



# **UNDERSTANDING THE OPPORTUNITIES AND CHALLENGES IN THE COASTAL CITIES IN AKWA IBOM STATE, NIGERIA IN A CHANGING CLIMATE**

***BY***

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***Global Flood Partnership 2017 Conference –  
27- 29 June 2017***



## ABSTRACT.

Climates studies over the coast of West Africa especially in the Coastal Cities in Nigeria like Akwa Ibom State, have in the past been based mainly on empirical/statistical techniques. These techniques consider concept of persistence, trends and cycles, which assume that future conditions can be extracted from past ones. These methods do not accurately understand the process that produce climate, and therefore find it difficult to predict the effects or changes in the process especially over the Ocean in West Africa.

The attempt in this study is however to highlight and extend examine the Opportunities and Challenges in the Coastal Cities in Nigeria, especially Akwa Ibom State in a Changing Climate, what are the principal patterns of various ocean properties and monsoon observed in both data and modeling simulations forced with realistic external forcing? also, what are the most likely underlying mechanism **understanding the Challenges and turning it to Opportunities for the Coastal Communities in Akwa Ibom State.**

The Paper concludes that rainfall variability is a major characteristic of the region climate, the last 42 years since 1970 have witnessed dramatic increases in mean annual rainfall throughout the region. Also, a study conducted in region showed a significant trend towards earlier cessation dates of the rains over a 43 year period from 1970 to 2015, with abrupt shift occurring around. Other studies conducted in this region have also noticed a trend towards early onset and false cessation, resulting in a longer rainy season.



## PRESENTATION OUTLINE

**INTRODUCTION**

**OBJECTIVES**

**CLIMATE OF AKWA IBOM STATE AND SYNOPTIC STATIONS NETWORK**

**OBSERVED CHANGES**

**SOME WEATHER-RELATED HAZARDS IN THE MARINE/PORT AND MARITIME SECTOR & SOCIO-ECONOMIC IMPACT**

**NIMET'S CLIMATE INFORMATION SERVICES (CIS) IN RESPONSE TO THE CHALLENGES IN ANALYSIS**

**AREAS OF COLLABORATIONS**

**CONCLUSION**



## **Purpose of Building Digital Terrain Model Map with Marine Met Inclined.**

To investigate all maritime-related hazards in coastal areas.

Identifying vulnerable portion of the coast.

Stratifying high hazard areas by identifying possible hazard, elevation, landscape, geospatial and bathymetric survey(Ocean floor mapping and survey).

Aiding Marine Meteorological early warning system and forecast.



## Critical goals and deliverables from using GIS in creating Digital Terrain Map helps us to achieve

Ground Profile (high resolution Imagery).

Over 400 elevation Data from our GPS.

Over 400 Latitude and Longitude Positions from our GPS.

3D image processing.

Contour Mapping.

Vulnerability Map along the coastline based on elevation and slope data.

Ground Truthing of the imagery.

A robust Shape files for Lagos coastline data (Data on Local Governments, Population Data, Street mapping, Buildings (point of interest)).

Relief map generated overlaid with contour map.

Topography mapping.

Hydrology Mapping (Hill shade and watershed Maps).



## **OBJECTIVES**

**To increase awareness of the local Coastal communities on the usefulness of weather and climate information and other activities that are their Challenges to turn it to Opportunities.**

**To increase interactions between Coastal Communities like the fishermen and Meteorologists, who provide the information with a view to meeting climate information needs of fishermen .**

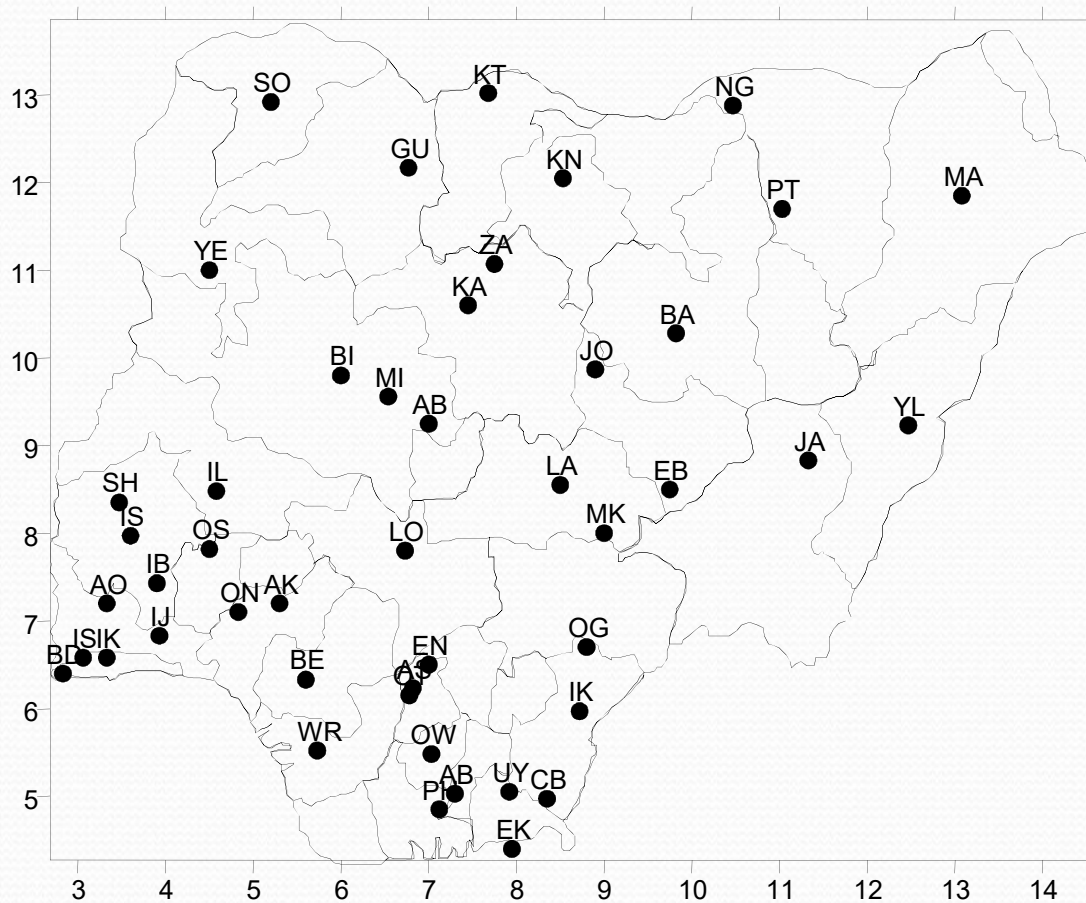
**Data/information gathering in respect of Coastal Communities like the fishermen fish farming practices in the respective communities.**

**To measure and record rainfall Data in the respective Coastal Communities like the fishermen fish farming communities, etc. via the use of rain gauges of WMO's Roving Seminars.**

**This Summit therefore is to make the rural Coastal Communities like the fishermen fish farming communities to be more aware of the advantages in utilizing NiMet's Weather and Climate Information Services for guidance in making operational decisions on their fishing activities for improved yield.**



# SYNOPTIC STATION NETWORK





## Marine Meteorological Stations in 1985



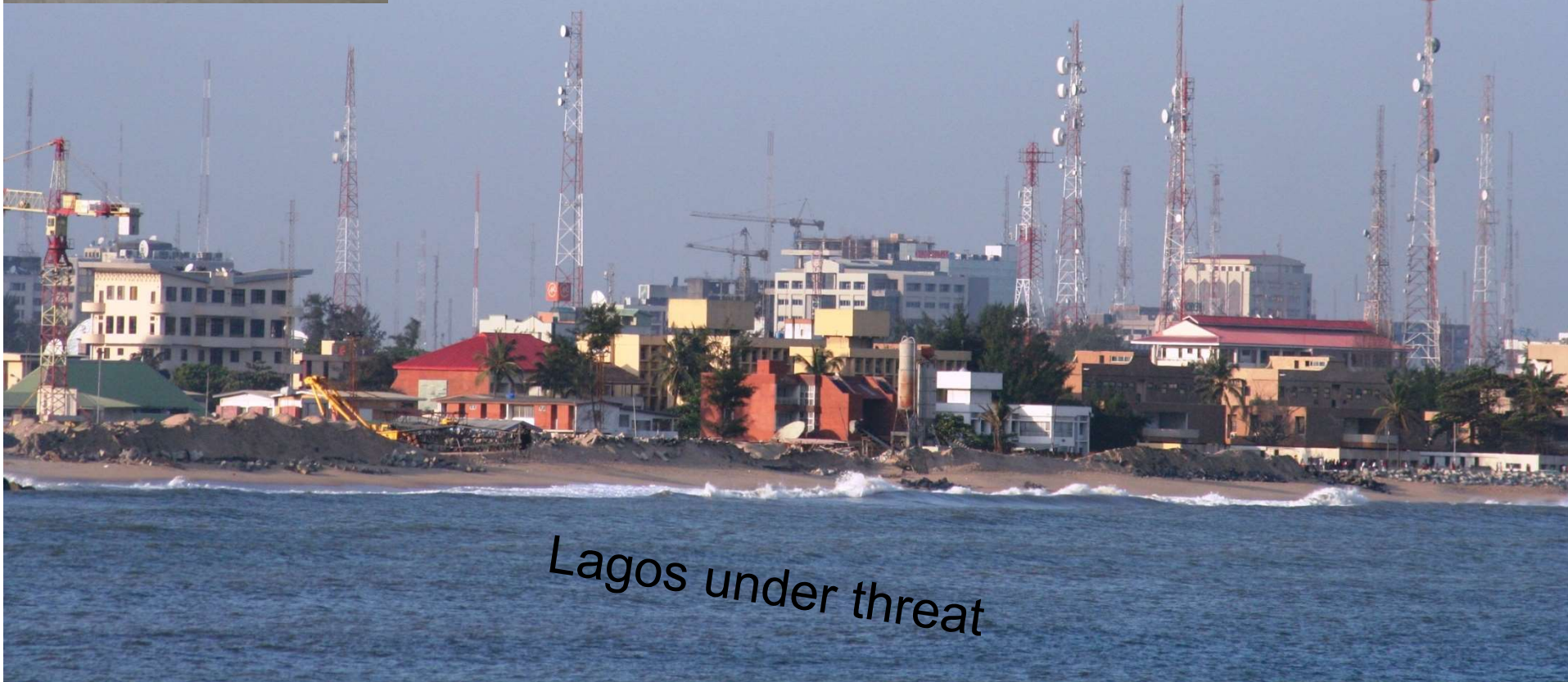
Eket, the then Cross Rivers State

**Nigerian Meteorological Agency (NIMET)** ..... *providing weather, climate and water information for sustainable development and safety of life and property*





