SPATIO-TEMPORAL ANALYSIS OF NIGERIA'S SURFACE AEROSOL DATA USING GIOVANNI

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ABSTRACT

- The study evaluates the spatial and temporal variation of the Aerosol Optical Depth (AOD-τ_{550nm}) across Nigeria (with area of 923,768.00 Sq kilometers and lies between latitude 40 and 140 North of the equator and longitudes 30 and 140 East of the Greenwich meridian) over a period of four years, from 2007-2013 using Giovanni software. Two experiments were performed: Monthly versus daily simulations to visualize the spatial distribution of AOD across the country and the planetary experiments to visualize the aerosol plume within the Planetary Boundary Layer (PBL). The results of day to-day variation of AOD as well as seasonal variation of aerosol were presented. Generally, highest AOD were observed in March each year with the highest value of (τ = 2.30μg/m^3) in 2012 across the shore line of South-South region of Nigeria; While the minimum AOD value of (τ = 1.25μg/m^3) was recorded in the month of June, 2011 in Plateau State. There exists also good relationship between MODIS TERRA and AQUA with correlation coefficient, R= 0.8025. The CALIPSO cloud/aerosol classification and OMI UV Aerosol Index reviewed the aerosol plume resides within the PBL (2.0 -2.5 KM) from sea level.

INTRODUCTION

- Aerosols are fine solid or liquid particles suspended in gases in the atmosphere
- Some examples of atmospheric aerosols are smoke, sulfates, volcanic ash, pollen, mold spores and it is measured in $\mu g/m^3$

INTRODUCTION

- Sources of Aerosol
- Effects of Aerosols on air quality, health and climate change

AIM

- The aim is to simulate Aerosol Concentration Using MODIS Aqua and Terra Aerosol Optical Thickness data.

OBJECTIVES

- To identify areas of high aerosols concentration within the local environment of Nigeria
- To determine the spatial and temporal distribution of aerosol over Nigeria
- To determine relationship between the particle size of aerosol and AOD

