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AFRICAN CENTRE OF METEOROLOGICAL APPLICATIONS FOR DEVELOPMENT

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FINAL PROGRESS REPORT

CLIMATE AND ENVIRONNEMENT DEPARTMENT

ISACIP/AFRICLIMSERV Project

ACMAD

September 6, 2012 to March 5, 2013

By

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ABBREVIATIONS

- **ACMAD**: African Centre of Meteorological Applications for Development
- **AEJ**: African Easterly Jet
- **AMJ**: April-May-June
- **AMS**: American Meteorological Services Bulletin
- **ASO**: August-September-October
- **CAB**: Congo Air Boundary
- **CAR**: Central African Countries
- **CDAS-1**: Climate Data Assimilated System
- **CPC**: Climate Prediction Center
- **CRR**: Central River Region
- **DRC**: Democratic Republic of Congo
- **ITD**: Inter-Tropical Discontinuity
- **ITCZ**: Inter-Tropical Convergence Zone
- **MJJ**: May-June-July
- **JJA**: June-July-August
- **JAS**: July-August-September
- **SON**: September-October-November
- **GoG** : Gulf of Guinea
- **GHA** : Great Horn of Africa
- **ITD**: Inter Tropical Discontinuity
- **LRR** : Lower River Region
- **NBR** : North Bank Region
- **MSL** : Mean Sea Level
- **NCEP**: National Center for Environmental Prediction
- **NOAA**: National Oceanic and Atmospheric Administration
- **RH**: Relative Humidity
- **SST**: Sea Surface Temperature
- **TI** : Thermal Index
- **URR** : Upper River Region

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ABSTRACT

A set of bulletins and publications were produced during the six months period including dekadal, monthly, climate & health and weekly meningitis vigilance bulletins.
The Climate Bulletin valid for 21st to 30th September 2012 shows a southward migration of the ITD over much of the Sahel, except over Mauritania where it migrates northwards which is unusual. Highest precipitation amounts ranged between 150 and 200 mm over the Gulf of Guinea countries, south Cameroun, west Gabon. The monthly bulletin for September 2012 indicated that, excess precipitation of more than 100 to 200mm prevailed over parts of GoG, Central African and southern African countries. Strong monsoon circulation characterized Sahelian countries with above normal precipitation. Deficits ranging between 50mm to 100mm were observed over central CAR, north-west of DRC and Greater Horn of Africa. The Climate and health bulletin for September 2012 also revealed that, Cholera and malaria to affected some regions of the African continent with excess precipitation more than 100mm and high temperatures greater than the mean of +1.5°C. The weekly meningitis bulletin valid for 8-15 February 2013 indicated that, the climatic conditions were favorable for high level vigilance for meningitis cases over much of the Meningitis belt. Moderate vigilance is observed at the southern part of Sudan, whereby low vigilance prevailed over south-east Sudan, much of Ethiopia and South Sudan.

The long Range Forecast bulletin during the period September-October-November and October-November-December 2012, indicated well above normal precipitation will prevail over most part of the continent except the Sahel, Gulf of Guinea countries and North Africa. The PRESAO15 product published in late May 2012 suggested a normal to above normal summer precipitation over the Gambia. Data from observations were consistent with the PRESAO15 product except over part of CRR (north) and URR. The most likely analog year 2001 was found quite close to the observations. The prediction has conformed well (>70%). ACMADs contribution to the state of global Climate for 2012 for publication of BAM's Precipitation in Africa for 2012 was characterized by a very active monsoon season in the Sahel with flooding leading to significant damages and losses. Anomalous warmth prevailed over North Africa during much of the year with very much above normal temperature in parts of Morocco and Tunisia in June-July-August 2012. After training on the use of CLIMSOFT CDMS, Rainfall, Minimum and maximum temperature database for the GAMBIA was developed as a contribution to African Regional Climate Centre data services at ACMAD. Training on updating of the African continental station database with hands on exercises was organized. The database tables for the capture of data on synoptic features have also been added to become part of the Climsoft CDMS data model for the ACMAD climate database.

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Background

Extreme weather and climate events have strong adverse impacts with overwhelming challenges facing the communities in coping with them.These have led to increasing demand for weather and climate services for managing climate risks and associated disasters for sustainable development in Africa. The African continent is in dire need for timely and skilful weather and climate forecasts due to the frequent climate disasters with several areas becoming extremely vulnerable due to excess rainfall (floods) and rainfall deficits associated with severe droughts.

The meteorological observational network is poor due to financial and infrastructural constraints. The rain-gauge and precipitation radar networks are currently extremely sparse or lacking over most of Africa. However, the Satellite-based rainfall monitoring and its access as well as dynamic models from global center's facilitate the monitoring and prediction of climatological elements for the entire continent that complement real time *in situ* observations. The weather and climate systems monitoring using better tools will be necessary for skillful forecasts. Of paramount importance and articulated in the ISACIP/AfriClimServ project and well covered in this report is the human resource capacity building in the production of climate information and products which include climate bulletins at different timescales.

1.0 Introduction

Extreme weather and climate events have significant impacts on various socio-economic sectors and community livelihoods and safety. The adaptation strategies to mitigate the climate risks and build climate resilient communities are posing major challenge in climate risk management. As a result there is increasing demand for tailored weather and climate information products and services to meet specific demands of various user-sectors and communities to cope with the increasing extreme climate events linked to the climate change.

The African continent is face with increasing vulnerability to adverse impacts of climate variability and change hampering countries' economic growth and sustainable development and planning. This is due to lack of preparedness coupled with non-existence of appropriate climate risks adaptation strategies developed through applications of accurate climate information products and services.

The ClimDevAfrica program at ACMAD was designed by the African Union, the Economic Commission for Africa and the African Development Bank to remedy to this situation.

In a conceptual approach to addressing the daunting challenges, the recruitment of staff on attachment/secondment to the African Centre of Meteorological Applications for Development (ACMAD) proves vital to attain and maintain its regional mandate in partnership with international climate science community to, (i) meet the current and future challenges and address better to the climate change and variability in the world and the African continent in particular, (ii) applying new tools and techniques to improve weather/climate forecasts as well as Meteorological information to socio-economic planning and development.

ACMAD therefore sought the support from national meteorological services of member countries in terms of qualified human resources in the form of attachment or secondment to enable them upgrade their capacity and also to contribute their expertise in addressing the various challenges on delivery of tailored weather and climate information products and services. It is to this concept that, I benefitted for an attachment to the implementation of the project 'Institutional support to African institutions of Climate' funded by African Climate Institutions Project ISACIP/AFRICLIMSERV (no. Don FAD nº 2100155016866; Project Nº:P-ZI-CZO-003) for a duration of six months effective September 6, 2012 to March 6, 2013. This attachment was facilitated through a Memorandum of Understanding (MOU) between the ACMAD centre and the Gambia Meteorological Services at the Department of Water Resources (DWR).

Upon completion of this programme, I will have increased my level of understanding and also improve my capacity as a Meteorologist. This will also allow me to acquire better skills (new tools & techniques) to improve preparation of tailored climate products to meet user-sectors needs including planning and development of appropriate climate policies and adaptation strategies to promote economic growth and communities' sustainable livelihoods. This platform also gave me an opportunity to interact and share knowledge with other climate science experts not only at ACMAD, but also others like me from different institutions. Staff on attachment is required to provide his/her report of activities at ACMAD at the end of the mission, and it is to this effect why this report has been prepared.

1.1 ACMAD

ACMAD was created in 1987 by the Conference of Ministers of the United Nations Economic Commission for Africa (UNECA) and the World Meteorological Organization (WMO) and is a Weather and Climate Centre. The center has been operational since 1992 in Niamey, Niger and serves fifty-four (54) countries in the African continent. To ensure its mission, ACMAD draws meteorologists from National Meteorological and Hydrological Services (NMHSs) in Africa to achieve its mission and fulfill mandate in Africa.

Furthermore, ACMAD encourages the NMHSs to prepare strategic development plans which integrate new African initiatives, and the socio-economic conditions related to the changing global environment (Post Rio Conventions & Kyoto Protocol).

The center's main objective is the provision of weather and climate information for the advancement of sustainable development of Africa (within the context of national strategies for poverty eradication) in the area of agriculture, water resources, health, public safety and renewable energy. Its specific objectives are (i) to strengthen the capacities of NMHSs in weather and climate predictions through international forums, technology transfer (Information or computer technology, rural communication and research). In 1999 ACMAD with NOAA OGP, CIMMS and other development partner's support established RAdio and InterNET technology (RANET) system for mainstreaming agro-hydro-meteorological, climate and environmental information into rural systems currently recognized as one the good practices with feedbacks on success stories from several NMHSs that use the system.

ACMAD is composed of three operational departments; (i) Climate and Environment Department (CED), (ii) Weather Watch and Prediction Department (WWPD) and (iii) Computer (Information Technology & Telecommunication) Department. There are also administrative services.

Many Institutions in the African continent have benefitted from ACMAD and to demonstrate, I have presented below an example of two (2) countries namely, the Gambia and Mozambique as follows:

1) The Gambia Benefits from ACMAD

<u>Training of nationals in the preparation, monitoring and validation of the seasonal/rainy outlook (prediction of the expected rainfall during JAS)</u>.

- Fatou Sima, PRESAO-15: 21-25 May 2012
- Lamin Mai Touray, PREASO-10: May 30 to June 1, 2007

- Lamin Mai Touray, PREASO- 09: May 21 to June 1, 2007
- Isatou Gaye, PREASO- AO/08:17 to 19 May, 2006
- Tijan Bojang, training course on Seasonal Climate Prediction: 4th November 1998 to 12th March 1999

Training of Television weather forecasters

- Dodou Njie, training on Numerical Weather Prediction: October to December 2008
- Lamin Mai Touray, training workshop on seasonal forecasting: May 21 to May 29, 2007
- Yasin Khan, forecasters training course: May 22 – June 2, 2006
- Yasin Khan, operations of the forecasting center: August 26 – September 15, 2006
- Ismaila Ceesay Meteo-Media: 6th to 31st October 1997
- Adama Njie, Meteo-Media: 6th to 31st October 1997
- Momodou Pateh Bah, Meteo-Media: 6th to 31st October 1997.

Attachment on-the-Job Programme

- Fatou Sima, Climate data, Monitoring and Forecasting for Africa: September 6, 2012 to March 5, 2013.

- Tombong Komma, Computer Information Technology, March 2012 to 30th April 2013.

Attachment On- the-Job training

- Fatou Sima, Climate Computing (CLICOM) advanced user level & Climate Information & Prediction Services (CLIPS): October 1996 - January 1997.

- Isatou Gaye, WMO/ACMAD computer training on CLICOM Systems Management: 6th May to 10 August 1996.

2) Benefits from ACMAD for Mozambique

Attachment On- the-Job training

- Isaias, Climate data management and applications, 28th September 2012 to 26th January 2013
- Adérito Aramuge, RANET workshop , March 2003 (4 days)
- Eusébio Matola, RANET workshop, March 2003 (4 days)
- Eusébio Matola, on the Job training, 1st February to 30th April 2002

On September 6 2012, I am deployed at the CED and its principal goal is the provision of climate information to agriculture, food security, water resources management, health, environmental protection and etc. The department also prepares and disseminates different climate bulletins over the African continent namely; (i) Dekadal Climate bulletin, (ii) climate diagnostic bulletin, (iii) Climate & Health bulletin (iv) Seasonal prediction for West Africa (PRESAO). The Department also prepares workshops for these programs both National and International. The Work Program drawn specifically for me covered the period from 6th September, 2012 to 5th March, 2013 and the details of the report are presented as follows:

- Chapter 1 discusses the Introduction, about ACMAD and Work program.
- Chapter 2 deals with Data method/ procedures and describes the different bulletins elaborated by ACMAD (dekadal and monthly). This chapter also discusses the Long range forecast for September-October-November and October-November-December.
- Chapter 3 talks about the July–August-September (JAS) cumulative rainfall profiles**,** percentage (%) of normal precipitation and anomalies for analog years (2012, 2001 & 1991), crops grown in the Gambia, comparison of yield and onsets with cumulative rainfall.
- Chapter 4 talks about Climate database Management
- Chapter 5 discusses conclusion and recommendation for the report.

1.2 Work program for September 6, 2012 to March 6, 2013

(i) Downloading climate data and products from international climate centres for climate monitoring;

(ii) Collecting precipitation, near surface air temperature and additional station data from countries for African climate monitoring;

(iii) Producing and disseminating climate monitoring and long range forecast products via emails and websites;

(iv) Contributing to data processing and analysis for preparation of the climate and health bulletins, dekadal and monthly climate diagnostic and outlook bulletins ;

(v) Promoting and maintaining the CED's interest and key role in the field of climate and health;

(vi) Assisting in the analysis of significant or extreme climate events ;

(vii) Providing support for the organization of workshops and conferences including Regional Climate Outlook forums;

(viii) Liaising with the computer and communication department for dissemination of climate products via the web and emails;

(ix) Liaising with the computer and communication department for climate database management;

(x) Assisting in training country experts in the framework of on the job training activities, workshops and fora on GIS mapping, statistical analysis of climate data, climate change detection and indices, seasonal forecasting, production of climate bulletin, statements and reports.

(xi) Carrying out other relevant duties as required.

2.0 Data and methods/procedures

During the period September 6 to date, I was involved in the preparation of the dekadal, monthly and weekly forecast bulletins The preparation of the bulletin involved first; downloading from International Research Institute *(IRI)* in Columbia, Climate Prediction Centre, National Climate Environmental Prediction, National Oceanic and Atmospheric Atmospheric Applications (NOAA) and the African Desk (cpc.ncep.noaa.gov/products/african_desk*),* USA, World Meteorological Organization Sand and Dust Storm Warning, Climate & Atmospheric Dust Forecast System (*WMO SDS-WAS: BSC-DREAM8b)* and The Center for Ocean-Land-Atmosphere Studies *(COLA).* These centers are among the twelve (12) WMO designated Global Producing Centres (GPCs). Historical daily rainfall data from the Gambia is also used in chapter three (3) for this study.

The downloading is done by using a readymade script which can be modified, taking into account the date, time, coordinates and levels for each parameter used and shown in Annex 1.
Introduction of new concepts of adding value to bulletins being produced included the comparison of the climatological mean of thirty years (1971-2000) reference data , (except for Relative humidity which is from 2002-2011) with present dekadal situation of the analyse data.

The following parameters used for the preparation of the bulletin to determine the climate in order to provide short and long range predictions are the following;

- Mean Sea Level (MSL) Pressure (observed & anomaly),
- Inter-Tropical Discontinuity (ITD),
- Wind at 925 & 850 hPa levels,
- Dust concentrations and loadings,
- Thermal Index (TI) at 300hPa (observed & anomaly),
- Relative Humidity (RH) at 850 & 700hPa (observed & anomaly),
- Forecasted Precipitation & Anomaly,
- Forecasted Temperature and Soil moisture
- Sea Surface Temperature (SST)
- El Nino/Southern Oscillation (ENSO)

The write-up for the bulletin is done by taking into consideration the behavior of these parameters for the previous and the current dekad. The purpose of the bulletin is an information background to informed policy decision making to impact the socio-economic conditions of the African continent.

The schedule of bulletins prepared during September 6 to November 6 consists a total of eight (8) bulletins under the supervision of ACMAD assigned training supervisors and were placed on ACMAD website for public consumption as shown in table 1 below.

Table 1: Number of bulletins produced by CED

Month	**Classification**				
	No. of dekadal bulletin	No. of Monthly Bulletins		No. of Weekly Bulletins	No. of Presentations
		Climatological bulletin for Africa	Climate & Health	Climate & Health	
September, 2012	3	1	1		1
October, 2012	3	1	1		
November, 2012	3	1	1		
December, 2012	3	1	1		2
January, 2013	3	1	1	4	2
February 2013	3	1	1	4	1

2.1 Dekadal bulletin/Method

Dekadal Bulletin reflects data collection, compilation, 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.

2.1.1 Highlights of dekadal bulletin

- Section 1 of the dekadal bulletin deals with "general situation" which provides the strengths of the surface: pressure systems and ITD displacement as well as the troposphere and gives a holistic concept on monsoon and dust concentration, TI regimes and the relative humidity during the dekadal period
- 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.
- Section 3 of the dekadal bulletin addresses "outlook for dekad" under review – predictions of the following overlapping one to two decadal periods.

Note: These systems maps are found in the annex to this report.

2.1.2 Method

Mean Sea Level (MSL)

- MSL Pressure and climatology data are downloaded from Global centres as mentioned chapter 2 and the data is obtained in a text format. The data is then exported to excel and save in excel format, whereby it is gridded in surfer. Paint is used to insert ACMAD logo to the maps and are finally inserted in the bulletin, except for the forecasted maps, Dust loadings & Concentrations). The gridding procedures in surfer are shown in Annex 1.

Note: all the downloaded data from the sites mentioned above are obtained in text format, exported to excel and gridded. This process is applicable for dekadal, Climate Diagnostics and climate & health bulletins. The gridding procedure in surfer is applicable for all the parameters except for the ITD, ITCZ and CAB. The parameters used in the bulletins have different legends and are hereby shown below:

- MSL pressure dekadal : legend_pressure.lvl
- MSL pressure anomaly: leg_pressure_anomaly.lvl
- Thermal Index dekadal: legende_IT.lvl
- Thermal Index anomaly: legende_ITAno.lvl
- Rain dekad: LegenRR_Dek.lvl
- Rain Anomaly: rranom_adj.lvl
- Rain monthly: LegenRR_Mois.lvl
- Relative Humidity dekadal: legRH.lvl
- Relative Humidity anomaly: legeRH_anomaly.lvl
- Temperature monthly: Monthly_T_Anom.lvl
- Monthly RH for Climate & Health: Legend_RRHH_Helth_Bull_Monthly.lvl

The Inter-Tropical Discontinuity, Congo Air Boundary and Inter-Tropical Convergence Zone

- The ITCZ has three components covering the African continent from west, central and eastern sector.
  - Inter-Tropical Discontinuity – ITD/FIT (Western part);
  - Congo Air Boundary - CAB (Central part) and
  - Inter-Tropical Convergence Zone – ITCZ (Eastern part).

Inter-Tropical Discontinuity **(ITD)**

The West and Central Africa region has wet and dry seasons resulting from the interaction of two migrating air masses. The first is the hot, dry tropical continental air mass of the northern high pressure system, which gives rise to the dry, dusty, *Harmattan* winds that blow from the Sahara over most of West Africa from November to March. The maximum southern extension of this air mass occurs in January between latitudes 5°N and 7°N. The second is the monsoon tropical maritime, which produces southwest winds. The maximum northern penetration of this wet air mass is in August between latitudes 18° N and 21°N. Where these two air masses meet is a belt of variable width and stability called the Inter-Tropical Discontinuity (ITD). The north and south migration of this ITD, controls the climate of the region.

- **The Congo Air Boundary (CAB)**

Generally, the ITCZ has a rather complex structure over east and central Africa. It consists of a north-south running dynamic trough which is locally referred to as "the meridional arm of the ITCZ" and the "zonal arm", Dhonneur (1971). The meridional arm which is a zone of convergence between the westerlies from the Atlantic Ocean and easterlies from the Indian Ocean, forms part of the **Congo Air Boundary** of the south western part of the region and sometimes couples with the Lake Victoria semi-permanent trough to give widespread rains over western Kenya (Asnani, 1993).

The Inter-Tropical Convergence Zone (ITCZ)

- The Inter-Tropical Convergence Zone (ITCZ) is the conventional zone of convergence between hemispheric winds, namely the 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 15ºS 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 (Mukabana, 1992).

Monitoring and mapping of the ITD, CAB and ITCZ

These ITD, CAB and ITCZ features are monitored throughout the year (January–December) and are prepared in order to locate their movements and locations over the African continent. The spatial and temporal displacements of these features over Africa are essential in determining the precipitation over the region and the extent of the Sahara dust especially the Harmattan strength and possible outbreak of meningitis and other common dust related ailments.

The daily values of these features are obtained from the Forecasting Department at ACMAD. The mean position for ITD and ITCZ has conventionally **fixed longitudes** and daily variations of latitudes are collected. The CAB has also conventionally **fixed latitudes** and only daily variations of longitudes are collected. We make a quality control (check the latitudes & longitudes) on the data collected. They are then entered in Excel, the dekadal, monthly calculations and analyses are done separately (for CAB, ITD and ITCZ). The mean for the Current dekad, mean Maximum & Minimum are calculated and gridded in SURFER including the mean for the previous dekad. They are put in different worksheets in excel and save either in excel or in "CSV" format, then finally gridded in surfer. The gridding procedures are explain in the Annexes.

Wind map

- The wind map is obtained directly from the site, but the Levels (e.g. Pressure: 925 & 850 hPa), Time (e.g. 21-30 Sep 2012), Coordinates are changed to **40N, 40S, 20W** & **55E**, the Color is reduced from **15** to **25** (the higher the value the lighter the colour) and finally inserted in the bulletin. The intensity with the backing of the West Africa monsoon winds to south westerly's over the Gulf of Guinea (GoG) countries with its extension over western part of Central African countries at 925hPa and 850 levels during the rainy season were associated with widespread rainfall over West Africa.

Thermal Index, Relative Humidity, Precipitation

- Thermal Index, Relative Humidity, Precipitation and their climatology data are downloaded and obtained in text format. They are then exported to excel, anomalies are calculated and saved, whereby gridded using SURFER software, (note: 0N 40N & 0N 40S are downloaded separately for the total Precipitation). The thermal index regimes at 300hPa threshold value ≥242°K coupled with relative humidity at 850 hPa with thresholds RH ≥60% and at 700 hPa with RH≥70% triggered deep convection with heavy rainfall which caused flooding and landslides over some parts. Parts with TI value ≤ 241°K with low humidity values (RH≤40%) experienced suppressed convective activities. These thresholds demonstrated appreciable predictability skill in providing the climate outlooks.

Dust concentrations and loadings

- Dust concentrations and loadings maps are sent from WMO SDS-WAS: BSC-DREAM8b is cropped to fine shape the image and finally inserted in the bulletin.

Forecasted Products

- The maps for the Forecasted Precipitation & Anomaly, Forecasted Temperature and Soil moisture are obtained directly from the site of COLA and also cropped and inserted in the bulletin.

2.2 Monthly bulletin

The monthly bulletin consists of Climate Diagnostics and climate health bulletin. It summarizes the dekadal bulletins and comprises of additional distinctive features projecting the meteorological/climatological evolution during the month and gives prospects of the succeeding period (s). The procedures of generating products for both dekadal 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.

2.2.1 Highlights of Climate Diagnostics

- 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 period under climate diagnostic review- ocean-atmosphere monitoring, assessments and prediction.

- Section 2 of the monthly bulletin depicts "climatological situation and impacts during the month" – the general climate situation covering two major parameters: Precipitation and Temperature which shows rainfall pattern over Africa
- Section 3 of the monthly bulletin addresses "outlook for monthly bulletin" under review-predictions of the succeeding overlapping two to three months periods based on SSTs, precipitation and ENSO characteristics and evolution of events and further provides "advice and action options" for users.

Note: These systems maps are found in the annex to this report.

Method

- Monthly MSL pressure and anomaly are downloaded and use the same procedure done for the Dekadal bulletin
- The wind map at 850 hPa level is obtained directly from the site of NOAA/NCEP
.
- Monthly TI, RH and anomalies at 850hPa and 700 hPa respectively are downloaded and use the same procedure done for the Dekadal bulletin.
- The Sea Surface Temperature and El Nino/Southern Oscillation (ENSO) are also downloaded from NOAA/NCEP site, cropped and inserted in the bulletin.
- Cumulative precipitation and anomaly data (40n & 40S) are downloaded from NOAA/NCEP site.

2.2.2 Climate and health bulletin/Method

- Section 1 of the Climate and health bulletin deals with ITD mean for the three dekads (1^{st} 2^{nd} & 3^{rd}) during the month" - it enables you to compare its location and displacement over Africa Dust load map, Precipitation, Relative humidity, temperature and the vegetation index coverage.
- Section 2 explains "Diseases sensible to climate". "Relief web", Pro-Med mail website is used to get iinformation's on diseases sensible to climate and regional office at Ouagadougou (Inter Country Supporting Team). Thresholds to indicate Malaria for the bulletins are temperatures between 18 and 32^0C, Relative Humidity more than 60% and dense vegetation cover.
- Section 3 addresses forecast on Cholera, Meningitis and malaria, long range forecast and seasonal prediction for Africa.

Note: These systems maps are found in the annex to this report.

Method

- The ITD data, mean for the three dekads (1^{st} 2^{nd} & 3^{rd}) for the month are gridded in Surfer to compare its location and displacement over the continent and use the same procedure done for the Dekadal bulletin.
- Dust load map (average for the month) is sent from WMO SDS-WAS: BSC-DREAM8b is cropped to fine shape the image and inserted in the bulletin.
- Cumulative precipitation and anomaly data (40N & 40S) are downloaded from NOAA/NCEP site.

- Monthly Relative humidity data is also downloaded, gridded in surfer and finally inserted in the bulletin.

- Monthly mean and anomaly for temperature are downloaded and gridded in surfer.

- The images for the vegetation index are downloaded from the EVI-MODIS from IRI website. Areas with dense vegetation coverage are favourable for mosquito breeding which provokes malaria is added in the bulletin.

- Diseases sensible to climate Forecasted details of Cholera and Meningitis are provided in the bulletin and also of malaria showing zones at risk.

- Long range forecast is also provided and added to the bulletin. The provision of the Long range forecast is taken from outputs from WMO Global Producing Centres for Long Range Forecasts and related Lead Centres, SSTs patterns and related trends, analog years analysis, knowledge and understanding of African climate variability and predictability across Africa. The blank map of Africa is used to colour the Precipitation and temperature events using surfer to show the categories of Above normal, normal and below normal in a particular location over the continent. Colours are chosen in accordance with the severity of events.

- The seasonal prediction is also added to the bulletin. Hence starting from 1998, each year, experts (Meteorologist and Hydrologist) from Member State come together and prepare a consensus rainfall and river flow forecasts (Meteorological and Hydrological forecast) for the sub region, (Seasonal Prediction for West Africa/**PRESA-OA**). This consensus forecast is based on the forecast that the individual State prepare and those prepared by the International Climate Prediction Centers such as United Kingdom Meteorological Office (UKIMO), Météo France, the International Research Institute (IRI), European Community Model Weather Forecast (ECMWF) and National Centre for Environmental prediction (NCEP). **PRESAO** process was found to be one of the ways of strengthening the regional collaboration, especially in the field of climate and weather forecasting. Hence, the Member State has the desire to continue with the **PRESAO** process as it linked to a greater socio- economic development of each Member State. Of late

Epidemiologists and Communicators were also involved in the **PRESAO** process. Epidemiologist wants to relate the seasonal climate forecast to their work and also how to make best use of the forecast information. The participation of the communicators in the process is to assist in diffusion and dissemination of the forecast to the end users.
An example of some of the products of the bulletin is presented below.

2.3 Long Range Forecast (LRF) for September-October-November (SON) and October-November-December (OND)

Introduction

In November 2010, experts from different Meteorological institutions and WMO met in Marrakesh, Morocco to discuss the African infrastructure and institutional infrastructure.
Each sub region should create climate services for their region; e.g. Southern African Development Community (SADC) for South Africa; ECOWAS for Africa whilst ACMAD should be a continental centre to deliver climate services for Africa.
Sub regions including ACMAD are designed to provide these functions (i) **climate monitoring**, (ii) **LRF** and (iii) **training for expected disasters**. Morocco took the lead and to become WMO region, you must demonstrate these functions. ACMAD is under the demonstration phase to become a WMO designated approved Regional Climate Centre for West Africa with a LRF mandate for West Africa.
LRF is done every month an example of the most current is **January-February-March (JFM)** and **February-March-April (FMA)** 2013. This forecasting is done with a set of products to be delivered.

The seasonal forecasting steps followed at ACMAD include:

- Analysis of historical and current sea surface and sub-surface temperature patterns and trends;
- use of expert knowledge and understanding of SST variability including trends and persistence to derive a first estimate of expected SST patterns for the target period;
- Use knowledge and understanding of teleconnections to derive a first estimate of expected precipitation or other relevant forecast variable;
- Look on historical SST data in the tropical pacific, Atlantic and Indian oceans for years with SST patterns similar to the most recent past few months variability and expected estimate of evolution during the target season;
- make a forecast of precipitation patterns or other relevant variable using the analog year technique;
- Combine expert knowledge of variability, trends and persistence, outputs of analog technique and global dynamical models to derive a consensus outlook on SST patterns;
- with knowledge and understanding of teleconnections during the same season, a third estimate of expected precipitation outlook is made;
- a statistical model based on principal component and linear regression is built, validated

and used to generate statistical precipitation forecast;

- Dynamical outputs from global centers are combined with statistical including analog, expert knowledge, trends and persistence products to generate a regional consolidated climate outlook.

2.3.1 Example of Precipitation forecast for SON and OND 2012

During the period September to December 2012, Uganda, western Kenya, western half of Tanzania, north Zambia, eastern DRC, Rwanda and Burundi are likely to observe well above normal precipitation. In contrast Normal precipitation will prevail over western DRC, Gabon, Cameroon and south Nigeria (figure 2a).

Well above normal precipitation is very likely over Western and eastern DRC and northern half of Congo, much of Uganda Southern Sudan, Western Kenya, northern Tanzania, Rwanda and Burundi for the period October to December 2012 (figure 2b).

2.3.2 Temperature forecast for SON and OND

Above normal temperature is very likely over the Mediterranean coast from Algeria to Libya, along the Gulf of Guinea coast from Sierra Leone to Congo, along the East African coast from Somalia to northern Mozambique and the northern half Madagascar figure 3a. Well above normal temperature (anomalies of +1°C or more) is very likely in Southern Morocco, much of Mauritania, Senegal, Guinea and western half of Mali from October to December 2012 (figure 3b).

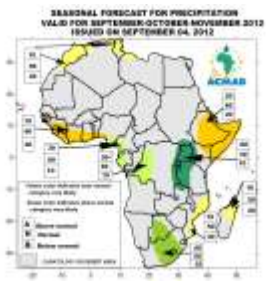


Fig. 2a: SON Seasonal precipitation forecast

Fig 2b: OND seasonal precipitation forecast

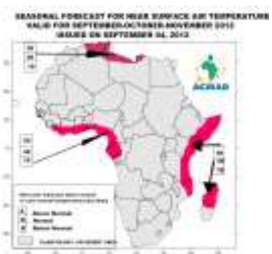


Fig. 3a: Seasonal forecast for temperature at 2m for SON

Fig. 3b: Seasonal forecast for temperature at 2m for OND

3.0 THE GAMBIA RAINFALL PATTERN, ONSETS, YIELD AND VERIFICATION OF SEASONAL PREDICTION

With the erratic rainfall pattern and short rainy season the Gambia experiences, it is vital to have a precise knowledge of the rainfall regime so as to efficiently advice farmers who form 70% of our Gambian population or decision makers. To achieve this objective, it is important to acquire knowledge of the onset and seasonal prediction rather than living the farmers on their first rain dependence as onset. This will reduce the replanting of seeds and improve the yield of the rain fed crops. Stations used for the study are: Banjul, Basse, Fatoto Jenoi, Kaur, Kerewan, Janjanbureh, Sapu and Yundum.

3.1 Comparison of the different 30 year rainfall pattern in The Gambia

Since 1950s, rainfall in the Gambia was very favorable, until in the late 1970s when rainfall occasionally was below normal and the situation is reflected in figure 4. The poor rainfall experienced in the last three decades led to uncertainty in the agricultural production of the farmers who form 70% of the Gambian population. The graph in figure 4 indicated different 30 reference periods (normals), showing very favorable rainfall amounts during 1951-1980 period with a sharp declined during 1971-2000.

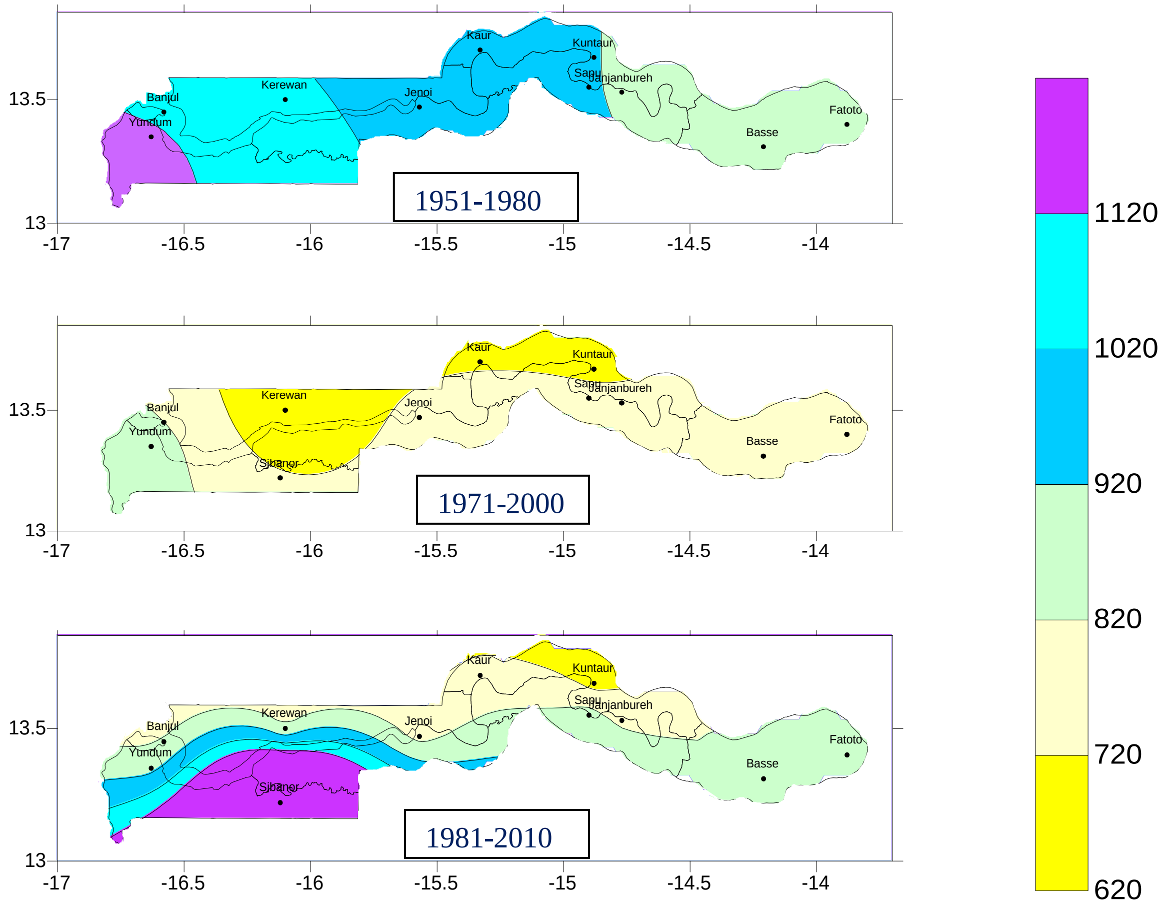


Figure 4: Comparison of different normal (30 years) rainfall (mm) in The Gambia

3.2 Comparison of cumulative rainfalls Profiles from 1st July to 30th September, for 1991, 2001, 2010, 2011 & 2012 with the long term normal

During this period, precipitation daily data was used to produce rainfall profiles for **1991, 2001, 2010, 2011 & 2012** for The Gambia. This analysis enables us to compare these years with the long term normal and also identify the analog year. Investigations concluded that, 2001 year is the most analog year to 2012 wet season. The results of the analysis are stated below in figure A1 to A9.

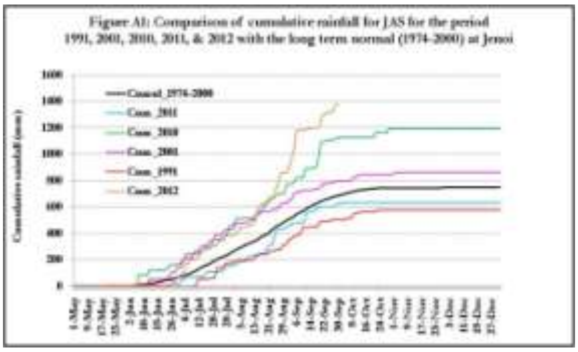
The rainfall profiles in figure A1 to A9 shows cumulative rainfall, percentage of normal and the onset of rains for selected stations at various administrative regions in The Gambia.

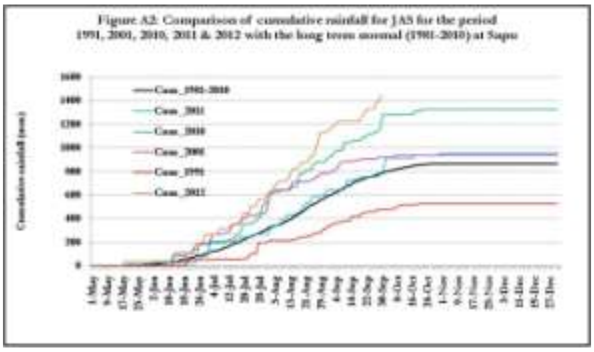
Figure A1 shows cumulative amount of 1307.2 and 618.4mm for the normal (1974-2000) at Jenoi located at the Lower River Region (LRR).This gives a surplus of 688.8 mm, 111 percent (%) of the normal.

- Onset of rains: June 22
- Onset of growing season: June 24

Sapu at the South of the Central River Region (CRR) indicate cumulative rainfall amount of 1177.3mm and 686.5 mm for normal (1981-2010) for JAS 2012. This gives a surplus of 490.8 mm, 71 % of the normal of 1981-2010 as indicated in figure A2.

- Onset of rains: May 18
- Onset of growing season: June 16





As stated in figure A3, the cumulative rainfall amount for JAS at Banjul, the Capital city at the Western Region (WR) is 1063.9 mm and 702.6 mm for the normal (1971-2000). A surplus of 361.3 mm, 51 % of the normal 1971-2000 is recorded.

- Onset of rains: May 17
- Onset of growing season: June 21

JAS cumulative rainfall in figure A4 is 1081.6mm and 750.0 mm for the normal (1971-2000) at Yundum Airport at the Western Region (WR). This gives a surplus of 331.6 mm, 44 % of the normal of 1971-2000.

- ➢ Onset of rains: May 17
- ➢ Onset of growing season: June 21

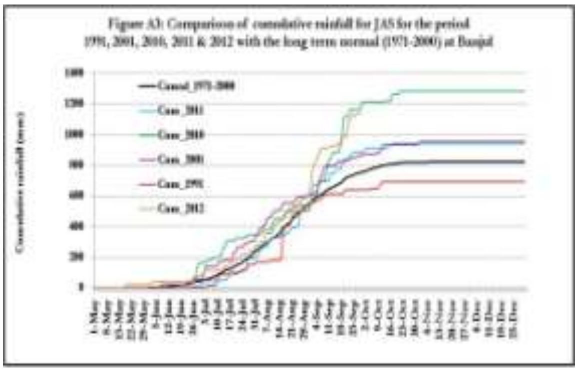


Figure A3: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1971-2000) at Banjul

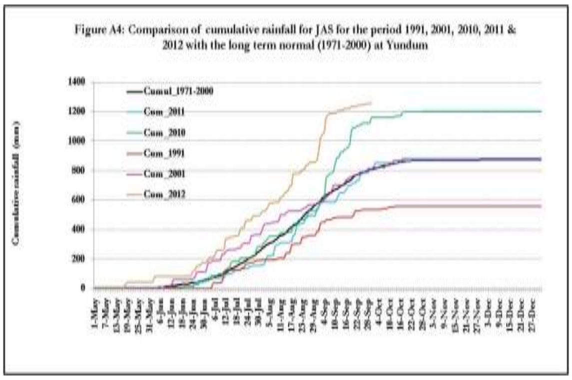


Figure A4: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1971-2000) at Yundum

According to figure A5, JAS cumulative rainfall amount for Kerewan at the North Bank Region (NBR) is 861.7 mm and 649.5mm for the normal (1971-2000) and obtained a surplus of 212.2 mm, 33 % of the normal.

- ➢ Onset of rains: June 22
- ➢ Onset of growing season: June 22

JAS cumulative rainfall of 700.1 mm and 614.5 mm for the normal (1971-2000) prevailed at Georgetown/Janjanbureh at the South of the Central River Region (CRR). This gives a surplus of 85.6 mm, 14% of the normal (figure A6).