## AKWA IBOM STATE UNDER TREAT



*Lagos under threat*



## Possible Environmental Hazard if Meteorological forecast fuse with DTM are ignored

Storms.

Increase in Wave Heights.

Rain Storms.

Flooding.

Tides.

Waterspouts.

Storm surge.

Tremors.



## **2.0 SOME WEATHER-RELATED HAZARDS IN THE PORT AND MARITIME SECTOR & SOCIO-ECONOMIC IMPACT**

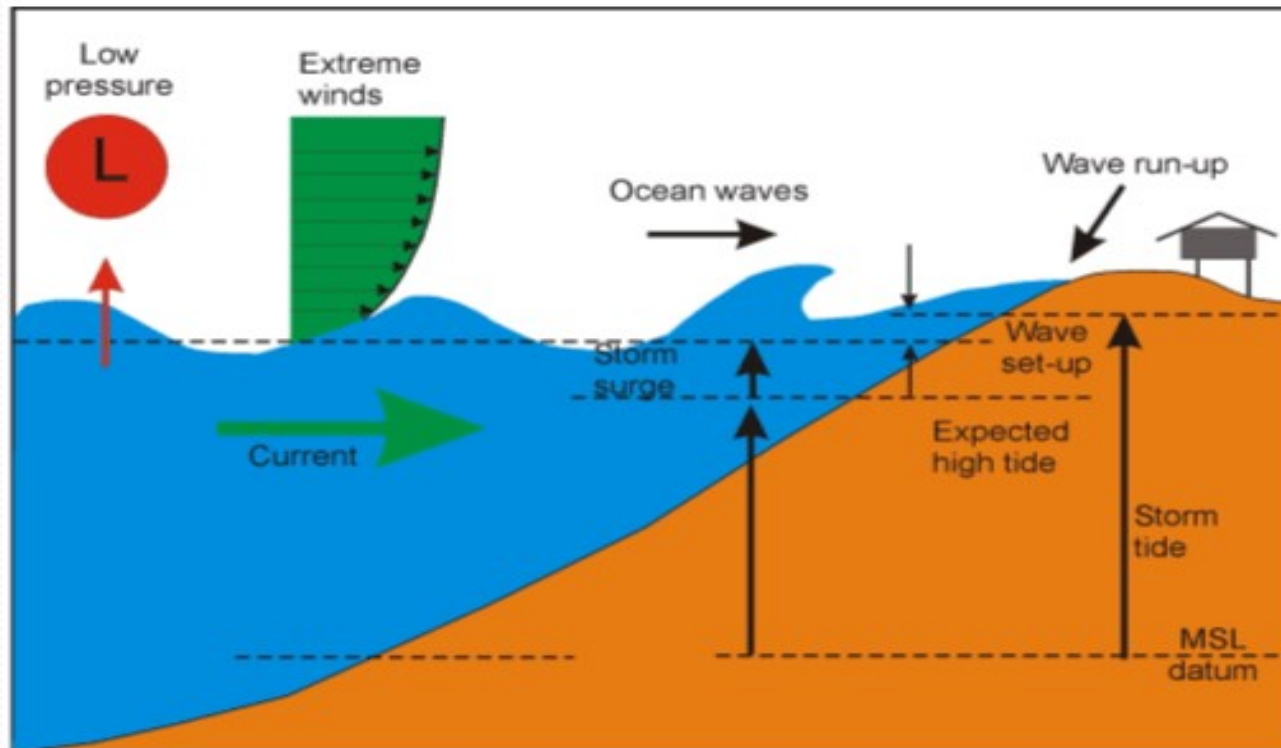
- Severe storms both in- and off-Shore
- Storm surges over the coast
- Poor Visibility leading to collision of Vessels
- Sea Level Rise
- Coastal Flooding & Erosion
- Ship wreckages/Boat cap siding
- Oil Spill & marine pollution
- Coastal Subsidence
- Ship wreckages/Boat cap siding
- Etc.



### Purposes.

- Application of GIS to coastal environment such as Akwa Ibom state shoreline helps to know coastal landforms, their evolution, the processes at work on them and changes taking place. The exercise helps us to investigate and interpret the Geomorphology and changes along coastal line. Also it gives exact information about earth surface.

- Storm tide is the level of the predicted tide plus storm surge. This is seen in fig 2 and it demonstrates the important point that high tides play a critical role in determining the elevation of coastal sea levels during a storm.



**FIG 2. STORM SURGE DIAGRAM**



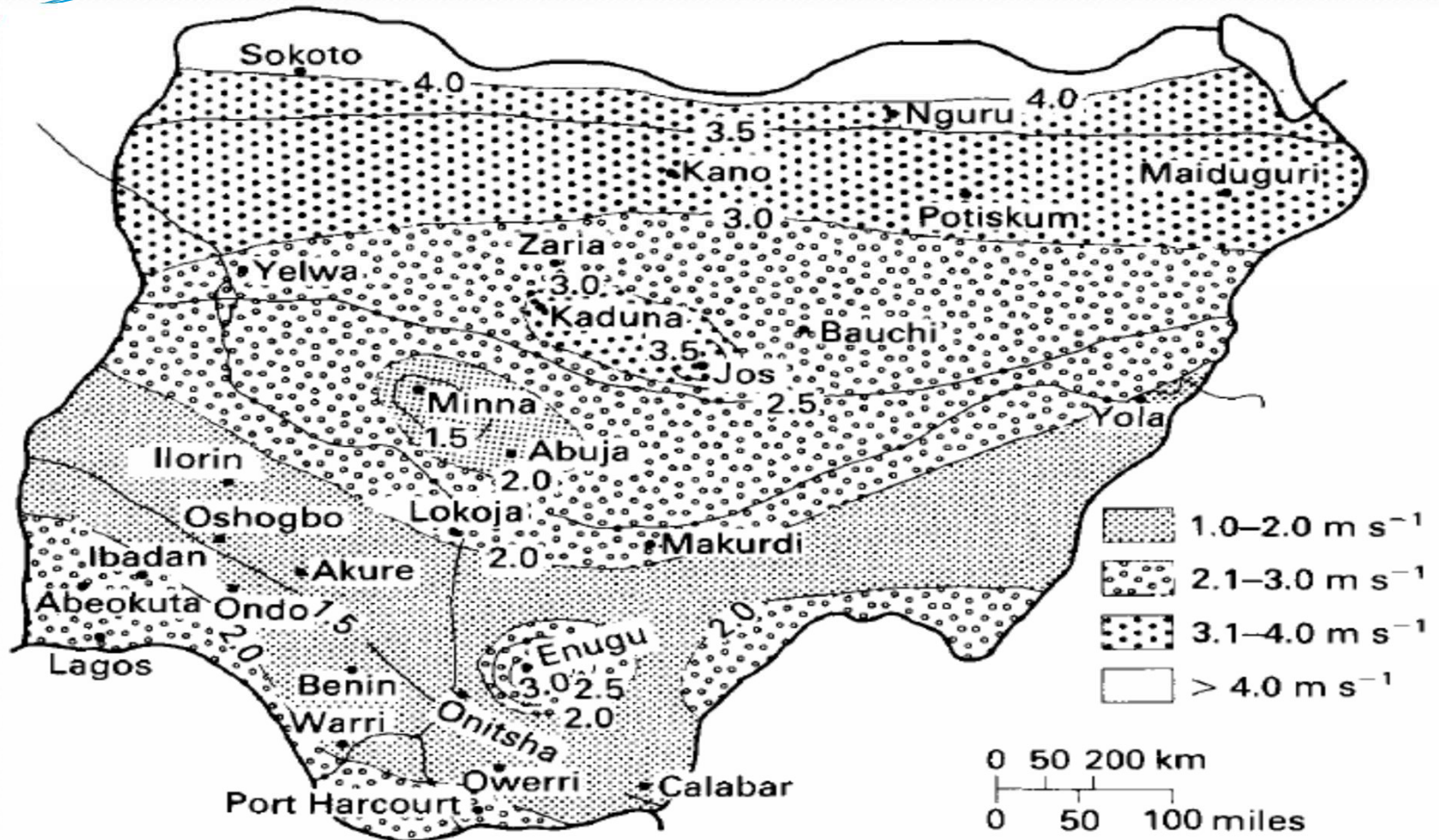
## MAN ORON CLIMATIC DATA (JANUARY 2013- APRIL, 2014) (Source: Maritime Academy of Nigeria, Oron 2014)

