ANNUAL REPORT 2013-14

CENTRE FOR ATMOSPHERIC RESEARCH

NATIONAL SPACE RESEARCH AND DEVELOPMENT AGENCY

FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

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FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

KOGI STATE UNIVERSITY CAMPUS, ANYIGBA, NIGERIA.

www.carnasrda.com

SUMMARY OF ACTIVITIES FOR 2013 AND 2014

DECEMBER, 2014

FOREWORD

From Cradle to Limelight

The years 2013 and 2014 were especially active for the Centre for Atmospheric Research (CAR). From cradle to planning and activity, our Centre has gone through thick and thin to register her arrival in the global community of atmospheric sciences. I officially assumed duty as the pioneer Director of the Centre on 2nd January 2013. My appointment came earlier on in December 2012 and I was mandated to develop a program for the new Centre. Before 2013, specifically since 2010, what is now known as CAR was a Laboratory under the management of the Centre for Basic Space Science located at Nsukka, Nigeria. It was then referred to as the CBSS Sub-Centre for Lower Atmospheric Research. The establishment of CAR was confirmed with an executive approval in January 2013. With this invigorated start, the newly established Center for Atmospheric Research became the seventh activity Centre of the National Space Research and Development Agency(NASRDA).

The Center is envisioned to be a research and development arm of NASRDA committed to research and capacity building in the atmospheric and related sciences. CAR is dedicated to understanding the atmosphere—the air around us—and the interconnected processes that make up the Earth system, from the ocean floor through the Ionosphere to the Sun's core.

The regular activities of the Centre resulted in the events highlighted in this bi-annual report. In the two teething years, we have organized and co-organized conferences and schools both at national and international levels. A number of these programs were hosted at our location in Anyigba. Over 150 visitors have visited our host community since inception.

Our Centre has played host to big meetings like the 2nd Cyril Onwumechili School on Physics of the Upper Atmosphere in 2013 with 65 participants drawn from across Nigeria and the Benin Republic. In 2014, we held three international meetings, all covered in this report. The Centre currently hosts the Secretariat of the African Geophysical Society and hosted the 1st Annual Conference of the Society in June of 2014. The AGS conference recorded participation from seven African Countries and one participant each from India, UK, and Japan.

Research activity at the Centre is quite encouraging. At the last count, twenty-six (26) research articles were published by the technical staff of the Centre in reputable journals in 2013 and 2014. Some of these appeared in high-ranking international journals. About ten graduate students at Masters and PhD levels visited our Centre for scientific interaction during the years under review. From Port-Harcourt to Sokoto, from Yola to Lagos, our atmospheric and space weather monitoring facilities are running at over 20 locations in Nigeria. Our various research activities are documented in this report. Environmental samples taken from multiple locations across Kogi and Delta states have been analyzed for environmental impact assessment due to industrial activities. Local instrumentation is being developed at CAR for monitoring the atmosphere. Our Five major research projects, viz: Tropospheric Data Acquisition Network TRODAN, Space Weather Observation Network SWONON, Atmospheric Research Software and Instrumentation Development ARSID, Atmospheric and Environmental Research ACER, and Microgravity and Human Space Technology MHST, are progressive.

In 2014 alone, 13 of our staff were undergoing graduate training at Masters and PhD level. One of our staff completed his PhD in Physics while another completed a Masters program in Mechanical Engineering. 12 of our staff participated in a number of specialized administrative and technical trainings organised by other bodies in 2014.

Our Centre was first captured in the budget in 2014 and we attained a self-accounting status in the same year. CAR has continued to gain both nationwide and global patronage and collaboration. Together with the Department of Physics at the University of Ilorin, CAR set up a national laboratory for air quality Research in 2013. A number of MoUs have been facilitated and concluded with more than seven national universities and international institutions. CAR has gained international recognition and acceptance at relevant quarters. Our international partners include the American Institute for

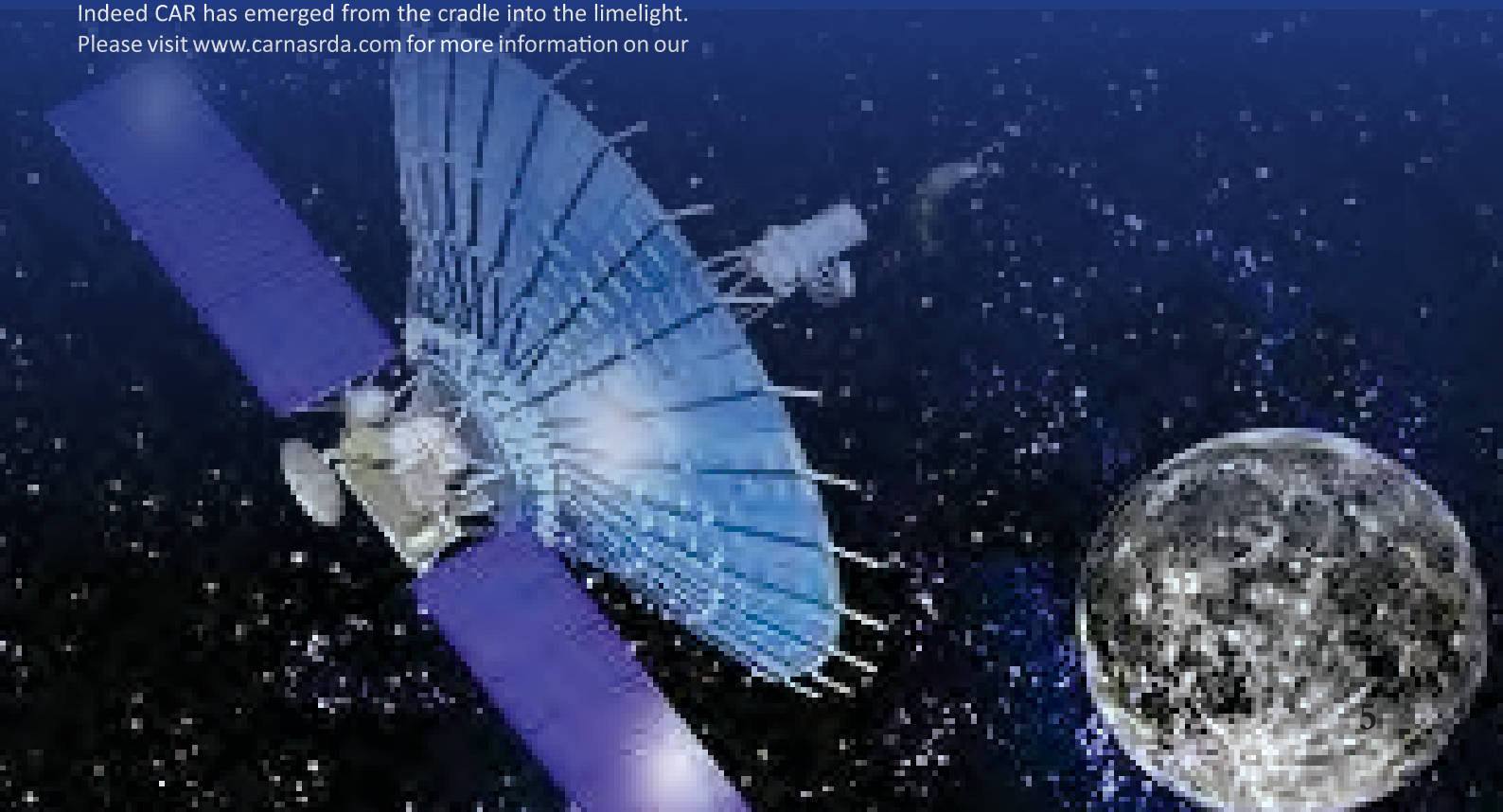
Scientific Research at Boston College, Massachusetts, USA; United States National Centre for Atmospheric Research at Boulder, Colorado; Solar Terrestrial Laboratory of Nagoya University, Japan; Rossby Centre of the Swedish Meteorological and Hydrological Institute, Norrköping, Sweden; and International Centre for Space Weather Science and Education of the Kyushu University, Fukuoka, Japan. Our collaboration with the West and Central Africa Research and Education Network WACREN has globally increased the visibility of our existing TRODAN data via the ei4Africa project. The data has been integrated into the Africa Grid Science Gateway for research purposes. eI4Africa is an FP7 project funded by the European Commission with the aim of boosting Research, Technological Development and Innovation (RTDI) potential of African e-Infrastructures and to support policy dialogues and Euro-African cooperation in the framework of the Joint Africa-EU Strategic Partnership on 'trade, regional integration and infrastructures' (JAES Partnership 3) as well as the Joint Africa-EU Strategic Partnership on 'science, information society and space' (JAES Partnership 8).

In the last quarter of 2013, CAR led Nigeria to become Adherent Member of the Scientific Committee on Solar-Terrestrial Physics SCOSTEP of the International Council for Science (ICSU). Our membership of SCOSTEP made Nigeria the first Sub-Saharan African Country in such global community. We have kept our membership record up to date with this important scientific body and are at moment reaping the benefits of such a unique partnership. We remain grateful to Professor Nat Gopalswamy, (President, SCOSTEP bureau), and Professor Marianna Shepherd (Scientific Secretary, SCOSTEP bureau) for their enormous support to our great continent.

Indeed CAR has emerged from the cradle into the limelight. Please visit www.carnasrda.com for more information on our activities and services, including more information about our operations, products and programs.We remain committed to our determination to be a one-stop world-class Centre for atmospheric research, and are very optimistic of taking advantage of the working international and national relationships we have created to achieve our ultimate goals.

On a final note, we owe the successes we have recorded in these teething years to divine grace and the teamwork of the entire CAR-NASRDA community at all levels. The Vice Chancellor and the entire members of our host community, Kogi State University, have been very supportive. The management of our parent body, the National Space Research and Development Agency, under the leadership of Professor SeiduO. Mohammed – Director General and Chief Executive, have been extraordinarily responsible in our developmental strides and responsive to our needs. I appreciate every bit of these divine and human supports. Really, the assignment at CAR has been a collective one and so I doff my hat in acknowledgement of everyone who has made these teething years historic and successful. I await more robust cooperation in the coming years. Many thanks.

PROFESSOR BABATUNDE RABIU
Director and Chief Executive,
Centre for Atmospheric Research CAR,
National Space Research and Development Agency,
Federal Ministry of Science and Technology, Anyigba, Nigeria
www.carnasda.com



METAMORPHOSIS OF THE CENTRE

The assumption of duty of the 1st substantive Director, Professor Babatunde Rabiu at the newly established Center for Atmospheric Research CAR of the National Space Research and Development Agency on 2nd January 2013, marked the beginning of activities at the Centre. The Center is a research and development arm of NASRDA committed to research and capacity building in the atmospheric and related sciences. Ever before January 2013, the Centre existed as a Sub-Centre of the Centre for Basic Space Science and was being addressed as the Sub-Centre for Lower Atmospheric Research. The name "Centre for Atmospheric Research" became effective in January 2013 with the Executive approval for the Centre to exist as a full-fledged Centre. This marked a turning point for good in the history of atmospheric studies in Nigeria.

MISSION STATEMENT

CAR exists to understand the behavior of the entire spectrum of the Earth's atmosphere; promote capacity development in relevant atmospheric sciences as a way of facilitating international competitiveness in research being conducted by atmospheric scientists; and disseminate atmospheric data/products to users towards socio-economic development of the Nation.

OUR MANDATES

We are committed to research and capacity building in the atmospheric and related sciences. CAR shall be dedicated to understanding the atmosphere—the air around us—and the interconnected processes that make up the Earth system, from the ocean floor through the ionosphere to the Sun's core. The NASRDA Center for Atmospheric Research provides research, facilities, and services for the atmospheric and Earth sciences community.

The NASRDA Center for Atmospheric Research is to provide sound education, research and knowledge in:

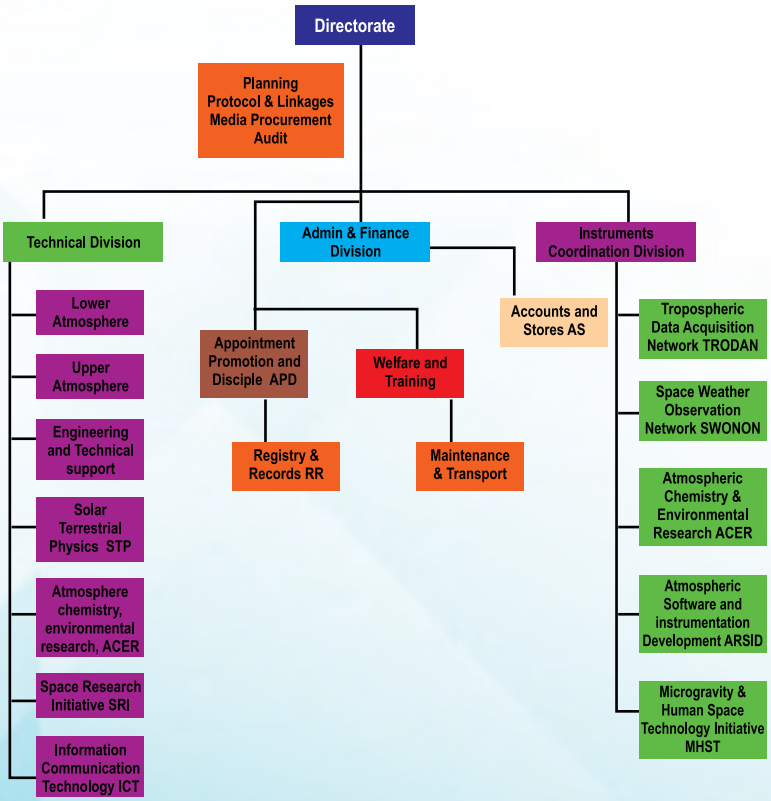
- Lower atmosphere
- Upper Atmosphere (Ionospheric/Magnetospheric physics),
- Atmospheric chemistry and environmental science
- Geomagnetism,
- Environmental research
- tropospheric and trans-ionospheric radio propagation research
- Solar physics, Solar Terrestrial Interactions, Space Weather
- Human space technology Initiative
- Space debris

OPERATIONS

CAR is envisioned to operate in three modes: Observations, Training and Research

ORGANIGRAM

The Organigram of CAR is as shown in the chart below



TECHNICAL DIVISION

The technical division of CAR is made up of the following seven specialized units:

i. **Lower Atmosphere LA**
The unit concentrates on research that has to do with the lower portion of the atmosphere right from the sea surface through the entire spectrum of the troposphere.

ii. **Upper Atmosphere UA**
The unit focuses on the study of the Ionosphere and magnetosphere of the Earth and other planets.

iii. **Solar Terrestrial Physics STP**
Solar physics, Solar Terrestrial Interactions and Space Weather (Sun and heliosphere)

iv. **Atmospheric Chemistry &Environmental Research ACER**
Environmental research, environmental impact assessment, environmental pollution, atmospheric chemistry

v. **Space Research Initiative SRI**
Human space technology Initiative – medical geography, Magneto-biology, space experiments as it affects agriculture, medicine and vaccine development etc, Space debris

vi. **Engineering and Technical Support**
Instrumentation development, maintenance of atmospheric monitoring facilities, development of equipment from locally available materials and imported sensors,

vii. **Information Communication Technology (ICT)**
Software development for atmospheric research, telemetry, data portal management etc,

MAJOR ACTIVE RESEARCH PROJECTS AT CAR

i. **Space Weather Observation Network over Nigeria – SWONON**
Network of ground-based space observatories (facilities include magnetometers, digisondes, Ionospheric GPS monitors, optical imagers)
Nowcasting of state of space environment
Enhancement of performance of Space-based technologies

ii. **Tropospheric Data Acquisition Network – TRODAN**
Network of ground stations monitoring lower atmospheric parameters (automatic weather stations, rain radar)
Improvement of space-earth communication systems

iii. Atmospheric Chemistry and Environment Research – ACER
Establishment of network of stations monitoring air quality in the atmosphere (sample collection, trace detection facilities)
Air pollution control
Air Quality Measurements

iv. **Microgravity and Human Space Technology – MHST**
Simulating microgravity experiments that are performable in the space environment
Food security and drug/vaccine developments

v. **Atmospheric Research Software and Instrumentation Development - ARSID**
Indigenous development of Software and Instrumentation for Atmospheric Research
Real-time maps of atmospheric parameters over Nigeria
Now-cast of space weather over Nigeria
Control of capital flight

TROPOSPHERIC DATA ACQUISITION NETWORK (TRODAN)

Tropospheric Data Acquisition Network TRODAN is designed to capture all the Lower Atmospheric Research facilities at the Centre for Atmospheric Research. TRODAN now combines three existing projects hitherto known as:

(i) Nigerian Environmental and Climatic Observing Project (NECOP),
(ii) Microwave Propagation Project (MPP), and
(iii) Micro Rain-Radar Projects (MRRP)

These facilities are networks established to provide our own terrain real-time research data to the scientific communities in Nigeria and at a global scale. CAR inherited these three projects at inception in 2013 from our parent Centre – NASRDA Centre for Basic Space Science CBSS. These projects are dedicated research facilities for frontline characterization of the Nigeria troposphere, hence the need to integrate them and bring them under one umbrella, that is, TRODAN.

Objectives of TRODAN

(I) To establish a national network of stations carrying out simultaneous basic measurements of atmospheric, meteorological and climatic variables, from earth surface to about 11 km in real time, at one minute update cycle.

(ii) To provide real time data for scientists and researchers interested in atmospheric research and other relevant fields in Nigeria, Africa and the world at large.

(iii) To have a real-time online archive for data dissemination so that research results from atmospheric groups could support decision and policy making under a wide range of meteorological and climatological scenarios in Nigeria.