- ➢ Onset of rains: May 18
- ➢ Onset of growing season: June 16

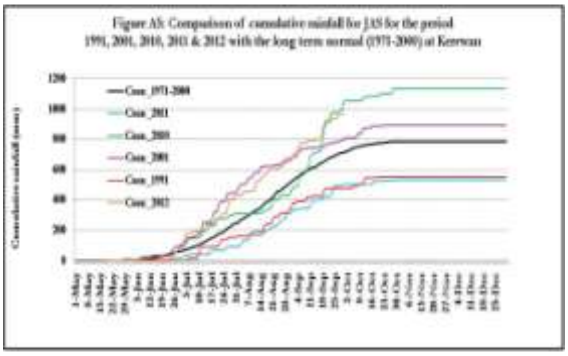


Figure A5: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1971-2000) at Kerewan

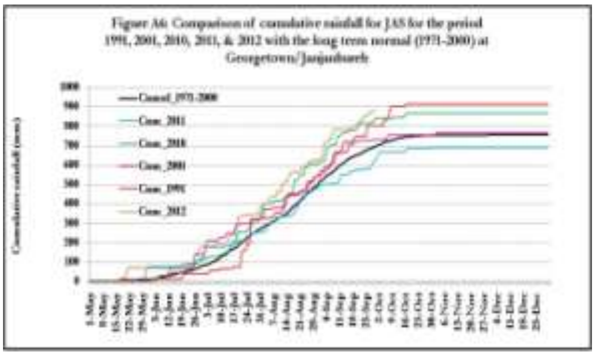


Figure A6: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011, & 2012 with the long term normal (1971-2000) at Georgetown/Janjanbureh

The JAS cumulative rainfall amount for Kaur at the northern part of the Central River Region (CRR) is 716.1 mm and 636.1 mm for the normal (1981-2010). This gives a surplus of 80.0 mm, 13 % of the normal as illustrated in figure A7.

- ➢ Onset of rains: June 12
- ➢ Onset of growing season: June 17

The analysis in figure A8 shows JAS cumulative rainfall amount of 686.2 mm and 680.6 mm for the normal (1981-2010) for Fatoto at the Upper River Region (URR) and a surplus of 5.6 mm, 1% of the normal.

- Onset of rains: May 18
- Onset of growing season: June 16

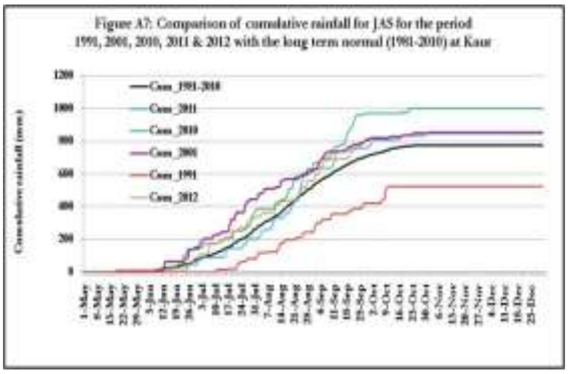


Figure A7: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1981-2010) at Kaur

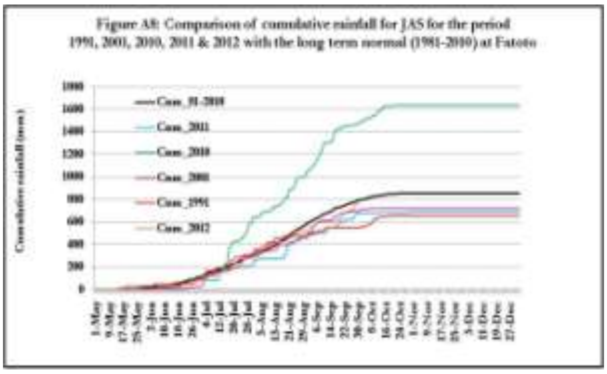


Figure A8: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1981-2010) at Fatoto

The JAS cumulative rainfall amounts of 553.6 mm and 666.9 mm for the normal (1971-2000) prevailed at Basse at the Upper River Region (URR) with a deficit of 113.3 mm, 17% of the normal (figure A9).

- Onset of rains: May 18
- Onset of growing season: June 16

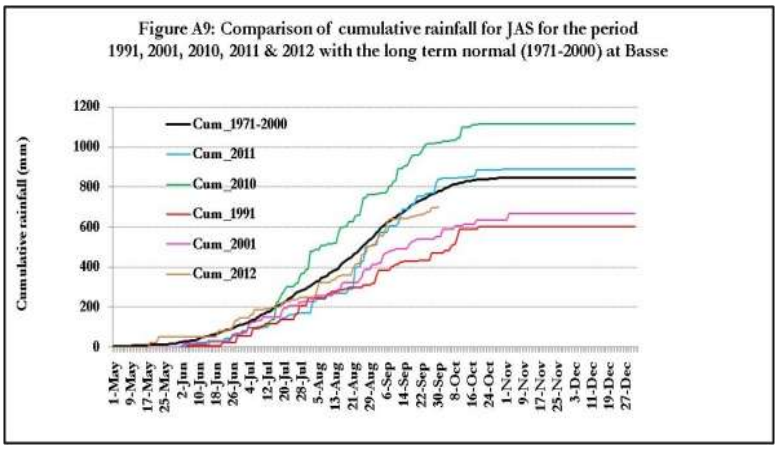


Figure A9: Comparison of cumulative rainfall for JAS for the period 1991, 2001, 2010, 2011 & 2012 with the long term normal (1971-2000) at Basse

3.3 Onset dates

3.3.1 Mean onsets dates

Agriculture in the Sudano–Sahelian zone is heavily dependent on the seasonal characteristics of rainfall, that is, onset, length and end of the rainfall season, seasonal rainfall amount, and intraseasonal rainfall distribution during the rainy season. The onset of “useful” rains, that is the first rains sufficient to ensure enough moisture in the soil at the time of the planting and not followed by prolonged dry spells that could prevent the survival of seedlings after sowing, is certainly the major point for agriculturists.

Figure 5 shows mean onsets dates for 2012 crop/growing season in The Gambia using precipitation daily data from January to December. The onset was defined using criteria as first rainfall after 1st May amounting to 20 millimeters or more in one or two consecutive days that is not followed by a dry spell of 10 days in the next 30 days *(Alimi & Gomez 1992)*. The graph reveals rainfall onsets around June 16 at Basse, Fatoto and Georgetown, between 22nd and 28th June at the remaining parts of the country.

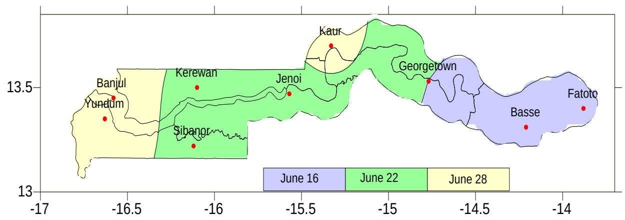


Figure 5: mean onset dates (Jan-Dec data)

3.4 Comparison of yield and onsets with the cumulative rainfall

3.4.1 Crops grown in The Gambia

The Gambia is primarily an agricultural country with more than 70 percent (%) of the population of 1.5 million depend on agriculture for its food and cash income. The rural area form majority of the farming community and used Dabada for their farming systems. Dabada is defined as the farm production unit in which two or more individuals (within the same compound) cultivate farms, outside the communal farm, for their own individual needs *(http://www.accessgambia.com/information/farming-agriculture.html)*. The most important crops in The Gambia are; rice (upland and swamp), groundnuts (old & new variety) millets (early & late varieties) sorghum and maize and groundnut is the main cash crop. Most Gambians used rice for their daily consumption and this study focuses on groundnut and millet.

3.4.2 Groundnuts

Groundnuts (Arachis for hypogea) are sown immediately after the first rains in June and are harvested between September for new variety and October to November for the old variety Optimal yields are around 851.5 kg/ha for new variety and 900 kg/ha for the old variety (Verheye and Camara, 1999). Groundnuts require about 500 to 700 mm of reliable rainfall over the total growing period *(http://www.fao.org/nr/water/cropinfo_groundnut.html)*.

3.4.3 Millets

According to Verheye and Camara, 1999, Millet (Panicum italicum) is traditionally sown in May to June and harvested from late September onwards. Early varieties (Souna) are sown after the very first rains in late May or early June, and are harvested late September to early October. Late varieties (Sanyo) are sown in the second half of June up to early July, and harvested up to November. Average yields are around 851.5 kg/ha for new variety and 900 kg/ha for the old variety (*Department of Planning, 2007*). Example of some crop varieties cultivated in The Gambia.

Table 2: Types of millet

Varieties	Recommended Zones	Ecological cycle (days)	Water Requirement (mm)
Souna 3	Nord and west	90	420
Sanio	East and South	120	600

Source : Department of Planning (DOP), Banjul, 2005

Figure 6a: Upland rice (Nerica rice 90 days)

Figure 6b: Long variety (120 days)

Figure 6c: Millet or Sanio

Figure 6d: Groundnuts Arachis hypogaea (90 days)

3.4.4 Results of Average yield (kg/ha), mean Onsets (days) and Cumulative rainfall (mm)

Figure 7 (right) shows average yield in kilograms per hectare (kg/ha) for early millet, late millet, upland and swampy rice, groundnuts new and old variety, maize and sorghum during the period 2001 to 2009 for The Gambia. The results illustrates average yield ranging from 550 to 1685 kg/ha with the lowest of 550kg/ha for the ground new variety in 2007and highest yield of 1685 kg/ha for the maize in 2001. Highest cumulative rainfall of 1094.8mm was recorded for 2008 with a mean onset around June 18th. In contrast, the lowest rainfall of 661.0mm and mean onset on June 23rd prevailed in 2002. Cumulative rainfall amount of 867 with a mean onset on July 2nd was indicated during 2007 season in figure 7 (left).

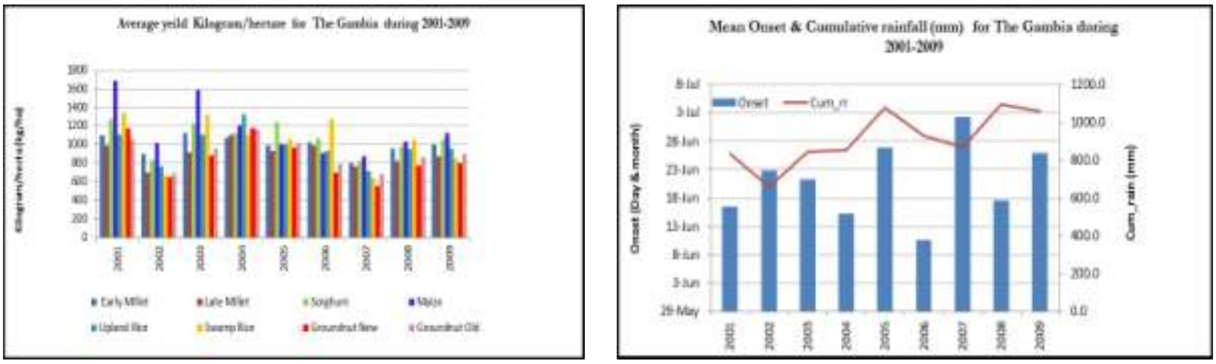


Figure 7: Average yield in kg/ha (left), *Source : Department of Planning (DOP), Banjul, 2005*
Right: Mean onset (day & month) and cumulative rainfall (mm), 2001-2009 (*source: Department of Water Resources, Banjul*).

3.5 Assessment of JAS seasonal Precipitation forecast for Analog years (2012, 2001 & 1991) for The Gambia

3.5.1 JAS precipitation Anomalies for 1991, 2001 and 2012

The analysis in Figure 8a shows the results of the precipitation anomalies for the 1991, 2001 and 2012 wet season (analog years) for JAS period. Well Below conditions dominated almost over the entire country during 1991, whilst 2001 season observed Near normal to Below to Below Normal conditions over Basse part of CRR (south) and Coastal area of the WR with a Well Above normal situation at Banjul only. During 2012 season, Near Normal conditions was observed over Kaur, Janjanbureh, Basse and Fatoto, Above normal condition exist at the remaining part the country, Well above Normal prevailed at Jenoi and over Yundum.

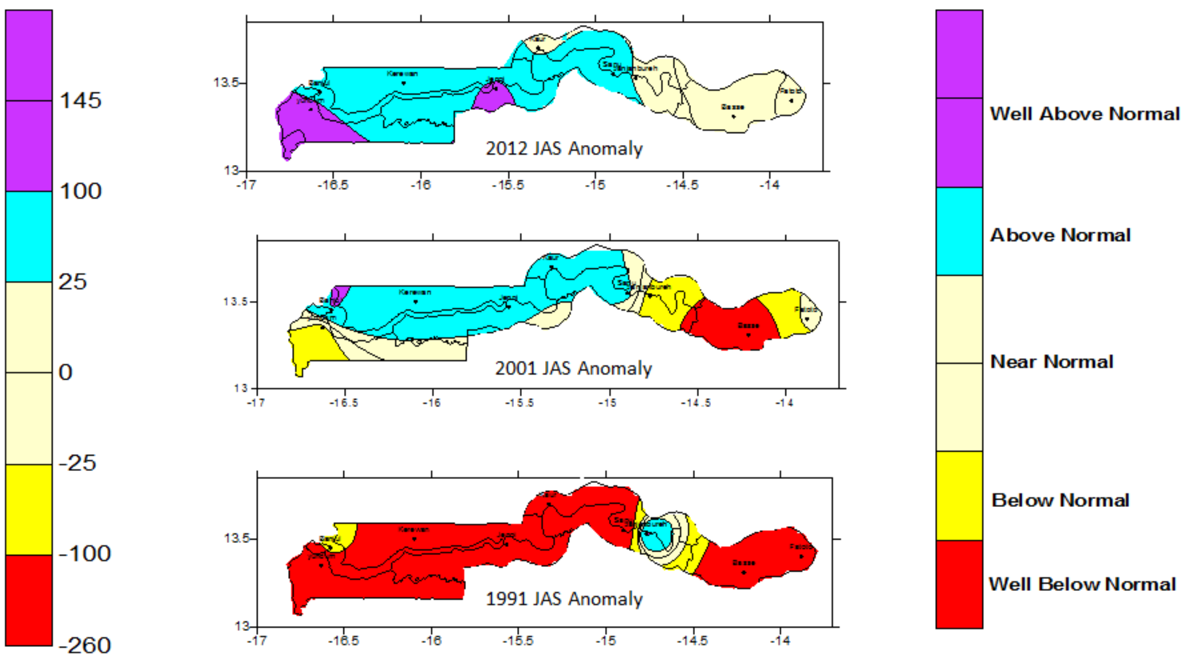


Figure 8a: JAS Precipitation Anomalies (mm) for 2012, 2001 & 1991 wet season.

3.5.2 JAS Percentage (%) of normal precipitation for 1991, 2001 and 2012

Analysis indicated in figure 8b shows the percentage of normal for Analog years for JAS period. During 2012 season, the percentage of normal (-25% to 100%) prevailed over the entire country, except over Jenoi which experienced 115%. The 2001 wet season also illustrated that, the Gambia observed -25% to 100% situation with only Basse observing -28%. In 1991, well below to Below Normal conditions prevailed over Yundum at WR, Kerewan (part of NBR), Kaur (at northern part of CRR), and Sapu at CRR south, over Basse and Fatoto at the URR.

During 2012 season, Near Normal conditions was observed over Kaur at CRR (north) Janjanbureh at CRR (south), Basse and Fatoto at the URR, whilst Above normal condition exist at the remaining part the country. Well above Normal prevailed at Jenoi at the LRR and over Yundum. However, the country experienced more than 75% rainfall in 2012 during JAS.

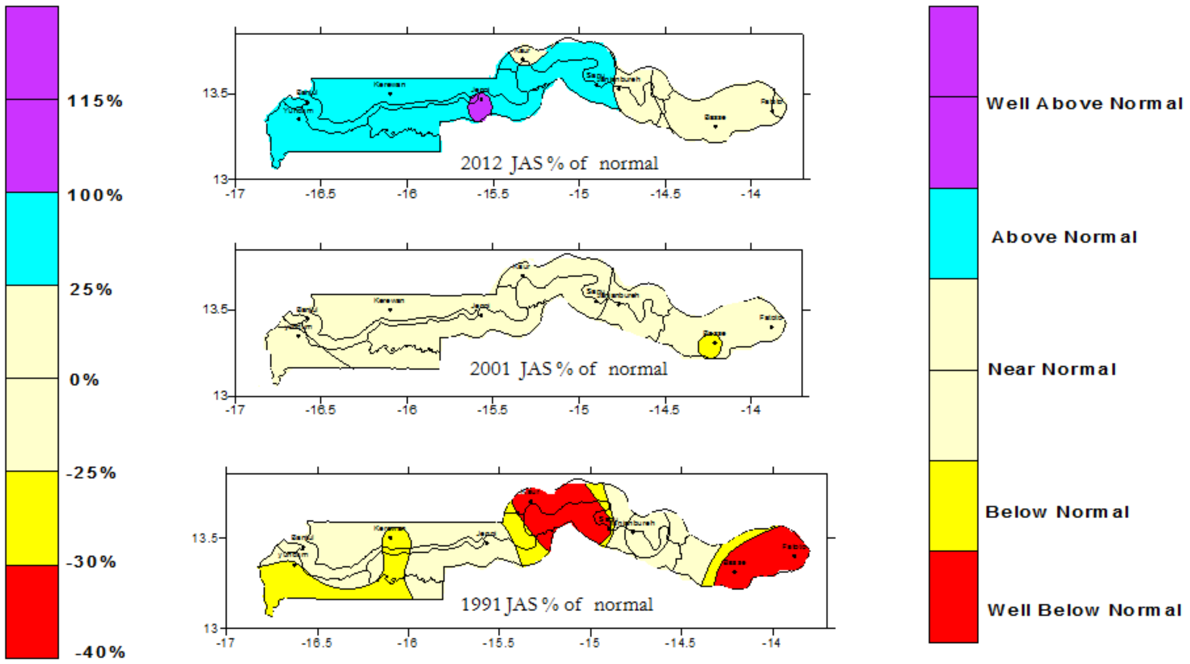


Figure 8b: JAS percentage % of normal precipitation for 2012, 2001 & 1991 wet season.

3.6 Verification of Precipitation anomaly percentage (observed) for The Gambia and Africa (estimated) from rain gauge data focusing on 1979-2000 base period

Having looked at the verifications for the above stated period, Africa 2012 was characterized by a very active monsoon season in the Sahel. The Gambia recorded near normal to above normal precipitation during JAS including many countries of the Sahel Region triggering flooding leading to major damages and fatalities (figure 9a & 9b). Most of Eastern Africa and southeastern part of southern Africa recorded below normal precipitation during the year. Northern part of South Africa recorded well below normal precipitation during February-March-April 2013 period (see annex 4).

The following months: April-May-June (AMJ), May-June-July (MJJ), June-July-August (JJA), July-August-September (JAS), August-September-October (ASO), September-October-November (SON), October-November-December (OND)are used for the verification of precipitation anomaly for The Gambia and that of Africa (estimated) precipitation anomaly.

The verification of the Precipitation anomaly percentage (observed) for The Gambia has conformed with the Africa (estimated) precipitation from rain gauge data analysis.

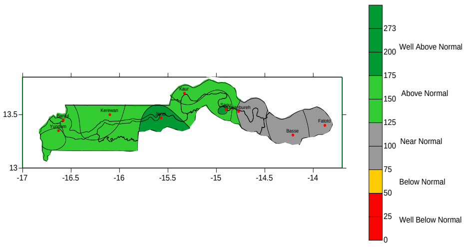


Figure 9a: Gambian precipitation anomaly percentage for JAS 2012 for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.

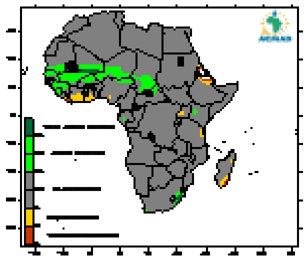


Figure 9b: African precipitation anomaly percentage for JAS 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).

3.7 ACMAD contribution to the state of global Climate for 2012 for publication of Bulletin American Meteorological service (BAM's)

Africa

Precipitation

In Africa, 2012 was characterized by a very active monsoon season in the Sahel. Many countries along the Sahelian Band from Chad to Senegal recorded above normal precipitation (figure 10a) and flooding leading to significant damages and losses. Much of Eastern African and southeastern part of southern Africa recorded below normal precipitation during the year. Northern part of South Africa recorded well below normal precipitation during the February-March-April 2013 period (figure in annex).

Temperature

African weather conditions were characterized by anomalous warmth over North Africa during much of the year with very much above normal temperature in parts of Morocco and Tunisia in June-July-August 2012 (Figure 10b).

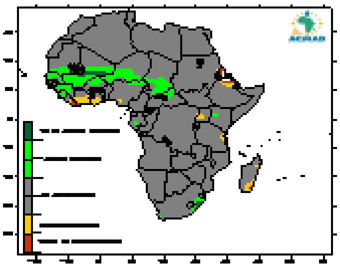


Figure 10a: African precipitation anomaly percentage for JAS 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).

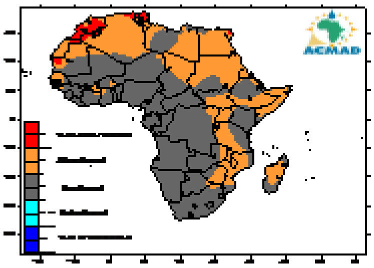


Figure 10b: African temperature anomaly for July-July-August 2012 for land areas; gridded 2.0-degree based on Temperature estimates of average focusing on the 1971-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA)

Extreme events

Central African Republic (CAR) and DRC Congo

From the end of August and into September 2012, continuous rain led to localized floods in several places in the CAR, which have damaged and destroyed houses, property and livelihoods (IFRC, 27 Sep 2012). 13,700 people were made homeless (OCHA, 9 Oct 2012).

At the end of September 2012, torrential rains caused flooding in the town of Gbadolite in Equateur province of DRC Congo. 3 people were killed, 300 houses destroyed and 327 households affected.

Congo

Heavy rains hit Pointe Noire, Congo on 17 to18 Nov 2012 at night, causing severe flooding of unprecedented magnitude during the last ten years. 5 people were killed and over 2,000 displaced.

Kenya

Heavy rains since early April 2012 have caused flash floods and landslides across the country, killing 84 people and displacing around 30,000. Nationwide, over 280,000 people have been affected. Widespread destruction of property and infrastructure has been reported, and key activities such as farming and education have been disrupted. Nairobi's Jomo Kenyatta Airport picked up 74 mm (2.9 inches) of rain within 24 hours.

Madagascar

Almost 73 people are dead and more than 21,000 people homeless after Tropical Storm Irina struck Madagascar.

Mozambique

In Mozambique, Tropical Storm "Dando" affected southern Mozambique, caused significant rainfall leading to flooding in many coastal areas with 25 people dead during 16 to 18th January, 2012. Tropical cyclone "Funso" hit Zambézia province and central Mozambique in 22 to 25th January 2012 (source: National Meteorological Institute of Mozambique)

West Africa

Precipitation

West Africa experienced a very energetic monsoon season in 2012 and caused significant destructions and damages in the Sahel Region. Recent empirical and modeling studies have found linkages between a warm summer in North Africa and active monsoon in the Sahel. Summer 2012 provided more observational evidence in this regard. On intra-seasonal timescale the precipitation over the Sahel is regulated by 3 main processes: a flow of moist air from the south Atlantic ocean associated with the West African Monsoon (WAM), the seasonal movement of the Inter-Tropical Convergence Zone (ITCZ) and a dry (and aerosol rich) advection from the Sahara. Figure 11a illustrate precipitation anomaly over Sahel for the period 1950-2012. 2012 is the fourth wet year since early 1990s after 1994, 1999 and 2010.

Temperature

Well above normal temperature (anomalies of +2°C or more) was observed over north-eastern Mali, much of Niger, Western Chad and northern Nigeria with peaks of +3°C in Niger during February-March-April 2012 (figure 11b).

Figure 11a: Sahel precipitation anomaly in cm/month for the period 1950-2012
(data source: NOAA NCDC Global Historical Climatology Network. Climatology: 1950-79, Sahel Average over 20-10N, 20W-10E.

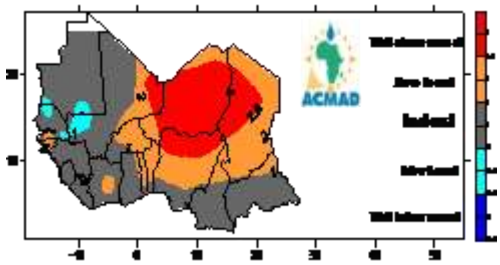


Figure 11b: African temperature anomaly for February-March-April 2012 for land areas; gridded 2.0-degree based on Temperature estimates of average focusing on the 1971-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA)

Extreme events

Burkina Faso

Between June and September 2012, heavy rains affected most of Burkina Faso, flooding many villages in the central and north eastern regions, including the four provinces of the Sahel region. The floods affected a total of 47,671 people with 33 wounded and 18 people killed.

Mali

Heavy rains in August 2012, resulted to flooding in Mali's southern regions of Ségou, Koulikoro, Sikasso, Kayes and Mopti, killed 5 people, 2,800 houses collapsed and almost 9,000 people have been made homeless, inundated also food crops.

Nigeria
In Nigeria, flooding affected Kemi Nshe, all the villages of the southern zone of Plateau State, Lafia, capital of Nasarawa State and Taraba state and Langtang in August 13, 2012. 28 people have been killed, while scores of others are still missing.

Niger
Heavy flooding in Niger over the past few weeks has killed up to 65 people and left 125,000 homeless

Senegal
several areas of Senegal, including St. Louis (North), Bambey (center) and the capital Dakar have experienced local flooding caused by torrential rains in July 2012.August 26, 2012 districts of Sourah, Keur Niang, Darou Miname, Gare Boundaw, Ndame and Darou Khoudoss have been the worst affected (grand mosque). 18 dead and 42 injured, 800 chickens has also been swept away by the water.

The Gambia
Floods and windstorms had affected nearly 23,000 people in The Gambia as of 9 Sep 2012. Almost 20% of the affected population were displaced (3,857 people) while 10 people were reported to have died either through drowning or burial by collapsed structures. North Bank and Lower River regions were the worst affected, accounting for more than half of the affected population and deaths.

Chad
Heavy rains in early August 2012 caused flooding in many parts Chad. By September, the floods had affected 466,000 people and killed 34 people. 96,000 houses were destroyed and 255,000 hectares of crops flooded. In the Sila region, more than 13,000 households were affected, and the flood blocked major humanitarian supply routes. In Guera, about 850 people were in need of emergency support. Floods were also reported in many areas of N'djamena, the capital.

Cameroon
From mid of August to late September 2012, large areas in the Northern Region of Cameroon recorded heavy rainfall and flooding. Tens of people died and hundreds were left homeless.

4.0 CLIMATE DATA MANAGEMENT SYSTEM (CLIMSOFT V.3.0)

4.1 Introduction

The CLICOM system was mainly implemented through the WMO Voluntary Cooperation Programme (VCP) for each country and still operational in The Gambia. CLICOM is an acronym for Climate Computing and runs on Microsoft Disk Operating System (MS-DOS). It was becoming difficult to adapt CLICOM on new operating systems and it was recommended to replace CLICOM with CLIMSOFT.

CLIMSOFT is an acronym for CLIMatic Software and is free software developed under a UK Met Office sponsorship. CLIMSOFT is portable and can be implemented to any relational database management system of once choice, whilst CLICOM is limited only to DataEase. CLIMSOFT is developed by three experts from the National Meteorological Services of Zimbabwe, Kenya and Guinea.

Objective of CLIMSOFT

- To impart adequate skills on the effective management of climatological data using CLIMSOFT Climate Data Management System (CDMS).

- to provide a CDMS that is affordable, reliable, efficient, scalable, easy to use and easy to adapt to new requirements (e.g. new product outputs, XML)

4.2 Creation of a Database

By definition, a database is an organized collection of software's that enables creation, generate and interrogate independent database application. You need to get network of meteorological observations of a region in order to construct a databank. A software application designed for working with databases is called a database management system (DBMS). Currently, the most widely used type of DBMS is a Relational Database Management System (RDBMS). The most common RDBMS designed for small databases is MS Access, which comes as part of MS Office. A database needs to be designed before any data can be stored. RDMBS applications like MS Access offer tools for designing databases, but the design can be produced independently of a RDBMS application. Access works with Climsoft and the Meteorological observation network is defined in in Access table. Its importance is to serve each data, save the number of each element code, and World Meteorological Organization (WMO) code.

In a properly designed database, a table should store only data which can be logically grouped together and identified as belonging to a particular entity like a station. Each entity must have a name and one or more attributes making up the entity. For example in meteorology, if we consider a **station** as an entity, it will have attributes like ***station name***, ***station ID***, ***latitude***, ***longitude***.

Relational database management systems are based on relational mathematics. From a more practical point of view, the data are stored in rows and columns, similar to a spreadsheet.

The database objects used for storing data are known as tables. In relational database terminology, the rows are referred to as records while the columns are known as fields.

Climatology serve the meteorological data with precise observation times observed by WMO. This data is entered in ACCESS software which is an intermediate database and should have geographical coordinates of each station, begin date and station history. The Access software has limitation of **2GB** of data, so the capacity should be checked any time large data is entered.
The goal of Access is (i) secure or store climate data of countries, (ii) explore environmental information's, (iii) create, produce and disseminate climate products, (iv) manage, control and treatment of information's (v) database at users disposition.

4.3 Starting MS Access

4.3.1 Table Design in MS Access

Table designing in MS Access is a collection of data in tables for different names. Each table contains information's of each element, field and column. We first parameterize and define the tables which are the data base. We have **OBSERVATION**, which defines, the **station**, **element**, **date** and **hour**, value (sometimes define the weather, Local Time (LT), (Universal Time)

Creating a new database in MS Access
Start Microsoft (MS) Access to create a new database. Double click on **MS Access icon**; click on the menu item **File**, then **New.** Design a new table called **station** by double clicking on **Create table** in Design view to get the new screen in Figure 12a. Click on new Blank database give the name **Climsoft_db1.mdb** in a new folder named **D:\ program files (x86)\Climsoft\dbase.** Save your work without creating **a Primary Key**, by answering No to the dialogue which comes up asking you if you want to create a primary key. After creating the new database, we get a screen similar to figure 12b, showing the types of database objects available in MS Access.

In the table, **STATION** is define;

- Station **ID** or WMO **station name**
- Geographical coordinates **(Latitude, Longitude and altitude)**
- **Type of station** (synoptic or climatology)
- Station **location**

In the table, an **ELEMENT is define ;**

- Different element names installed at a particular station (e.g. synoptic, climate, agrometeorologic. Elements examples : rainfall, temperature, humidity and maximum instantaneous wind.
- Element **codes : Tmax 002 =** Maximum Temperature**, Tmin 003=** Minimum Temperature, **RR 005** = rainfall.

- **Units** of measurements of parameters **:** e.g. Precipitation in **mm ;** Temperature in ^{0}**C** and Humidity in **%.**

If you double click on **station** in the newly created table**,** you will then get the new station object in datasheet view. This allows you to enter some data like you would do in a spread sheet.

Figure 12a: Creating new database

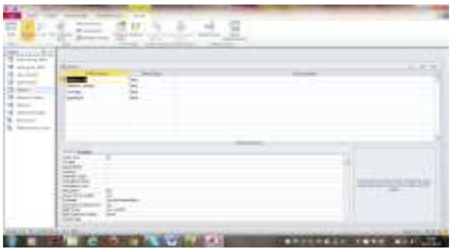


Figure 12b: Configuring field data types and field properties

4.3.2 Query Design in MS Access

A query is defined in easiest form of an object used for selecting data from a table. The structural language serve to create the relationship between the tables. Therefore, there should be difference between **Observation** and **station** but at times the two are related. However, in many cases one would want to carry out other operations on the selected data e.g. adding the selected data to an existing table or modifying the selected data.

To create a new query from the MS Access main window, click on **Queries** under **Objects** and then double click on **Create query in design view** to get the screen shown in figure 13b.

Warning on Action Queries

Action queries are those queries that will make changes to data in a table e.g. Append Query, Update Query and Delete Query. You must always first view the output of an action query before executing it, because the changes made to the data in the table cannot be reversed.

Delete Query

To design a delete query, we first design a select query to select the records to be deleted. The criteria for the records to be deleted must be clearly specified and then click on **Delete** from the Tool Bar.

Primary Key

We save all the climate data in tables. A Primary Key is a field that uniquely identifies a table record and cannot contain a Null value (a unique field to identify saved information's).
A field or combination of fields is configured as a Primary Key or Index by selecting the field or combination of fields and then clicking on the **Primary Key icon or Indexes icon** on the tools below the menu items in table design. An Index is a field or combination of fields

designed for record searching. The index enables data quality control. Data errors are possible and quality control is very important in making a database.

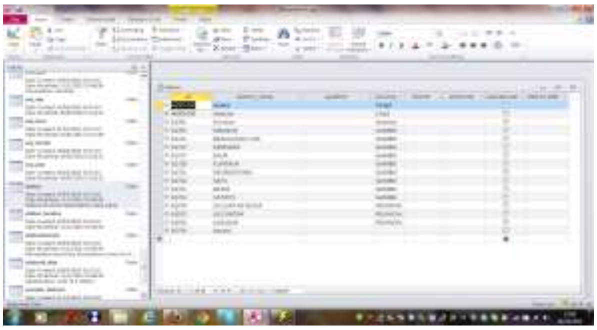


Figure 13a: Table designed in Access

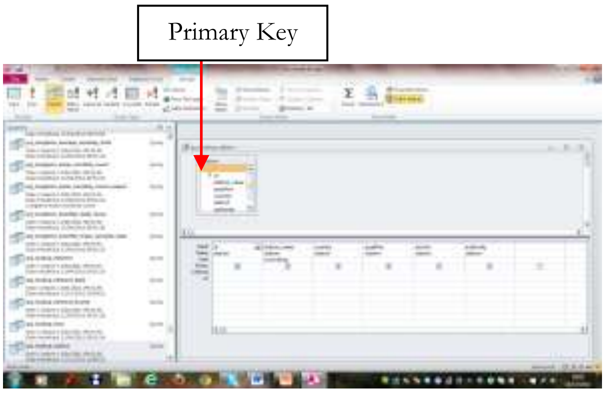


Figure 13b: Query design

4.3.3 Relational Database Design

Relational database management systems are based on relational mathematics. From a more practical point of view, the data are stored in rows and columns, similar to a spreadsheet. The database objects used for storing data are known as tables. In relational database terminology, the rows are referred to as records while the columns are known as fields. Unlike a spreadsheet, a database needs to be designed before any data can be stored. RDMBS applications like MS Access offer tools for designing databases, but the design can be produced independently of a RDBMS application.

In a properly designed database, a table should store only data which can be logically grouped together and identified as belonging to a particular **entity** like a station. Each entity must have a name and one or more attributes making up the entity. For example in meteorology, if we consider a **station** as an entity, it will have attributes like ***station name***, ***station ID***, ***latitude***, ***longitude***. See table 3a. Another entity shown in table 3b would be **instrument** which would have attributes like ***instrument name*** and ***serial number***.

Table 3a: Station Entity

Station
station_name
station_id
latitude
longitude

Table 3b: Instrument Entity

Instrument
instrument_name
serial_number

Table 3c. Observation Entity

Observation
station
obs_element
obs_datetime
obs_level
obs_value

Rather than showing this design in graphical form we could also represent the design as follows: **Entity** (attribute*1*, attribute*2*,…….attribute*n*). For example **station** (station name, station ID, latitude and longitude).

However there is need for a systematic approach to the identification of these entities. We are interested in observing and storing and the primary data should be identified first.

In meteorology or climatology, the primary data of interest is the **observation**. For an observation value like say **20.7** to be meaningful there would be need to know ***what*** (**element**) this value represents. A value of **20.7** could be temperature or precipitation. We also need to know ***where*** (**station**) the value was observed and ***when*** (**datetime**) the value was recorded. So at the first level of design, we would have **observation** as an entity as shown in table 3c, with attributes of ***station***, ***element***, ***datetime*** , ***observation level*** and etc.

When we have drawn up an exhaustive list of attributes we then look at each attribute in turn to see if the attribute has its own attributes. For example if we look at ***station*** as an attribute of the **observation** entity, it would be observed that **station** has its own attributes like ***station name***, ***station ID***, latitude, ***longitude***. In this case, we design separate secondary entities for such attributes like station, but still maintaining them as attributes of the original entity e.g. observation. This process of identifying secondary entities from a primary entity is called **normalization**.

Strong Entities and Weak Entities

An entity whose existence does not depend on the existence of another entity like the entity **station** is known as a strong entity or parent entity while an entity that depends on the existence of another entity is called a weak entity or child entity. An example of a weak entity is the entity **observation**. A strong entity must have a Primary Key but it is not mandatory for a weak entity to have a Primary Key.

Entity Relationships

In designing databases there is nearly always a need to define relationships between entities. For example in meteorology we know that an observation belongs to a particular station and that for one station we can have many observations, giving a one to many relationship. To design relationships in MS Access, we click on menu item; **Database Tools, Relationships** icon **Referential integrity**, the **Create** button and finally the relationship is created (figure 14).

The type of relationship created in this case is a one to many relationships. This means that for one station, we can have many observations. And referential integrity means that before we can have an observation, a station must exist i.e. an observation must refer to an existing station. We cannot have an observation which is not associated with a station. The non-Primary Key field ***station*** in the **observation** table that is matched to the Primary Key field ***station_id*** in the **station** table is known as a Foreign Key.

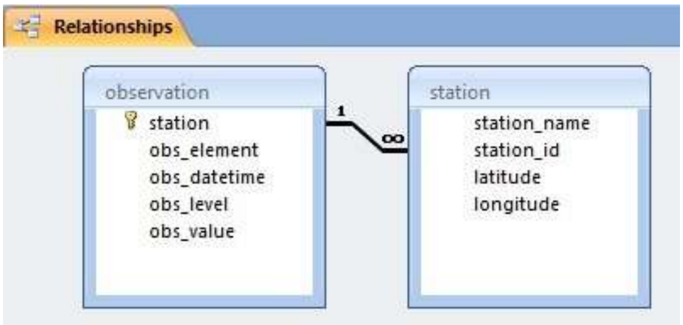


Figure 14: Relationship created

Quality Control (QC)

According to the WMO Guidelines to Climatological Practices, climatological data should go through a number of QC checks. The data Quality Control (QC) is done manually in climatological data management .One of the QC checks is for internal consistency, for example to check that for a given station and observation time, the maximum temperature is greater or equal to wet bulb temperature, or minimum temperature reading higher than maximum temperature.

4.4 CLIMSOFT 3.0

The Climsoft system is a suite of software which is specifically designed for storing climatic data in a secure and flexible manner, and for obtaining useful information using these data.

The system comprises:

- A Database, which holds climatic data for multiple stations in a logical and flexible structure.
- A Data Entry program, to allow users to add new data to the database in a secure and controlled manner.
- Facilities for importing climatic data in various formats into the database.
- Quality Control checking of data that has been loaded into the database.
- A number of Products, application programs which use subsets of the data stored in the database to produce useful reports, summaries and diagrams.
- Systems Management facilities for administering the database and for tailoring the functions of the system to local needs.

Climsoft system layout guide

This guide deals specifically with using the Data Entry program and the products supplied as part of the standard Climsoft system. It is divided in the following sections;

- **The ClimSoft Program:** Shows how to start the Climsoft program and describes its general features.
- **The Key-entry facility:** Describes in detail how to use the Data Entry facility,

including a description of all the standard data entry forms.

- **Checking Data Quality:** Describes the quality control facilities available for checking the consistency of data that have been entered, and for correcting values when necessary.
- **Updating the Database:** Describes how to update the intermediate and main databases once the data have been checked.
- **Products:** Describes the standard products, Which extract information from the database and present it in various forms. The section gives details of how to use the products and examples of the results that they produce.
- **Administration:** Describes administration functions, such as defining users of the System and updating the metadata (information about stations, elements and other entities described in the database).

4.5 Climsoft Basic Installation

To install the climsoft system, place the Data stick into a suitable drive, copy the climsoft files in a suitable folder and in my case the files are in **D** folder.
Climsoft functions with three languages namely; English, French, and Portuguese and is displayed by default in the Windows control panel.

- Click on **D:\Program Files (x86)\climsoft training\distribution\ setup.exe;** choose the language, e.g. **English, ok;** A dialogue box will be displayed, click **next, next, next;** a directory **C:\programme Files\climsoft** will show by default, you can choose it if you are using that particular directory but in my case I put in **d:\Program Files (x86)\climsoft training, I accept the agreement, next, installed.** Figure 15 window will pop up, click on **ignore** (it might not show in some computers). If installations succeed, it will show updates installed. Don't tick the boxes in the Screen that shows "*Completing the Climsoft Data Management System Setup Wizard*" (see figure 16).

Figure 15: Snapshot of message to ignore

There is an option for joining the MS Access workgroup file (system database) required for user-level security. In some cases involving Office XP, there may be need to join the workgroup file through Access in order to open directly databases with user-level security. When prompted to create or join a workgroup; open **climsoft** by clicking on climsoft icon **,** the **join** will show automatically in Ms Office 2007 and 2010. Go to climsoft menu and click on **Administration**, **Ms Office Workgroup Administrator**, Access will automatically open and will show **Work group: c:\windows\system32\climsoft.mdw,** click on **Join, ok, close.**

The dialogue shown below will appear during the final stage of the setup process, and it is recommended to leave the check boxes for all the setup options as they are particularly on the initial setup. On subsequent installations of ClimSoft, you may uncheck the options for MDAC and Windrose plot (WRPSetup).