LITERATURE REVIEW

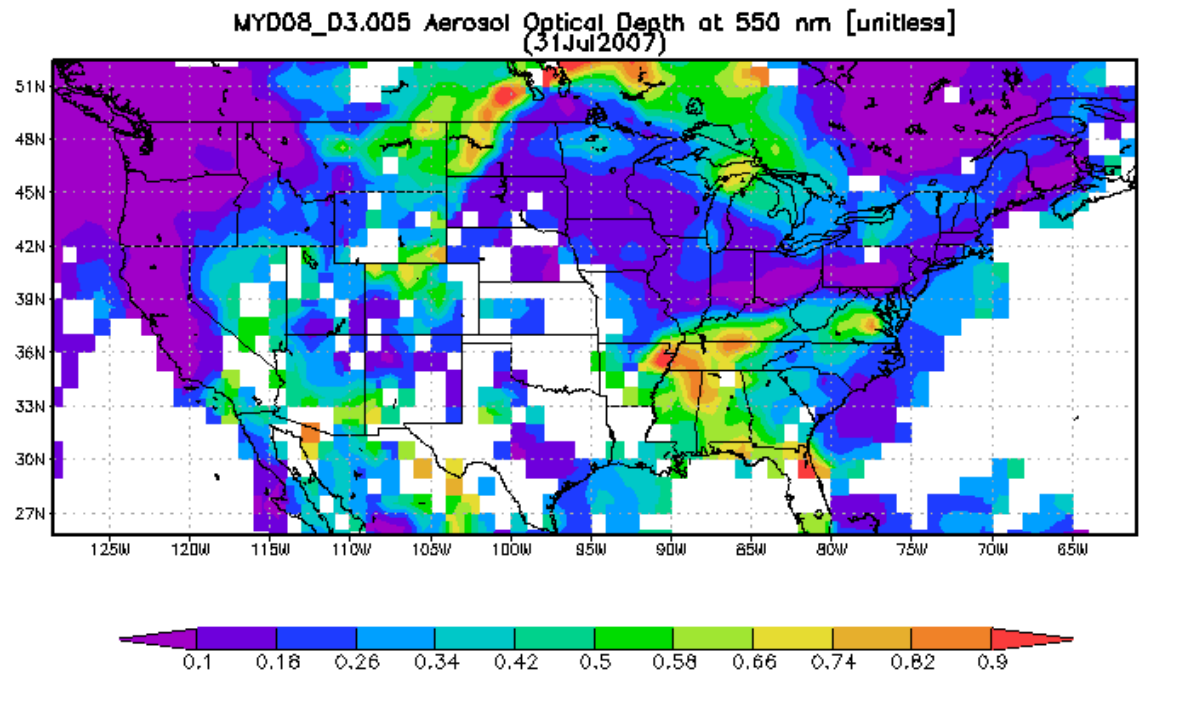


Fig 1: In Canada and the South-east US, MODIS show thick aerosols plumes. (Source Ana Prados and Gregory L, 2008)