(iv) To develop a real-time data acquisition and delivery system as an important tool for public education and awareness purposes during emergency management events.

(v) To cover all the states in Nigeria at first with the hope of expansion to neighboring African countries.

(iv) To produce, after a sufficientperiod of data collection and analysis, a comprehensive technical report of tropospheric, meteorological and climatic conditions in Nigeria, which would be useful to end users and designers of equipment suited to our terrain.

TRODAN-NECOP equipment comprise of Campbell Scientific instrument sensors, solar power systems for uninterruptible power supply, measurement and control systems and the data logging system. The Microwave Propagation Instrumentation is composed of a number of multiple Vantage Pro 2 Weather Stations installed at different altitudes (0 m, 50 m, 100 m, 150 m and 200 m). The Wireless Vantage Pro2 is equipped with the integrated sensor Suite (ISS), a solar panel (with an alternative battery source) and a wireless console. The Micro Rain Radar is a compact 24 GHz FM-CW-radar for the measurement of profiles of drop size distributions and derived from this are rain rates, liquid water content and characteristic falling velocity resolved into 301 range gates. Due to the high sensitivity and fine temporal resolution, very small amounts of precipitation below the threshold of conventional rain gauges are detectable. Due to the large scattering volume (compared to in situ sensors) statistically stable drop size distributions can be derived within a few seconds. The droplet number concentration in each drop-diameter bin is derived from the backscatter intensity in each corresponding frequency bin. In this procedure the relation between terminal falling velocity and drop size is exploited.

As at today, the TRODAN project components have registered success with the usage of its data in developing both graduate and bachelor theses within and outside Nigeria. A number of research articles, which made use of TRODAN data, have been published in reputable international journals.

Vegetation Map of Nigeria Showing TRODAN Automatic Weather Stations Network

Anyigba Station, installed (July 2010)

CAR staff at ATBU Installing a new TRODAN-NECOP (BAUCHI Station) 2013

CAR Team at JOS Station, 2013

Vegetation Map of Nigeria Showing TRODAN-MPP Network

Integrated Sensor Suit (ISS)

Vantage Pro 2 Console

Installed TRODAN-Micro Rain Radar and the Control Room at Nsukka, Nigeria

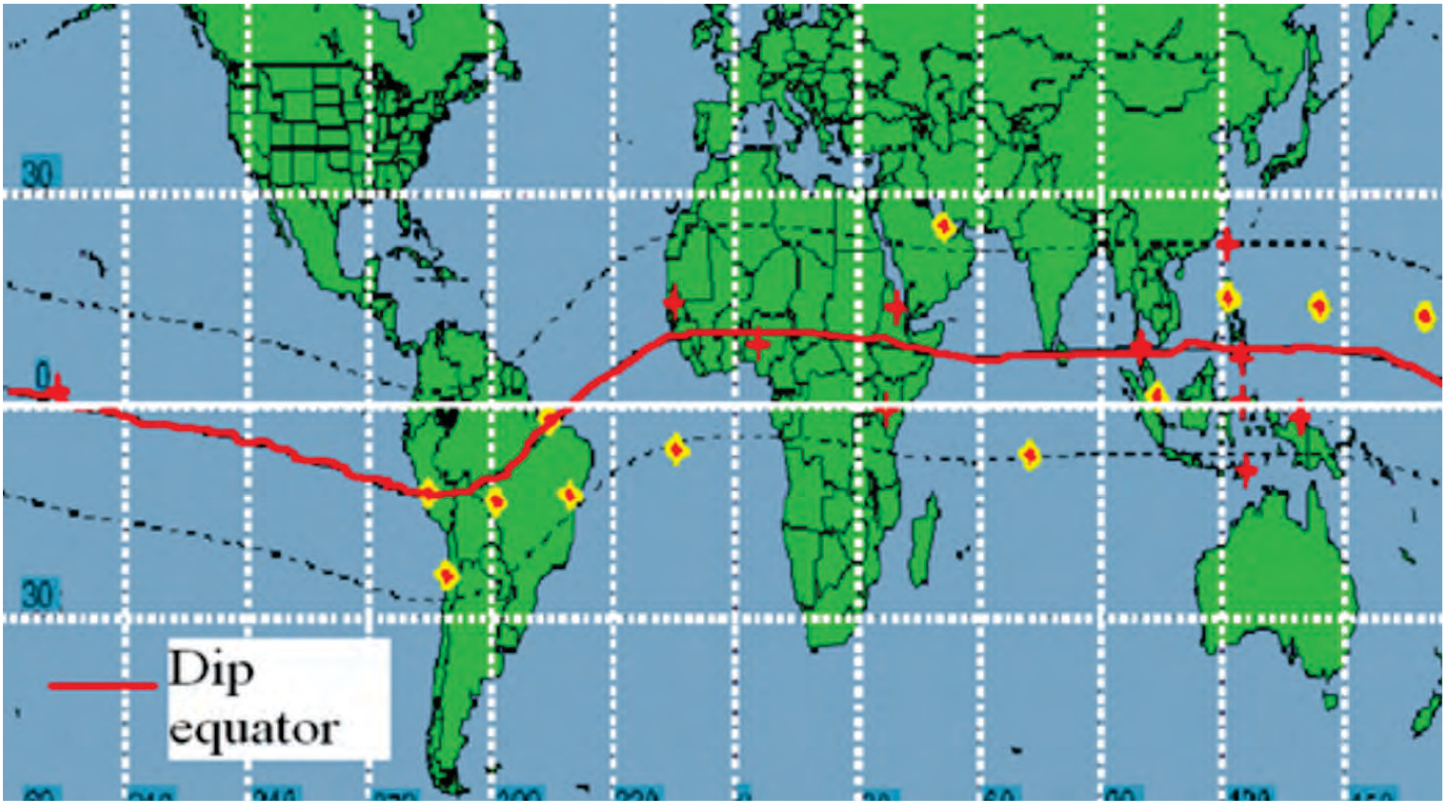
Space Weather Observation Network Over Nigeria SWONON

Space Weather Observation Network over Nigeria SWONON is envisioned to comprise of multiple equipment capable of monitoring the space environment over Nigeria, from an altitude of 40 km to a region beyond satellite altitudes, on real time basis. Main Objectives of SWONON are:

i. To identify, upgrade and consolidate existing space observatories in the country.
ii. To integrate the existing space observatories into the planned SWONON.
iii. To build and install the first Distributed Space Observatory across Nigeria and provide real-time display of observables. Data from all instruments will be transmitted in near real-time with a cadence of 15 minutes or less, to three central computers at the main headquarters of the National Space Research and Development Agency (NASRDA) in Abuja, CAR and one other location. Data transfers may use site-dependent alternatives: phone line and a local Internet provider, DSL, cable or satellite link.
iv. To nowcast the state of the ionosphere over Nigeria in terms of TEC, scintillations, TEC depletions, bottomside F- and E-region densities, geomagnetic field and associated phenomenon over Nigeria.
v. To monitor and nowcast space weather over Nigeria. Thus safeguarding our huge investment in satellite technology, communication technology and associated products.
vi. To develop in-country expertise for implementation, operations, processing and analyses of space weather processes.
vii. To establish a solid ground infrastructures for space exploration.

Nigeria is located within the geographical window 4°N-15°N and 4°E-15°E and has a surface land area of 923,768 square kilometers. Nigeria's economy is one of the fastest growing in the world and is the largest in Africa. Nigeria has the highest population of all African countries and is the eighth most populous country in the world. The country is located within a region of equatorial ionosphericanomaly which is characterized by high spatial gradient of electron density, equatorial electrojet, and all sorts of equatorial ionospheric phenomenon and their associated phenomena. The complexities associated with equatorial processes have continued to arouse international interest in the study of the region.

Understanding the space over Nigeria is paramount to the actualization of the goals and objectives of NASRDA – harnessing space and its products for national development. Our space is the medium of transmission of electromagnetic waves from numerous satellites to ground stations. Its dynamics is very crucial to our signal performance and hence the end product of any satellite.



Position of Nigeria on the World map (the dip equator passes through the centre of the Nigera – a great opportunity for studying ionospheric processes in equatorial area. Nigeria lies within the Equatorial anomaly region)

SWONON is envisioned monitor the ionosphere over Nigerian landscape within the equatorial anomaly region with the purpose of studying and forecasting the ionospheric phenomena, and with special emphasis on dynamic and photochemical energy transport processes. Therefore SWONON is a permanent array of multiple space probing instruments such as GPS stations, magnetometers, optical imagers and ionosondes collocated at 37 points within the country. Each state and the Federal Capital Territory shall have a unit each. SWONON shall proffer answer to key questions about the physics of the equatorial ionosphere and shall be useful to develop forecasting capabilities concerning the onset of equatorial spread-F (ESF). The data acquired by SWONON will be complemented with an assimilative physics-based model designed to "nowcast" the ionospheric state above the Nigeria. The model will be constrained with multipoint and multi-instrument observations from SWONON to produce accurate estimates of ionospheric electron density distributions, conductivities, E×B plasma drifts, and neutral winds in near real time, and will also be integrated forward in time to make predictions about the onset of ESF.

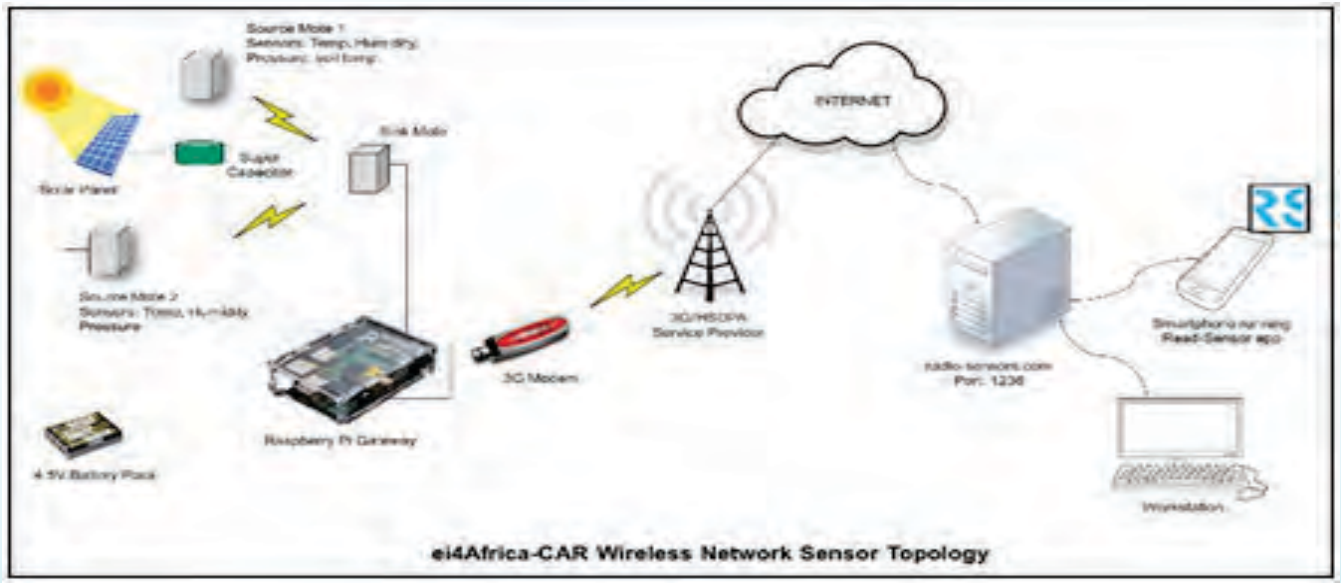
Developing an observatory capable of estimating plasma densities, ion drifts and neutral winds over a large geographic area constitute a logistical challenge with inherent intellectual merits. Additional merits of the effort include its anticipated advances in equatorial Aeronomy, the development and testing of forecasting capability of ESF on a regional basis, and setting the pace for National Network of Observatories that can be copied by other African countries.

Atmospheric Research Software and Instrumentation Development (ARSID) Project

The NASRDA Centre for Atmospheric Research presently seeks to promote indigenous technology with the establishment of the Atmospheric Research Software and Instrumentation Development(ARSID) project. The main objectives are to: promote indigenous development of Software and Instrumentation for Atmospheric Research; generate real-time maps of atmospheric parameters over Nigeria; provide software for now-cast of space weather over Nigeria; and attempt to control capital flight with respect to acquisition of instruments for monitoring the atmosphere. The progress of this lofty idea will go a long way towards advancing indigenous know-how in designing and development of equipment/software which, prior to this time, have been imported. Such initiative would sky-rocket our technological advancement in the area of space research and development, making it possible for Nigeria to join the alliance of Nations with reputable space research technologies. The project prospective borders on the development of ground and space instrumentation for monitoring the atmosphere and space environment, as well as characterization and analysis software for atmospheric research studies that agree with the Centre's mandate.

Wireless Sensor Networks WSN for Atmospheric Observations

The Centre for Atmospheric Research, in collaboration with the Telecommunication Systems Lab of the KTH Royal Institute of Technology Sweden, is incorporating test Wireless Sensor Networks (WSN) alongside existing TRODAN Automatic Weather Stations in Nigeria. WSN are lightweight, low-cost, low maintenance alternatives to standard meteorological sensors and can relay data to remote servers in real time. In the pilot phase, two WSN installations were deployed, one in Lagos (6.43438N, 3.3226W) and the other in Anyigba (7.2988N, 6.8297W) in Nigeria. Lagos and Anyigba are about 7 m and 420 m above sea level respectively. An additional WSN station was set up at the Swedish Meteorological and Hydrological Institute (SMHI) in Sweden to perform calibration studies on the meteorological sensors.



CAR WSN Configuration and topology

The WSN configuration consists of a data gathering source sensor mote (ATMega128rf Mcu, radio transceiver, adc, Contiki-OS) and a sink mote connected to a Raspberry Pi minicomputer Gateway with 3G connection to the internet. The source mote has onboard meteorological sensors for Temperature, Relative Humidity and Barometric Pressure and possesses ports for the installation of additional sensors for other meteorological variables.

WSN Challenges in Nigeria

Power availability to equipment and internet access are two main challenges to deploying WSN in remote regions. Although the reliability of internet connectivity varies from one region to the other, one common denominator is the unavailability of fixed IP addresses which is essential for reaching WSN gateways from the internet. Modifications have been put in place in the WSN code to allow for gateways to forward collected data in real time to a proxy webserver which receives the data and makes it available over the internet at a specified port. A simple query to the proxy server at the designated port will give access to the forwarded data. The Read-Sensor app developed at KTH could also connect to the webserver and retrieve and plot the streaming data. The read-sensor app can enable a smartphone to act as a WSN gateway if required.

CAR Engineers and scientists co-locating the WSN with CAR TRODAN Automatic Weather Station at Anyigba, Nigeria.

WSN Installation at CAR TRODAN Station

Initial test data will be used for calibrating the sensors and assessing the performance of locally made radiation shields (pagodas) compared to standard WMO recommended shields. Despite challenges, the WSN stations for meteorological observations have been a success. The next phase will include additional sensors to measure more meteorological variables, the deployment of more WSN nodes across the country, and the development of reliable power solutions, such as super-capacitor/solar charging and voltage inverter power combinations.

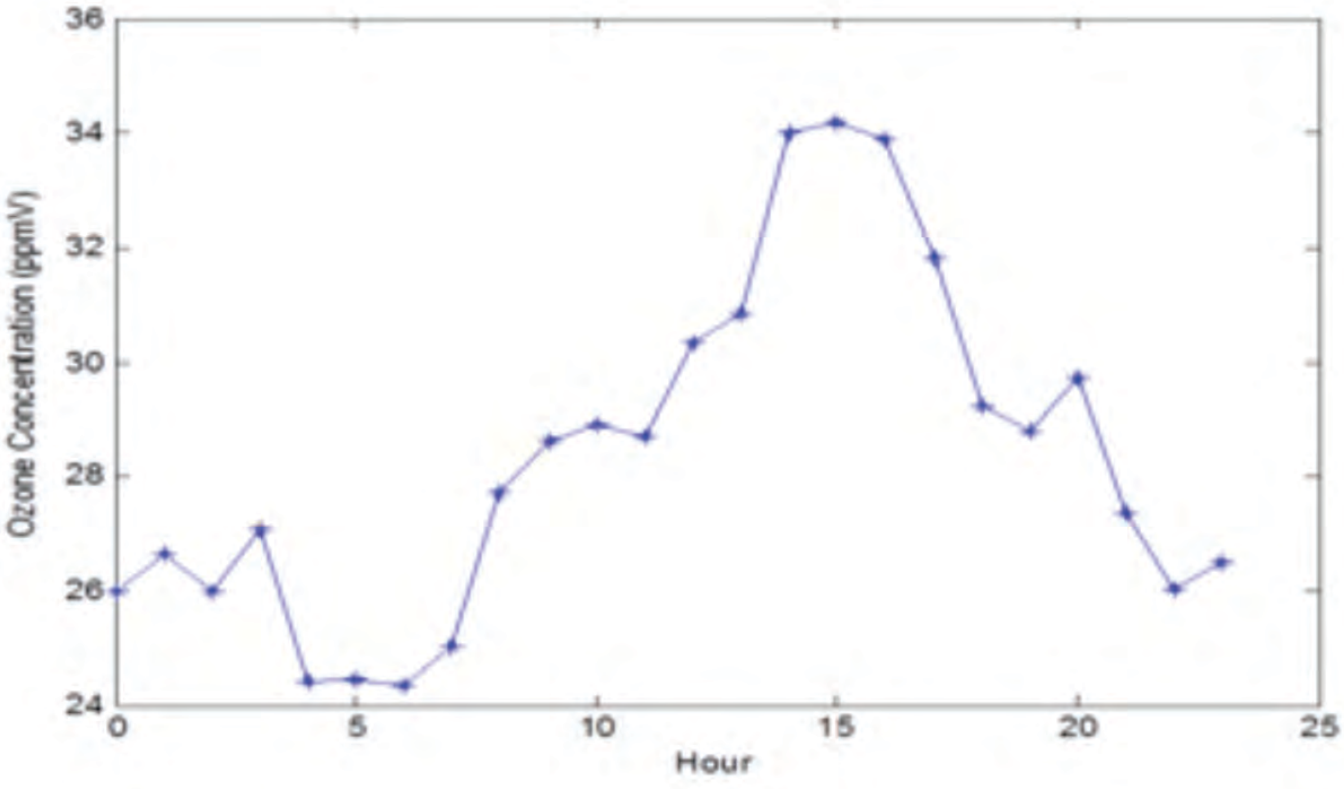
ACER: Preliminary Report of Ground Level Ozone Measurement at CAR

With much effort and dedication towards contributing to research and development, the Centre for Atmospheric Research (CAR) Nigeria has recently established a collaboration with National Center for Atmospheric Research NCAR, Boulder, CO. Through this laudable achievement, a regional workshop on air quality measurements and modelling was held at the NASRDA Headquarters Abuja, Nigeria to facilitate research and capacity building for researchers and students alike in the West African region. The training covered both regional and global atmospheric modelling as well as instrumentation.