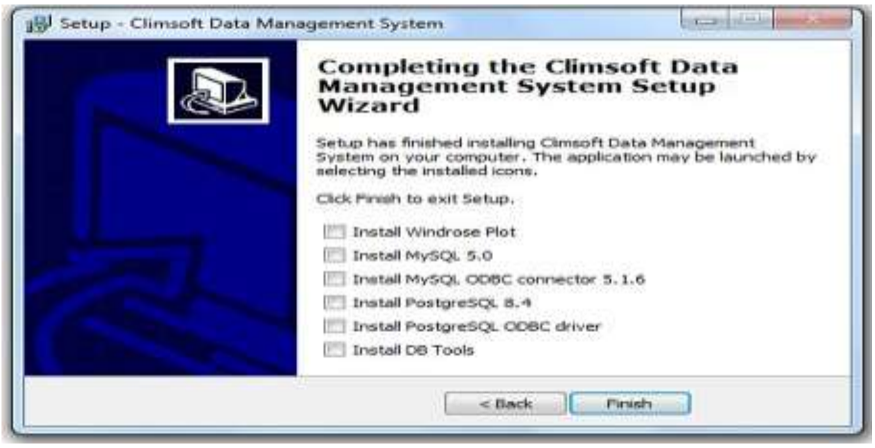


Figure 16: Completed Climsoft Installation screen

Climsoft is installed with one default user **"administrator"**. On the initial launch of the application after setup, a password for the administrator must be defined and a dialogue for this configuration appears as shown below in figure 17a.
After the administrator's password has been confirmed correctly, the login dialogue will then appear with default username "Admin" and a blank textbox for the password as shown in 17b. You will be required to enter the password (admin) you configured in the preceding stage. Enter **admin** for the password and confirm password **by** entering **admin** again**, ok.**

Figure 17a: Blank text box for password

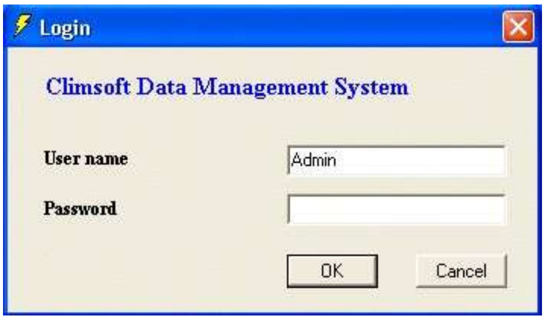


Figure 17b: Text box with user name

When Climsoft is first started, the main Climsoft window is displayed. This window is a **Welcome dialogue** and consists of a menu bar and an area that is used to contain the dialogues and forms that are currently being used (figure 18).

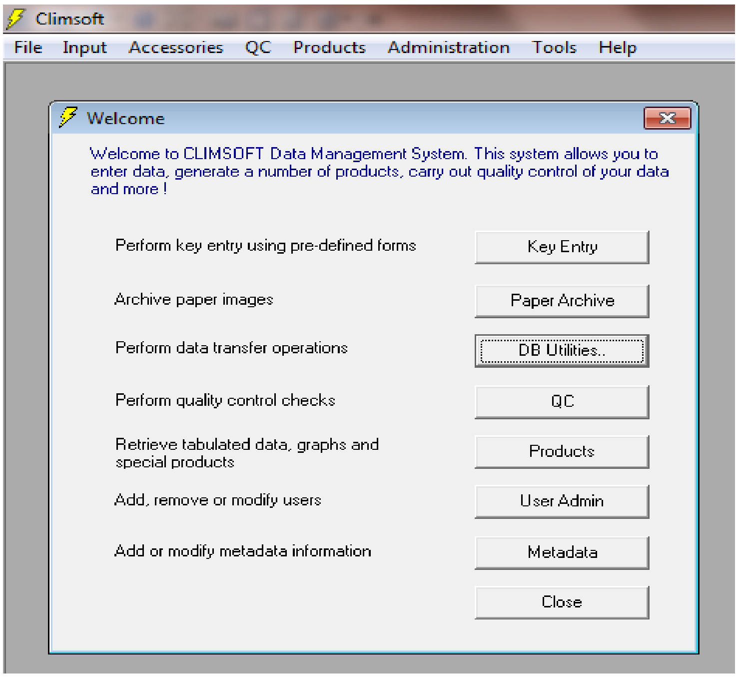


Figure 18: Climsoft DBMS window (Welcome dialogue)

The Welcome dialogue contains several command buttons that you can click to display further dialogues that enable you to perform various tasks in Climsoft. These in turn may invoke further dialogues or forms that help you specify the functions that you want to perform. Exiting from any of these brings you back to the dialogue at the previous level, and eventually back to the Welcome dialogue again.

Apart from the basic installation required to run ClimSoft, there are other installations which may be necessary or even mandatory for the proper functioning of ClimSoft, or to enable its integration with other utilities like example, the program for windrose plotting. The following five files were also installed; (i) **mysql connector**, (ii) **mysql5.0_setup.exe,** (iii) **Psgl dbc.msi**, (iv) **postgresql 8.4.2.1. windows**, (v) **prosetup 3039 EN.exe.**

4.6 Climsoft Key entry

Key Entry facility of the Climsoft program enables you to take climatic data that has been supplied on paper forms and input the data via the keyboard into the Climsoft system. A number of quality checks will be performed automatically as you enter the data to catch obvious errors. These may be caused, for example, by mis-typing on the keyboard, misreading of the paper records, or misrecording of the original observation. If a problem is detected, the program will display a suitable message, and will give you an opportunity to correct the problem.

Key entry Layout

Climsoft standard Data Entry forms all have a similar layout, to make them easy to understand and to use. They are intended to reflect the structure of typical paper forms used to record climatic data. The general layout can be illustrated by one of the forms, "**Data for one element**

for the whole month", which allows daily data about a particular element to be entered for a whole month.

To get the Key entry layout to enter your data; click on **key entry** (figure 19a), double click on "**Data for one element for the whole month**" (figure 19b), a blank daily data Key entry layout will show (figure 19c), and you type in the station of interest (e.g. Yundum), element (e.g. precipitation daily total), year, month, hour and the precipitation values, then you will get a dialogue box as in figure 19d.

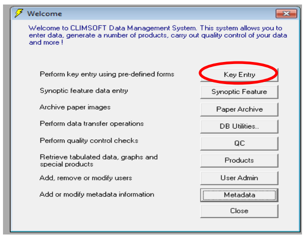


Figure 19a: Climsoft DBMS window

Figure 19b: Data for one element for the whole month.

Figure 19c: blank daily data Key entry layout

Figure 19d: Keyed daily data in Key entry layout.

Meta data

Metadata gives more information about observation data. A mere observation value would be meaningless if for example there is no information about where the observation reading was taken, the units of measurement, time of observation etc. Other important metadata, particularly in the analysis of Climate Change, is information on station movement over time.

To get the metadata; click on **Metadata** on climsoft DBMS window, **station**, Dialogue box for station details will appear as in figures 20a, 20b and 20c.

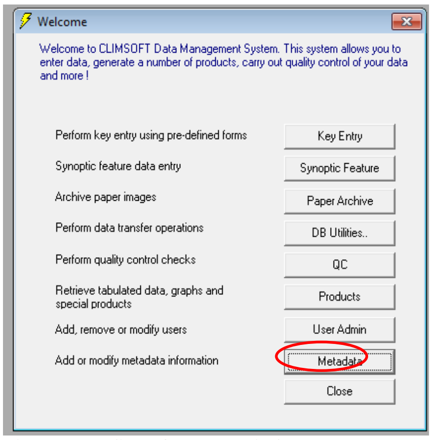


Figure 20a: Climsoft DBMS window

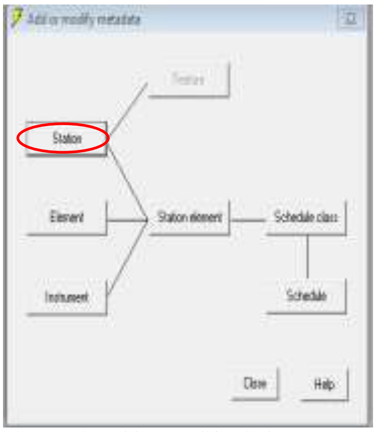


Figure 20b: Add or modify window

Figure 20c : Dialogue box for station details

The Climsoft database system was designed to support data management practices that aimed at (a) ensuring that data are processed efficiently (b) minimize chances of data loss through accidents or malice (c) ensure high quality data are available for effective decision making.

The data flow through the system Climsoft recognizes different sources of data – from the traditional paper records, to automatic equipment. Electronic forms have been designed to resemble the paper forms for data entry. Data so captured are held temporarily, quality checked, then uploaded to a central store. This process continues until the central store capacity nears such a limit as the size of the available archive/backup media, the **2GB** limit imposed by Access – whichever comes first. This procedure is supported by **3** types of files:

(1) **Temporary work file:** This is a data file in Access format comprising of tables that map directly to the data entry forms. This file is important if you design new data entry forms for a specialized data entry need that is not adequately met by the standard forms shipped with a new Climsoft installation.

(2) **Intermediate Database:** is mainly to help implement quality control procedures, to be applied to all data sets – whether coming from input forms or otherwise – before uploading to the central store.

(3) **Main Database:** is the central store and starting point for all data retrieval needed for various reports and data products. It effectively integrates data input operations and data outputs.

The data that you input will be stored in a small database called the ***Temporary Work File***. This database is "temporary" in the sense that it is a holding place for data. This data in the temporary work file is then transferred to the ***intermediate database*** **and** finally to the ***main climsoft database*** for permanent storage. Example if we keyed metadata, it will go to the Temporary work file.

4.7 Procedure to import CLIcom excel file in Climsoft

To import CLIcom file into climsoft; if your data is in excel format, save your excel file in format.csv in **d:\climsoft\program files (x86),** open climsoft, click on **DB Utilities**, **clicom_2 daily (csv), ok, update intermediate db**, **Banjul.csv** (file name), **open** (see figure 21).

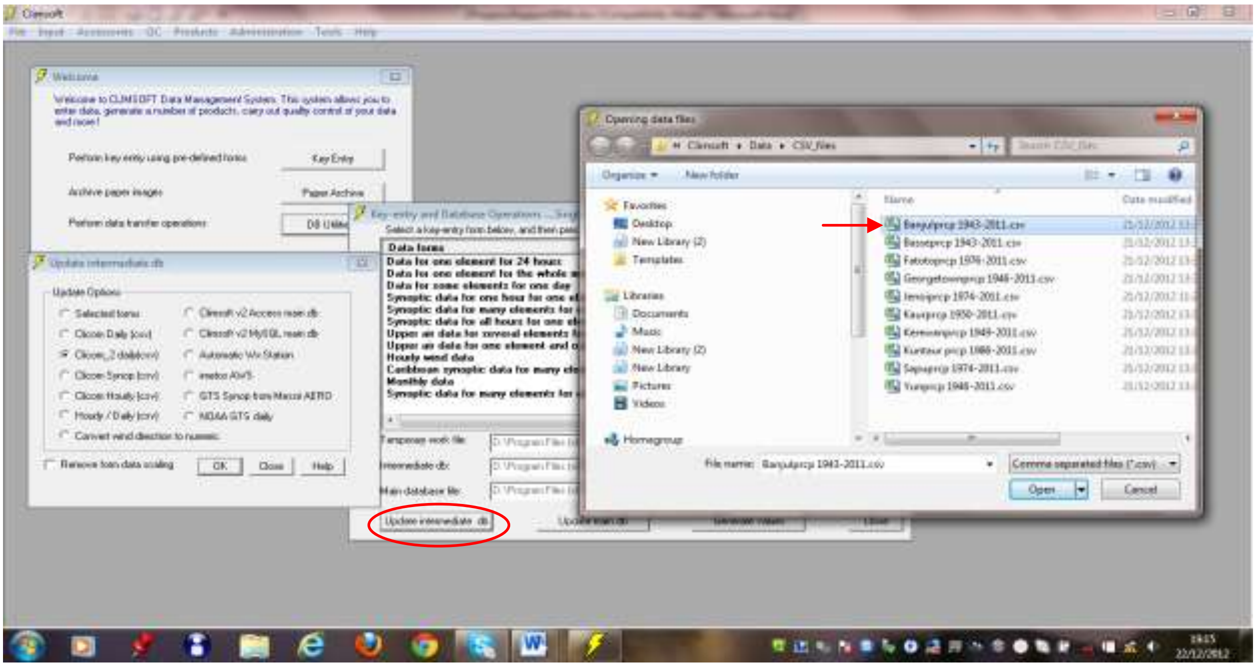


Figure 21: Importing clicom excel file to climsoft

After importing the datafiles (csv files) into climsoft from the update Intermediate db, it is then imported into the main climsoft database ; the procedure : click on **climsoft, DB Utilities** (figure 22a), **update main db** (figure 22b), **select all stations** put the **begin & end year** (*put start date of year of your data you are to use in Climsoft)*, **begin & end month** (*put start date of month of your data you are to use in Climsoft)*, **ok** (figure 22c). A window will show ; **data will now be uploaded to main database, do you want to continue**? click **yes** (figure 22d), and will be uploaded to the main climsoft database.

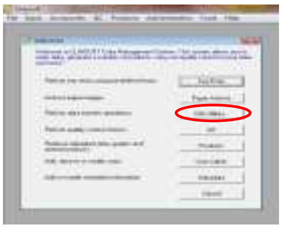


Figure 22a: Climsoft DBMS window

Figure 22b: Update main window

Figure 22c: Uploading to main db window

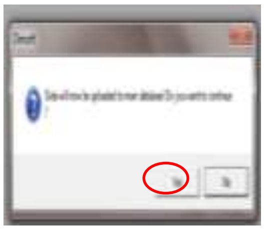


Figure 22d: Question whether to continue the upload

4.8 Procedure to import CLIcom Ascii file in Climsoft

To import CLIcom file into climsoft; if your data is in excel format, save your excel file in format.csv in **d:\climsoft\program files (x86),** open climsoft, click on **DB Utilities**, **clicom Daily (csv), ok, update intermediate_db**, e.g. **Banjul.csv** (file name), **open** (see figure 23).

A window will show indicating **"uploading please wait"** and a window will show again indicating **"clicom data will now be uploaded".** Be patient and wait until it finish loading.

You perform Quality Control and finally upload to Main database as explained in section 4.7

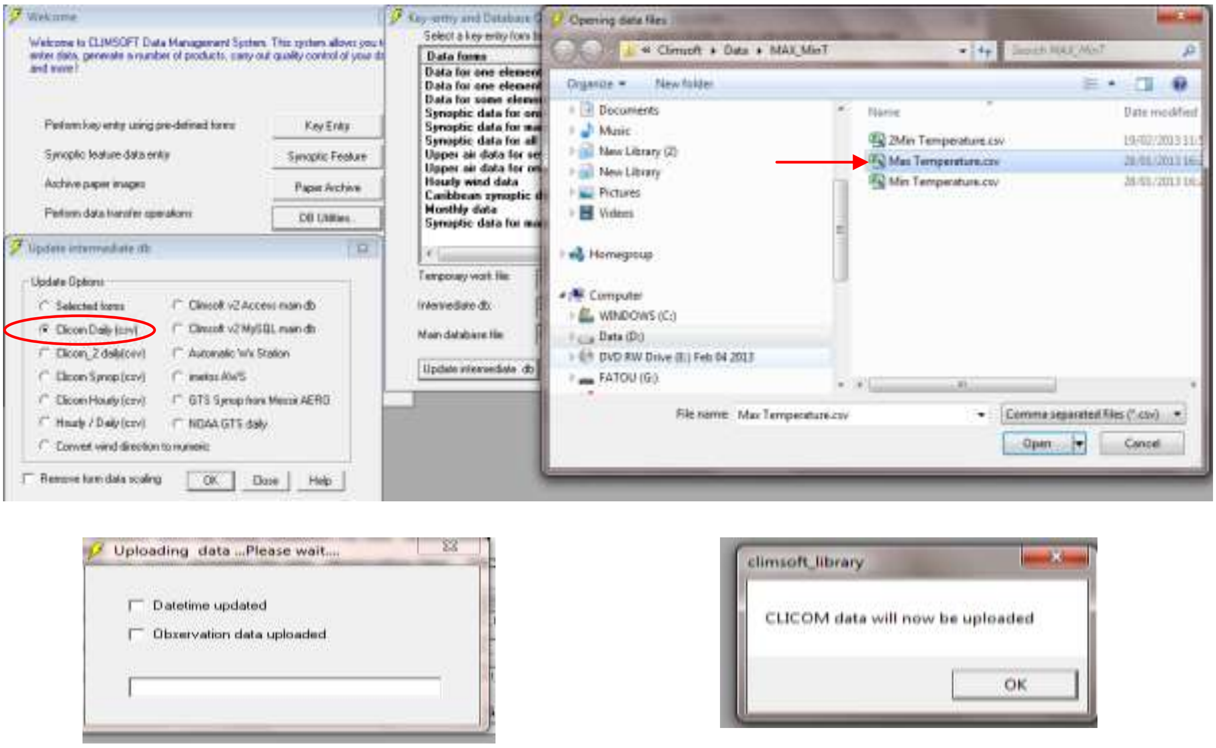


Figure 23: Window to export CLIcom ascii file to climsoft

4.9 Development of a Database for the Storage and Analysis of Data on the Geographical Positions of Large Scale Quasi-stationary Rain Bearing Synoptic Systems over Africa

Albert Mhanda and Fatou Sima, ACMAD, 24 December 2012

Abstract

The spatial and temporal pattern, and intensity of rainfall activity over Africa, largely depends on the position and activity of large scale and slow moving synoptic systems, namely, the Inter-tropical Discontinuity (ITD), Inter-tropical Convergence Zone (ITCZ) and the Congo Air Boundary (CAB). Data on the varying geographical positions of these systems is therefore of great importance in climate monitoring. Currently at ACMAD, the process of extracting and capturing the data for operational use is largely manual and laborious. At the same time, the data summaries are not suitable for direct graphical analysis. So a system has been developed to capture and store the data in a form which makes it easy for analysis.

Current Data Acquisition and Description of Existing Data Format

At ACMAD, the data on the geographical positions of ITD, ITCZ and CAB are extracted from the available systems for weather watch and prediction. The data are entered into a spreadsheet as shown in Fig 1. Below the rows of the captured data, are the 10-day statistics of the geographical positions i.e. the minimum, average and maximum latitudinal positions for **fixed longitudes**, in the case of ITD and ITCZ. In the case of CAB, the statistics are for longitudinal positions at **fixed latitudes**.

Table 4: Snapshot of data of the original ITD in Excel Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L
1		**20W**	**15W**	**10W**	**5W**	**O**	**5E**	**10E**	**15E**	**20E**	**25E**	**30E**
378	09-10-12											
379	10-10-12											
380	**Moy déca1**											
381	**Max déca1**											
382	**Min déca1**											
383												
384	11-10-12	16.48	18.32	19.03	17.36	16.28	14.54	13.21	14.28	13.03	11.01	11.31
385	12-10-12	19	18.03	16.16	13.57	14.46	15.23	14.03	13.19	14.03	11.42	11.37
386	13-10-12	12.52	15.18	16.08	16.25	17.36	16.28	14.39	14.36	13.16	12.28	14.13
387	14-10-12	17.16	17.33	16.13	16.24	18.2	17.27	14.26	12.22	12.38	11.39	13.21
388	15-10-12	15.39	16.57	18.16	16.51	17.27	16.15	13.24	14.13	13.06	12.35	15.33
389	16-10-12	15.38	18.04	17.46	19.25	20.36	17.07	13.04	13	13.07	14.06	15.52
390	17-10-12	11.52	15.33	18.1	21.13	20.56	14.5	12.11	14.19	14.38	15.02	14.5
391	18-10-12	13.55	16.15	20.21	21.02	17.52	14.19	14.25	14.5	14.44	14.01	14.5
392	19-10-12	11.52	14.50	18.45	22.01	14.56	16.15	16.03	13.49	13.30	14.50	15.02
393	20-10-12	14.54	17.01	10.31	18.13	16.37	16.13	13.53	13.22	15.12	14.54	16.15
394	Moy déca2	**14.71**	**16.65**	**17.01**	**18.15**	**17.29**	**15.75**	**13.81**	**13.66**	**13.60**	**13.06**	**14.10**
395	Max déca2	**19.00**	**18.32**	**20.21**	**22.01**	**20.56**	**17.27**	**16.03**	**14.50**	**15.12**	**15.02**	**16.15**
396	Min déca2	**11.52**	**14.50**	**10.31**	**13.57**	**14.46**	**14.19**	**12.11**	**12.22**	**12.38**	**11.01**	**11.31**
397												

ITCZ_Data / 2012 / ITD

Relational Database Design in MS Access

In order to store the data in a form more suitable for long-term storage and easier analysis, a relational database has been developed. Figure 24d shows the entity relationships diagram (ERD) consisting of two tables, namely, "**synop_feature**" (figure 24a) and "**feature_geographical_position**" (figure 24b). The name and description of a synoptic feature are stored in the "**synop_feature**" table, and information on the various positions occupied by a synoptic feature is stored in the "**feature_geographical_position**" table. More attributes could be added to each of the tables, for example an attribute on intensity could be added as an extra field to the table "**feature_geographical_position**". The table "**synop_feature**" can store any type of synoptic feature of interest in addition to the currently analyzed systems of ITD, ITCZ and CAB.

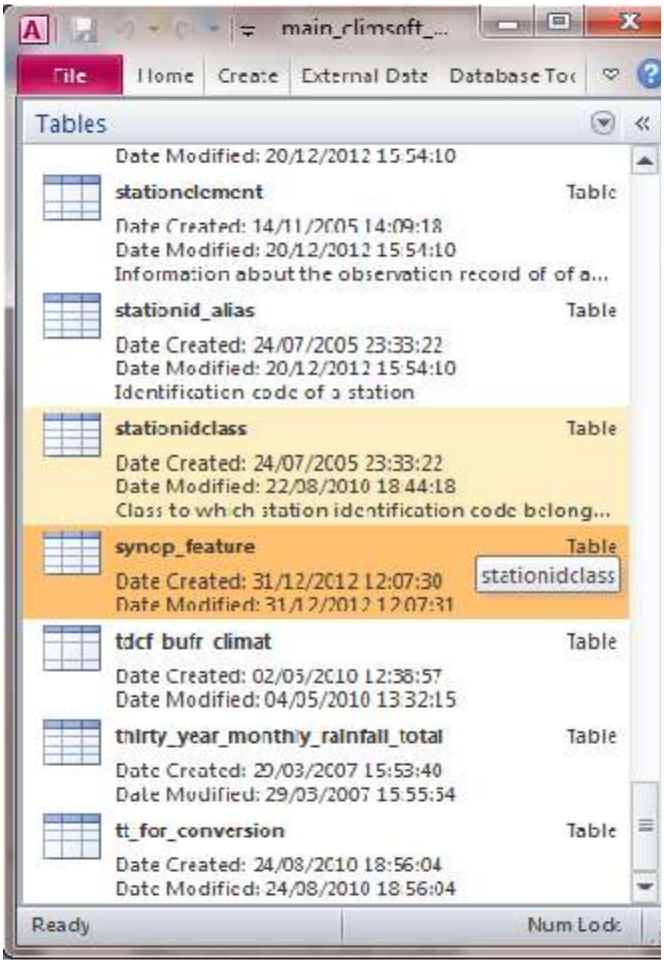


Figure. 24a: synop_feature

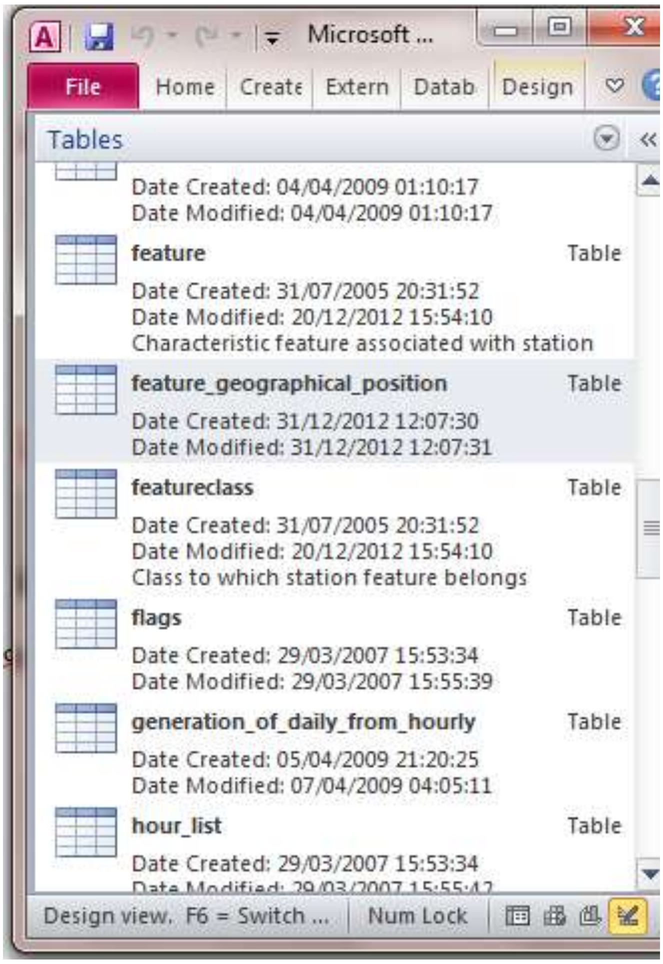


Figure 24b: feature_ geographical position

The design of the tables includes constraints to ensure the integrity of the data. The abbreviated name of the synoptic feature "**name_description**" has been made "Primary Key" to ensure that the name of each synoptic feature and its description are entered only once. An "Index" has been defined on the "**feature_geographical_position**"table to enforce a rule that on a given day, for a selected synoptic feature, for a particular latitude position there is only one corresponding longitude position, and vice versa. An Index is a field or combination of fields designed for record searching, e.g. you want to identify uniquement of a child e.g *belongs_to and etc*. in figure 24c. (As the entity relationship diagram shows, there is a one to many relationships between "**synop_feature**" and "**feature_geographical_position**", which means that, for any one synoptic feature, e.g. ITD, there are many geographical locations.

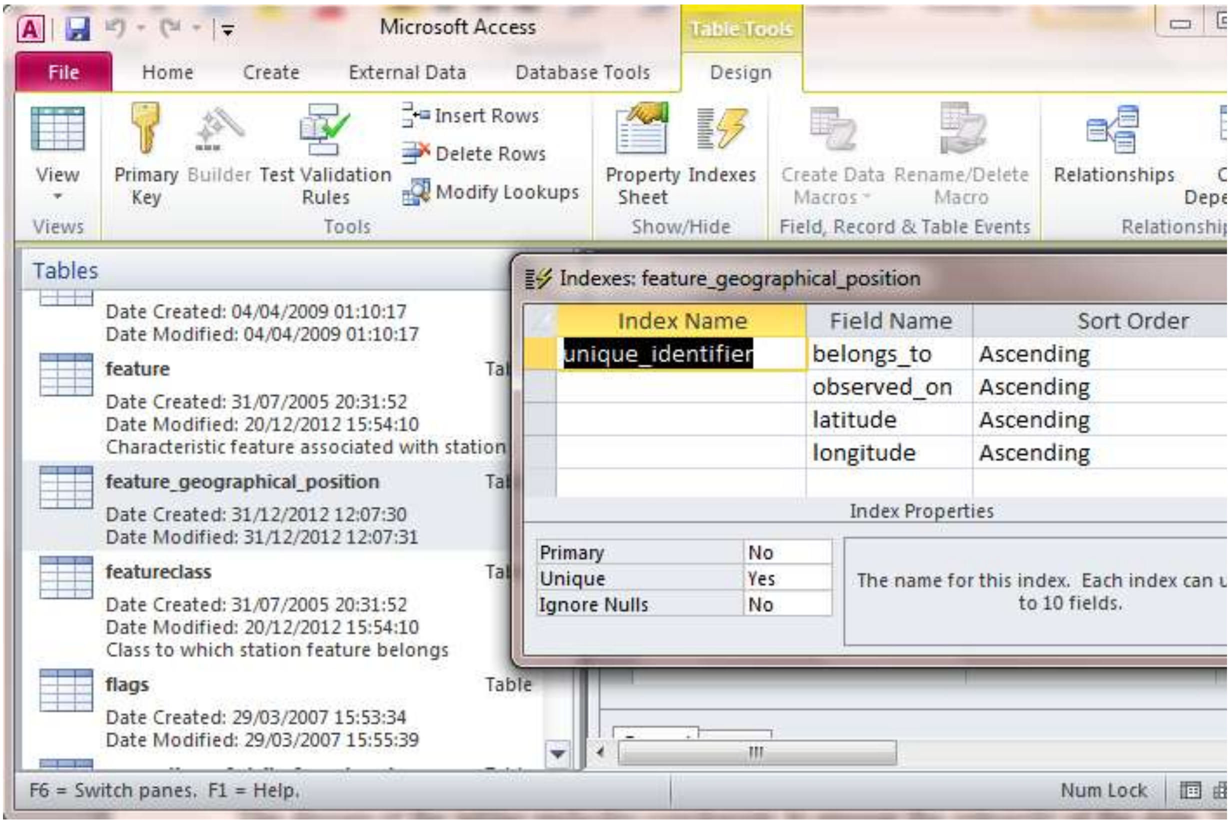


Figure 24c: Index design window

The new database tables have now been added to the design of the Climsoft main database.

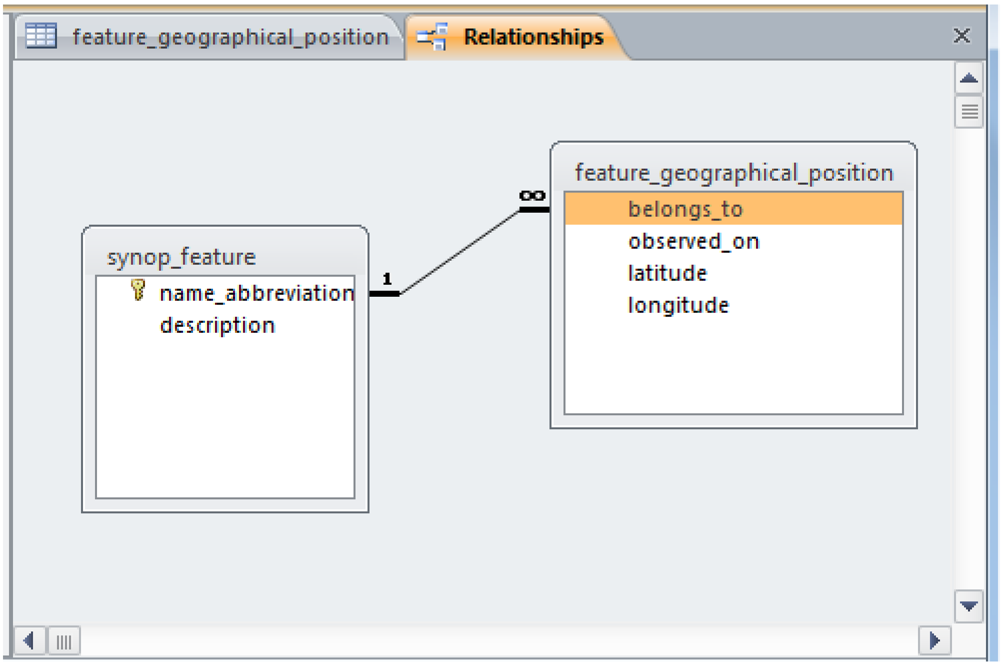


Figure 24d: Entity Relationship Diagram in MS Access

Re-formatting of Data and Ingestion into Database

For the data already captured into Excel spreadsheet to be imported into the database, there was need for re-formatting as shown in table 5.

Table 5: Re-formatted spreadsheet for importing into Access Database

	A	B	C	D
1	Obs_date	Synoptic_Feature_ITD	itd_Lon_values_20W	itd_Lat_values_20W
276	12-10-12	ITD	-20	19.0
277	13-10-12	ITD	-20	12.5
278	14-10-12	ITD	-20	17.2
279	15-10-12	ITD	-20	15.4
280	16-10-12	ITD	-20	15.4
281	17-10-12	ITD	-20	11.5
282	18-10-12	ITD	-20	13.6
283	19-10-12	ITD	-20	11.5
284	20-10-12	ITD	-20	14.5
285	21-10-12	ITD	-20	15.2
286	22-10-12	ITD	-20	11.5
287	23-10-12	ITD	-20	10.2
288	24-10-12	ITD	-20	13.1
289	25-10-12	ITD	-20	13.2

ITCZ_Data / 2012 / ITD / CAB / IYCZ

New Key-entry Form for Direct Capture of Data into Database

In order to simplify the capture of new data into the database, a suitable key-entry form has been designed using Visual Basic. The form is accessed from the Climsoft front end graphical user interface. Figure **24e** shows the new button for selecting the option to enter data for synoptic feature positions which has been added to the "Welcome" screen on the Climsoft user interface. The button is labeled "Synoptic Feature".

When the button for "Synoptic Feature" data entry has been clicked, the corresponding data entry form will be displayed as shown in figure **24f.** The form has data entry fields for the defined attributes of feature name, date of observation, latitude and longitude. The name of the synoptic feature is selected from a dropdown list. On clicking inside the textbox for entering date of observation, the current date will be automatically displayed. The form has been designed to behave this way because the data is expected to be entered on the same day the synoptic feature has been observed. However, the date can be modified if necessary. For ITD and ITCZ, on clicking inside the textbox for latitude, the values for longitude will be automatically generated and sequenced according to predefined fixed longitude positions. So one only needs to enter the corresponding latitude values. In the case of CAB, it is the latitude values that are automatically generated and sequenced according fixed latitude positions.

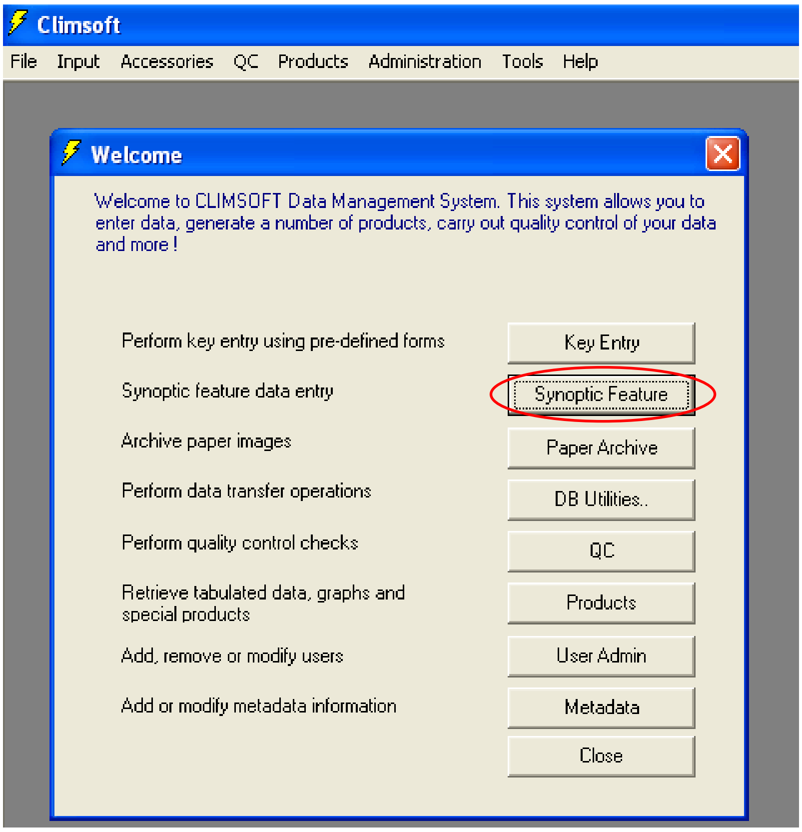


Figure 24e: New button for launching key-entry form for synoptic feature

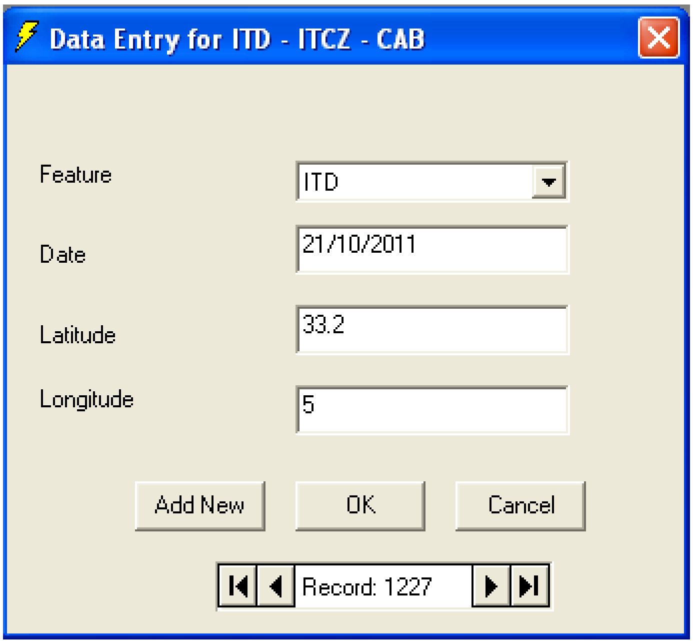


Figure 24f: Key-entry form for synoptic feature geographical positions

Dekadal Products for Climate Monitoring

A number of products for climate monitoring on a 10-day basis have been developed. Additional products can be easily developed and the layout of the data can be modified to any required format. However, the currently available format is suitable for the plotting of a graph in Excel spreadsheet with no further adjustment to the structure of the data layout.

1. **Tables of Statistics on Geographical Positions**

   Queries have been designed in the MS Access database to get tables of statistical summaries of the geographical positions for each of the currently selected synoptic features, namely ITD, ITCZ and CAB.

   An interface for generating statistics has been developed using **Visual Basic** and has been brought under the main Climsoft user interface (see figure 24g). After specifying the input parameters on the dialogue box, the output is automatically displayed in Excel as shown in table 6.

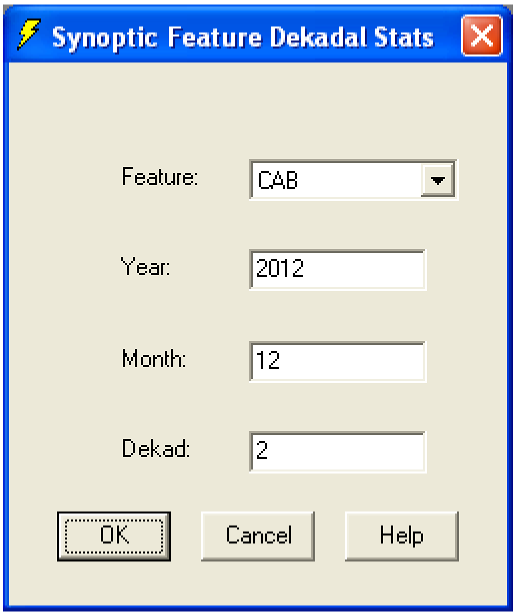


Figure 24g: Dialogue for selecting dekadal summary output

Table 6: ITD geographical positions for dekad 2, October 2012

synoptic_system	yyyy	mm	dekad	longitude	dek_min_	dek_mean_lat	dek_max_lat
ITD	2012	10	2	-20	11.52	14.71	19
ITD	2012	10	2	-15	14.5	16.65	18.32
ITD	2012	10	2	-10	10.31	17.01	20.21
ITD	2012	10	2	-5	13.57	18.15	22.01
ITD	2012	10	2	0	14.46	17.29	20.56
ITD	2012	10	2	5	14.19	15.75	17.27
ITD	2012	10	2	10	12.11	13.81	16.03
ITD	2012	10	2	15	12.22	13.66	14.5
ITD	2012	10	2	20	12.38	13.60	15.12
ITD	2012	10	2	25	11.01	13.06	15.02
ITD	2012	10	2	30	11.31	14.10	16.15

2. **Graphical Output of Geographical Positions**

A graph of the data extracted for the synoptic feature ITD, second dekad of October 2012 is shown in figure 25 below.