MONTH	AVERAGE SPEED	AVERAGE HIGH	WIND DIRECTION
JANUARY	2.1	43.5	SSW
FEBUARY	2.3	33.0	SSW
MARCH	2.1	28.7	SSW
APRIL	2.0	26.1	SSW
MAY	2.1	40.0	SSW
JUNE	2.0	29.6	SSW
JULY	2.1	20.0	SSW
AUGUST	2.3	22.6	SSW
SEPTEMBER	2.1	23.5	SSW
OCTOBER	2.0	23.5	SSW
NOVEMBER	1.6	33.9	SSW
DECEMBER	1.8	19.1	SSW
JANUARY	2.0	17.4	SSW
FEBUARY	2.3	21.7	SSW
MARCH	2.0	29.6	SSW
APRIL	1.7	31.3	SSW



## FROM ABOVE DATA

- Analysis of speed, direction and duration of wind were also carried out to determine the pattern of flow and strength of the coastal area.
- Statistical speed duration analysis of the wind data was also carried out to determine the average duration that the wind of a specific speed blew from a certain direction.
- Summary of wind data from maritime academy of Nigeria Oron from January 2013 to April 2014. From the table above the average wind speed was high in the month of February, August and February again while the lowest average wind speed was in November the data shows that variations was too high.



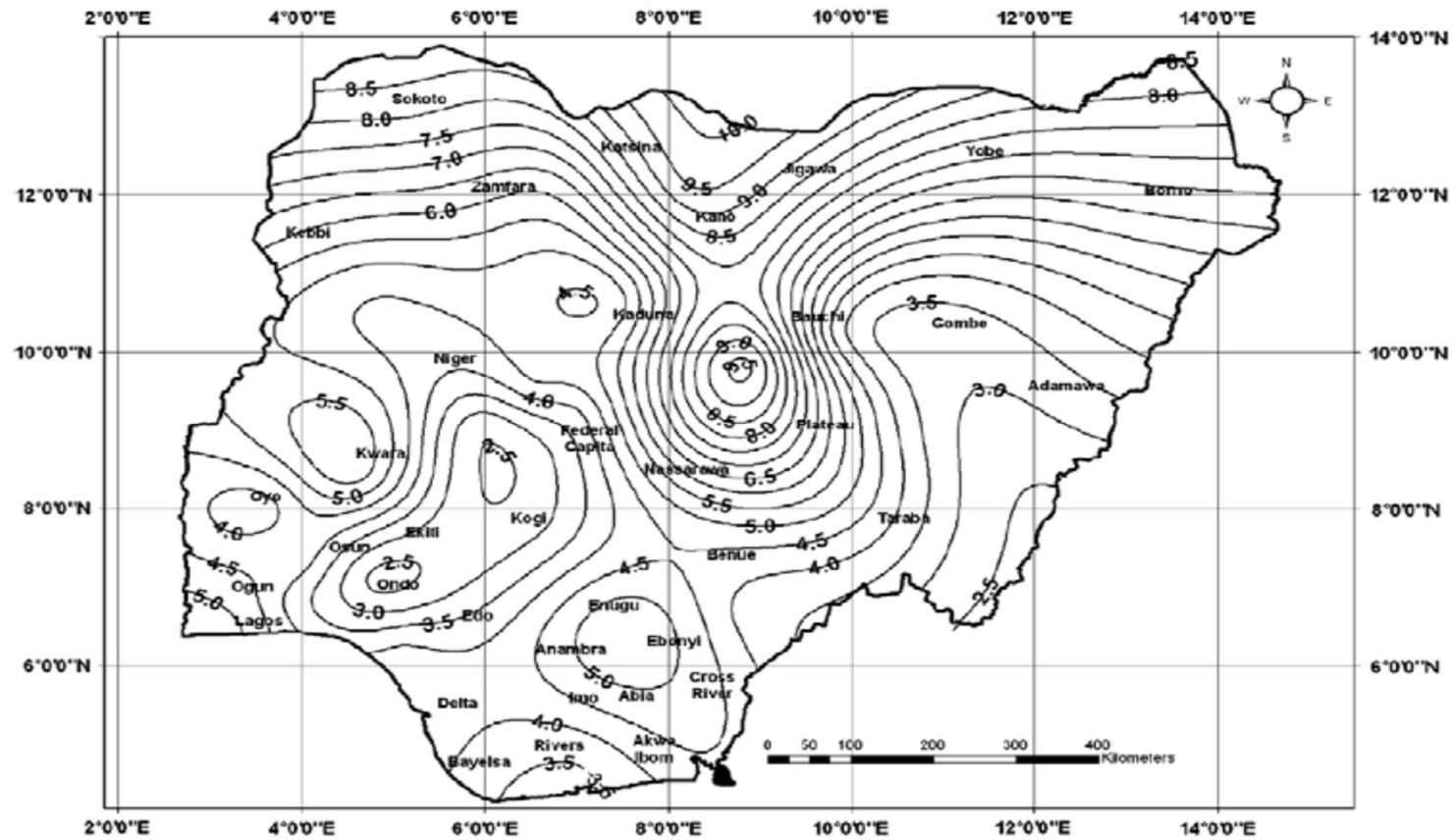
(Source: Ojosu and Salawu, 1990b).

Map 1. Average Wind Speed Distribution in Nigeria





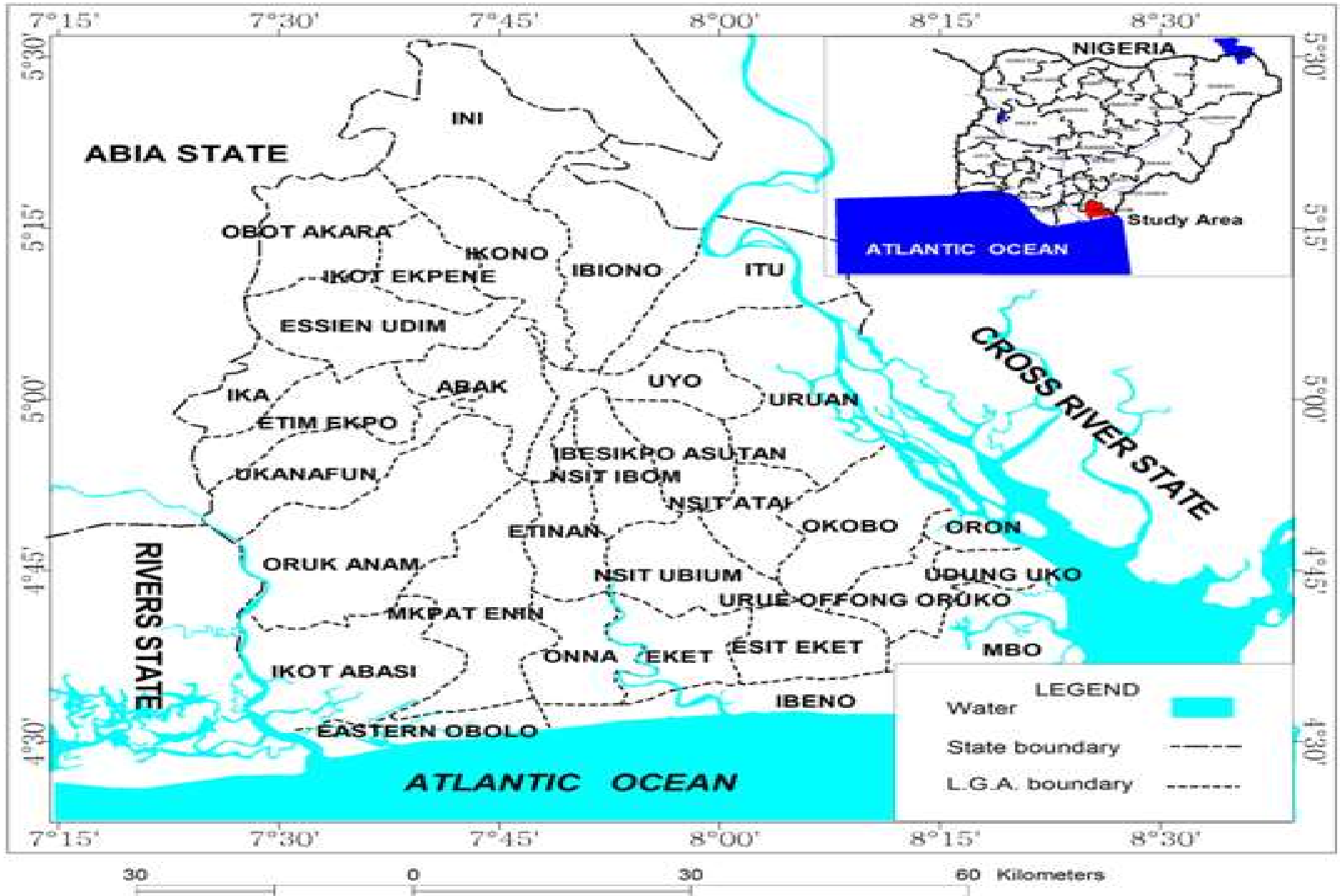
Map 2, the Nigeria annual average wind speeds distribution (isovents at 10 m height) Showing four different wind speed regimes.