Furthermore, NCAR deployed Ozone and Nitric Oxide monitors and NO2 converters to CAR for research purposes. Continuous measurement of ozone (O_3) has been on going at CAR in Anyigba. Ozone, a triatomic oxygen occurs in very small amounts in the lowest part of the atmosphere, a region known as the troposphere where it is produced at ground level through photochemical reactions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), some of which are produced by human activities from power plants and automobiles. Ozone in the atmosphere mostly resides in the stratosphere. The concentrations of ground-level O_3 currently range from a few parts per billion (ppb) by volume up to 200 ppb. Our international collaborators on the project are Dr Simone Tilmes and Dr John Ortega from the Atmospheric Chemistry division of NCAR

Preliminary analysis of diurnal data for the period of four months,obtained from the ozone monitor, showed that Ozone concentrations in Anyigba are relatively low (about 25 ppmv or 0.0025% on the average) in the early hours of the day while at mid-day hours, the average concentrations of ozone are higher (about 34 ppmv), and at the later hours, ozone concentrations return to about 27 ppmv. The higher daytime values may be attributed to ultraviolet radiation from the sun which catalyzes ozone precursors (VOCs and NOx) during the day.

The Ozone Monitor at CAR, Nigeria



Typical diurnal variation of Ozone at CAR Location – Anyigba, Nigeria.

Microgravity and Human Space Technology – MHST

Space environment is a microgravity environment. The United Nations Office for Outer Space Affairs (UNOOSA), under the framework of the United Nations Programme on Space Applications, launched the Human Space Technology Initiative (HSTI) with the objective to promote international cooperation in human spaceflight and space exploration-related activities. The 1st United Nations Expert Meeting on Human Space Technology, under the UN Human Space Technology Initiative (HSTI), jointly organized by the UN and the Malaysian government was held in Putrajaya, Malaysia from 14-18th November 2011.

HSTI encourages promoting indigenous capacities in microgravity science education and research. CAR is leading research studies in microgravity with emphasis on food security and drug/vaccine developments. We intend to work with national and international scientists to simulate microgravity experiments performable in the space environment.

ANNUAL REPORT FOR THE YEAR 2013

Memorandum of Understanding

The Centre has successfully initiated and established Memoranda of Understanding between NASRDA and the following three Institutions:

i. Institute for Scientific Research, Boston College, Boston, USA;
ii. Salem University, Lokoja, Nigeria; and
iii. University of Ilorin, Nigeria.

Hosting of African Geophysical Society AGS Secretariat

Our Centre for Atmospheric Research has been the proud host of the International Secretariat of the continent wide African Geophysical Society since 2013. This was with the gracious permission of Professor S. O. Mohammed, Director General/Chief Executive of the National Space Research and Development Agency. The African Geophysical Society AGS is a dynamic, innovative, and interdisciplinary scientific association committed to the pursuit of understanding of Earth and Space for the benefit of mankind. The fields of relevance to African Geophysical Society are: Solid Earth Science, Atmospheric Science, Oceanic Science, Astronomy and Planetary Science, Solar and Terrestrial Physics, and Hydrological Science. It is a broad based Society with membership from several African countries and beyond. Professsor Babatunde Rabiu, the Director of CAR, is the first and serving President of AGS. The Secretariat of the AGS moves with the Presidency and thus becomes the official address of the Society for the duration of office of the serving President. The official address of the AGS Secretariat is:

African Geophysical Society Secretariat
National Space Research and Development Agency
km 17 Umar Musa Y'Aradua Expressway,
ABUJA, Nigeria

Our Centre for Atmospheric Research in Anyigba is responsible for the day-to-day running of the AGS Secretariat. The official webpage of AGS is: www.afgps.org

Activities Organised at the Centre

i. Staff Induction/Orientation; Guest Speakers:Mr. J. D. Ali, Director Admin and finance, NASRDA; Dr. Olufemi A. Agboola, Director Engineering and Space Systems ESS, NASRDA.; and Mr. Sylvester E. Ogobor, Deputy Director Admin and Finance NASRDA. Date: 15th -17th January, 2013

ii. Symposium on Space Weather and Space Based Technologies; Guest Speakers:Professor Christine Amory Mazaudier, Universitie Pierre Marie curie, Paris, France; Professor Babatunde Rabiu, Centre for Atmospheric Research, NASRDA, Anyigba.Date: 30th – 31st January 2013.

iii. Seminar on the "Equipment for the Measurement of Lower Atmospheric Parameters".Guest Speakers: Dr. E. O. Ogolo- Obafemi Awolowo University, Ile-Ife, Nigeria; Dr. M. O. Ayoola - Obafemi Awolowo University, Ile-Ife, Nigeria; and Dr O. R. Oladosu– African Regional Centre for Space Science Technology and Education – English, ARCSSTE-E, NASRDA, Ile-Ife, Nigeria. Date: 23-24th April 2013

iv. 2nd Cyril Onwumechili School of Physics of the Upper Atmosphere: Theme: MATLAB program for Atmospheric Research. Guest Lecturer: Dr. O. S. Bolaji, University of Lagos, Lagos, Nigeria. Date: 23rd – 27th June, 2013(65 participants drawn from across Nigeria and Benin Republic).

v. Seminar on Developing a Culture of Financial Discipline. Guest Speaker: Dr (Mrs.) J. N. Ekere (University of Nigeria, Nsukka); Guest Participants: Professor A.Y.B. Anifowose and Dr. Frank Akinluyi, FUT Akure. 11th July, 2013.

vi. Symposium on Environmental Chemistry Research. Guest Speaker: Professor Tunde Victor Ojumu, Head, Chemical Engineering, Cape Town Peninsula University of Technology, South Africa. Date: 12th July, 2013.

vii. Seminar on "Importance of Environmental Impact Assessment". Guest Speaker: Dr Mojisola Usikalu, Covenant University, Ota, Ogun State, Nigeria. 01 August, 2013.

viii. Central Working Committee Meeting on Microgravity Program and Seminar on "Microgravity Experiments: Problems and Prospects" by Dr. Arotipin Daniel Juwon, Prof. O. Ashamo, Dr F. Omoya, Dr. B. J. Akinyele, Federal University of Technology, Akure, Nigeria. 9thSeptember, 2013. (A team of 10 staff from Salem University and National Microgravity Research Team).

Indoor Seminars

i. Space Weather Observatory Network Over Nigeria by Professor Babatunde Rabiu, Ag DCAR. 1st August, 2013.
ii. Introduction to the Earth's Ionosphere by Bashir Buhari(Corps Member). 1st August, 2013.
iii. Aerosols - Jatto Solomon Sunday. 10th August, 2013.
iv. Climate Change by Muawiya Sani on10th August, 2013.
v. Ozone by Timiyo T. Justice on 10th August, 2013.
vi. Maintenance practice: A high degree of facility reliability and cost effectiveness by Engr. Oluwaseye Adedoja. 14th August, 2013.
vii. Radiation: A Dilemma by Shehu Sharafadeen A. 14th August, 2013.
viii. How to Design a Blog by Akolo John. 24th August, 2013.
ix. How to Design a Web Portal by Suleiman Abdulrahman. 24th August, 2013.
x. The imperative of inventory management in public sector by Mrs Rahinat Aminu. 4th September 2013.

Workshops/Conferences jointly co-organized with another bodies

i. One-Day Symposium On Space Weather And Space-Based Technologies, 29th January 2013, National Space Research and Development Agency NASRDA, Abuja, Nigeria

ii. Symposium On Space Weather And Space-based Technologies, 2nd – 9th February 2013; Bells University, Ota, Nigeria

iii. Women in Physics Workshop. 21-23 May 2013. ALDC Hall Covenant University, Ota, Ogun State, Nigeria

iv. 2013 ISWI/SCOSTEP School On Space Sciences, Oct 21 - Nov 1,Nairobi Kenya

v. 2013 National Conference of the Astronomical Society of Nigeria; 21-22 October 2013; Abuja, Nigeria

Participation in Conferences and Workshops

i. 50th session of the scientific and technical sub-committee of the United Nations committee on the peaceful uses of the outer space (UNCOPUOS). 11th – 22nd February, 2013; UN office, Vienna, Austria. Participant - Professor Babatunde Rabiu (Ag Director)
ii. United Nations Institute for Disarmament Research (UNIDIR) regional seminar on "The Role of Norms of Behaviour in African Outer Space Activities". 6th – 9th March, 2013; United Nations Conference Centre, Addis Ababa, Ethiopia. Participant: Professor Babatunde Rabiu
iii. GNSS Data Application to low Latitude Ionospheric Research. 6th – 17th May, 2013. Abdus Salam Institute for Theoretical Physics, ICTP, Trieste, Italy. Participant: Professor Babatunde Rabiu
iv. 2013 General Assembly of Computer Professionals Of Nigeria. Theme.: Information Technology for Wealth Creation. 19 -20, June, 2013.Nicon Luxury, Abuja. Participant: Iloanusi, N. L.
v. 2013 Centre for Satellite Technology Development CSTD Week; 21st-22nd August 2013.Senator (Prof.) Ajayi Borofice Conference Hall, NASRDA complex Abuja. Participants: Prof Babatunde Rabiu (Ag DCAR), Mr Najib Yusuf, Mrs N. L. Iloanusi, Engr. Seye Adedoja, Mr David Zhema and Mrs Ronke Obafaye-Isreal. Papers presented by CAR Staff: Mr Najib Yusuf -Tropospheric Data Acquisition Network TRODAN: an archive for data dissemination; Prof Babatunde Rabiu- Spacecraft Anomalies and Space Weather
vi. UN/ChinaWorkshop on Human Space Technology Initiative, 16th – 20thSeptember, 2013.Beijing, China. Participant: Professor Babatunde Rabiu; Paper Presented: Space Research Initiatives and Nigerian Space Agency
vii. 2013 International UN/ISWI MAGDAS School; 23 - 27 September, 2013; FHB University, Bingerville, Cote d'Ivoire; Participant: Professor Babatunde Rabiu; Lectures delivered: The Ionosphere – A Tutorial; and "Estimation of Equatorial Electrojet from MAGDAS Data"
viii. 2013 International Conference of the Nigerian Meteorological Society (NMetS), 17th – 20th November, 2013, Nigerian Meteorological Agency (NIMET), Abuja, ; Participants: Najib Yusuf and NkemEzeh. Paper Presented: Tropospheric Data Acquisition Network TRODAN: Towards a Data Archive for Atmospheric and Related Sciences
ix. International Climate and Weather of the Sun Earth - Systems CAWSES-II Symposium; 18th - 26th November, 2013; Solar –Terrestrial Environment Laboratory STEL, Nagoya University, Japan. Participant: Professor Babatunde Rabiu; Paper Presented: Spatio-Temporal Variability of Ionosphere over Africa Determined from Array of Instruments installed during IHY/ISWI 2006 - 2013
x. African Leadership Conference (ALC) on Space Science and Technology, 3rd - 5th December 2013; Accra, Ghana. Participant: Professor Babatunde Rabiu; Paper Presented: (a) Equatorial Ionosphere Over Africa: Peculiarities, Characteristics and Implications; (b) GNSS in Africa: Applications, Infrastructures, Research Implications and Prospects
xi. American Geophysical Union Fall Meeting, 9-13 December 2013, San Francisco, USA. Participant: Professor Babatunde Rabiu; Paper Presented: Dynamics of the Landmark and Current Parameters of the Equatorial Electrojet Over India

Deployment/Maintenance of Atmospheric Equipment

Maintenance/Installation of TRODAN Stations. Schedule (Dates): 13th/14thMay, 2013 - Jos Station; 18thMay, 2013 - Yola; 19th/20th May, 2013 - Makurdi. Participants: Mr. Najib Yusuf, Engr Oluwaseye Adedoja, Engr Umar Saleh, Mr. Zhema D. A.

Installation of New TRODAN Station: 15th to 17thMay, 2013. Abubakar Tafawa Balewa University, Bauchi. Participants: Mr. Najib Yusuf, Engr Oluwaseye Adedoja, Engr Umar Saleh, Mr. Zhema D. A.

Installation of GPS facility for Space Weather Monitoring at the Nigerian Airforce Base Sokoto; 5-8 November 2013, Participants: Prof. Babatunde Rabiu and Aderonke Obafaye

Staff on Graduate Training

I. Najib Yusuf : MSc programme, Ebonyi State University, Abakaliki
ii. Iloanusi, N. L. PGD programme at the Ebonyi State University, Abakaliki
iii. Engr A. U. Saleh: M.Eng.,AbubakarTafawaBalewa University, Bauchi
iv. Adedoja, O. M.Eng., University of Nigeria, Nsukka
v. Ezeh, N: MSc programme at the Ebonyi State University, Abakaliki
vi. Suleiman Abdulrahman : M.Sc., University of Technology, Malaysia.
vii. Solomon S. Jatto: PhD., Ahmadu Bello University, Zaria

Higher Degrees Obtained by Staff

I. Kadiril Ben Angulu - PGD Accounts, Kogi State University, Anyigba
ii. Nkiru L. Iloanusi- PGD Computer Science, Ebonyi State University, Abakaliki

Special Administrative/Technical Training

i. Training on Unmanned Aerial Vehicle for Atmospheric Research.Mingwei Electronics and Technology Company limited in collaboration with Nanjing University of Aeronautics and Astronautics Liaoning Province, Fuxin city, China. February 28th to March 30th, 2013.CAR Staff Participants: Mr. Najib Yusuf, Engr. Oluwaseye Adedoja, Engr. Adeyemi Alesinloye R.

ii. Training on Policy, Strategy and Leadership (Course 9/ 2013). 10th – 30th March, 2013. The National Institute for Policy and Strategic Studies NIPSS, Kuru– Jos, Nigeria. Participant: Professor Babatunde Rabiu

iii. Training on Web Management. 22nd to 26th April, 2013. NASRDA Complex, Abuja. Participants: Mrs. N. L. Iloanusi. and Mr. Musa I. A.

iv. Training on "Ensuring accountability and productivity". 25-27 June 2013. Organised by the Chartered institute of Accountants of Nigeria, Rohi Hotel, Maraba, Nasarawa State. Mr. Kadirl Ben Angulu (Accountant) and Micheal Omede (Auditor)

Working Visits / Courtesy Calls

31st January 2013: The Vice Chancellor, Kogi State University KSU, Anyigba. This working visit to the Vice Chancellor was in company of visiting Professor Christine Mazaudier from Universitie Pierre Marie Curie, Paris, France. A two-day symposium was held on Space Weather and Space Based Technologies at Anyigba

6th February 2013: The Polytechnic Ibadan, Nigeria. This working visit to the Polytechnic was in company of visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France. A one-day symposium was held at the Polytechnic on Space Weather and Space Based Technologies

7th February 2013: Working visit in company of visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France, to the Vice Chancellor, Tai Solarin University of Education, Ijagun-Ijebu Ode TASUED, Nigeria. A one-day symposium was held at the University on Space Weather and Space Based Technologies

13th June 2013: Palace of the Ogohi, OnuAnyigba. Courtesy call on the Royal Highness in his palace.

4th July, 2013: Salem University, Lokoja. To discuss possible areas of collaboration. CAR team: Director, Mr. Najib Yusuf, Mrs. Iloanusi, N. I., Mr. Zhema A. D, Mr. Iben K. Angulu, Ms Awe Oluwayomi F. SALEM Team: Vice Chancellor - Professor Joseph Fuwape, Deputy VC - Professor Abraham Onugba, Deputy Librarian - Mr. James Onoja, Registrar - Mrs. Elizabeth Ocholi, University P.R.O. - Mr. Jude

3rd September 2013: Nigerian Airforce Office, Defence Headquarters, Abuja. A presentation was made by the Ag. Director CAR on the important of space weather monitoring vis-à-vis communication effects.

CAR Visitors

- About 92 visitors to CAR
- Over 60 first time visitors to our location
- Over 30 visiting scientists with PhD
- 3 foreign scientists (South Africa, France, Benin Republic)
- Over 50 visiting Graduate students from different parts of Nigeria

2013 Publications

The following publications were made by staff of the Centre during the period under review.