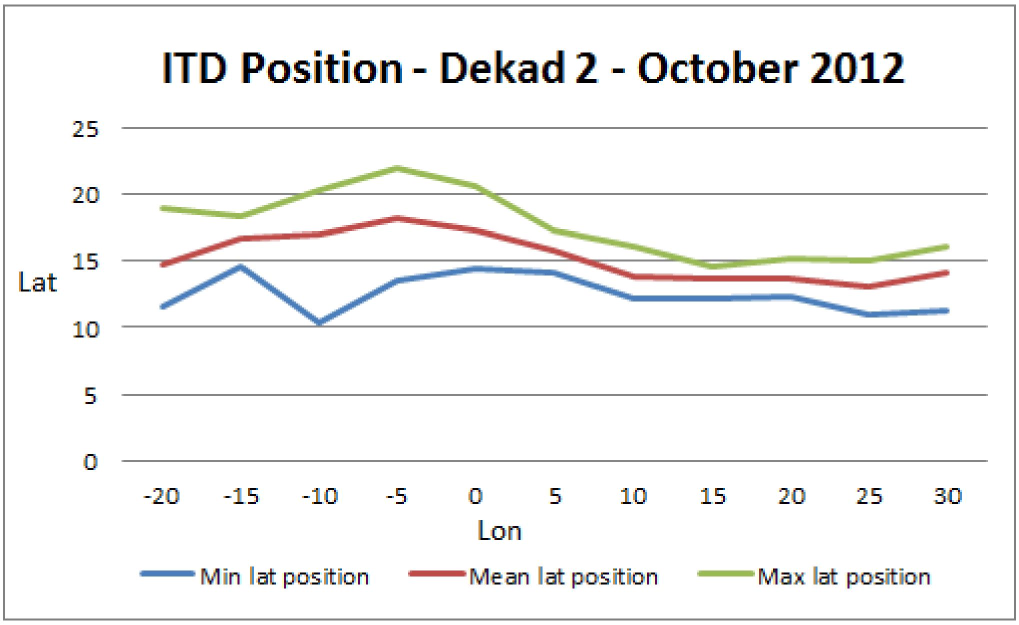


Figure 25: Graph of geographical positions for ITD

5.0 CONCLUSION/ RECOMMENDATION

The importance of the climatological reference period such as 1971-2000 in relation to the status of climate systems and parameters proved vital in the provision of climate prediction at short-range (≤7 days), medium-range (≥10 days), Long-range (≥30 days) and seasonal timescales (3-4 months).
The long Range Forecast indicated that, part of east Africa, South Africa, part of Central Africa were likely to observe well above normal precipitation during SON 2012. Well above normal precipitation was very likely over western and eastern DRC and northern half of Congo, much of Uganda South Sudan, Western Kenya, northern Tanzania, Rwanda and Burundi for OND 2012.
The rainfall profiles for 2012 shows that, almost all the regions in The Gambia recorded surplus rainfall amounts ranging from 1% at Fatoto (at URR) to 111% at Jenoi (at the LRR) compared to the long term mean 1971–2000. However, only Basse at URR experienced a deficit of 17%.

Results in the rainfall anomalies and percentage of normal demonstrated that, Near Normal to above normal conditions dominated the country during 2012. Near normal to Below Normal conditions in 2001, whilst Well Below conditions dominated almost the entire country in 1991. Nevertheless, on average the country experienced very favorable rainfall amounts in 2012 in particular during July-August-September period. Late onset of the growing season prevailed over most parts of the Gambia during 2001, 2009 and 2012 season.

The yield analysis indicates that, early millet, late millet, upland and swampy rice groundnuts (new & old variety), maize and sorghum produced a good yield particularly during 2001 to 2009 growing season, except for 2007 which produced the lowest yield. Furthermore, cumulative rainfall amount was above normal for 2007, and then experienced onset around July 2nd, this scenario is among the factors that contributed to the poor yield. Comparing the 1991, 2001 & 2012 analog years, it is agreed that, 2012 and 2001 looks similar. Base on the analysis in figure 7 (left) and also with climatological advice, we therefore, expect also good yield for the 2012 season, hence the average yield for 2001 was good.

This study concluded that, the products used to forecast rainfall amounts is not enough, therefore, it is vital to look at onsets, spatial and temporal distribution of precipitation. It is recommended that, ACMAD Centre should include onsets, distribution of the rains and the rainy/growing season during the productions of the climate and seasonal forecast.
This programme has also given us the opportunity to be familiar with the production of different bulletins as well as seasonal and long range forecasting methods. We have also gain the knowledge in managing climate database.

The database tables for the capture of data on synoptic features have now been added to become part of the Climsoft CDMS data model for the ACMAD climate database. The design for the storage of data for synoptic systems could be modified to accommodate the storage of data on other synoptic systems like jet streams. The position and strength of the Tropical Easterly Jet is a good indicator of the rainfall activity in the neighborhood of the areas below the jet stream. The database could also store data on the position and intensity of the major semi-permanent anticyclones around the African continent.

The resolution of the latitude positions could also be increased to allow the capturing of data on small scale synoptic systems (squall lines, tornado, dust -storm, etc), which can be observed at an individual meteorological station with the help of a weather radar system. In this case, the more suitable time scale of observation would be hours or minutes, rather than the time scale of a day which is more suitable for larger scale systems like ITD, ITCZ, CAB, and perhaps tropical cyclone tracks overland particularly over Southern Africa. An attribute to define the station from which the observation was made would also need to be added to the design of the appropriate table i.e. the table named "**feature_geographical_position**".

- Apart from the Seasonal forecast products, Nine (9) bulletins are prepared every month by the Climate and Environment Department. In order to enable the smooth running of the Department, to reduce the work load on personnel's (work more than eight hours a day), and also for the human health reasons, I therefore recommend ACMAD to recruit more permanent staff.

- As an African Centre, good computers or Laptops should be available for the visiting scientist as part of work material during the training period.

- We solicit ACMAD to provide vehicle to transport personnel's to and from work.

REFERENCES

- **Alimi, N., Gomez, B., 1992.** Agroclimatology of The Gambia, Department of Water Resources, Banjul. 89p.

- **Asnani , G. C. 1993:** Tropical Meteorology . Published by Prof. G. C. Asnani , Pune India

- **http://wxmaps.org/pix/clim.html:** COLA/weather and climate data/Short-Term Climate Outlooks.

- **Mhanda, A., 2012:** Climsoft training course notes, African Centre for Meteorological Applications for Development.

- **Mukabana, J.R., 1992:** Numerical Simulation of the influence of the large-scale flow on the weather patterns using a three-dimensional limited area model. Ph.D. Dissertation, Dept. of Met., University of Nairobi, 211 pp.

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

- **http://www.esrl.noaa.gov/psd/data/reanalysis/reanalysis.shtml:** NOA*A* NCEP/*NCAR* Reanalysis *at PSD* - NOAA *Earth System Research Project*

- www.acmad.org

- http://www.accessgambia.com/information/farming-agriculture.html.

- http://www.fao.org/nr/water/cropinfo_groundnut.html).

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

- 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/

- http://www.bsc.es/earth-sciences/mineral-dust-forecast-system/bsc-dream8b-forecast

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

- http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP. CPC .FEWS .Africa .DAILY .ARC2 .daily .est_prcp
- http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS-1/.MONTHLY/.Intrinsic/.MSL/.pressure
- http://iridl.ldeo.columbia.edu/expert/SOURCES.NOAA/.NCEP-NCAR/.CDAS-1/.MONTHLY/.Intrinsic/.PressureLevel/.rhum
- http://iridl.ldeo.columbia.edu/maproom/.Regional/.Africa/.Atm_Circulation/Wind_Anomaly.html
- http://iridl.ldeo.columbia.edu/expert/ SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp
- http://iridl.ldeo.columbia.edu/maproom/.Global/.Ocean_Temp/Anomaly.html
- http://iridl.ldeo.columbia.edu/expert/SOURCES/.NOAA/.NCEP-NCAR/.CDAS1/.DAILY/.Intrinsic/.PressureLevel/.temp
- http://iridl.ldeo.columbia.edu/maproom/.Global/.Forecasts/.SST/
- http://iridl.ldeo.columbia.edu/maproom/.Global/.Ocean_Temp/Anomaly.html
- http://iri.columbia.edu/climate/ENSO/currentinfo/SST_table.html
- http://origin.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/
- http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/seasonal_charts_sst!2m%20temperature!1%20month!Global!201212!tercile%20summary/
- http://portal.iri.columbia.edu/portal/server.pt?open=512&objID=585&PageID=7809&cached=true&mode=2&userID=2
- http://wxmaps.org/pix/temp10.html
- http://www.cpc.ncep.noaa.gov/products/african_desk
- OCHA, 9 Oct 2012
- **Verheye. W., and Camara B., 1999:** Agroclimate and agroclimatic zones of The Gambia Field Dc.3, FAO/TCP/GAM6715, Banjul, The Gambia, 19p.

ANNEX 1: Procedure to generate Climate bulletins

URL/Scripts / Procedure

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

Dekadal Mean Sea Level (MSL) Pressure Script:

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

- Expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure
- T (21 Sep 2012) (30 Sep 2012) RANGEEDGES
- Y (50N) (50S) RANGEEDGES
- X (60W) (120E) RANGEEDGES
- [T]average
- 100 div
- Ok
- Get Table
- Click on columnar table with options
- Choose **number** on **column 1, column 2** and **column 3** → get table, as shown in the window below.

- Get Table

- Right click on the downloaded text file and save in excel.
- Import data in surfer and plot

Gridding procedure in Surfer;

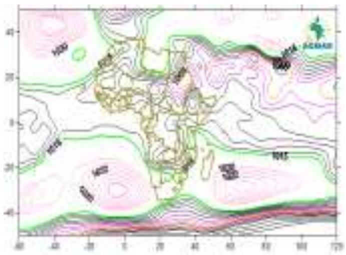
- SURFER,
- Grid
- Data ….
- Select data file <mslp data file>
- Open
- Scattered Data Interpolation X (40N) (40S) Y (90W) (120E)
- Ok
- Close
- Save … No
- Grid
- Spline smooth
- Open file … Data file
- Save … Yes
- Ok
- Map
- Contour map
- New map
- Open
- Contour map properties
- Highlight smooth contours
- Level
- Load

- File <mslplegend.lvl>
- Open
- Ok
- Map
- Base map
- Afr_nat.bna
- Open
- Ok
- Edit
- Select all
- Map
- Overlay maps
- Click on T, click on map to type txt
- Ok
- Edit
- Select all, copy
- Open paint, copy the plotted map, and insert ACMAD logo
- Save and paste in the bulletin.

Downloaded dekadal MSL pressure 21-31 September 2012

Downloaded MSL pressure in text format for 21-31 September 2012 *(source: NOAA/NCEP)*

MSL Pressure gridded in surfer for 21-31 September 2012 *(source: NOAA/NCEP)*



Completed plotted MSL Pressure 21-30 September 2012 *(source NOAA/NCEP)*

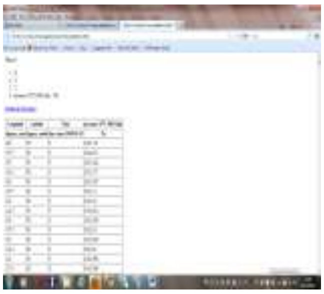
Procedure to download dekadal Climatology (1971-2000): MSL Pressure Anomaly

- Expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure dekadalAverage

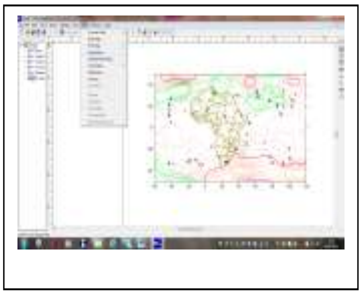
- T (1 Jan 1949) (31 Dec 1949) RANGE
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .MSL .pressure dekadalAverage
- T (21 Sep 1971) (30 Sep 2000) RANGE
- T name
- npts NewIntegerGRID
- replaceGRID
- T 36 splitstreamgrid
- [T2]average
- T 2 index
- T dekadaledgesgrid partialgrid
- 1 roll
- pop
- 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
- 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
- Ok
- Tables

- Click on columnar table with options
- Choose **number** on **column 1, column 2** and **column 3**
- Get tables
- Right click on downloaded data (text format), copy and save in excel
- Import data in surfer and plot

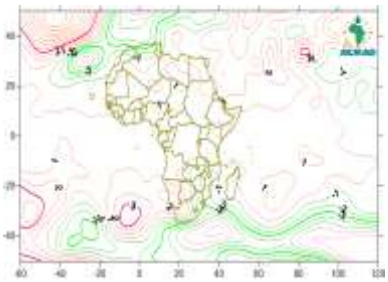
MSL Pressure Anomaly for 21-30 September, 2012



Downloaded MSL presure climatology in text format for 21-31 September 2012 *(source: NOAA/NCEP)*



MSL Pressure anomaly gridded in surfer 21-30 September 2012 *(source: NOAA/NCEP)*



Completed plotted MSL Pressure anomaly 21-30 September 2012 *(source NOAA/NCEP)*

Gridding procedure in surfer for ITD and ITCZ (e.g. dekad 3 September 2012)

- Surfer
- Map, Post map, New post map
- Open the data file, click the worksheet and choose ITD or ITCZ, ok
- Double click on Post icon on the left side, [X coordinate is Long and Y coordinate is for the mean for the present & previous dekad, mean Max and mean Min for the present dekad].
- Apply, Ok (choose black symbol for the current dekad which is dekad 3 September, blue symbol for the previous dekad which is dek 2 Sep, Red triangle for the mean Max for the current dekad and green triangle for mean Min for the current dekad, click → apply → ok
- Join the points with a line in black color using polyline for the present dekad and blue line for previous dekad;
- Click on Map, Base map, W_AFRICA. BNA, Ok,
- Edit, Select All, Map, Overlay map
- Click on T and click on map to insert txt/logo or
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Copy the map in the bulletin and save.
- *Note: Worksheet Columns (X Co ord. –Column A: Long), (Y Coord. –Column B: min-max-moy). Default symbol: Fixed size 0.05*).

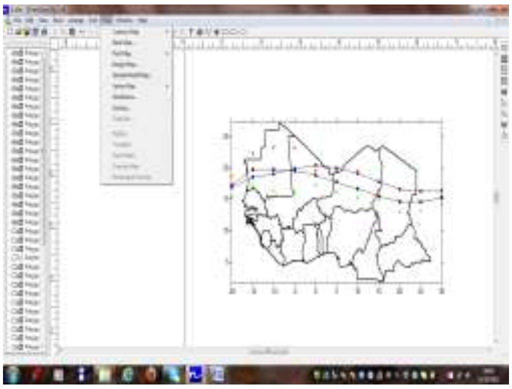
Gridding procedure in surfer for Congo Air Boundary (CAB)

- Open the data file, click the worksheet and choose CAB, ok

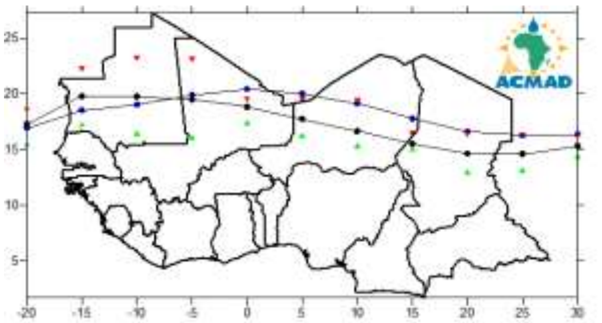
Repeat the same procedure for CAB but in this case, X coordinate mean for the present & previous dekad, mean Max and mean Min for the present dekad, Y coordinate is Latitude choose → black color symbol for Mean for the present dekad -; mean Max →Red; mean Min → Green; Mean previous dek → Blue) →Apply →Ok.

Table 7a : Example of computed and arranged ITD data in Excel during 21-30 September 2012

Long	**MeanSep2012dek3**	**MeanSep201□ dek2**	**MaxSep2012dek3**	**MinSep2012dek3**
-20	17.28	16.95	18.57	15.49
-15	19.80	18.55	22.24	17.27
-10	19.77	19.06	23.21	16.48
-5	19.50	19.92	23.12	16.12
0	18.84	20.45	19.51	17.42
5	17.76	20.04	19.51	16.31
10	16.66	19.16	19.39	15.36
15	15.53	17.78	16.41	15.05
20	14.64	16.59	16.35	13.00
25	14.62	16.28	16.27	13.18
30	15.31	16.39	16.23	14.41



ITD gridded in surfer for 21-30 September 2012



Completed plotted ITD: The mean position 2nd dekad of September (blue), 3rd dekad of September 2012 (black). The red & green triangles represent their maximum & minimum displacements for September 2013

Table 7b: Example of computed and arranged ITD, CAB & ITCZ data in Excel for 1-10 February 2013

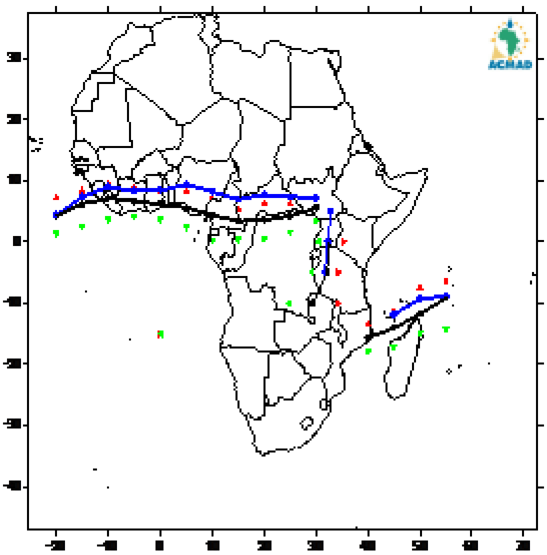
Long	Meanfeb2013dek1	Maxfeb2013dek1	Minfeb2013dek1	MeanJan2013dek3
-20	6.09	8.30	3.36	8.33
-15	8.44	11.44	5.59	11.84
-10	9.43	12.43	7.16	13.37
-5	9.23	13.27	7.52	11.69
0	9.97	12.54	8.24	11.36
5	9.88	11.09	9.06	10.58
10	8.28	11.00	6.54	9.20
15	7.47	9.27	4.58	8.80
20	8.41	9.44	6.04	8.74
25	7.78	9.32	6.13	7.45
30	8.07	9.49	6.54	7.65

CAB

Lat	MeanFeb2013dek1	Maxfeb2013dek3	Minfeb2013dek1	MeanJan2013dek3
5				
0	32.77	34.45	31.04	32.81
-5	32.03	34.50	29.31	31.50
-10	29.48	34.00	25.42	29.62
-15				28.06

ITCZ

Long	MeanFeb2013dek1	Maxfeb2013dek3	Minfeb2013dek1	MeanJan2013dek3
40	-6.88	-4.04	-9.49	-5.77
45	-3.43	1.45	-9.00	-5.07
50	-4.09	1.56	-10.06	-5.31
55	-3.85	1.17	-7.29	-5.10



The mean positions of ITD, ITCZ & CAB 1st dekad of February (black), 3rd dekad of January 2013 (blue). The red & green triangles represent their maximum & minimum displacements for February 2013.

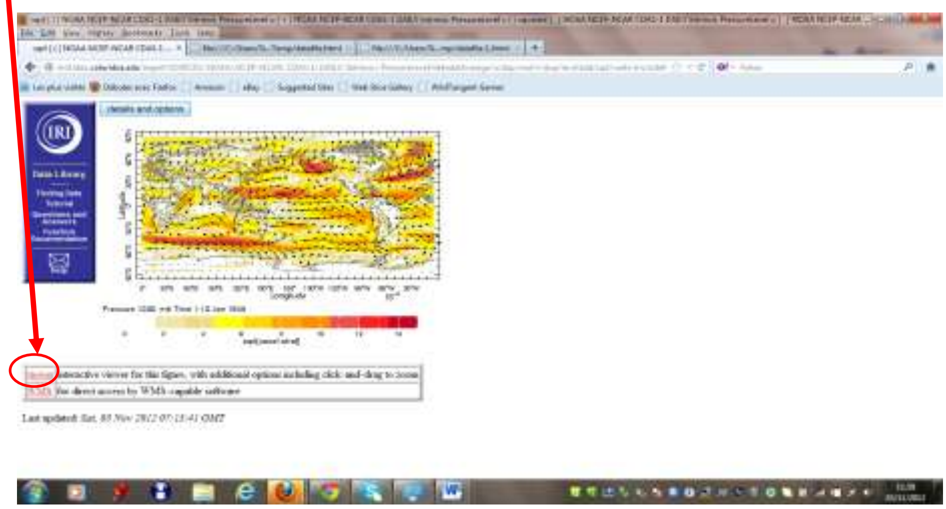
The African Monsoon

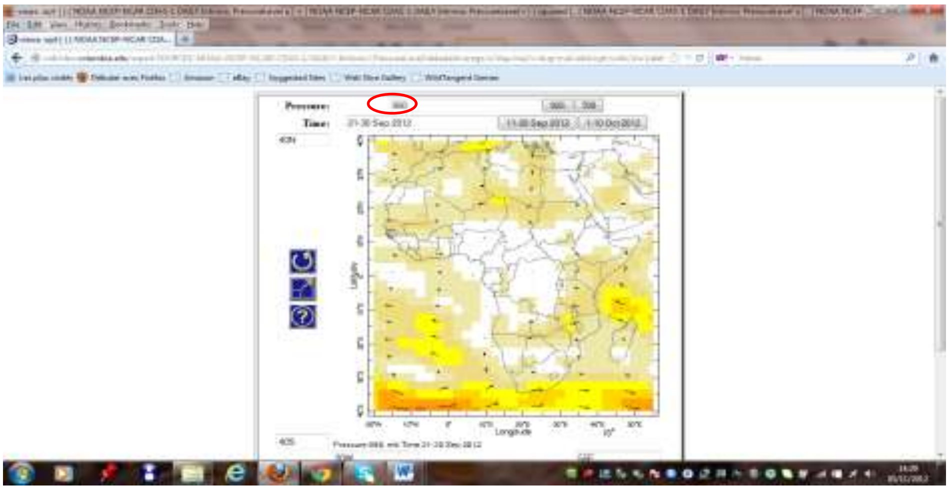
- The map is obtained directly from the site.
- Click on viewer on bottom left of map below; change the pressure levels to 850 and then to 925 hPa hence they use the same script.
- Put Time: e.g. 21-30 Sep 2012,
- Change coordinates to **40N, 40S, 20W** & **55E**,
- Reduce Color from **15** to **25** (the higher the value the lighter the colour)
- Right click on image and save, then insert finally in the bulletin.

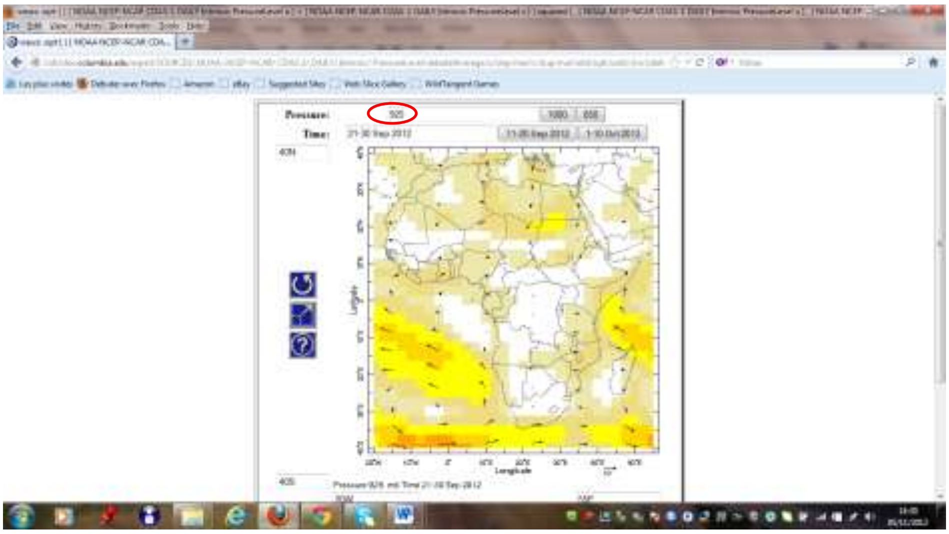
Script used to download combination of dekadal map of zonal wind (u) and meridien (v):

- 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/

Note: Click on viewer (showed in red circles) on this map, change the pressure levels to 850 and then to 925 hPa hence they use the same script.

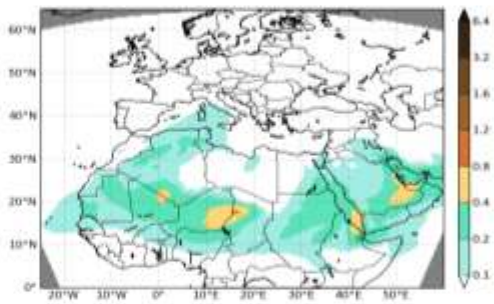




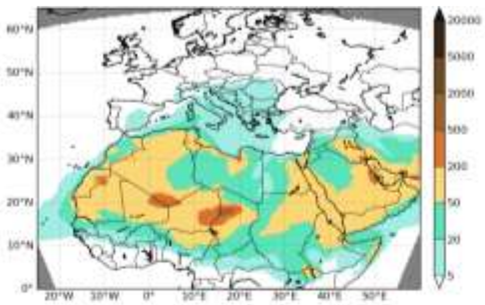


Dekadal Dust loading & Dekadal Dust Surface Concentration

- Dekadal Dust concentrations and loadings are sent from **WMO SDS-WAS: BSC-DREAM8b,**
- Cropped to fine shape the image and finally inserted in the bulletin.



Dekadal Dust loading (g/m2)
21-30 September 2012
(Source WMO SDS-WAS: BSC-DREAM8b)



Dekadal Surface Dust Concentration
(µg/m³) 21-30 September 2012
(Source WMO SDS-WAS: BSC-DREAM8b)

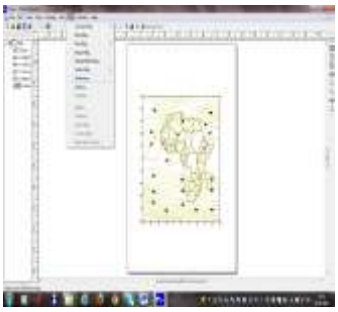
Thermal Index (TI) 300 hPa level in degree Kelvin (⁰K) 21-30 September, 2012

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

- expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .temp
- T (21 Sep 2012) (30 Sep 2012) RANGEEDGES
- Y (50N) (50S) RANGEEDGES
- P (300) VALUES
- X (40W) (60E) RANGEEDGES
- [T] average
- Ok
- Tables
- Click on columnar table with options.
- Choose **number** on **column 1, column 2** and **column 3**
- Get tables
- Right click on downloaded data (text format), copy and save in excel
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and plot
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Put in the bulletin and save.

Plots of TI for 21-30 September, 2012

Downloaded TI at 300hPa in text format at 300hPa 21-30 September 2012 *(source: NOAA/NCEP)*



TI at 300 hPa gridded in surfer 21-30 September 2012 *(source: NOAA/NCEP)*

Completed plotted TI at 300hPa (°k) 21-30 September 2012 *(Source: NOAA/NCEP)*

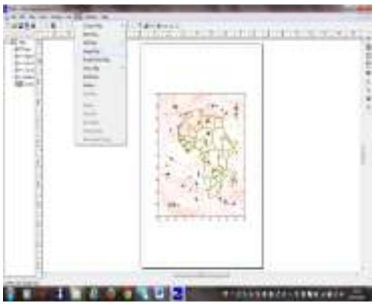
TI Dekadal Climatology (1971-2000) 300 hPa level

- 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 Sep 1971) (30 Sep 2000) RANGE
- T name
- npts NewIntegerGRID
- replaceGRID
- T 36 splitstreamgrid
- [T2]average
- T 2 index
- T dekadaledgesgrid partialgrid
- 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
- 1 roll
- pop
- /fullname (temp 1971-2000 clim) def
- /long_name (temp 1971-2000 clim) def
- Y (50N) (50S) RANGEEDGES
- P (300) VALUES

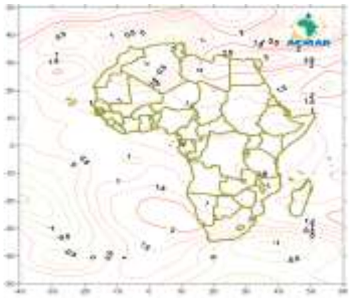
- X (40W) (60E) RANGEEDGES
- Ok
- Tables
- Columnar table with options.
- Choose **number** on **column 1, column 2** and **column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Save and put in the bulletin.

Plots of Thermal Index Anomaly for 21-30 September, 2012

Downloaded TI climatology (1971-2000) at 300 hPa in text format for 21-31 Setember 2012 *(source: NOAA/NCEP)*



TI anomaly at 300 hPa gridded in surfer for 21-31 Setember 2012 *(source: NOAA/NCEP)*



Completed plotted TI Anomaly at 300hPa (°k) 21-30 September 2012 *(Source: NOAA/NCEP)*

RH at 700 hPa level: Dekadal values

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

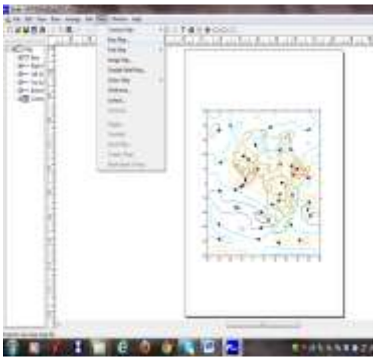
- expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .DAILY .Intrinsic .PressureLevel .rhum
- T (21 Sep 2012) (30 Sep 2012) RANGEEDGES
- Y (50N) (50S) RANGEEDGES
- P (700) VALUES
- X (40W) (60E) RANGEEDGES
- [T]average
- Ok
- Tables

- Columnar tables with options
- Choose **number** on **column 1, column 2 column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Edit, Select All, Arrange, Combine, copy file to paint, copy & paste the ACMAD logo
- Save and insert in the bulletin.

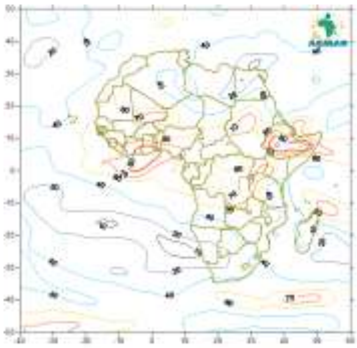
Note: This script is applicable for 850 hPa level also. Download again and change the level to 850.

Plots of dekadal RH at 700 hPa for 21-30 September, 2012

Downloaded RH at 700hPa in text format 21-30 September 2012 *(source: NOAA/NCEP*



RH at 700 hPa gridded in surfer for 21-30 September 2012 (*Source:: NOAA/NCEP/ESRL: PSD)*



RH at 700 hPa for 21-30 September 2012 (*Source: NOAA/NCEP/ESRL: PSD)*

Plots of dekadal RH for 850 hPa level.

Downloaded RH at 850 hPa in text format for 21-31 Setember 2012 *(source: NOAA/NCEP)*

RH at 850 hPa gridded in surfer for 21-30 September 2012 *(source: NOAA/NCEP)*

Completed plotted RH at 850hPa 21-30 for September 2012 *(Source: NOAA/NCEP/ESRL: PSD)*

Procedure to download Dekadal Climatology (1971-2000): RH for 700 hPa levels

- 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 Sep 2002) (30 Sep 2011) RANGE
- T name
- npts NewIntegerGRID
- replaceGRID
- T 36 splitstreamgrid
- [T2]average
- T 2 index
- T dekadaledgesgrid partialgrid
- 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
- 1 roll
- pop
- /fullname (rhum 2002-2011 clim) def
- /long_name (rhum 2002-2011 clim) def
- Y (50N) (50S) RANGEEDGES
- P (700) VALUES

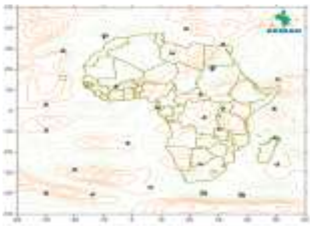
- X (40W) (60E) RANGEEDGES
- Ok
- Tables
- Columnar tables with options
- Choose number on **column 1, column 2** and **column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Save and insert the bulletin.

Note: This script is applicable for 850 hPa level also. Download again and change the level to 850 hPa.

Plots of RH Anomaly at 700 hPa for 21-30 September, 2012

Downloaded RH climatology (2002-2011) at 700 hPa in text format for 21-31 Setember 2012 *(source: NOAA/NCEP)*

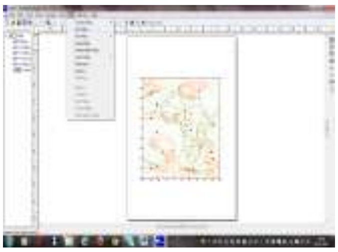
RH anomaly at 700 hPa gridded in surfer 21-30 September 2012 *(source: NOAA/NCEP)*



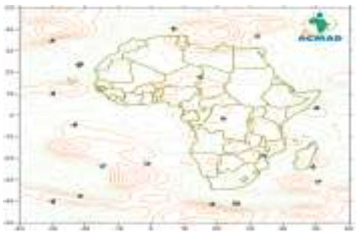
Completed plotted RH Anomaly at 700 hPa 21-30 September 2012 (*Source: NOAA/NCEP)*

Plots of RH Anomaly for 850 hPa level, 21-30 September, 2012

Downloaded RH climatology (2002-2011) at 850hPa in text format for 21-30 September 2012 *(source: NOAA/NCEP)*



RH Anomaly at 850 hPa gridded in surfer for 21-30 September 2012 *(source: NOAA/NCEP)*



Completed plotted RH Anomaly at 850 hPa for 21-30 September 2012 (*Source: NOAA/NCEP)*

Procedure to download Dekadal total Precipitation for 21-30 September 2012

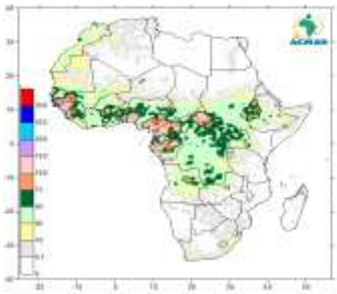
- expert
- SOURCES .NOAA .NCEP .CPC .FEWS .Africa .DAILY .ARC2 .daily .est_prcp
- T (21 Sep 2012) (30 Sep 2012) RANGEEDGES
- X (20W) (55E) RANGEEDGES
- Y (0N) (40N) RANGEEDGES
- T SUM
- Tables
- Columnar tables with options
- Choose number on **column 1, column 2 column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Repeat procedure for Y (00S) (40S)
- Plot in surfer Save
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Insert in the bulletin and save.

Downloaded data for estimated cumulative precipitation and plots for 21-30 September, 2012

Downloaded Estimated cumulative precipitation at **40N** in text format for 21-30 September, 2012

Downloaded Estimated cumulative precipitation at **40S** in text format for 21-30 September, 2012

Estimated cumulative precipitation at 850 hPa gridded in surfer for 21-30 September 2012
(Source: NOAA/NCEP)



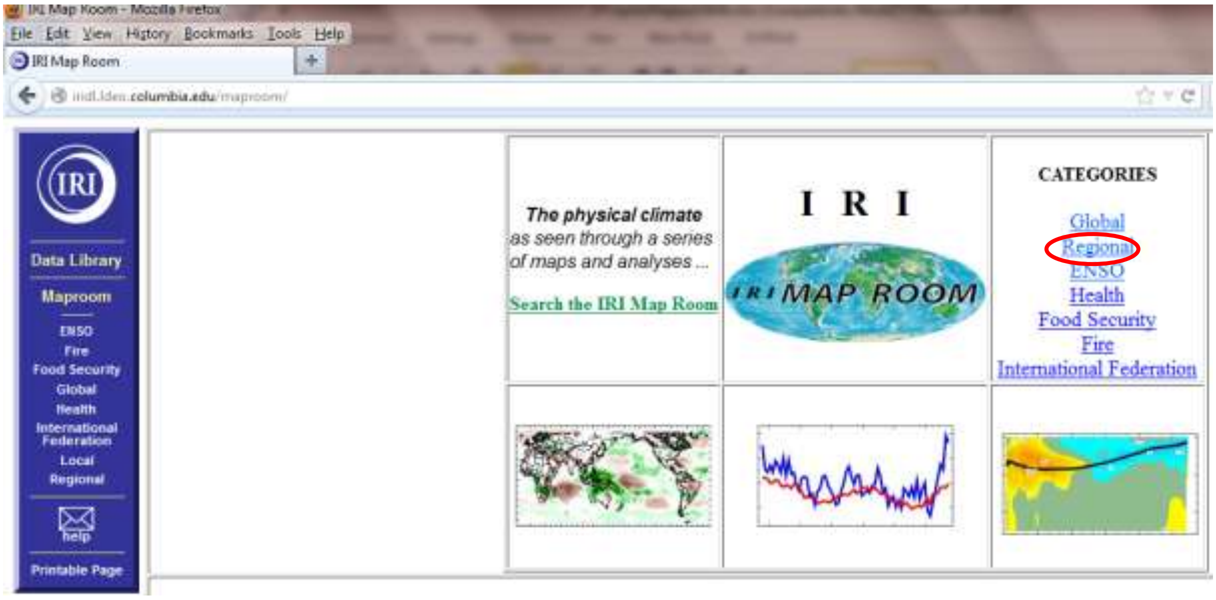
Completed plotted estimated cumulative precipitation at 850 hPa 21-30 September 2012,
(Source : NOAA/NCEP)

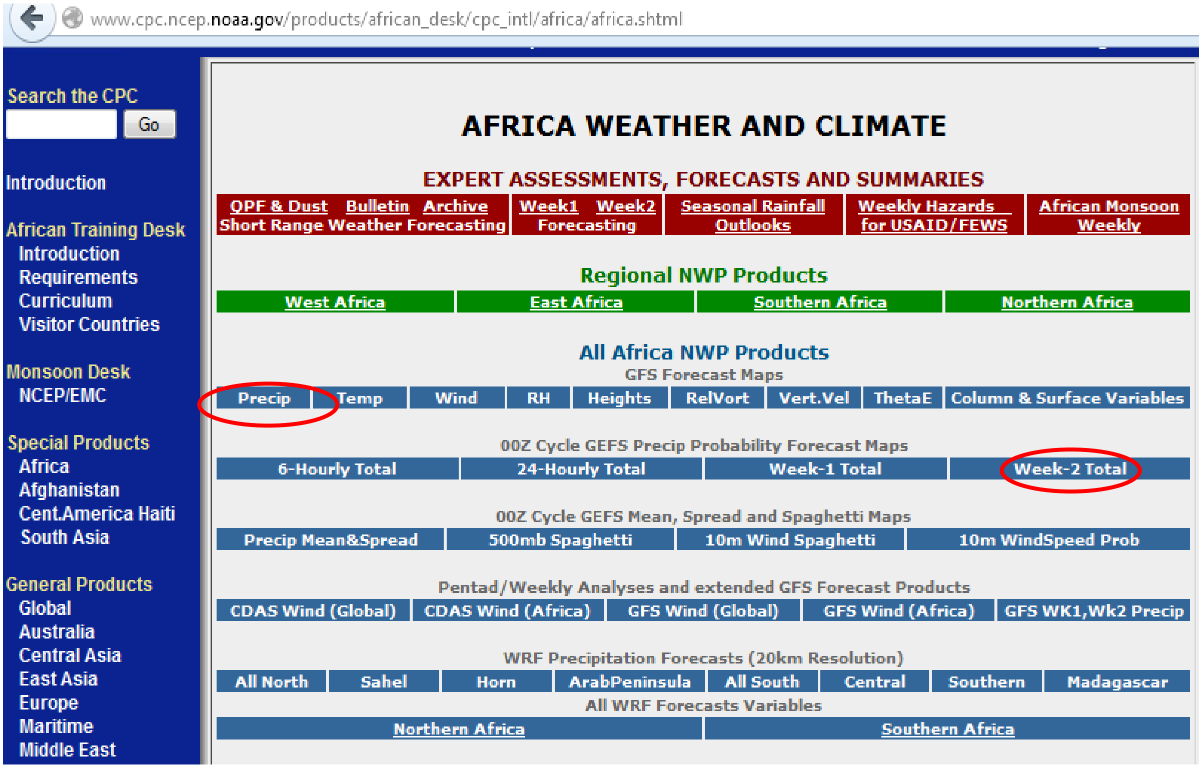
Procedure to download Cumulative & probability precipitation dekadal forecast valid September 29 to October 7, 2012

The website used to download precipitation dekadal forecast:

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

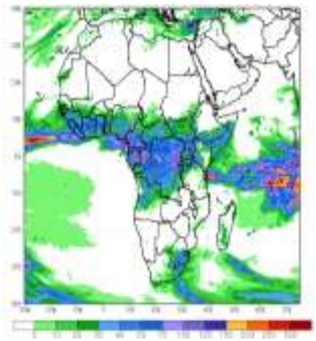
The window below provides options for the products of your interest; example you can click on **Regional** for precipitation in Africa; or **Global** for **SST;** or **ENSO**. Example for precipitation: click on **Week-2 Total**, you have also the option to choose the amount of probability (e.g. 75 or 100mm & e.t.c).



