CURRENT METHODS AND PRODUCTS OF SEASONAL PREDICTION IN KENYA

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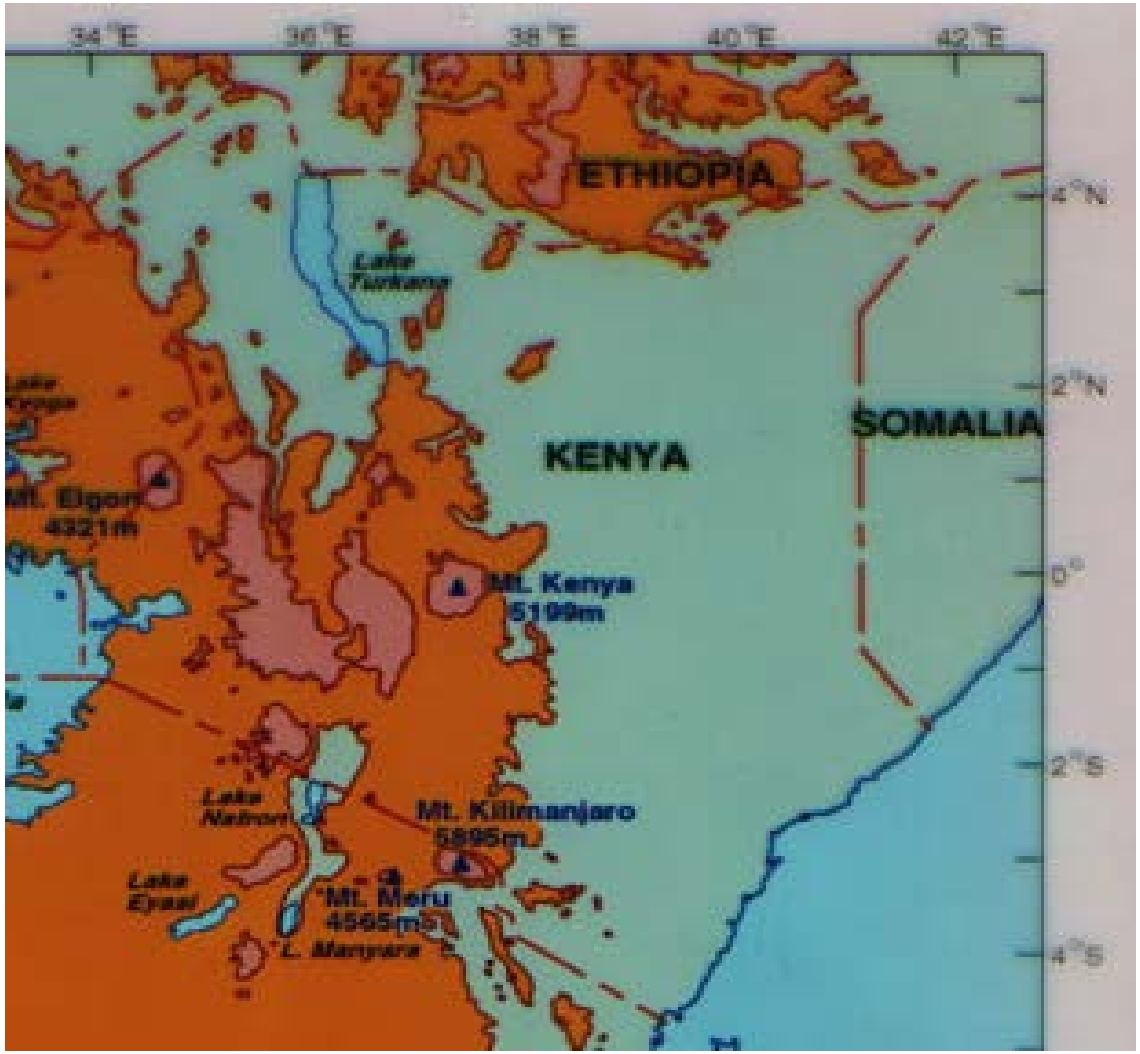
OUTLINE

- **Introduction**
  - Brief Geography of Kenya
  - Brief Rainfall Climatology of Kenya
- **Current Methods of Seasonal Prediction**
- **Outputs and Products**
- **Conclusion**

Brief Geography Of Kenya

- Characterized by very diverse topographic (relief) features
- Steady rise of the land surface from the coastal plains to altitudes of over 500 m in the interior to form the highlands in the East and West separated by the Great Rift Valley
    - Lowest points are areas along the Indian Ocean at height of 0m amsl
    - Highest point is the snow-capped Mt. Kenya in eastern highlands at 5,199 m amsl (15,600 ft)

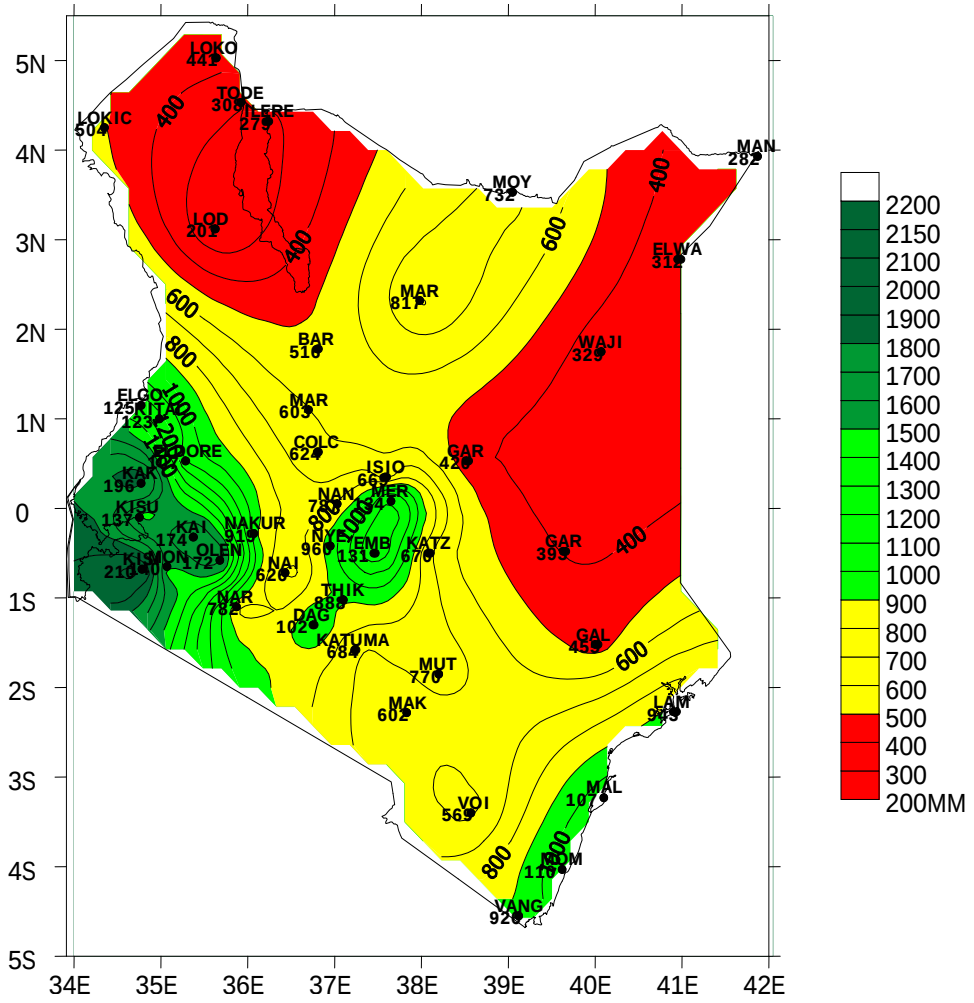
TOPOGRAPHY OF KENYA



RAINFALL CLIMATOLOGY OF KENYA

- Ranges from humid coastal areas to semi arid and arid lands, the snow capped mountains and the wet highlands.
- High spatial variability in rainfall because of the diverse relief features
  - *The annual rainfall varies from as low as 250mm in the arid zones to as high as 2000mm in the high rainfall potential areas.*
- Strong seasonality