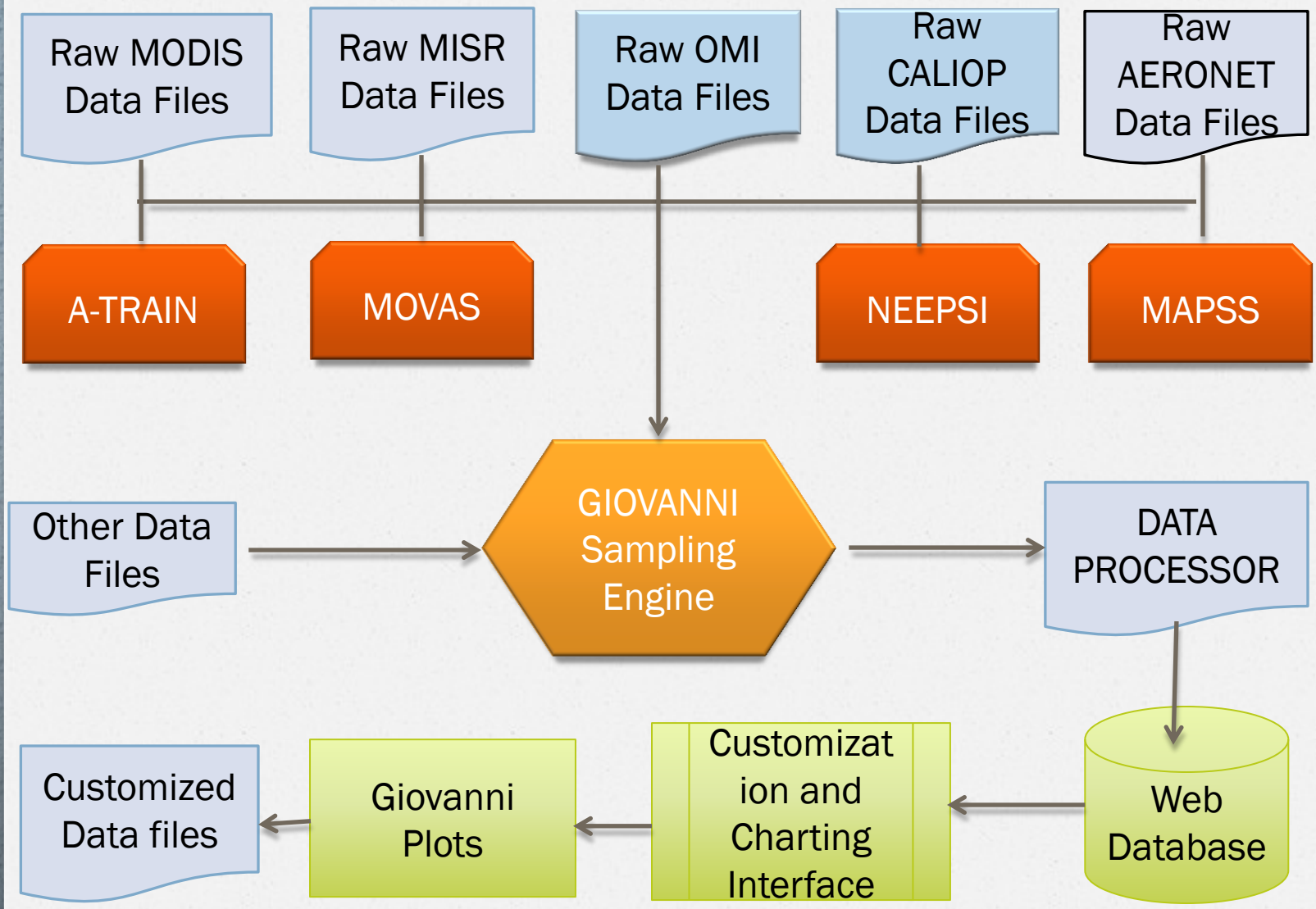
LITERATURE REVIEW CONT'D

- Health problems related to particulate pollution identified in the River rine industrial areas in Nigeria. Okecha, (2000) and Efe, (2006)