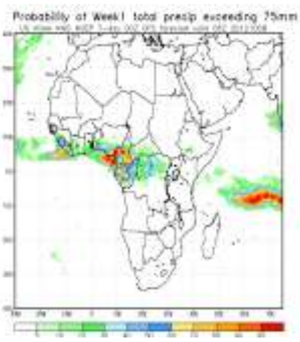


Downloaded Precipitation forecast maps

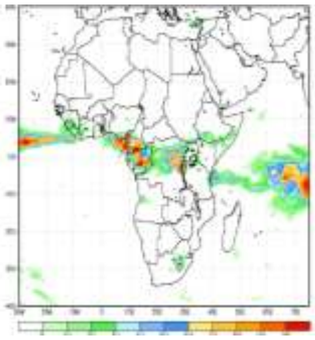
- Downloaded precipitation maps are cropped and inserted in the bulletin



Cumulative precipitation forecast forecast September 29 to October 7, 2012, *(Source : NCEP/GFS)*



Downloaded Probability of precipitation forecast exceeding 75mm, September 29 to October 7, 2012 *(Source: NCEP/GFS)*

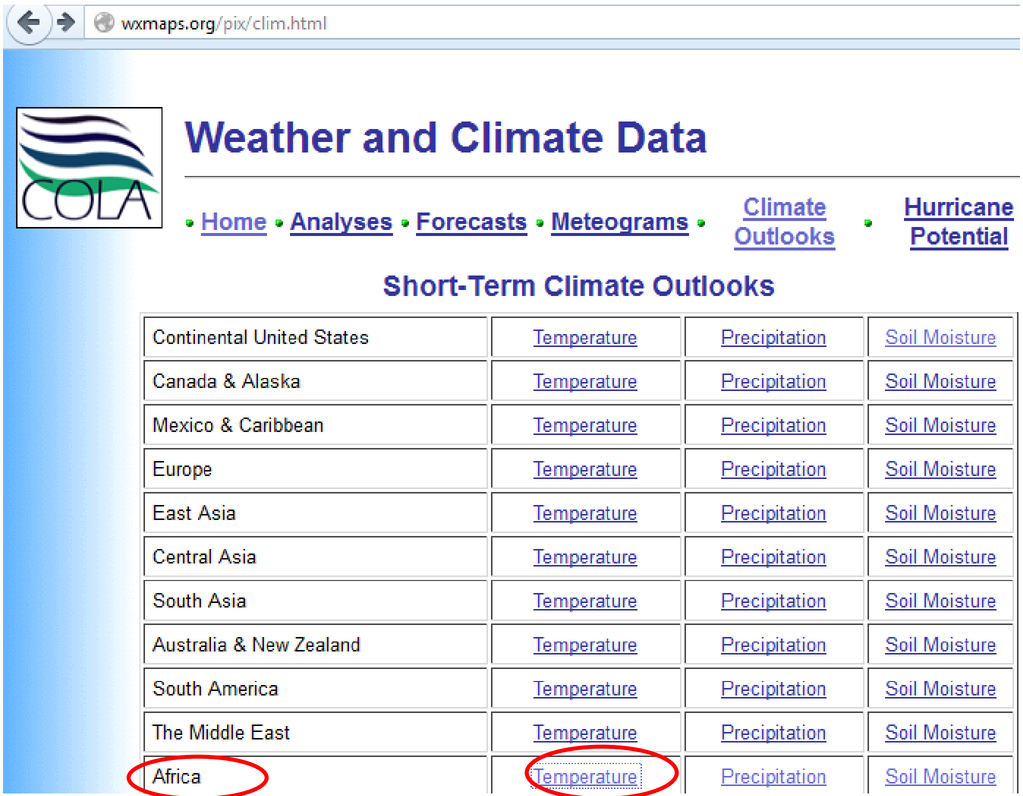


Cropped Probability of precipitation forecast exceeding 75mm, September 29 to October 7, 2012 *(Source: NCEP/GFS)*

Procedure to download Dekadal precipitation forecast, Temperatures & Soil Moisture valid for September 29 to October 7, 2012

COLA website is used to download Precipitation, Temperatures and Soil Moisture forecast:

- Click on **http://wxmaps.org/pix/clim.html**
- Go to **Africa** on bottom left and click on **Temperature/Soil Moisture**


wxmaps.org/pix/clim.html

Weather and Climate Data

• Home • Analyses • Forecasts • Meteograms • Climate Outlooks • Hurricane Potential

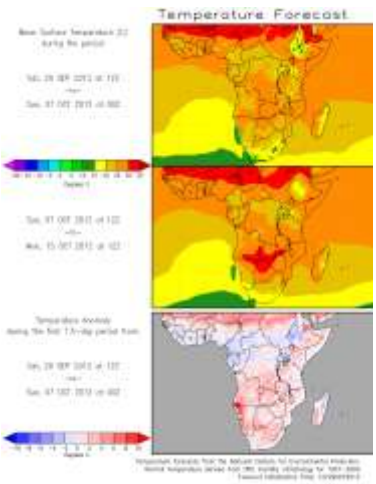
Short-Term Climate Outlooks

Continental United States	Temperature	Precipitation	Soil Moisture
Canada & Alaska	Temperature	Precipitation	Soil Moisture
Mexico & Caribbean	Temperature	Precipitation	Soil Moisture
Europe	Temperature	Precipitation	Soil Moisture
East Asia	Temperature	Precipitation	Soil Moisture
Central Asia	Temperature	Precipitation	Soil Moisture
South Asia	Temperature	Precipitation	Soil Moisture
Australia & New Zealand	Temperature	Precipitation	Soil Moisture
South America	Temperature	Precipitation	Soil Moisture
The Middle East	Temperature	Precipitation	Soil Moisture
Africa	Temperature	Precipitation	Soil Moisture

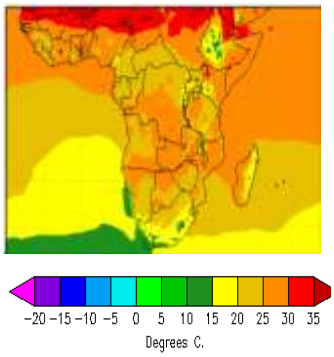
Downloaded Temperature forecast maps for the period September 29 to October 7, 2012 from COLA website

- Downloaded maps are joint on the left side. Only the first and last maps are used for the bulletin, the middle map is not used, because it has a different forecast period.

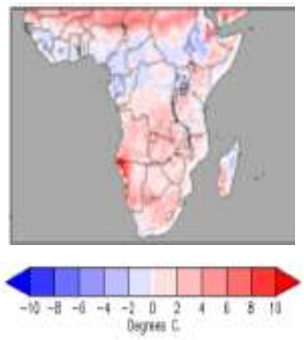
- The selected maps (first & middle) are then cropped and inserted in the bulletin.



Downloaded Temperature forecast for September 29 to October 7, 2012 *(Source: COLA)*



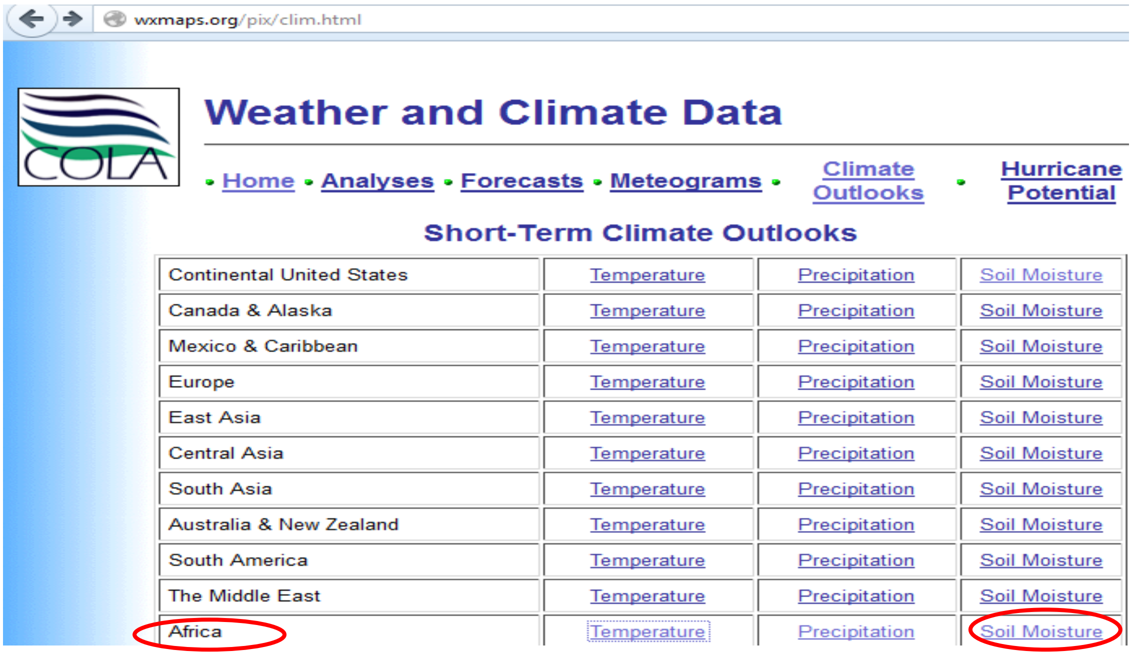
Mean surface temperature forecast September 29 to October 7, 2012 (Source: COLA)



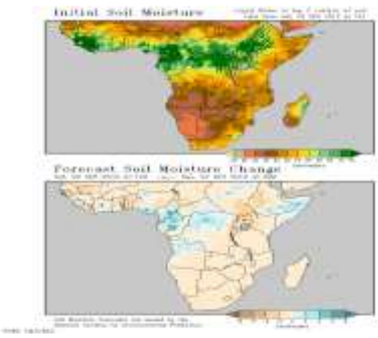
Temperature Anomaly forecast September 29 to October 7, 2012 (Source: COLA)

Procedure to Download Soil Moisture forecast maps for the period September 29 to October 7, 2012

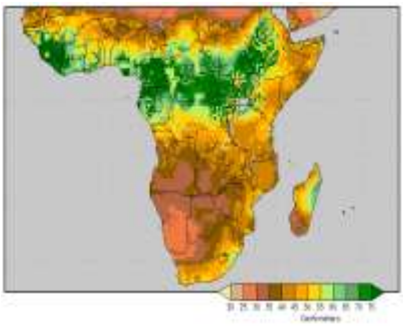
- Go to **Africa** on bottom left and click on **Soil Moisture**



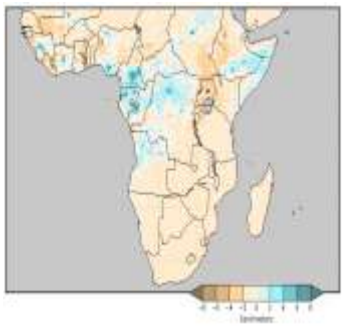
- Downloaded maps joint on the left side are separated by cropping and inserted in the bulletin.



Downloaded Initial Soil moisture and Soil moisture change forecast for September 29 to October 7, 2012 *(Source: COLA)*



Cropped Initial Soil moisture forecast for September 29 to October 7, 2012 *(Source: COLA)*



Cropped Soil moisture change forecast for September 29 to October 7, 2012, *(Source: COLA)*

Procedure to download Monthly & Weekly bulletins

Monthly Diagnostic: Procedure to download Monthly mean surface temperature for September 2012

- expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Diagnostic .surface .temp
- (Celsius_scale) unitconvert
- Y (40N) (40S) RANGEEDGES
- X (20W) (55E) RANGEEDGES
- T (Sep 2012) VALUES
- Click on Tables
- Columnar tables with options
- Choose number on **column 1, column 2** and **column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Repeat procedure for Y (00S) (40S)
- Plot in surfer Save
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo
- Insert in the bulletin and save.

Plots of Monthly mean surface temperature

Downloaded monthly mean surface temperature and for September *(NOAA/NCEP)*

Monthly mean surface temperature gridded in surfer for September 2012 *(source: NOAA/NCEP)*

Completed plotted mean surface temperature for September 2012 *(source NOAA/NCEP)*

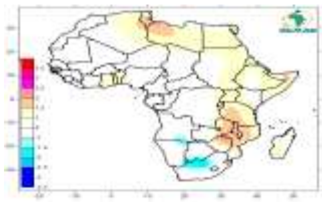
Procedure to download Monthly surface temperature anomaly

- expert
- SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp
- T (1 Sep 2012) (30 Sep 2012) RANGEEDGES
- Y (40S) (40N) RANGEEDGES
- X (20W) (55E) RANGEEDGES
- Click on Tables
- Columnar tables with options
- Choose number on **column 1, column 2 and column 3**
- Get table
- Right click on downloaded data, copy and save data in excel
- Import data in surfer and grid
- Repeat procedure for Y (00S) (40S)
- Plot in surfer Save
- Edit, Select All, copy file to paint, copy & paste the ACMAD logo and save
- Insert in the bulletin and save.

Plots of Monthly temperature anomaly

Downloaded monthly mean surface temperature for September *(NOAA/NCEP)*

Surface temperature anomaly gridded in surfer for September 2012 *(source: NOAA/NCEP)*



Completed Surface temperature anomaly for September 2012 *(Source : NOAA/NCEP)*

Procedure to generate monthy Climate & Health Bulletin for Malaria, September, 2012

African Malaria Epidemic Risk Zones: Information's to generate this graph are provided from the **"Relief web", Pro-Med mail** website and regional office at Ouagadougou (Inter Country Supporting Team). Monthly Dust concentration is also obtained from the website below; **"http://sds-was.aemet.es/forecast-products/time-averaged-values"**

The **Criteria** to produce the monthly African Malaria Epidemic Risk Zones are the following:

- Temperature 18 to 32^{0}C
- RH >= 60%
- Precipitation > 80mm
- Areas with dense vegetation in the vegetation map

Note: The Climate and Health Relative Humidity gridding in surfer is the same procedure as gridded in Dekadal bulletin, but with different legends.

Procedure to download monthly surface RH

- expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Intrinsic .PressureLevel .rhum
- Y (40N) (40S) RANGEEDGES
- P (1000) VALUES
- X (20W) (55E) RANGEEDGES
- T (Sep 2012) VALUES

Procedure to download Monthly Surface Temperature

- expert
- SOURCES .NOAA .NCEP-NCAR .CDAS-1 .MONTHLY .Diagnostic .surface .temp
- (Celsius_scale) unitconvert
- Y (40N) (40S) RANGEEDGES
- X (20W) (55E) RANGEEDGES
- T (Sep 2012) VALUES

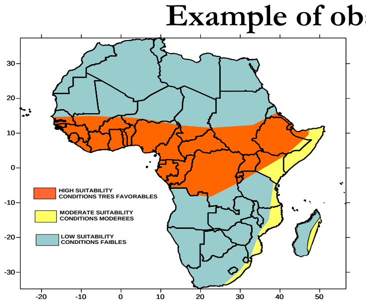
Procedure to download Monthly Surface Temperature Anomaly

- expert
- SOURCES .NOAA .NCEP .CPC .CAMS .anomaly .temp
- T (1 Sep 2012) (30 Sep 2012) RANGEEDGES
- Y (40S) (40N) RANGEEDGES
- X (20W) (55E) RANGEEDGES

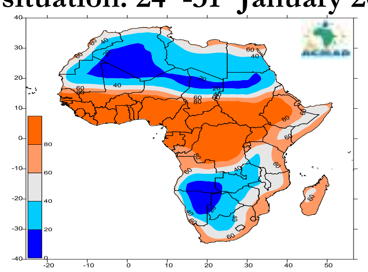
Procedure to download monthly precipitation

- expert
- SOURCES .NOAA .NCEP .CPC .FEWS .Africa .DAILY .RFEv2 .est_prcp
- T (1 Aug 2012) (31 Aug 2012) RANGEEDGES
- Y (0S) (40S) RANGEEDGES
- X (20W) (55E) RANGEEDGES
- T SUM

Example of observed climate situation: 24th-31st January 2013



African Malaria Epidemic Risk Zones for September 2012, (Source : NOAA/NCEP-NCAR)



Surface Relative humidity for September 2012 (Source : NOAA/NCEP-NCAR

Procedure to download Vegetation

The following scripts are used to download vegetation maps for three parts of Africa (West, East and South) and finally inserted in the bulletin.

Part: West Africa

- expert
- SOURCES .USGS .LandDAAC .MODIS .version_005 .WAF .EVI
- Y (0N) (40N) RANGEEDGES
- X (20W) (20E) RANGEEDGES
- T (1 Sep 2012 - 30 Sep 2012) VALUES

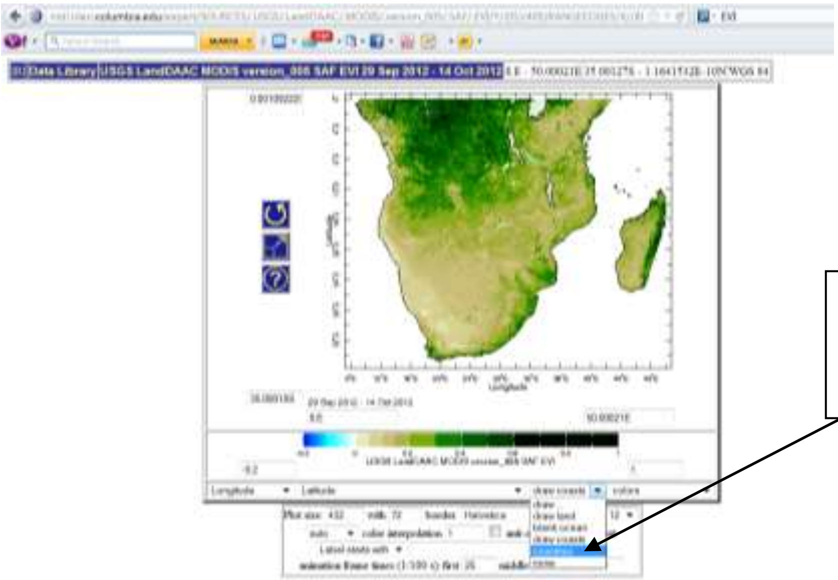
Part: East Africa

- expert
- SOURCES .USGS .LandDAAC .MODIS .version_005 .EAF .EVI
- Y (0N) (40N) RANGEEDGES
- X (20E) (60E) RANGEEDGES
- T (1 Sep 2012 -30 Sep 2012) VALUES

Part: Southern Africa

- expert
- SOURCES .USGS .LandDAAC .MODIS .version_005 .SAF .EVI
- Y (0S) (40S) RANGEEDGES
- X (8E) (50E) RANGEEDGES
- T (1 Sep 2012 - 30 Sep 2012) VALUES

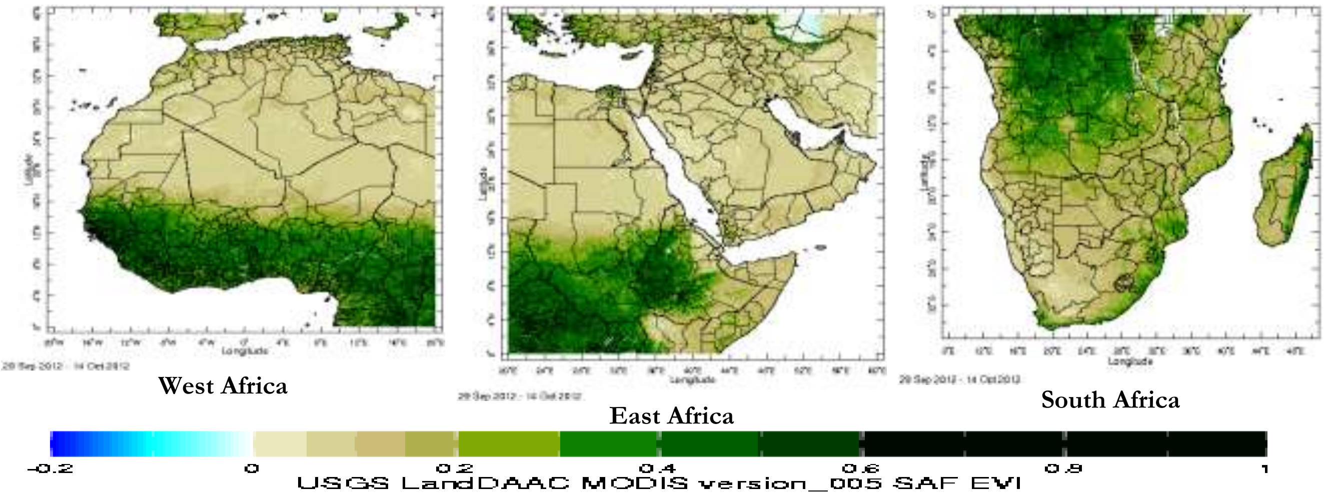
- Click in the small window to get access to the image
- Cliquer sur la petite fenêtre pour accéder à l'image



- Click here to display the countries contours
- Cliquer ici pour afficher les contours des pays

- Click on this arrow (redraw) to get the image
- Cliquer sur redraw pour avoir l'image

Example of downloaded vegetation images for 29 September to 14 October 2012



EVI images : 29 September to 14 October 2012, Source: IRI

Procedure to prepare weekly Meningitis bulletin

The data and website used for the preparation of the meningitis bulletin are as follows:

Data used :

- RH and Meridonial wind at **1000hpa**, Dust concentration, ITD, CAB and ITCZ data are used to prepare the weekly climate bulletin.
- The wind and RH data are downloaded from IRI/NOAA site and gridded in surfer.
- Dekadal dust concentrations are sent directly from *WMO SDS-WAS: BSC-DREAM8b*:
- The ITD, CAB and ITCZ data are obtained from the Forecast Department at ACMAD.

"http://iridl.ldeo.columbia.edu/maproom/.Health/" is used to download additional Meningitis information.

Criteria to prepare the Vigilance map for the weekly Meningitis bulletin is in the Table below;

Thresholds of Climate parameters for determination of vigilance zones of meningitis

	Threshold	**Colour**
Relative Humidity at 1000 Hpa	0 – 20%	Red
	20 – 40%	Orange
	40 – 60%	Yellow
	>60%	Grey
Dust concentration	< 150 µg/m³	White
	150 – 300 µg/m³	Yellow
	>300 µg/m³	Red
Meridonial wind at 1000 hpa	>1 m/s	Yellow
	[-1; 1]	Orange
	< -1m/s	Red

Colour to choose for the vigilance map

	COLOUR	**VIGILANCE**
Relative Humidity	Red	High Vigilance
Dust Concentrations	Brown	
Meridional Wind	Red	
Relative Humidity	Red	High Vigilance
Dust Concentrations	Brown	
Meridonial Wind	Orange	
Relative Humidity	Red	High Vigilance
Dust Concentrations	yellow	
Meridonial Wind	Orange	
Relative Humidity	Red	High Vigilance
Dust Concentrations	Yellow	
Meridonial Wind	Red	
Relative Humidity	Orange	Moderate Vigilance
Dust Concentrations	Yellow	
Meridonial Wind	Red	
Relative Humidity	Orange	Moderate Vigilance
Dust Concentrations	Yellow	
Meridonial Wind	Red	
Relative Humidity	Orange	Moderate Vigilance
Dust Concentrations	Yellow	
Meridonial Wind	Orange	
Relative Humidity	Yellow	Moderate Vigilance
Dust Concentrations	Red	
Meridonial Wind	Red	
Relative Humidity	Yellow	Low Vigilance
Dust Concentrations	Yellow	
Meridonial Wind	Red	

Example of Week 4 Meningitis bulletin for January 2013

CLIMATE & HEALTH BULLETIN: MENINGITIS VIGILANCE ZONES

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

Direction General ACMAD, BP 13184, 85 Avenue des Ministères, Niamey – Niger
Tél. (227) 20 73 49 92, Fax : (227) 20 72 36 27, E-mail : dgacmad@acmad.ne, Web : http://www.acmad.org

No: 006 8th to 15th February 2013

The climatic conditions were favorable for high level vigilance for meningitis cases over much of the Meningitis belt, in particular, in The Gambia, Senegal, southern Mali, Burkina, Niger, Chad, north of the Gulf of Guinea countries, western Sudan, northern Cameroon and Central African Republic (CAR). Moderate vigilance is observed at the southern part of Sudan, whereby low vigilance prevailed over south-east Sudan, much of Ethiopia and South Sudan.

OBSERVED CLIMATE SITUATION: 8th to 15th February 2013

- Low humidity (below 20%) prevail over the meningitis belt of Africa, in particular over all the Sahelian countries, west and south of Sudan, south Algeria and Libya. The remaining parts of the belt experienced humidity between 20 and below 40% (figure 1).

- Significant dust concentration (between 200 and 500 µg/m^3) was observed over southern Morocco, few parts in Algeria, central Tunisia, coastal part of Libya, north-west Mauritania and Mali, eastern Niger, western Chad, north-east Nigeria, north-east Ethiopia, Djibouti and south-west Eritrea (figure 3).

- Northerly dry winds were dominant over The Gambia, western Senegal and Guinea-Bissau, much of Mauritania and Morocco, north-west Mali, western Algeria, eastern Niger, northern Chad, Sudan and South Africa, eastern Libya, Egypt and southern Botswana (figure 4).

- The ITD is located at the northern part of the Gulf of Guinea, Central Africa and north of South Sudan (see figure 2 No. 04 dekadal bulletin).

- **The conditions of humidity less than 20%, moderate to high dust concentrations, the migration of the ITD around 2 degrees towards south and the strong harmattan has prevailed over much of the Meningitis belt. However, this situation has created more favorable climatic conditions than the previous week over most of the belt (figure 5). The level of vigilance is moderate at the southern part of Sudan, whilst low vigilance prevailed over south-east Sudan, much of Ethiopia and South Sudan.**

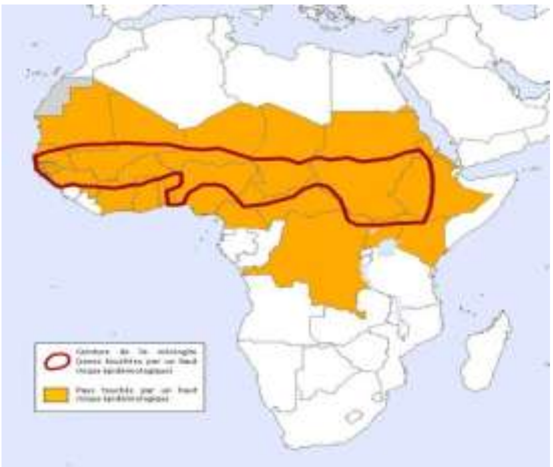


Figure 1: African Meningitis Belt

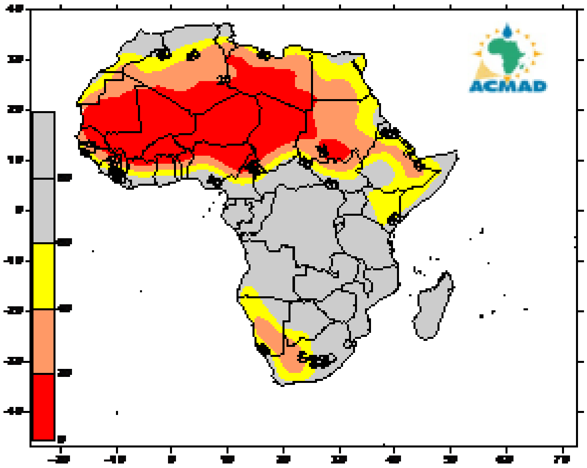


Figure 2: Relative Humidity 8-15 February 2013

Source: NOAA/NCEP-NCAR

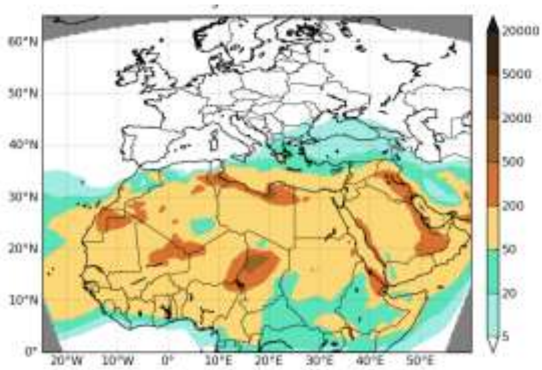


Figure 3 : Dust Concentration (µg/m³) 1-10 February 2013

(Source WMO SDS-WAS: BSC-DREAM8b)

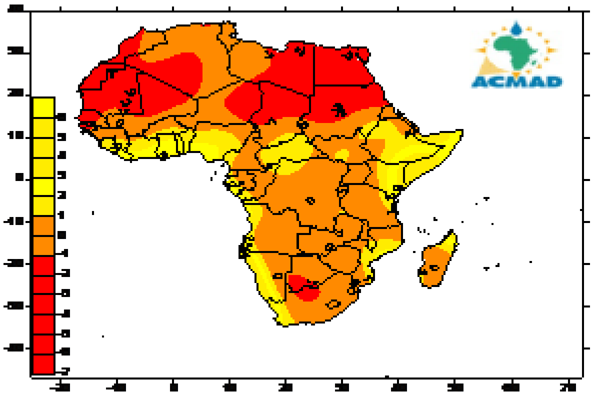


Figure 4: Meridional Wind 8-15 February 2013

(Source: NOAA/NCEP-NCAR)

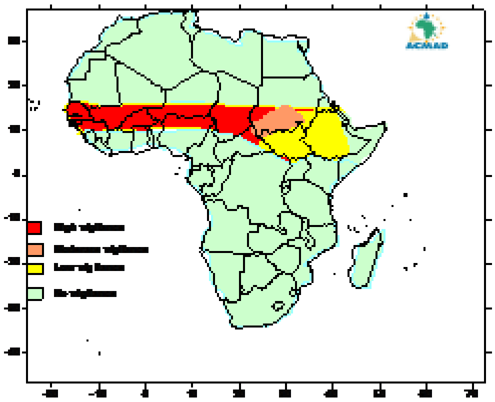
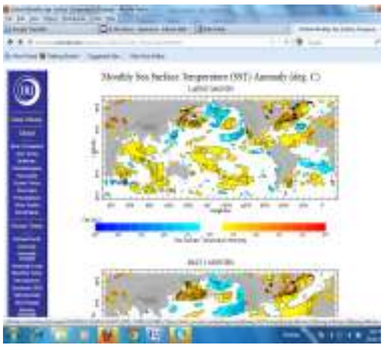


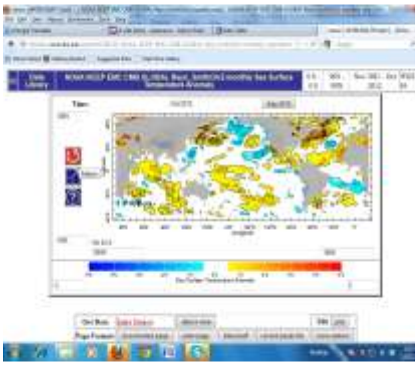
Figure 5: Vigilance map for emergence of meningitis in Africa

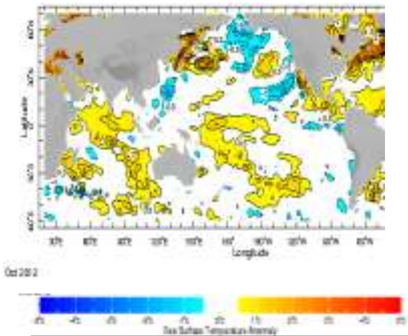
Procedure to download monthly global Sea Surface Temperature (SST) Forecast for October 2012

- http://iridl.ldeo. columbia.edu/maproom/.Global/.Forecasts/.SST/ or
- http://iridl.ldeo.columbia.edu/maproom/.Global/.Ocean_Temp/Anomaly.html
- Double click on first map
- Put the month and year of interest e.g. **Oct 2012**; Time **60N 60S; 180W 180E**
- Right click on map → save image in a folder in word and finally insert in the bulletin.

Example of downloaded Global SST and ENSO Forecast maps for October 2012



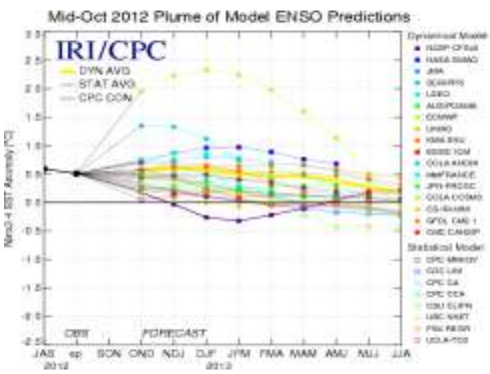




Cropped SST September 2012 *(source : IRI)*

Procedure to download El Nino/Southern Oscillation (ENSO) for October 2012

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

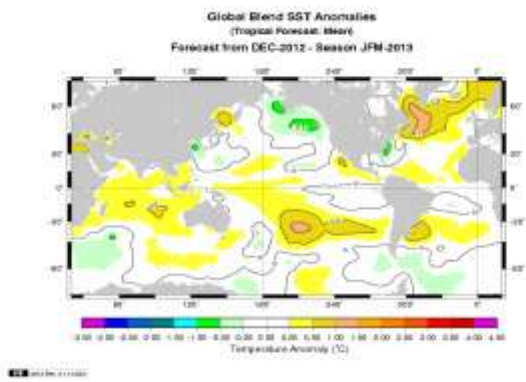


ENSO Predictors for October 2012 (Dynamic and statistical models over Niño 3.4 (5°N–5°S, 120°W–170°W), *(Source : IRI)* SST September 2012 *(source : IRI)*

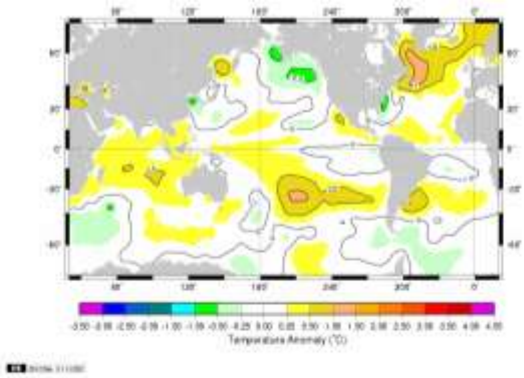
Procedure to download monthly SST Forecast

The site used to download SST map:

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



Downloaded monthly Forecasted Surface Ocean Temperatures for December 2012 *(Source : IRI)*



Cropped monthly Forecasted Surface Ocean Temperatures for December 2012

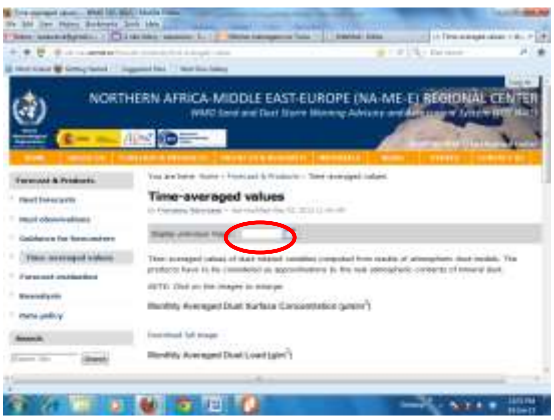
(Source : IRI)

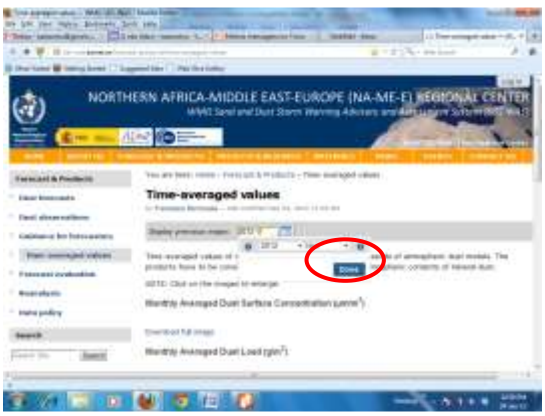
Procedure to download monthly Dust Loading and Concentration

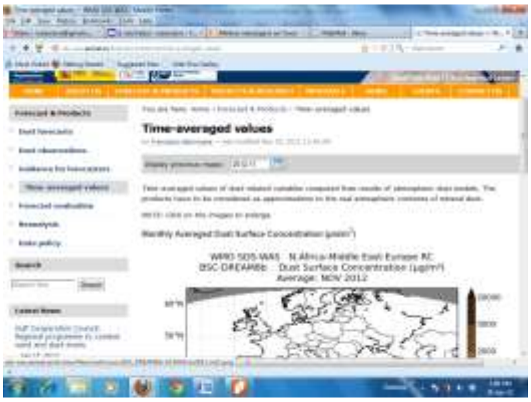
Website used to download dust loading and concentration :

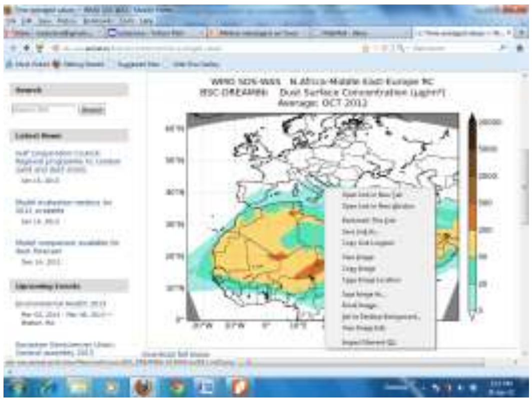
http://sds-was.aemet.es/forecast-products/time-averaged-values

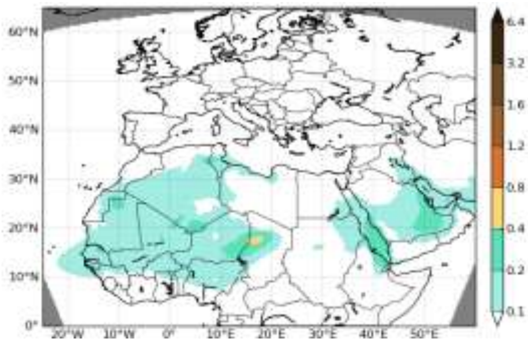
- Click on the browser button on 'Display previous maps' → put the year and month of interest
- Click **Done** on the map at right
- Right click on image and save in word format and later insert in the bulletin



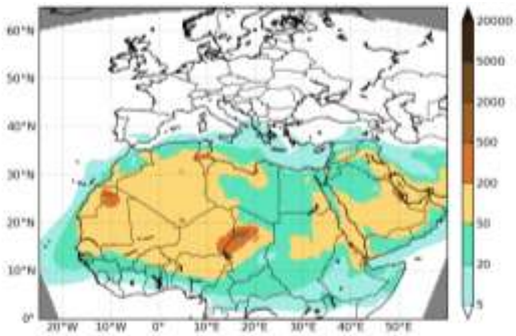








Monthly Dust loading for October 2012



Monthly Dust Concentration for October 2012

ANNEX 2: Procedure to download Long Range Forecasting (LRF)

The following websites are used to download LRF maps:

- http://origin.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/:
- http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/group/seasonal_charts_sst!2m%20temperature!1%20month!Global!201212!tercile%20summary/
- http://origin.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/

Procedure to prepare the LRF for JFM and FMA 2013

1. Analysis of historical Sea Surface Temperature (SST), Precipitation Circulation, and Convection.
2. Analog year detection.
3. Use of the following 3 to 4 months precipitation and temperature anomalies as an initial forecast.
4. Analysis of outputs of statistical and dynamical Global LRF systems for SST, Circulation, Precipitation, temperature and including relevant skill maps
5. Use knowledge and understanding of regional climate variability to interpret models output and adjust analog year's forecasts.