ANNUAL RAINFALL DISTRIBUTION



SPATIAL MEAN ANNUAL RAINFALL DISTRIBUTION

STRONG SEASONALITY

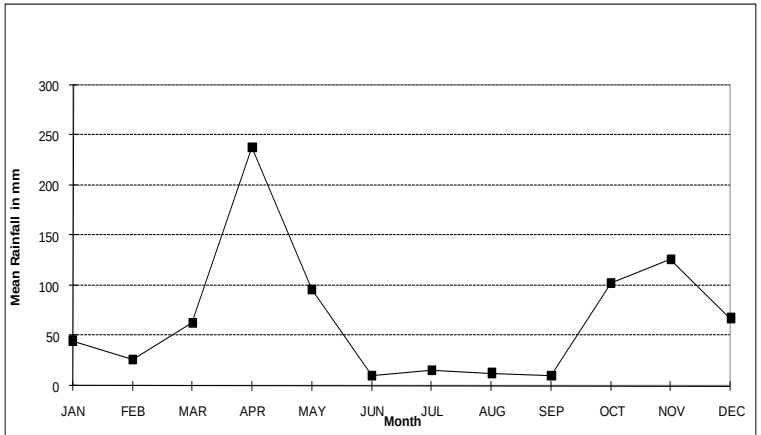


Figure 4c: Mean Monthly Rainfall Over Marsabit

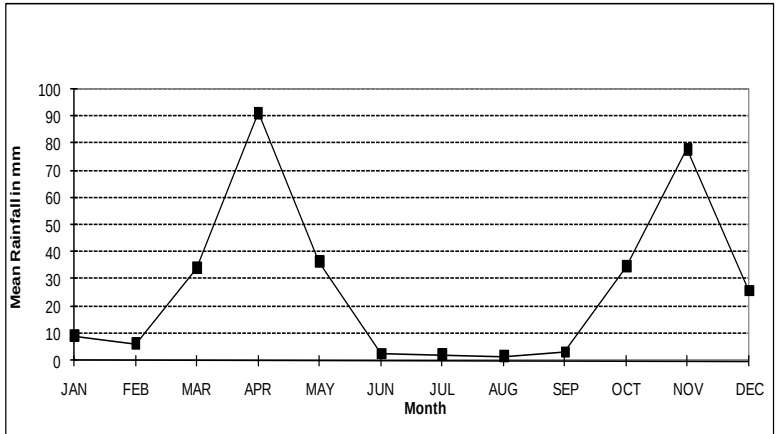


Figure 4d: Mean Monthly Rainfall over Wajir

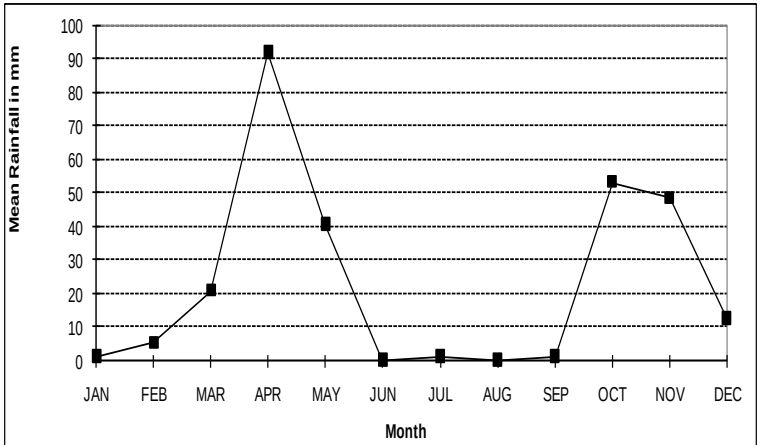


Figure 4e: Mean Monthly Rainfall Over Mandera

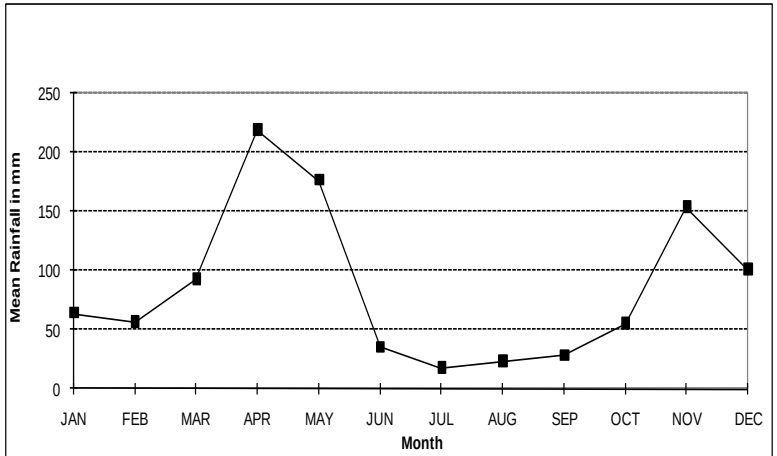


Figure 4l: Mean Monthly Rainfall Over Dagoretti Corner

ANNUAL MARCH OF MEAN MONTHLY RAINFALL AT DIFFERENT STATIONS

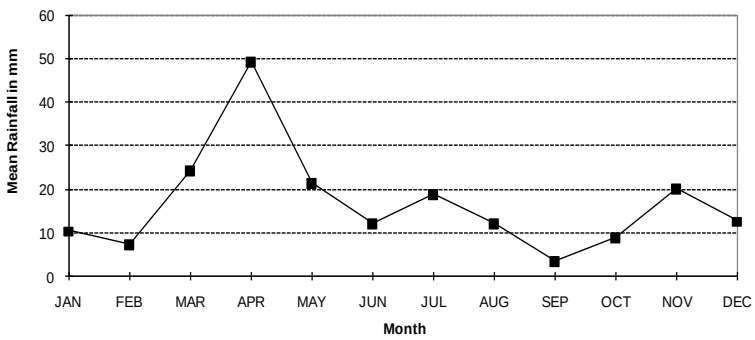


Figure 4a: Mean Monthly Rainfall Over Lodwar

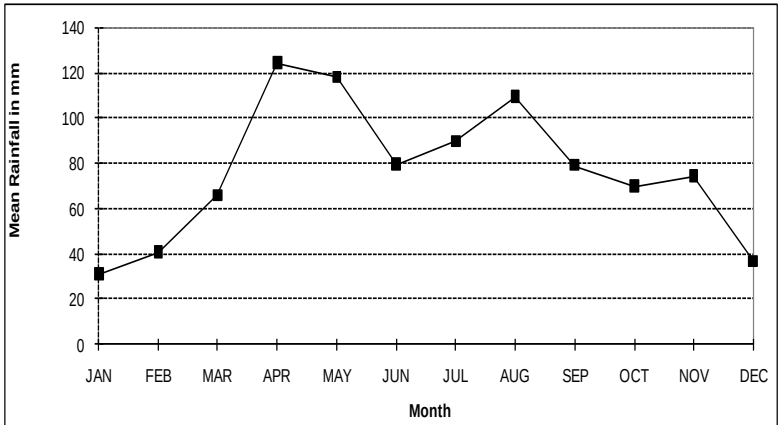


Figure 4o: Mean Monthly Rainfall Over Nakuru

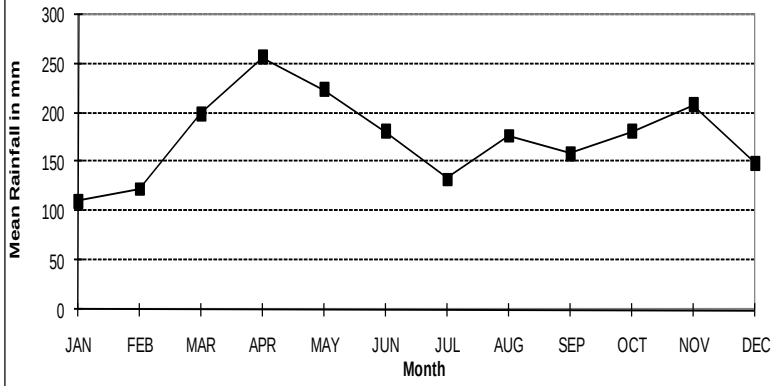


