background for planning activities and informed policy decision making to impact the socio-economic conditions of the African continent.

4.1.Dekadal Bulletin

Dekadal Bulletin reflects data collection, compilation, and analysis and text preparation for ten (10) days meteorological/climatological evolution over the continent and gives forecasts of perceived impacts based on prevailing meteorological/climatological factors. The bulletin thus presented prevailing scenarios and prospects.

4.1.1 Highlights of dekadal bulletin

1. Section1of the dekadal bulletin deals with “general situation” which provides the strengths of the surface: pressure systems and ITD, BAB and ITCZ displacement as well as the troposphere and gives a holistic concept on monsoon and dust concentration, thermal index regimes and the relative humidity during the dekadal period under climate diagnostic review- ocean-atmosphere monitoring, assessments and prediction.
2. Section 2 of the dekadal bulletin delineates “rainfall and temperature situation” - It provides a summary on estimated rainfall amounts and distribution with table showing

stations observed rainfall, number of rainy days, mean maximum and mean minimum temperatures.

3. Section 3 of the dekadal bulletin addresses "outlook for dekad" under review – predictions of the following overlapping one to two decadal periods(see annex).

4.2 Monthly Bulletin

The monthly bulletin summarizes the dekadal bulletins and comprises of additional distinctive features projecting the meteorological/climatological evolution during the month and gives prospects of the successive 3 months ahead.

The procedures of generating products for both decadal and monthly bulletins are to some extend similar. Timeline is one of the major distinctive factors. However, there are operational procedures applicably unique to monthly bulletin.

4.2.1 Highlights of monthly bulletin:

a) Section 1 of the monthly bulletin deals with "synoptic situation during the month" - it provides information on surface pressure patterns; the 850hPa general circulation anomalies; upper troposphere thermal regimes; relative humidity; sea surface temperature (SST) and El Nino/Southern Oscillation (ENSO) for the period under climate diagnostic review- ocean-atmosphere monitoring, assessments and prediction.

b) Section 2 of the monthly bulletin depicts "climatological situation and impacts during the month" – the general climate situation covering two major parameters: rainfall and Temperature which shows rainfall pattern over Africa

c) Section 3 of the monthly bulletin addresses "outlook for monthly bulletin" under review - predictions of the successive overlapping three months periods based on SSTs, precipitation and ENSO characteristics, outputs of WMO Global producing Centre for Long range Forecasts, knowledge and understanding of african climate derived from analysis of historical climate data (see annex).

4.3 Climate & health Bulletin

The climate & health bulletin focus on climate conditions for Cholera, malaria, measles, typhoid fever, and Meningitis that continue to affect African countries and contents additional distinctive features projecting the meteorological/climatological evolution during the month including prospects of regions at risk of such disease.

The procedures of generating products for all of these bulletins are to some extend similar. However, there are operational procedures applicably unique to climate & health bulletin.

4.3.1 Highlights of climate & health bulletin:

a) Section 1 of the climate & health bulletin deals with "Climatic and environmental condition over Africa" - it provides information of Inter-Tropical Discontinuity (ITD), Congo air Boundary (CAB) and Inter-Tropical Convergence Zone (ITCZ) position; Dust loading; precipitation (estimated cumulative rainfall and anomaly); the mean surface Relative Humidity; near surface Air Temperature and Anomaly and vegetation Index.

b) Section 2 of the climate & health bulletin depicts "Climate Related Diseases" – the general outbreak of diseases over all Africa, and relationship between climate conditions and disease occurrence.

c) Section 3 of the climate & Health bulletin addresses "outlook for climate and epidemiological situation" under review – ITD, CAB and ITCZ, predictions, Malaria, Meningitis, Cholera and ACMAD Seasonal climate Outlook for Rainfall and Temperature (see annex).

4.4.Lessons, weaknesses and suggested solutions on bulletins production

With the production of bulletins, I learned to make, climate monitoring, an instrument for social and economic development, aid decision-making and planning of various activities.

I see the late disclosure of the bulletins as a weakness, which makes them lose their added value contribution in the development of Africa.

I suggest to increase bulletins disclosure over the continent and including in the monthly bulletin the ITCZ mean position. I also suggest to hiring two permanent people for Climate and Environment Department of ACMAD as a way to reduce the work volume and ensure the knowledge transfer to the trainers.

4.5. Schedule of operational activities

From September 2012 to January 2013, a total of 4 (10 dekadal and 7 monthly and climate & health) bulletins were prepared under the supervision of ACMAD assigned training supervisors as shown in table below.

Table 1: schedule of operational activities from 28th September 2012 to 26th January 2013

N°	Month	Classification			
		N° of Dekadal Bulletin	N° of Monthly Bulletin	N° of Long range Forecast / verification (Date)	N° of presentation (Date)
1.	October	2	0	0	0
2.	November	3	2 (with climate & health)	0	0
3.	December	3	2 (with climate & health)	1 (20/12/2012)	1 (07/12/2012) **ITCZ**
4.	January	2	2 (with climate & health)	1 (18/01/2012)	1 (16/01/2013) **Climsoft**

4.5.1.Problems on the dates of issue for bulletins

The bulletins were not published in real time because of the following reasons:

- ✓ Reduced number of staff in relation to the workload, which forced to work more than 8 hours per day.
- ✓ low Internet quality, which takes a long time to download data..
- ✓ Obsolete computers and full of virus, which forced the trainers to use personal laptops.
- ✓ Lack of working materials like pen, notebook and data stick

4.6. Climatological mean thirty years data reference period

The period under review also witnessed introduction of new concepts of adding value to bulletins being produced. The concepts included comparing the climatological mean of thirty years reference data with present dekadal situation to present analysis of the pressure(Mean Sea Level) systems for Africa (Azores High, St. Helena High, the Thermal Low and Mascarene High) and the troposphere (Thermal Index (TI) and Relative Humidity (RH) using anomaly maps.

The URL, scripts and procedure used to download thirty years data as reference period (1971 – 2000) from NOAA/IRI data source (see annex).

After downloading, these data were opened and processed in excel format by finding the average of the climatological reference period. The reference period average is then subtracted from the present dekadal or monthly average to derive the anomaly; plotted in surfer and developed maps for analysis, interpretation and text preparation for period.

4.7. Collecting ITD, CAB & ITCZ data

The InterTropical Convergence Zone (ITCZ) is the conventional zone of convergence between hemispheric winds (northeast and southeast trades). During the year, the ITCZ moves northward most as far as 20º N during July-August (northern hemisphere summer) and southward most at approximately 15º S during January-February (southern hemisphere summer). Between these extreme north and south positions, the ITCZ crosses equator twice, during April-May and November–December giving double rainfall maxima around April and November experienced in many parts of the region.

The ITCZ has three components (InterTropical Discontinuity – ITD, Congo Air Boundary – CAB and InterTropical Convergence Zone – ITCZ) covering the African continent from west, central and eastern sector as presented in figure 5:

The monitoring process of ITCZ, include data collect and managing, plotting the map and analyses. The procedures are showing in annex.

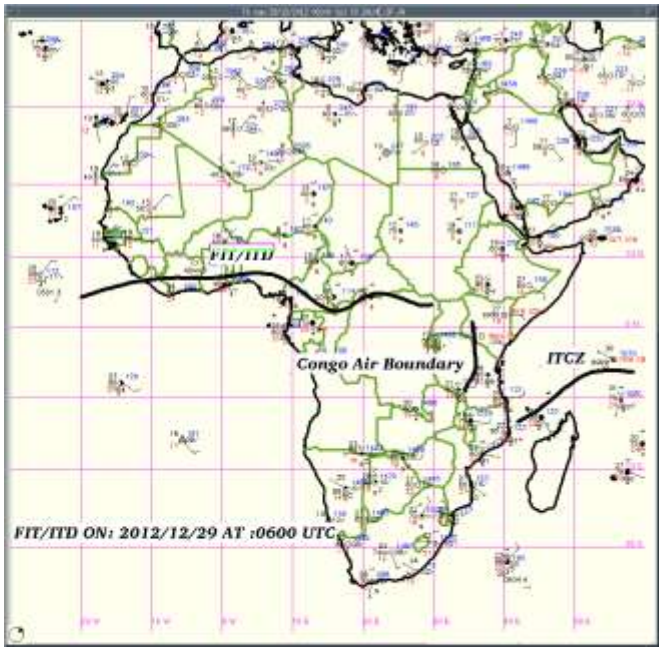

Fig. 5: Components of ITCZ (ITD, CAB & ITCZ), over Africa

4.8. Importing Mozambican data (from Excel to Climsoft)

Climsoft is a system of a climate data management system selected by WMO. It is a system which has more advantages than Clicom on Key Entry of Paper Forms, Import of Digital Data, Validation and Quality Control, Database Model Used for Climate Data Storage, Data Extraction, Metadata, Output Products and Data & System Administration.

This is part of training on climate data management . The activity, consist on getting knowledge on climate data management and analyses, using programs as Excel, Access and Climsoft. We imported from Excel to Climsoft, 31 Mozambican stations with precipitation, maximum temperature and minimum temperature, from January 1979 to December 2009.

The procedure of importing these data, are shown, with details, in annex.

4.9. Long Range Forecast (JFM/FMA-2013) for Africa

One of ACMAD activity, requested by WMO in November 2010, is to produce and provide regularly a long range forecast for Africa region. This forecast, plugs the gap between weather forecasting which predicts African climate for following 3 & 4 months. The predicted elements are temperature and precipitation, using statistical method (analogue technique) which consist

on identify, during last 30 years (historical record), the very similar with 2012, by seeing on global monthly SST anomaly, monthly temperature anomaly and monthly precipitation anomaly.
2001 was before identify as analogue year of 2012 for Africa by ACMAD climate center.
Were also analyzed different forecasts (precipitation, temperature, SSt anomaly and ENSO), for January-February-March and February-March-April, made by statistical and dynamic models, available at other climate centers as Beijing, NOAA, Moscow, ECMWF and NCEP.
The final product of LRF is a bulletin were we mention about recent sst condiction and outlook and subseasonal precipitation variability.
The procedure for maps download are shown in annex.

4.10. WMO assessment for Africa seasonal forecast Verification.

The seasonal forecast has its end on verification of elements predicted before. ACMAD as African climate center, should provide in January a verification of ten (10) season predicted on previous year. This activity was also for assist WMO global seasonal forecast verification, as regional climate center.
This process consist on download seasonal climatology and anomaly data for precipitation and seasonal anomaly for temperature. For precipitation, we calculate percentages of anomaly using the following formula: % = [(seasonal anomaly / seasonal climatology) * 100] + 100. With these data, we plot maps (one for each season), using surfer program, as shown in the annex.

5. CONCLUSION

This Job Training Programme at ACMAD, gave me strong climate capacities on monitoring and forecast African climate witch I have not before. It is interesting to note that these final products (bulletins) provide relevant information that has bearing on the socio-economic development, health public and food security as well as the political affairs of the continent. Taking due note of such information would help informed decision making to achieving the very aims/objectives/goals which gave birth to the ISACIP/AfriClimServ project.

The methodology used by ACMAD on this project, provide the trainers easily understanding/ capacity building of "junior staff" in National Meteorological and Hydrological Services in Africa

My humble appeal goes to users or readers of this information to utilize the content in practical situations to circumvent adverse effects of climate and weather impacts on our human as well as natural resources for sustainable environment and development.

6. RECOMMENDATION

On this monthly progressive report, I would like to make the following recommendations:

1. That ACMAD as a regional center should provide a good quality internet, for data downloading,
2. That at presentations, since ACMAD is a regional body (whose staff are predominately French speaking) hosting English and French speaking personalities on job training, language equilibrium and receptiveness to the needs of the English speaking trainee should be observed to allow equitable and mutual edification.
3. That there should be available computers (Laptops) for the trainers during the job training at ACMAD, as part of work material.
4. That there should be interactive lecture series/sessions, exploring various aspects of the defined training programme prior to or at interval of practical applications.
5. That the ACMAD Climate and Environment Department should have permanent staff for reduce work time, which is more than 8 hours a day.

7.REFERENCES

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8. ANNEX

URL/Scripts / Procedure

The Figures/maps below were produced through the use of the URL, procedure and scripts for dekadal bulletin.

8.1 Procedure for generating dakadal bulletin maps:

8.1.1 Mean Sea Level Pressure (SLP)

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

Procedure

- ✓ Use folowing script for 10 day average mslp data during a given month →Ok (click OK):

expert
SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure
T (21 Oct 2012) (31 Oct 2012) RANGEEDGES
Y (50N) (50S) RANGEEDGES
X (60W) (120E) RANGEEDGES
[T]average
100 div

- ✓ And this script for normal (1971-200) mslp data for a given dekad → Ok :