Method: Sea Surface Temperature (SST)

- Identify Analog years; look at past very similar years (e.g. use years past that have similarity in terms of SST analog years). The first pattern closest likely analog year was 2001 followed by 1991.
- Download SST's Precipitation and Temperatures for 1991, 1992, 2001, 2002 and 2012 form IRI, NOAA and ECMWF Centre's.
- For forecasted anomaly seasonal forecast for JFM and FMA: Download NOAA SST for JFM
- For Seasonal Forecast, download Nino 3 and the Atlantic from ECMWF and NOAA for the following periods:
  - SST anomaly seasonal forecast for JFM
  - SST anomaly seasonal forecast for JFM and FMA
  - NWA, north Tropical Atlantic, Nino3.4; eastern tropical Indian
  - SST anomaly forecast (ENSO plumes)

Method: Precipitation

- Download Precipitation for 1991, 1992, 2001, 2002 and 2012 from IRI, NOAA and ECMWF Centre's for the following periods:
  - August to October 1991, 1992, 2001, 2002 and 2012
  - November 1991, 1992, 2001, 2002 and 2012
  - December 1991- February 1992
  - December 1992- February 1993
  - December 2001- February 2002
  - December 2002- February 2003

  January to March 1991, 1992, 2001, 2002 and 2012:
  - Jan-Mar 1991
  - Jan-Mar 1992
  - Jan-Mar 2001

- Jan-Mar 2002
- Jan-Mar 2012
- Precipitation February to April 1991, 1992, 2001, 2002 and 2012
- Precipitation anomaly JFM 2013
- Forecasted precipitation 2011 with ensemble models

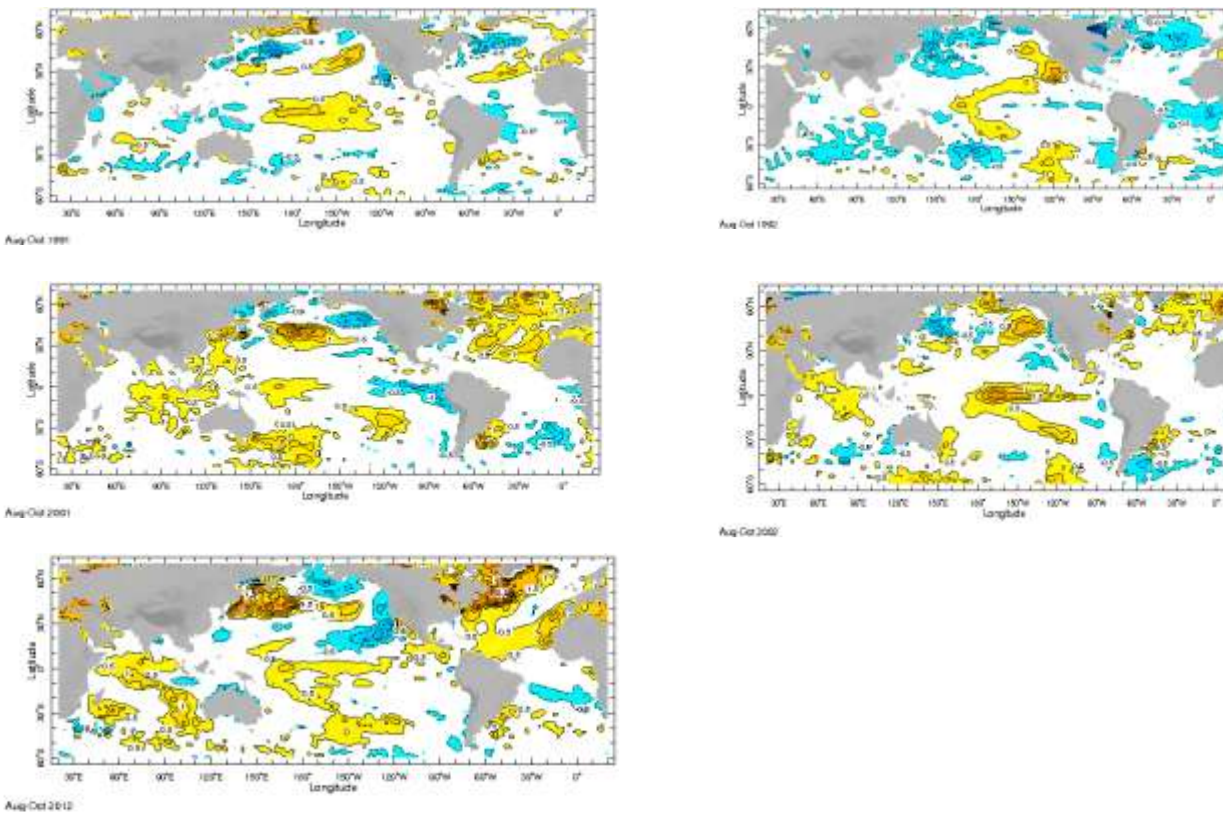
Method: Temperature at 2m

➢ Download Temperature for 1991, 1992, 2001, 2002 and 2012 from IRI, NOAA and ECMWF Centre's for the following periods:

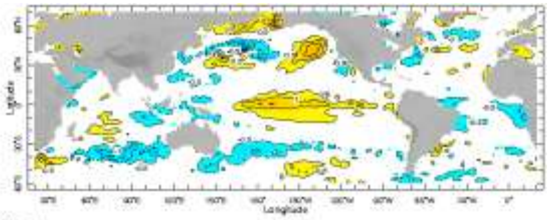
- August to October 1991, 1992, 2001, 2002 and 2012
- September to November 1991, 1992, 2001, 2002 and 2012
- November 1991, 1992, 2001, 2002 and 2012
- December 1991 to February 1992
- January to March 1991, 1992, 2001, 2002 and 2012
- Ensemble forecast
- Temperature anomalies for December to June for the Sahel, Southern Africa and Eastern Africa.

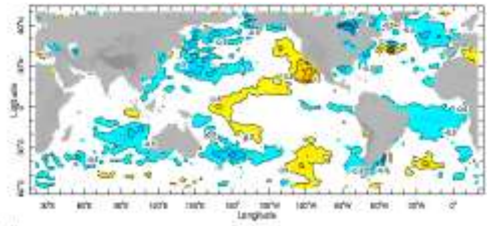
Example of some LRF products

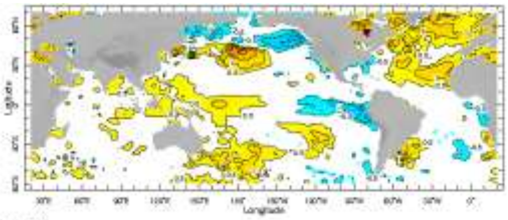
SST ASO: 1991, 1992, 2001, 2002, 2012

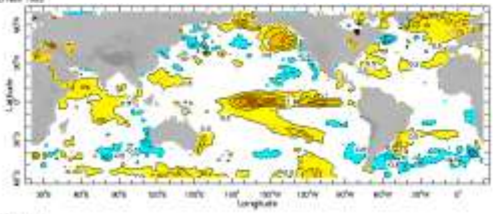


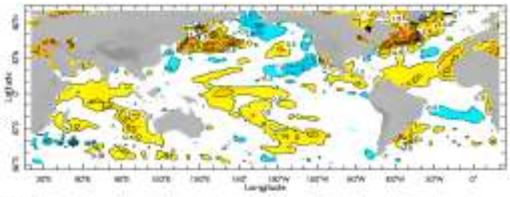
SST for SON 1991, 1992, 2001 2002 et 2012



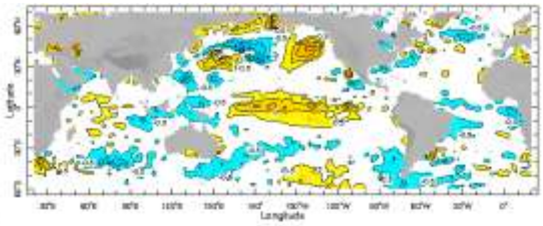


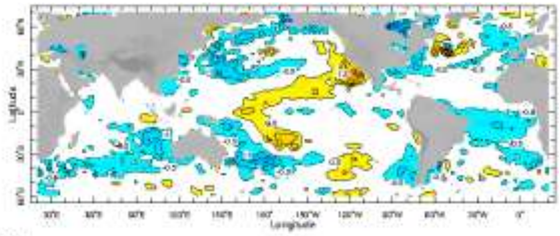


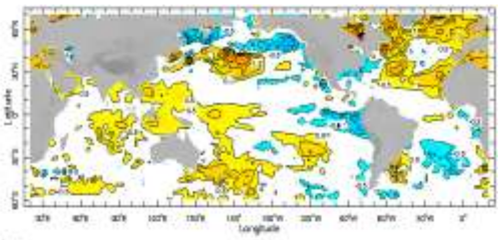


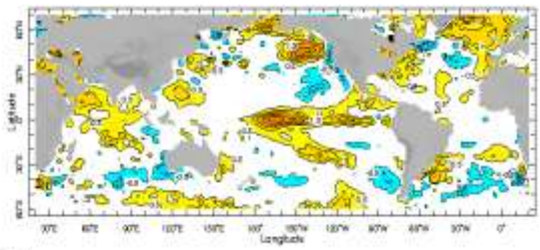


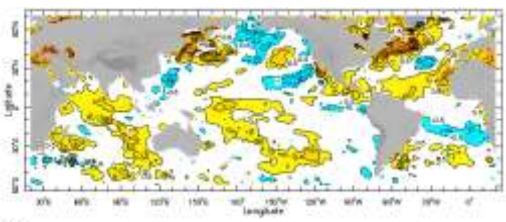
SST Oct : 1991, 1992, 2001, 2002, 2012



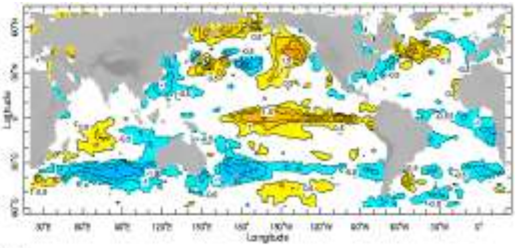




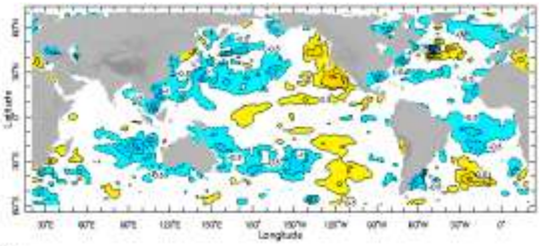




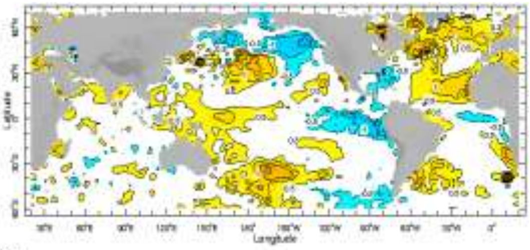
SST Nov: 1991, 1992, 2001, 2002



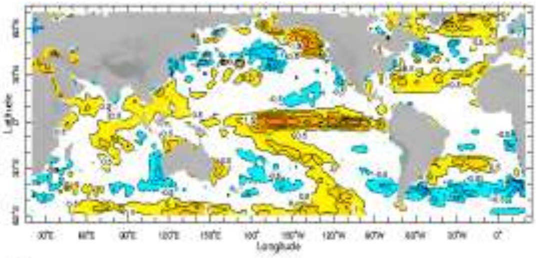
Nov 1991



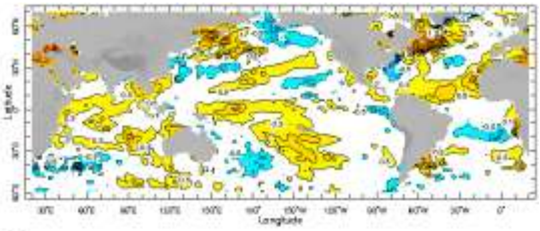
Nov 1992



Nov 2001

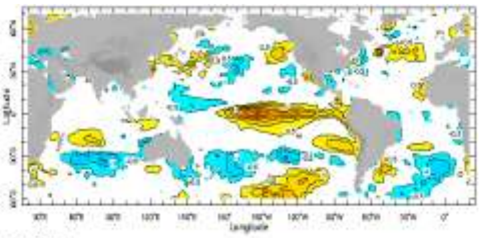


Nov 2002

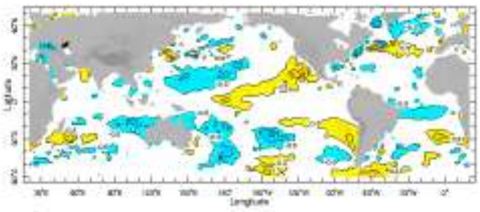


Nov 2012

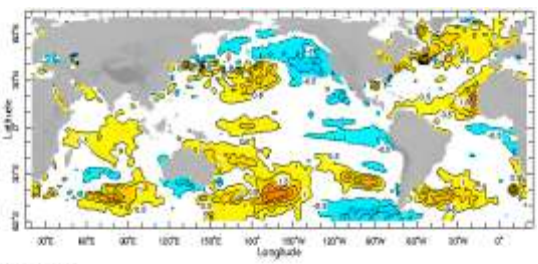
SST DJF: 1991, 1992, 2001, 2002



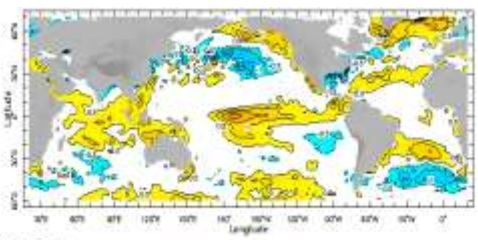
Dec 1991 - Feb 1992



Dec 1992 - Feb 1993

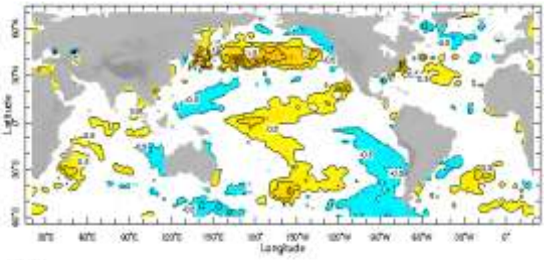


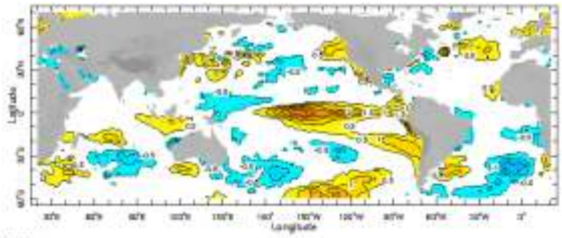
Dec 2001 - Feb 2002

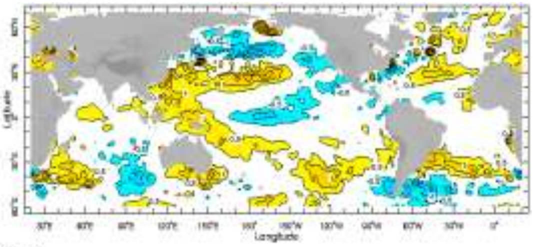


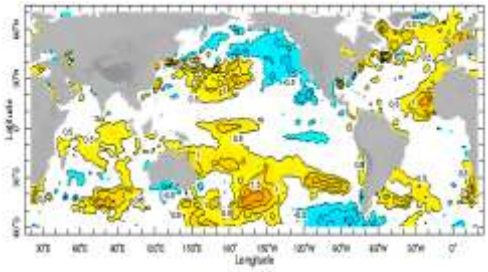
Dec 2002 - Feb 2003

SST JFM: 1991, 1992, 2001, 2002

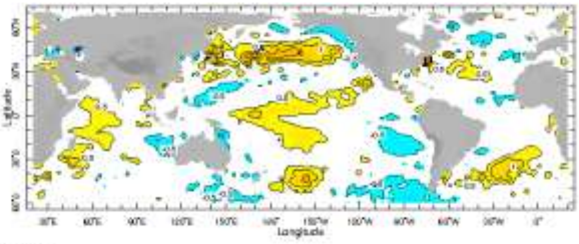

Jan-Mar 1991

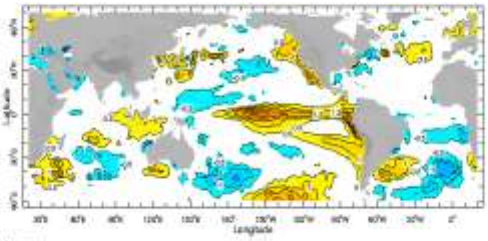

Jan-Mar 1992

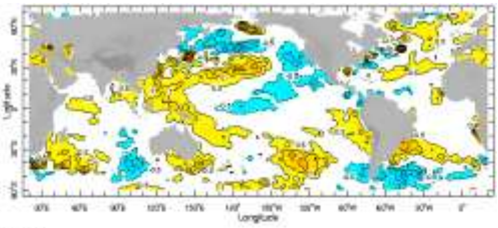

Jan-Mar 2001

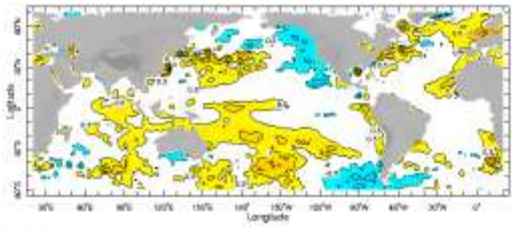

Jan-Mar 2002

SST FMA: 1991, 1992, 2001, 2002


Feb-Apr 1991

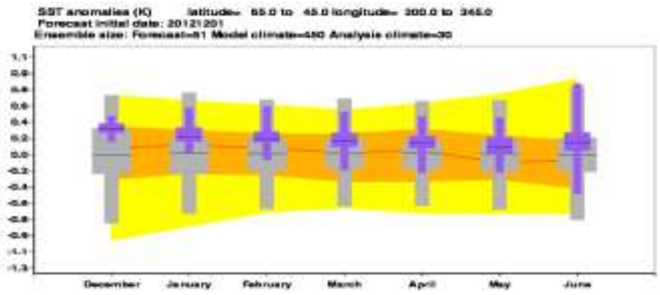

Feb-Apr 1992

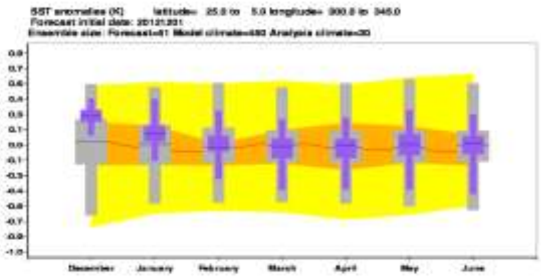

Feb-Apr 2001

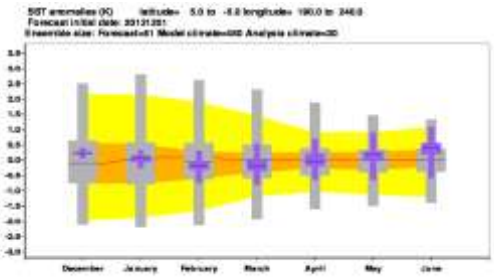

Feb-Apr 2002

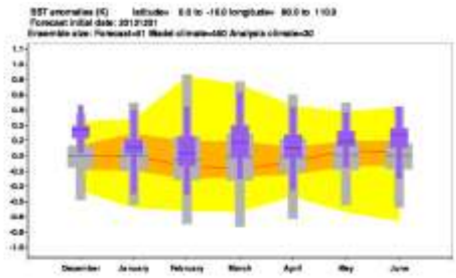
North Western Atlantic

Northern Trop Atlantic

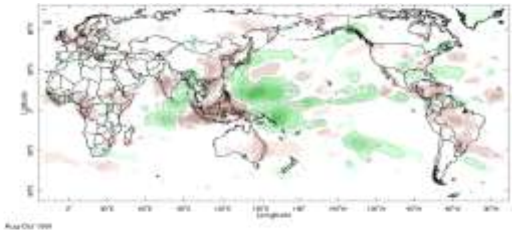


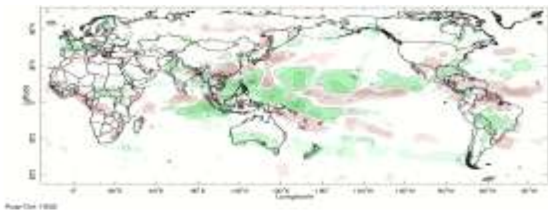


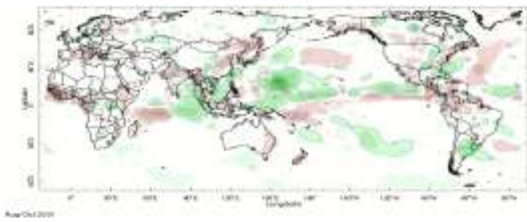


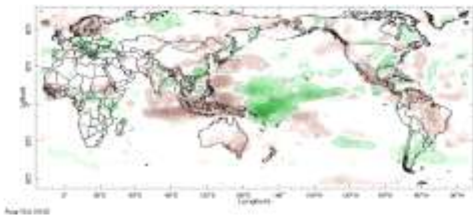


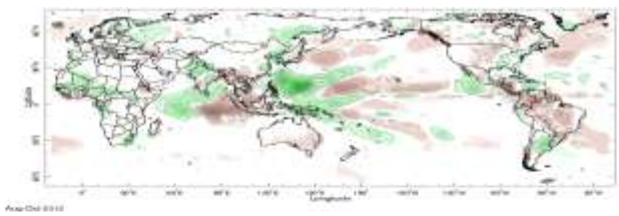
PRECIP ASO: 1991, 1992, 2001, 2002 et 2012



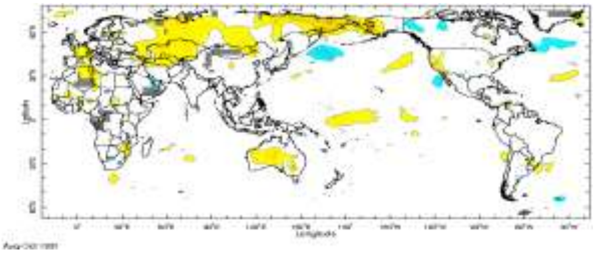


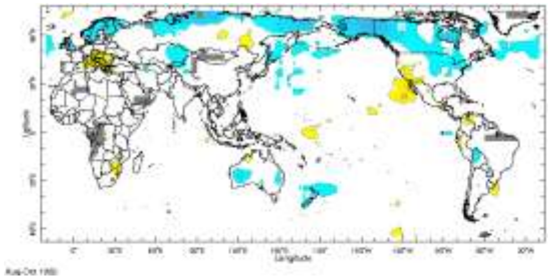


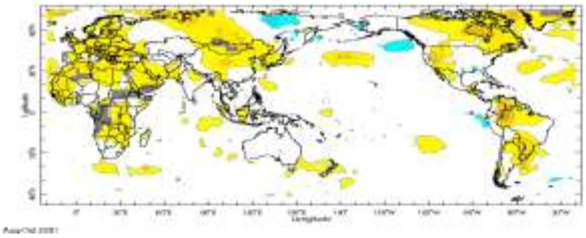


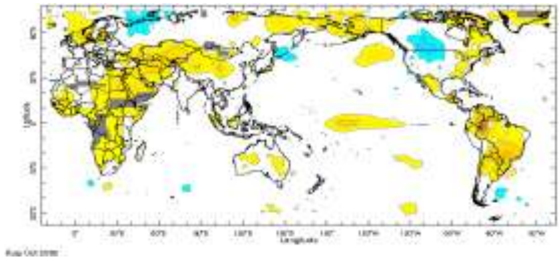


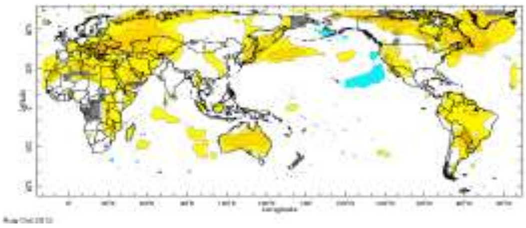
Temp 2m ASO: 1991, 1992, 2001, 2002



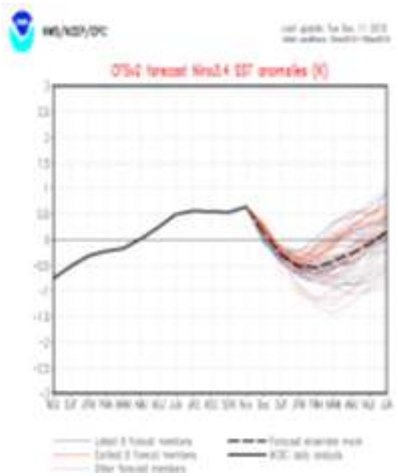


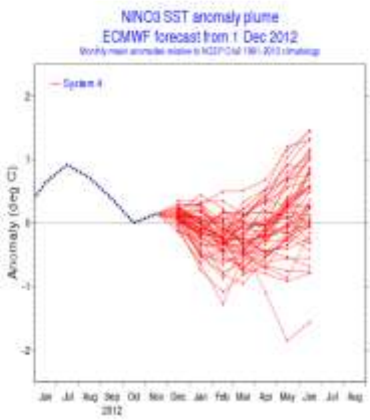


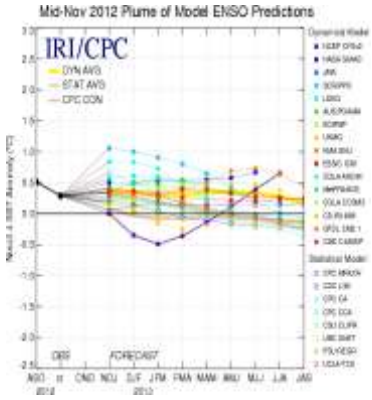




SST anomaly forecast







Annex 3: Procedure to prepare the Rainfall profiles

- The Precipitation daily data used was exported from CLICOM ascii format and converted to excel
- Inorder to suit the format to be used for the analysis of the profiles, the excel data is transposed by year for 365/366 days using **SSC-STA** macro.
- Tr is replaced by 8888,
- Leap year is replaced by 9988
- Missing is replaced by 9999

Table 8a: Example of data having leap years replaced with 9988

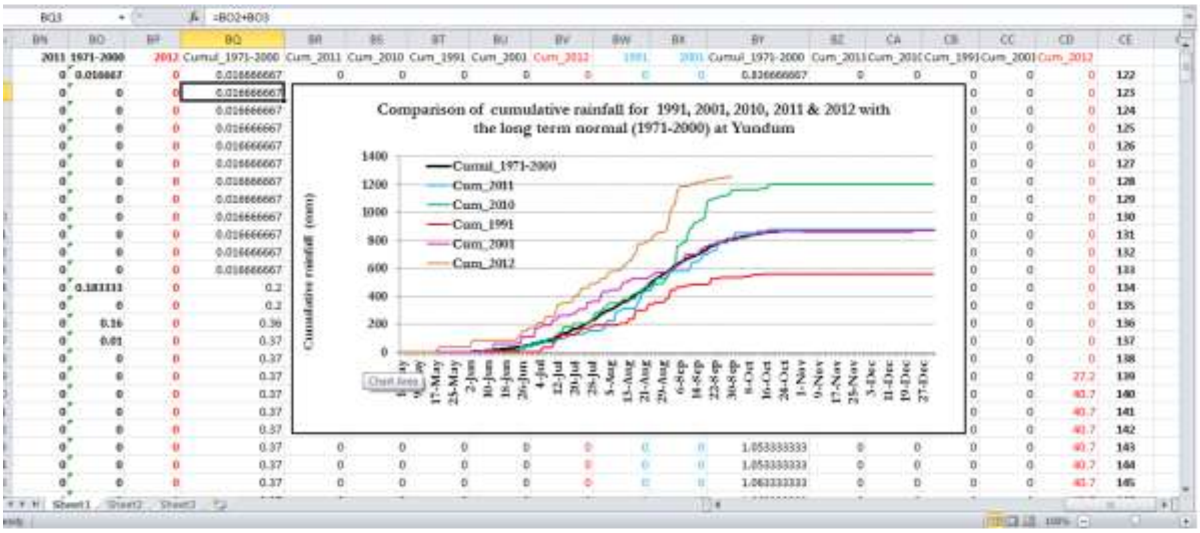
0	0	0.3	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
9988	9988	0	9988	9988	9988	0	9988	9988	9988	0	9988	9988	9988
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0

- The normal is calculated by adding the 30 years data and dividing by 30, another column is provided for the final calculation of the normal and is in this manner**;**

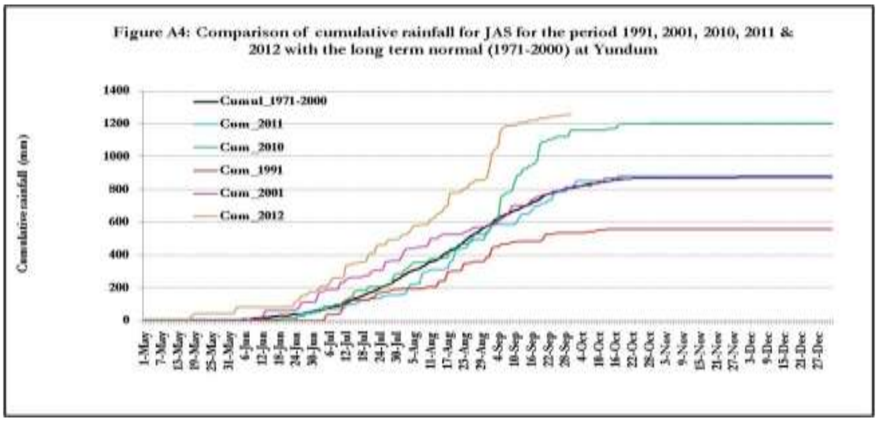
- E.g. for the normal for Yundum in BO column; Add the previous cell for 2012 year (e.g. BO2) + the next cell (e.g. BO3) e.g. =**BO2+BO3** and put in the **BO3 cell**; next **BO3+BO4** put in **BO4 cell** and drag downwards until the end of the data. Repeat the same process for 2011, 2010, 2001, 1991 and the normal.

- We create another column for the days (period) and we start with day 122 (start of the rainy season) to day 366/367.

- We put the results of the calculations for both the normal, 2011, 2010, 2001, 1991 and plot against the days, then we obtained the graph below;



Analyzed Precipitation profile 2012, 2011, 2010, 2001, 1991 years with the normal (1971-2000)



Completed analysed precipitation profile for Yundum 2012, 2011, 2010, 2001, 1991 and the normal (1971-2000)

Procedure to compare the yield, mean onsets, and cumulative rainfall; (Yield data; Source: Department of Planning (DOP), Banjul, 2005; Cumulative rainfall (source: Department of Water Resources, (DWR), Banjul

- The yield data (excel format) is provided by DOP at Banjul from 2001 to 2009.
- The rainfall data is provided by the Department of Water Resources (DRW), Gambia for 9 synoptic stations. The data was exported from CLICOM in Ascii format and later transformed to excel format
- Excel software is used to do statistical calculations of the mean for both the yield and cumulative rainfall and graph analysis.
- Instat software is used to calculate the mean Onset.

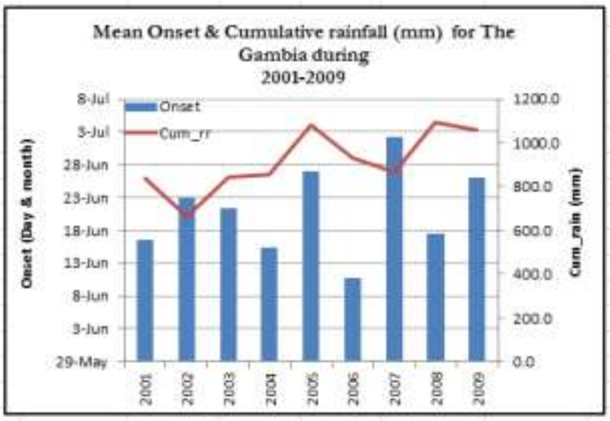
Table 8b: Yield data, onset and cumulative rainfall

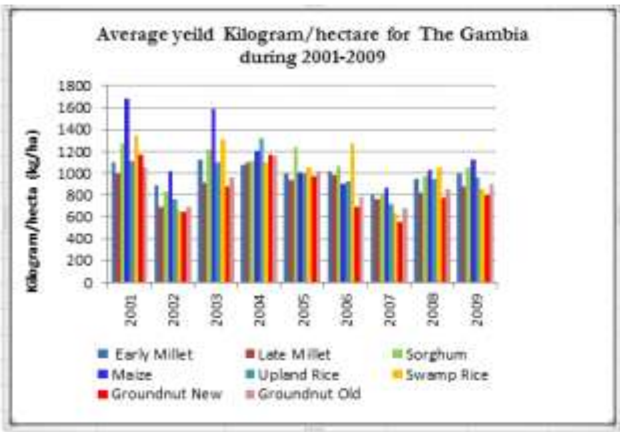
				Yield data	Kilogram/hecta (kg/ha					
	Early Millet	Late Millet	Sorghum	Maize	Upland Rice	Swamp Rice	Groundnut New	Groundnut Old	Onset	Cum_rr
2001	1095	992	1277	1685	1108	1341	1170	1059	169	836.6
2002	894	696	829	1013	762	662	646	690	175	661.0
2003	1121	917	1221	1585	1104	1313	884	959	173	845.0
2004	1072	1104.7	1113	1207	1324	1098	1175.92	1156	167	853.4
2005	993	932	1240	1005	998	1055	968	1013	179	1078.9
2006	1021	987	1069	903	927	1275	695	787	163	930.6
2007	805	761	826	869	713	639	550	680	184	867.2
2008	954	820	975	1033	950	1050	775	860	170	1094.8
2009	1000	875	1053	1126	955	850	800	900	178	1058.0

Table 8c: Onsets for 9 synoptic stations for the Gambia for 2001-2009

			ONSET (days)							
	Banjul	Basse	Fatoto	GT	Jenoi	Kaur	Kerewan	Sapu	Yundum	Avg
2001	178	154	185	165	165	165	176	165	164	**169**
2002	169	164	156	156	164	223	164	156	222	**175**
2003	179	166	167	180	167	179	179	167	176	**173**
2004	180	147	146	151	180	180	180	163	179	**167**
2005	179	179	179	179	179	**179**	179	179	178	**179**
2006	209	154	154	154	154	154	166	154	165	**163**
2007	199	165	165	191	191	165	199	185	198	**184**
2008	192	173	164	168	173	158	158	168	172	**170**
2009	**196**	166	166	203	167	189	167	166	182	**178**
2010	180	176	176	159	159	175	159	159	180	**169**
2011	184	184	166	179	184	198	199	198	176	**185**

Outputs: Analyzed graphs mean Onset & cumulative rainfall





ANNEX 4a: Procedures to generate downloaded precipitation (observed) anomaly % in The Gambia and Africa (estimated) precipitation anomaly %

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 script: "for extraction example FMA normal for the period 1979-2000"

Expert 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

- **Example: To 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

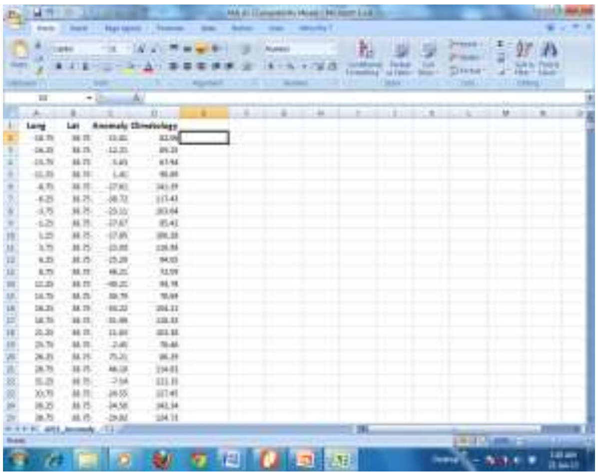
[T]average

90 mul

Data processing and map plotting

- Files are opened with precipitation data in Excel as shown below:
- The percentage is calculate using this formula in separated column:

  % =(anomaly/climatology)*100

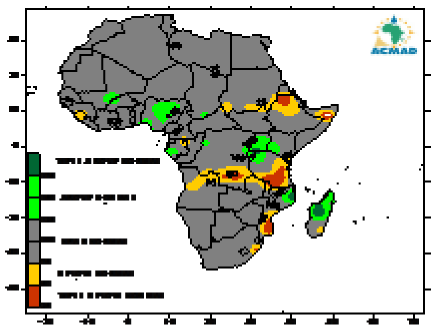


- Stns with climatology < 100mm for 3 months are replaced by 100 in a separate column using this formula**: e.g. =IF(D4<100,100,E4)**

✓ Save the file in csv format

✓ The plotting map procedures are the same with that of decadal precipitation

✓ legend (Pressao SG sharedDoc; Base Maps; LEGEND; Monthly ; Legen_temp_anom_Assesment_Mois.lvl).



African precipitation anomaly percentage for April-May-June 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).

ANNEX 4b: Procedure to generate precipitation anomaly maps and percentage of normal for The Gambia focusing on 1979-2000 base period

The sum and normal is calculated with the percentage of normal for every three months and the data layout in excel are as follows: Nine synoptic stations are used for the work.

- 2012 mean total precipitation for AMJ, MJJ, JJA, JAS, ASO, SON and OND.
  are calculated from the daily values,
- the normal (1979-2000) is calculated by adding the values of the period and divide by the number of years (22 years).
- Anomaly is calculated; **observed – normal/climatology**
- The percentage of normal is also calculated by; (**Anomaly/normal)*100**.

Table 9a: Data excel spread sheet

Banjul	sum_2012	1979-2000	%	Fatoto	sum_2012	1979-2000	%	Sapu	sum_2012	1979-2000	%	Basse	sum_2012	1979-2000	%
Apr	0	0.0		Apr	0	2.2		Apr	0	0.0		Apr	0	2.9	
may	22.1	3.8		may	32.2	17.4		may	37.5	8.4		may	52.9	20.3	
jun	57.8	50.5		jun	45.7	85.9		jun	229.8	85.2		jun	95.5	92.7	
	79.9	54.2772727	147.2		77.9	105.4772727	73.9		267.3	93.7	285.4		148.4	115.9	128.0
may	22.1	3.8		may	32.2	17.4		may	37.5	8.4		may	52.9	20.3	
jun	57.8	50.5		jun	45.7	85.9		jun	229.8	85.2		jun	95.5	92.7	
jul	184.8	177.5		jul	202.7	166.3		jul	313.6	190.2		jul	101	180.4	
	264.7	231.786364	114.2		280.6	269.5363636	104.1		580.9	283.8	204.7		249.4	293.4	85.0
jun	57.8	50.5		jun	45.7	85.9		jun	229.8	85.2		jun	95.5	92.7	
jul	184.8	177.5		jul	202.7	166.3		jul	313.6	190.2		jul	101	180.4	
aug	359	294.4		aug	243.7	251.1		aug	553	269.3		aug	261.1	274.8	
	601.6	522.331818	115.2		492.1	503.2727273	97.8		1096.4	544.6	201.3		457.6	547.9	83.5
jul	184.8	177.5		jul	202.7	166.3		jul	313.6	190.2		jul	101	180.4	
aug	359	294.4		aug	243.7	251.1		aug	553	269.3		aug	261.1	274.8	
sep	520.1	196.0		sep	239.8	175.2		sep	310.7	185.8		sep	191.5	197.5	
	1063.9	667.827273	159.3		686.2	592.6090909	115.8		1177.3	645.25	182.5		553.6	652.7	84.8
aug	359	294.4		aug	243.7	251.1		aug	553	269.3		aug	261.1	274.8	
sep	520.1	196.0		sep	239.8	175.2		sep	310.7	185.8		sep	240.2	197.5	
oct	51	63.2		oct	89.8	57.4		oct	111.9	77.6		oct	57.3	60.5	

Table 9b: Excel data arranged after statistical calculation

	AMJ				AMJ		
Longitude	Latitude	Anomaly	Station	Longitude	Latitude	% of normal	Station
-16.63	13.35	109.2	Yundum	-16.63	13.35	165	Yundum
-16.58	13.45	24	Banjul	-16.58	13.45	43	Banjul
-16.1	13.5	34.7	Kerewan	-16.1	13.5	50	Kerewan
-15.33	13.7	18.5	Kaur	-15.33	13.7	26	Kaur
-13.88	13.4	-35	Fatoto	-13.88	13.4	-31	Fatoto
-14.77	13.53	84.8	anjanbureh	-14.77	13.53	89	anjanbureh
-14.9	13.55	160.7	Sapu	-14.9	13.55	151	Sapu
-14.21	13.31	30.8	Basse	-14.21	13.31	26	Basse
-15.57	13.47	-5.9	Jenoi	-15.57	13.47	-7	Jenoi
	MJJ				MJJ		
Longitude	Latitude	Anomaly	Station	Longitude	Latitude	% of normal	Station
-16.63	13.35	212.4	Yundum	-16.63	13.35	74	Yundum
-16.58	13.45	29	Banjul	-16.58	13.45	12	Banjul
-16.1	13.5	182.7	Kerewan	-16.1	13.5	73	Kerewan
-15.33	13.7	74.4	Kaur	-15.33	13.7	29	Kaur
-13.88	13.4	-26.1	Fatoto	-13.88	13.4	-9	Fatoto
-14.77	13.53	92.4	anjanbureh	-14.77	13.53	32	anjanbureh
-14.9	13.55	274.1	Sapu	-14.9	13.55	89	Sapu
-14.21	13.31	-57.9	Basse	-14.21	13.31	-19	Basse
-15.57	13.47	107.5	Jenoi	-15.57	13.47	38	Jenoi

Table 9c: Excel data arranged to be gridded in surfer in different worksheets

Longitude	Latitude	%	Station
-16.63	13.35	288	Yundum
-16.58	13.45	147	Banjul
-16.1	13.5	153	Kerewan
-15.33	13.7	185	Kaur
-13.88	13.4	74	Fatoto
-14.77	13.53	220	Janjanbureh
-14.9	13.55	285	Sapu
-14.21	13.31	128	Basse
-15.57	13.47	93	Jenoi

AMJ / MJJ / JJA / JAS / ASO / SON / OND

- Save the data in excel file;
- Open surfer ; Grid ; Data ; Open the file for gridding.
- On X, put "Long", "Lat" on Y and (AMJ) on Z ; Ok ; Ok→ close ; No
- Grid ; spline smooth ; open the file (AMJ) ; browse ; select the file ; save ; Yes ; Ok ; Ok.
- Grid ; blank →; open data file ; open blank file in my documents\files\cartographie and choose blank2009.bln
- Browse for the Basemap also ; my documents \files\cartographie and choose;
- Maps ; Base Map; my documents\files_cartograhie\ GMNIV2.BNA (in my labtop named: Fatou Tosh); save data file; Ok.

- Map ; Contour map; new contour map; open the file
- Double click on contour levels and choose the colour you want; apply; ok.
- Repeat the same process for **MJJ, JJA, JAS, ASO, SON and OND**

Interpretation of the analysis for the Gambia Gambian precipitation anomaly percentage for 2012:

AMJ: Near Normal conditions prevailed at Jenoi, (LRR), and Fatoto at the URR
The rest of the country experienced Above normal to Well Above normal precipitation.

MJJ: Near normal conditions prevailed over part of Banjul (WR), Kerewan, (NBR) Basse and Fatoto at the URR. Above normal to well Above normal prevailed over the remaining parts of the country.

JJA: Near normal conditions was observed over Banjul, Kaur, Janjanbureh, Basse and Fatoto Above normal to Well Above normal prevailed over the remaining parts of the country.