Figure 4q: Mean Monthly Rainfall Over Kisii

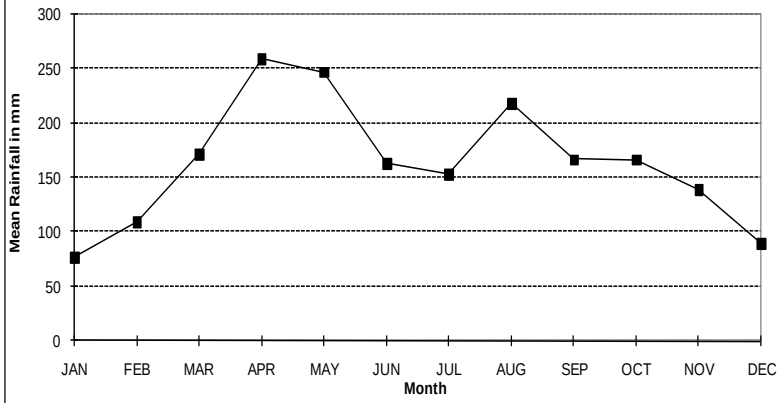


Figure 4r: Mean Monthly Rainfall Over Kakamega

ANNUAL MARCH OF MEAN MONTHLY RAINFALL AT DIFFERENT STATIONS

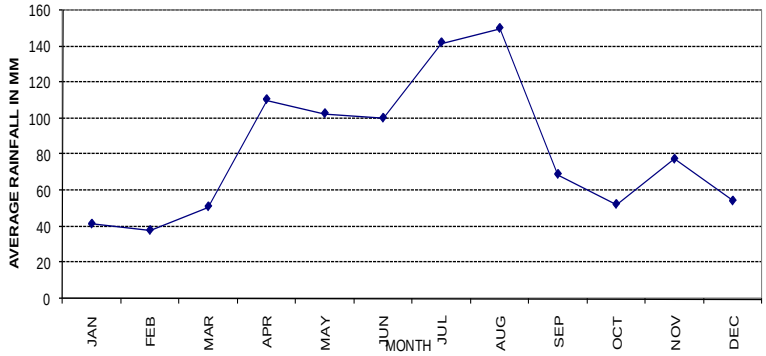


Figure 4n: Mean monthly rainfall over Nyahururu

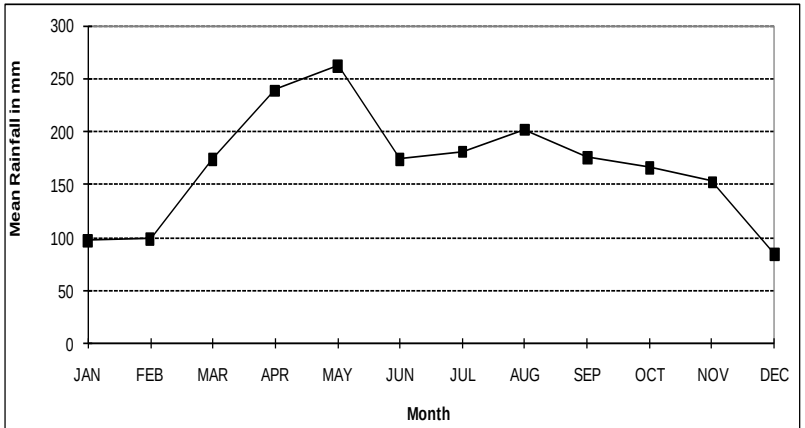


Figure 4t: Mean Monthly Rainfall Over Kericho

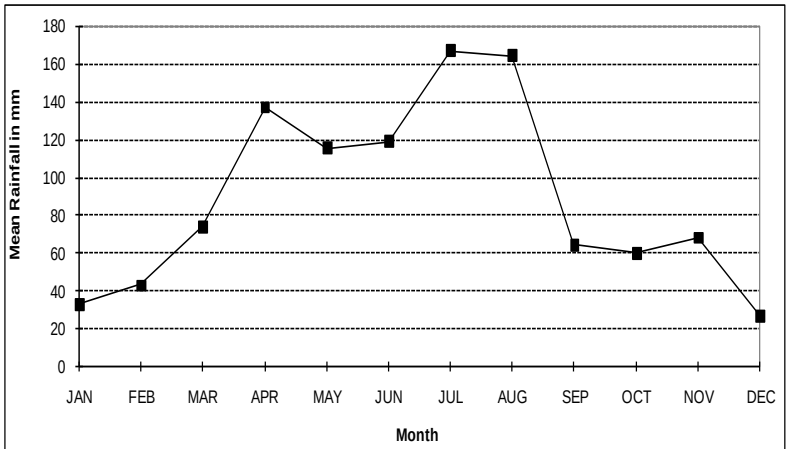


Figure 4u Mean Monthly Rainfall Over Eldoret

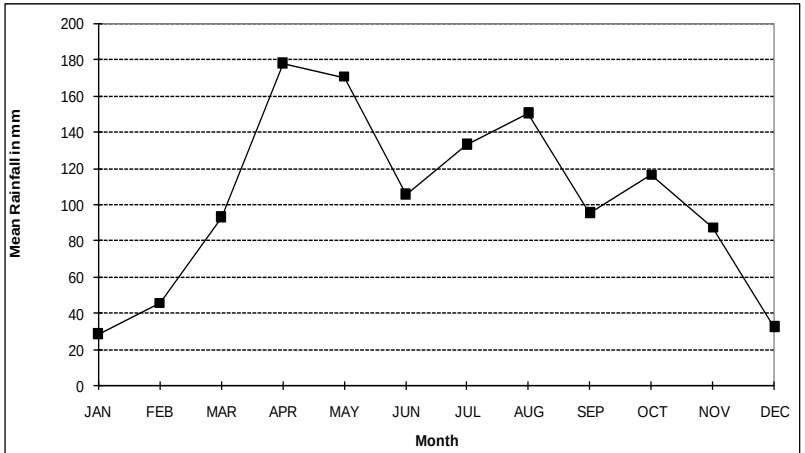


Figure 4v: Mean Monthly Rainfall Over Kitale

ANNUAL MARCH OF MEAN MONTHLY RAINFALL AT DIFFERENT STATIONS

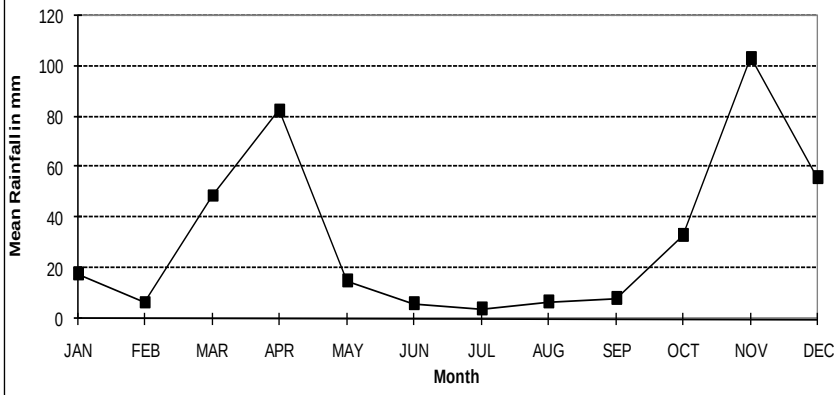


Figure 4f: Mean Monthly Rainfall Over Garissa