- Research Gap [Insitu vs Remote techniques of AOD retrieval]

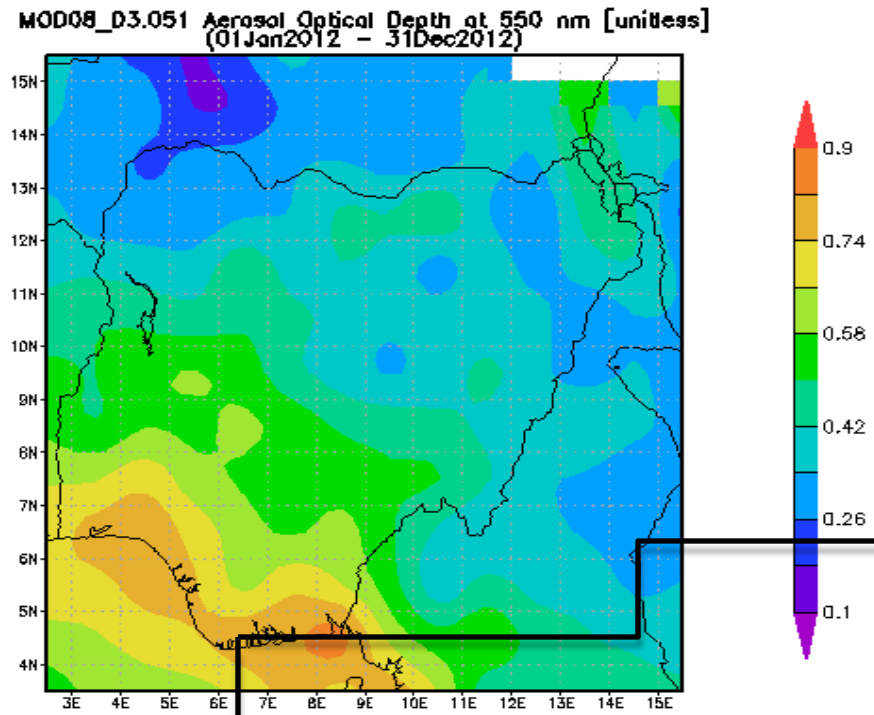
METHODOLOGY

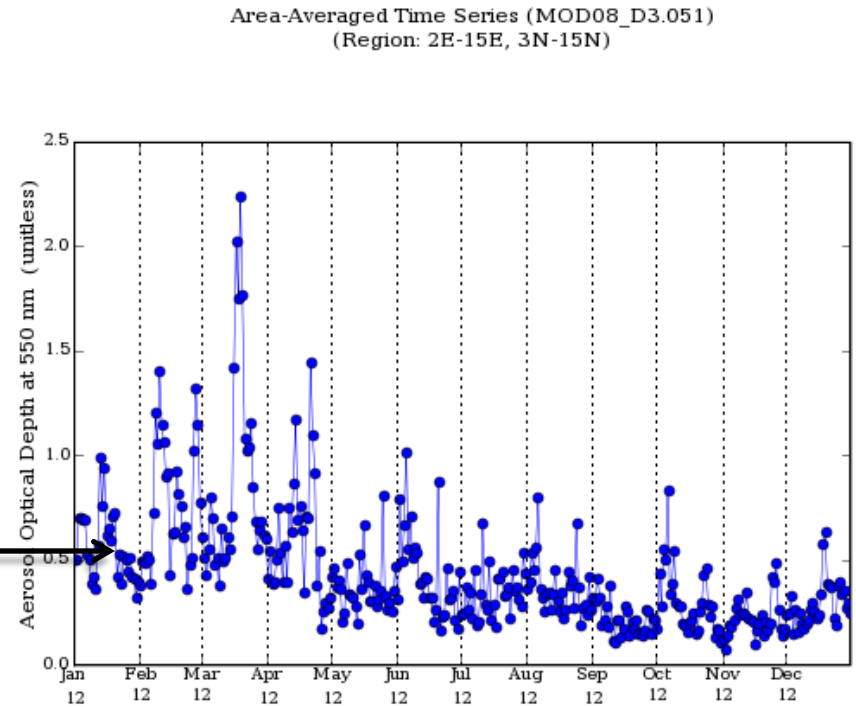
- **DATA TYPE.:**
- **SECONDARY** - MODIS TERRA, MODIS AQUA
- **SOFTWARE**: GIOVANNI