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure dekadalAverage
  T (1 Jan 1949) (31 Dec 1949) RANGE
  SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure
dekadalAverage
   T (21 Oct 1971) (31 Oct 2000) RANGE
   T name
     npts NewIntegerGRID
     replaceGRID
   T 36 splitstreamgrid
   [T2]average
   T 2 index
     T dekadaledgesgrid partialgrid
      2 1 roll
      pop
     replaceGRID
   T (days since 1949-01-01) streamgridunitconvert
   T T dekadaledgesgrid
     first secondtolast subgrid
     /calendar /365 def
     gridS
      365 store modulus
      pop
     periodic setgridtype
     partialgrid replaceGRID
   [X Y]REORDER
   2 1 roll
   pop
  /fullname (pressure 1971-2000 clim) def
  /long_name (pressure 1971-2000 clim) def
  Y (50N) (50S) RANGEEDGES
```

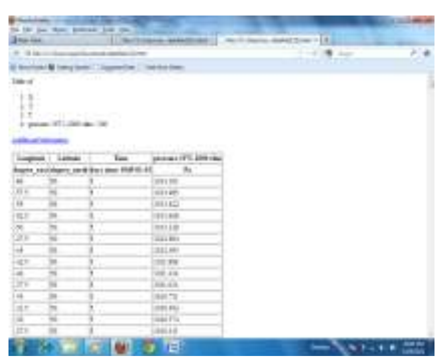
X (60W) (120E) RANGEEDGES

100 div

- ✓ Go to table → columnar table with options →

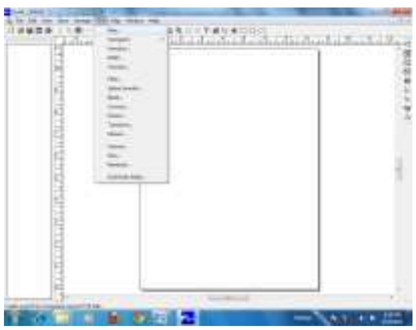
- ✓ Choose number on column 1, column 2 and column 3 → get table, as following picture→ Save file → Ok.

Observed data and Climatological data

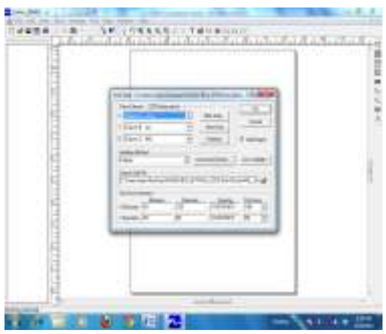


- ✓ Save the data in excel file and calculate anomaly;

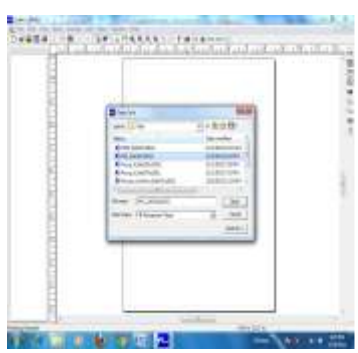
- ✓ Open surfer → Grid →Data → Open the file.

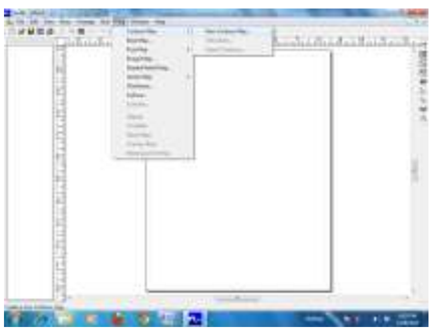
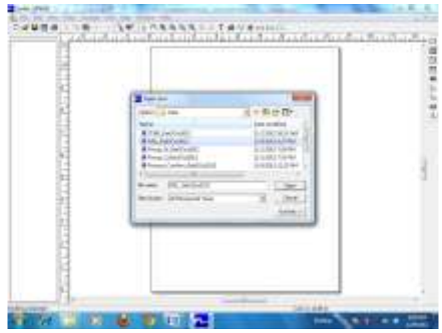
- ✓ On X, put “Long”, “Lat” on Y and “SLP” on Z → Ok → Ok→ close → No

- ✓ Grig → splin smooth → open the file (SLP) → browse → select the file → save → Yes →Ok → Ok

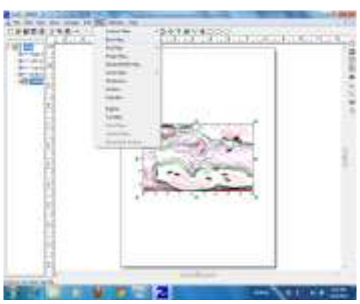
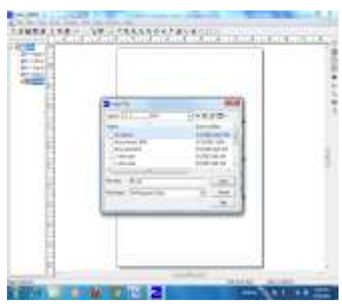
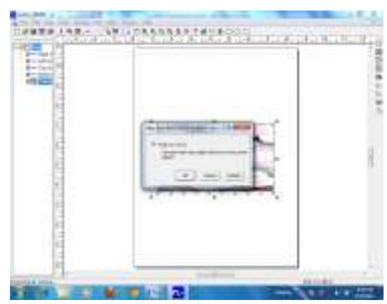
- ✓ Map → Contour map → new contour map → open the file (*.grd file)

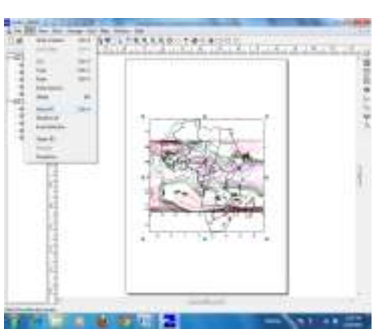
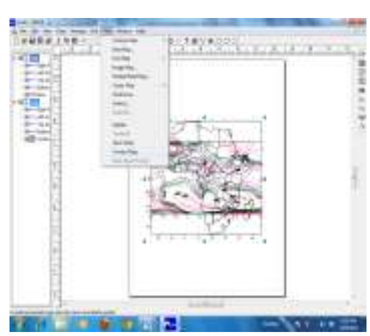
- ✓ Double click on contol → levels → load → open the legend file (Pressao SG → sharedDoc → Base Map → LEGEND →Dekada → MSL_dekadal.lvl) → Apply → Ok



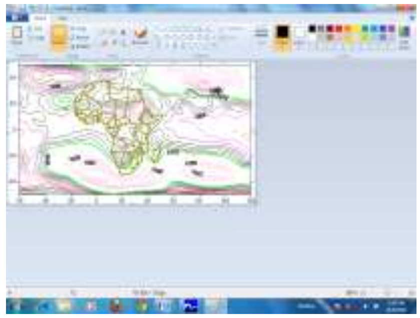

- ✓ Map → Base map → open African map (Pressao SG → Base Maps → Maps → Africa_Actual.bna)→ Ok

- ✓ Edit → Select all → map → overlay map

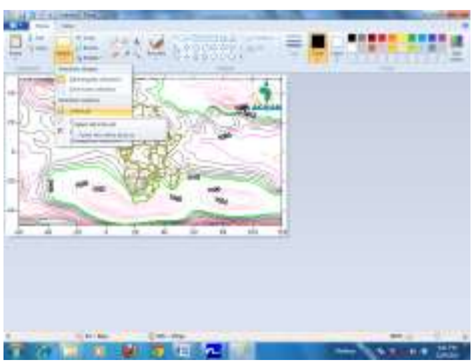



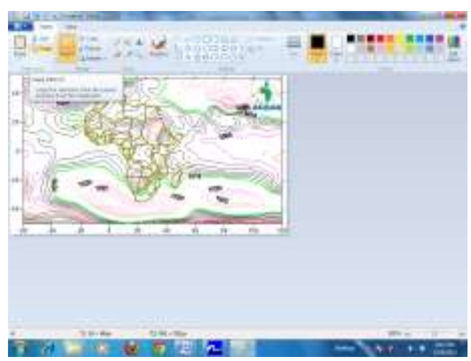
- ✓ Edit → Select all → Copy → open paint → paste



- ✓ Copy ACMAD logo → Paste on the map and put it at the correct position

- ✓ Select all → Copy the map to the Bulletin.





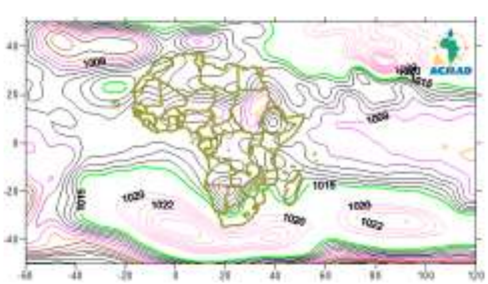


Fig.1a: Pressure at MSL 21 to 31 Oct 2012

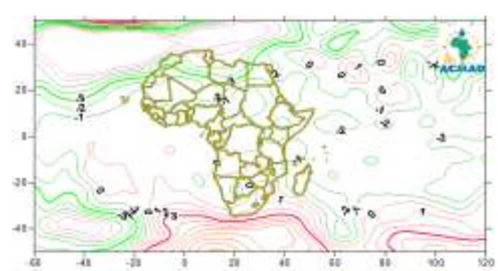


Fig 1b : Presure Anomaly at MSL 21 to 31 Oct 2012

8.1.2. ITD, CAB and ITCZ Procedure

Daily data for the ITCZ, ITD and CAB are collected from the Weather Forecast Department at the ACMAD Centre.

The mean position for ITD and ITCZ has conventionally fixed longitudes and we collect daily variations of Latitudes. The CAB has also conventionally fixed Latitudes and we just collect daily variations of longitudes. Enter the data in excel and do statistical calculations for Average, Maximum and Minimum of the current dekad. Calculate the mean for the previous dekad and put them in different worksheets in excel and save in “CSV” format as folowing example:

Table 2: ITCZ

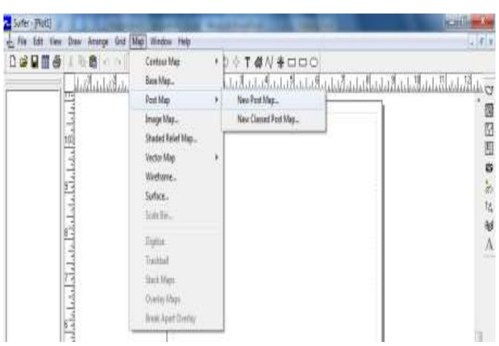
Long	**Mean dek3 Oct**	**Max dek3 Oct**	**Min dek3 Oct**	**Mean dek2 Oct**
-20	12.8	15.1	9.2	13.6
-15	15.4	17.0	12.0	15.3
---	-----	------	------	------

Table 3: CAB

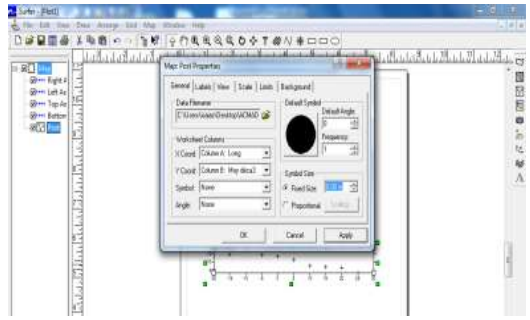
Lat	**Mean dek3 Oct**	**Max dek3 Oct**	**Min dek3 Oct**	**Mean dek2 Oct**
-5	29.7	33.6	24.5	31.6
0	30.1	34.5	22.1	32.3
----	------	----	----	----

Procedure in SURFER

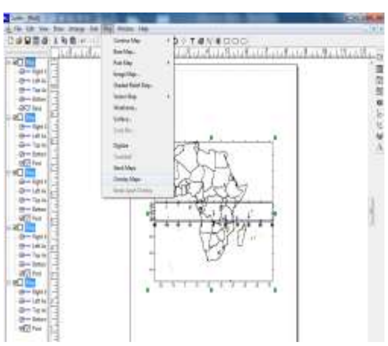
- ✓ Open Surfer and go to Map → Post map → New post map → open the file →

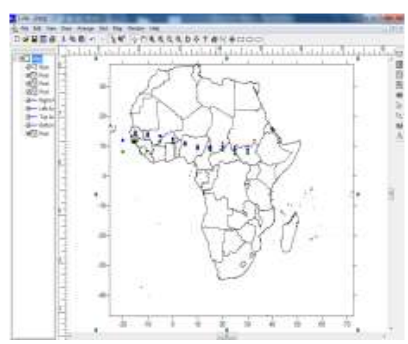


- ✓ click the correct worksheet → ok → double click on Post icon on the left side



- ✓ For ITCZ and ITD, X coordinate is Long and Y coordinate is for the mean for the present, & previous dekad, Max and Min.
- ✓ For CAB; Y coordinate is Lat, X coordinate for Mean for the present & previous dekad and Max and Min → choose black color symbol for Mean for the present dekad -; Max – Red; Min – Green; Mean previous dek – Blue) → Apply → Ok.
- ✓ Repeat the procedure for the Mean, Max, Min and mean for the previous dekad for ITD, ITCZ, and CAB respectively;
- ✓ Add base map of Africa ((pressoa SG → sharedDoc → Base Maps → Maps → Afrca_Actual.bna) → select all → overlay map;





- ✓ Join the points with a line in black color using polyline for the present dekad and blue line for previous dekad;
- ✓ Copy the map to Paint and put the logo of ACMAD and
- ✓ Copy the final map to the bulletin as the following example:

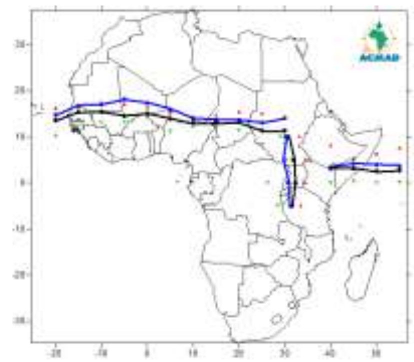


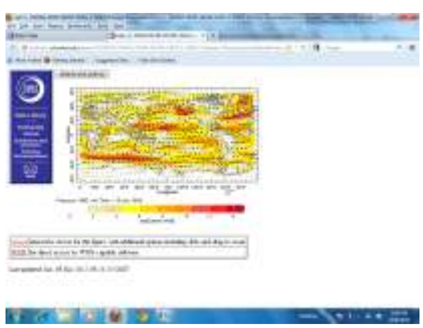
Fig.2 : The mean position of ITD, ITCZ and CAB 3rd dekad of October (black), 2nd dekad of October 2012

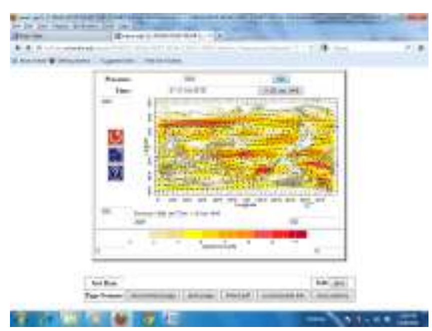
8.1.3. African Monsoon

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.PressureLevel/dekadalAverage/u/dup/mul/v/dup/mul/add/sqrt/units/%28m/s%29def/long_name/%28Vitesse%29def/windspeed_colors/DATA/0/15/RANGE/u/v/X/Y/fig:/colors/vectors/grey/countries_gaz/:fig//plotaxislength/432/psdef//plotborder/72/psdef//XOVY/null/psdef/

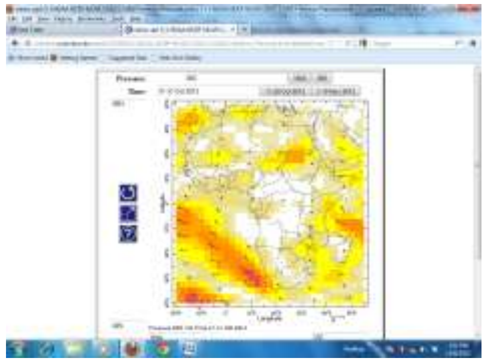
Procedure for winds

- ✓ We go to new → put the correct coordinates as folowing example





- ✓ Right click on image → save image as → choose the director → save



- ✓ Open the image → select → copy → past in word page
- ✓ Double click on image in word → crop → cut what you don't need in the image
- ✓ Copy the finally image → past in the bulletin

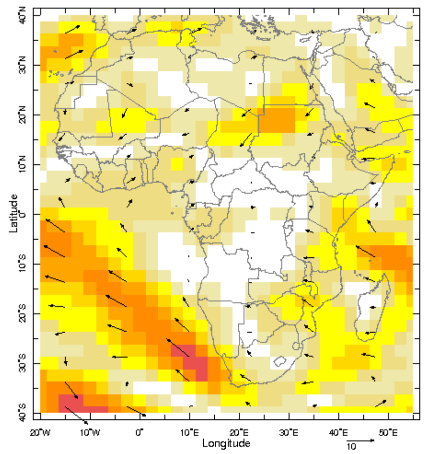


Fig.3: Mean wind at 925 hPa in m/s 21 to 31 October 2012

8.1.4.Thermal Index (TI) at 300 hPa

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

Procedure

For download Thermal Index at 300 hPa level, we use the same procedure as pressure, but with following scripts and correct legend (Pressao SG → sharedDoc → Base Map → LEGEND →Dekada → TI300_dekadal.lvl / TI300_Anomaly_dekad.lvl), respectively:

- ✓ For observed data:

expert

SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .temp

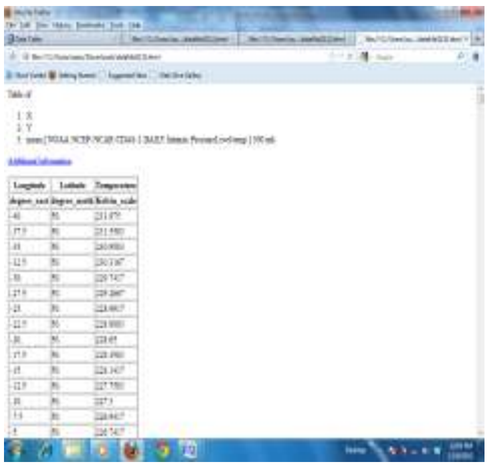
T (21 Oct 2012) (31 Oct 2012) RANGEEDGES

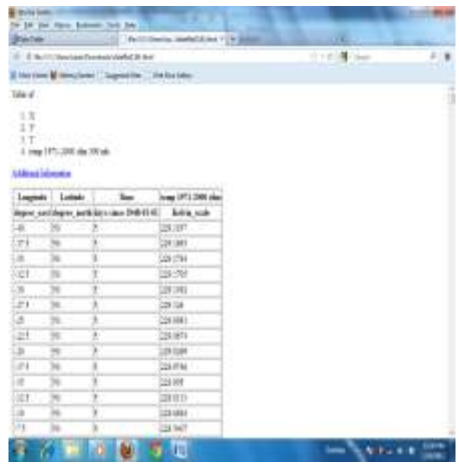
```
  Y (50N) (50S) RANGEEDGES
  P (300) VALUES
  X (40W) (60E) RANGEEDGES
  [T] average
```

- ✓ For climatological data

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .temp
dekadalAverage
  T (1 Jan 1948) (31 Dec 1948) RANGE
  SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .temp
dekadalAverage
   T (21 Oct 1971) (31 Oct 2000) RANGE
   T name
     npts NewIntegerGRID
     replaceGRID
   T 36 splitstreamgrid
   [T2]average
   T 2 index
     T dekadaledgesgrid partialgrid
      2 1 roll
      pop
     replaceGRID
   T (days since 1948-01-01) streamgridunitconvert
   T T dekadaledgesgrid
     first secondtolast subgrid
     /calendar /365 def
     gridS
      365 store modulus
      pop
     periodic setgridtype
```

```
  partialgrid replaceGRID
 [X Y]REORDER
 2 1 roll
 pop
/fullname (temp 1971-2000 clim) def
/long_name (temp 1971-2000 clim) def
Y (50N) (50S) RANGEEDGES
P (300) VALUES
X (40W) (60E) RANGEEDGES
```





- ✓ The griding map procedure are the same with pressure, but you must use the TI300hPa file and the correct legend for getting finally map as the following example:

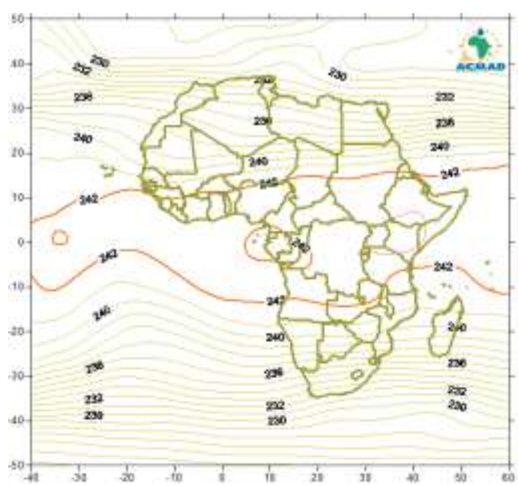


Fig.4a: TI at 300hPa (°k) 21 to 31 Oct 2012

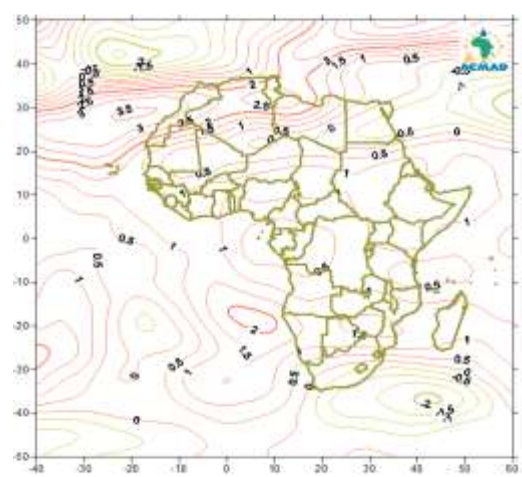


Fig. 4b: TI Anomaly at 300hPa (°k) 21 to 31 Oct 2012

8.1.5 Relative Humidity

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

Procedure

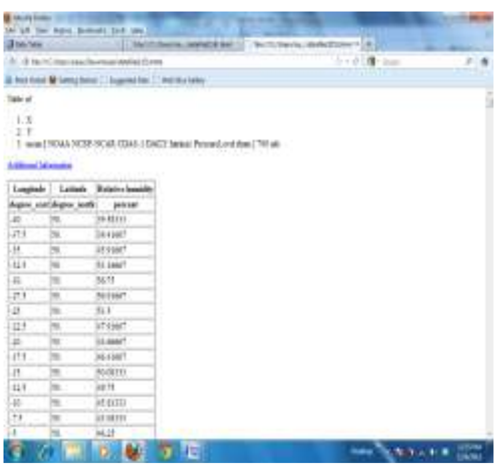
- ✓ For download Relative Humidity at 850 and 700 hPa level, we use the same procedure as pressure and TI, but with following scripts, respectively:
- ✓ Observed data at 700 & 850 hPa:

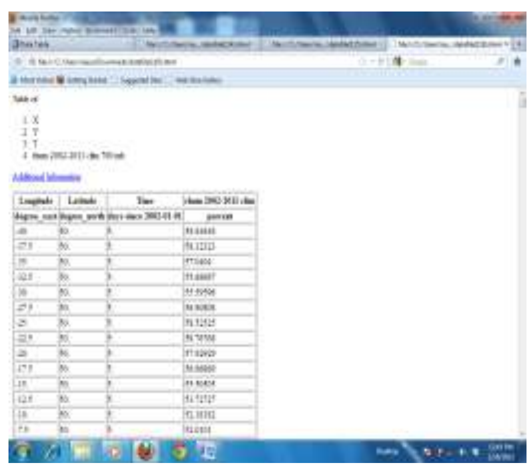
```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .rhum
  T (21 Oct 2012) (31 Oct 2012) RANGEEDGES
  Y (50N) (50S) RANGEEDGES
  P (700/850) VALUES
  X (40W) (60E) RANGEEDGES
  [T]average
```

- ✓ For climatological data, at 700 & 850 hPa:

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .rhum
dekadalAverage
  T (1 Jan 2002) (31 Dec 2002) RANGE
  SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .rhum
dekadalAverage
   T (21 Oct 2002) (31 Oct 2011) RANGE
   T name
     npts NewIntegerGRID
     replaceGRID
   T 36 splitstreamgrid
   [T2]average
   T 2 index
     T dekadaledgesgrid partialgrid
```