Map 2. Monthly Average Wind Speed Distribution  
(Source: Fadare, 2010).



A map of AKWA IBOM STATE showing Coastal Slum Communities (Adapted from Gandy, 2005)





## CHALLENGES ON FISHERY ACTIVITIES

- The resulting warmer climate is harmful to fish, and shortens duration of fish growth . In addition, it leads to increased evaporation over water surfaces.
- The warm condition also diminish the solubility of dissolved oxygen and thus decrease the availability of this essential gas.
- Resulting to violent storms over the oceans and seas creating safety problems for fishermen, and destroying fishing implements like fishing nets and fishing boats. the resultant effects are: the fishermen have less fish to feed their families and also less fish to sell to the market which in itself can affect national food security.
- Leading to sea level rise, coastal erosion and flooding which changes in salinity of the aquatic environment, and chemical composition of the water and also pollution.

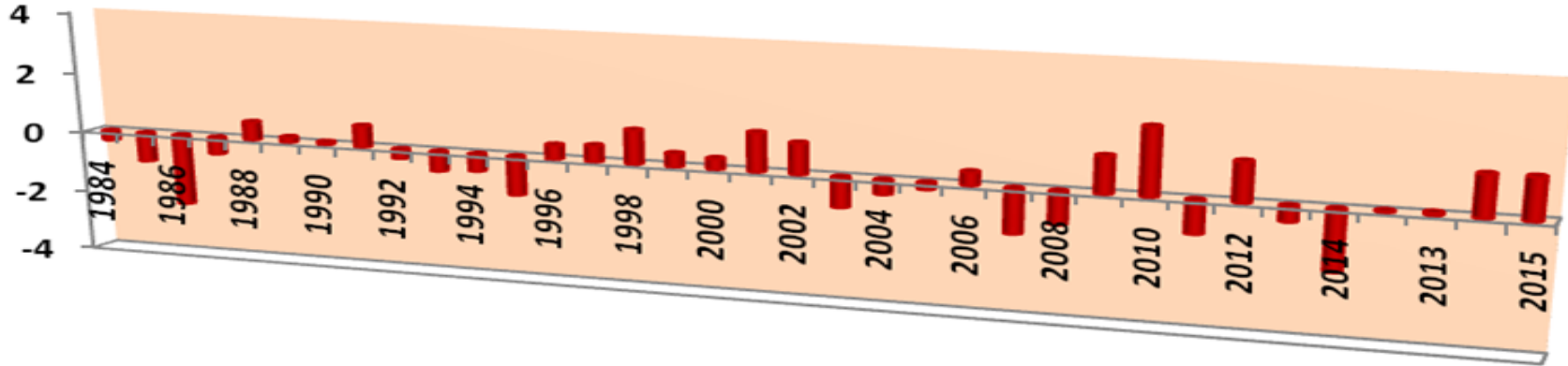




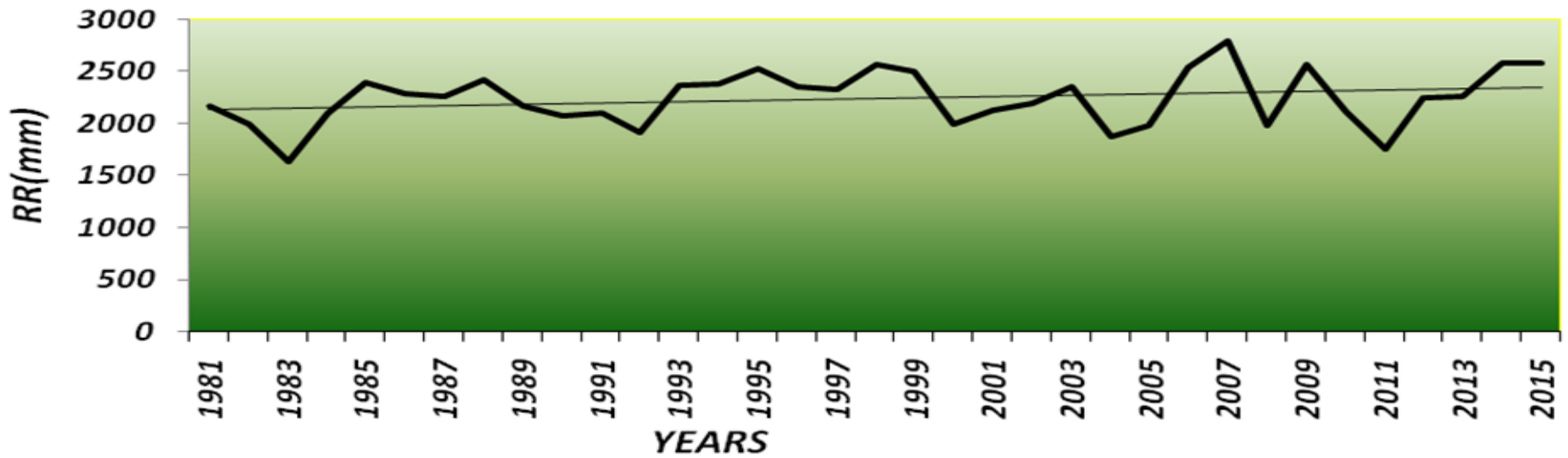
# MARINE DATA FROM MARINE DIVISION NIMET