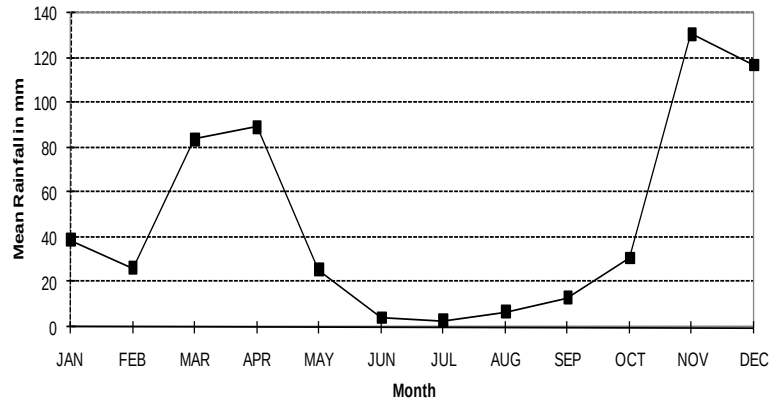


Figure 4j: Mean Monthly Rainfall Over Voi

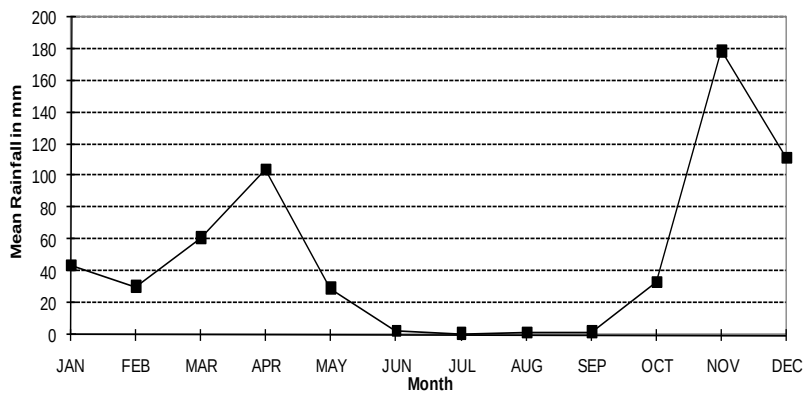


Figure 4k: Mean Monthly Rainfall Over Makindu

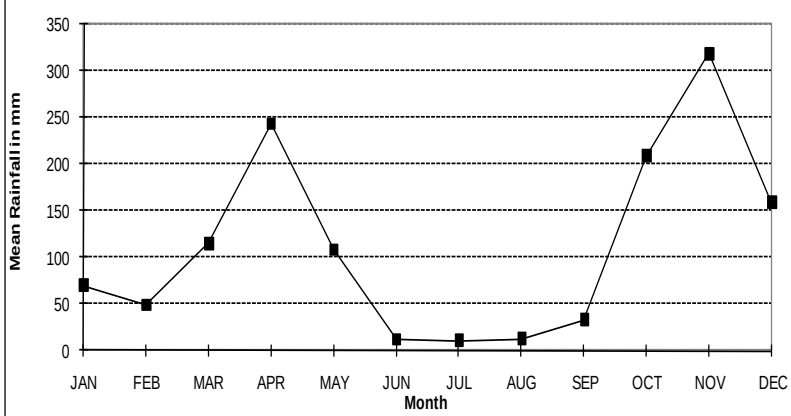


Figure 4m: Mean Monthly Rainfall Over Meru

ANNUAL MARCH OF MEAN MONTHLY RAINFALL AT DIFFERENT STATIONS

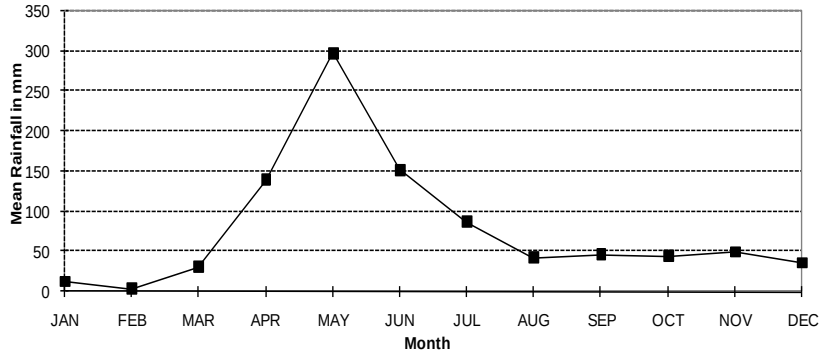


Figure 4g: Mean Monthly Rainfall Over Lamu

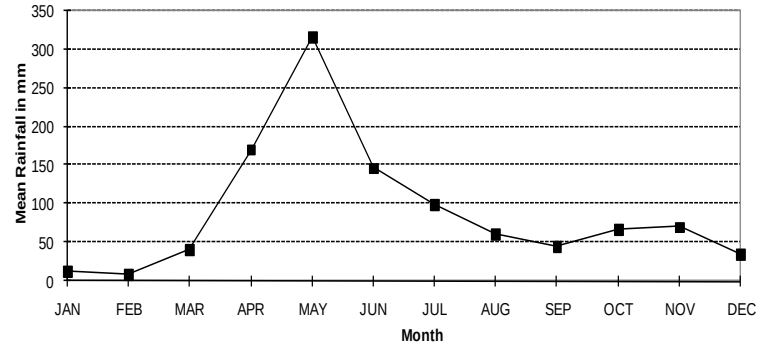


Figure 4h: Mean Monthly Rainfall Over Malindi

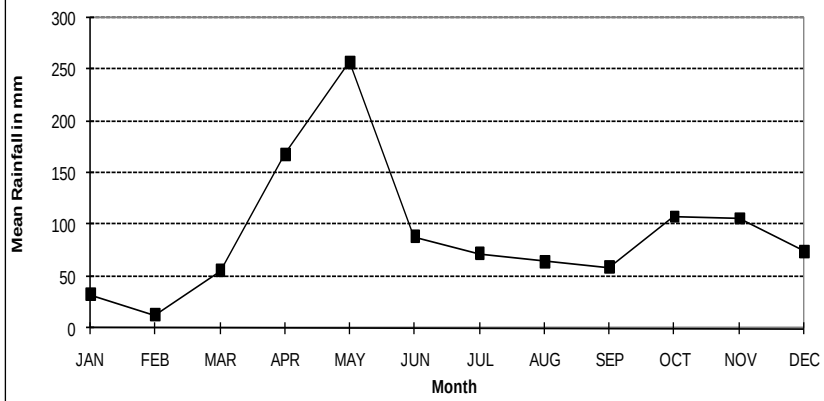


Figure 4i: Mean Monthly Rainfall Over Mombasa

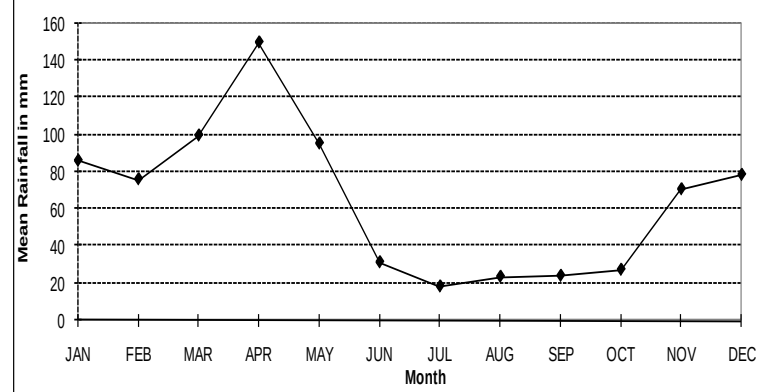


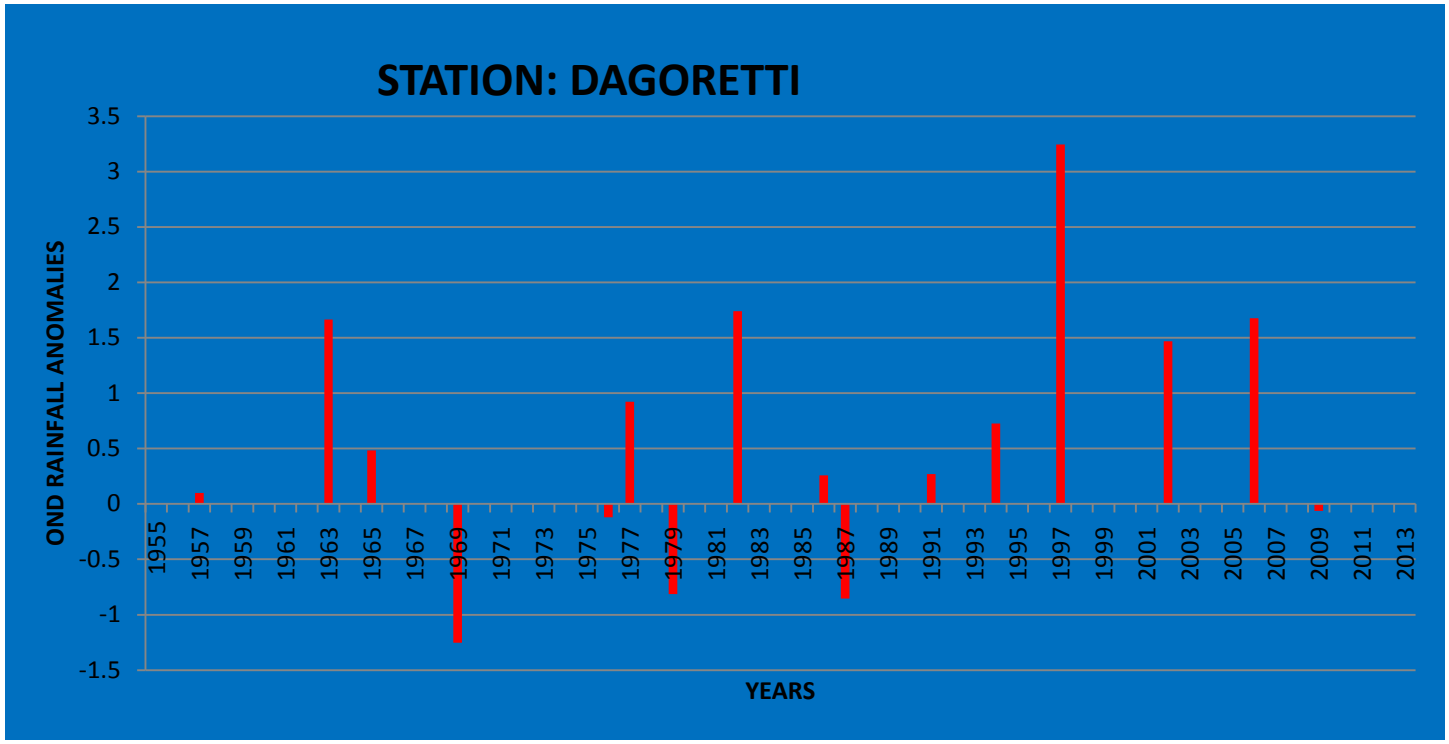
Figure 4p: Mean Monthly Rainfall Over Narok