```
  2 1 roll
  pop
 replaceGRID
T (days since 2002-01-01) streamgridunitconvert
T T dekadaledgesgrid
 first secondtolast subgrid
 /calendar /365 def
 gridS
  365 store modulus
  pop
 periodic setgridtype
 partialgrid replaceGRID
[X Y]REORDER
2 1 roll
pop
/fullname (rhum 2002-2011 clim) def
/long_name (rhum 2002-2011 clim) def
Y (50N) (50S) RANGEEDGES
P (700/850) VALUES
X (40W) (60E) RANGEEDGES
```





- ✓ The griding map procedure are the same with pressure and TI, but you must use the RH file and the correct legend ((pressoa SG → sharedDoc → Base Maps → Legend → dekadal →

legend_RH_dek.lvl / legend_RH_anomaly_dek.lvl) for getting finally map as the following example:

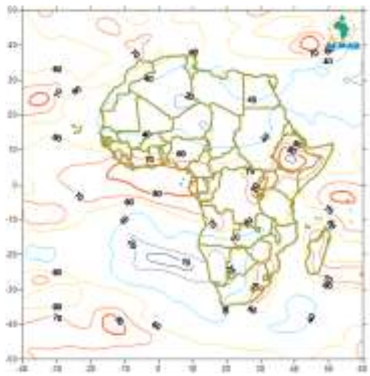


Fig.5a: RH (%) at 850hPa 21 to 31 Oct 2012

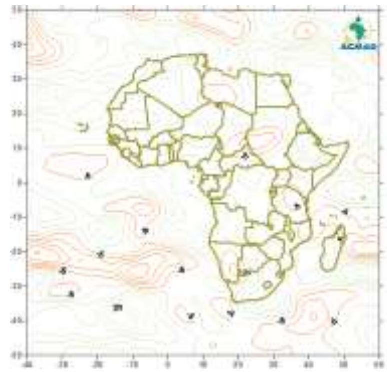


Fig. 5b: RH Anomaly at 850hPa 21 to 31 Oct 2012

8.1.6.Precipitation

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

Procedure

- ✓ For download cumulative estimated precipitation, we use the same procedure as pressure, TI and RH; but with following script:

Because huge dataset, precip is downloade for 0-40N potted and dowloade for 0-40S and plotted then everythoing is overlaid in surfer.

expert

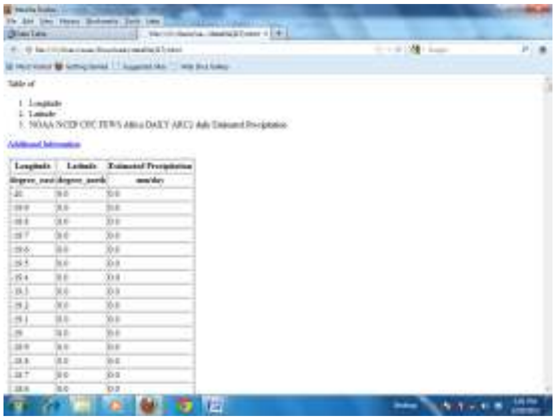
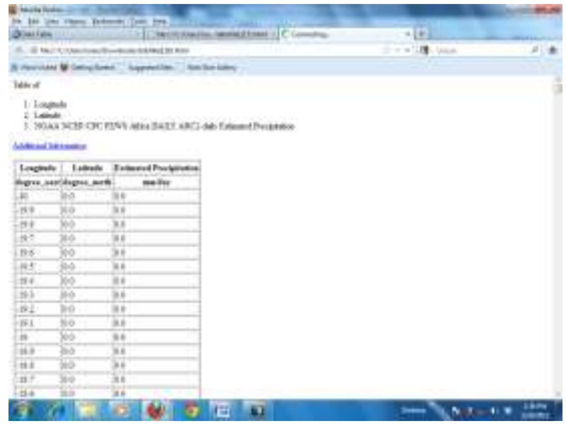
SOURCES .NOAA .NCEP .CPC .FEWS .Africa .DAILY .ARC2 .daily .est_prcp

T (21 Oct 2012) (31 Oct 2012) RANGEEDGES

X (20W) (55E) RANGEEDGES

Y (0N/S) (40N/S) RANGEEDGES

T SUM

- ✓ Save the data in excel file;
- ✓ Open surfer → Grid →Data → Open the file for gridding.
- ✓ On X, put “Long”, “Lat” on Y and “Precip_N” on Z → Ok → Ok→ close → No
- ✓ Grig → splin smooth → open the file (Precip_N_dek) → browse → select the file → save → Yes →Ok → Ok
- ✓ Grid → blank → open data file → open blank file (Pressao SG → sharedDoc → Base Map → Maps → Africa_Blank.bln) → save data file → Ok

- ✓ Map → Contour map → new contour map → open the file

- ✓ Double click on contol → levels → load → open the legend file ((pressoa SG → sharedDoc → Base Maps → Legend → dekadal → legend_RR_dek.lvl)→ Apply → Ok
- ✓ Repeat the same exercise for "Precip_of southern Hemisphere" file
- ✓ Map → Base map → open African map ((pressoa SG → sharedDoc → Base Maps → Maps → Afrca_Actual.bna) → Ok
- ✓ Edit → Select all → map → overlay map
- ✓ Edit → Select all → Copy → open paint → past
- ✓ Copy ACMAD logo → Past on the map and put it at the correct position
- ✓ Select all → Copy the map to the Bulletin.

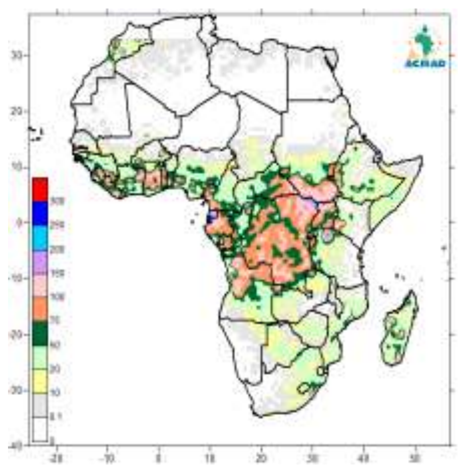


Fig 6 : Cumulative Estimated Precipitation 21 to 31 October 2012

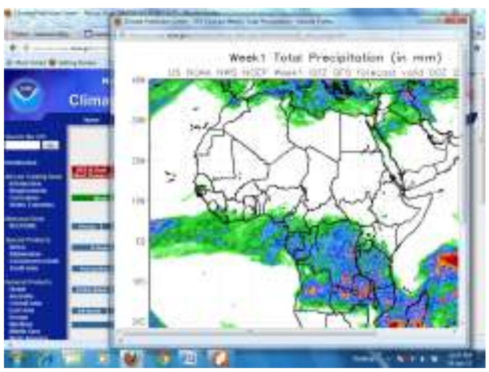
8.1.7.Precipitation Forecast

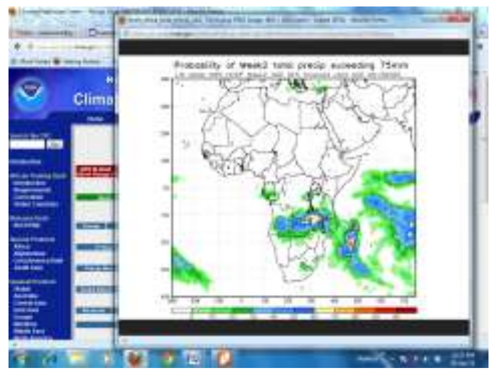
http://www.cpc.ncep.noaa.gov/products/african_desk/cpc_intl/africa/africa.shtml

Procedure

- ✓ Go to precipitation → week 2 → right click on picture → save image as→ put in diretor ; / go to probability → 100 mm → right click on picture → save image as→ put in diretor

✓ Open image → right click → copy → paste in bulletin and crop it





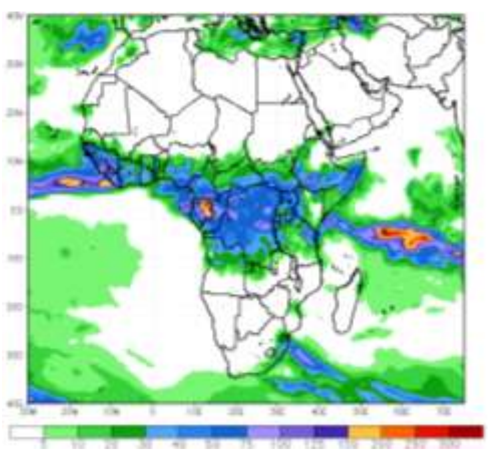


Fig. 7a: forecast of total precipitation (mm)

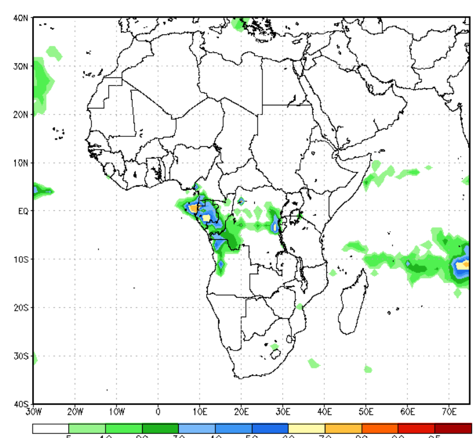


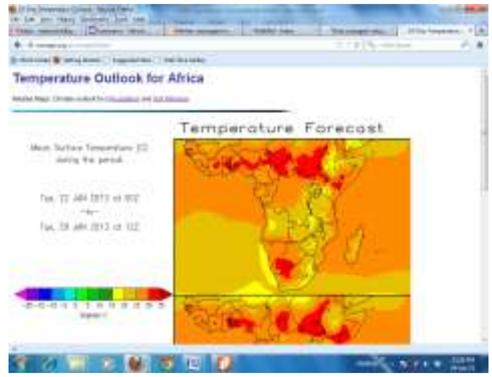
Fig. 7b: Prob of precip exceeding 100mm

8.1.8.Temperature Forecast

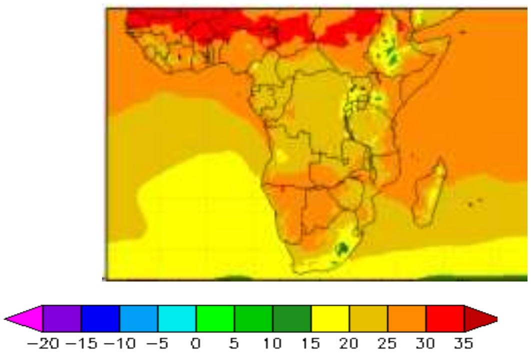
http://wxmaps.org/pix/clim.html

Procedure

✓ Go to temperature (Africa) → right click on picture → save image as → put it in director



✓ Open image → right click → copy → paste in bulletin and crop it



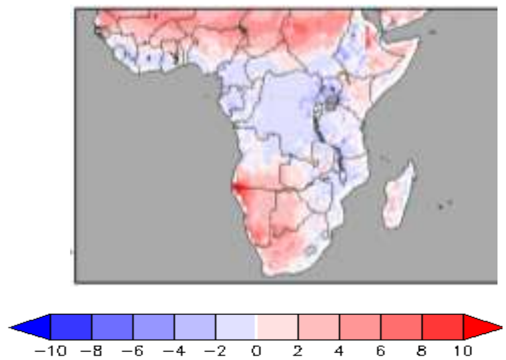


Fig. 8a: Mean surface temperature forecast

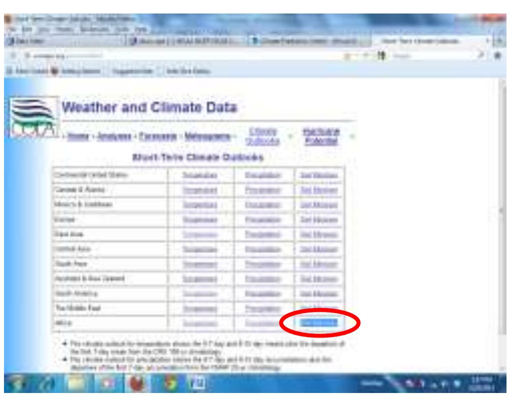
Fig. 8b: Temperature Anomaly forecast

8.1.9.Soil Moisture Forecast

http://wxmaps.org/pix/clim.html

Procedure

✓ Go to Soil Moisture (Africa) → right click on picture → save image as → put it in director



- ✓ Open image → right click → copy → paste in bulletin and crop it

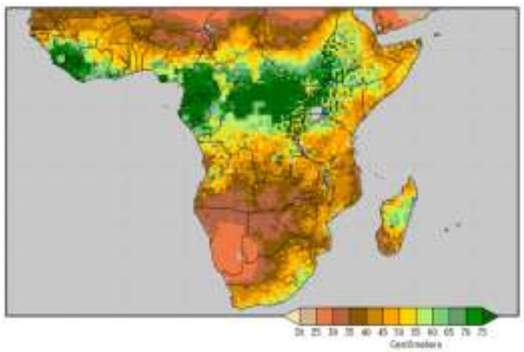


Fig 9a.: Initial Soil moisture

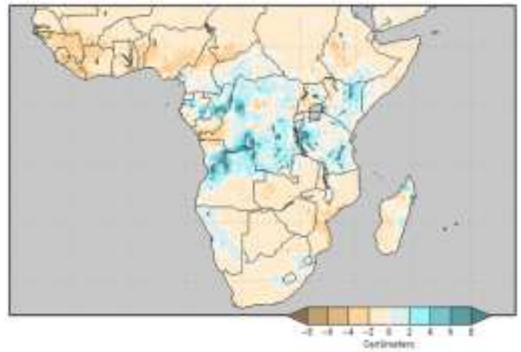


Fig 9b. : Soil moisture change

8.2. Procedure for generating monthly bulletin maps:

8.2.1. Mean Sea Level Pressure (SLP)

- ✓ The procedures for data download and plot the map, is the same with decadal one; using following site:

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

- ✓ The following script for observed data:

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .MSL .pressure
  T (Oct  2012 ) VALUES
  Y (50S) (50N) RANGEEDGES
  X (60W) (120E) RANGEEDGES
  100 div
```

- ✓ For climatology dada :

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .MSL .pressure
  T (Oct 1971) (Oct 2000) RANGEEDGES
  Y (50N) (50S) RANGEEDGES
  X (60W) (120E) RANGEEDGES
  T 12 STEP
```

100 div

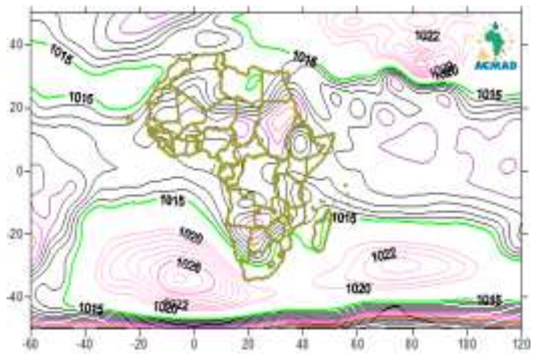


Fig 10a Pressure at MSL Oct 2012

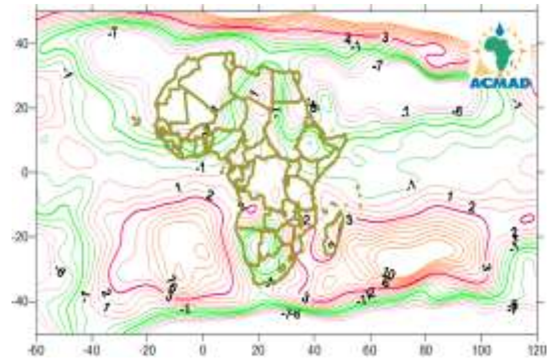
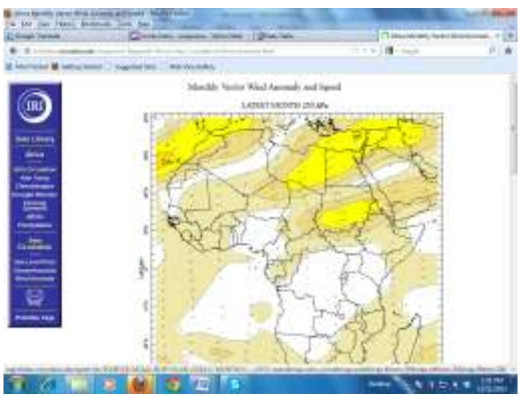


Fig 10b : Presure Anomaly at MSL Oct 2012

8.2.2.Wind Anomalies (m/s) at 850hPa

We use following site to download wind anomaly at 850hPa map.

http://iridl.ldeo.columbia.edu/maproom/.Regional/.Africa/.Atm_Circulation/Wind_Anomaly.html



- ✓ Double click on first map
- ✓ Put the correct coordinates, level and dates
- ✓ Right click on map → save image as → save it in a directory

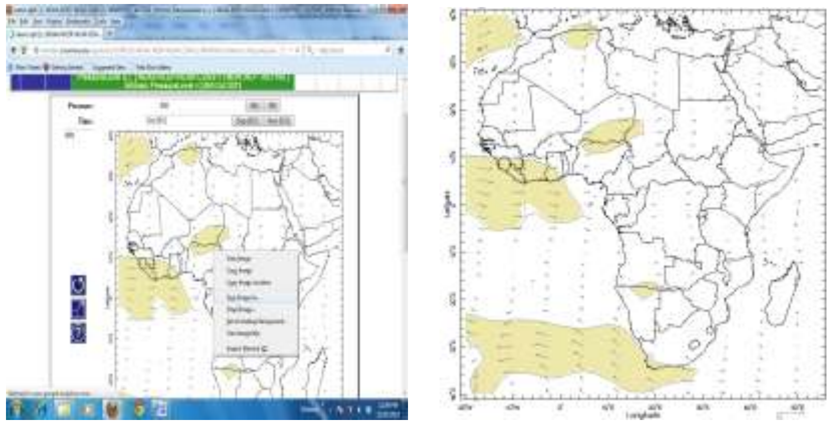


Fig. 11 wind anomaly at 850 hPa

8.2.3.Thermal Index (TI) at 300 hPa

The procedures are the same with decadal TI.

expert

SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .temp

T (Oct 2012) VALUES

Y (50S) (50N) RANGEEDGES

P (300) VALUES

X (40W) (70E) RANGEEDGES

expert

SOURCES .NOAA .NCEP-NCAR .CDAS-1 .mc7100 .Intrinsic .PressureLevel .temp

T (Oct) VALUES

Y (50S) (50N) RANGEEDGES

P (300) VALUES

X (40W) (70E) RANGEEDGES

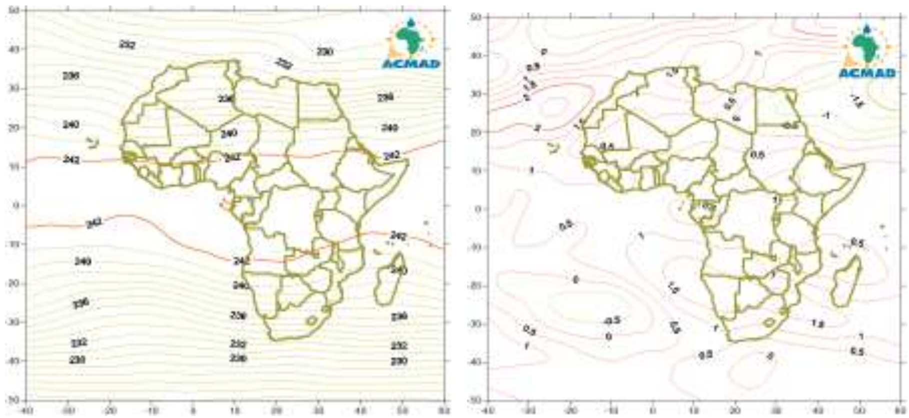


Fig. 12 Observed Thermal Index (left) and anomaly (right) at 300 hPa

8.2.4.Relative Humidity (RH) at 850 hPa

The procedures for download data and map plotting for monthly Relative Humidity at 850hPa and anomaly, are the same with decadal Relative Humidity shown before at decadal bulletin.; but we use the following scripts:

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum
  Y (50N) (50S) RANGEEDGES
  P (850) VALUES
  X (50W) (70E) RANGEEDGES
  T (Oct 2012) RANGEEDGES
```

- ✓ Anomaly

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum
  Y (50N) (50S) RANGEEDGES
  P (850) VALUES
  X (50W) (70E) RANGEEDGES
  T (Oct 1971) (Oct 2000) RANGEEDGES
  T 12 STEP
```

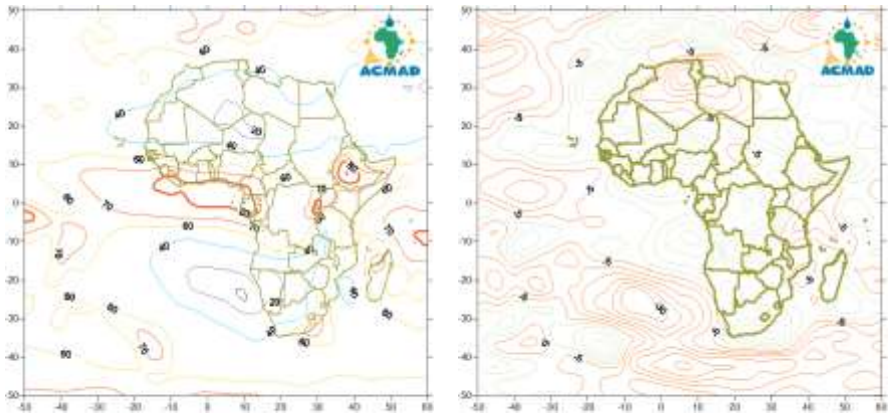


Fig. 13 Relative Humidity (laft) and anomaly (right) at 850hPa

8.2.5.Relative Humidity at 700 hPa

The procedures for download data and map plotting for monthly relative Humidity at 700hPa and anomaly, are the same with decadal relative Humidity shown before at decadal bulletin.; but we use the following scripts:

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum
  Y (50N) (50S) RANGEEDGES
  P (700) VALUES
  X (50W) (70E) RANGEEDGES
  T (Oct 2012) RANGEEDGES
```

- ✓ Anomaly

```
expert
 SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum
  Y (50N) (50S) RANGEEDGES
  P (700) VALUES
  X (50W) (70E) RANGEEDGES
  T (Oct 1971) (Oct 2000) RANGEEDGES
  T 12 STEP
```

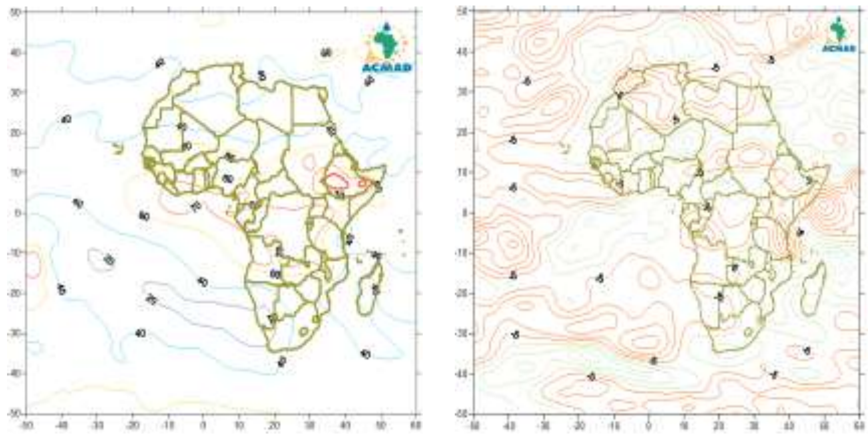
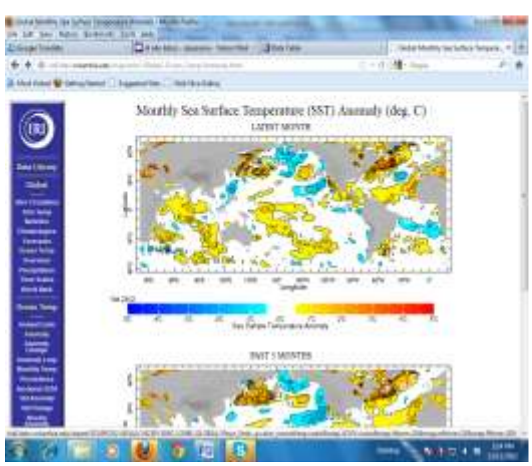


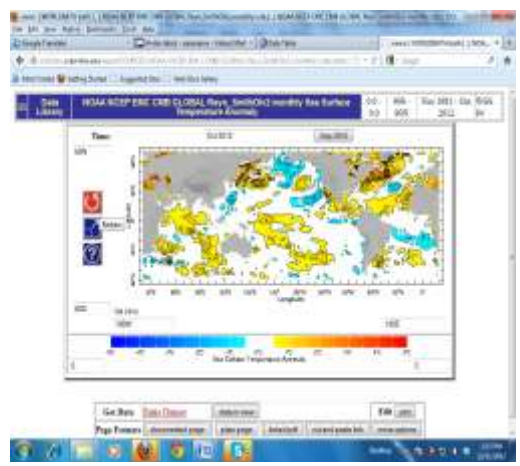
Fig. 14 Relative Humidity (laft) and anomaly (right) at 700hPa

8.2.6.Sea Surface Temperature (SST) and et El Nino/Southern Oscillation (ENSO)

We use following site to download SSTs and ENSO map.

http://iridl.ldeo.columbia.edu/maproom/.Global/.Ocean_Temp/Anomaly.html





- ✓ Double click on first map
- ✓ Put the correct coordinates, level and dates
- ✓ Right click on map → save image as → put it in a directory