1. Najib Yusuf., Balogun T. A., Agbor A.G., and Ayantunji B. G., 2013. Seasonal variation of weather parameters over Anyigba North-Central Nigeria. Nigeria Journal of Space Research, 11, 91-95.
2. Najib Yusuf., Ayantunji B. G., Ekpe, O.E., Balogun T A., Umeh M.C., and Akenbor B., 2013. Seasonal variation of surface radio refractivity over Anyigba North-Central Nigeria. Nigeria Journal of Space Research, Vol. 12.
3. Lanre Daniyan, Okeke Pius, Najib Yusuf, and NasiruAliyu,

2013. 'A New Wireless Telemetry System for Meteorological Application'. International Journal of Scientific and Engineering Research. IJSER. Vol. 4. Issue 8.

4. Ayantunji B.G., Najib Yusuf.,Onah O.A., Obi I., and Okeke P.N., 2013. A Semi-Empirical Model for Predicting Signal Strength at UHF and VHF Bands using Refractivity Measurement at Nsukka. South-Eastern Nigeria. Nigeria Journal of Space Research, Vol. 11.,Page 14-19.

5. Najib Yusuf and Ekpe, O.E., 2013. Solar Photospheric Index Variability Forcing of Climate Change on Seasonal Scales in Anyigba North-Central Nigeria. Nigerian Meteorological Society, Book of Conference Proceedings. P103-106.

6. Rabiu, A.B.,Onwumechili,C.A., Nagarajan, N., Yumoto, K., 2013. Characteristics of equatorial electrojet over India determined from a thick current shell model. Journal of Atmospheric and Solar-Terrestrial Physics, 92, 105-115. 10.1016/j.jastp.2012.10.014

7. Akala, A.O., Rabiu, A.B.,Somoye, E.O., Oyeyemi, E.O., Adeloye, A.B., 2013. The Response of African equatorial GPS-TEC to intense geomagnetic storms during the ascending phase of solar cycle 24, Journal of Atmospheric and Solar-Terrestrial Physics, http://dx.doi.org/10.1016/j.jastp.2013.02.006

8. Onimisi, M. Y., Achem, U. C., and Rabiu, A. B., 2013. Classification of Days Using Locally Generated Magnetic Indices from Magnetic Data Acquisition System (MAGDAS) Ground Based Observatories at Three (3) Nigerian Stations, British Journal of Applied Science & Technology, 3(4): 735-747, 2013

9. Achem, U.C., Rabiu, A.B., Onimisi, M.Y., 2013. Using Locally Generated Magnetic Indices to Characterize the Ionosphere From Magnetic Data Acquisition System (MAGDAS) Ground Based Observatories in Nigeria. European Journal of Sustainable Development, 2(4) 177-190

10. Bello, O.R., Rabiu, A.B.,Yumoto, K., Yizengaw, E., 2013. Mean Solar Quiet Daily Variations in the Earth's Magnetic Field Along East African Longitudes, Advances in Space Research, doi: http:// dx.doi.org/10.1016/j.asr.2013.11.058

CAR STAFF LIST 2013

Technical Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Prof. Rabiu, A. Babatunde	Ph.D. (Physics)	Acting Director
2.	Dr. Gbobaniyi, E.O.	Ph.D. (Physics)	Asst. Chief Scientific Officer
3.	Najib Yusuf	B.Sc, PGD (Physics)	Principal Scientific Officer
4.	Iloanusi N. L.	HND Computer Science	Principal Comp. Analyst I
5.	Elemo E.O.	MSc. Physics	Principal Scientific Officer
6.	Okoh Daniel I.	B.Sc, MSc. (Physics)	Senior Scientific Officer
7.	Musa Ibrahim A.	B.Sc (Computer Science)	Scientific Officer I
8.	Adedoja O. S.	B.Eng.(Mechanical)	Engineer I
9.	Jatio S. S.	M.Sc (Geophysics)	Scientific Officer I
10.	Shehu S.A.	M.Sc Physics	Scientific Officer I
11.	Adeyemi R. A.	B.Eng (Electrical)	Engineer II
12.	Eze Francis N.	B.Sc (Phy&Astro)	Scientific Officer II
13.	Saleh A. U.	B.Eng (Electrical)	Engineer II
14.	Muawiya Sani	B.Sc (Physics)	Scientific Officer II
15.	Akolo J. A.	B. Sc (Computer Science)	Scientific Officer II
16.	Suleiman A.	B.Sc (ICT)	Scientific Officer II
17.	Timiyo T. J.	B.Tech	Scientific Officer II
18.	Otu J.O.	B.Sc. Chemistry	Scientific Officer II
19.	Ezekiel J.	Diploma (Mech. Eng)	Tech. Asst. Officer

Administrative Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Omale Ramatu	B.Sc (Ed & Psy)	Snr. Admin. Officer
2.	Omede Michael	Bed (ED Eco)	Snr. Auditor
3.	Rahanat M. Aminu	B.Sc/MBA (Bus. Admin.)	Account Officer I
4.	Daniel Alfa	HND (Bus. Admin)	Higher Exec. Officer
5.	Balogun Taofeek A.	B.Tech; M.Sc (Agric.Eco)	Admin Officer I
6.	Zhema David Aji	B.Sc (Economics)	Planning Officer
7.	Kadiri Iben Agulu	HND (Banking & Finance),	PGD (Accts) Account Officer
8.	Onuh O Joyce	HND (Bus. Adm & Mgt)	Higher Exec. Officer
9.	Garacci Husaini	HND (Banking/Fin)	Higher Exe. Officer
10.	Yusuf H.	B.Sc Account	Accountant II
11.	Omede Okolo Ali	NCE (Hausa Social Studies)	Exe. Officer
12.	Ndah Ojoago	NCE	Exec. Officer
13.	Yakubu Fatumatu	NCE	Exec. Officer
14.	James Ojone	A"O'' Level	Clerical Officer
15.	Omada Philip	OND	Clerical Officer

Associate Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Ozioko Juliet	HND Sec. Studies	Secretary to the Director
2.	Obafaye-Isreal, A. A.	B.Sc Physics	Program Officer, African Geophysical Society AGS
3.	Awe Oluwayomi F.	M.Sc Chemistry	Research Fellow, Environmental Research
4.	Maha Jubrin	ND Public Admin	Clerical Officer
5.	Isaka Baba	SSCE, Driver's Grade Test 1,2,3	Driver
6.	James Eleojo	SSCE	Clerical Officer

Visiting Senior Research Fellows

S/N	NAME	DESIGNATION	HOME UNIVERSITY
1.	Professor T. V. Ojumu	PhD. Chemical Engineering Coordinator, Advanced research in atmospheric chemistry	Cape Peninsula University of Technology, South Africa
2.	Dr (Mrs) M. Usikalu	PhD Physics Coordinator, Environmental research in atmospheric radiation	Covenant University, Ota, Nigeria
3.	Dr (Mrs) F. O. Omoya	PhD Microbiology Co-Coordinator; Advanced research in Microgravity and Human Space Technology (MHST)	Federal University of Technology, Akure, Nigeria

Ag. Director CAR Professor Babatunde Rabiu addressing the Vice Chancellor of KSU and other dignitaries during the courtesy call on the latter before the Symposium on Space Weather and Space Based Technologies at Anyigba: 30th January 2013.

The Director explaining the operation of newly installed GPS antenna to an officer at the Nigerian Air Force Base Sokoto; 7th November 2013

Visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France, and the Vice Chancellor of KSU during the courtesy call on the latter in his office before the Symposium on Space Weather and Space Based Technologies at Anyigba: 30th January 2013.

Visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France, inspecting the site of CAR under construction During the Symposium on Space Weather and Space Based Technologies at Anyigba: 30th January 2013.

Visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France, addressing the Vice Chancellor of KSU and other dignitaries during the courtesy call on the latter before the Symposium on Space Weather and Space Based Technologies at Anyigba: 30th January 2013.

L-R: Prof Babatunde Rabiu-Ag Director CAR, Rose Yemson ESS-NASRDA, Visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France; Bolanle Abdulrahman – CSTD NASRDA, Mr Y Onuh – DD CBSS NASRDA. During the Symposium on Space Weather and Space Based Technologies at Anyigba: 30th – 31st January 2013.

L-R: Prof Babatunde Rabiu-Ag Director CAR, Visiting Professor Christine Mazaudier from Universitie Pierre Marie curie, Paris, France; The Rector of the Polytechnic Ibadan during the working visit to the Polytechnic on 6th February 2013.

UAV team during UAV prototype operational practice at Fuxin city, China. February 28th - March 30th, 2013

Participants at the Workshop on "GNSS Data Application to low Latitude Ionospheric Research, ICTP, 6-17 May 2013. Trieste, Italy

Staff of the National Institute for Policy and Strategic Studies NIPSS and Course 9 Participants, Ag Director CAR standing 3rd from the right.

Visiting Scientists posing with the Staff of the Centre for Atmospheric Research. Mr Najib (Project Manager, TRODAN, CAR, standing 3rd from left ,Dr M. Ayoola (standing 4th from left), Dr E. O. Ogolo (standing 5th from left)), Ag Director CAR (standing 6th from left)), MrsN. Iloanusi (standing 7th from left) , Dr. O. R.Oladosu (standing 8th from left)

Group photograph of participants and lecturers at the 2nd Professor Cyril Onwumechili School of Physics of Upper Atmosphere taken on 27th of June 2013 immediately after the closing ceremony

The combined team of Salem University and CAR on tour of the physical facilities of Salem University, Lokoja on 4thJuly, 2013

2

Prof. Babatunde Rabiu CAR Director delivering a closing remark at the end of 2nd Cyril Onwumechili School on Physics of Upper Atmosphere, sitting is Professor Omada, Dean of theFaculty of Science KSU.

Visiting Scientists posing with the Staff of the Centre for Atmospheric Research. Mr Najib (Project Manager, TRODAN, CAR, standing 3rd from left ,DrM. Ayoola (standing 4th from left), DrE. O. Ogolo (standing 5th from left)), Ag Director CAR (standing 6th from left)), MrsN. Iloanusi (standing 7th from left) , Dr. O. R.Oladosu (standing 8th from left)

The CAR team and The Salem University team pose for a photograph during working visit on 4th July, 2013: 4th from right, Director CAR – Prof Babatunde Rabiu; 5th from right, SALEM University Vice Chancellor - Professor Joseph Fuwape.

Mr. Muawiya Sani of CAR delivering a presentation on Climate Change 10thAugust, 2013

Mr. Jatto S.S. of CAR delivering a presentation on Aerosols 10thAugust, 2013.

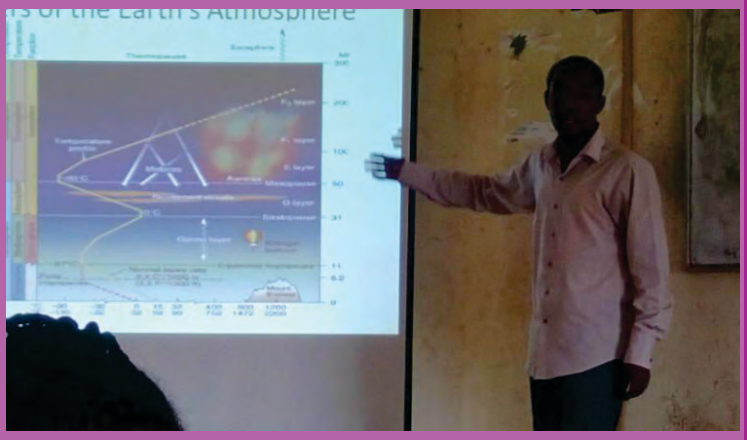
Mr. Timiyo T. Justice of CAR delivering a presentation on Ozone. 10th August 2013

The participants at the lecture on Financial Discipline delivered by Dr. Mrs. J. N. Ekere (Standing at Center in the front) of University of Nigeria Nsukka. 11thJuly, 2013.

Director CAR Delivering Opening Address Before the presentation of a Paper on: "Environmental Chemistry Research" by Professor Tunde Victor Ojumu, Cape Town Peninsula University of Technology, South Africa: seated first from right. 12thJuly, 2013.

Dr Mojisola Usikalu of the Covenant University Ogun State, Nigeria. Seated 1st from left in the front row just before she presented a paper titled "Importance of Environmental Impact Assessment" 1stAugust, 2013.

Mr. Akolo John of CAR presenting a seminar on "How to Design a Blog", 24thAugust, 2013.



Bashir Buhari (Corps Member CAR) Presenting a paper titled "Introduction to Earth's Ionosphere". 1st August 2013.

Director CAR, Dr Mojisola Usikalu, and Participants after the Lecture on "Importance of Environmental Impact Assessment". 1stAugust, 2013.

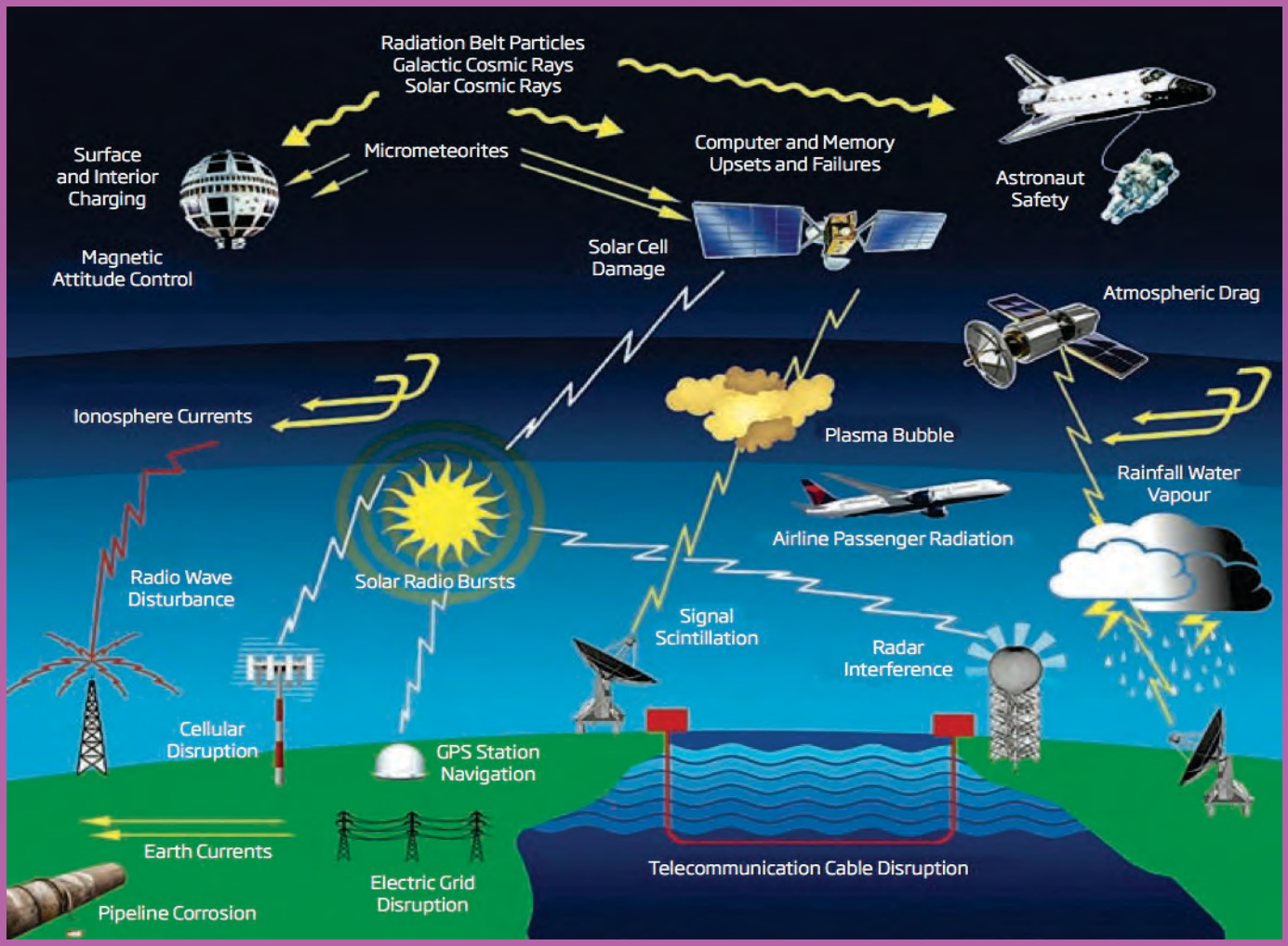
Participants at the inaugural meeting of the Central Working Committee Meeting on Microgravity Program and Seminar on "Microgravity Experiments: Problems and Prospects". 9th September 2013.

A group photograph of The Director CAR (fourth from the left) some CAR staff and other participants at the 2013 CSTD week.