## UYO RAINFALL / TEMPERATURE ANALYSIS

### SPI FOR UYO

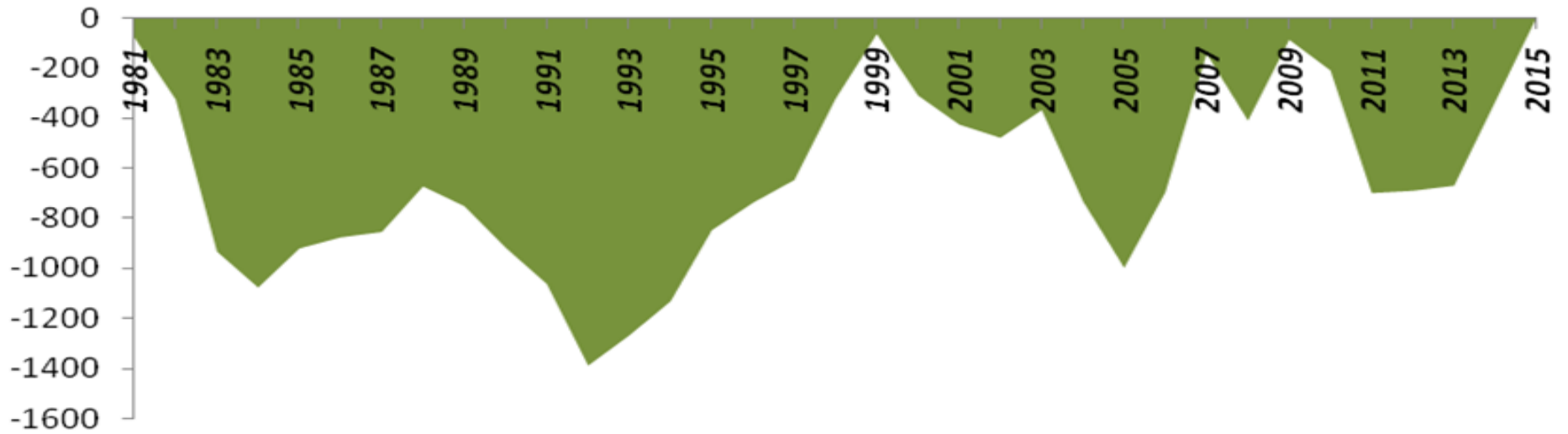


### Annual Rainfall Time-series for Uyo

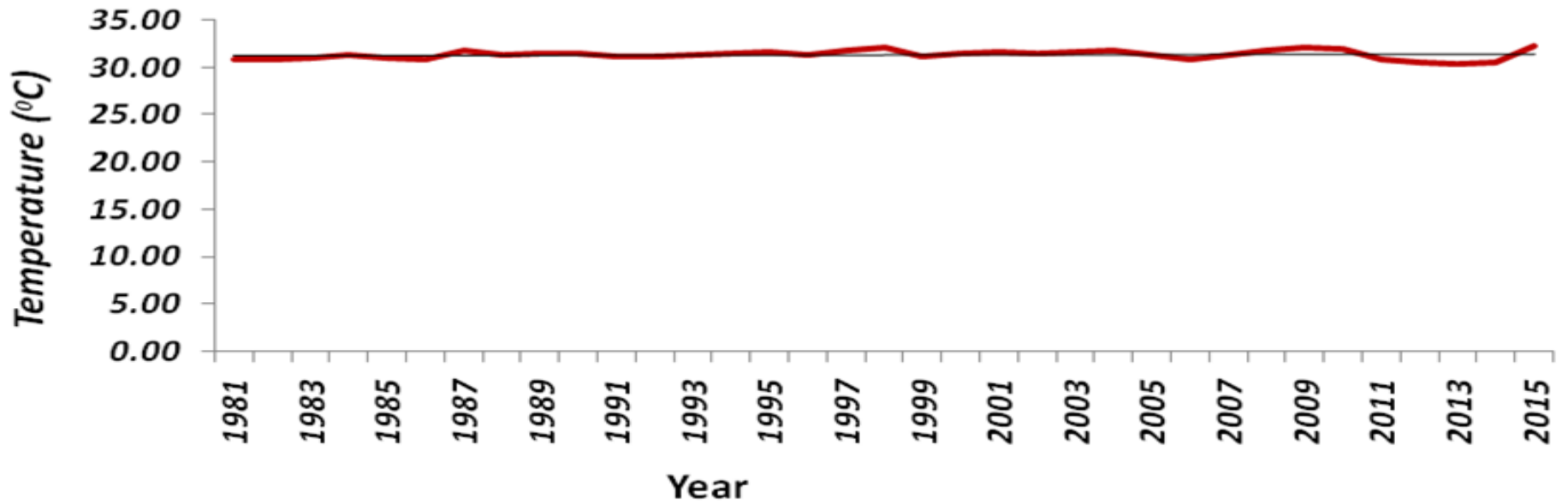




### Cumulative Sum of Rainfall Change Detection over Years in Uyo

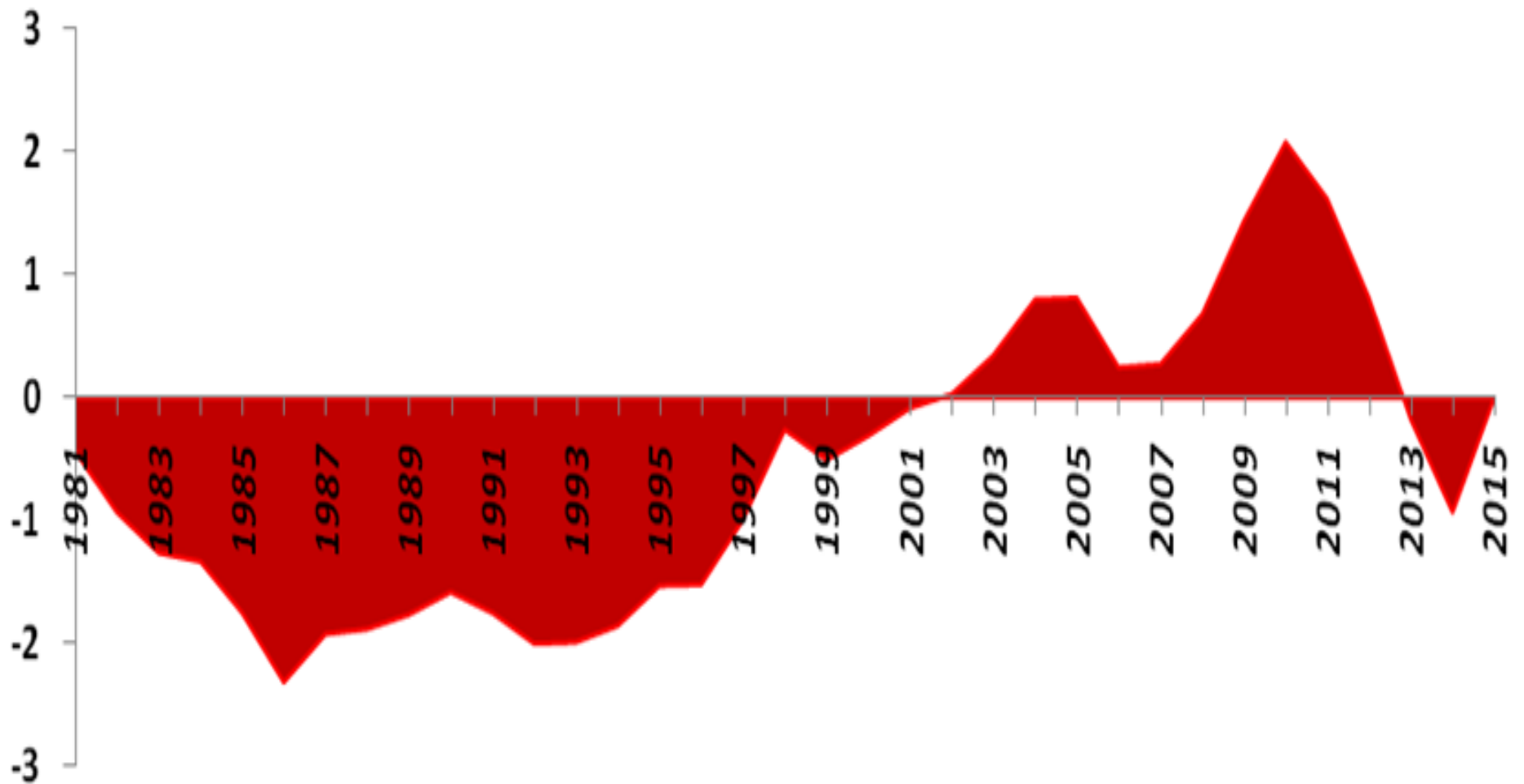


### Average Temperature Trend in Uyo





## Cumulative Sum of Temperature Change Detection over years in Uyo



.Monthly frequencies of wind directions in the coastal region of Nigeria in 1997-2007. The horizontal axis is divided into 8 bins of wind directions. Bars in each bin show the monthly frequencies from January to December, respectively.

MARINE DATA FROM MARINE DIVISION NIMET

**FREQUENCY OF DIRECTIONAL OCCURENCE OF COASTAL WIND**

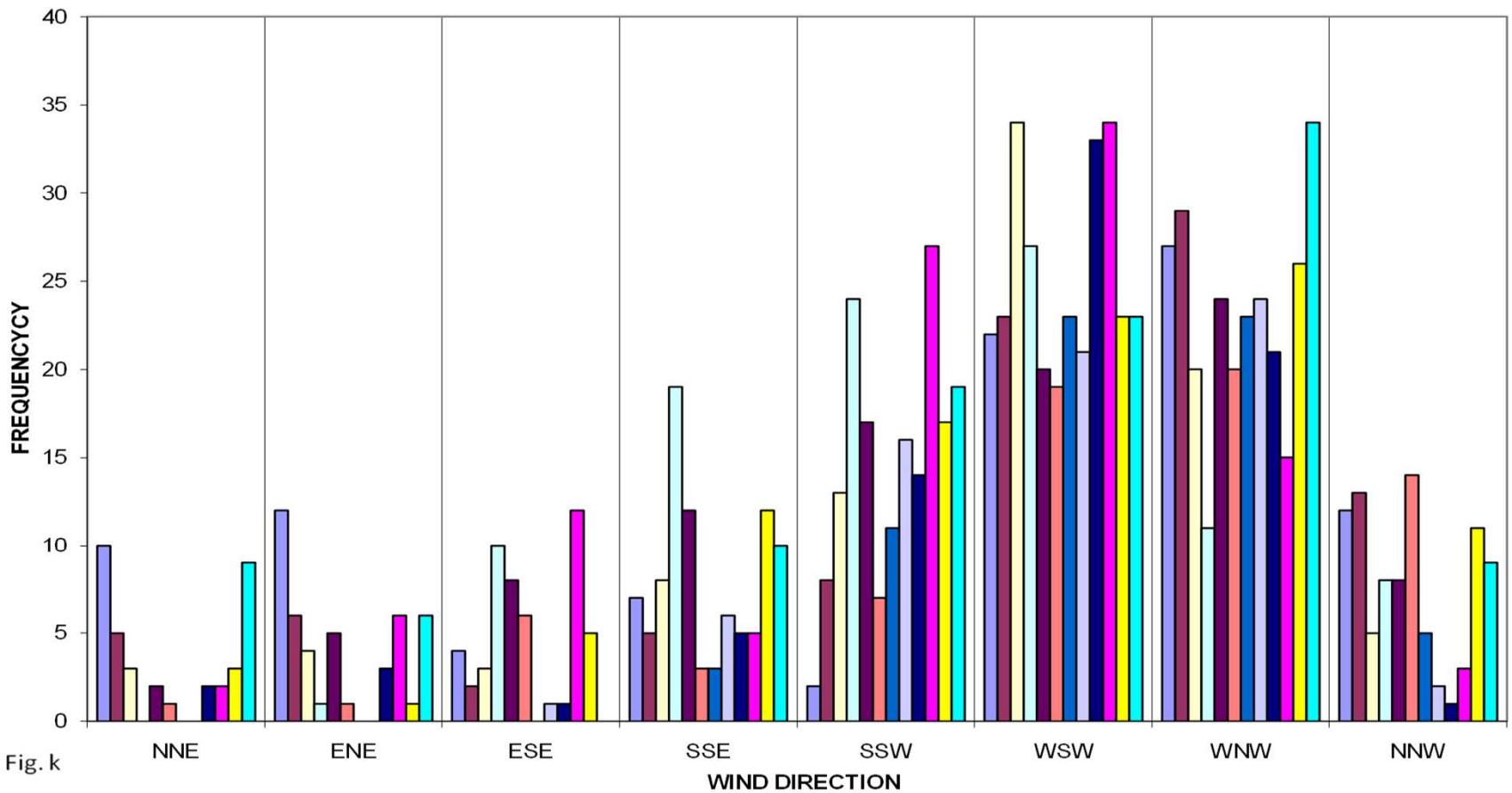
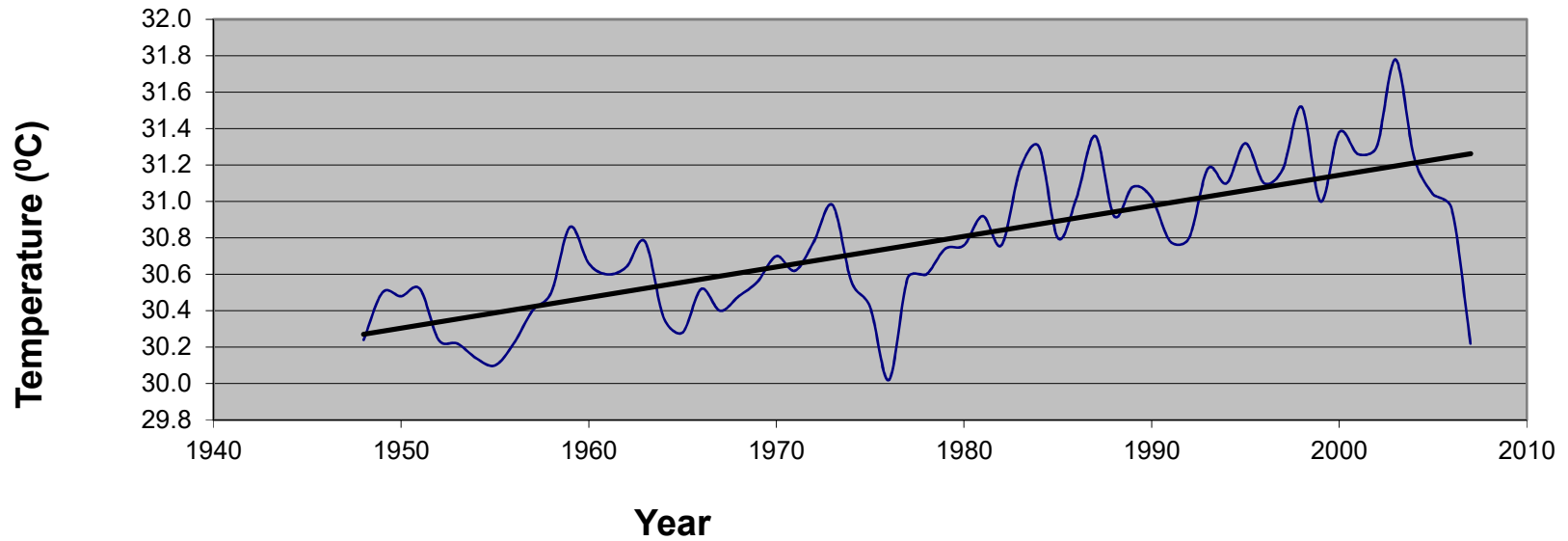