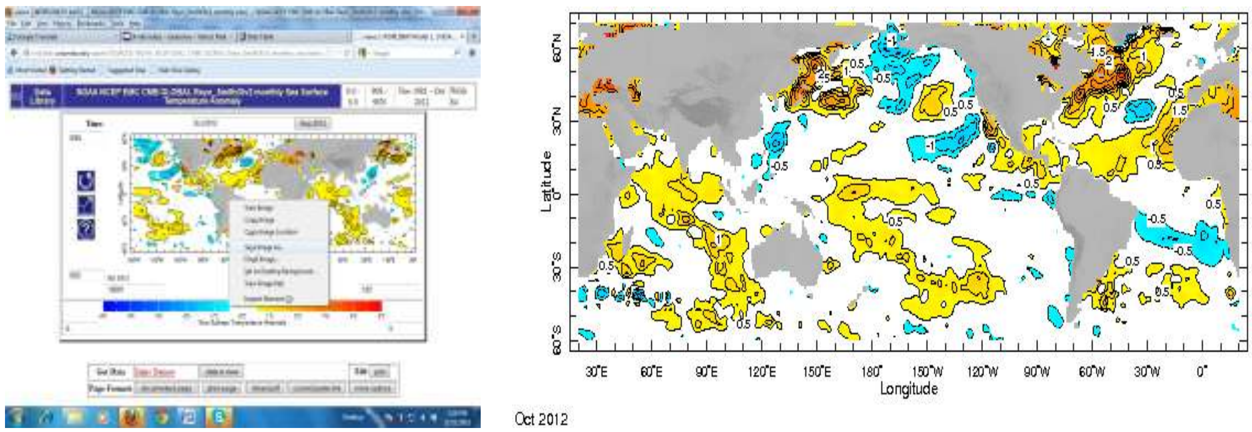


Fig. 15: Monthly SSTs & ENSO

8.2.7.Precipitation

The procedures for download data and map plotting for monthly precipitation and anomaly, are the same with decadal precipitation shown before at decadal bulletin.; but we use the following scripts and correct legends (pressoa SG → sharedDoc → Base Maps → Legend → monthly → legend_RR_monthly.lvl and Legend_RR_anomaly_monthly.lvl);

expert

SOURCES .NOAA .NCEP .CPC .FEWS .Africa .DAILY .RFEv2 .est_prcp

T (1 Oct 2012) (31 Oct 2012) RANGEEDGES

Y (0S) (40S) RANGEEDGES

X (20W) (70E) RANGEEDGES

T SUM

- ✓ Precipitation anomaly

expert

SOURCES .NOAA .NCEP .CPC .CAMS_OPI .v0208 .anomaly .prcp

T (days since 1960-01-01) streamgridunitconvert

T differential_mul

T (1 Oct 2012) (31 Oct 2012) RANGEEDGES

Y (40S) (40N) RANGEEDGES

X (20W) (70E) RANGEEDGES

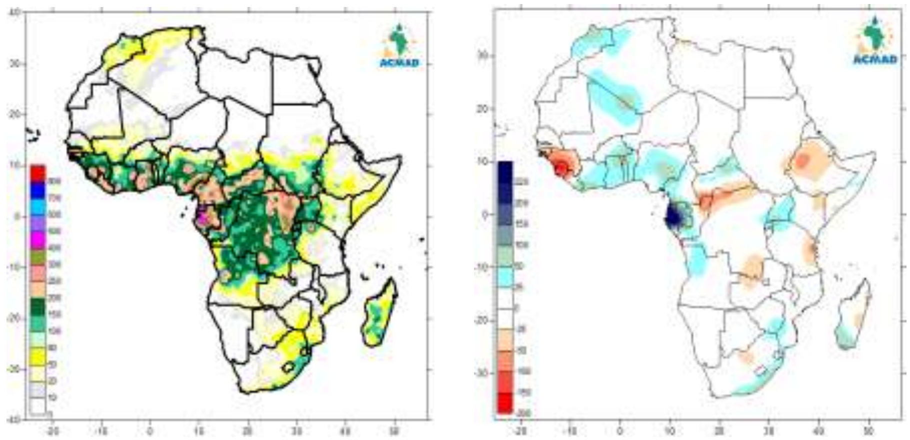


Fig. 16: Monthly precipitation (left) and anomaly (right)

8.2.8.Near Surface air Temperature Anomalies

The procedures for download data and map plotting for monthly near surface air temperature anomaly, are the same with decadal precipitation shown before at decadal bulletin.; but we use the following scripts and correct legend (pressoa SG → sharedDoc → Base Maps → Legend → monthly → legend_Temp_anomaly_monthly.lvl):

```
expert
 SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp
  T (1 Oct 2012 ) (31 Oct 2012) RANGEEDGES
  Y (40S) (40N) RANGEEDGES
  X (20W) (70E) RANGEEDGES
```

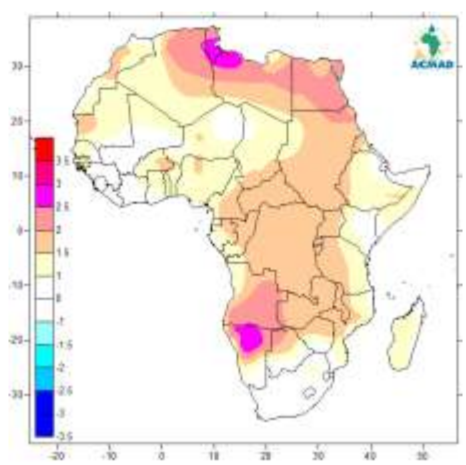


Fig. 17: Monthly Near surface temperature anomaly

8.2.9.Sea Surface Temperature (SST) Forecast

We use following site to download Sea Surface Temperature map.

http://portal.iri.columbia.edu/portal/server.pt?open=512&objID=585&PageID=7809&cached=true&mode=2&userID=2

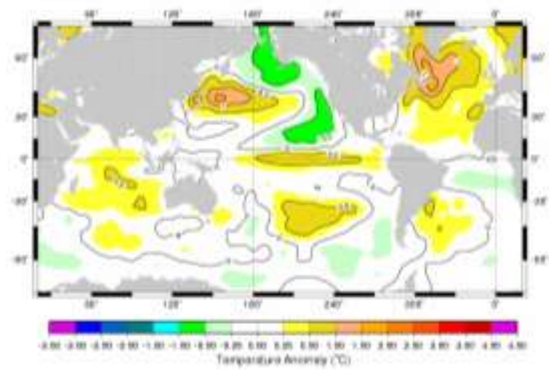


Fig. 18: Monthly Sea surface temperature forecast

8.2.10.El Niño/La Niña

We use following site to download El Nino / La Nina map.

http://portal.iri.columbia.edu/portal/server.pt?open=512&objID=945&PageID=0&cached=true&mode=2&userID=2

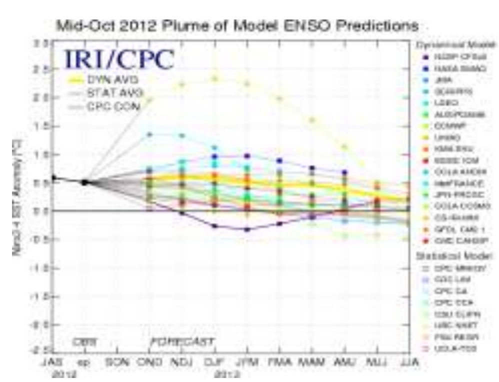


Fig. 19: El Nino / La Nina

8.3. Procedure for generating Climate &helth bulletin maps:

8.3.1. , InterTropical Discontinuity, Congo Air Boundary-CAB and IterTropica Convergence Zone-ITCZ

The procedures for map plotting for monthly ITD, CAB & ITCZ, are the same with decadal ITCZ shown before at decadal bulletin.; but we plot only three dekads for the month. No maximum and minimum position. We use black line for third dekad, blue line for second dekad and red line for first dekad.

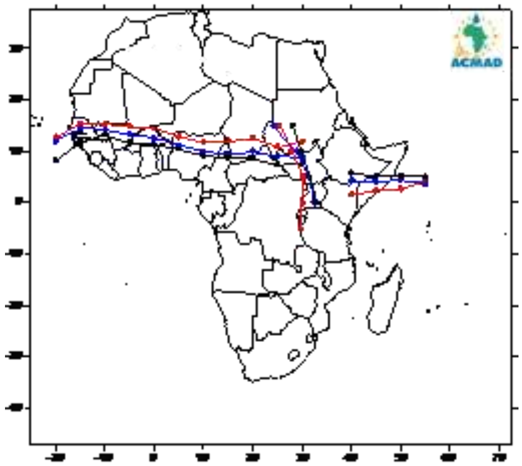


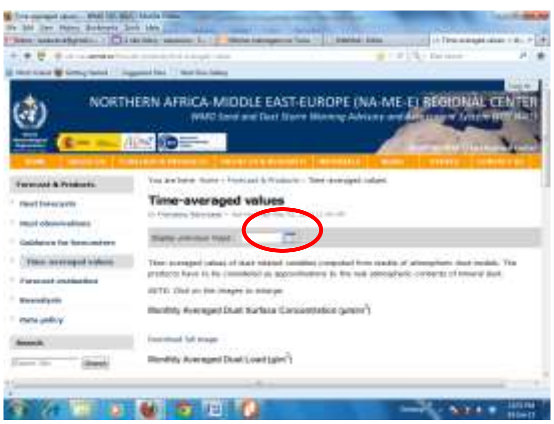
Fig. 20: ITCZ position during three dekads of October 2012.

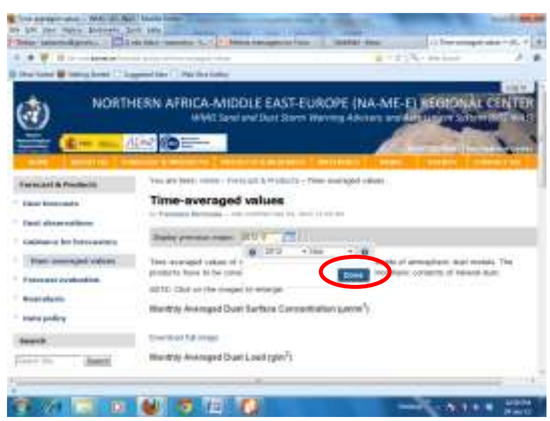
8.3.2.Dust Lauding and Concentration

Monthly dust loading and concentration, we download using folowing site.

http://sds-was.aemet.es/forecast-products/time-averaged-values

- ✓ Go to ‘Display previous maps’ → put the correct year and month → Done





- ✓ Right click on image → save image as → put it in a folther

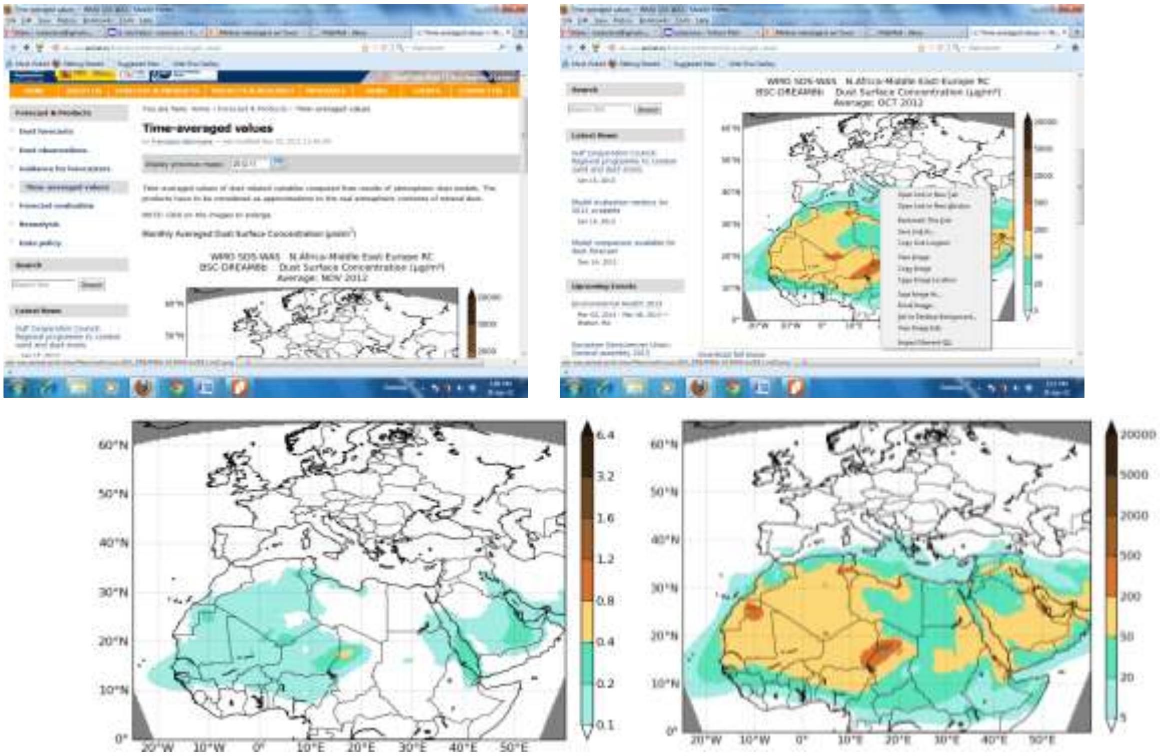


Fig. 21: Monthly Dust loading (left) and Concentration (right)

8.3.3.Cumulative Precipitation

The procedures for download data and map plotting for monthly precipitation and anomaly, are the same with decadal precipitation shown before at decadal bulletin.; but we use the following scripts and the correct legend (pressoa SG → sharedDoc → Base Map s→ Legend → monthly → legend_RR_monthly.lvl and Legend_RR_anomaly_monthly.lvl):

expert

SOURCES .NOAA .NCEP .CPC .FEWS .Africa .DAILY .RFEv2 .est_prcp

T (1 Oct 2012) (31 Oct 2012) RANGEEDGES

Y (0S) (40S) RANGEEDGES

X (20W) (70E) RANGEEDGES

T SUM

- ✓ Precipitation Anomaly

expert

SOURCES .NOAA .NCEP .CPC .CAMS_OPI .v0208 .anomaly .prcp

T (days since 1960-01-01) streamgridunitconvert

T differential_mul

T (1 Oct 2012) (31 Oct 2012) RANGEEDGES

Y (40S) (40N) RANGEEDGES

X (20W) (70E) RANGEEDGES

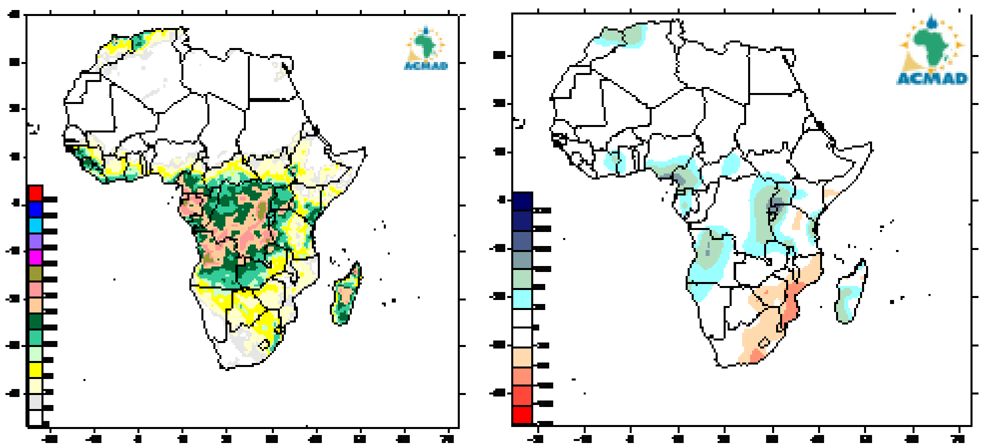


Fig. 22 :Cumulative Monthly precipitation (left) and Monthly precipitation anomaly (right)

8.3.4.Surface Relative Humidity.

The procedures for download data and map plotting for monthly surface Relative Humidity, are the same with decadal precipitation shown before at decadal bulletin.; but we use the following scripts and correct legend (pressoa SG → sharedDoc → Base Maps → Legend → monthly → legend_RH_monthly.lvl);:

expert

SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum

Y (40N) (40S) RANGEEDGES

P (1000) VALUES

X (20W) (70E) RANGEEDGES

T (Oct 2012) VALUES

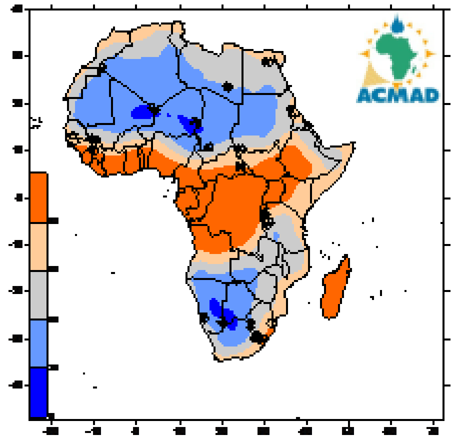


Fig. 23: Monthly Surface Relative Humidity

8.3.8.Near Surface air Temperature

The procedures for download data and map plotting for monthly near surface air and anomaly, are the same with decadal precipitation shown before at decadal bulletin.; but we use the following scripts and correct legend (Pressoa SG → sharedDoc → Base Maps → Legend → monthly → legend_Temp_monthly.lvl and Legend_Temp_anomaly_monthly.lvl);:

expert

SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Diagnostic .surface .temp

(Celsius_scale) unitconvert

Y (40N) (40S) RANGEEDGES

X (20W) (70E) RANGEEDGES

T (Oct 2012) VALUES

- ✓ Temperature Anomaly

expert

SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp

T (1 Oct 2012) (31 Oct 2012) RANGEEDGES

Y (40S) (40N) RANGEEDGES

X (20W) (70E) RANGEEDGES

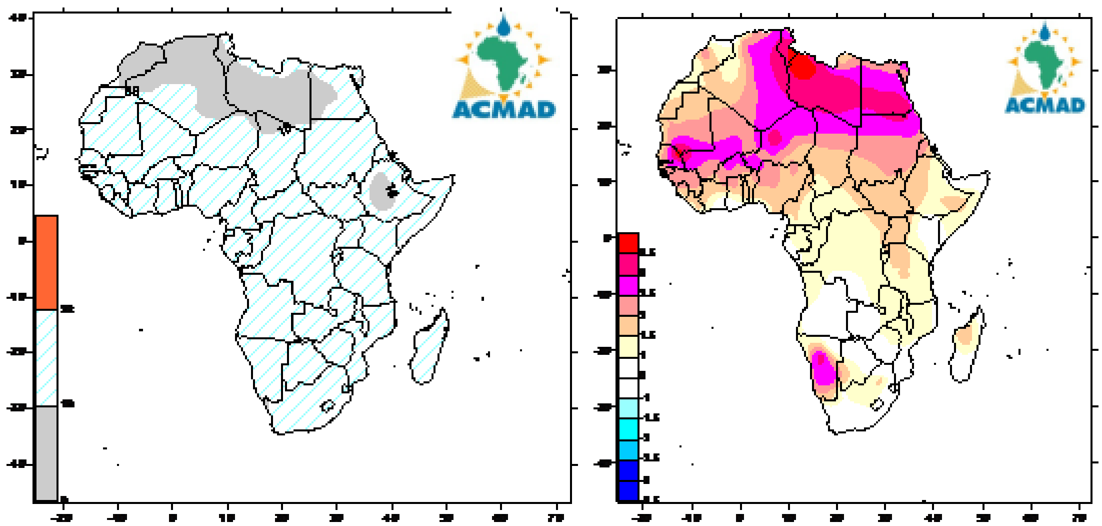


Fig. 24: Monthly surface temperature (left) and Anomaly (right)

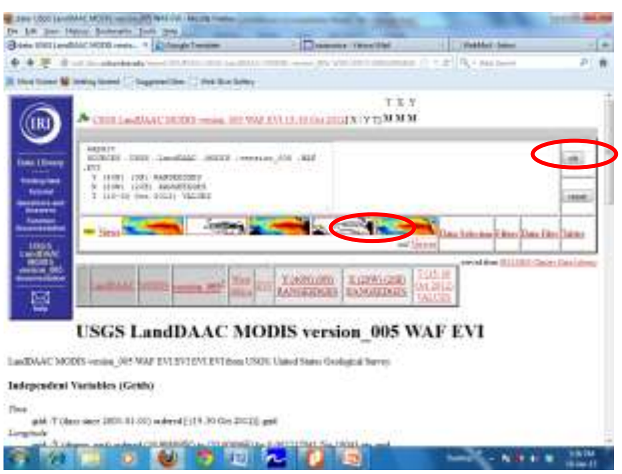
8.3.9.vegetation Indeces

For downloard the vegetation pictures, we use the following site, from IRI.

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.DAILY/.Intrinsic/.PressureLevel/.temp/

We put the script for each part of Africa (West, East and South), as instructions below.