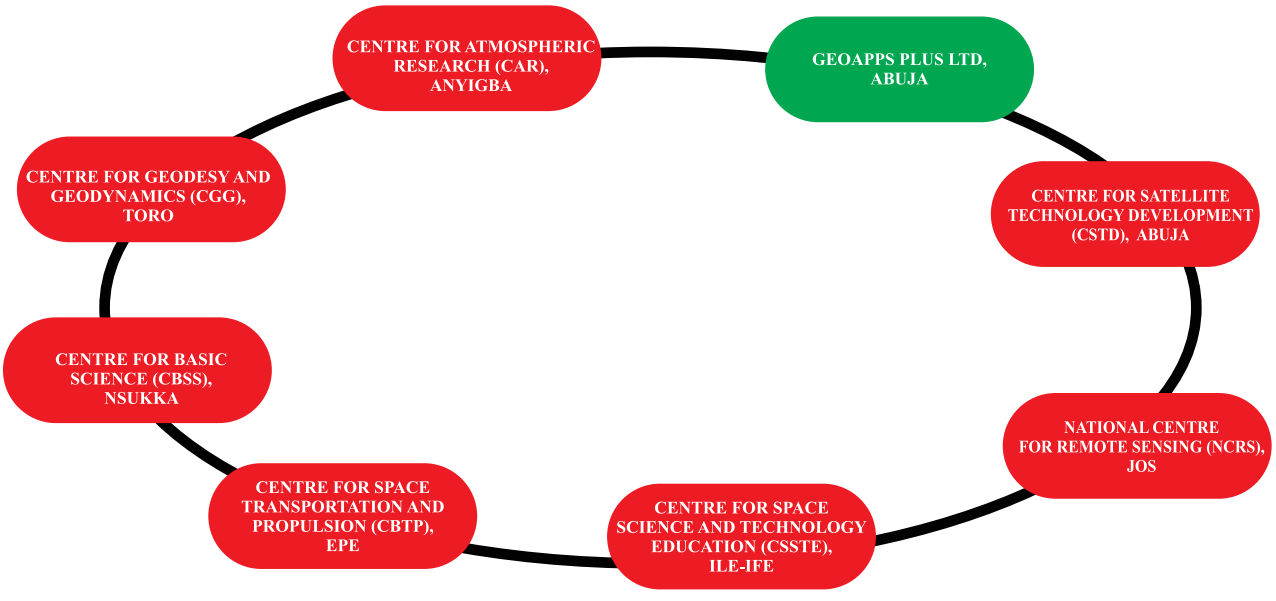
Dr. Arotipin Daniel Juwon, FUT Akure Presenting a paper on Microgravity experiments. 9thSeptember, 2013.

The Ag. Director CAR (at the Centre) with officersof the Nigerian Air Force on 3rd September 2013. Watching at the right is the Director of the Space Technology Directorate of the NAF Hq, Grp Captain Oluwatoyin.

The Ag. Director CAR (fourth from right) and other NASRDA staff with men of the Nigerian Air Force, Defence Headquarters, Abuja, on 3rd September 2013.



NASRDA AND ITS CENTRES



CENTRE FOR ATMOSPHERIC RESEARCH

NATIONAL SPACE RESEARCH AND DEVELOPMENT AGENCY

FEDERAL MINISTRY OF SCIENCE AND TECHNOLOGY

KOGI STATE UNIVERSITY CAMPUS, ANYIGBA, NIGERIA.

ANNUAL REPORT OF ACTIVITIES

DECEMBER, 2014

PARTNERSHIP

The Centre successfully initiated and established Memoranda of Understanding between NASRDA and the following four Institutions in 2014:

1. University of Ilorin, Nigeria
2. Osun State University, Nigeria
3. Federal University of Technology, Akure, Nigeria
4. Federal University, Ndufu-Alike, Ikwo FUNAI

At the moment, CAR has ongoing collaborative relationships with the following institutions:

1. Institute for Scientific Research, Boston College, Boston, USA
2. International Center for Space Weather Science and Education, Kyushu University, Fukuoka, Japan
3. Solar Terrestrial Laboratory, Nagoya University, Japan
4. Rossby Centre, Swedish Meteorological and Hydrological Institute, Norrköping, Sweden
5. Bells University of Technology, Ota, Nigeria
6. National Centre for Atmospheric Research NCAR, Boulder, Colorado, USA
7. West and Central African Research Education Network WACREN

Activities organised and hosted by the Centre

The 1st CAR Foundation Lecture Held at The Salem University, Lokoja, Kogi State; Tuesday 28th January, 2014:
This lecture was organised to commemorate the one year anniversary of the Centre. The Chairperson of the occasion, Professor (Mrs) Ibiyinka A. Fuwape, Dean School of Science, Federal University of Technology, Akure, gave the opening remarks. The Vice Chancellor Salem University Lokoja, Professor J. O. Fuwape, gave the welcome address at the occasion. Thereafter Professor Babatunde Rabiu, Ag Director, CAR, gave a presentation on "The achievements of the Centre in the past one year". The Guest Speaker, Professor Christine Amory Mazaudier of the Universitie Pierre Marie curie, Paris, France spoke on the topic of the main lecture: "Atmospheric Research in Nation Building". A visiting scientist from FHB University, Abidjan, Ivory Coast, Professor Olivier Obrou delivered a paper on "Introduction to Global Navigation Satellite System (GNSS) and its applications". Other Special guests at the occasion included Professor C.O. Akoshile (University of Ilorin) and Dr M.Y. Onimisi (National Defence Academy/Federal University Lokoja).
Participants for the program were drawn from among the staff and students of science departments of all the tertiary institutions from Kogi state; this included Kogi State University, Anyigba; Kogi State College of Education, Ankpa; Kogi State College of Education Technical, Kabba; Kogi State Polytechnic, Lokoja; Federal University, Lokoja; Federal College of Education, Okene; Federal Polytechnic, Idah; and Salem University, Lokoja. The audience was about 430 in all.

29th January 2014. Taking the Message of Atmospheric Research to the Palace

The Management and staff of CAR led the visiting Professor Christine Amory Mazaudier (University Pierre et Marie Curie, Paris, France) and Professor Olivier Obrou (FHB University, Abidjan – Ivory Coast) to pay a courtesy call on the Royal Highness Ogohi-Onu of Anyigba.

29th January 2014. The Atmospheric Outreach Program

The outreach program was organized for school children within the categories of Junior Secondary School JSS1 to Senior Secondary School SSS1 as a way of stimulating their interests in the field of sciences and also familiarizing them with the activities of the National Space Research and Development Agency and her activity centers especially, "The Centre for Atmospheric Research".

The speakers at the program were:

i) Professor Christine Amory Mauzaudier, from University of Pierre Marie Curie, Paris, France (Guest Speaker)
ii) Professor Olivier Obrou, from FHB University, Abidjan, Ivory Coast (Visiting Scientist).
iii) Professor Babatunde Rabiu, Director, Centre for Atmospheric Research.

A total of 132 participants drawn from students and teachers of 8 secondary schools across Kogi state took part in the program. Lectures were delivered by the resource persons after which a questions and answers session ensued. A hands-on lesson was coordinated by Professor Olivier Obrou who taught the students how to use GPS to navigate. The participating schools were: Royal Success Academy, Anyigba; Muslim High School, Anyigba; CMML Secondary School, Anyigba; Living Stone Secondary School, Anyigba; Federal Government College, Ugwolawo; Federal Polytechnic Secondary School, Idah; Federal Government Girls College, Kabba; and Isa Memorial Islamic Academy, Ajiyolo.

2014 African Geophysical Society (AGS) Conference; 2-6 June 2014.

From June 2nd to 6th, 2014 the Centre for Atmospheric Research Anyigba hosted and co-sponsored 2014 African Geophysical Society (AGS) Conference. The three days event took place at the Senator Robert Ajayi Borofice Multipurpose Conference Centre, National Space Research and Development Agency, km 17 Umaru Musa Yar'adua Expressway, Abuja. The Conference benefited from the support of the Japan Society for the Promotion of Science, Solar-Terrestrial Environment Laboratory, Nagoya University, Japan, Scientific Committee on Solar Terrestrial Physics SCOSTEP; and SCOSTEP's Variability of the Sun and Its Terrestrial Impact VarSITI program. The opening programme and all technical sessions took place within various halls/rooms reserved within the Multipurpose Conference Centre. The program started at 09:00 am on Tuesday, 3rd June of 2014. The conference commenced with an opening ceremony featuring the citation of the Nigerian national anthem. The Chairperson of the opening session, Professor A. Y, B. Anifowose, gave the opening remark; which was followed by the welcome address delivered by Professor S. O. Mohammed, Director General / CEO of the Nigerian National Space Research and Development Agency NASRDA who was the chief host of the 2014 AGS conference. Professor Babatunde Rabiu read the presidential address in which he gave the chronology of the AGS and details of achievements recorded so far. Goodwill messages were delivered by Professor Jacob Adeniyi (Nigeria), Professor Paul Baki (Kenya), Prof (Mrs) I. A. Fuwape (Nigeria, represented by Professor A. Y. B. Anifowose), and the representative of the Nigerian Chief of Air Staff of the Nigerian Air Force, Defence Headquarters who was the Chief Guest of Honour.

The sole Plenary paper titled "Planetary ionospheres and its effects

on radio-propagation", was delivered remotely by Professor Sandro.M. Radicella of the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. The Co-chair of the program committee, Dr E.O. Falayi, highlighted the program logistics. The opening ceremony was brought to a close with closing remarks from the chairperson and a closing prayer.

The main conference activities followed a well-structured program. These included oral technical presentations and poster sessions as well as the Annual General Meeting of AGS. Comprehensive reports of the day-to-day activities, plenary sessions and technical sessions are detailed in the Society's webpage, www.afgps.org

The Annual general Meeting of the AGS took place in the afternoon of the first day. One of the fall-outs of the meeting was the adoption of the reviewed version of the AGS Constitution, after much comprehensive deliberation coordinated by the chairperson of the Constitution Review Committee, Professor Paul Baki of Technical University, Nairobi, Kenya.

Specifically, Day 2 of the conference started with a presentation of the award of fellowship, which is the highest honour of the AGS, to the following six distinguished scientists in recognition of their great contributions to the development of Earth and Space Science in Africa:

1. Prof. Cyril A. Onwumechili (Nigeria) – University of Ibadan, University of Ile-Ife and University of Nigeria, Nsukka, Nigeria
2. Prof. Sandro M. Radicella (Argentina/Italy) - Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
3. Prof. Kiyohumi Yumoto (Japan) - International Centre for Space Weather Science and Education, Kyushu University, Fukuoka, Japan
4. Prof. Ousseini Fambitakoye (France, Post Humus), Laboratoire de Géophysique, ORSTOM, Bondy Cedex, France
5. Prof. Patricia H. Doherty (USA) - Institute for Scientific Research, Boston College, USA
6. Dr. Endawoke Yizengaw (Ethiopia/USA) - Institute for Scientific Research, Boston College, USA.

The last day of the conference witnessed presentation of certificates to participants by a team of Professors Paul Baki (Kenya), Olivier Obrou (Cote d'Ivoire) and Babatunde Rabiu (Nigeria). The conference was brought to a close with a dinner on Thursday 5th June, 2014.
82 of the 121 invited participants attended the 1st AGS conference, Attendees came from Ghana, Uganda, Kenya, Ethiopia, Nigeria, Cote d'Ivoire, United Kingdom, Japan, and India. 68 papers were presented as follows: 7 plenary papers; 37 orals and 24 posters. The Plenary Speakers and the respective topics of their presentation were:

i. Professor Sandro. M. Radicella - Planetary ionospheres and its effects on radio-propagation
ii. Professor Babatunde Rabiu - Space Weather Science in Africa: Peculiarities, Observations and Scientific Results 2006-2014
iii. Dr Akimasa Yoshikawa- Research and capacity building activities at the International Centre for Space Weather Science and Education
iv. Professor O. K. Obrou - Fundamentals of Equatorial Ionosphere
v. Dr Elijah O. Oyeyemi - African Contributions to the Development of IRI: Implication for African Space Science
vi. Dr Olawale S. Bolaji - Interplay between the equatorial electrojet and the dynamics of the equatorial ionospheric anomaly: Call for intensive collaborative research
vii. Dr Shaba Halilu –Space Science Collaboration: A case of remote sensing in Nigeria.

The Japan Society for the Promotion of Science JSPS, Solar-Terrestrial Environment Laboratory, Variability of the Sun and Its Terrestrial Impact VarSITI and Scientific Committee on Solar Terrestrial Physics SCOSTEP provided full travel funds for some Africans from their resident countries to Nigeria. The Centre for Atmospheric Research of the Nigerian National Space Research and Development Agency NASRDA hosted the meeting, provided lodging/feeding, offered full travel funds for some participants and took care of all the logistics for the meeting. CAR was also responsible for the provision of conference materials. NASRDA thus provided the bulk of the support for this meeting.

Apart from the Director, the following staff from the Centre for atmospheric Research Anyigba also participated in the conference: Dr. Bode Gbobaniyi, Mr. Najib Yusuf, Mr. Enoch Elemo, Dr. Daniel Okoh, Mr. Jatto S. S., and Mrs Aderonke Obafaye.

1st West African Regional Workshop on Air Quality Measurement and Modeling; 9-12 June 2014

West Africa has experienced rapid urban growth in recent decades. Lagos, Nigeria is the most populated city in Africa with over 20 million inhabitants. Increasing anthropogenic emissions from exploitation of fossil fuels and other anthropogenic sources the air quality. West Africa is in need of continuous long-term measurements to quantify the current and future atmospheric composition, identify emission sources, and better comprehend their impacts on human health, the ecosystem and climate.

For these reasons, CAR, in collaboration with the United States National Centre for Atmospheric Research (NCAR), Boulder, Colorado organized the 1st West African Regional workshop on Air Quality Measurement and Modeling on the premises of the National Space Research and Development Agency, Abuja.
The Director General and CEO of the National Space Research and Development Agency Professor S. O. Mohammed declared the workshop open in an event attended by over 150 people comprising of researchers, students, NASRDA management and staff, and the news media. He welcomed all guests to the workshop and wished them a happy and fruitful stay in Abuja, Nigeria. Thereafter, the welcome remarks were given by Prof. Babatunde Rabiu, Director Centre for Atmospheric Research who gave a brief overview of the Centre and its activities.

The workshop keynote speakers and their keynote address topics were:

i. Prof Mathew Evans: University of York, United Kingdom – "West African regional air pollution: What do we know?"

ii. Prof A. F. Oluwole, Scientific Engineering and Environmental Monitoring Systems (SEEMS), Lagos – "Air Quality measurements in Nigeria"

iii. Dr Simone Tilmes: National Centre for Atmospheric Research (NCAR), USA and

iv. Dr John Ortega: National Centre for Atmospheric Research (NCAR), USA – "Factors resulting in air pollution: Important sources of pollutants, fires, dust, combustion (traffic, cooking, agricultural burning), industrial source, and important of meteorological condition rural Vs. urban pollution"

At the end of the keynote session, there was a presentation of NASRDA souvenirs to the guest speakers by Mrs. Iheanacho, Director of Planning on behalf of the Director General. The opening ceremony was rounded up with a vote of thanks given by Dr E. O. Gbobaniyi.

The four day workshop which aimed to raise awareness of air pollution and associated impacts, identify existing air quality observations and discuss current and future research projects, brought together about 50 participants, including graduate students, teachers and scientists from Nigeria, the USA, United Kingdom and Benin Republic. Participants presented ongoing research on emission estimates, recent observations including satellite and ground-based measurements, and modeling. Measurements and modeling were key themes of the workshop. NCAR provided demonstration instruments, including an ozone monitor which was installed at CAR to start the first long-term measurements in Anyigba, Nigeria. Other instruments demonstrated at the workshop included a nitric oxide/nitrogen dioxide monitor and low-cost sensor packages for observing other important air pollutants such as CO and VOCs. Workshop participants were introduced to the regional Weather Research Forecasting Model coupled with Chemistry (WRF-Chem) and the global Community Earth System Model (CESM). Both models were preinstalled and deployed on workshop workstations as virtual Linux machines. WRF-Chem helped participants understand the emissions and atmospheric transport of pollutants in the region and CESM illustrated the connections between regional and global air quality with implications for climate change. Below is a summary of topics presented at the workshop.

PLENARY SESSION 1 (MODERATOR: DR. ORTEGA)

· Dr. A. Balogun, of the Federal University Technology Akure, delivered a talk on Progress in urban Climates and Air Quality research in Nigeria, Measurements of the Urban Head Island and Carbon Monoxide Concentration in Akure.

· Dr. Simone Tilmes presented on behalf of Eloise Marais on 'Ozone Air Quality Implication (Lagos and Niger Delta)' She identified a large and growing population with inefficient energy mixed with wasted natural resources as the course of Ozone air pollution in Nigeria.

· Prof. C. O. Akoshile of the University of Ilorin delivered a paper titled 'Preliminary Result on Emission Pollutants from Stationary and Mobile Sources' where he stated that both stationary and mobile sources are major contributors to many air quality problems.

DAY 2
PLENARY SESSION II (MODERATOR: DR. GBOBANIYI)

· Prof. Matt Evans of the York University London talked on Aerosol-Chemistry-Cloud-Interactions in West Africa.

· Dr. Simone Tilmes from the NCAR, USA presented on Global Chemistry-Climate Modeling.

· Dr Bode Gbobaniyi of the Centre for Atmospheric Research, Anyigba presented on the Proposed Air Quality Measurements in African Mega Cities: Start-point Lagos. In this talk, he stressed the challenges faced in carrying out an extensive air quality measurement in African megacities, which ranges from the increasing population to the erratic power supply down to the availability of manpower as emissions must have to be mapped simultaneously at various measurement sites.

OTHER PRESENTATIONS

· Najib Yusuf from the Centre for Atmospheric Research, Anyigba talked on Atmospheric Measurements at CAR. He gave a detailed insight on how far ahead the Centre has taking atmospheric research to and the giant stride the TRODAN project has made by being available online for easier access to researchers and scholars alike.

· Dr Rabia Sa'id from Bayero State University, Kano spoke on Dust Aerosols. She gave an overview the role dust aerosols play in cloud formation and its implication on climate change. She also elaborated on how aerosols enhance global pollution.

· Ojeh Vincent Nduka from the Federal University of Technology Akure on the topic "LUCIL Project on Urban Climate in Lagos". The LUCIL project he said, aims to quantify and assess the local urban climate in Lagos and its impact on thermal comfort, energy use and health.