CURRENT METHODS OF SEASONAL PREDICTION IN KENYA

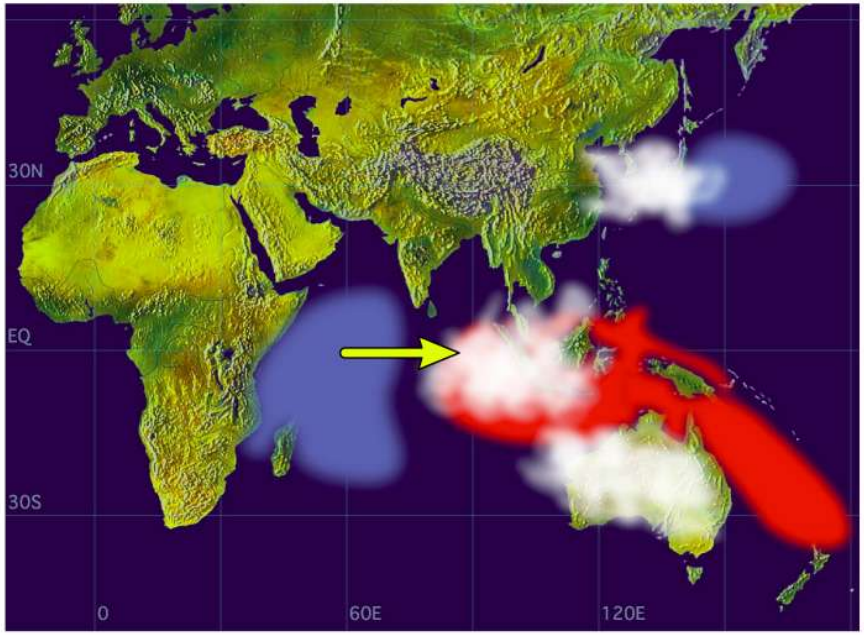
Main Drivers of weather/climate in Kenya

- Ocean surface temperatures anomalies in the major ocean basins
  - EL-Nino and La-Nina phenomena
  - Indian Ocean Dipole
- Upper level wind regimes-atmospheric stability (QBO)
- Tropical Cyclones (TC)- Propagation

OND RAINFALL ANOMALIES DURING EL-NINO YEARS



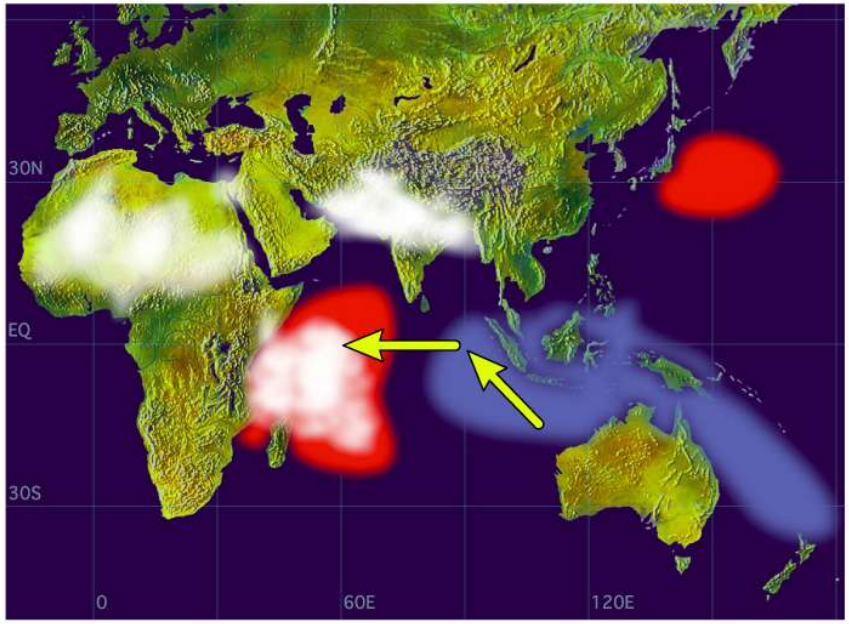
Negative Dipole Mode



Indian Ocean Dipole

-ve IOD: – Normally associated with depressed rainfall in the country. **Most of the winds are off-shore of the EA Coastline**

Positive Dipole Mode



+ve IOD: - Normally associated with enhanced rainfall in the country. **Most winds are on-shore to the EA coastline**

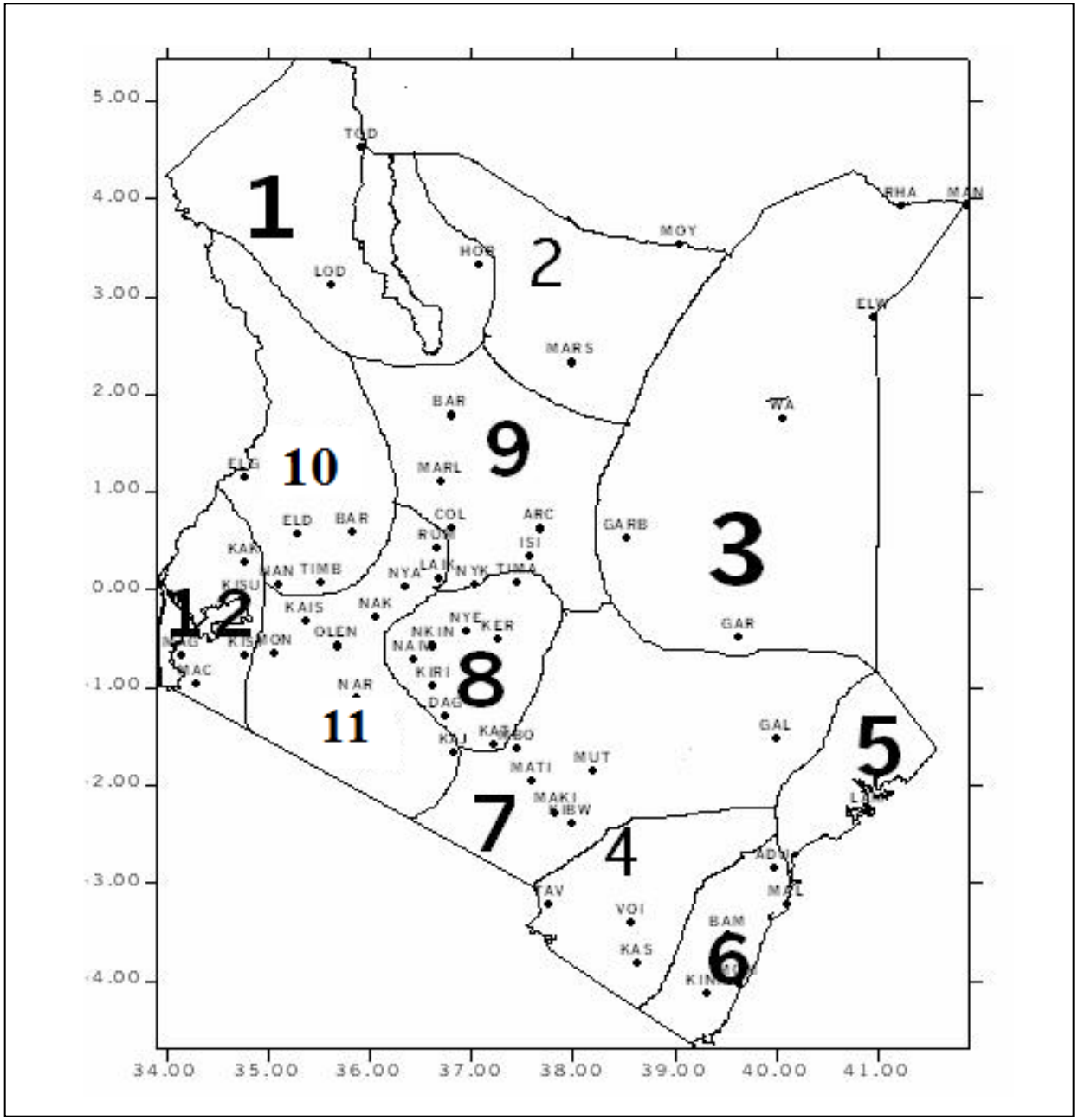
Current Methods used for seasonal prediction:

- **Creating Climatological zones**
- **Searching for predictors**
- **Generating relationships between the predictors and seasonal rainfall**
- **Developing of forecast models (statistical) for each zone based on the computed relationships with of the major drivers**
- **Training the models using time series (1971-2000; 1981-2010)**