- ✓ Click Ok → colour with cousts → country (to see the country border) → redraw.
- ✓ Répète the procédure with East and South Africa



West Africa

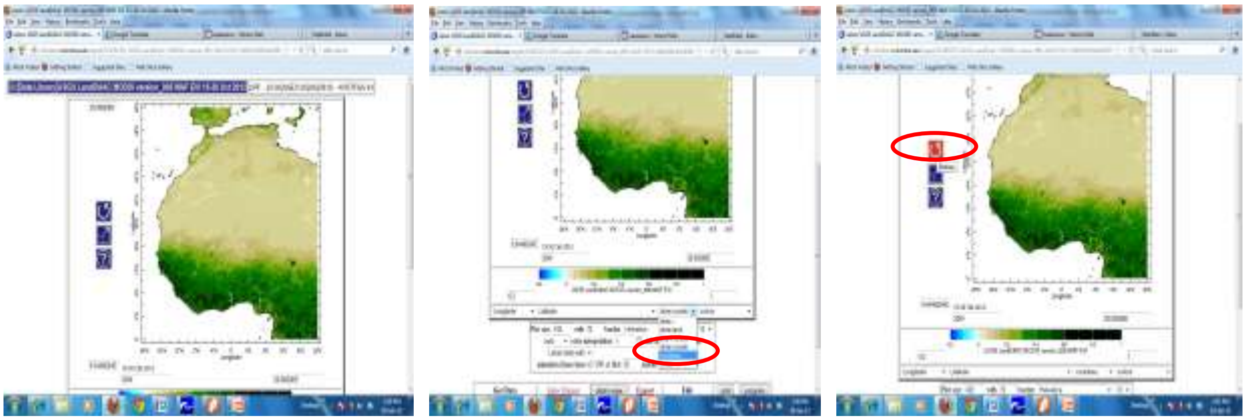
expert

SOURCES .USGS .LandDAAC .MODIS .version_005 .WAF .EVI

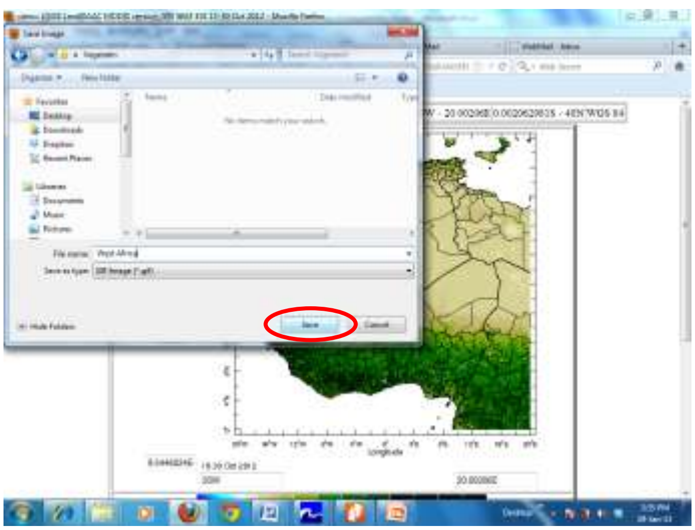
Y (40N) (0N) RANGEEDGES

X (20W) (20E) RANGEEDGES

T (15-30 Oct 2012) VALUES



✓ Click the image and save into the folder → copy and past in correct page in a bulletim



✓ West Africa

expert

SOURCES .USGS .LandDAAC .MODIS .version_005 .WAF .EVI

Y (40N) (0N) RANGEEDGES

X (20W) (20E) RANGEEDGES

T (15-30 Oct 2012) VALUES

- ✓ East Africa

expert

SOURCES .USGS .LandDAAC .MODIS .version_005 .EAF .EVI

Y (40N) (0N) RANGEEDGES

X (20E) (60E) RANGEEDGES

T (15 - 30 Oct 2012) VALUES

- ✓ Southern Africa

expert

SOURCES .USGS .LandDAAC .MODIS .version_005 .SAF .EVI

Y (0S) (40S) RANGEEDGES

X (8E) (50E) RANGEEDGES

T (15 - 30 Oct 2012) VALUES

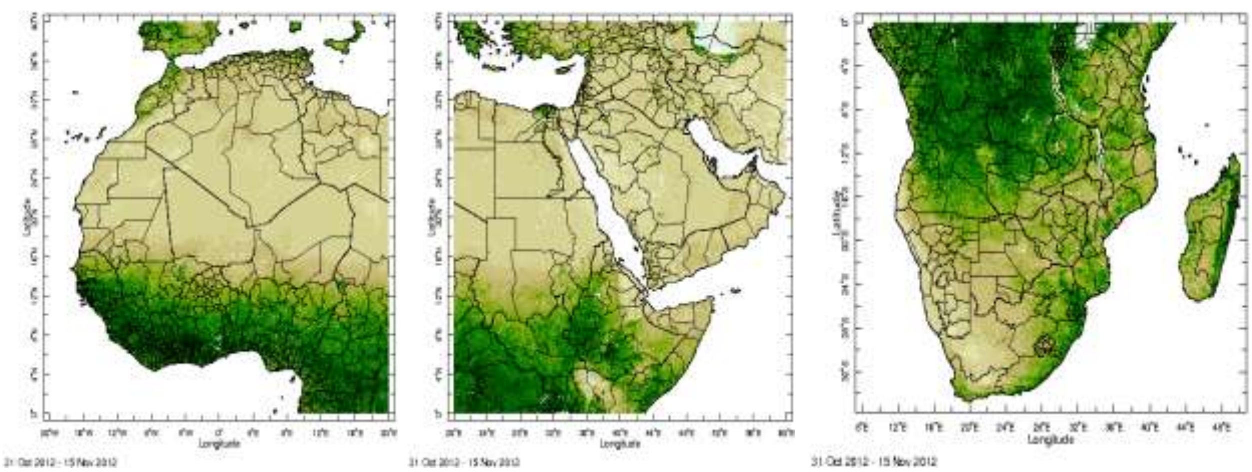


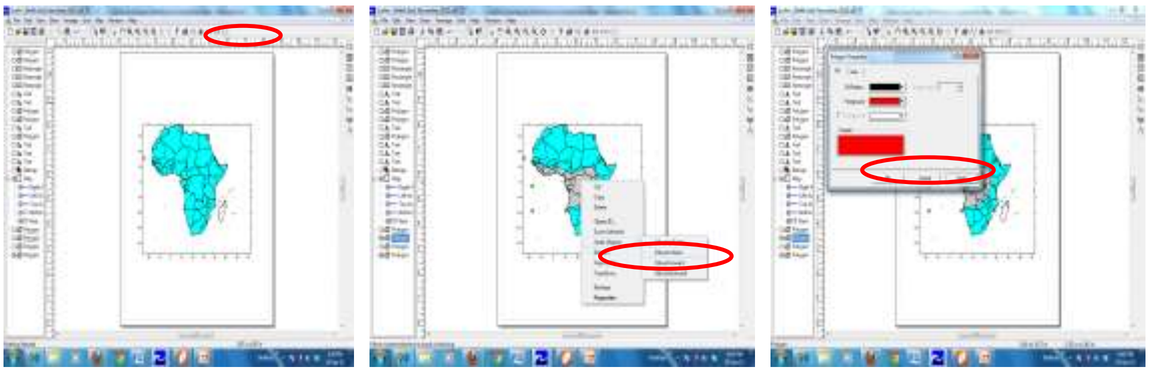
Fig. 25: Vegetation indeces from 15 to 30 October 2012

8.2.10.Health Risk zone

The folowing map, was produced by cibin all of climatic elements above, namely » ITCZ position, dust loading and concentration, Precipitation, relative Humidity, Temperature and vegetation.

Surfer program, was used on map plotting, as folowing :

- ✓ Open surfer → add african base map → click on polyline.
- ✓ Click on polyline → digitalyse the area you need → right click on new area → order object → move to back → duble click on the same area → choose the colour → apply → ok.



- ✓ Do the same process for all areas you need.
- ✓ Write the test using T (on tool bar) → put ACMAD logo → select all → copy → past in the bulletim

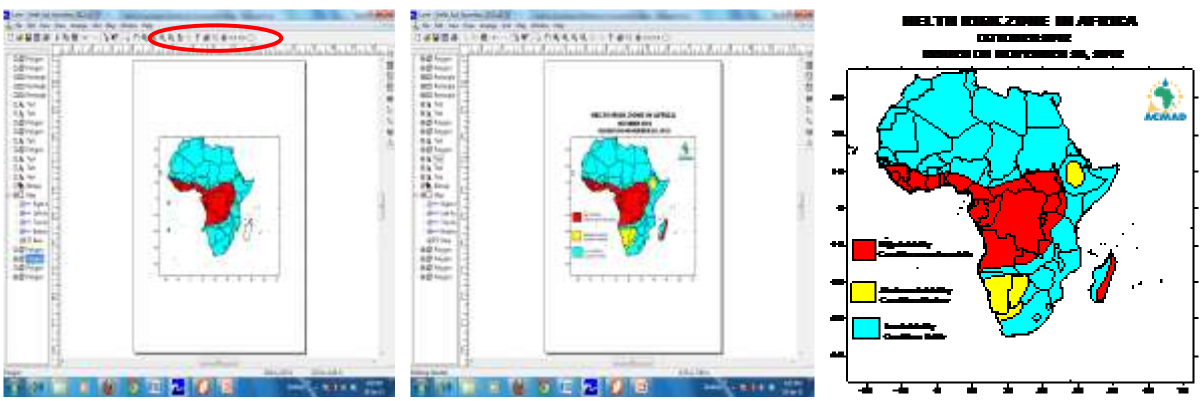
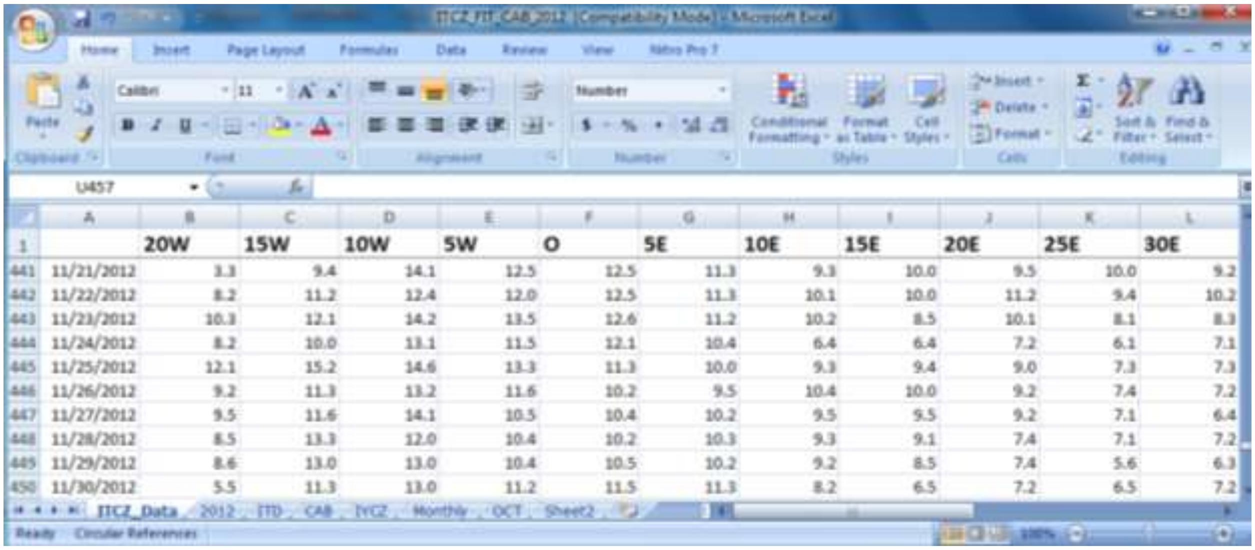


Fig. 26: Zone of risk in October 2012

8.4. Procedure for generating ITCZ

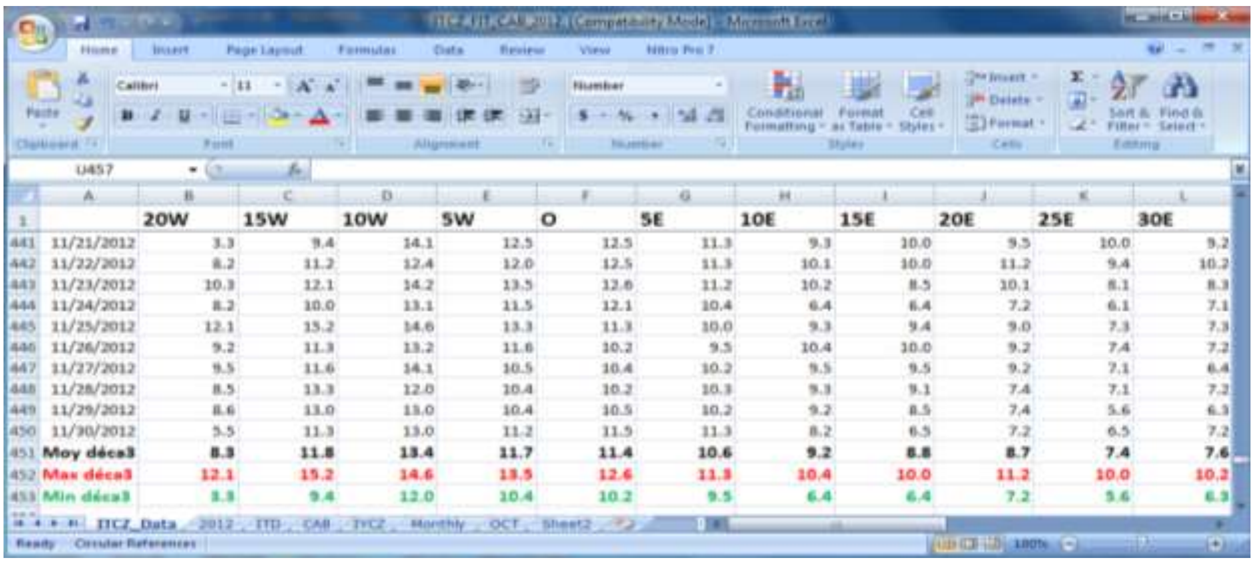
8.4.1.Data collecting

The data to be collected daily, are mean position, at 6 UT, from fix longitudes (ITD & ITCZ) and fix Latitudes (CAB), as shown below(daily position of ITD);



	A	20W	15W	10W	5W	O	5E	10E	15E	20E	25E	30E
441	11/21/2012	3.3	9.4	14.1	12.5	12.5	11.3	9.3	10.0	9.5	10.0	9.2
442	11/22/2012	8.2	11.2	12.4	12.0	12.5	11.3	10.1	10.0	11.2	9.4	10.2
443	11/23/2012	10.3	12.1	14.2	13.5	12.6	11.2	10.2	8.5	10.1	8.1	8.3
444	11/24/2012	8.2	10.0	13.1	11.5	12.1	10.4	6.4	6.4	7.2	6.1	7.1
445	11/25/2012	12.1	15.2	14.6	13.3	11.3	10.0	9.3	9.4	9.0	7.3	7.3
446	11/26/2012	9.2	11.3	13.2	11.6	10.2	9.5	10.4	10.0	9.2	7.4	7.2
447	11/27/2012	9.5	11.6	14.1	10.5	10.4	10.2	9.5	9.5	9.2	7.1	6.4
448	11/28/2012	8.5	13.3	12.0	10.4	10.2	10.3	9.3	9.1	7.4	7.1	7.2
449	11/29/2012	8.6	13.0	13.0	10.4	10.5	10.2	9.2	8.5	7.4	5.6	6.3
450	11/30/2012	5.5	11.3	13.0	11.2	11.5	11.3	8.2	6.5	7.2	6.5	7.2

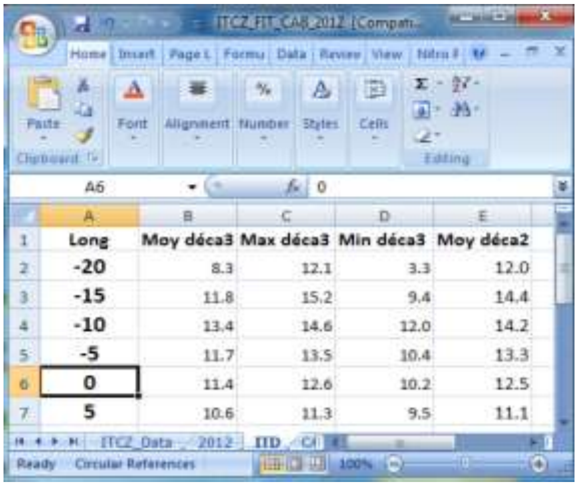
Using Excel, we calculate average, max and Min for the dekad, value witch we use to analyse the decadal situation of ITCZ., as shown below:



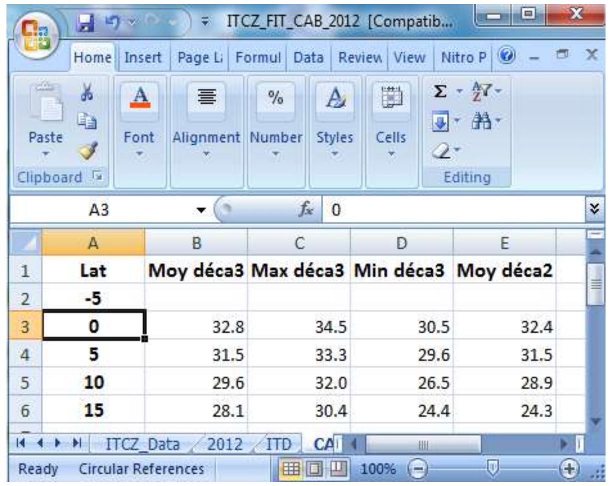
	A	20W	15W	10W	5W	O	5E	10E	15E	20E	25E	30E
441	11/21/2012	3.3	9.4	14.1	12.5	12.5	11.3	9.3	10.0	9.5	10.0	9.2
442	11/22/2012	8.2	11.2	12.4	12.0	12.5	11.3	10.1	10.0	11.2	9.4	10.2
443	11/23/2012	10.3	12.1	14.2	13.5	12.6	11.2	10.2	8.5	10.1	8.1	8.3
444	11/24/2012	8.2	10.0	13.1	11.5	12.1	10.4	6.4	6.4	7.2	6.1	7.1
445	11/25/2012	12.1	15.2	14.6	13.3	11.3	10.0	9.3	9.4	9.0	7.3	7.3
446	11/26/2012	9.2	11.3	13.2	11.6	10.2	9.5	10.4	10.0	9.2	7.4	7.2
447	11/27/2012	9.5	11.6	14.1	10.5	10.4	10.2	9.5	9.5	9.2	7.1	6.4
448	11/28/2012	8.5	13.3	12.0	10.4	10.2	10.3	9.3	9.1	7.4	7.1	7.2
449	11/29/2012	8.6	13.0	13.0	10.4	10.5	10.2	9.2	8.5	7.4	5.6	6.3
450	11/30/2012	5.5	11.3	13.0	11.2	11.5	11.3	8.2	6.5	7.2	6.5	7.2
451	**Moy déca3**	**8.3**	**11.8**	**13.4**	**11.7**	**11.4**	**10.6**	**9.2**	**8.8**	**8.7**	**7.4**	**7.6**
452	**Max déca3**	**12.1**	**15.2**	**14.6**	**13.5**	**12.6**	**11.3**	**10.4**	**10.0**	**11.2**	**10.0**	**10.2**
453	**Min déca3**	**3.3**	**9.4**	**12.0**	**10.4**	**10.2**	**9.5**	**6.4**	**6.4**	**7.2**	**5.6**	**6.3**

With mean, max, min and fix values, we make a table like exemples below:

- ✓ Make 3 tables with these data (Mean of present & previous dekad, Max & Min) for each components (ITD, CAB & ITCZ).
- ✓ Save each table in a different worksheet on the same excel file (in csv format).



	A	B	C	D	E
1	Long	Moy déca3	Max déca3	Min déca3	Moy déca2
2	-20	8.3	12.1	3.3	12.0
3	-15	11.8	15.2	9.4	14.4
4	-10	13.4	14.6	12.0	14.2
5	-5	11.7	13.5	10.4	13.3
6	0	11.4	12.6	10.2	12.5
7	5	10.6	11.3	9.5	11.1

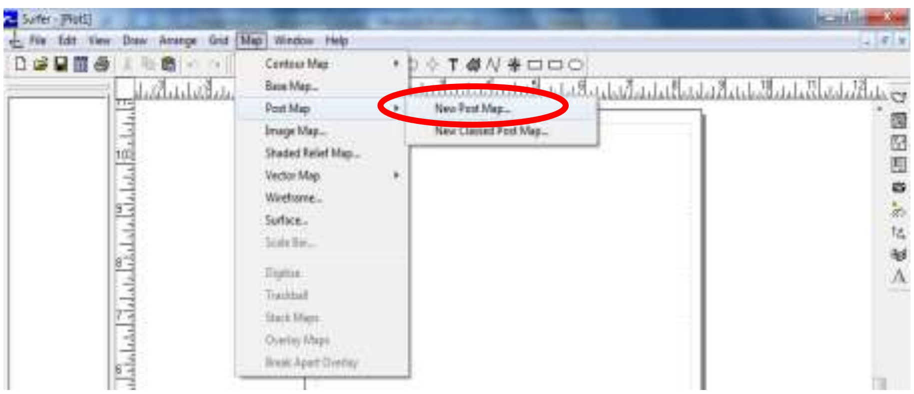


	A	B	C	D	E
1	Lat	Moy déca3	Max déca3	Min déca3	Moy déca2
2	-5				
3	0	32.8	34.5	30.5	32.4
4	5	31.5	33.3	29.6	31.5
5	10	29.6	32.0	26.5	28.9
6	15	28.1	30.4	24.4	24.3

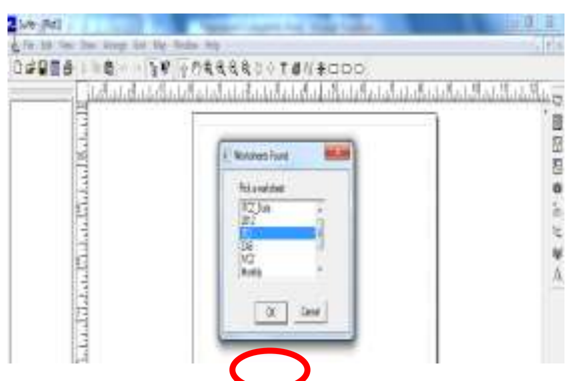
8.4.2.Map plotting.