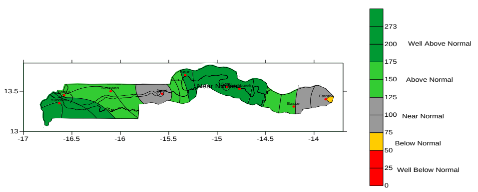
JAS: Above normal prevailed over Banjul, Yundum, Kerewan, Kaur and Sapu, whilst Near Normal was observed over Janjanbureh, Basse and Fatoto.

ASO: Near normal conditions was observed over Kerewan, Kaur, Janjanbureh, Basse and Fatoto whilst Above normal to Well Above normal is observed over the rest of the country.

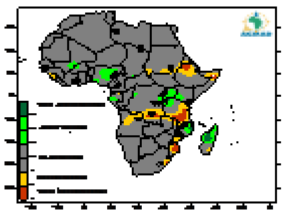
SON: Above normal prevailed over Banjul, Yundum, Kerewan, Kaur and Sapu, whilst Near Normal was observed over Janjanbureh, Basse and Fatoto.

OND: Well below to below Normal precipitation prevailed over the eastern half of the country (areas in red & yellow). The remaining parts of The Gambia also record Near normal to Above normal and Well Above Normal precipitation.

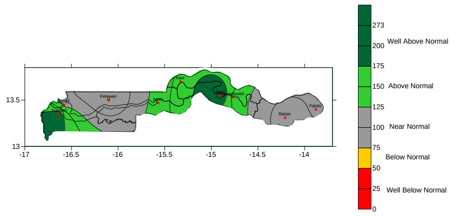
This situation for the Gambia conforms with Africa (estimated) precipitation anomaly.



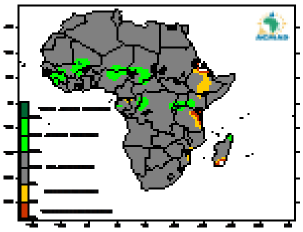
Gambian precipitation anomaly percentage for April-May-June 2012 for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



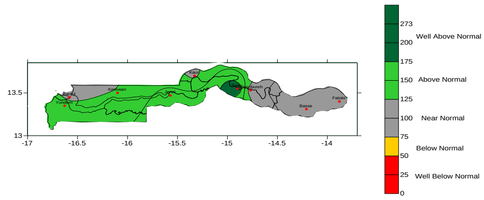
African precipitation anomaly percentage for April-May-June 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).



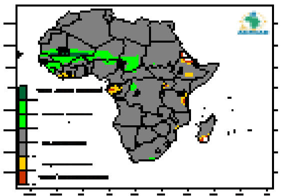
Gambian precipitation anomaly percentage for May-June-July for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



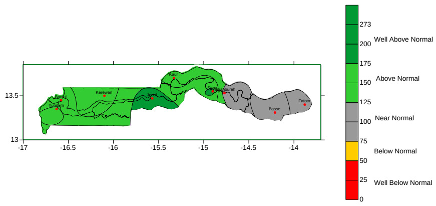
African precipitation anomaly percentage for May-June-July 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).



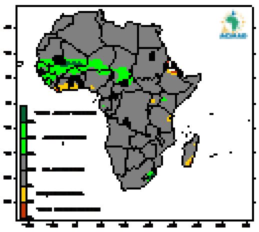
Gambian precipitation anomaly percentage for June-July-August for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



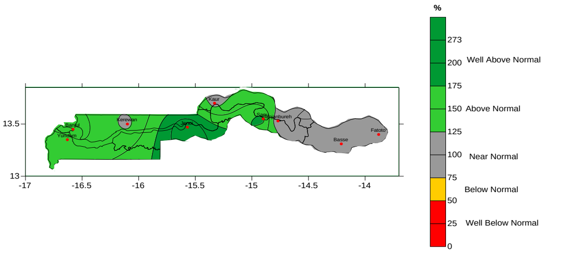
African precipitation anomaly percentage for June-July-August 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).



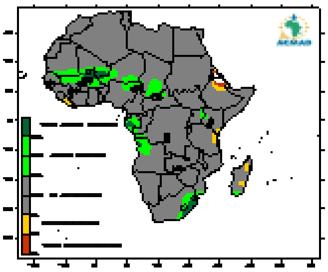
Gambian precipitation anomaly percentage for July-August-September for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



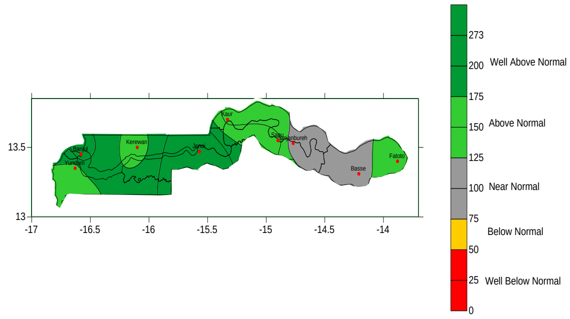
African precipitation anomaly percentage for July-August-September 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).



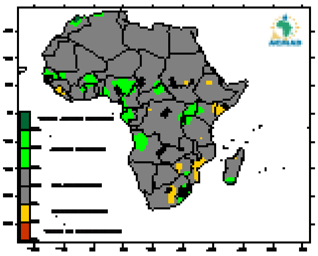
Gambian precipitation anomaly percentage for August-September-October for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



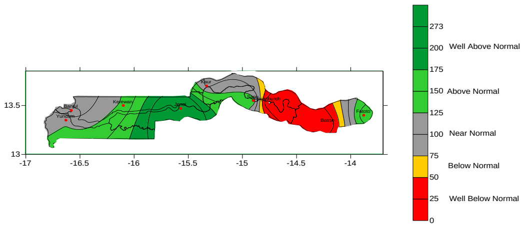
African precipitation anomaly percentage for August-September-October 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC,USA).



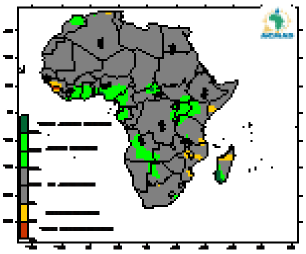
Gambian precipitation anomaly percentage for September-October-November for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period



African precipitation anomaly percentage for September-October-November 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).



Gambian precipitation anomaly percentage for October-November-December for synoptic stations; based on observed precipitation from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period.



African precipitation anomaly percentage for October-November-December 2012 for land areas; gridded 2.5-degree based on precipitation estimates from rain gauge data analysis as percentages of average focusing on the 1979-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA).

Procedure to prepare JAS percentage of normal precipitation for Analog years (2012, 2001 & 1991)

- 2012 mean total precipitation for JAS is calculated from daily values.
- Diff normals are calculated by **adding the values of the period** and ÷ **by the no. of yrs**.
- Anomaly is calculated ; **observed-normal**
- The %tage of normal is also calculated; **(Anom/normal)*100.**
- Results are arranged in a format and gridded in Surfer

Fatoto	Sum_2012	1981-2010	Anomaly	%
July	202.7	195.5	7.2	4
August	243.7	277.4	-33.7	-12
September	239.8	207.7	32.1	15
	686.2	680.6	5.6	1
Yundum	Sum_2012	1971-2000	Anomaly	
July	325	208.2	116.7967	56
August	368.6	312.1	56.50333	18
September	388	229.7	158.3433	69
	1081.6	750.0	331.6	44
Gtown	**Sum_2012**	**1971-2000**	**Anomaly**	
July	205	195.5	9.5	5
August	244.6	237.5	7.1	3
September	250.5	181.5	69.0	38
	700.1	614.5	85.6	14
Sapu	Sum_2012	1981-2010	Anomaly	
July	313.6	200.2	113.4	57
August	553	277.2	275.8	99
September	310.7	209.1	101.6	49
	1177.3	686.54	490.76	71
Kerewan	Sum_2012	1971-2000	Anomaly	
July	329.8	181.9	147.9	81
August	225.2	272.9	-47.7	-17
September	306.7	194.6	112.1	58
	861.7	649.475	212.225	32.67639

Fatoto	Sum_2001	1981-2010	Anomaly	%
July	283.5	195.5	88.0	45
August	171.2	277.4	-106.2	-38
September	218.7	207.7	11.0	5
	673.4	680.6	-7.2	-1
Yundum	Sum_2001	1971-2000	Anomaly	
July	250.8	208.2	42.6	20
August	208.4	312.1	-103.7	-33
September	241.1	229.7	11.4	5
	700.3	750.0	-49.7	-7
Gtown	Sum_2001	1971-2000	Anomaly	
July	187.9	195.5	-7.6	-4
August	218.1	237.5	-19.4	-8
September	187.9	181.5	6.4	4
	593.9	614.5	-20.6	-3
Sapu	Sum_2001	1981-2010	Anomaly	
July	272.5	200.2	72.3	36
August	320.8	277.2	43.6	16
September	134.7	209.1	-74.4	-36
	728	686.54	41.46	6
Kerewan	Sum_2001	1971-2000	Anomaly	
July	364.6	181.9	182.7	100
August	218.8	272.9	-54.1	-20
September	122.7	194.6	-71.9	-37
	706.1	649.5	56.6	8.72

Fatoto	Sum_1991	1981-2010	Anomaly	%
July	240.6	195.5	45.1	23
August	134.3	277.4	-143.1	-52
September	77	207.7	-130.7	-63
	451.9	680.6	-228.7	-34
Yundum	Sum_1991	1971-2000	Anomaly	
July	194	208.2	-14.2033	-7
August	191.7	312.1	-120.397	-39
September	149.1	229.7	-80.5567	-35
	534.8	750.0	-215.2	-29
Gtown	Sum_1991	1971-2000	Anomaly	
July	280.4	195.5	84.9	43
August	231.1	237.5	-6.4	-3
September	249.4	181.5	67.9	37
	760.9	614.5	146.4	24
Sapu	Sum_1991	1981-2010	Anomaly	
July	146.9	200.2	-53.3	-27
August	111.3	277.2	-165.9	-60
September	165.4	209.1	-43.7	-21
	423.6	686.54	-262.94	-38
Kerewan	Sum_1991	1971-2000	Anomaly	
July	158.9	181.9	-23.0	-13
August	185.8	272.9	-87.1	-32
September	133.3	194.6	-61.3	-32
	478	649.475	-171.475	-26.4021

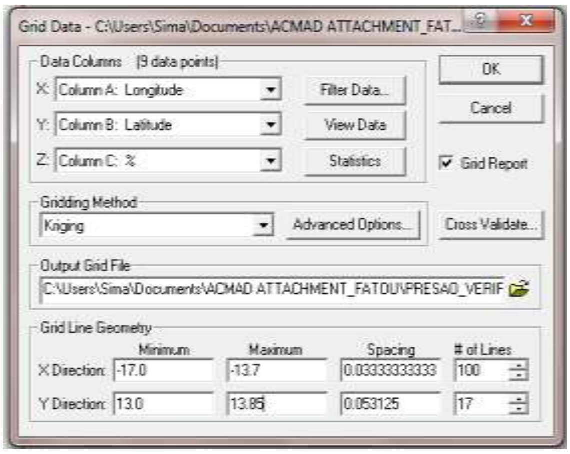
Spread sheet showing calculated data in excel for synoptic stations in The Gambia

Longitude	Latitude	Anom	Station
-16.63	13.35	143	Yundum
-16.58	13.45	51	Banjul
-16.1	13.5	33	Kerewan
-15.33	13.7	13	Kaur
-13.88	13.4	7	Fatoto
-14.77	13.53	14	anjanburel
-14.9	13.55	71	Sapu
-14.21	13.31	-17	Basse
-15.57	13.47	114	Jenoi

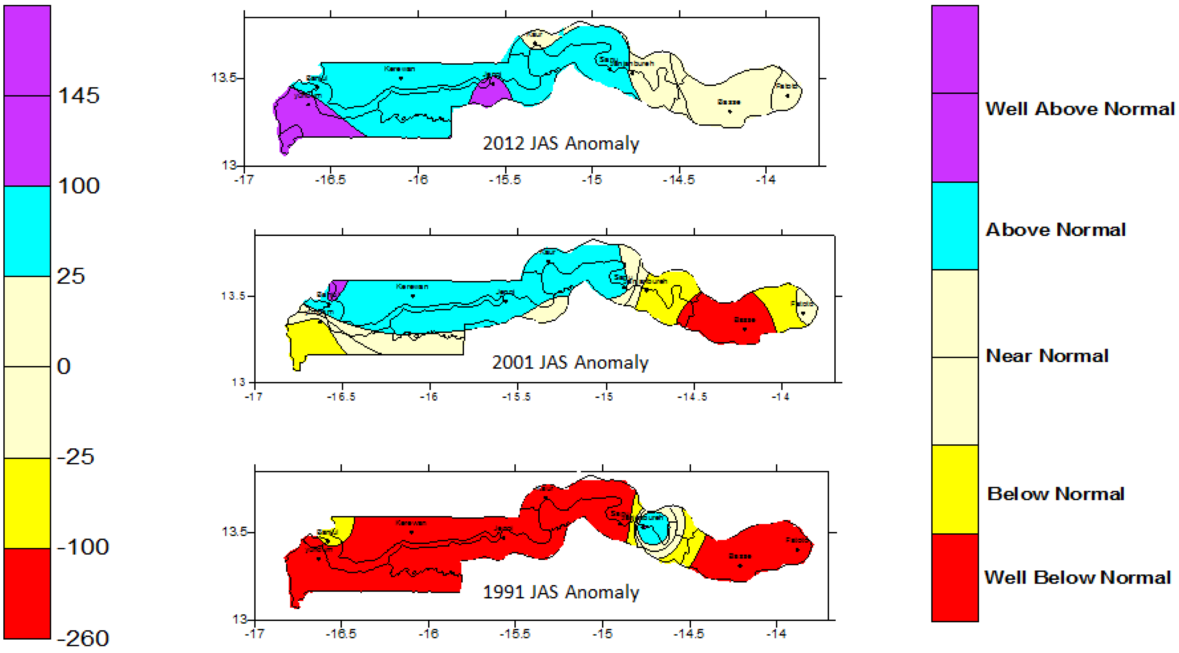
Calculated Anomaly to be gridded in Surfer

Longitude	Latitude	% of normal	Station
-16.63	13.35	44	Yundum
-16.58	13.45	51	Banjul
-16.1	13.5	33	Kerewan
-15.33	13.7	13	Kaur
-13.88	13.4	1	Fatoto
-14.77	13.53	9	anjanbureh
-14.9	13.55	71	Sapu
-14.21	13.31	-17	Basse
-15.57	13.47	111	Jenoi

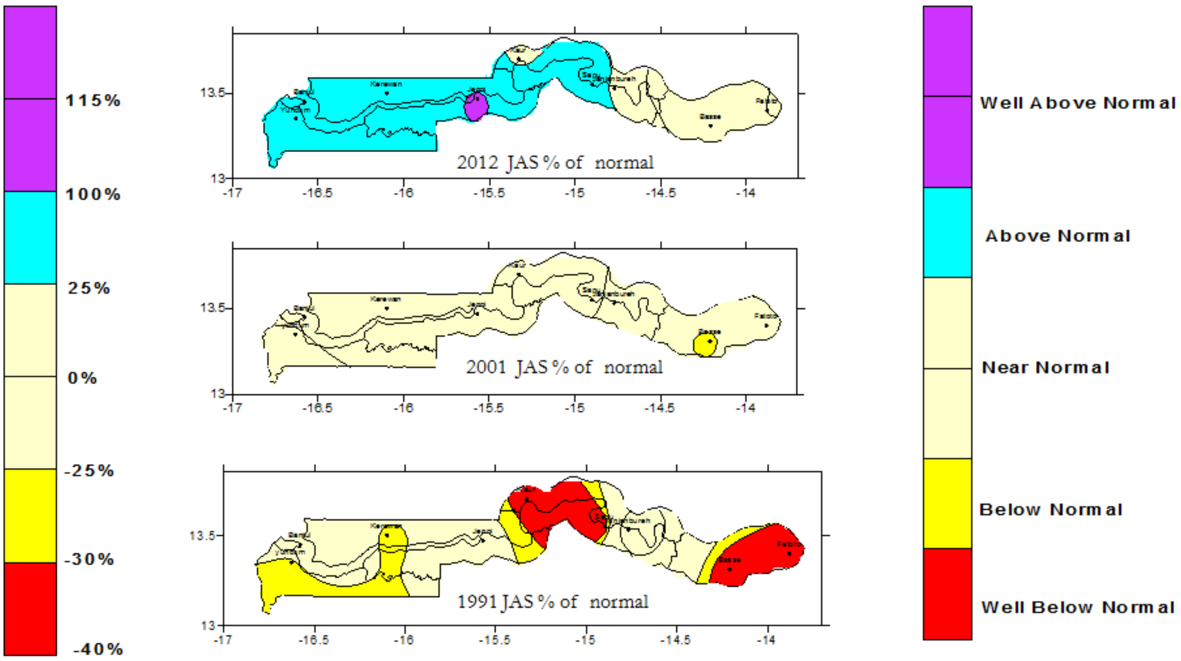
Calculated Percentage of normal to be gridded in Surfer



Gridding window in Surfer



JAS Precipitation Anomaly for 2012, 2001, and 1991



JAS precipitation percentage of normal for 2012, 2001, and 1991

ANNEX 4c: ACMAD contribution to the state of global Climate for 2012 for publication Bulletin American Meteorological service (BAM's).

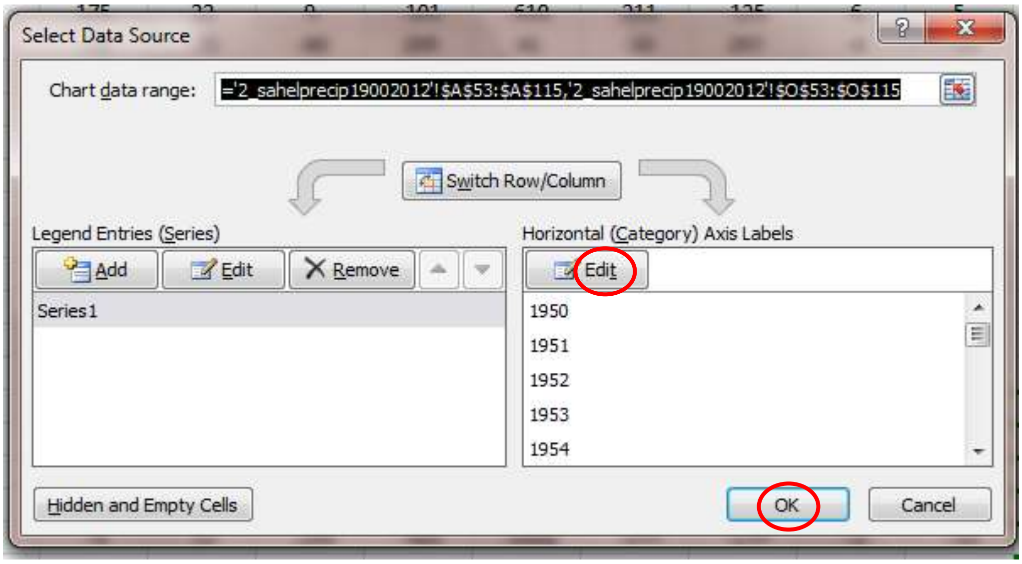
Procedure to generate the SAHEL rainfall index 1900-2012 accessible via IRI data Library

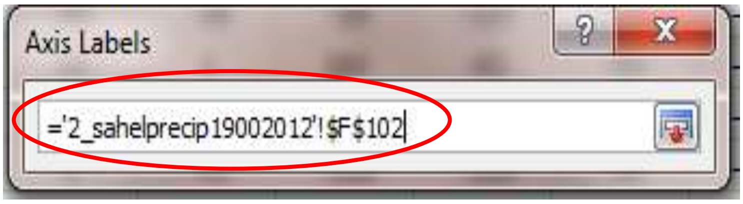
- Downloaded from iri.columbia.edu**; jisao.washington.edu**
- Sahel precipitation graph will show, click on digitize to download rainfall which will be in text format (dataset contains monthly precip anomalies in mm/month)
- Save the text file in excel format
- Calculate the total (note: the values are millimetres)
- Divide the total value (which is in millimetres) by 400 to convert to centimetres (cm)
- Choose period from 1950 to 2012
- Perform graphical analysis in excel and the steps are as follows; select the total from 1950-2012 and click on **insert, column, 2-column**, right click on the graph, **select data**, click on **edit**, select also the years (1950-2012) on the left and click on **ok**

Table 8: Sahel precipitation 1900-2012 (source NOAA)

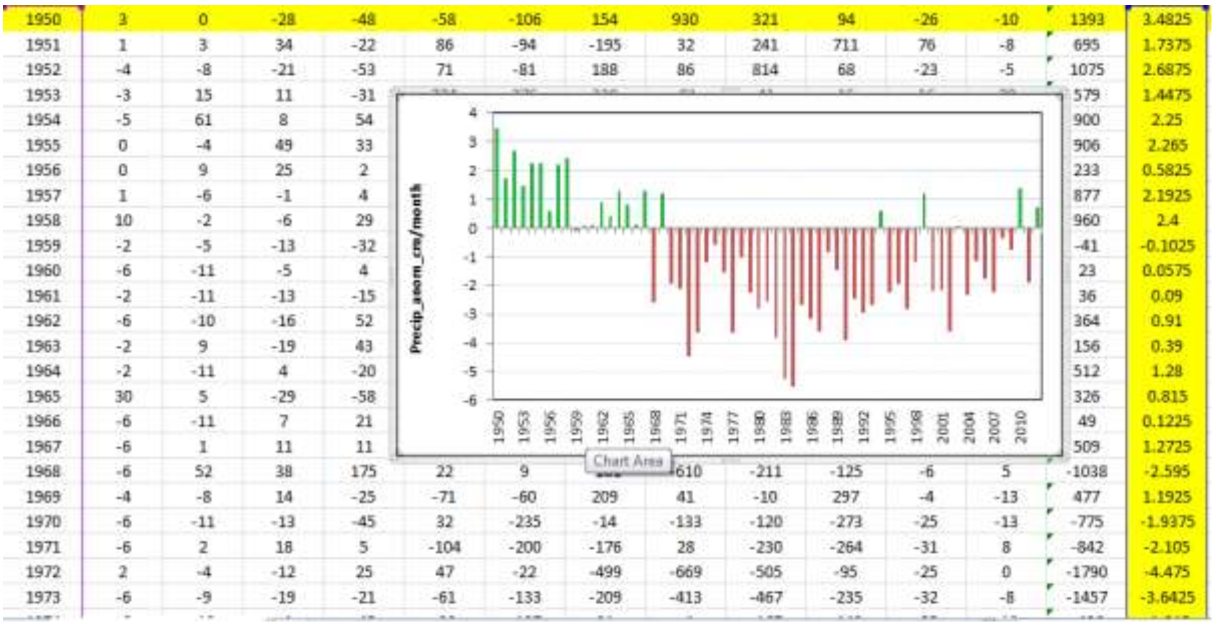
SAHEL PRECIPITATION 1900-2012

yyyy	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Sum	cm
1900	-6	7	-6	-10	98	200	514	-917	-185	-275	-43	-15	-663	-1.6575
1901	-8	-7	-6	10	68	78	378	229	-280	-201	-39	-15	204	0.51
1902	-5	-8	4	-9	-116	-147	-15	-978	-729	-52	-40	-14	-1321	-3.3025
1903	-7	-8	-12	6	167	36	-353	1066	-870	-298	-37	-18	-419	-1.0475
1904	-7	-8	-16	-27	98	203	-40	114	-642	-188	18	28	-553	-1.3825
1905	-3	11	-1	-34	-93	295	64	179	18	257	-32	8	813	2.0325
1906	-8	2	-38	31	103	133	708	829	-171	-51	7	191	1488	3.72
1907	-4	-5	-12	-73	-114	-14	-303	-206	-92	-116	-23	-15	-933	-2.3325
1908	-7	-15	13	-32	-120	-65	-77	450	-74	-230	-19	11	4	0.01
1909	3	-4	2	144	60	213	131	488	28	-93	-33	-3	767	1.9175
1910	-7	-10	-44	-21	-70	-72	222	78	-79	-239	-45	-17	-92	-0.23
1911	-8	-14	21	101	212	-78	-199	-182	-298	-183	4	-9	-938	-2.345
1912	0	-12	-45	29	-169	-31	-359	257	-45	-151	-14	4	-329	-0.8225
1913	14	-12	-40	-25	-65	-152	-414	-329	-453	-203	-32	-2	-1551	-3.8775
1914	-7	-12	-34	-66	-152	-19	-193	57	-46	-64	41	-12	-265	-0.6625
1915	-6	-10	34	140	107	98	-40	-37	-541	-150	-35	-11	-672	-1.68
1916	-6	-8	4	95	-113	-118	-15	237	152	-280	-16	-10	-24	-0.06
1917	0	-1	-26	-40	235	-338	-178	234	278	-338	-13	-8	-342	-0.855
1918	-3	-10	-13	-10	137	394	117	298	115	-7	-40	-13	917	2.2925
1919	-6	-9	-15	-35	131	-130	94	-364	-100	-124	-30	-13	-624	-1.56
1920	-3	6	-25	-10	2	101	-273	434	40	-237	-29	-14	65	0.1625
1921	-6	-7	1	-11	16	-134	-314	81	-163	-165	31	-10	-695	-1.7375
1922	1	-6	-17	60	-61	-108	-16	117	384	149	29	-6	466	1.165





Windows to select period for graphical analysis (e.g. 1950-2012)



1950	3	0	-28	-48	-58	-106	154	930	321	94	-26	-10	1393	3.4825
1951	1	3	34	-22	86	-94	-195	32	241	711	76	-8	695	1.7375
1952	-4	-8	-21	-53	71	-81	188	86	814	68	-23	-5	1075	2.6875
1953	-3	15	11	-31									579	1.4475
1954	-5	61	8	54									900	2.25
1955	0	-4	49	33									906	2.265
1956	0	9	25	2									233	0.5825
1957	1	-6	-1	4									877	2.1925
1958	10	-2	-6	29									960	2.4
1959	-2	-5	-13	-32									-41	-0.1025
1960	-6	-11	-5	4									23	0.0575
1961	-2	-11	-13	-15									36	0.09
1962	-6	-10	-16	52									364	0.91
1963	-2	9	-19	43									156	0.39
1964	-2	-11	4	-20									512	1.28
1965	30	5	-29	-58									326	0.815
1966	-6	-11	7	21									49	0.1225
1967	-6	1	11	11									509	1.2725
1968	-6	52	38	175	22	9	[illegible]	-610	-211	-125	-6	5	-1038	-2.595
1969	-4	-8	14	-25	-71	-60	209	41	-10	297	-4	-13	477	1.1925
1970	-6	-11	-13	-45	32	-235	-14	-133	-120	-273	-25	-13	-775	-1.9375
1971	-6	2	18	5	-104	-200	-176	28	-230	-264	-31	8	-842	-2.105
1972	2	-4	-12	25	47	-22	-499	-669	-505	-95	-25	0	-1790	-4.475
1973	-6	-9	-19	-21	-61	-133	-209	-413	-467	-235	-32	-8	-1457	-3.6425

Analyzed Sahel precipitation anomaly in cm/month for the period 1950-2012

Procedure to prepare West Africa Temperature for February-March-April 2012 via IRI data Library

expert

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

T (Feb 2012) (Dec 2012) RANGEEDGES

Y (30N) (20S) RANGEEDGES

X (20W) (55E) RANGEEDGES

T 3 runningAverage

T 12 STEP

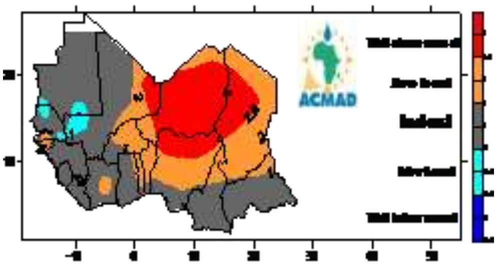
[T]average

90 mul

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 column:

  % = anomaly/climatology)*100

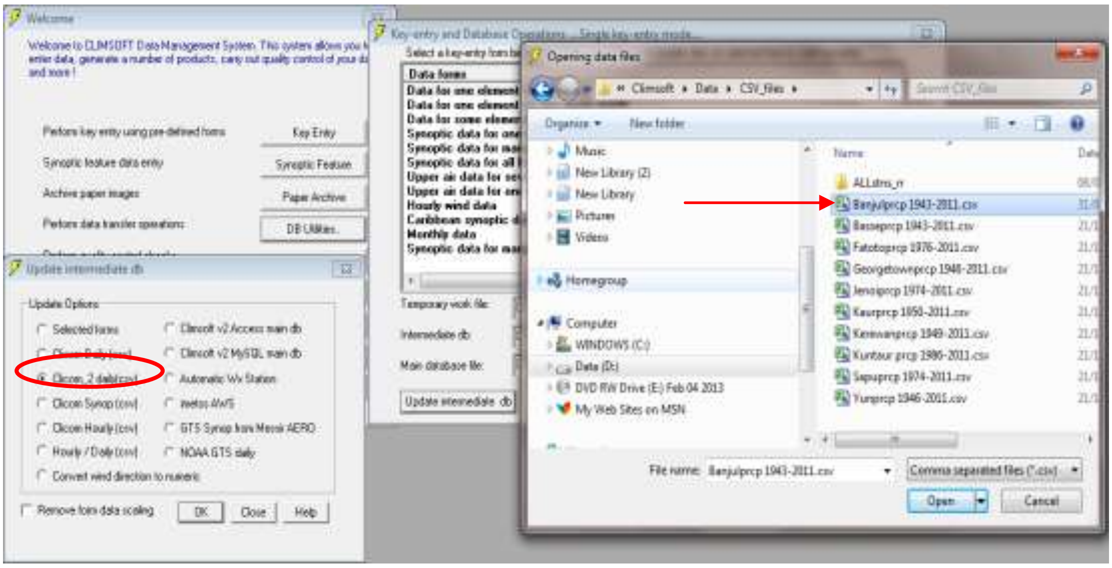


African temperature anomaly for February-March-April 2012 for land areas; gridded 2.0-degree based on Temperature estimates of average focusing on the 1971-2000 base period. (Source: ACMAD, Niger, and NOAA/NCEP/CPC, USA)

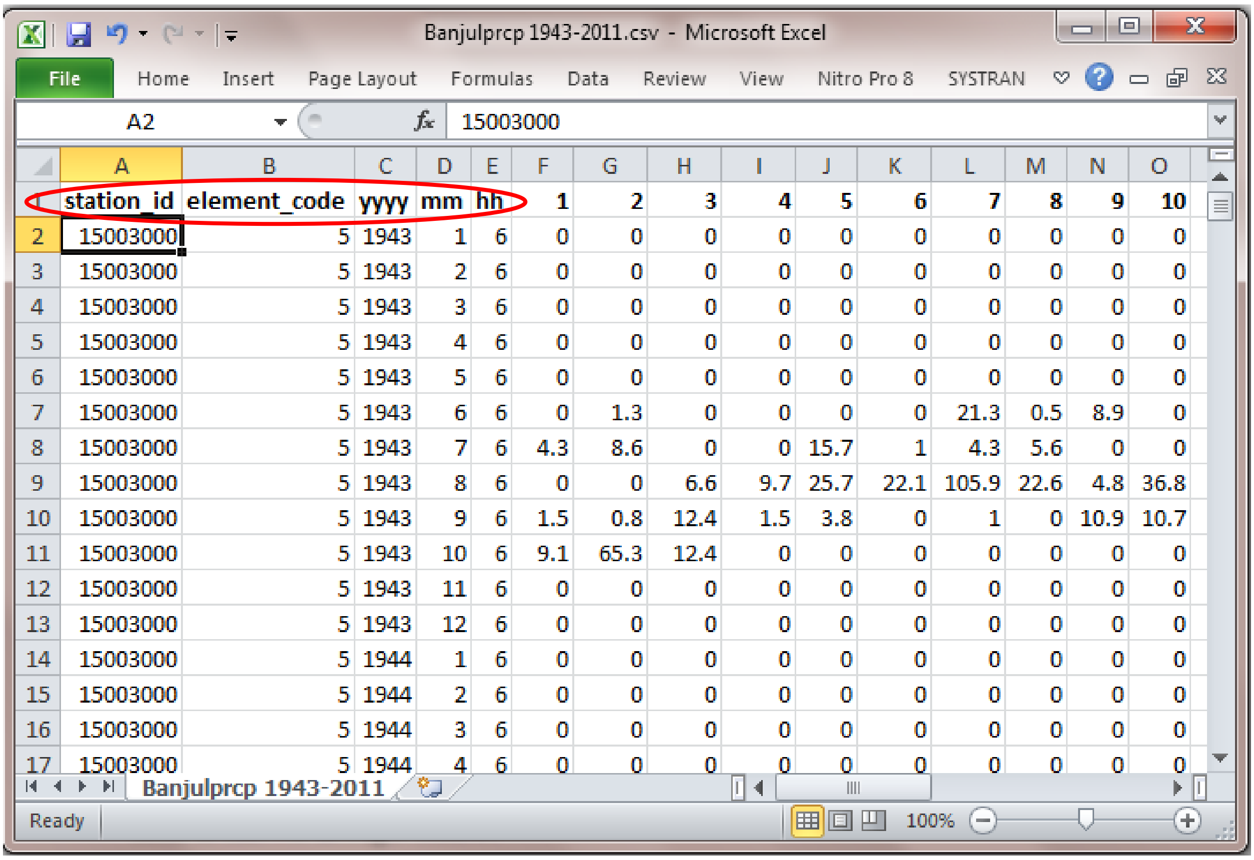
ANNEX 5: Procedure to import climate data, downloading NOAA and MESSIR Data in Climsoft

Procedure to import excel data file into climsoft

- First arranged your raw data in format shown in window below;
- Put **station_id, element_code, yyyy, mm, hh** at the extreme top in the red circle
- Save your excel file in format.csv in your folder,
- open **climsoft, DB Utilities, clicom_2 daily (csv), ok, Update intermediate db**, go to your folder **d:\Program files (86)\climsoft\data**and click on your file e.g. **Banjulprcp 1943-2011.csv** (file name), **open.**



Snapshot of window showing procedure to import excel data file to be imported to Climsoft

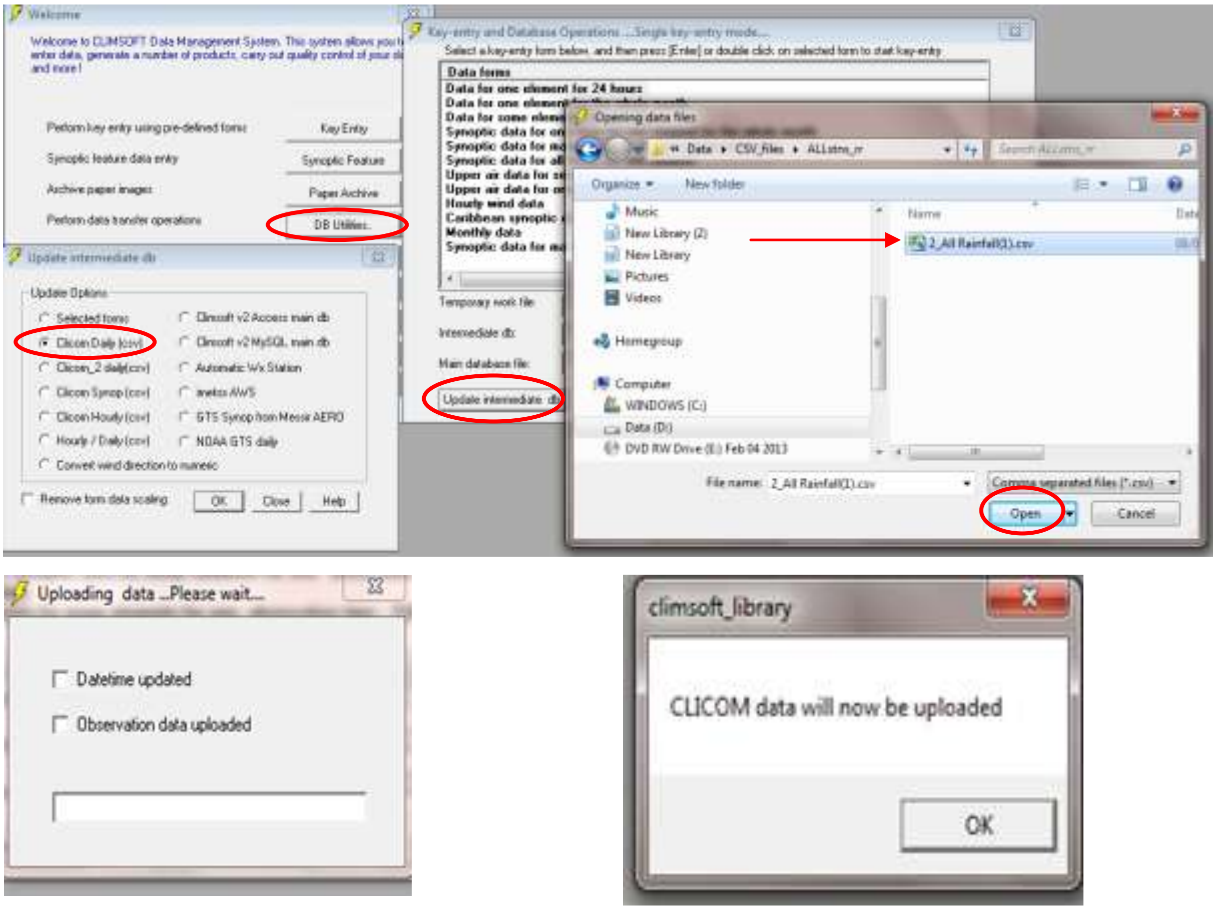


station_id	element_code	yyyy	mm	hh	1	2	3	4	5	6	7	8	9	10
15003000	5	1943	1	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	2	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	3	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	4	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	5	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	6	6	0	1.3	0	0	0	0	21.3	0.5	8.9	0
15003000	5	1943	7	6	4.3	8.6	0	0	15.7	1	4.3	5.6	0	0
15003000	5	1943	8	6	0	0	6.6	9.7	25.7	22.1	105.9	22.6	4.8	36.8
15003000	5	1943	9	6	1.5	0.8	12.4	1.5	3.8	0	1	0	10.9	10.7
15003000	5	1943	10	6	9.1	65.3	12.4	0	0	0	0	0	0	0
15003000	5	1943	11	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1943	12	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1944	1	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1944	2	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1944	3	6	0	0	0	0	0	0	0	0	0	0
15003000	5	1944	4	6	0	0	0	0	0	0	0	0	0	0

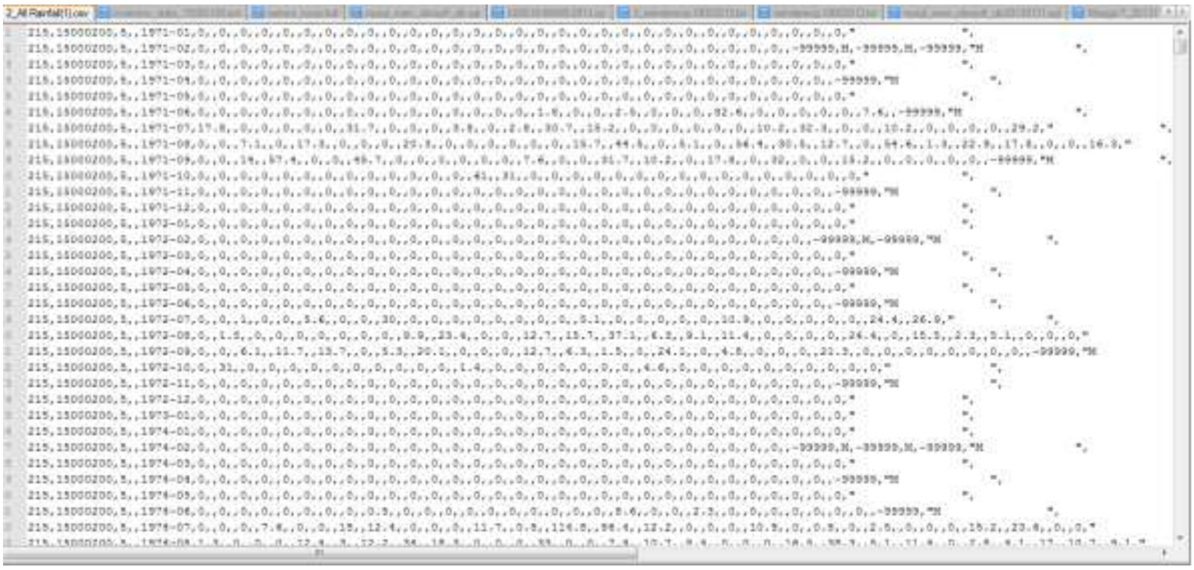
Snapshot of window showing excel data file arranged to be imported to Climsoft