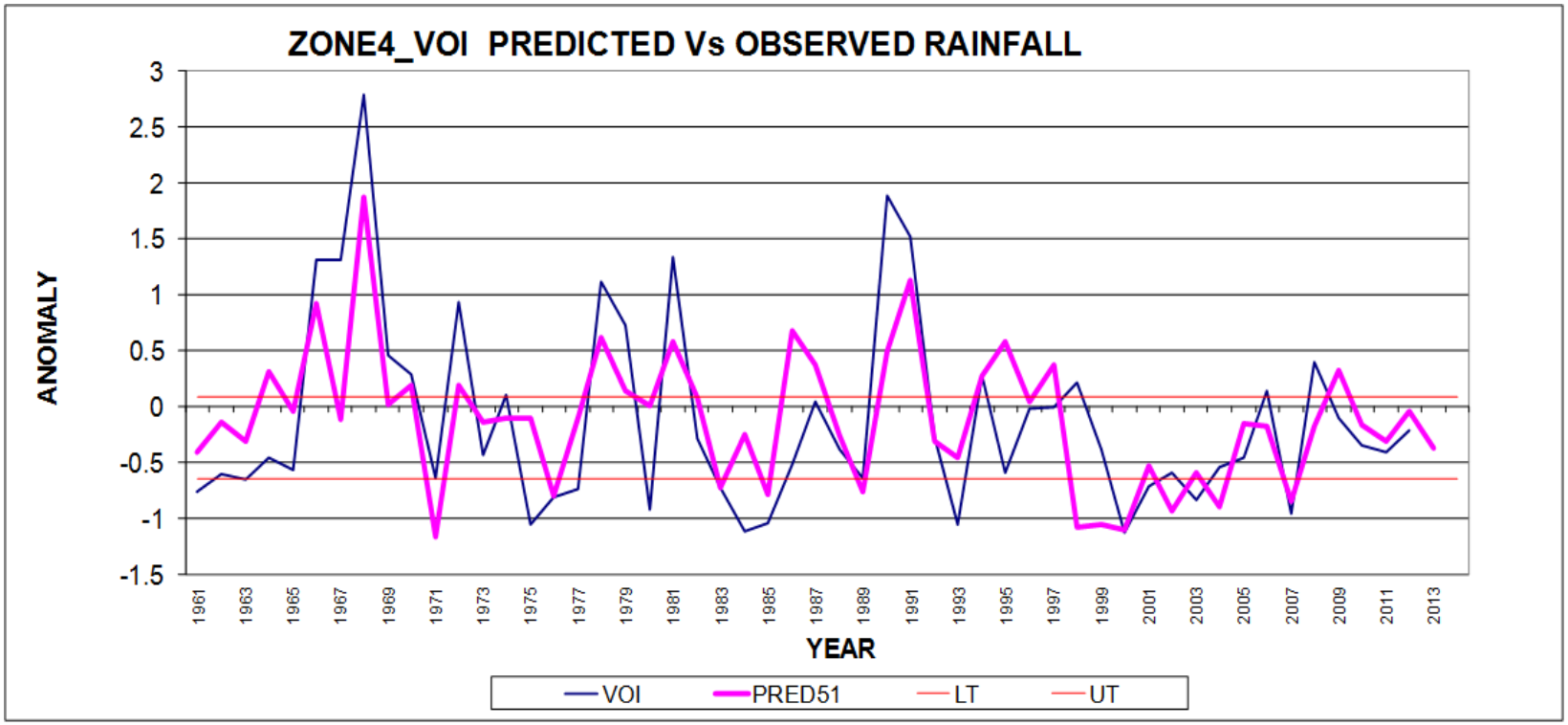
Current Methods used for seasonal prediction:

- **Generating outputs for the remaining period**
- **Assessing the skills of the models for each zone**
- **Using analogue years to assist in determining the possible onset, cessation dates and rainfall distribution within the season.**

HOMOGENEOUS ZONES

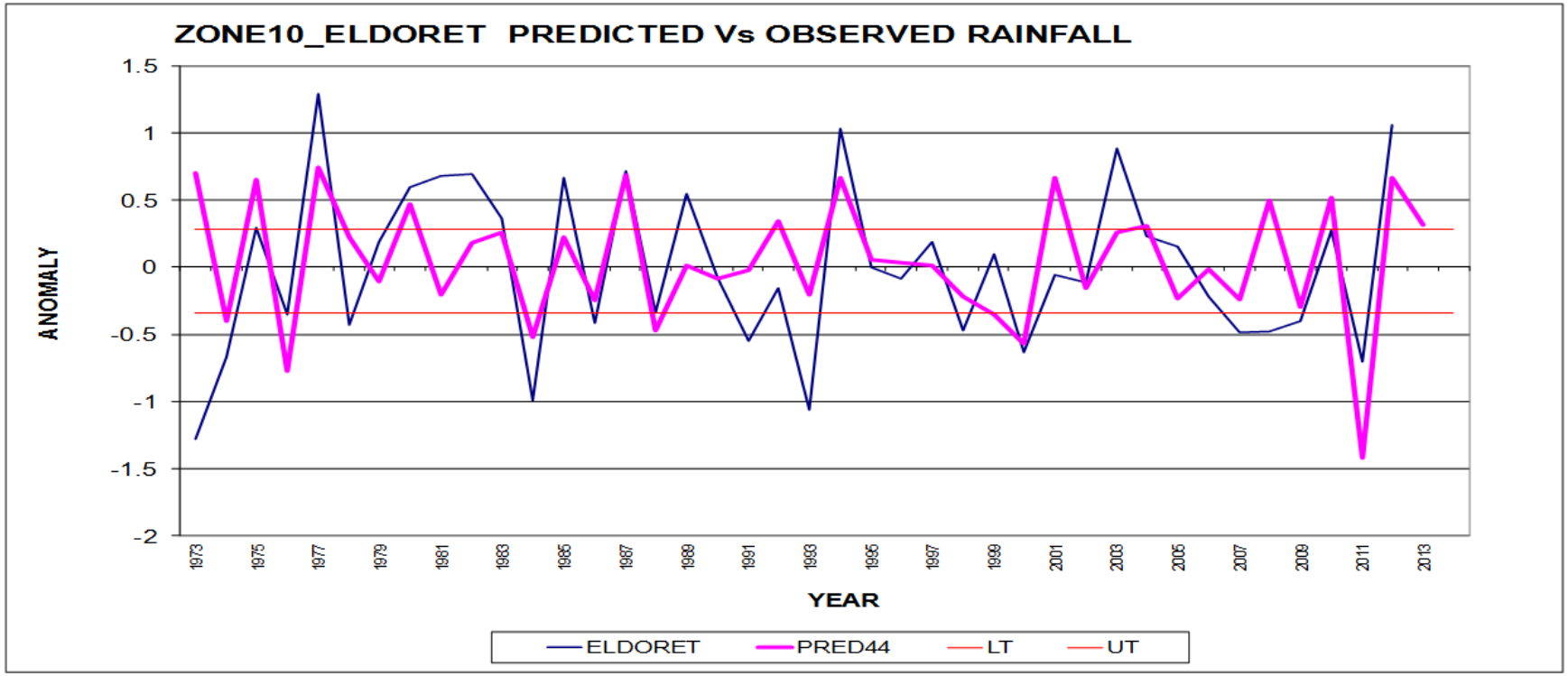


SAMPLE STATISTICAL MODEL OUTPUTS



Voi, An ASAL area, SE Lowlands– Near normal tending to depressed rainfall expected.

SAMPLE OUTPUTS



Eldoret, Highlands west of the Rift Valley– Near normal tending to slightly enhanced rainfall expected.

Seasonal Forecast Bulletin

REPUBLIC OF KENYA
MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES
STATE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
KENYA METEOROLOGICAL SERVICE
Dagoretti Corner, Ngong Road, P. O. Box 30259, 00100 GPO, Nairobi, Kenya
Telephone: 254 (0) 20 3867880-7, **Fax:** 254 (0) 20 3876955/3877373/3867888,
e-mail: director@meteo.go.ke, **info@meteo.go.ke** **Website:** http://www.meteo.go.ke