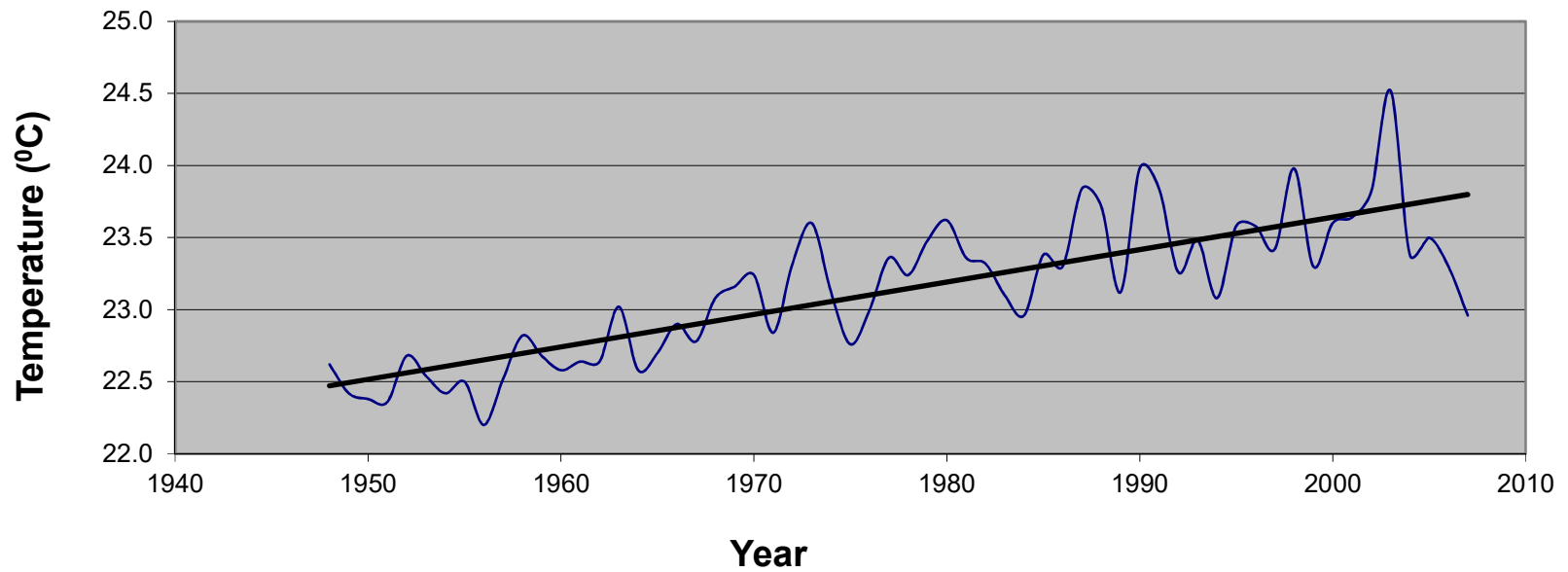
Fig. k



### Maximum Temperature Over Nigerian Coast



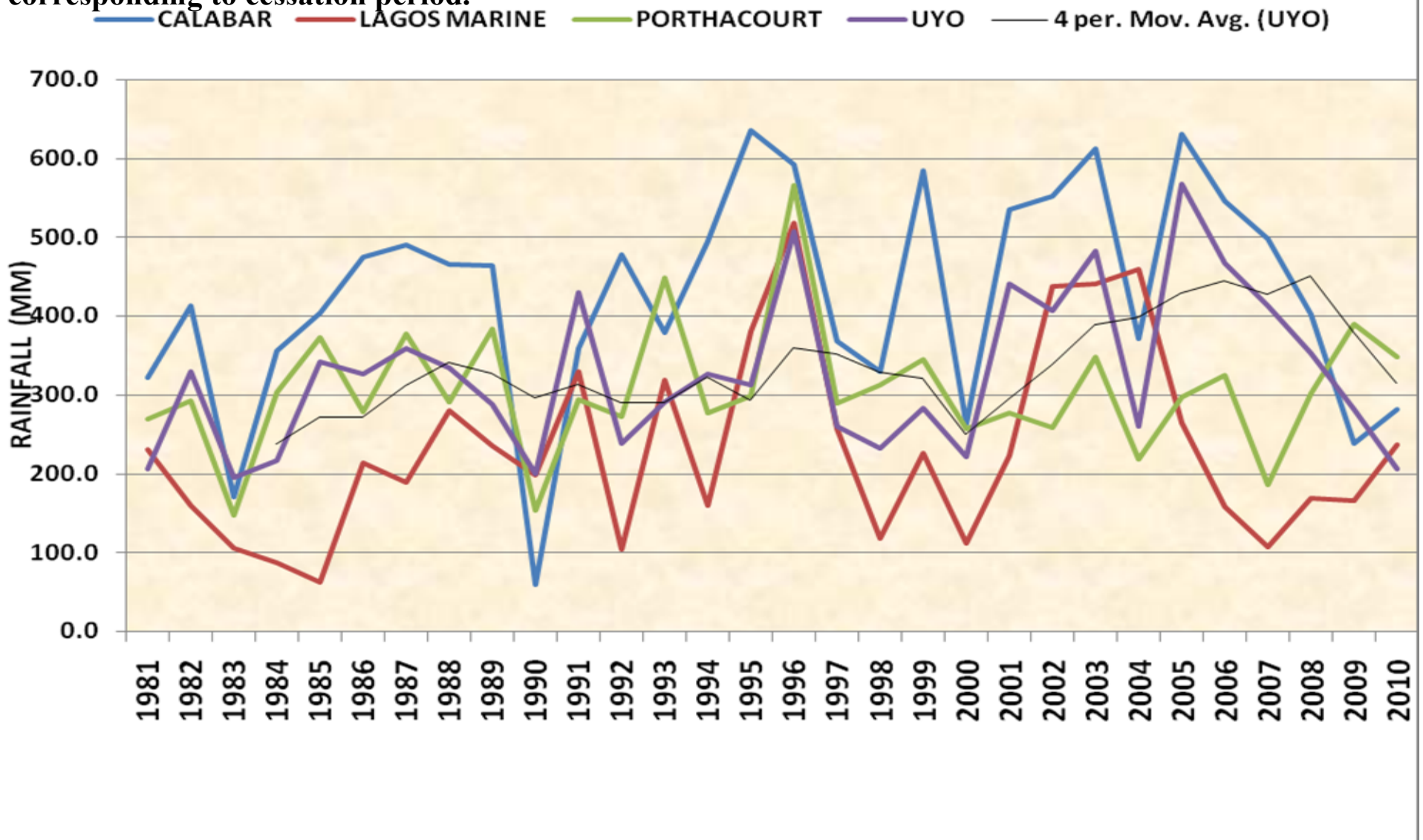
### Minimum Temperature Over Nigerian Coast