Procedure to import CLIcom Acsii data file into climsoft

- First arranged your raw data in format shown in window below;
- The file must contain **id, station_code, element, year** and **data** and must be **comma** separated
- Save the file in **csv** format
- Open **climsoft, Db utilities, clicom daily (csv), ok, update intermediate db**, go to your folder **d:\Program files (86)\climsoft\data**and click on your file e.g. **2_All rainfall(1).csv** (file name), **open**
- Will show "**uploading_ please wait"** and later will show again **"clicom data will now be uploaded"** and will load your file.
- After importing, you perform **Quality Control**



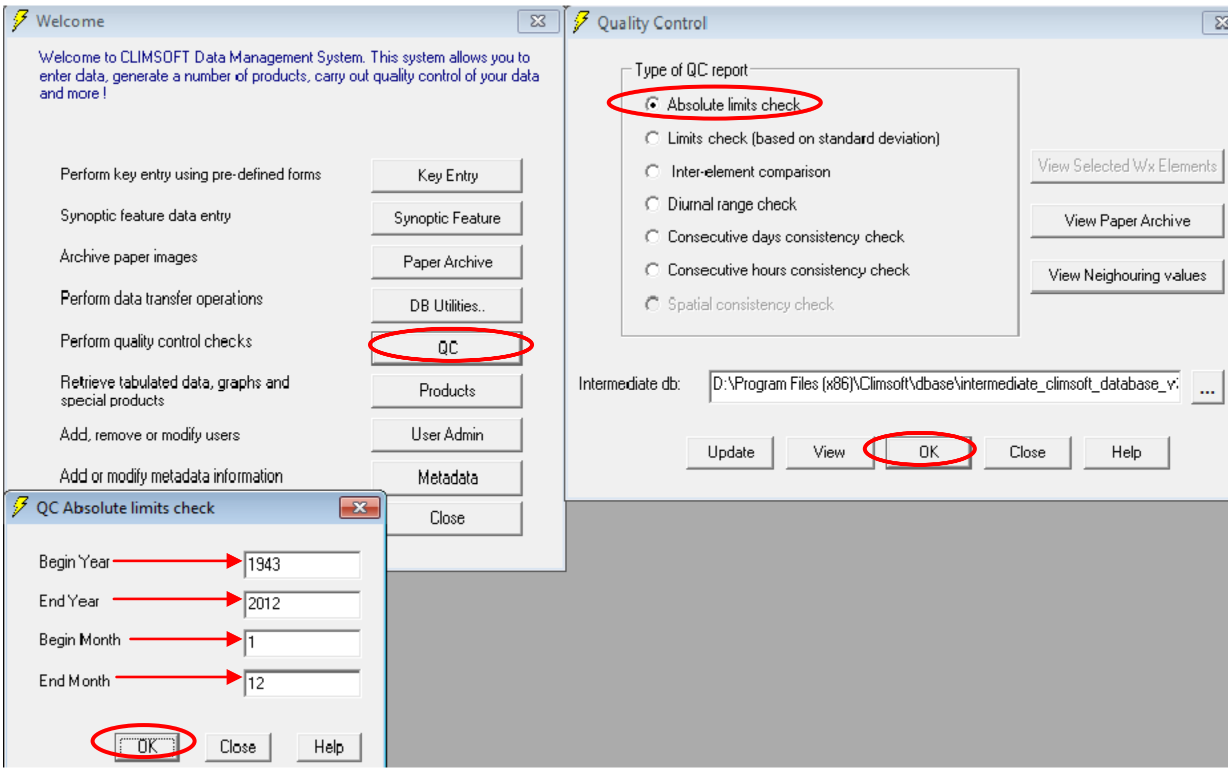
Snapshot of window showing procedure to import CLIcom ACSII data file into Climsoft



Snapshot of window showing CLIcom ACSII data arranged and saved in csv format

Procedure to perform Quality Control in climsoft

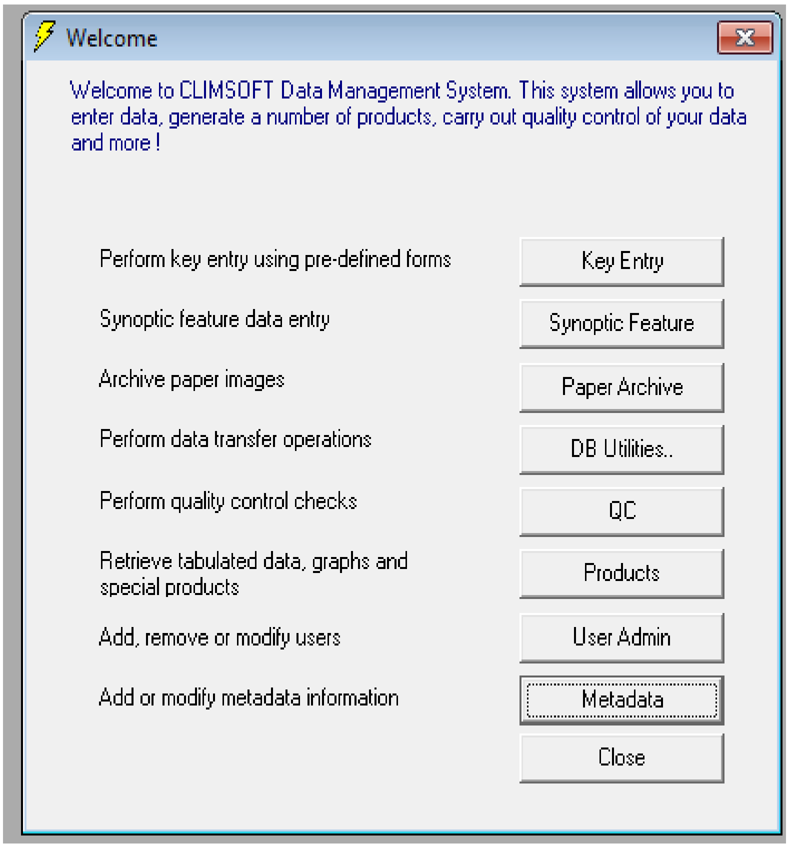
- Open **climsoft,** click on **Quality Control** (QC) **Absolute limits check, ok,**
- Put **begin & end year; begin & end month, ok** and finally upload to main database

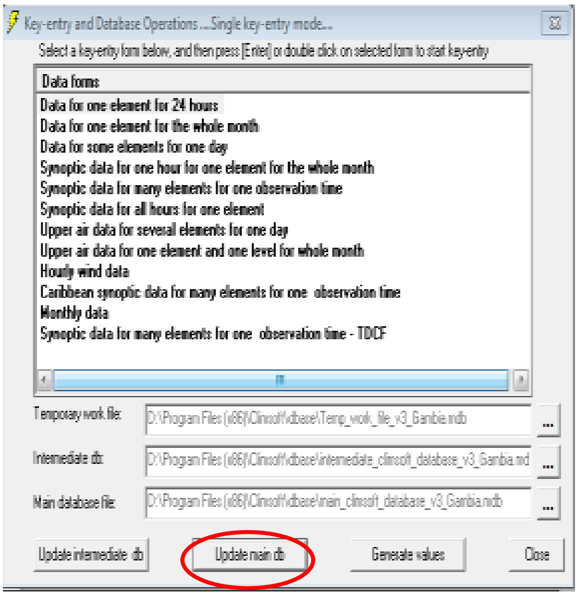


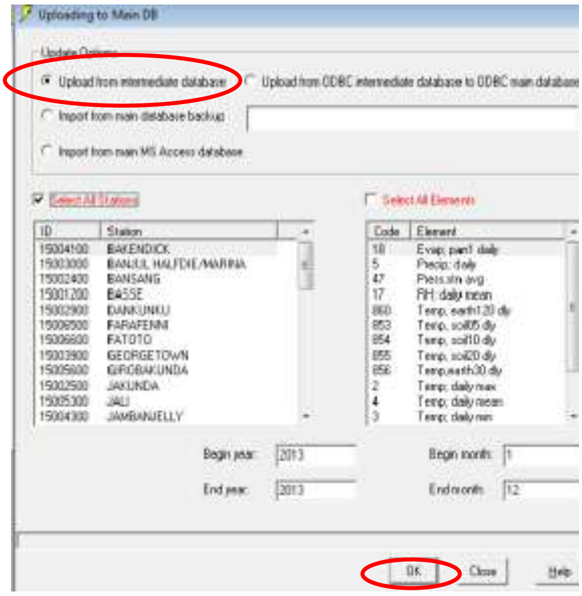
Snap shot of window showing procedure to perform Quality Control in Climsoft

Procedure to upload to main database

- Open **climsoft, Db utilities, clicom daily (csv), ok, update main db**, **upload from intermediate** (will show by default)
- Select **all stations** and the **elements** of interest (e.g. Precip daily, tmax and tmin)
- Put **begin & end year; begin & end month, ok**



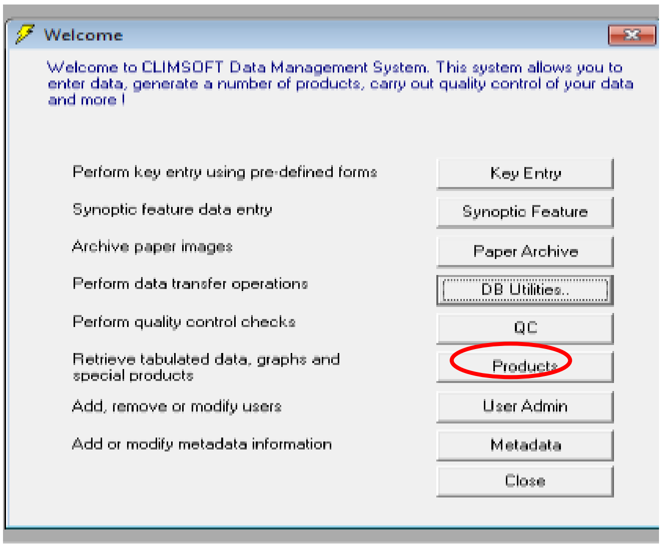


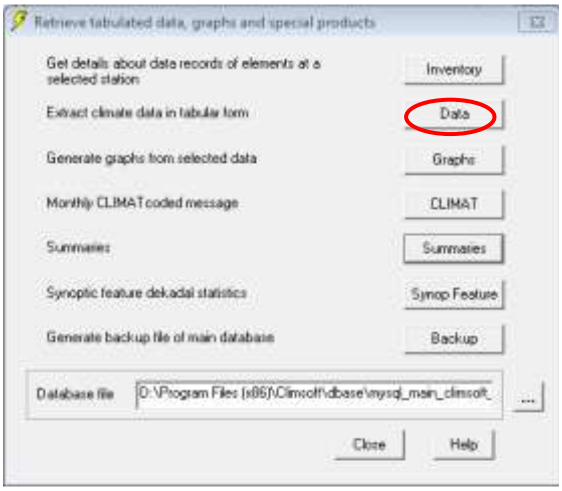


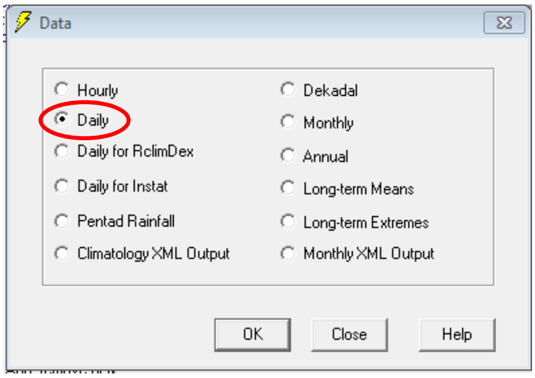
Snapshot of window showing procedure to import into main db in Climsoft

Procedure to download Precipitation data for the Gambia from Climsoft

- Open **climsoft,** click on **Products, Data, Daily, ok** as shown in window below







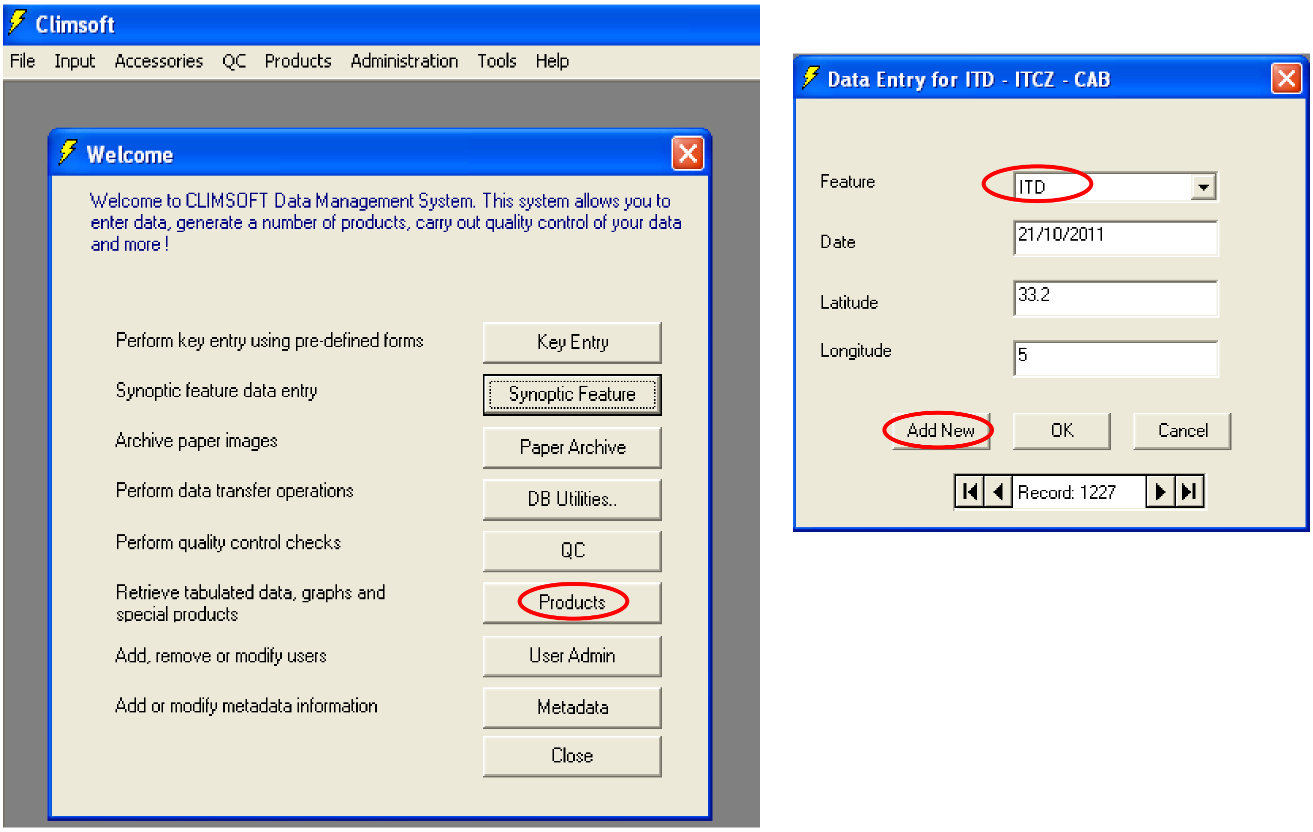
Snapshot of window showing procedure to download data from Climsoft

A	B	C	D	E
station_name	yyyy	mm	dd	PRECIP
BANJUL HALFDIE/MARINA	1943	1	1	0
BANJUL HALFDIE/MARINA	1943	1	2	0
BANJUL HALFDIE/MARINA	1943	1	3	0
BANJUL HALFDIE/MARINA	1943	1	4	0
BANJUL HALFDIE/MARINA	1943	1	5	0
BANJUL HALFDIE/MARINA	1943	1	6	0
BANJUL HALFDIE/MARINA	1943	1	7	0
BANJUL HALFDIE/MARINA	1943	1	8	0
BANJUL HALFDIE/MARINA	1943	1	9	0
BANJUL HALFDIE/MARINA	1943	1	10	0
BANJUL HALFDIE/MARINA	1943	1	11	0
BANJUL HALFDIE/MARINA	1943	1	12	0
BANJUL HALFDIE/MARINA	1943	1	13	0
BANJUL HALFDIE/MARINA	1943	1	14	0
BANJUL HALFDIE/MARINA	1943	1	15	0
BANJUL HALFDIE/MARINA	1943	1	16	0
BANJUL HALFDIE/MARINA	1943	1	17	0
BANJUL HALFDIE/MARINA	1943	1	18	0
BANJUL HALFDIE/MARINA	1943	1	19	0
BANJUL HALFDIE/MARINA	1943	1	20	0
BANJUL HALFDIE/MARINA	1943	1	21	0
BANJUL HALFDIE/MARINA	1943	1	22	0
BANJUL HALFDIE/MARINA	1943	1	23	0
BANJUL HALFDIE/MARINA	1943	1	24	0

Snapshot of Banjul data retrieve from climsoft

Procedure to key synoptic features (ITD, CAB & ITCZ) in Climsoft

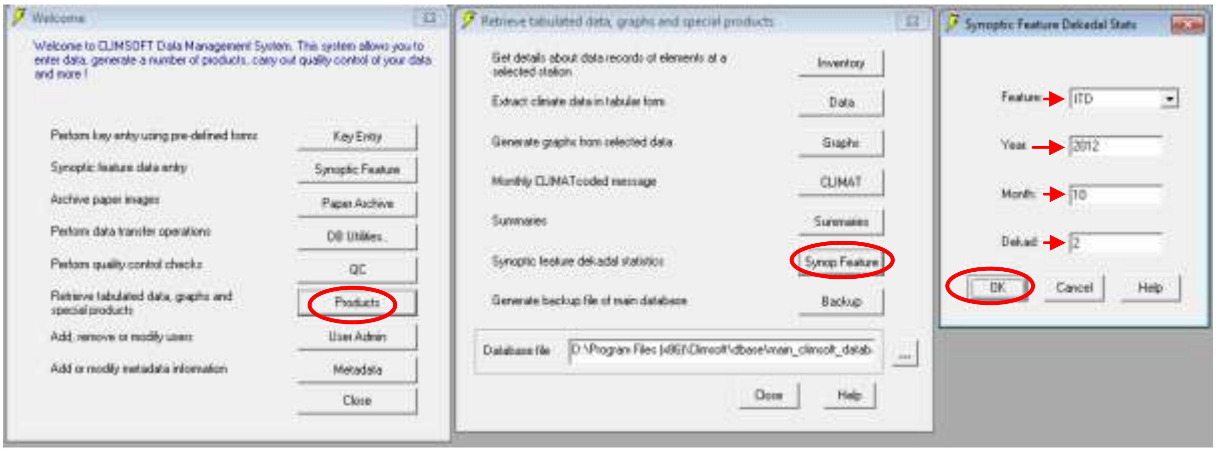
- Open **climsoft,** click on **Synoptic features,** click on the window of the **"feature"** and choose the **feature (e.g. ITD)** you want to key
- Click on "**Add new"** to bring a new window for another entry,
- Click **"ok"** when you complete the entry for ITD,
- Repeat the same process for **CAB and ITCZ.**



Window showing Key entry layout for Synoptic features

Procedure to retrieve synoptic features (ITD, CAB & ITCZ) in Climsoft

- Open **climsoft,** click on **Products, Synoptic features,** click on the window of the **"feature"** and choose the **feature (e.g. ITD)** you want to key
- Put the type of **feature** (e.g.) you want to retrieve
- Put **begin & end year; begin & end month, ok** as shown below



Window showing procedure to retrieve ITD data from Climsoft

Manual downloading NOAA Data:

- Start, core FTP.pro connect, pub, data, gsod, 2013 (path: pub\data\gsod\2013)
- Set date few minutes after 5 am, assumed after mid-night at noaa.
- Capture data for all stations that start with block no. starting with 60 to 68 (African stations), double click on the up arrow ⟵ quickly and click on overwrite if newer (if message pops up);

In ACMAD PC:

- downloaded files goes to : j:\gsod\2013\compressed and should be unzipped;
- Unzipped files goes to: j:\gsod\2013\decompressed;
- Unzipped files are merged into one file called noaa_gsod.txt into j:\program files (x86)\climsoft\data\noaa_gsod. But now there is automatic extraction and here goes the procedure below;

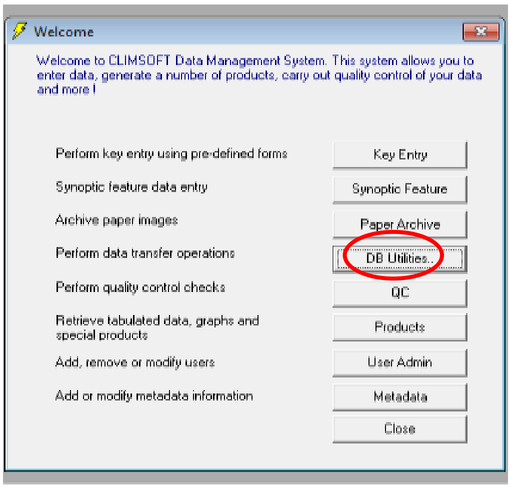
Automatic extraction using Script

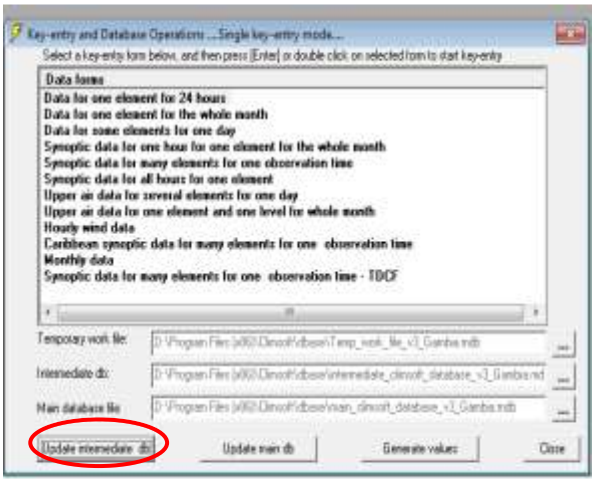
- Double click on run (short cut), extract_noaa will show at bottom , click ok
- Import the data into climsoft; **update intermediate**, then do **QC** and finally upload to **Main data base**.

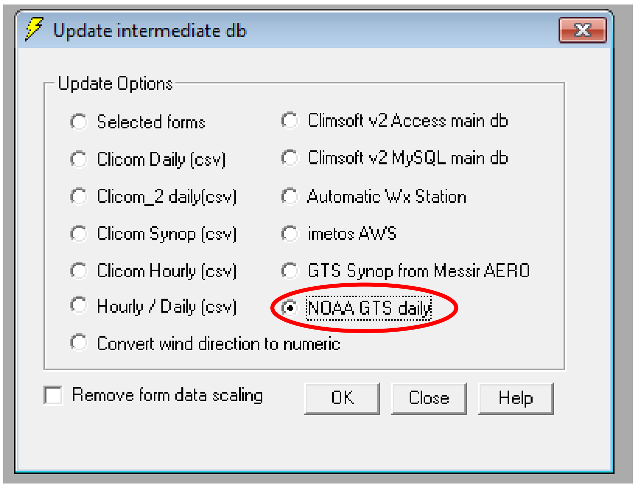
To retrieve the noaa data from the climsoft database:

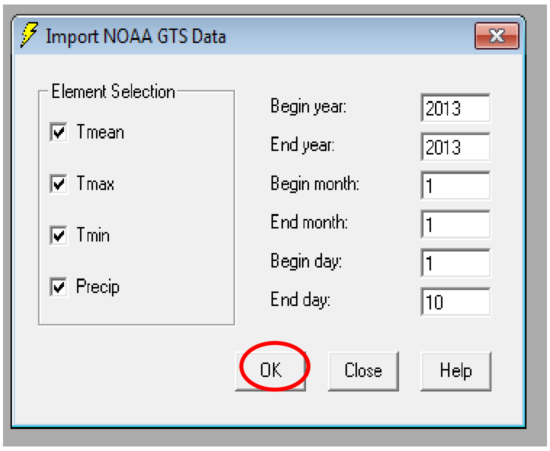
- Climsoft, products, summaries, ok
- Data will be for a particular dekad and file name example for the first dekad of Janaury 2013 will be shown like this **acmad_dekadal_bulletin_201301_dek1.csv**

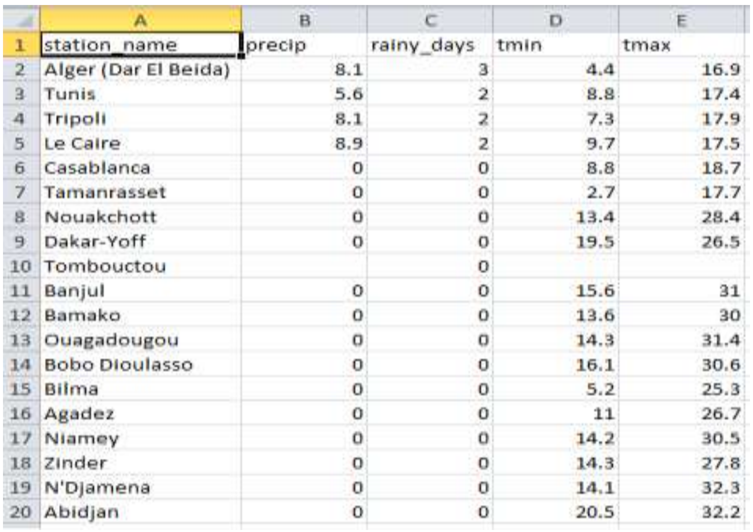
Procedure to import downloaded NOAA data into CLIMSOFT









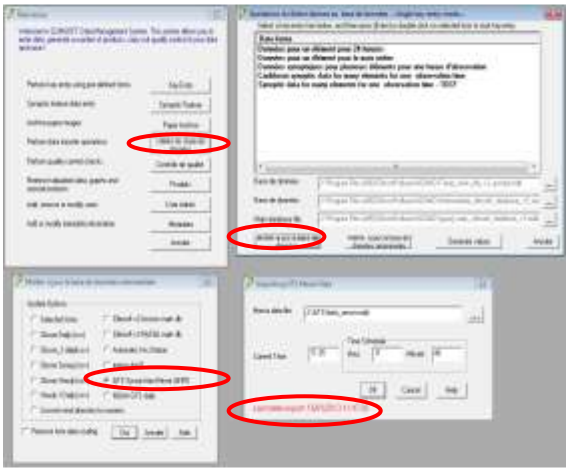


	A	B	C	D	E
1	station_name	precip	rainy_days	tmin	tmax
2	Alger (Dar El Beida)	8.1	3	4.4	16.9
3	Tunis	5.6	2	8.8	17.4
4	Tripoli	8.1	2	7.3	17.9
5	Le Caire	8.9	2	9.7	17.5
6	Casablanca	0	0	8.8	18.7
7	Tamanrasset	0	0	2.7	17.7
8	Nouakchott	0	0	13.4	28.4
9	Dakar-Yoff	0	0	19.5	26.5
10	Tombouctou		0		
11	Banjul	0	0	15.6	31
12	Bamako	0	0	13.6	30
13	Ouagadougou	0	0	14.3	31.4
14	Bobo Dioulasso	0	0	16.1	30.6
15	Bilma	0	0	5.2	25.3
16	Agadez	0	0	11	26.7
17	Niamey	0	0	14.2	30.5
18	Zinder	0	0	14.3	27.8
19	N'Djamena	0	0	14.1	32.3
20	Abidjan	0	0	20.5	32.2

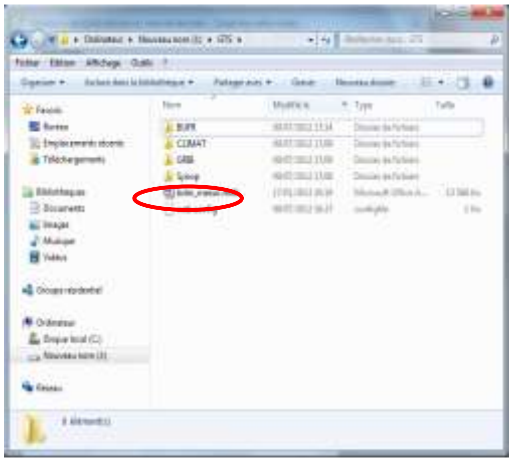
Example of downloaded NOAA data for dekad 1 January 2013 from climsoft

Procedure to import downloaded MESSIR data into CLIMSOFT

- Open climsoft, click on **DB utilities, Update Intermediate, GTS synop from Messir AERO, Yes**. (Note: Last data import is shown in red at the bottom).
- The location of MESSIR data in ACMAD computer : **J:\GTS.**

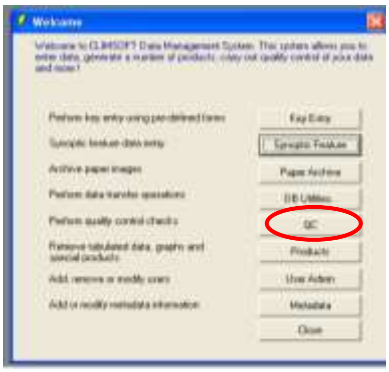


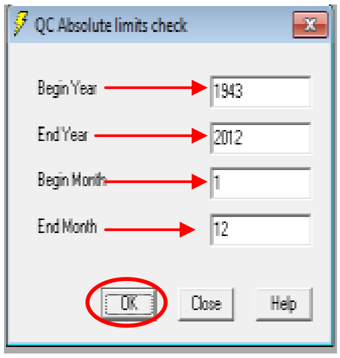
Procedure to download MESSIR data



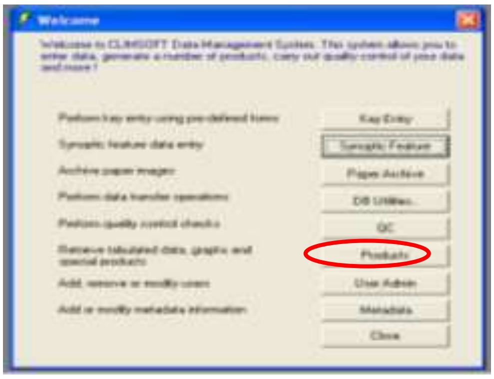
Location of MESSIR data in ACMAD computer

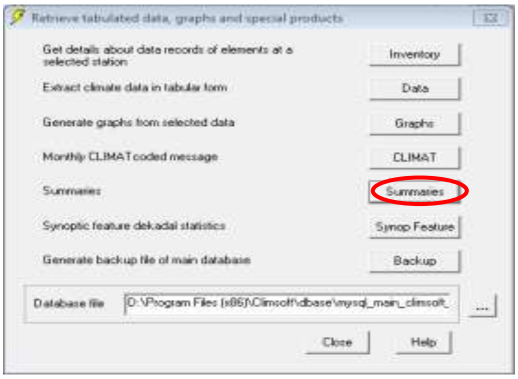
- Quality Control (QC) is done by clicking on **QC, Absolute limits check, put begin & end yr., begin & end month, ok** as window as shown below;

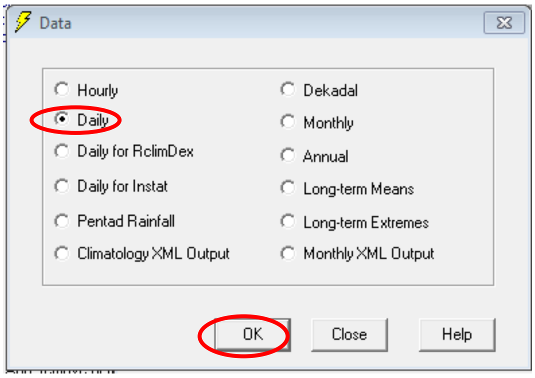


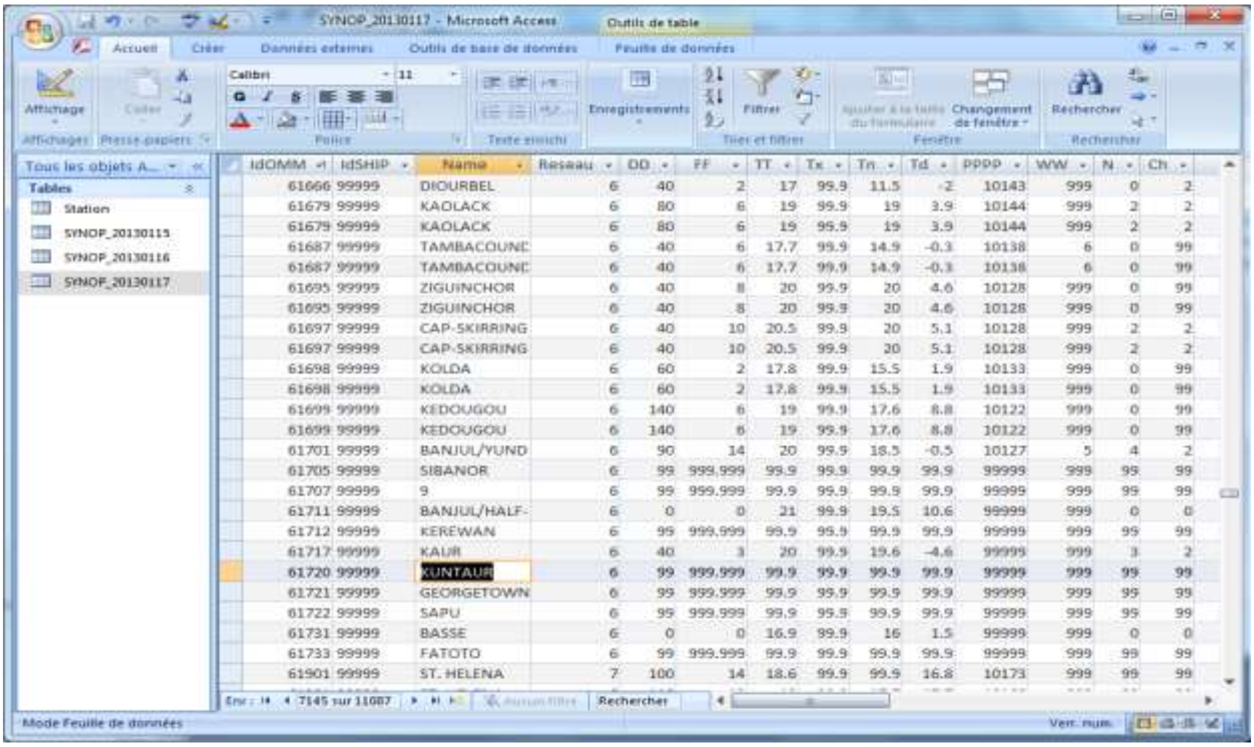


- Later transferred to main database by clicking on **Db utilities, Update main db, GTS Synop Messir AERO.**
- Messir data is retrieved by clicking on **Climsoft, products, summaries, put year, month, dekad, ok.**









IdOMM	IdSHIP	Name	Reseau	DD	FF	TT	Tx	Tn	Td	PPPP	WW	N	Ch
61666	99999	DIOURBEL	6	40	2	17	99.9	11.5	-2	10143	999	0	2
61679	99999	KAOLACK	6	80	6	19	99.9	19	3.9	10144	999	2	2
61679	99999	KAOLACK	6	80	6	19	99.9	19	3.9	10144	999	2	2
61687	99999	TAMBACOUNE	6	40	6	17.7	99.9	14.9	-0.3	10138	6	0	99
61687	99999	TAMBACOUNE	6	40	6	17.7	99.9	14.9	-0.3	10138	6	0	99
61695	99999	ZIGUINCHOR	6	40	8	20	99.9	20	4.6	10128	999	0	99
61695	99999	ZIGUINCHOR	6	40	8	20	99.9	20	4.6	10128	999	0	99
61697	99999	CAP-SKIRRING	6	40	10	20.5	99.9	20	5.1	10128	999	2	2
61697	99999	CAP-SKIRRING	6	40	10	20.5	99.9	20	5.1	10128	999	2	2
61698	99999	KOLDA	6	60	2	17.8	99.9	15.5	1.9	10133	999	0	99
61698	99999	KOLDA	6	60	2	17.8	99.9	15.5	1.9	10133	999	0	99
61699	99999	KEDOUGOU	6	140	6	19	99.9	17.6	8.8	10122	999	0	99
61699	99999	KEDOUGOU	6	140	6	19	99.9	17.6	8.8	10122	999	0	99
61701	99999	BANJUL/YUND	6	90	14	20	99.9	18.5	-0.5	10127	5	4	2
61705	99999	SIBANOR	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61707	99999	9	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61711	99999	BANJUL/HALF-	6	0	0	21	99.9	19.5	10.6	99999	999	0	0
61712	99999	KEREWAN	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61717	99999	KAUR	6	40	3	20	99.9	19.6	-4.6	99999	999	3	2
61720	99999	KUNTAUR	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61721	99999	GEORGETOWN	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61722	99999	SAPU	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61731	99999	BASSE	6	0	0	16.9	99.9	16	1.5	99999	999	0	0
61733	99999	FATOTO	6	99	999.999	99.9	99.9	99.9	99.9	99999	999	99	99
61901	99999	ST. HELENA	7	100	14	18.6	99.9	99.9	16.8	10173	999	99	99

Example of Messir AERO data 20130117

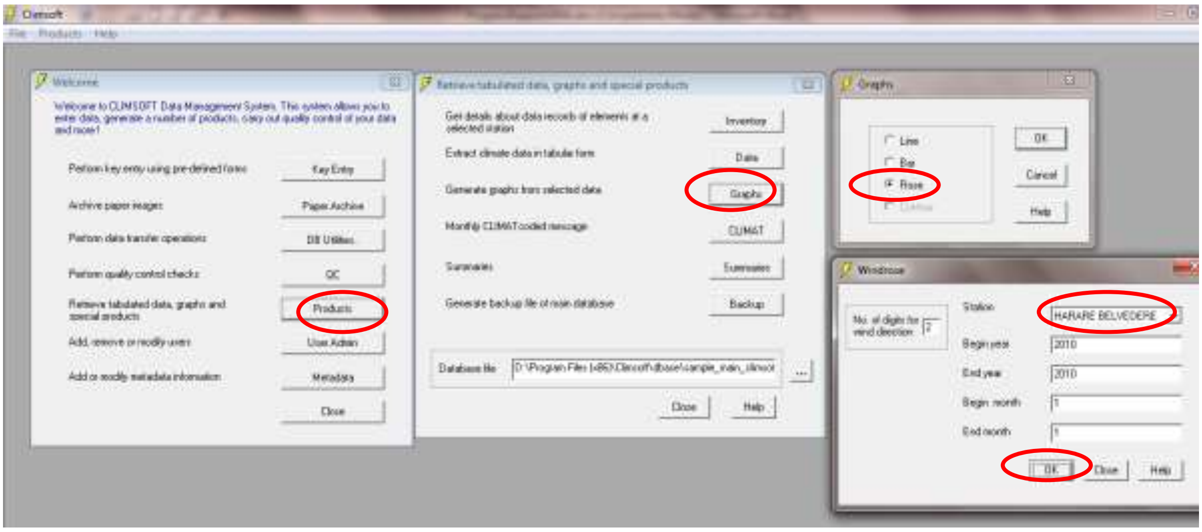
CLIMSOFT Products

Climsoft system can store historical and new climatic data in computerized form. These data can be used to produce summary reports, maps or diagrams, or subsets of the data can be extracted for further processing. An example is shown in figure 20a and 20b.

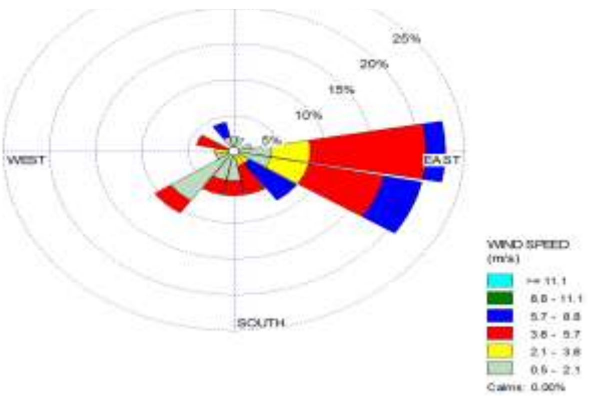
Wind Rose graph

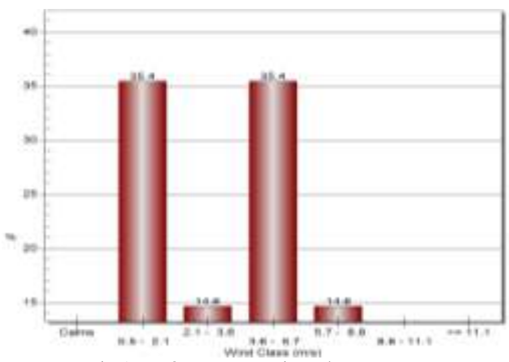
In order to produce wind rose in Climsoft; click on **Climsoft, products, graph, Rose,** put **station (**e.g. Harare Belvedere**)** and the period of interest **begin & end year, begin & end month, ok.** The license key to run the wind rose is provided in the **climsoft\bin** folder.

The wind rose graph shows the most predominant easterly's winds at Harare Belvedere station for the month of January 2010. The wind class frequency indicates that, between 0.5 to 2.1 and 3.6 to 5.6 meter's/second, the distribution will be 35%.



Procedure to get wind rose in climsoft





Wind class frequency distribution
at Harare Belvedere station for January 2010