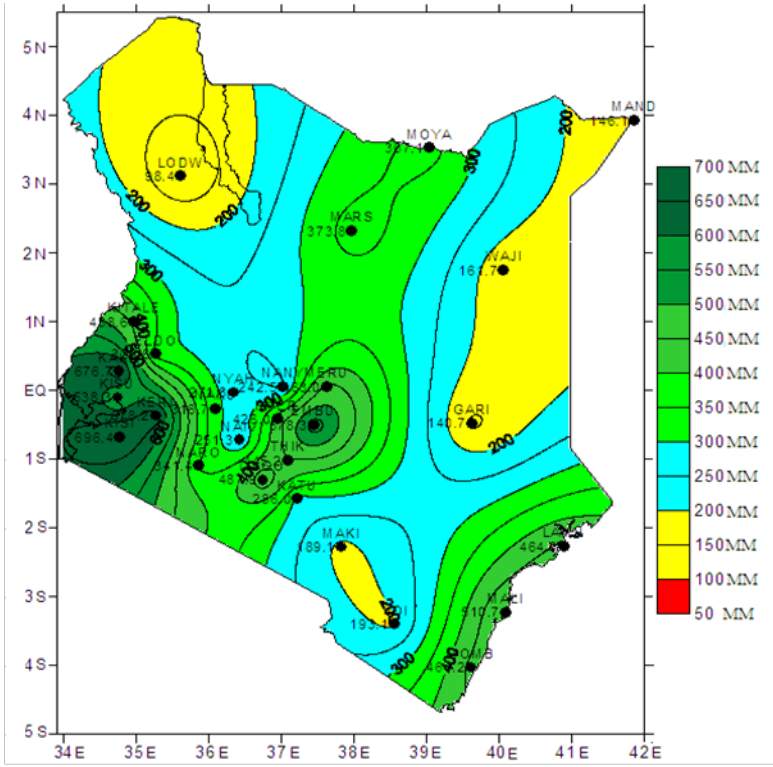
THE OUTLOOK FOR THE MARCH-APRIL-MAY (MAM) 2015 "LONG-RAINS" SEASON IN KENYA

Ref No: KMD/FCST/5-2015/SO/01

Issue Date: 27/02/2015

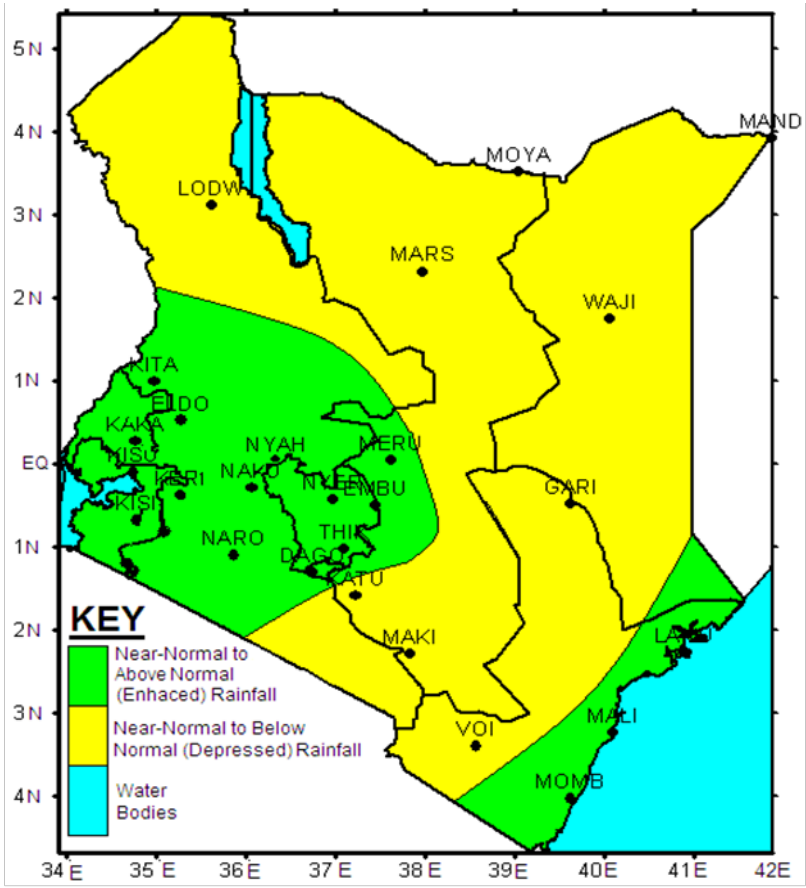
- Highlights
- Assessment of rainfall performance in the last season
- Observed impacts
- Outlook for the coming season including the possible onset and cessation dates as well as the distribution
- Potential impacts on various sectors

OUTPUTS: THE MAM 2013 OUTLOOK



MEAN MARCH-MAY SEASONAL RAINFALL

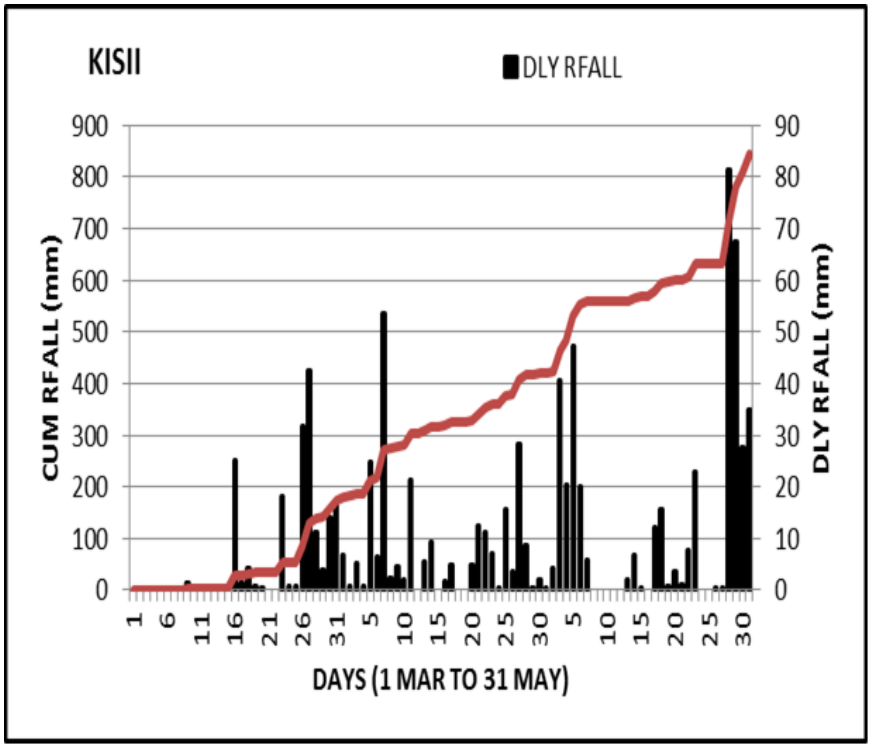
Highest rainfall amounts of over 300mm are recorded over Western, Central, Coastal strip and parts of northern Kenya (Marsabit, Moyale).

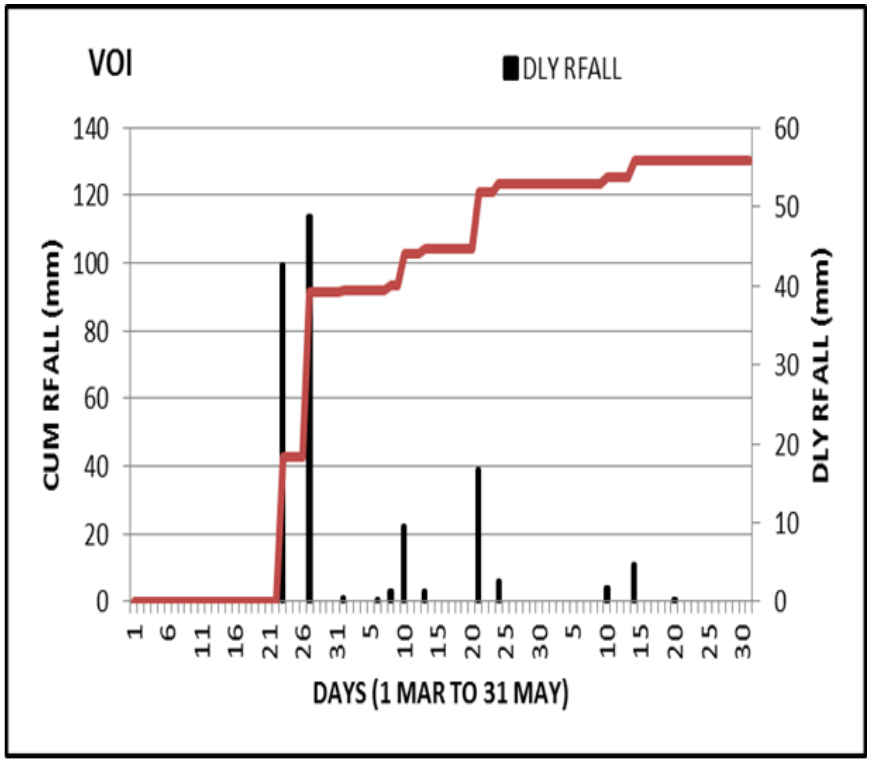


MARCH-MAY (MAM) 2013 SEASONAL RAINFALL OUTLOOK

OUTPUTS: THE ANALOGUE YEAR(S)