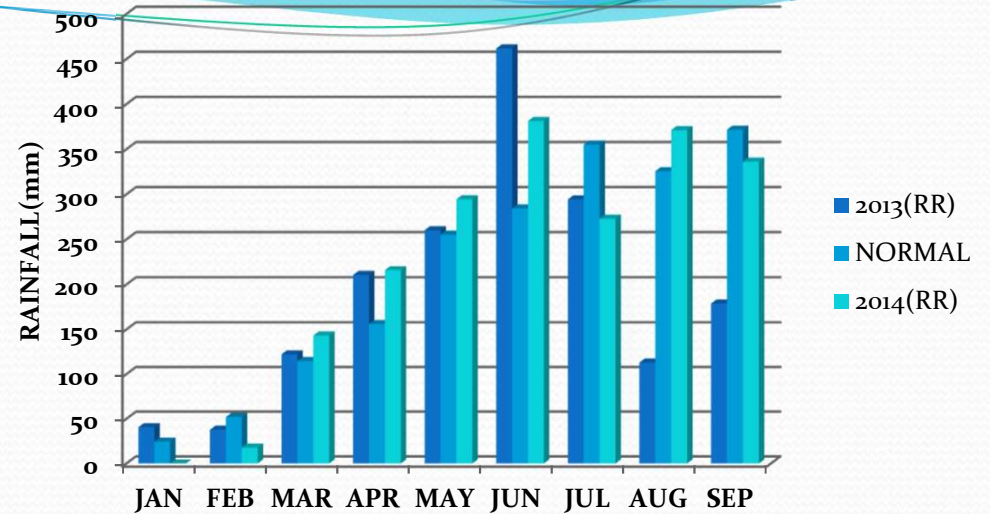
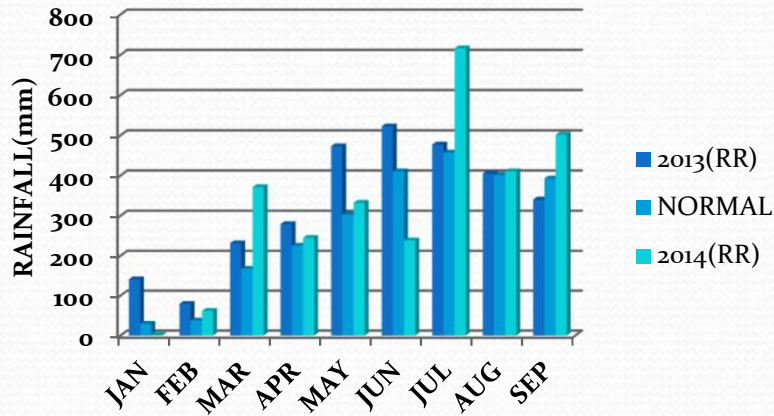
The coastal areas also seem to have their maximum amount of rainfall much earlier than other parts. The first quarter (Jan-Mar) of each year in the period (1981-2010) of study is marked by minimal rainfall and can be regarded as commencement period of rainfall, second and third quarter (April-Sept) have greatest amount of rainfall while the last quarter has the least amount of rainfall corresponding to cessation period.



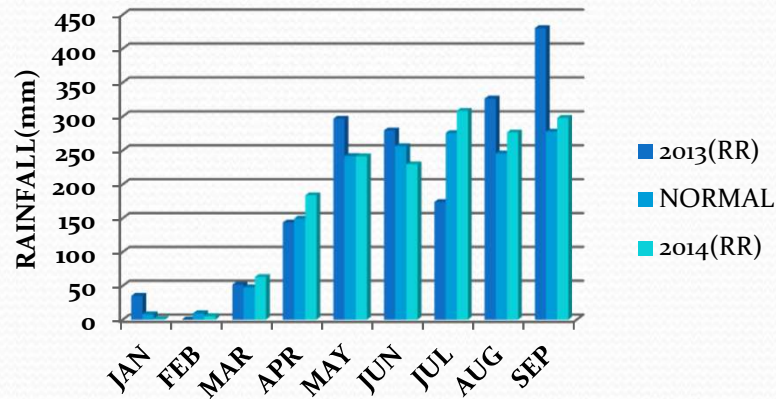


**COMPARISON OF 2013 AND 2014 MEAN MONTHLY RAINFALL AMOUNT WITH NORMAL OVER PORT-HARCOURT**

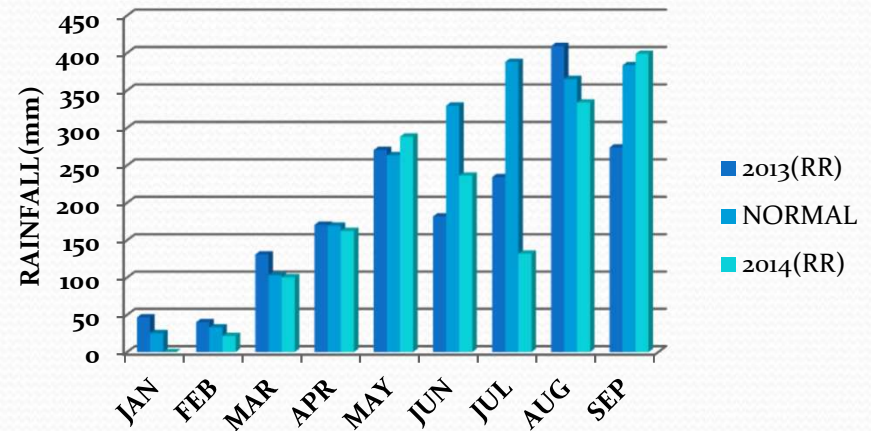
**COMPARISON OF 2013 AND 2014 MEAN MONTHLY RAINFALL AMOUNT WITH NORMAL OVER CALABAR**



**COMPARISON OF 2013 AND 2014 MEAN MONTHLY RAINFALL AMOUNT WITH NORMAL OVER ENUGU**



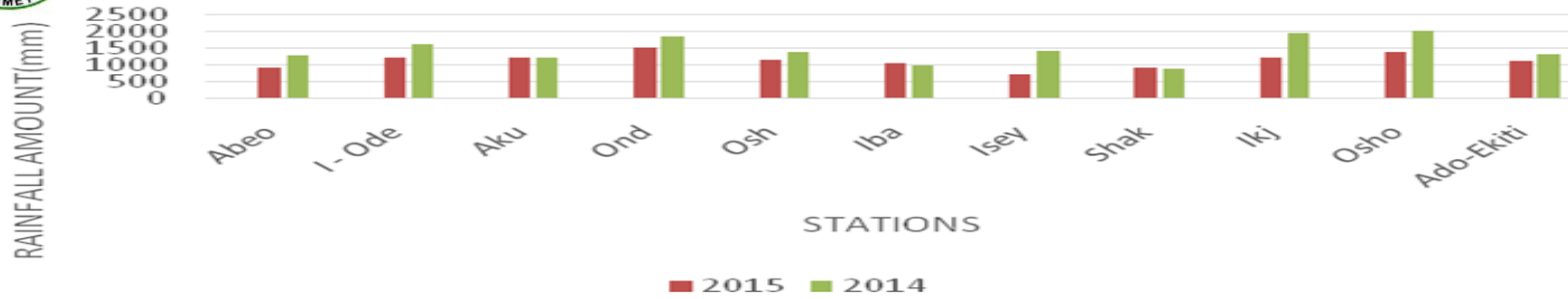
**COMPARISON OF 2013 AND 2014 MEAN MONTHLY RAINFALL AMOUNT WITH NORMAL OVER OWERRI**