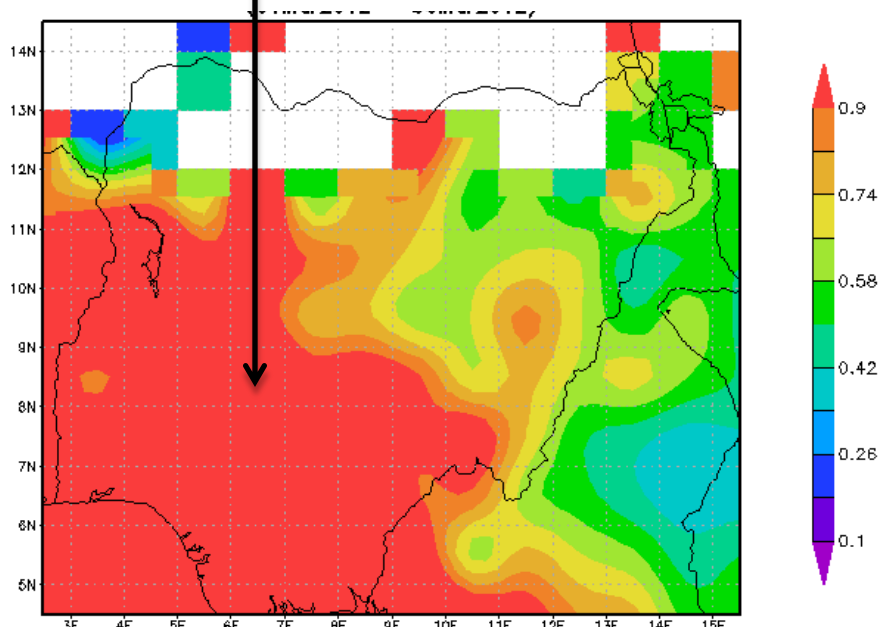
FLOW CHART


Raw MODIS Data Files
Raw MISR Data Files
Raw OMI Data Files
Raw CALIOP Data Files
Raw AERONET Data Files
A-TRAIN
MOVAS
NEEPSI
MAPSS
Other Data Files
GIOVANNI Sampling Engine
DATA PROCESSOR
Web Database
Customizat ion and Charting Interface
Giovanni Plots
Customized Data files