We plot the **ITCZ** dekadal map, using surfer software as following instructions:

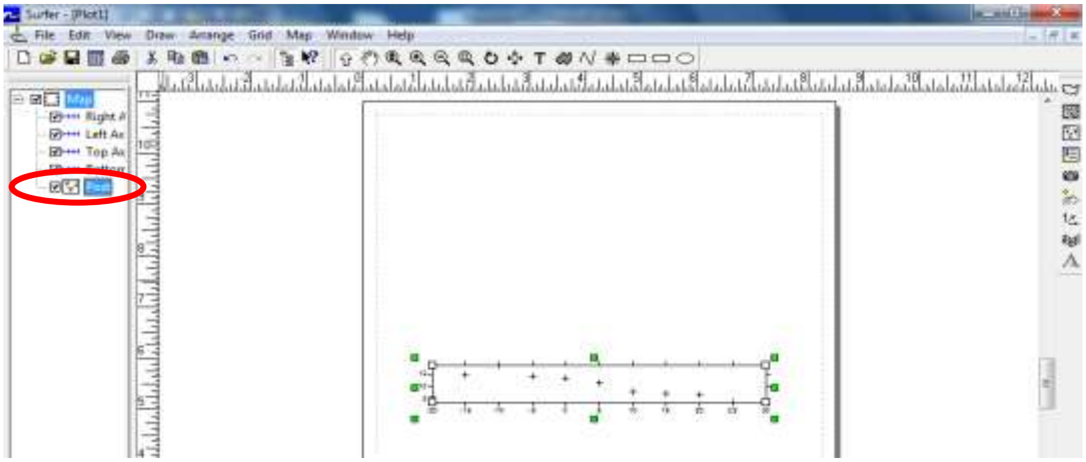
- ✓ Open Surfer and go to Map → Post map → New post map



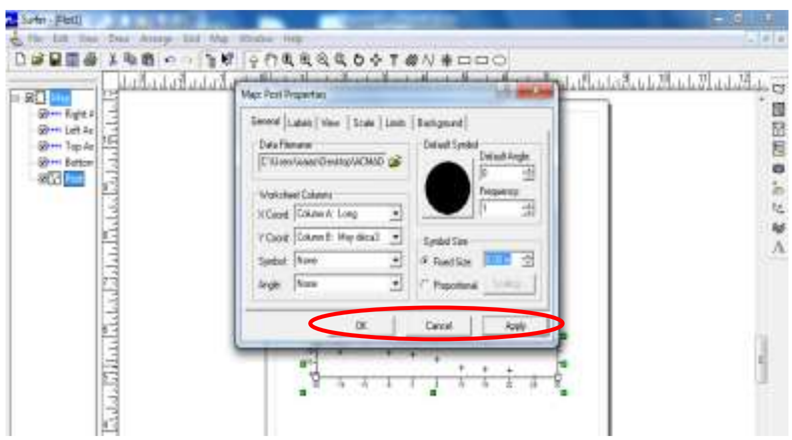
- ✓ Open the file → Select the correct worksheet →Ok



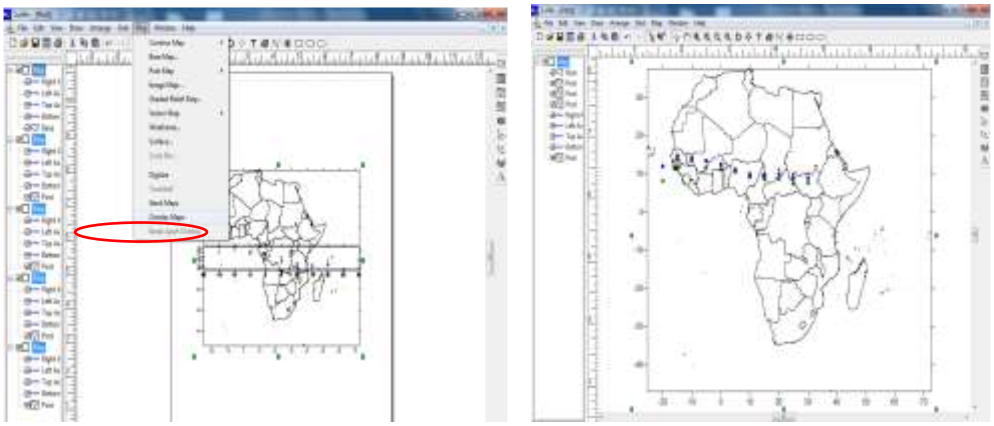
- ✓ Double click on Post icon on the left side



- ✓ **ITCZ** & **ITD**, **X** coordinate is Long (Fix) and **Y** coordinate is for the mean for the present, & previous dekad, Max and Min.
- ✓ **CAB**; **X** coordinate is for Mean for the present & previous dekad and Max and Min **Y** coordinate is Lat, (Fix).



- ✓ choose black color symbol for present dekad Mean ; Max – Red; Min – Green; Mean previous dek – Blue) → Apply → Ok.
- ✓ Repeat the procedure for the Max, Min and Mean for the previous dekad for **ITD**, **ITCZ**, & **CAB.**
- ✓ . Add base map of Africa → by clicking on Map → base map → open the file with African map (Pressao SG → sharedDoc → Base Maps → Maps → Africa Actual) → open → select all → Map → overlay map.



- ✓ Join the points with a line in black color using polyline for the present dekad and blue line for previous dekad;
- ✓ Copy the map to Paint and put the logo of ACMAD.
- ✓ Copy the final map to the bulletin.

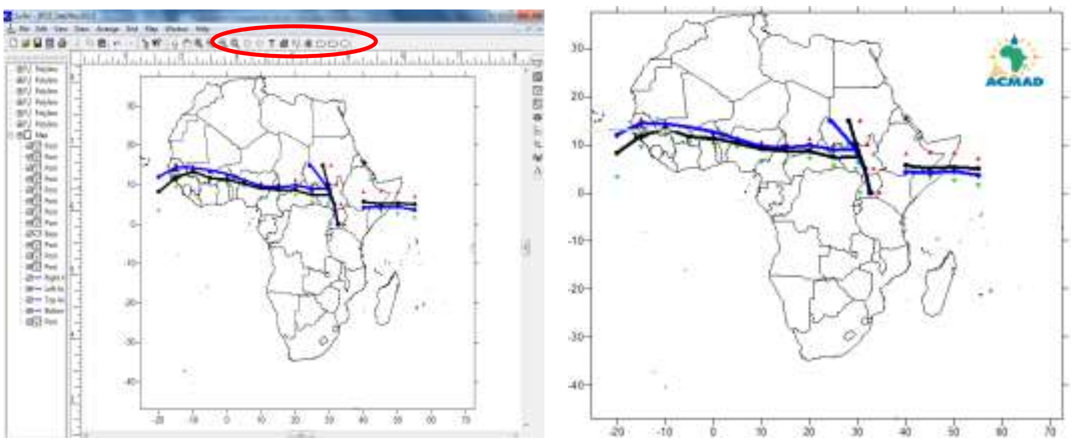


Fig. 27: Dekadal ITCZ; present (black) and previours (blue) mean position

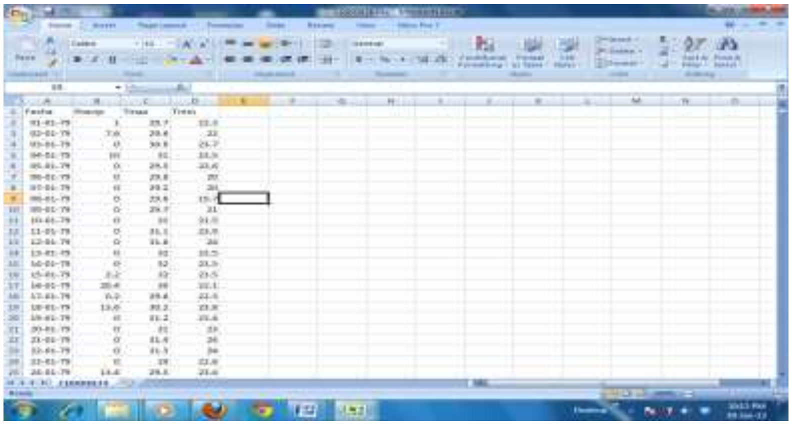
8.4.3.Map Interpretation

- ✓ We speak about the position of the ITD, ITCZ (Latitudinal) and CAB (Longitudinal) during the present and previous dekad.
- ✓ We speak also about Its movement over the countries (name the countries over)

8.5. Procedure for import data from Excel to Climsoft

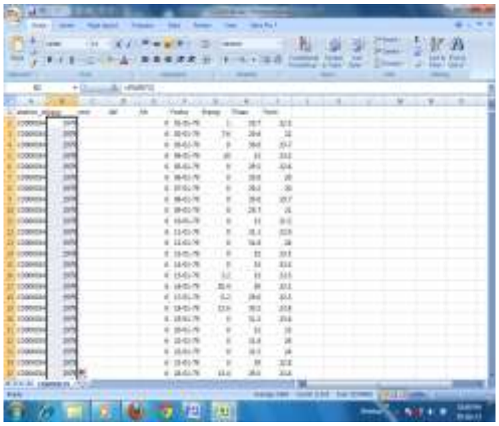
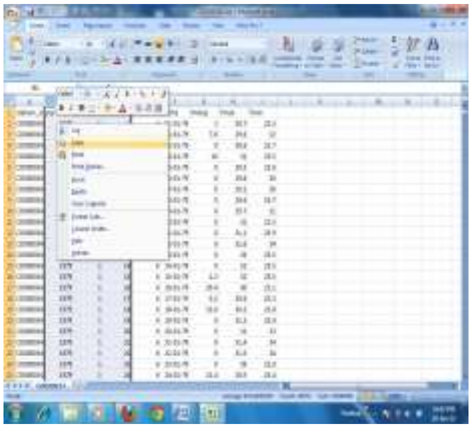
8.5.1.Organizing data

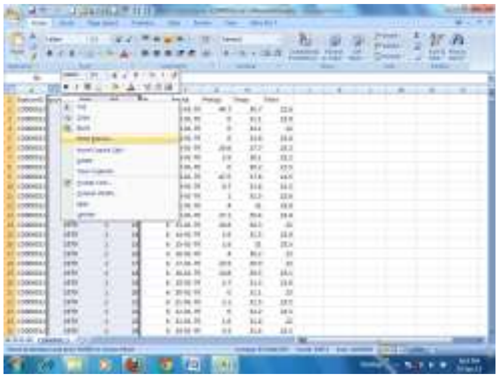
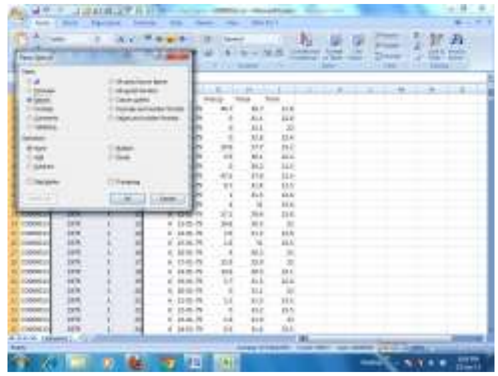
From Mozambique we have daily data in Excel file, for each station below. Before we import to climsoft, we should organize our data.



Data initial format for Mozambique

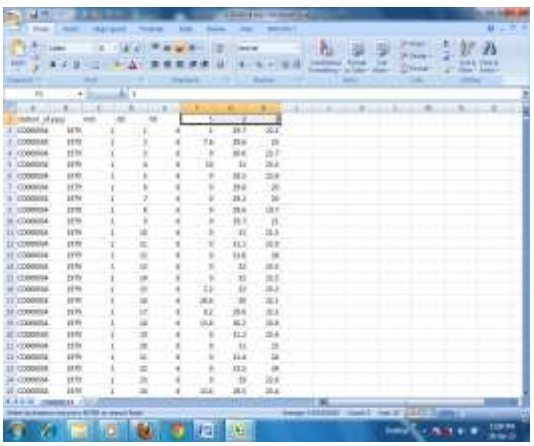
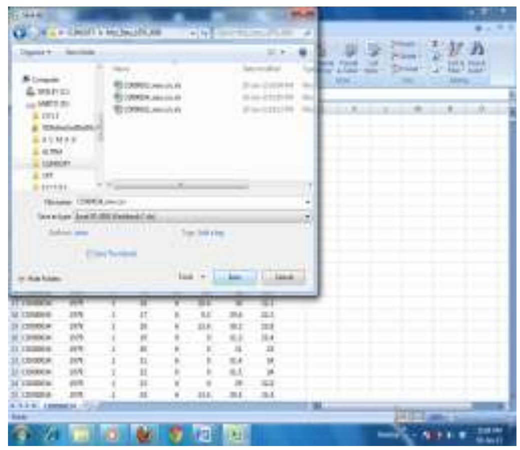
- ✓ Insert 5 colons at the left
- ✓ Put on first row (station_id , yyyy, mm, dd, and hh) respectively
- ✓ Put the station id in first colon and observation time on the fifty colon
- ✓ Put (in cell B2) =year(F2) →enter and drag
- ✓ For remove formulas in each colum by, Selecting the year, month and day colons → copy and paste special at the same colons → thick on values → ok.
- ✓ Select and delite the data colon

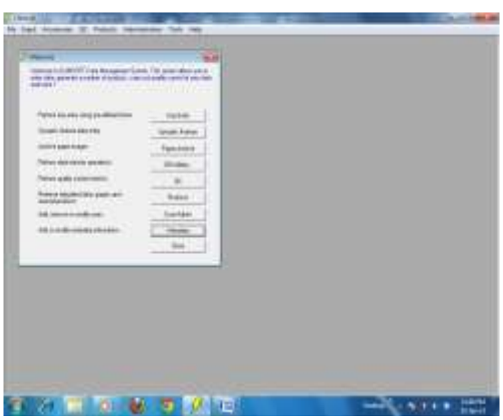
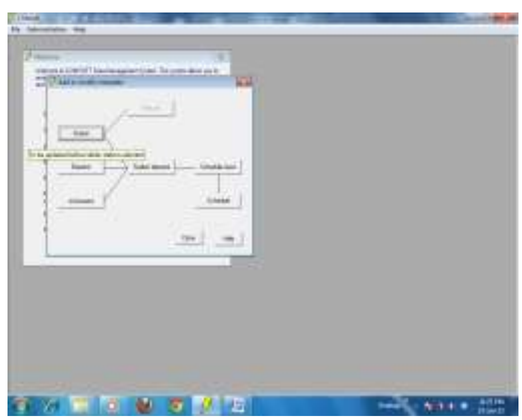
✓ Put elements cod (5, 2 and 3) for precipitation, tx and tm respectively.

Save the file in csv format

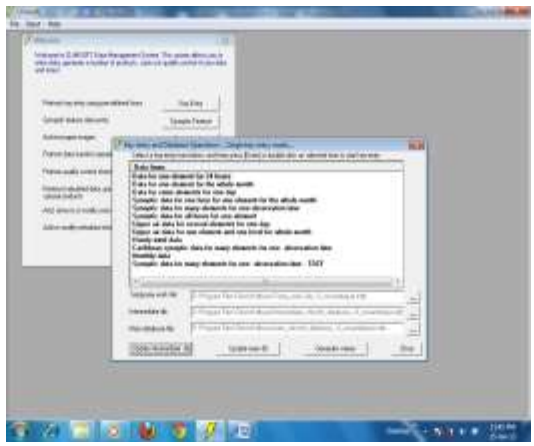
8.5.2.Data importing

✓ Open Climsoft → Metadata → Station

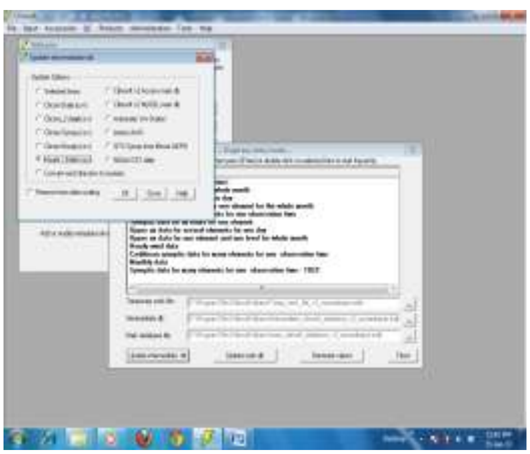
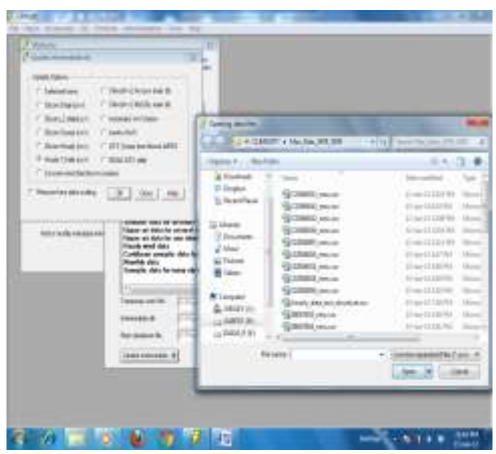
 

✓ Add new →put ID station, station name and country → update → Close → Close

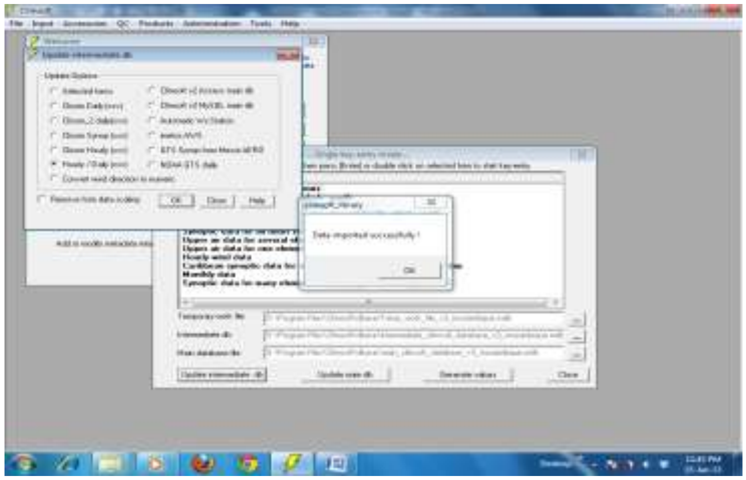
- ✓ replete these process with each station
- ✓ DB utility → update intermediate db → hourly / daily (csv) → ok

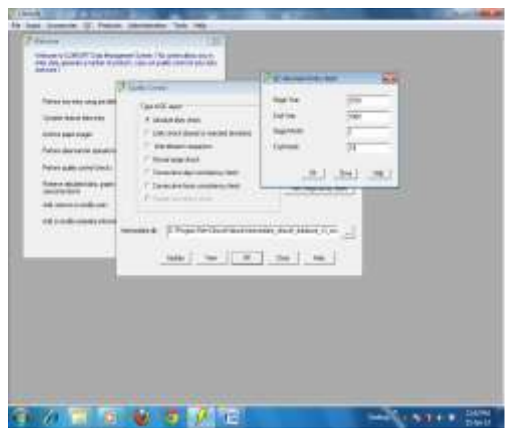
- ✓ Select the file (pathname for one station) → ok → ok

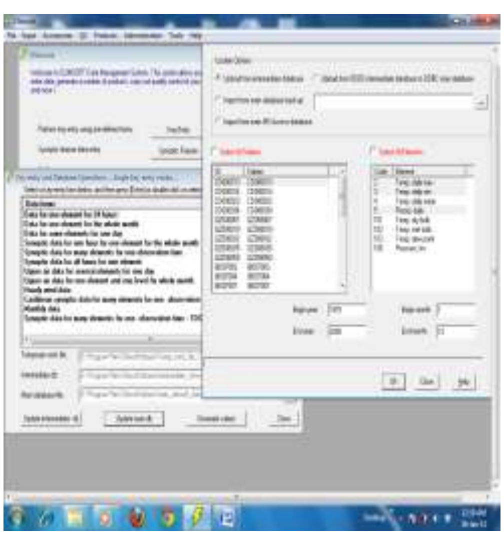
- ✓ Close → close



- ✓ QC → tick on absolute limits check → ok → put begin & end (year / month) → ok



- ✓ Do it for every 10 years period on ACCESS, if on MYSQL do it for all years
- ✓ DB utilities → update main db → select elements and begin & end year → ok → yes → ok→ Close → close