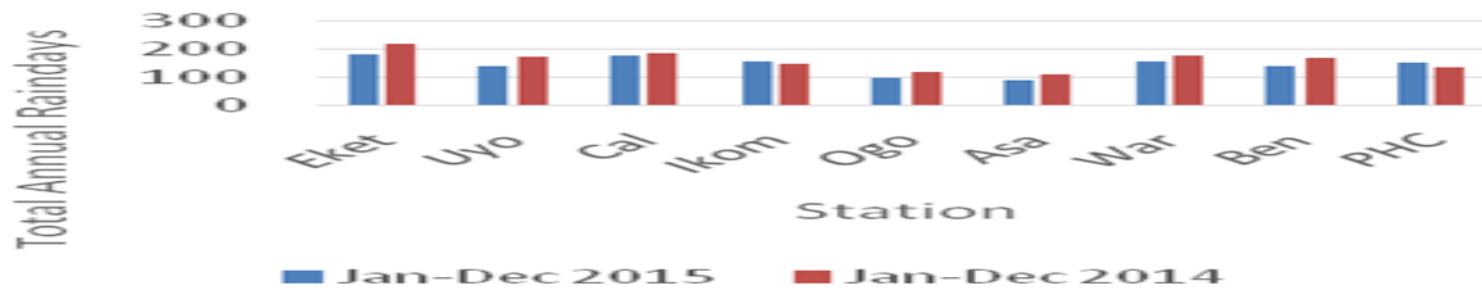
MARINE DATA FROM MARINE DIVISION NIMET



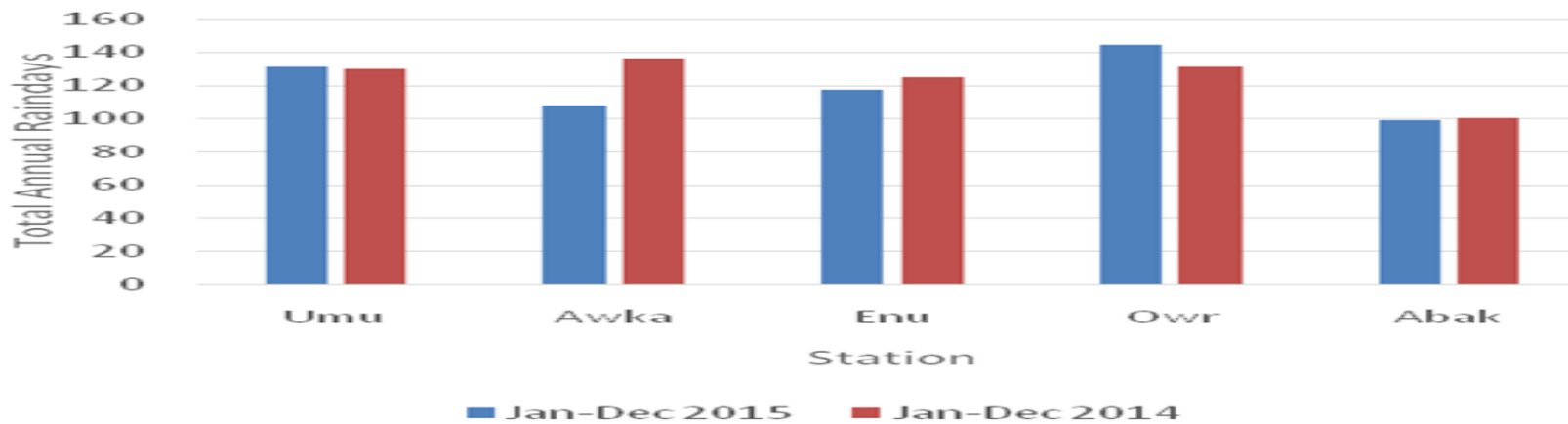
### COMPARISONS OF ANNUAL RAINFALL AMOUNT FOR 2015 & 2014 OF SOUTH WEST GEOPOLITICAL ZONES



### COMPARISON ANNUAL 2015/2014 RAINY DAYS FOR SOUTH SOUTH GEOPOLITICAL ZONE



### COMPARISON OF JAN-DEC 2015 WITH JAN-DEC 2014 RAINY DAYS FOR SOUTH EAST GEOPOLITICAL ZONE





Most of the Ocean surges occurrences have happen during the summer months of April to October, except that which occurred in march 2002. Also 24<sup>th</sup>, 26<sup>th</sup> and 27<sup>th</sup> of August,2011 and 17<sup>th</sup> and 18<sup>th</sup> August,2012,18<sup>th</sup> march 2013.20<sup>th</sup> ,21<sup>st</sup> ,22<sup>nd</sup> August,2013, ocean surges dates recorded and observed.

YEARS	EXACT DATE	PHYSICAL OCCURRENCE
1994	8 <sup>TH</sup> ,9 <sup>TH</sup> SEPT,28 <sup>TH</sup> OCT,4 <sup>TH</sup> 5 <sup>TH</sup> NOV	FLOODING
1995	16 <sup>TH</sup> 17 <sup>TH</sup> 18 <sup>TH</sup> AUG,	
1996	16 <sup>TH</sup> MAR,25 <sup>TH</sup> MAR	
1997	11 <sup>TH</sup> OCT	WINDY,RAINY,FLOODING
1998	21 <sup>ST</sup> APRIL 21 <sup>ST</sup> MAY	WINDY ,FLOODING
2000	20 <sup>TH</sup> JULY,6 <sup>TH</sup> SEPT	MASSIVE FLOODING
2001	6 <sup>TH</sup> ,7 <sup>TH</sup> ,MAY ,28 <sup>TH</sup> 29 <sup>TH</sup> JULY	
2002	28 <sup>TH</sup> MAR	FLOODING
2005	22 <sup>ND</sup> JULY,31 <sup>ST</sup> AUG,17 <sup>TH</sup> OCT	
2007	13 <sup>TH</sup> AUG, 11 <sup>TH</sup> 12 <sup>TH</sup> 13 <sup>TH</sup> OCT	
2008	4 <sup>h</sup> and 5 <sup>h</sup> Sept	WINDY, RAINFALL, FLOODING



**Map of showing extent of flood in Nigeria – in 'blue' are the states affected in September as reported in national media:**





19 feb. 2010 - Heavy storm over the weekend forced 16 unseaworthy vessels anchored of shore in Nigeria



<http://www.towingline.com>



## **AREAS OF PARTNERSHIP FOR IMPROVING THE COASTAL COMMUNITIES LIKE THE FISHERMEN FISH FARMING COMMUNITIES CLIMATE INFO SERVICES**

**The following areas of collaborations will ensure improved Coastal Communities like the fishermen fish farming communities on climate information services/products: by NiMet**

**(A) Expansion of network of weather observing station in the various fishing communities**

**(A) Spreading the lessons learnt here with fellow fishermen i.e. on the use & socio-economic benefits of agrometeorological services & other Early Warning Services (EWS) of NiMet,**

**(A) Identification of other climate information needs of fishermen.**

**(A) Receiving Inputs on fish farming practices of the respective fishing communities**

**(A) Receiving Feedback on NiMet's climate information services in order to improve subsequent products.**



# We cannot avoid hazards

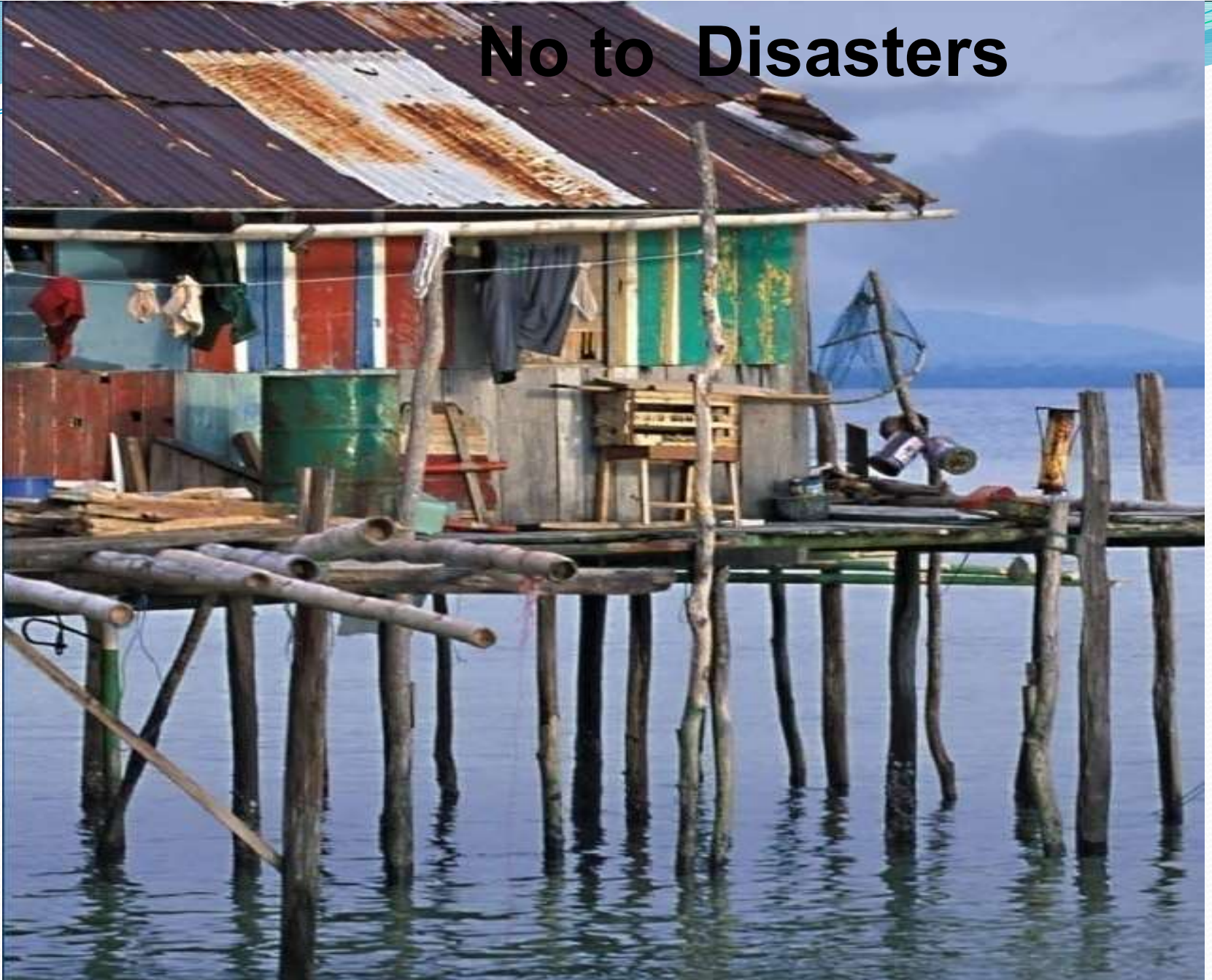


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# No to Disasters



**Nigerian Meteorological Agency (NIMET)** ..... *providing weather, climate and water information for sustainable development and safety of life and property*



# Thank You for your Attention

&

# GOD BLESS

**Nigerian Meteorological Agency (NIMET)** ..... *providing weather, climate and water information for sustainable development and safety of life and property*