- **1973 and 2001 were picked as the Analogue years**

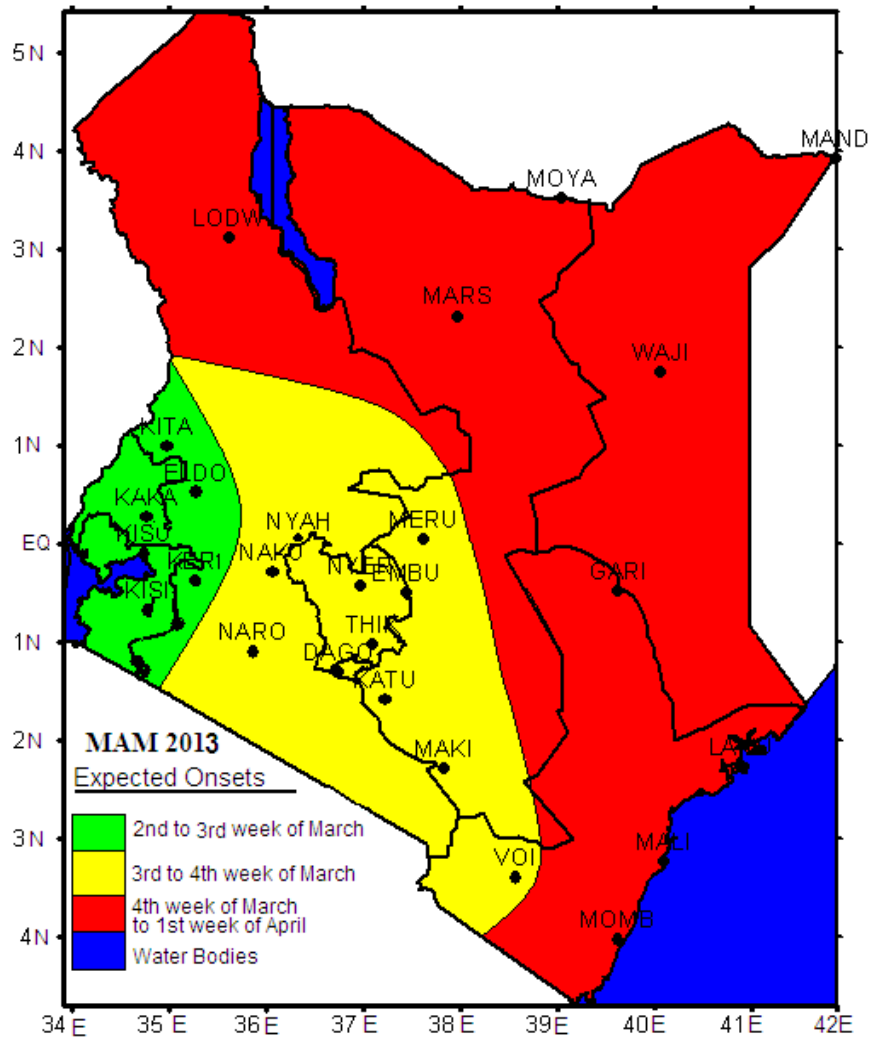


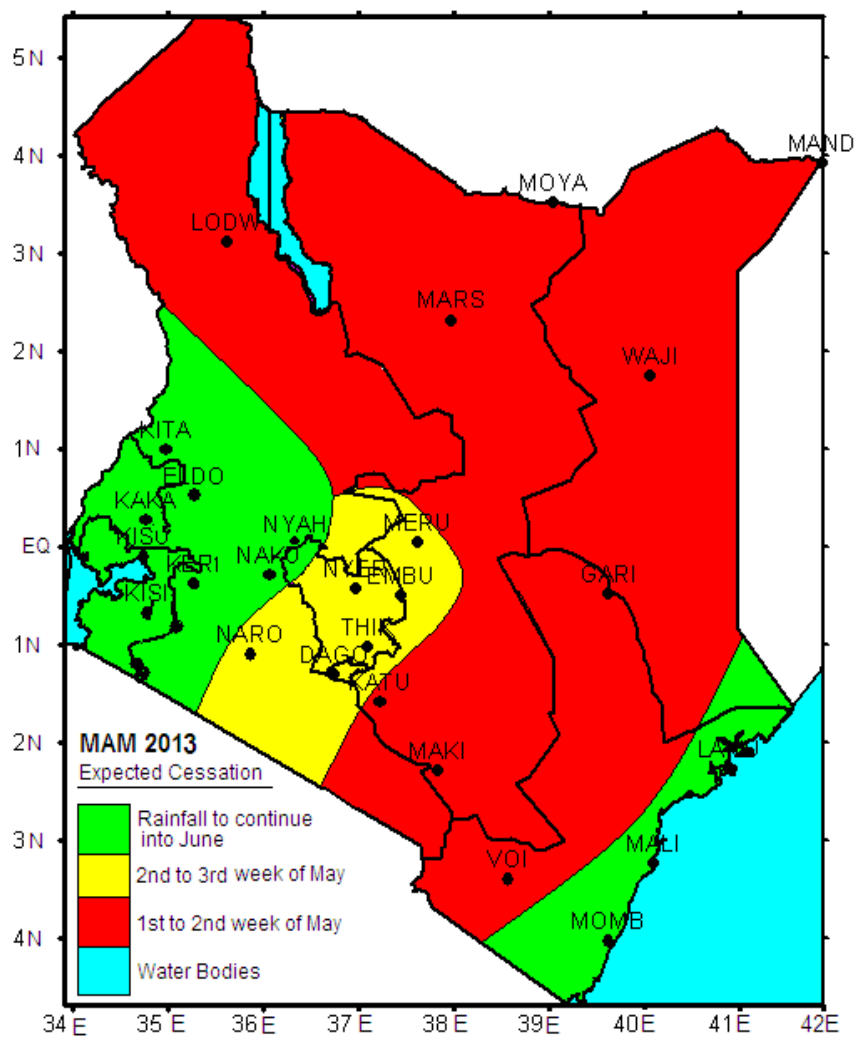


Onset: 2nd to 3rd week of March
Cessation : continues to June

Onset: 3rd to 4th week of March
Cessation : 2nd week of May

ONSET AND CESSATION OF THE RAINS





EXPECTED MARCH-MAY 2013 SEASONAL RAINFALL ONSET

EXPECTED MARCH-MAY 2013 SEASONAL RAINFALL CESSATION

UPDATES

- ***ESSENTIAL FOR CAPTURING VARIOUS IMPORTANT EVENTS SUCH AS:***
  - ***Onset dates***
  - ***Heavy Rainfall Events***
- ***5-day; Monthly and Ad Hoc Advisories***

PRESS RELEASE

WEATHER & MARINE ADVISORY FOR THE COASTAL STRIP

Heavy rainfall accompanied with strong winds and moderate to rough seas expected over the coastal region

Issued on: *08th May 2015*
Valid: *09 – 13 May 2015*

Kenya Meteorological Service
P.O. Box 30259-00100, Ngong Road, Dagoretti-Corner, Nairobi.
Tel: +2542038567880-5, +254724255153-4 Email: director@meteo.go.ke

Heavy Rain & Storms Advisory

Message Type:	Heavy rain /storm surges
Message Update No.:	Two
Date of Origin:	3rd June 2015, 0930 UTC
Validity:	3rd and 4th June 2015
Severity:	Moderate
Certainty:	Probability of occurrence (33% chance on 3rd June increasing to 66% chance on 4th June)
Message Description:	Intermittent rainfall of more than 20mm in 24hrs is likely to fall in high ground areas of the Aberdares range on 3rd June and likely to increase in intensity by 4th June. On 4th, areas of heavy rainfall are expected to extend from Mt. Elgon to the central and south Rift valley region to the Aberdares and Mt.Kenya. Landslides in prone areas are likely to occur.
Area(s) of Concern:	The areas include all counties around Mt. Elgon, (Trans-Nzoia, Bungoma, Uasin-Gishu, West-Pokot), central and south Rift Valley (Elgeyo-Marakwet, Baringo, Nakuru and Narok) and areas around Mt. Kenya and Aberdares (Nyandarua, Kiambu, Nairobi, Kirinyaga, Murang'a, Nyeri, Meru and Embu).
Instructions:	Residents in some low-lying areas are advised to be on the lookout for flash floods as the upper catchments continue to receive heavy rainfall. Drivers should exercise caution as roads are muddy and very slippery. People should also avoid wading through or swimming in swollen rivers. Those in the highlands should take necessary care to move to safer areas if they are in landslide prone areas. Continue listening to local media as updates will be provided if conditions change significantly. Further advisories will be issued as we follow up on the progress of this weather event.
Message Addressed to:	Media, County Directors of Meteorological services in affected areas, NDOC, Red Cross and other emergency response institutions.
Originator:	Director, Kenya Meteorological Service-Headquarters Nairobi

CONCLUSION

- Kenya exhibits very complex topography that results in highly variable climate.
- Rainfall exhibits strong seasonality
- Statistical methods is the main method of generating seasonal predictions
- Updates on shorter time scales are used to capture important events within the rainfall seasons

THE END &
THANK YOU
FOR YOUR
ATTENTION