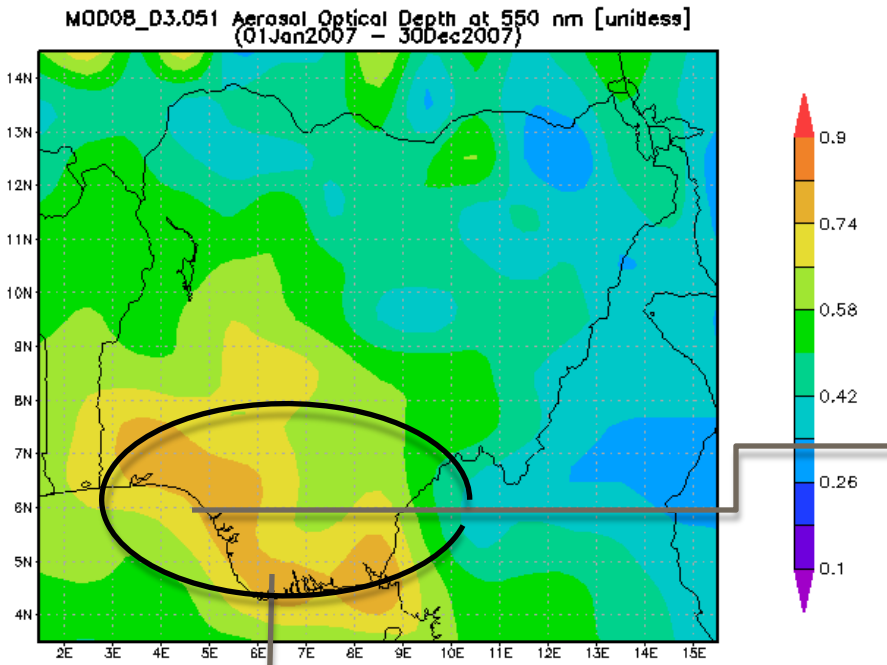
RESULT AND DISCUSSION

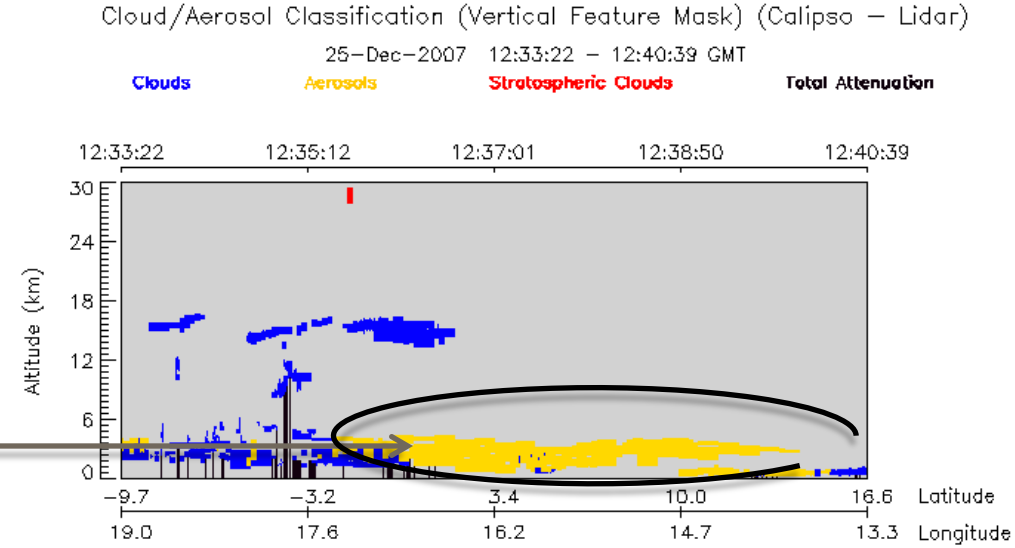


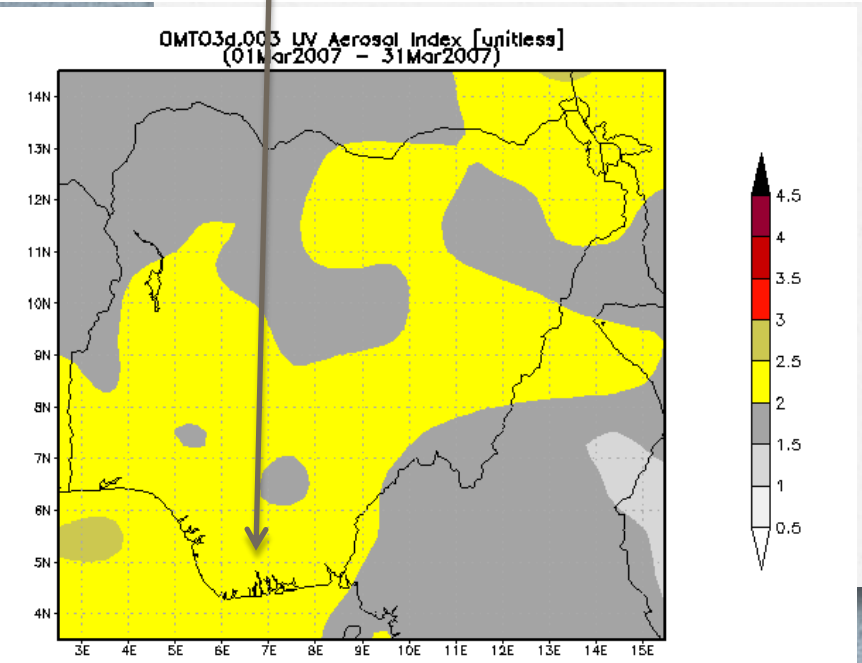




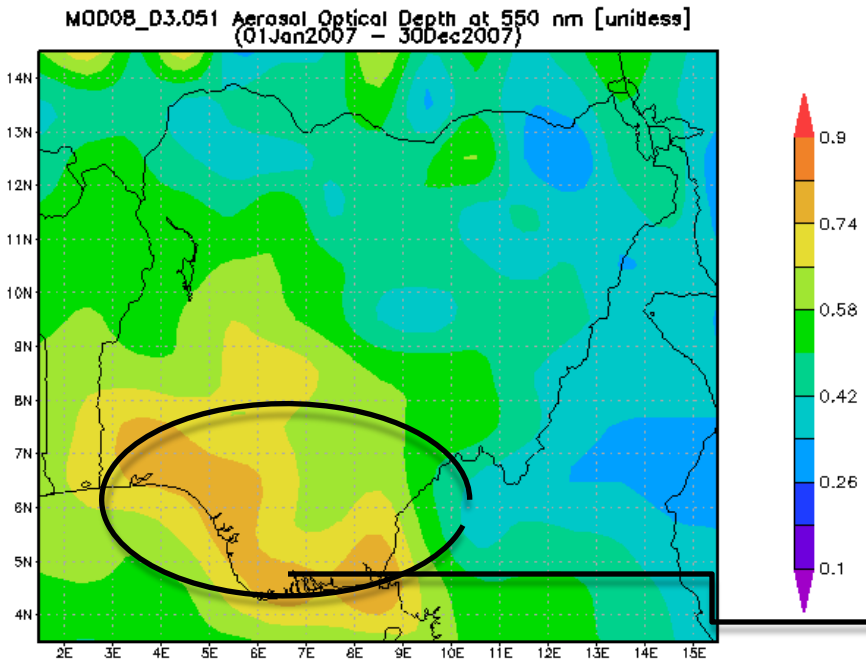
- In South-South region, MODIS TERRA & AQUA show aerosol plume
- Highest AOD in March 2012: (=2.30μg/m^3
- Highest coverage in March 2012 shown