· Dr Ahmed Balogun presented on behalf of Prof. K. Ogunjobi of the Federal University of Technology Akure. His paper was termed The West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL). WASCAL is a German initiative and will be funded by the German Ministry of Science and education (BMBF). Its major aim is the establishment of Graduate Research Programs in about six foremost Universities across West Africa, with FUTA being selected as the Lead University for the program. Further noted was that the program is for training of PhD students only in all aspects of the West African Climate System.

· Achuka Justina from the Covenant University, delivered her paper titled 'Radon Measurements in Selected Laboratory of Covenant University Ota.' Her talk bordered on how radon, a radioactive particle affects our environment and the danger it poses to our health.

· Dr Simone Tilmes again presented an Introduction to Community Earth System Model (CESM).

DAY 3
SESSION I (MODERATOR: DR. TILMES)

· Dr John Ortega; Introduction to Atmospheric Chemistry Measurement. Talked on the challenges faced in the course of taking those readings and the factors determining atmospheric composition and its environmental implications for climate, air quality, and biogeochemical cycling.

TUTORIAL LABS

· Dr Simone Tilmes: CESM tutorial session.

· Dr John Ortega: Introduction to Atmospheric Measurements II.

· Dr. Bode Gbobaniyi: Introduction to WRF-ARW (tutorial session)

DAY 4

The last day of the workshop rounded up the WRF-ARW programming classes conducted by Dr Gbobaniyi.

Closing Ceremony

The Director of the Centre for Atmospheric Research, Prof Babatunde Rabiu kicked off the closing ceremony with the closing remarks where he expressed satisfaction on the success of the workshop and thanked the participants for honoring the invitation and the manner they comported themselves during the course of the workshop. The participants in turn made comments and suggestions as regards the workshop stating the significance it played in their various fields of research. Dr. Agboola, Director ESS who was present at the closing ceremony also gave some closing remarks.

The visiting speakers Dr John Ortega and Dr (Mrs.) Simone Tilmes also gave their closing remarks stating how satisfied they were with the workshop and how delighted they were to be visiting Nigeria for the first time. They were presented with gifts of Ankara shirt and gown alike which they wasted no time in donning much to the amusement of the participants. The vote of thanks was given by Dr Gbobaniyi and the workshop came to a close with participants departures.

Other CAR scientists who participated in the workshop are: Najib Yusuf, Enoch Elemo, Musa I.A, Engr. Oluwaseye Adedoja, Engr. Saleh U. A., Jatto S. S., Iben K. Angulu, Aderonke Obafaye, Eze Nkem and Sani Muawiya.
Participation in Conferences and Workshops

30th Annual Conference of the Nigerian Institute of Science Laboratory Technology NISLT, 30th October 2014, Federal University of Technology, Akure, Nigeria:

The Director CAR delivered an invited sub-thematic lecture on "The Role of the Laboratory in Mineral Exploitation". Other CAR staff participants at the Conference are: Dr Daniel Okoh and Engr. Oluwaseye Adedoja

African School On Space Science: Related Applications and Awareness For Sustainable Development of the Region, Kigali Institute of Science and Technology 30 June - 11 July 2014, Kigali, Rwanda.

This School was jointly organized by the Abdus Salam International Centre for Theoretical Physics, Trieste Italy; Boston College, USA; and the Ministry of Education Rwanda. Our Centre for Atmospheric Research also provided a measure of support for this meeting. Prof. Babatunde Rabiu (Director CAR) and Dr Daniel Okoh were resource persons at this International School.

3rd Lund Regional - scale Climate Modelling Workshop on 21st Century Challenges in Regional Climate Modelling, Lund, Sweden, 16-19 June 2014

This workshop was jointly organized bt the SMHI and other European modeling groups. Dr Gbobaniyi presented a paper on the West African Monsoon in CORDEX simulations.

e-Infrastructures for Africa imentors Meeting, Brussels, Beligum, 26-31 October, 2014

The final meeting of the current phase of the eI4Africa European Commission FP7 Project held successfully on the 29th October 2014 in Brussels with the active participation and full representation of CAR and other project partners. Dr Gbobaniyi delivered an oral presentation titled The CAR TRODAN Repository on the Science Gateway for Africa Grid. The talk highlighted the achievements of the TRODAN project since inception and also mentioned new collaborations and innovations that have been added to the TRODAN initiative in the course of the year. These include the creation of a Visualization and Delivery portal for TRODAN data on the Science Gateway for Africa Grid, ongoing sensor calibration experiments at the SMHI in Sweden in conjunction with the KTH partners, and the Wireless Network Sensor project with two new wireless sensor meteorological stations added to the TRODAN installations in Lagos and Anyigba.

CAR also had a poster on display during the meeting titled "Exploring Wireless Sensor Networks in Nigeria". The poster authored by Gbobaniyi, E., Olsson, R., Pehrson, B., and Rabiu, B., of the Centre for Atmospheric Research and The Royal Institute of Technology (KTH), discussed the challenges encountered during the development and deployment of WSN networks in Nigeria and proffered solutions for mitigating these problems to allow an efficient scaling up of the WSN coverage in the country. The accuracy of data from the WSN project was also presented, showing impressive results compared to a WMO standard meteorological station located at the SMHI calibration site in Sweden. Live data from the CAR WSN stations in Anyigba and Lagos were received and viewed in real time in Brussels during the technical demonstration of the ei4Africa project deliverables.

SPECIAL ADMINISTRATIVE/TECHNICAL TRAINING

One day Hands-on workshop on "Grid Computing User Applications for Academics and Research Communities" Organized by UNN-UNESCO-HP Brain Gain Initiative, University of Nigeria, Nsukka, Nigeria, 8th July, 2014. The theme of the training was e-Infrastructure for research and Collaboration and it featured Demonstration of the Africa grid Science Gateway

applications, Demonstration of Lion Grid – UNN Grid application portal; How to use the NgREN IdP; How to locate, run and get results from grid; and How to build virtual organizations. Mr. Najib Yusuf, a Principal Scientific officer at CAR, presented a paper titled TRODAN on African Grid Science Gateway. CAR Participants: Mr. Najib Yusuf, Mrs, Iloanusi, Nkiru L., Mr. Musa I. A., Mr. Oluwaseye Adedoja, Mr. Akolo John and Miss. Beauty Uranta.

Workshop on "Service wide training on the requirements of International Public Sector Accounting Standards (IPSAS) and Timely Rendition of Returns to the Treasury". 10-11 September, 2014.

The Federal Treasury Academy, Abuja. As part of the efforts of the management of the Centre to ensure that her staff keep abreast of financial and accounting techniques, three (3) staff of the Centre attended the two-day workshop for Ministries, Departments and Agencies of the Federal Government Organized by Office of the Accountant General of the Federation, Federal Ministry of Finance. CAR staff participants: Ogbeiwi Kenneth O., Onuh Joyce O., and Iben Kadiri Angulu.

Workshop on "New IPSAS Cash Compliant Template for Transcript of Accounts". 3rd December 2014. The Computer Studio Ground Floor, Office of the Accountant General of the Federation OAGF. CAR staff participants: Ogbeiwi Kenneth O. and Onuh Joyce O.

Training on the Unmanned Aerial Vehicle organized by the Centre for Basic Space Science (CBSS), Nsukka, Nigeria. 24th November – 4th December, 2014. The technical session of the training captures the flying basic skills/control, assembling of hardware and maintenance, software and payloads. CAR Staff participants: Mr. Najib Yusuf, Engr. Oluwaseye Adedoja, Engr. Adeyemi Alesinloye R.

Activities supported and co-organised by the Centre West African Regional Space Weather School, Bells University of Technology, Ota Campus, Nigeria. 20 - 25 January 2014.

Our Centre for Atmospheric Research co-organized this School with the Bells University of Technology at the Ota Campus of the university between 20th and 25th January 2014.

Space weather refers to the prevailing condition in the space environment which affects objects that are located within the region and technologies that are space-dependent. Advanced nations and fast developing nations are becoming highly dependent on space-based technologies. Today, navigational systems, communications and even financial transactions are largely dependent on space-based technology. Bells University of Technology has been playing host to this annual groundbreaking scientific meeting since 2012. This third meeting, organized as a School, was aimed at strenghtening capacity in space weather related science at the West African regional level. The first two days of this School ran in parallel with the Annual Conference of the Nigerian Geophysical Society at the same venue. A common opening program kicked off the two distinct events followed by parallel activities. Opportunity for mentor-mentee interaction was created during the School. The school recorded participation from Masters students, PhD candidates and early career reserachers in fields of relevance to Space Weather.

This five-day school featured presentation of diverse topics on Space Weather by the following experts:

i. Prof Christine Amory-Mazaudier (France) : Sun-Earth connection; Research Ethics, Transient variations of the Earth's magnetic field associated with ionospheric currents
ii. Dr E O. Falayi: Space Weather Tutorial
iii. Prof. A.B. Rabiu: Tutorials on the Ionosphere
iv. Dr. E .O. Oyeyemi : International Reference Ionosphere IRI
v. Dr. A. O. Adewale : IRI Laboratory
vi. Prof. A.B. Rabiu, Dr. A. O. Adewale and T.T. Ayorinde : Online tools and GPS-TEC data analysis Laboratory
vii. Dr M. Usikalu : Analytical Tools for Environmental Research
viii. Dr. O. S. Bolaji : Magnetic data analysis techniques
ix. Dr. R. S. Fayose: State of Global Navigation Satellite Systems GNSS
x. Dr. A. Akala: Variability of the ionosphere during space weather events

Ninety-one (91) participants attended the School from the following four countries: Nigeria [83], France [1], Ghana [6] and Benin Republic [1].

3rd eI4Africa Thematic Workshop "Leveraging Science Gateway and Virtual Research Communities in African e-Science", Afe Babalola Auditorium, University of Lagos, Lagos, Nigeria. 19th March, 2014:

The workshop which was co-hosted by the Centre for Atmospheric Research, Anyigba, and Eko-Konnect Research and Education initiative, was organized under the aegis of the European commission (EC) by the West and Central African and Education Network (WACREN) with the support of Sigma Orionis, the UbuntuNet Alliance and all e14Africa partners. eI4Africa is an FP7 project funded by the European Commission (DG CONNECT) with the aim of boosting Research, Technological Development and Innovation (RTDI) potential of African e-Infrastructures and to support policy dialogues and Euro-African cooperation in the framework of the joint Africa-EU Strategic Partnership on 'trade, regional integration and infrastructures' (JAES Partnership 3) as well as the Joint Africa-EU Strategic Partnership on 'science, information society and space' (JAES Partnership 8).

The main objectives of the workshop were to:

- Enhance collaboration among African and European scientists;
- Raise awareness on the regional research and education networks and their transformative potential;
- Propose alternate means of conducting research and delivering services;
- Demonstrate the relevance of e-Infrastructures and advanced networks;
- Provide a forum for discussions and debates on recent development and perspectives in the field.

The workshop which was broken into five sessions had resource persons drawn from across the globe and covering relevant fields of the theme. Among these are the Director of NASRDA Centre for Atmospheric Research, Professor Babatunde Rabiu, who gave a brief overview of the activities of the Centre in an opening remark and Dr. Bode Gbobaniyi, the head of Technical Division of the Centre, who made a presentation on "The TRODAN repository in the African Grid Science Gateway"

The workshop was attended by 72 participants: 61 were from Nigeria, 5 from other African countries and 6 from Europe. These participants represented government officials, policy makers, ICT Directors, academics, journalists, researchers and other ICT experts.

The following staff of the Centre participated in the workshop alongside the Director: Dr. Bode Gbobaniyi, Mr. Odaudu Moses, Mr. Najib Yusuf, Mrs. Nkiru L. Iloanusi, Mr. Enoch Elemo, Dr. Daniel Okoh, Mr. Musa I .A., Engr. Oluwaseye Adedoja, Mr. David Zhema, Engr. Saleh U. A., Akolo John, Miss. Beauty Uranta, and Mr. Omada Philip.

3rd Biennial Conference on Environmental Issues, 8-10, April 2014, Yaba College of Technology, Lagos.

The Centre for Atmospheric Research Anyigba in collaboration with Environmental Research group of Yaba College of Technology, Lagos, organized and hosted the 3rd Biennial Conference on Environmental Issues. The three-day conference with the theme "International Diplomacy, the Environment and the Government" had the Director of CAR, Professor Babatunde Rabiu as the Conference Chairman. Prof Anthony Nwafor of the University of Venda, South Africa, and Prof. Rosemary Anyangah of the University of Kwazulu-Natal, Durban, South Africa were the keynote speakers.

Professor Babatunde Rabiu, Director CAR, gave a presentation on "Monitoring the Earth-Space Environment for Sustainable Development: Opportunities & Implications". Mr. Jatto S. S. of CAR presented a paper on a research work titled: "Environmental Magnetism Study of Vehicle-Generated Pollutants in Abuja and Environs". Other CAR participants: Mr. Enoch O. Elemo and Mrs Aderonke Obafaye.

Second Annual Conference of the School of Sciences, Federal University of Technology, Akure, FUTA; 1-4 April, 2014. The Director and Engr Oluwaseye Adedoja participated in the Conference.

4thAnnual Conference of the Astronomical Society of Nigeria ASN, Abuja. 29 October – 02 November, 2014.

Collaboration Meeting Held at Osun State University UNIOSUN Osogbo Campus on Monday 5th May, 2014.

The Director led the CAR delegation to hold a collaboration meeting with the Management of the Osun State University at the Osogbo campus of the University on Monday 5th May 2014. Prof. Okesina. A.B., the Vice Chancellor of UNIOSUN and his management team received the delegation in his office at about 11:00 a.m. The VC gave a presentation on UNIOSUN while the Director CAR presented "NASRDA and her Activity Centres". The Vice Chancellor and the Registrar of the University signed a copy of the MoU on behalf of the University after they accepted to collaborate with NASRDA. The management of the University proposed to visit the NASRDA headquarters in Abuja as soon as possible. The team and University staff later visited the University Central laboratory where an appropriate laboratory space has been provided for the proposed joint "Space Weather and Atmospheric laboratory". In attendance were; Prof. C. O. Adedire (Visiting Professor to UNIOSUN), Dr. Popoola (Dean of Science), Dr. J.O Faniran (Registrar), Mr. Lasisi (Bursar), Mr. Biodun Odetoyinbo (Director of Works), Dr. Alabi (Head, Mathematics and Physical Planning Uniosun), Dr. Akinde (Head, Biological Science), Ms Awe. O.F (Project Fellow CAR) and Engr. Adedoja O.S. (Head, Engr Dept, CAR).

Keynote Presentation at the Centre for Satellite Technology Development (CSTD) Space week 2014, 3rd- 5th June 2014. Abuja, Nigeria:

The Director, Professor Babatunde Rabiu was the keynote speaker at the Centre for Satellite Technology Development (CSTD) Space week 2014, 3rd-5th June 2014. He spoke on the theme of the meeting titled: "Sustainable Socio-Economic Benefits of Space Technology: Innovative Small Satellite Programs for Developing Nations". The three-day event provided a forum for creating awareness about the socio- economic benefits of space technology, its products and services and developments and contributions to daily life.

Meeting between CAR/NARSDA and Nigerian Research Education Network/ West and Central African Research Education Network NgREN/WACREN, National University Commission NUC Office, 25th November 2014, Abuja:

Dr. Joshua Atah, Head, ICT Projects Department at the National University Commission (NUC) anchored the meeting. To kick-start the programme, Dr. Atah facilitated a walk-through and demonstration of the NgREN facilities. The participants were shown the physical resources and facilities available on the network. They also had the opportunity of using video-conferencing over the NUNET to interact with staff of Ahmadu Bello University, Zaria (ABU), Usmanu Dan Fodio University, Sokoto (UDU) and Nnamidi Azikwe University, Awka (NAU). Dr. Joshua Atah gave a detailed presentation of the history, relevance, facilities and functions of the Nigerian Research and Education Network (NgREN). He enumerated the benefits of the NgREN which include; provision of high-speed internet facility as backbone for research and education in Nigerian Universities, inter-institutional communications such as video conferencing, remote supervision/joint supervision of PhD candidates to boost capacity development at reduced costs, research collaboration through shared access to data and analytical tools, hosting of e-Services among participating institutions, etc. Prof. Babatunde Rabiu (Director, CAR) made an elaborate presentation on the research activities and achievements of the Centre since its inception. The participants were impressed by the research activities of the Centre and the progress recorded within just two years of existence. He emphasized the need for collaboration between CAR and other institutions or individuals in the country. Mr. Najib Yusuf

(Project Manager of TRODAN, CAR) presented the Tropospheric Data Acquisition Network (TRODAN) project and facilities. He explained extensively the instrumentation involved in setting up TRODAN and utilizing the data generated for scientific research. His presentation covered the positive contributions TRODAN project has offered by provision of atmospheric parameters for researchers in various disciplines. He stated that a lot of Nigerians have used the data to complete their undergraduate, Masters and PhD theses.

The Centre for Atmospheric Research entered into collaboration with NgREN to enhance her three main modes of operation: Observations, Research and Capacity building.