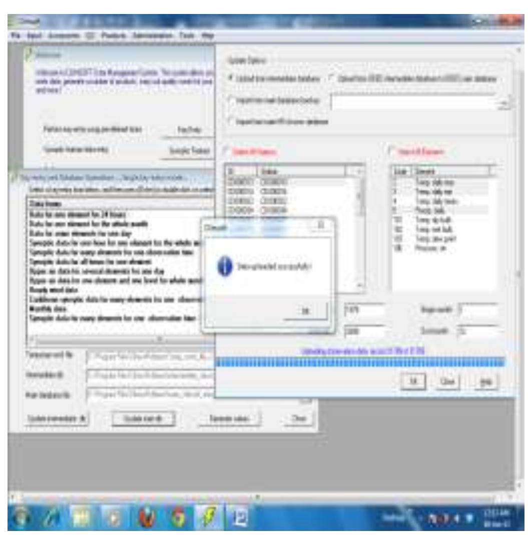
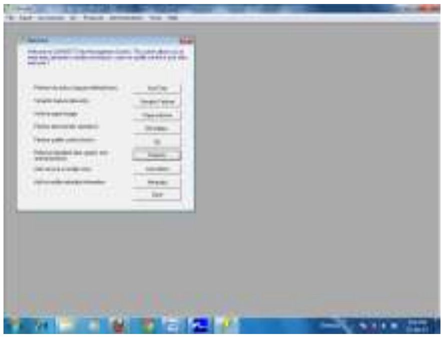
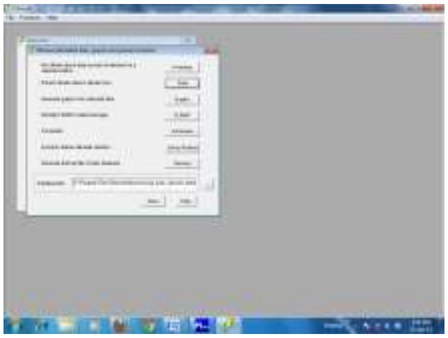


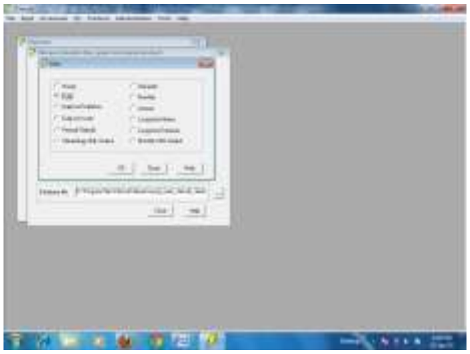
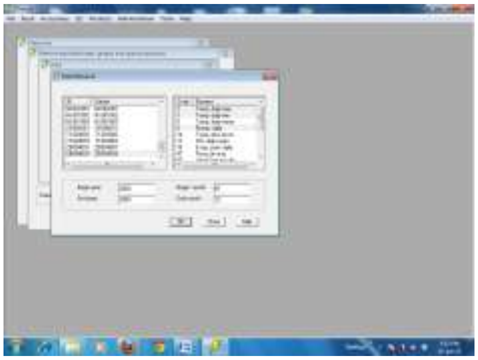
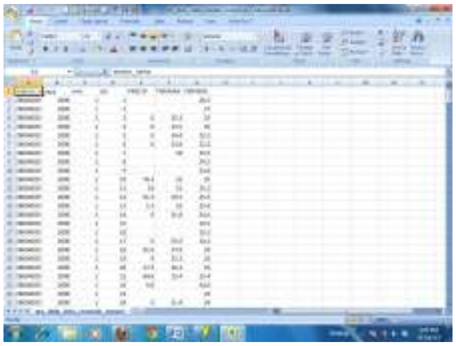
Fig. 28: Importing data from Excel to Climsoft

8.5.2.Data view and retrieve from climsoft

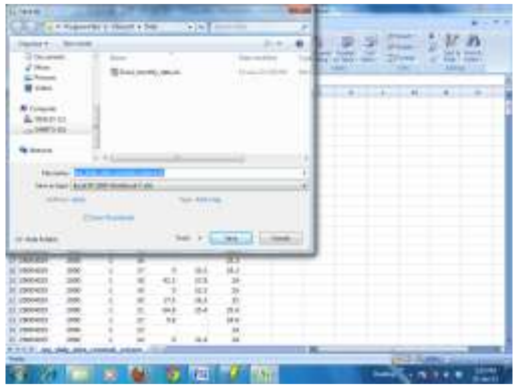
- ✓ Open Climsoft → Products → Data

- ✓ Daily → Ok → select the station ID, elements, begin / end year and month → ok

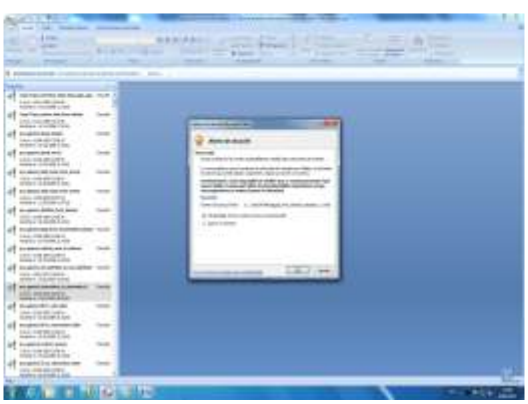
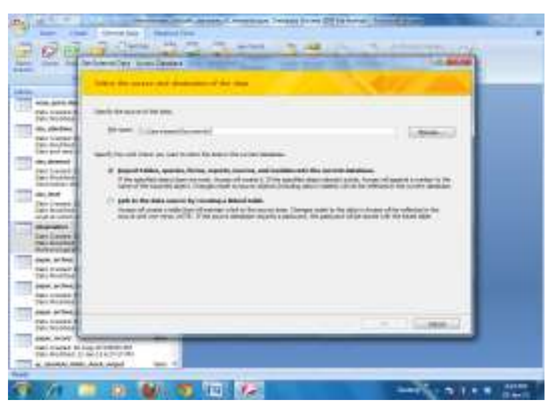
- ✓ Save tha as csv file, by clicking on file → save as → choose the folther → save

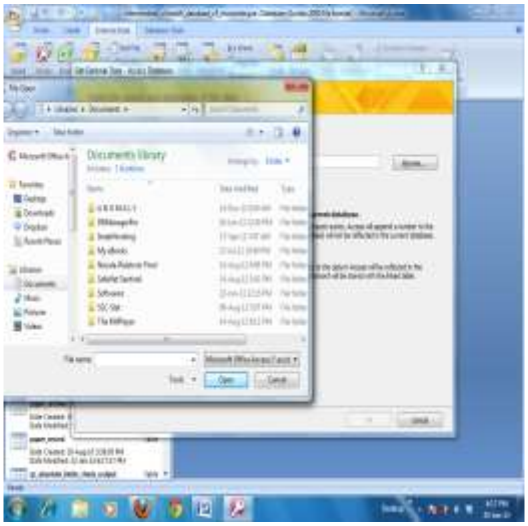


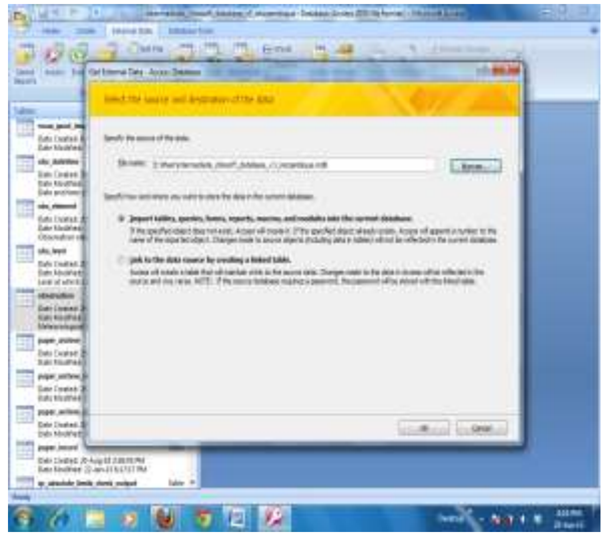
8.5.3.Procedure for migrating Mozambican temperature and precipitation for synoptic stations from laptop to continental database.

- ✓ Copy the main Mozambican file from the laptop, using data stack and past in continental database (Open Access → G → program file → climsoft → Dbase → ACMAD) → past

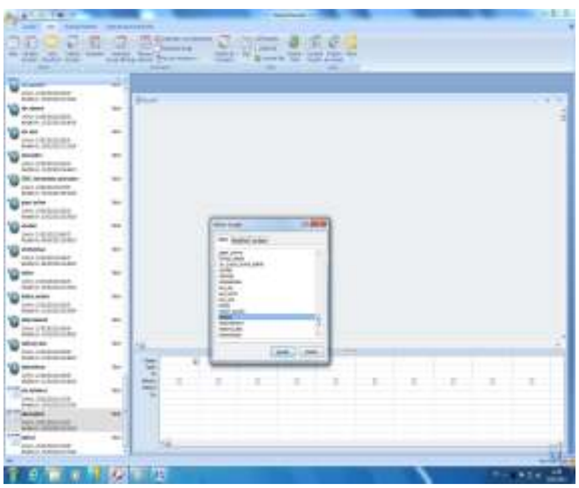
- ✓ We link the tables (tation with station1, obs_data_time with obs_data time1 and observation with observation1)

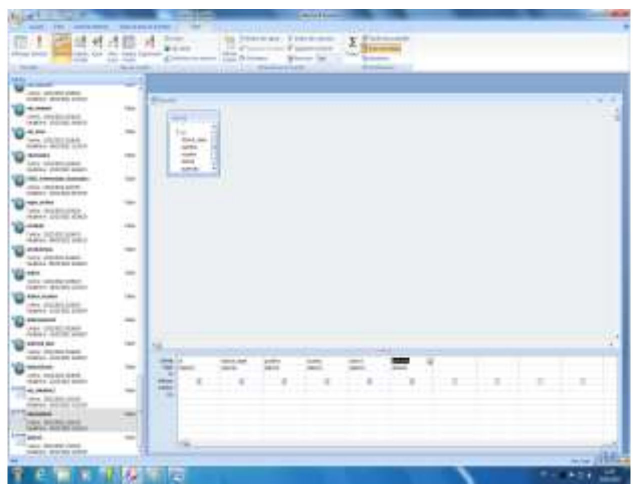



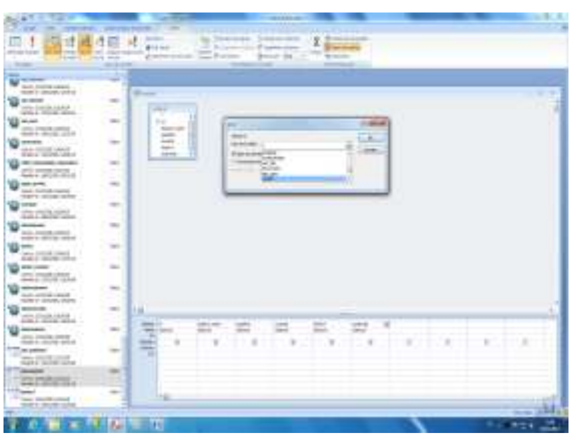




- ✓ We open the table (observation1) and append to observation.
- ✓ We increase a new colon after recorded_at with following description (yyyy:year(recorded_at)
- ✓ In criters row we put the formula (between 1979 and 1985) → run







✓ We change the period from five to five years.

✓ After runing all the data period, you close access.

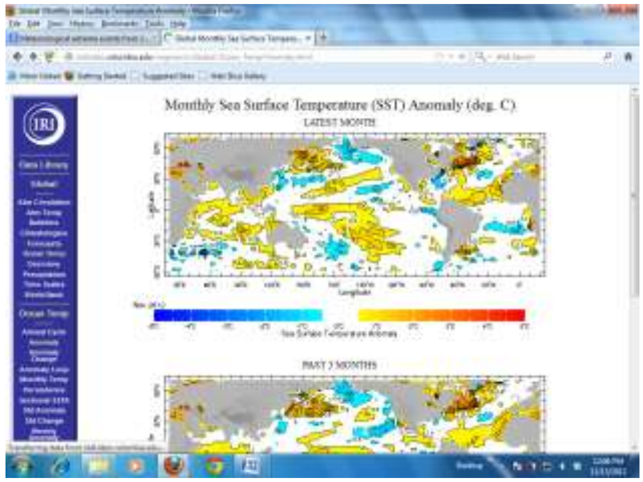
8.6.Procedures to generating maps for Long Range Forecast (JFM/FMA-2013) for Africa

8.6.1.Histarical record

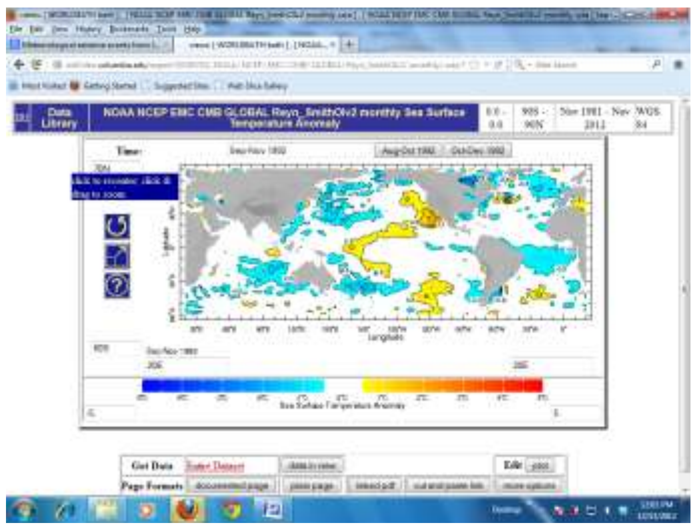
For analyzing the analogue year (s), we use large scale SST anomaly available at IRI websaite. http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

✓ Click on Library

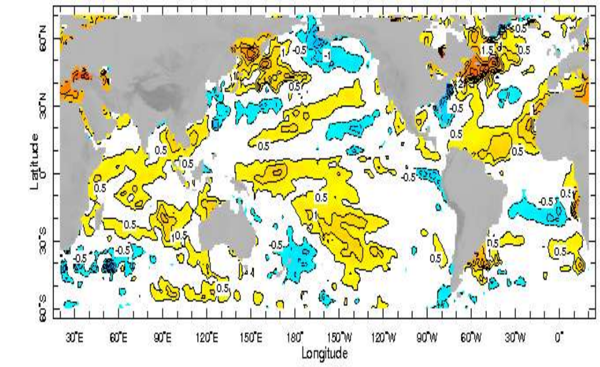
✓ Click on Monthly anomaly (Ocean temperature)



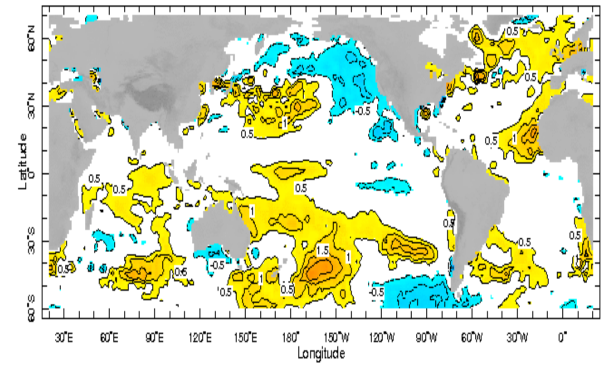
- ✓ Click on monthly map



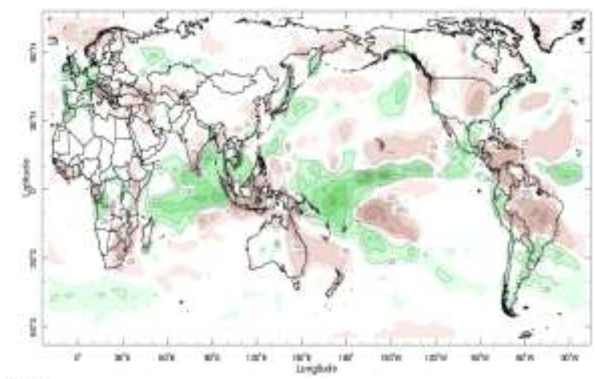
- ✓ Put the correct date (month) → click on red squaier at the left → right click on map → save image as → put it in a folder.
- ✓ The same procidure with seasonal SSTs, precipitation and temperature.

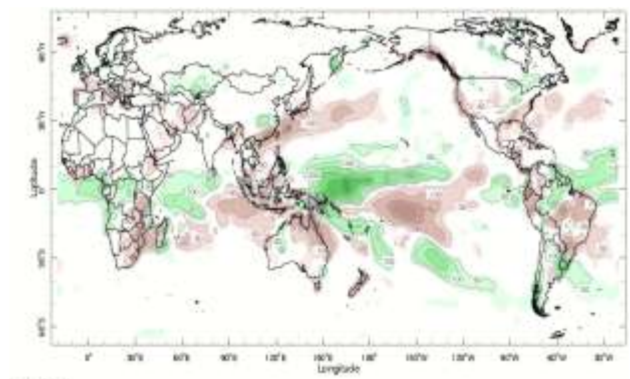


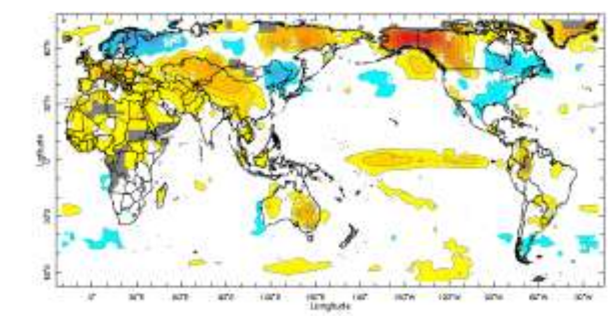
Nov 2012

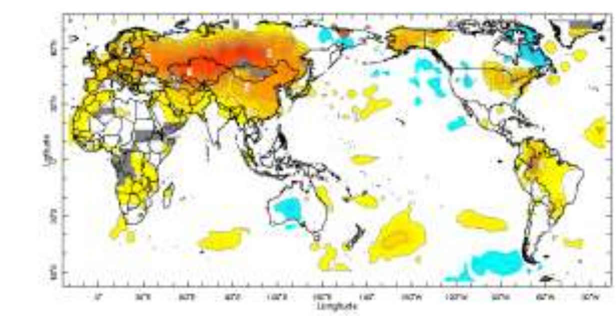


Jan-Mar 2002

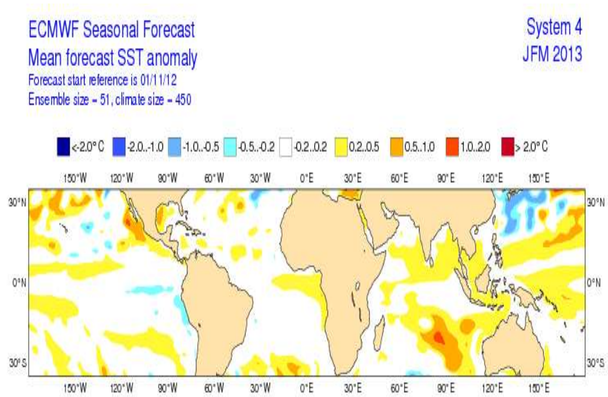


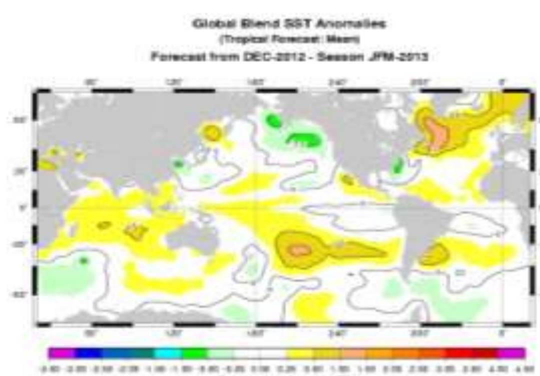


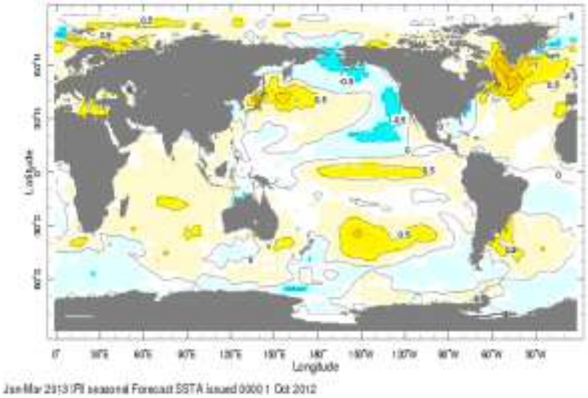


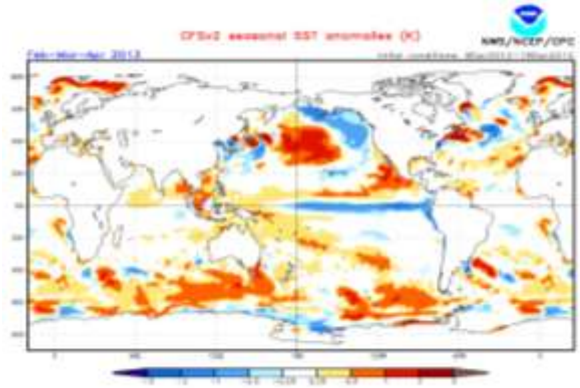


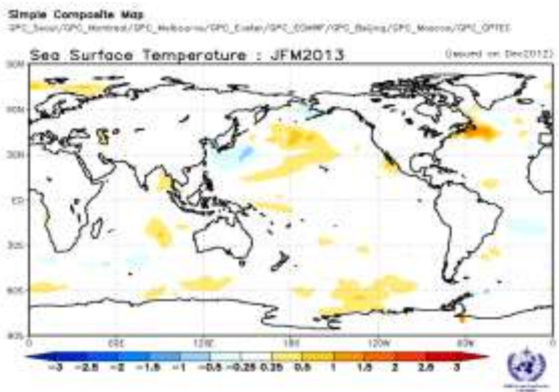
- ✓ Other maps to be analyse: Forecast SST anomaly