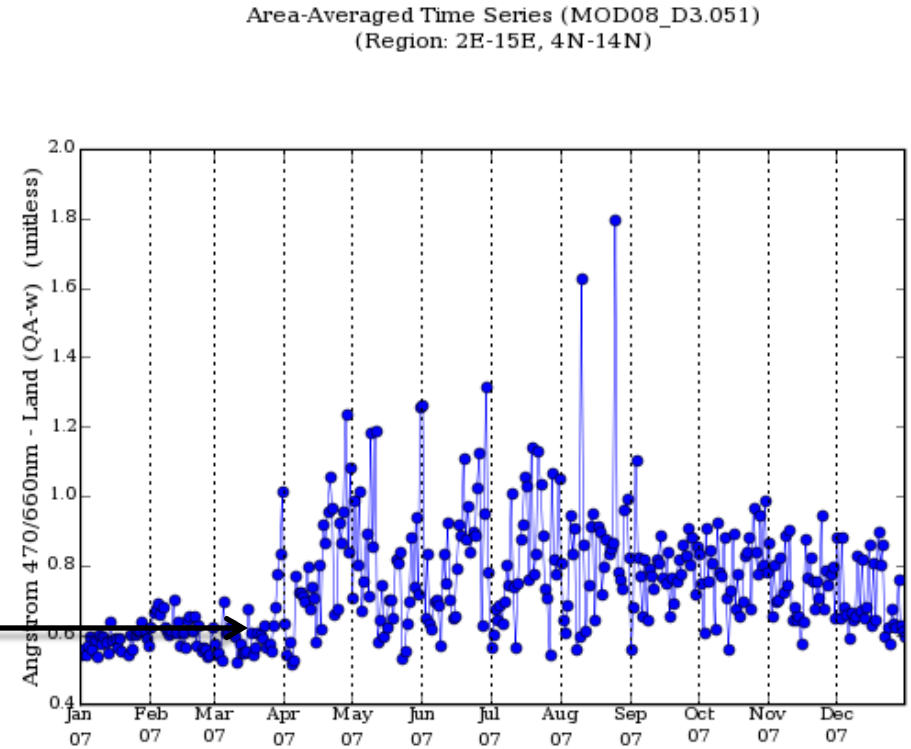


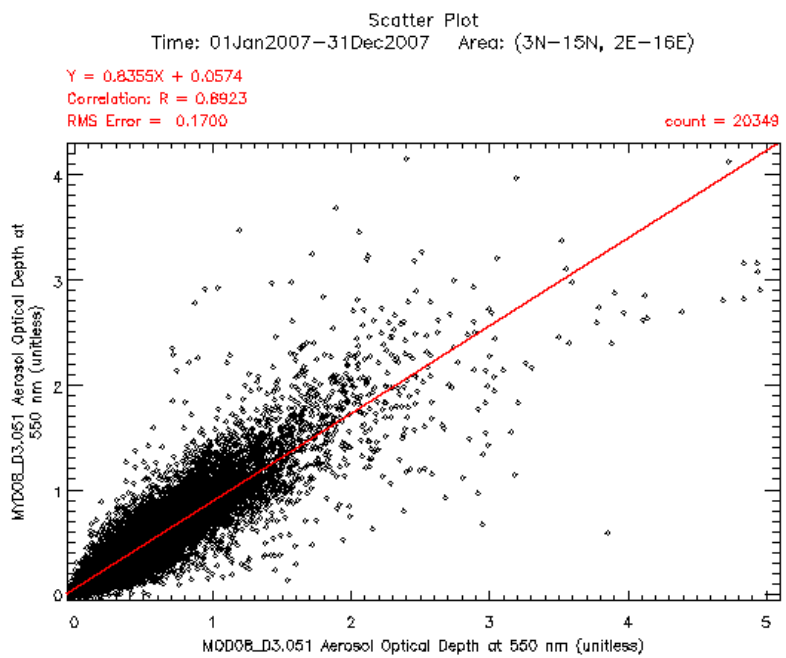




- OMI UV AI & Calipso aerosol flag indicate aerosol are primarily confined to the PBL (2.0KM to 2.5KM) height







- Size/Hygroscopic Characterization of Aerosol
- MODIS TERRA & AQUA shows good spatial and have good moderately good correlation
- R= 0.8025

Summary

- As a tool GIOVANNI has been employed in attempt to simulate the Aerosol concentration by Aerosol Optical Depth technique across the entire region of Nigeria which was located in West Africa sub-region (Longitude 14^0N and Latitude 8^0E) by its climatological and geographical weather condition.
- The study has been carried out to access spatial and temporal aerosol concentration for the sake of air quality management and to reduce anthropogenic loading of aerosols for future air conservation.
- The GIOVANNI software has been able to simulate different aerosol features including spatial distribution, seasonal variation, size variation and the height of PBL within which aerosol resides. All these have been done through MODIS data, OMI UV Aerosol Index and CALIPSO aerosol/cloud classification.

CONCLUSION

- Highest Aerosol Concentration were identified along the shore line of Cross River, Rivers, Balyelsa, Delta and Lagos state of Nigeria. These were as a result of Petroleum and industrial activities dominance of the area as noted by Efe et al 2008
- While other areas with average coverage of aerosol are liken to Biomass burning and other human activities.

Reference

- **Gregory Leptoukh, 2008:** A Web-based Tool for Exploring Earth Science Data for NEESPI GIOVANNI. NASA Goddard Space Flight Center http://giovanni.gsfc.nasa.gov
- **Efe S. I 2006**. Particulate Pollution and its Health Implications in Warri Metropolis, Delta State Nigeria. *Env. Anal.* 11, 1339-1351
- http://giovanni.gsfc.nasa.gov/

Thanks for your ATTENTION!