CAR Participants: Prof. Babatunde Rabiu, Dr. D. Okoh, Mr. Najib Yusuf, Mr. I. Adejoh, Engr. O. S. Adedoja, Mr. K. Ogbeiwi, and Ms. A. A. Obafaye

STAFF ON GRADUATE TRAINING

i. Najib Yusuf: M.Sc. Physics, Ebonyi State University, Abakaliki
ii. Engr A. U. Saleh: M.Eng. Electrical Electronic Engineering, Abubakar Tafawa Balewa University, Bauchi
iii. Ezeh, N: M.Sc. Physics, Ebonyi State University, Abakaliki
iv. Suleiman Abdulrahman : M.Sc., University of Technology, Malaysia
v. David Zhema: M.Sc. Economics, University of Nigeria, Nsukka
vi. Musa, I. A.: M.Sc., Computer Science, Kogi State University, Anyigba, Nigeria
vii. Rufai Mohammed; M.Sc., Nasarawa State University, Nigeria
viii. Solomon S. Jatto: PhD. Physics, Ahmadu Bello University, Zaria
ix. Muawiya Sani; M.Sc. Physics, University of Ilorin, Nigeria
x. Jibrin Otu; M.Sc. Chemistry, Kogi State University, Anyigba, Nigeria
xi. Omale R.: M.A., Kogi State University, Anyigba, Nigeria
xii. Timiyo T. J.: M.Sc. Physics, Kogi State University, Anyigba, Nigeria
xiii. Balogun, T. A.: PhD., University of Fort Hare, South Africa.

RECENTLY COMPLETED GRADUATE PROGRAMMES

i. Dr. Daniel Okoh PhD, Physics, University of Nigeria, Nsukka
ii. Adedoja, O. M.Eng. Mechanical Engineering, University of Nigeria, Nsukka

INTERNATIONAL SCIENTIFIC VISIT

Prof Christine Amory Mazaudier arrived the international wing of the Nnamdi Azikiwe Airport in Abuja on 19th January 2014 at about 5:30 p.m. and was warmly received by the CAR team led by the Director, Professor Babatunde Rabiu. A bouquet of flower was presented to her on arrival. Other CAR staff at the airport included Dr. Olabode Gbobaniyi [Head, Technical Division CAR], Mr Kadiri Angulu [Accountant CAR], Mr David Zhema [Planning Officer CAR] and Mrs Aderonke Obafaye [Project Fellow CAR]

On the following day, Prof Mazaudier, in the company of the Director of CAR, flew into Lagos, the venue of the Space Weather school. The school took place at The Bells University of Technology, Ota, and had participants drawn from both within and outside the country. Prof Mazaudier gave a series of lectures on space weather during the school.

She spent 13 days in Nigeria and during her stay, she had beautiful memories to take back home; she visited 5 Nigerian universities, viz: Bells University of Technology, Ota; Obafemi Awolowo University, Ile-Ife; Federal University of Technology, Akure; Salem University, Lokoja; and Kogi State University, Anyigba. She had a hand-shake with Former President Olusegun Obasanjo while on tour to the presidential Library in the ancient city of Abeokuta and had the singular honour of visiting the palace of the King of Anyigba, Kogi State where she was presented with a calabash of Kolanuts and traditional dress. On 31st of January 2014, she was accompanied back to the Nnamdi Azikwe airport in Abuja at 7:30pm to board her return flight to France.

Technical Visit of Professor Kazuo Shiokawa from Nagoya University, Japan. 4 - 6 March 2014.

The Centre for Atmospheric Research played host to Professor Kazuo Shiokawa of the Solar-Terrestrial Environment Laboratory, Nagoya University between 4th and 6th March 2014. He came under the Japanese JSPS core-to-core program (b) Asia-Africa science platforms. He is the Principal Investigator of the project on "Observations of the equatorial ionosphere in south-east Asia and west Africa" and visited to conduct site survey for an optical all-sky airglow imager to be installed in Nigeria. He also delivered a public lecture, at the NASRDA's headquarters at Abuja, on his research work during his visit.

Technical Visit of Dr (Mrs) Olusola Fasunwon from Regina University, Regina, Canada, 18th August 2014.

The technical staff of the Centre had an interactive meeting with Dr (Mrs) Olusola Fasunwon, of the Regina University Canada, who was on a visit to Nigeria. It was the start of a Mentor-Mentee forum which has started yielding benefits.

Upgrading of GPS receiver for monitoring space weather, Sokoto, 2nd–5th December 2014:

A three-man team led by Prof Babatunde Rabiu arrived the Sadiq Abubakar III Airport, Sokoto, from Abuja at 11:30 am on Tuesday 2nd December 2014. The purpose of the visit was for a routine check on the GPS receiver equipment installed in 2013 for monitoring space weather, to facilitate utility of information from it, and to upgrade software on the system that has previously caused date errors on the records. The team worked tirelessly to perform the necessary upgrading and a presentation was organised by the team to enlighten officers and men of Nigerian Air Force (NAF) in Sokoto on 'Effects of space weather on radio signal propagation'. It was attended by all the available officers of the base. High level questions asked by the participants received comprehensive and detailed answers. Installation Team Members: Mrs Aderonke Obafaye – Project Fellow, CAR; Dr Daniel Okoh – Senior Scientific Officer, CAR and Prof Babatunde Rabiu - Director, CAR

SUMMARY OF INTERNATIONAL SCIENTIFIC VISITS TO CAR IN 2014:

i. Professor Christine Amory Mazaudier - University Pierre et Marie Curie, Paris, France

ii. Professor Kazuo Shiokawa - Solar-Terrestrial Environment Laboratory, Nagoya University, Japan
iii. Professor Olivier K, Obrou - FHB University, Abidjan – Cote D'Ivoire
iv. Dr Sola Fasunwon, - Regina University, Canada
v. Dr Simone Tilmes - National Centre for Atmospheric Research (NCAR), Boulder, Colorado, USA
vi. Dr John Ortega - National Centre for Atmospheric Research (NCAR), Boulder, Colorado, USA
vii. Prof Mathew Evans - University of York, United Kingdom

SOCIAL EVENTS OF 2014

Wedding bells jingled as the following members of staff of the Centre got married during the 2014 activity year: Mr. Jatto S. S. (29/03/2014), Engr. Oluwaseye Adedoja (19/04/2014), Mr. David Zhema A. (03/05/2014), Muawiya Sani (21/06/2014), Mr. Yusuf Hamza, Mr. Timiyo T. J. (22/11/2014). Also 6 of our staff were blessed with new born babies.

STAFF MOVEMENT

6 members of staff were transferred out of the Centre, while a total of 12 new staff were redeployed to work with us.

Publications

1. Alex T. Chartier; Joe Kinrade; Cathryn N. Mitchell; Julian A. R. Rose; David R. Jackson; Pierre Cilliers; John-Bosco Habarulema; Zama Katamzi; Lee-Anne Mckinnell; Tshimangadzo Matamba; Ben Opperman; Nicholas Ssessanga; Nigussie Mezgebe Giday; Vumile Tyalimpi; Giorgiana De Franceschi; Vincenzo Romano; Carlo Scotto; Riccardo Notarpietro; Fabio Dovis; Eugene Avenant; Richard Wonnacott; Elijah Oyeyemi; Ayman Mahrous; Gizaw Mengistu Tsidu; Harvey Lekamisy; Joseph Ouko Olwendo; Patrick Sibanda; Tsegaye Kassa Gogie; Babatunde Rabiu; Kees De Jong; Adekola Adewale.(2014). Ionospheric imaging in Africa. Radio Science. doi:10.1002/2013RS005238

2. Anders, I., & Gbobaniyi, E. (2014). Future changes in the West African Monsoon: A COSMO-CLM and RCA4 multimodel ensemble study. EGU General Assembly Conference Abstracts (Vol. 16, p. 5258).

3. Browne Klutse N.A., Sylla M.B., Dhiédiou A., Kamga A., Abdou A., Lamptey B., Gbobaniyi E.O., Owusu K., C. Lennard , B. Hewitson , A. Diosio , G. Nikulin , H. Panitz , M. Büchner (2014). Daily Characteristics of West African Summer Monsoon Precipitation in CORDEX Simulations. Theoretical and Applied Climatology. DOI: 10.1007/s00704-014-1352-3.

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CAR STAFF LIST 2014

Technical Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Prof Rabiu, A. Babatunde	B.Sc., M.Sc., Ph.D. (Ionospheric Physics)	Director/Chief Executive
2.	Dr. Gbobaniyi, E.O.	B.Sc., M.Sc., Ph.D. (Atmospheric Science)	Asst. Chief Scientific Officer
3.	Najib Yusuf	B.Sc., PGD (Physics)	Principal Scientific Officer
4.	Elemo E.O.	B.Sc., M.Sc., Physics	Principal Scientific Officer
5.	Dr. Okoh Daniel I.	B.Sc, MSc., Ph.D. (Physics)	Senior Scientific officer
6.	Musa Ibrahim A	B.Sc (Computer Science)	Scientific Officer I
7.	Engr. Adedoja O. S	B.Eng.(Mechanical Engineering)	Engineer I
8.	Jatto S. S.	B.Sc. M.Sc (Geophysics)	Scientific Officer I
9.	Shehu S.A.	B.Sc. M.Sc Physics	Scientific Officer I
10.	Adeyemi R. A.	B.Eng (Electrical Engineering)	Engineer I
11.	Eze Francis N.	B.Sc (Physics & Astronomy)	Scientific Officer II
12.	Engr. Saleh A. U.	B.Eng (Electrical Engineering)	Engineer II
13.	Muawiya Sani	B.Sc (Physics)	Scientific Officer II
14.	Akolo J. A.	B. Sc (Computer Science)	Scientific Officer II
15.	Suleiman A	B.Sc (ICT)	Scientific Officer II
16.	Timiyo T. J	B.Tech (Physics /Electronics)	Scientific Officer II
17.	Otu J.O.	B.Sc. Chemistry	Scientific Officer II
18.	Ikani Ojochenemi	B.Sc. Physics	Scientific Officer II
19.	Onuigbo Ifeanyi	HND (Electrical Engineering)	Engineer II
20.	Ezekiel J.	Diploma (Mech. Eng)	Tech. Asst. Officer

Administrative Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Adejoh Isaac	HND (Pub. Admin)	Principal Executive Officer
2.	Omale Ramatu	B.Sc (Ed & Psy)	Snr. Admin. Officer
3.	Omede Michael	Bed (ED Eco)	Snr. Auditor
4.	Daniel, Alfa	HND (Bus. Admin)	Higher Exec. Officer
5.	Balogun Taofeek A.	B.Tech., M.Sc. (Agric. Economics)	Admin Officer I
6.	Ogbeiwi, Kenneth.	B.Sc., M.Sc. (Accounting)	Account Officer I
7.	O.Agoh, Maritha .C.	B.Sc., MBA (Accounting)	Account Officer I
8.	Onuh, O Joyce	HND (Bus. Adm & Mgt)	Higher Exec. Officer

Administrative Staff

S/N	NAME	QUALIFICATION	DESIGNATION
9.	Garacci, Husaini	HND (Banking/Fin)	Higher Exe. Officer
10.	Yusuf, Hamza	B.Sc. Accounting	Account Officer II
11.	Adamu, Yusuf	B.Sc. (Public Admin)	Admin Officer II
12.	Mohammed, Rufai	B.Sc. (Pol. Science)	Admin Officer II
13.	Abalaka Inikpki	B.A.(Philosophy)	Admin Officer II
14.	Achedo Jude	B.Sc(Bus. Admin)	Admin Officer II
15.	Omede Okolo Ali	NCE (Hausa Social Studies)	Executive Officer
16.	Ndah Ojoago	NCE	Executive Officer
17.	Yakubu Fatumatu	NCE	Executive Officer
18.	Onuh Mercy	NCE	Executive Officer
19.	Audu Pius	NCE	Executive Officer
20.	Hassan Sule	NCE	Executive Officer
21.	Mamuda Yusuf	"O" Level	Senior Clerical Officer
22.	Onwubolu Kelvin. O	"O" Level	Senior Clerical Officer
23.	.James Ojone A.	"O" Level	Clerical Officer

Associate Staff

S/N	NAME	QUALIFICATION	DESIGNATION
1.	Ozioko Juliet	HND Sec Studies	Secretary to the Director
2.	Obafaye-Israel, A. A.	B.Sc Physics	Program Officer, African Geophysical Society AGS
3.	Awe Oluwayomi F.	M.Sc Chemistry	Research Fellow, Environmental Research
4.	Maha Jubrin	ND Public Admin	Clerical Officer
5.	Isaka Baba	SSCE, Driver's Grade Test 1,2,3	Driver
6.	James Eleojo	SSCE	Clerical Officer

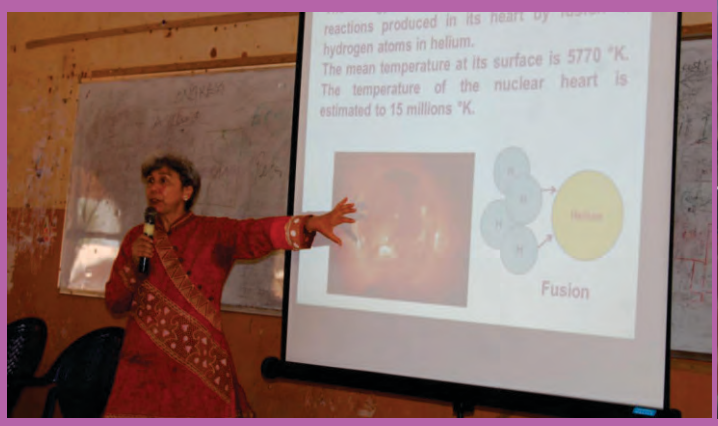
Visiting Senior Research Fellows

S/N	NAME	DESIGNATION	HOME UNIVERSITY
1.	Professor T. V. Ojumu	PhD. Chemical Engineering Coordinator, Advanced research in atmospheric chemistry	Cape Peninsula University of Technology, South Africa
2.	Dr (Mrs) M. Usikalu	PhD Physics Coordinator, Environmental research in atmospheric radiation	Covenant University, Ota, Nigeria
3.	Dr (Mrs) F. O. Omoya	PhD Microbiology Co-Coordinator; Advanced research in Microgravity and Human Space Technology (MHST)	Federal University of Technology, Akure, Nigeria

Visiting Senior Research Fellows

S/N	NAME	DESIGNATION	HOME UNIVERSITY
4.	Dr D. J. Arotupin	PhD Microbiology Co-Coordinator; Advanced research in Microgravity and Human Space Technology (MHST)	Federal University of Technology, Akure, Nigeria
5.	Dr. Bolaji. O.S.	PhD Space Physics, Project Manager, Space Weather Observation Network over Nigeria (SWONON)	University of Lagos, Akoka, Lagos, Nigeria
6.	Dr. Akpan Vincent. A.	PhD Electronic/Instrumentation Physics Visiting Senior Research Fellow, Atmospheric Research Software and Instrumentation Development (ARSID)	University of Lagos, Akoka, Lagos, Nigeria

The Vice Chancellor, Salem University, Professor J. O. Fuwape making an opening remark at the CAR Foundation lecture. 28th January 2014



Visiting Professor Christine Mazaudier (Universitie Pierre Marie curie, Paris, France) delivering an outreach lecture on space physics at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

It's press time at the West African Regional Space Weather School, Bells University of Technology, Ota Campus, Nigeria. 21 January 2014.

Cross section of the participants at the West African Regional Space Weather School, Bells University of Technology, Ota Campus, Nigeria. 21 January 2014. The Vice Chencellor, Bells University of Technology (far right)

The Director CAR posing with participants from Ghana and 3 Nigerians at the West African Regional Space Weather School, Bells University of Technology, Ota Campus, Nigeria. 21 January 2014.

Chairperson of the 2014 CAR Foundation lecture, Prof. (Mrs) Ibiyinka A Fuwape, Coordinating the event on 28th January 2014.

Professor Christine Amory Mazaudier from Universitie Pierre Marie curie, Paris, France, Presenting the 2014 Foundation Lecture titled: "Atmospheric Research in Nation Building". 28th January 2014

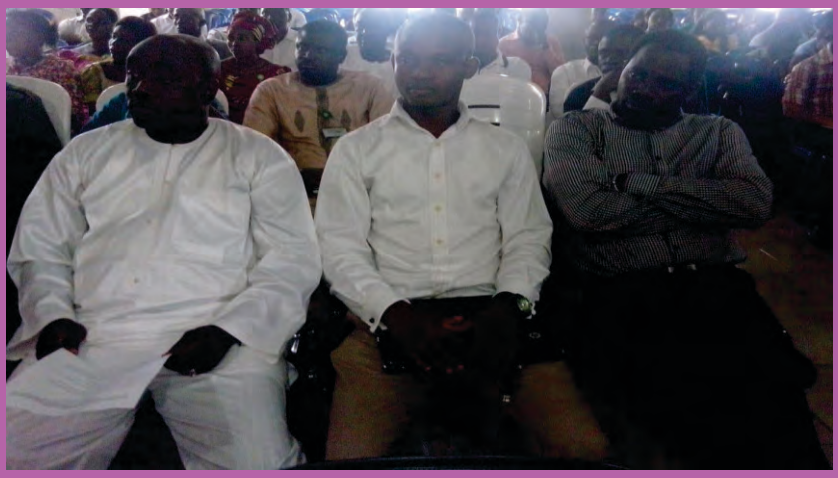
Professor Babatunde Rabiu, the Pioneer Director of NASRDA Centre for Atmospheric Research, outlining the achievements of the Centre within the past one year during 2014 CAR Foundation lecture on 28th January 2014

Mrs Aderonke Obafaye (right) presenting bouquet to Professor Christine Amory Mauzaudier (Centre) on arrival at the Nnamdi Azikiwe Int'l Airport Abuja on 19th January 2014. The Director watches on.

Professor Olivier Obrou, of the FHB University, Cocody, Abidjan, Cote D'Ivore, Presenting a paper on Introduction of Global Navigation Satellite System (GNSS) and its applications" during the 2014 Foundation day on 28th January 2014

Professor C. O. Akoshile (University of Ilorin, Nigeria) Contributing to the 2014 CAR Foundation Lecture on 28th January 2014.