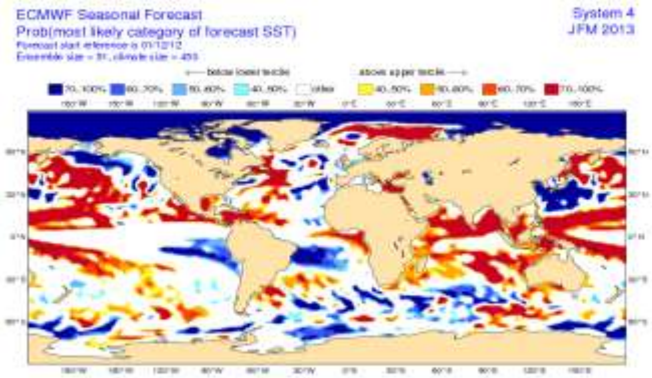




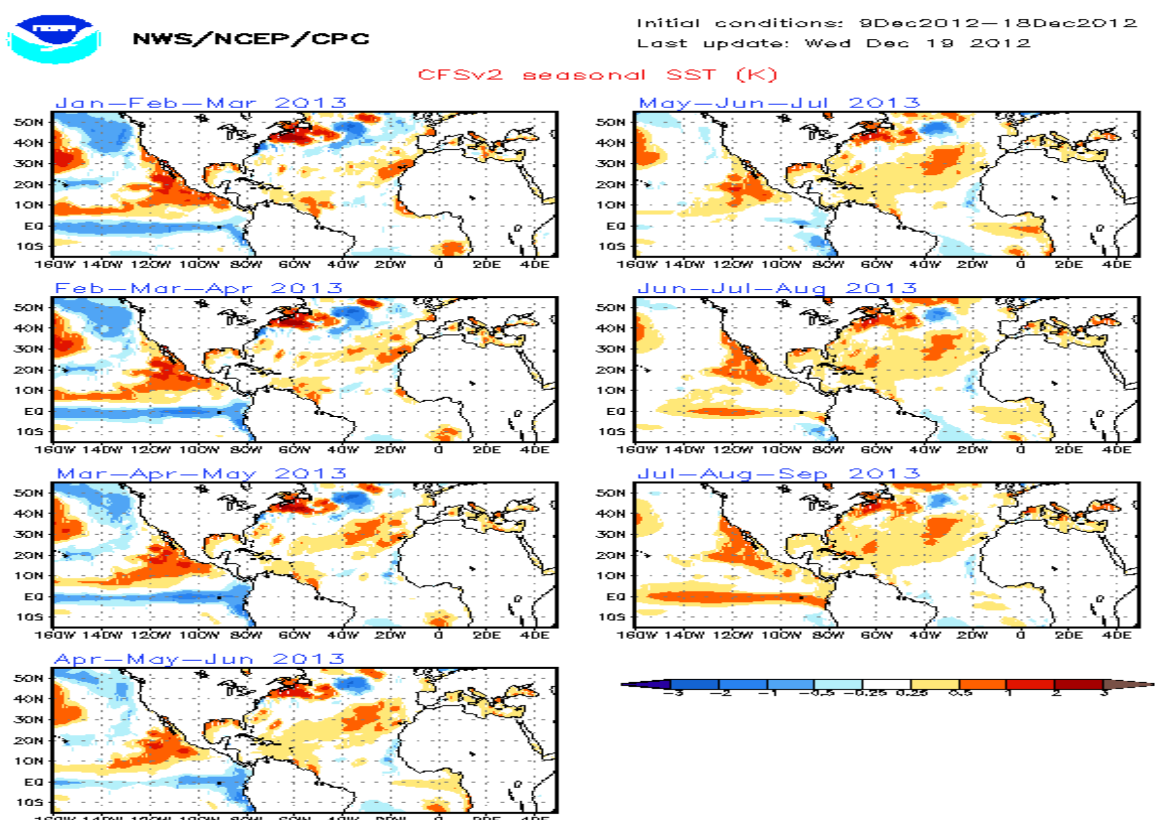


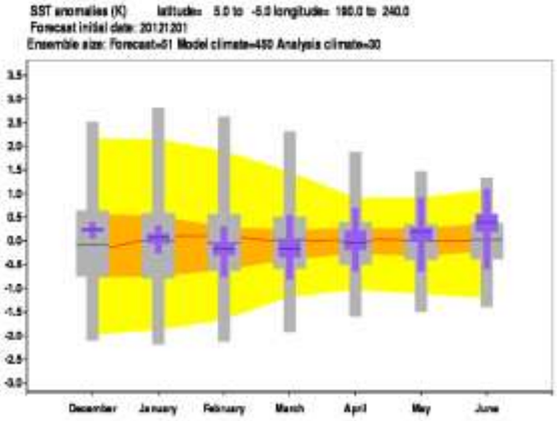


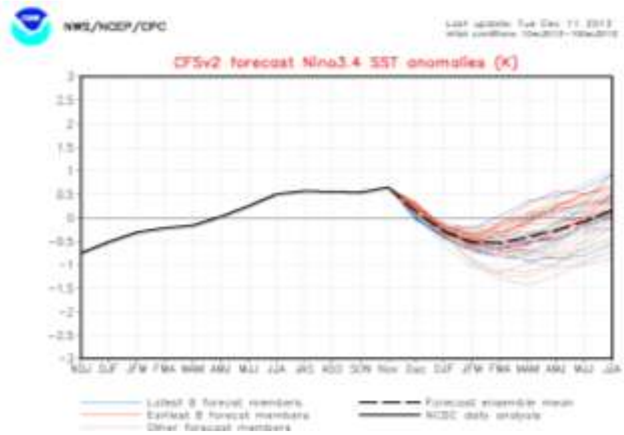


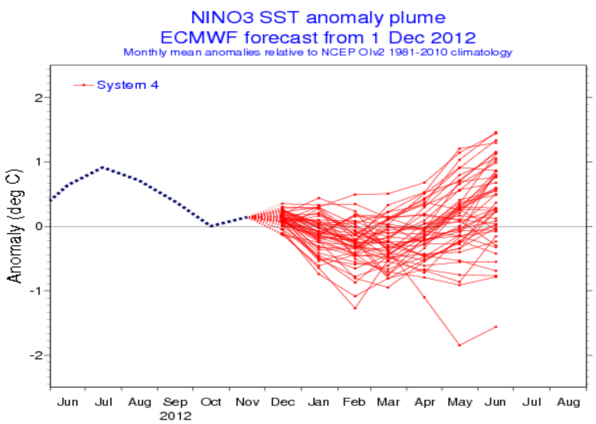


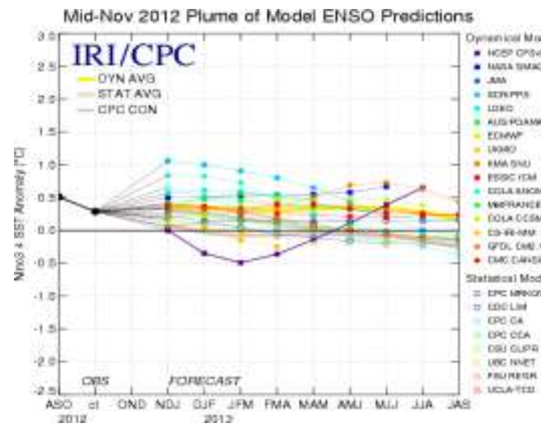
- ✓ We use these maps to compare this forecasts with analogue year.

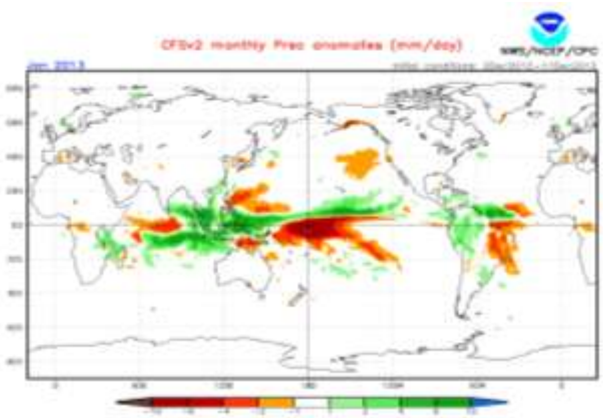


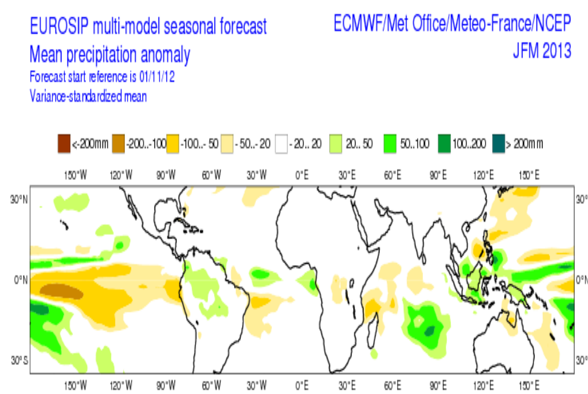

SST anomalies (K) latitude= 5.0 to -5.0 longitude= 190.0 to 240.0
Forecast initial date: 20121201
Ensemble size: Forecast=51 Model climate=450 Analysis climate=30
December
January
February
March
April
May
June

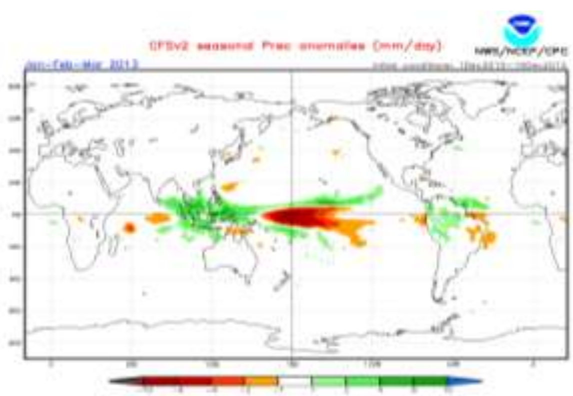

NWS/NCEP/CPC
CFSv2 forecast Nino3.4 SST anomalies (K)


NINO3 SST anomaly plume
ECMWF forecast from 1 Dec 2012
Monthly mean anomalies relative to NCEP OIv2 1981-2010 climatology
System 4
Anomaly (deg C)
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
2012


Mid-Nov 2012 Plume of Model ENSO Predictions
IRI/CPC
DYN AVG
STAT AVG
CPC CON
Nino3.4 SST Anomaly (°C)
OBS
FORECAST
Dynamical Model
Statistical Model
2012
2013


CFSv2 monthly Prec anomalies (mm/day)
NWS/NCEP/CPC
Jan 2013


EUROSIP multi-model seasonal forecast
Mean precipitation anomaly
Forecast start reference is 01/11/12
Variance-standardized mean
ECMWF/Met Office/Meteo-France/NCEP
JFM 2013
<-200mm
-200..-100
-100..-50
-50..-20
-20..20
20..50
50..100
100..200
> 200mm


CFSv2 seasonal Prec anomalies (mm/day)
NWS/NCEP/CPC
Jan-Feb-Mar 2013

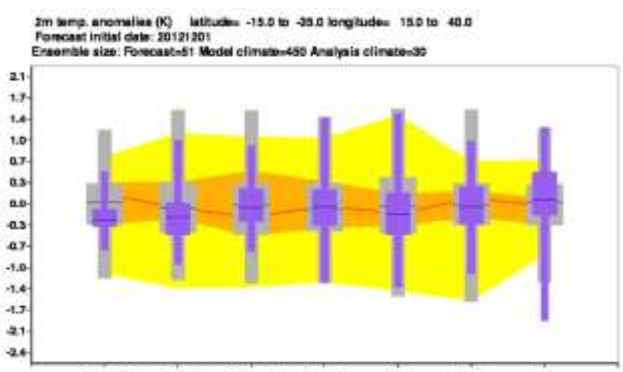

2m temp. anomalies (K) latitude= -15.0 to -35.0 longitude= 15.0 to 40.0
Forecast initial date: 20121201
Ensemble size: Forecast=51 Model climate=450 Analysis climate=30
December
January
February
March
April
May
June

Fig. 29: Maps for Long Range forecast analyses

8.7.Procidures to generating maps for WMO assessment for Africa seasonal forecast Verification.

8.7.1.Data download

Data used for plot are from IRI, using following site:

http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp

- ✓ For precipitation climatology, we use the folowing scrip:

Expert “for extraction FMA normal for the period 79-200”

SOURCES .NOAA .NCEP .CPC .CAMS_OPI .v0208 .mean .prcp

T (Feb 1979) (Dec 2000) RANGEEDGES

Y (40N) (40S) RANGEEDGES

X (20W) (55E) RANGEEDGES

T 3 runningAverage

T 12 STEP

[T]average

90 mul

-999 setmissing_value

- ✓ Extract anomaly for MJJ 2012 For anomaly of precipitation:

expert

SOURCES .NOAA .NCEP .CPC .CAMS_OPI .v0208 .anomaly .prcp

T (May 2012) (Dec 2012) RANGEEDGES

Y (40N) (40S) RANGEEDGES

X (20W) (55E) RANGEEDGES

T 3 runningAverage

T 12 STEP

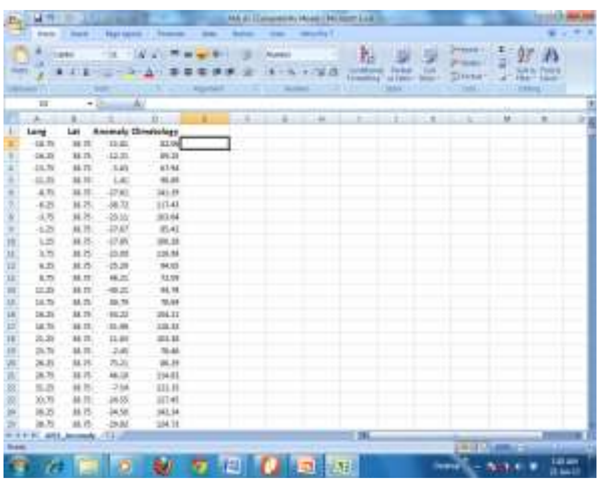
[T]average

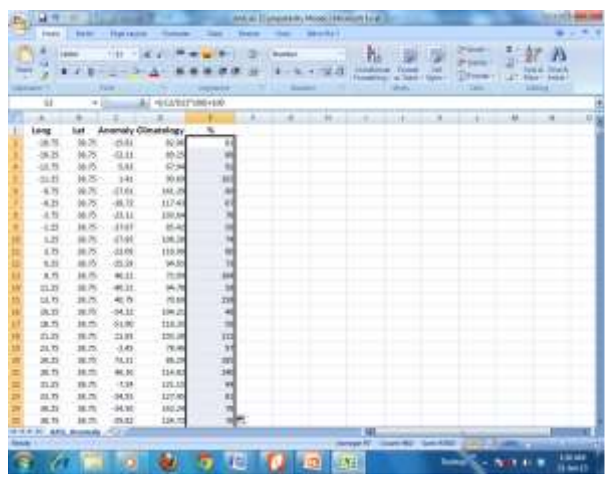
90 mul

8.7.2.Data processing and map plotting

- ✓ We open the files with precipitation data in Excel as shown below:
- ✓ We calculate percentage using this formula in separated columun:

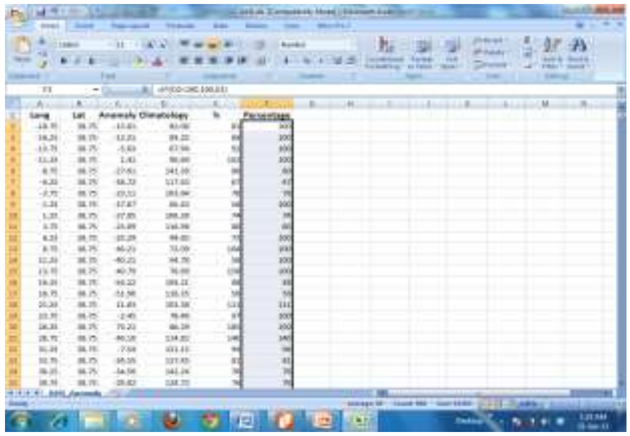
% =[(anomaly/climatology)*100]+100





- ✓ We replace by 100 all of stations with climatology less than 100mm for 3 months, by create other colon, using following formula:

=IF(D4<100,100,E4)



- ✓ Save the file in csv format
- ✓ The plotting map procedures are the same with precipitation shown before at decadal bulletin → put the correct legend (Pressao SG → sharedDoc → Base Maps → LEGEND → Monthly → Legen_temp_anom_Assesment_Mois.lvl).

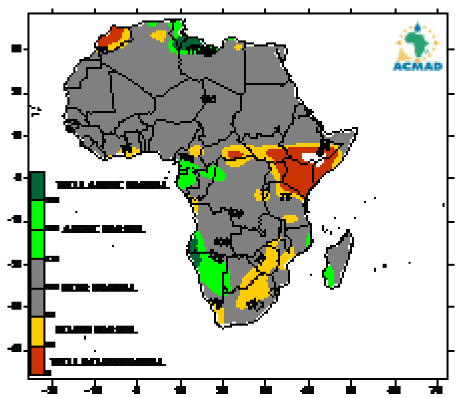
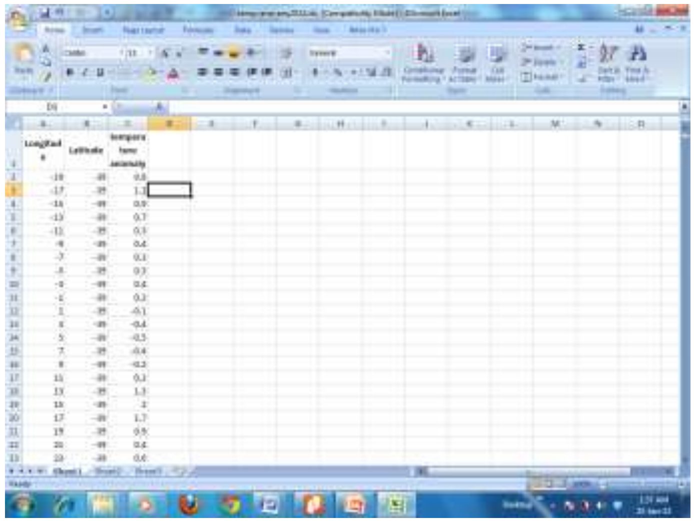


Fig. 30: Precipitation anomaly in percentage for January to March 2012 (verification)

- ✓ For temperature anomaly, we do not need to calculate any thing and we use the same site with precipitation; and following script to download the data:

```
expert
 SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp
  T (1 Jan 2012 ) (31 Mar 2012) RANGEEDGES
  Y (40S) (40N) RANGEEDGES
  X (20W) (70E) RANGEEDGES
```

- ✓ Open the file on excel → organize → save as csv and put it in a folder as shown below.



- ✓ The map plotting procedures are the same with temperature anomaly shown before at monthly bulletin → put the correct legend (Pressao SG → sharedDoc → Base Maps → LEGEND → Monthly → Legen_temp_anom_Assesment_Mois.lvl).

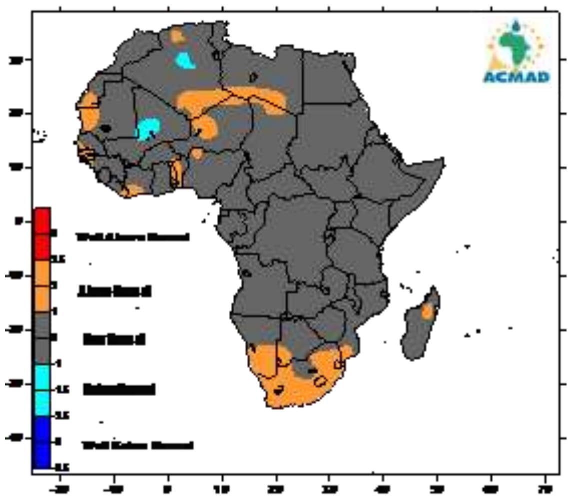


Fig. 30: Temperature anomaly for January to March 2012 (verification)