L-R: Prof. Oliver Obrou, Prof.. Christine Amory Mauzaudier and Prof. J. A. Fuwape at the 2014 Foundation day on 28th January 2014



Cross section of participants at the CAR staff at the 2014 Foundation day on 28th January 2014

Prof. Babatunde Rabiu (Director, CAR) exchanging pleasantries with the paramount ruler, Ogohi of Anyigba, during a courtesy visit to the palace on 29th Jan 2014

Cross section of participants at the CAR staff at the 2014 Foundation day on 28th January 2014

L-R: The paramount ruler of Anyigba, Ogohi of Anyigba, Prof Olivier Obrou, Prof Babatunde Rabiu and Prof Christine Amory Mazaudier during a courtesy call on the Royal Highness on 29th January 2014

Prof Christine Mazaudier receiving a traditional gift from the paramount ruler of Anyigba, Ogohi of Anyigba during the visit to the palace on 29th January 2014

High School students posing with the guest scientists during the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

Prof Christine Mazaudier admiring the traditional kolanut gift presented to her by the paramount ruler of Anyigba, Ogohi of Anyigba during the visit to the palace on 29th January 2014

The paramount ruler of Anyigba, Ogohi of Anyigba posing for photographs with staff and visitors of CAR during the visit to the palace on 29th January 2014

L-R: Mr Kadiri Angulu Iben (CAR), Mr David Zhema (CAR), Visiting Professor Christine Mazaudier (Universitie Pierre Marie curie, Paris, France); Prof Babatunde Rabiu-Ag Director CAR, Ms Aderonke Obafaye CAR, on arrival at the Nnamdi Azikiwe International Airport Abuja, Nigeria on 19th January 2014.

L-R: Dr Bode Gbobaniyi (CAR), Mr Kadiri Angulu Iben (CAR), Visiting Professor Christine Mazaudier (Universitie Pierre Marie curie, Paris, France); Prof Babatunde Rabiu-Ag Director CAR, Ms Aderonke Obafaye CAR, on arrival at the Nnamdi Azikiwe International Airport Abuja, Nigeria on 19th January 2014.

High School students receiving lectures and hands-on-training on use of GNSS for navigation from visiting Professor Olivier Obrou at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

High School students receiving lectures and hands-on-training on use of GNSS for navigation from visiting Professor Olivier Obrou at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

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High School students receiving lectures and hands-on-training on use of GNSS for navigation from visiting Professor Olivier Obrou at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

L-R: Dr Spencer Onuh (Director, Centre for Satellite Technology Development, NASRDA), Prof. Christine Mazaudier and Prof. Babatunde Rabiu at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

High School students receiving lectures and hands-on-training on use of GNSS for navigation from visiting Professor Olivier Obrou at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

Dr. Spencer Onuh (Director, Centre fro Satellite Technology Development, NASRDA) delivering a good will message at the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

Professor Kazuo Shiokawa of the Solar-Terrestrial Environment Laboratory, Nagoya University inspecting the proposed site for the 1st Optical Imager in Africa at Abuja on 4th March 2014

2nd from left is Professor Kazuo Shiokawa of the Solar-Terrestrial Environment Laboratory, Nagoya University being received on arrival at the Nnamdi Azikwe International Airport, Abuja, on 4th March 2014

Visiting Professors Obrou and Mazaudier posing with the staff of CAR during the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

Workshop Poster for the Space weather School held at Bells University. 21-24 Jan 2014

High School students posing with the guest scientists during the Atmospheric Outreach program of CAR at Kogi State University, Anyigba on 29th January 2014

Prof Babatunde Rabiu, Director CAR, posing with the fresh Masters and PhD graduands of the Kyushu University who did their research project with the International Centre for Space Weather Science and Education, Kyushu University, Fukuoka, Japan on 25th March 2014.

Dr Bode Gbobaniyi delivering his Paper on 'The TRODAN Data Repository in the Science Gateway Africa Grid.' during the 3rd eI4Africa Thematic Workshop "Leveraging Science Gateway and Virtual Research Communities in African e-Science", Lagos, Nigeria. 19th March, 2014

The Vice Chancellor, Osun State University, Osogbo Prof. Adekunle Bashiru Okesina signing the MoU between NASRDA and UNIOSUN. To his left is Prof. C. O. Adedire, Former Dean of School of Science, to his right is the Director CAR on 5th May 2014

Group photograph of a section of the participants the 1st Annual Conference of the African Geophysical Society hosted by CAR, 3rd June 2014

Prof Babatunde Rabiu, DCAR and other participants during a meeting between CAR/NARSDA and NgREN/WACREN at the NUC office in Abuja

Professor S. O. Mohammed (The Director-General of National Space Research and Development Agency NASRDA) delivering a welcome speech at the 1st Annual Conference of the African Geophysical Society hosted by CAR - 3rd June 2014 2014.

Group photograph of a section of the participants the 1st Annual Conference of the African Geophysical Society hosted by CAR, 5th June 2014

Professor S. O. Mohammed (The Director-General of National Space Research and Development Agency NASRDA) granting press interview at the 1st Annual Conference of the African Geophysical Society hosted by CAR, 3rd June 2014

Director CAR and President AGS delivering his presidential address at the 1st Annual Conference of the African Geophysical Society hosted by CAR - 3rd June 2014

Grp Capt NV Aguiyi, (Director Space Technology Directorate, Nigerian Airforce) delivering a goodwill message at the 1st Annual Conference of the African Geophysical Society hosted by CAR - 3rd June 2014

Professor Babatunde Rabiu granting press interview at the 1st Annual Conference of the African Geophysical Society hosted by CAR, 3rd June 2014

Dr Shuji Abe (International Centre for Space Weather Science and Education, Kyushu University, Fukuoka, Japan) receiving the AGS fellowship award on behalf of Professor K. Yumoto at the 1st Annual Conference of the African Geophysical Society hosted by CAR - 3rd June 2014

The Director CAR, Professor Babatunde Rabiu delivering the keynote Address at the Centre for Satellite Technology Development (CSTD) Space week 2014, 3rd June 2014

Prof Mat Evans of York University, UK giving his keynote lecture at the Opening Ceremony of the Air Quality and Modelling Workshop

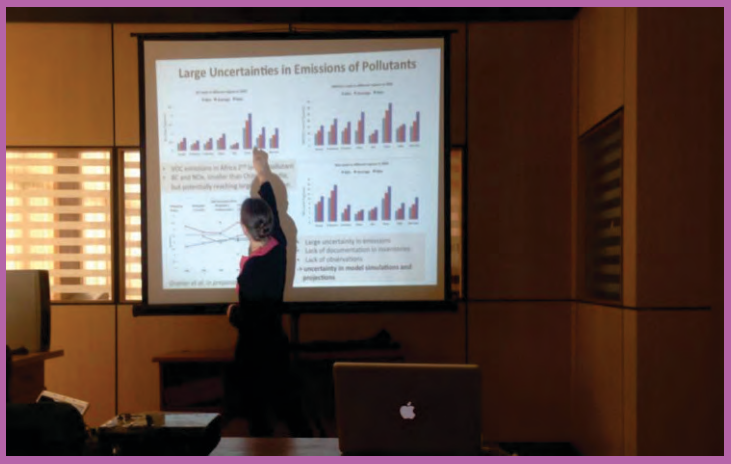
The Director CAR, Professor Babatunde Rabiu delivering the keynote Address at the Centre for Satellite Technology Development (CSTD) Space week 2014, 3rd June 2014

A cross section of the audience at the keynote Address delivered by the Director CAR at 2014 Space week organized by the Centre for Satellite Technology Development (CSTD), 3rd June 2014

Dr Gbobaniyi giving a hands-on tutorial on modelling at the First West African Work shop on Air Quality Measurements and modeling, 9-12 June 2014 in Abuja

NCAR Speakers Dr Ortega and Dr Tilmes in local attires flanked by Dr Gbobaniyi (far left) Prof Babatunde Rabiu (left), Dr Agbola (far right) and Dr (Mrs) Sa'id (right) at the closing ceremony of the First West African Workshop on Air Quality Measurements and modeling, 9-12 June 2014, Abuja

Ozone monitoring instrument brought by the NCAR team and installed at CAR in Anyigba for continous ozone measurments



Dr. Simone Tilmes giving a lecture at the First West African Workshop on Air Quality Measurements and modeling, 9-12 June 2014 in Abuja

Professor G Ciraolo (ICTP, Trieste) having a chat with CAR's Dr. Daniel Okoh during the African School On Space Science, 30 June - 11 July 2014, Kigali, Rwanda.

Professor Babatunde Rabiu and Professor G Ciraolo (ICTP, Trieste) during the African School On Space Science, 30 June - 11 July 2014, Kigali, Rwanda.

A cross section of the participants at the African School on Space Science, 30 June - 11 July 2014, Kigali, Rwanda.

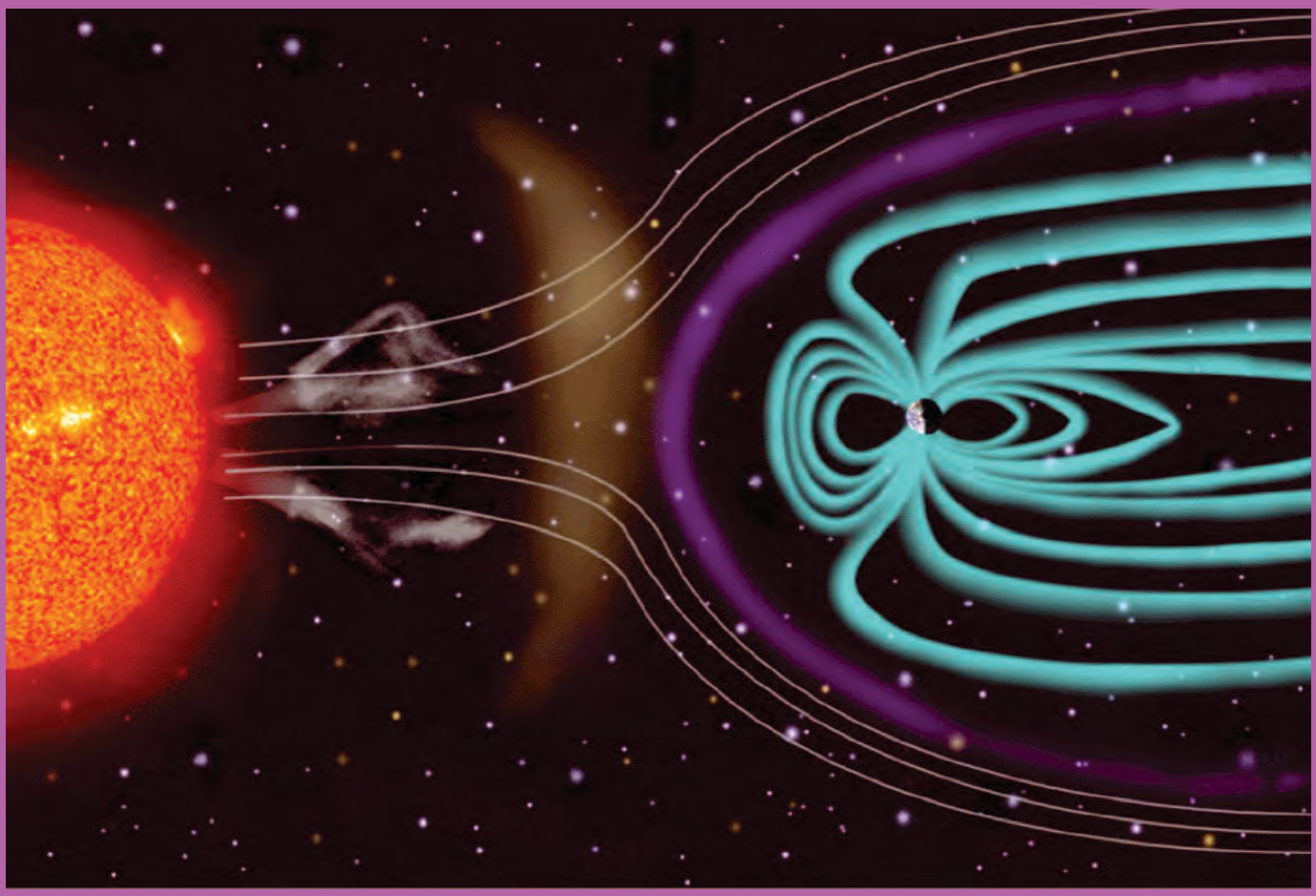
Dr (Mrs) Sola Fasunwon (4th from left) during her technical visit to CAR, August 2014

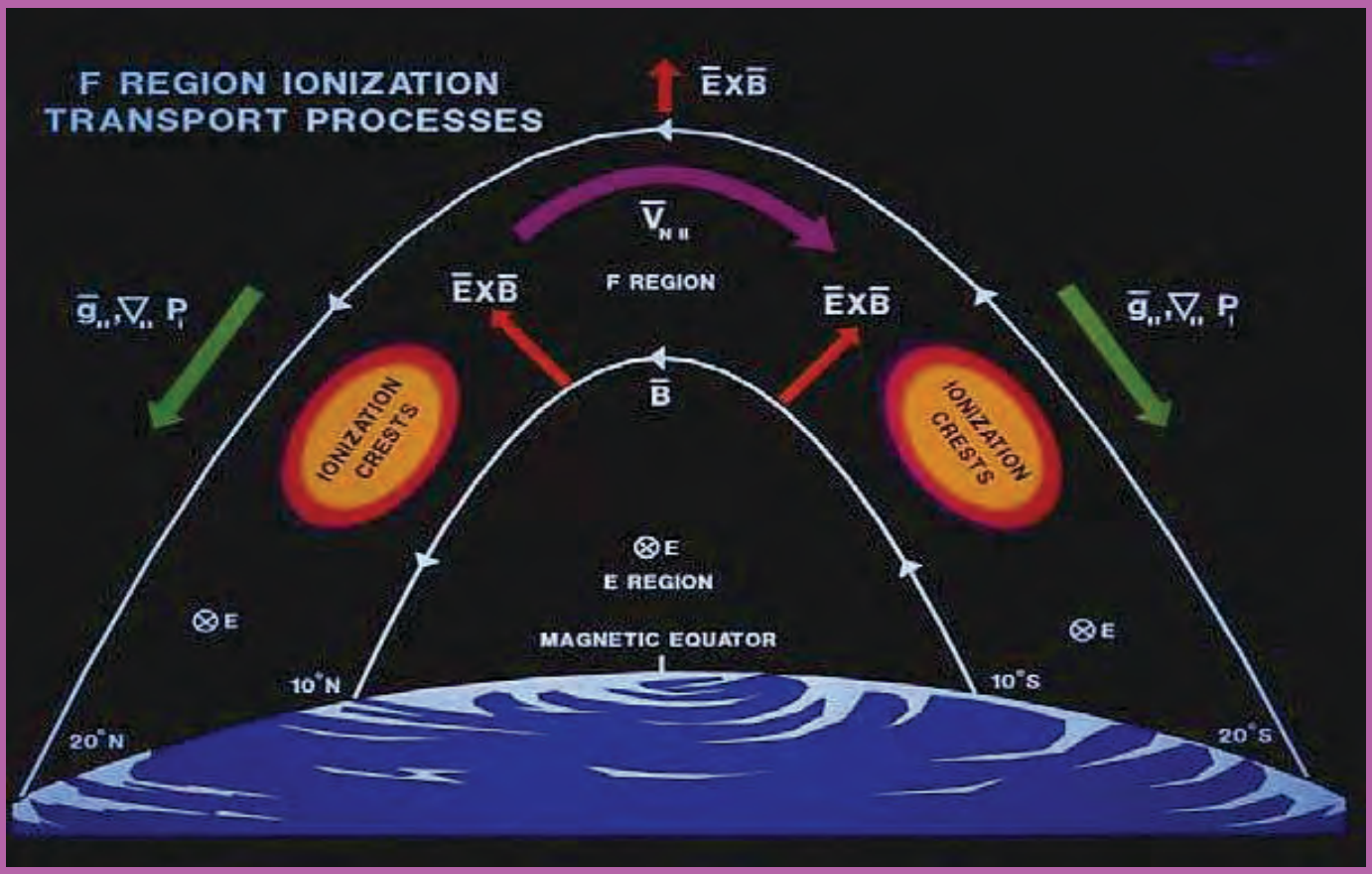
CAR-NASRDA UAV Team Mr. Najib Yusuf (far left) Engr. Adeyemi Alesinloye R. (2nd left) and Engr. Oluwaseye Adedoja (far right) with the Chinese Technical Experts on Unmanned Aerial Vehicle during the Training on UAV organized by the Centre for Basic Space Science (CBSS), Nsukka, Nigeria. 24th November – 4th December 2014

CAR personnel posing with the men of Nigerian Air Force at the Sokoto NAF Base during the upgrading of the GPS receiver installed at Sokoto, 5th December 2014

CAR staff Sharafdeen and Sani at the Air Quality Station at the University of Ilorin

L-R: Professor C. O. Akoshile of the University of Ilorin and CAR staff Sharafadeen and Sani at the Air Quality Laboratory at the University of Ilorin

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20°S

Mr and Mrs David Zhema

Mr and Mrs David Zhema

Mr and Mrs David Zhema

Mr and Mrs Justice Timiyo

Mr and Mrs Justice Timiyo

Mr and Mrs Yusuf Hamza

Engr and Mrs Oluwaseye Adedoja

Mr and Mrs Muawiya Sani

Engr and Mrs Oluwaseye Adedoja