



Space Weather Activities in Nigeria



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Institutions involving in Space Weather Research in Nigeria

- Universities
- Centre for Atmospheric Research



Centre for Atmospheric Research

- Established in January 2013
- R & D Establishment of the Federal Government
- Located at Anyigba, Kogi State, Nigeria

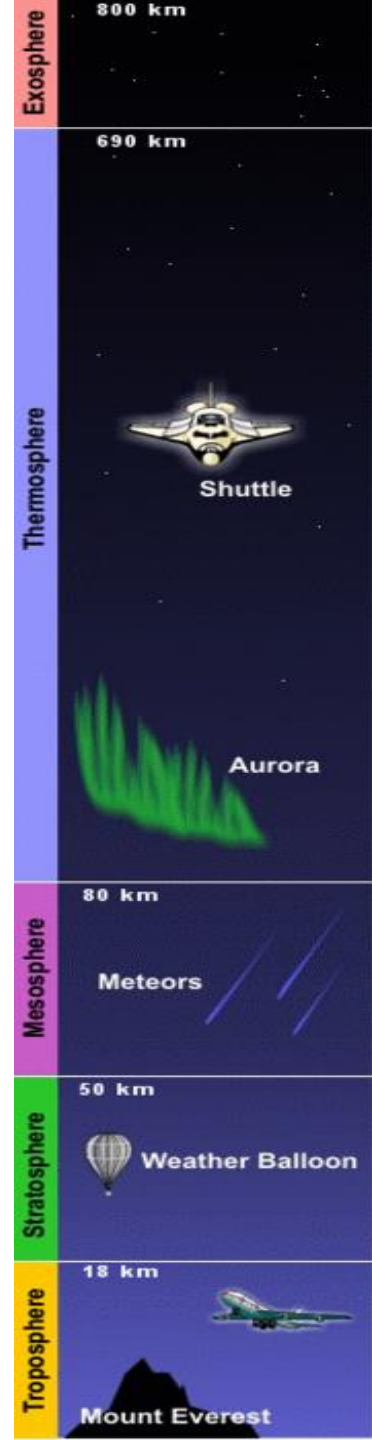




Center for Atmospheric Research

- A world class research and development center of NASRDA committed to **research and capacity building** in the **atmospheric and related sciences**
- 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**
- provides **research facilities** and **services** for the atmospheric and Earth sciences community

29/10/2018





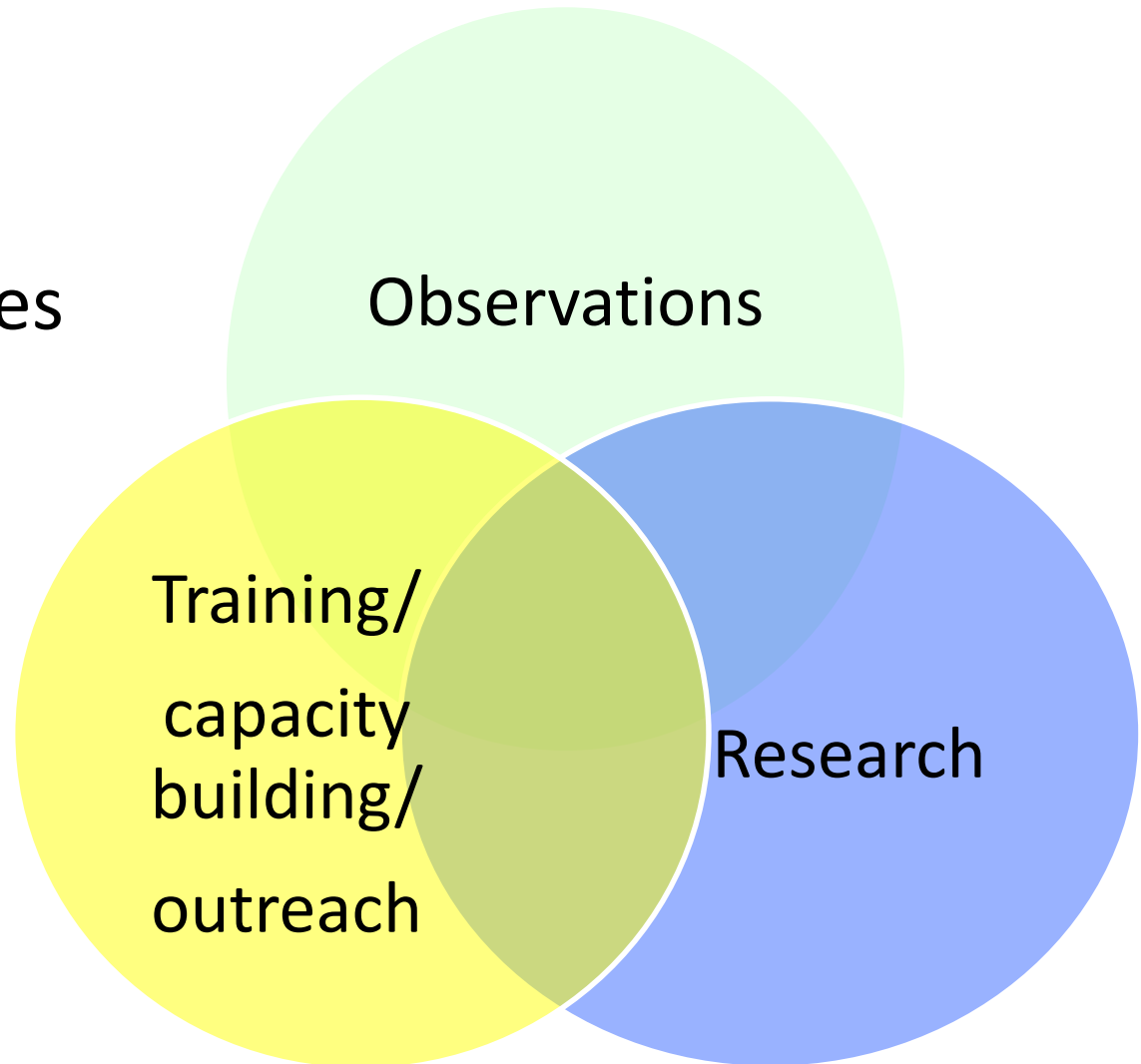
Focus Areas

- Lower atmosphere: micrometeorology, BDL
- Upper Atmosphere: **Ionosphere/magnetosphere**
- Solar Terrestrial Physics: **Solar physics, Solar Terrestrial Interactions and *Space Weather (Sun and heliosphere)***
- Atmospheric chemistry & environmental research
- Space Research Initiative: **Human space technology Initiative – medical geography, Magneto-biology, space experiments as it affect agric, medicine, vaccine development etc,**



CAR

is envisioned to
operate in 3 modes





Space Weather related Research Projects of CAR

- Space Weather Observation Network over Nigeria-
SWONON
 - Space Weather Observation Network over Africa-
SWONOA
- Atmospheric Research Software and
Instrumentation Development - ARSID



Status of Space Weather Stations

- 4 Magnetometers
 - MAGDAS 3 units @ Ilorin, Abuja, Lagos
 - AMBER @ Abuja
- Ionosonde @ Ilorin – **(at moment undergoing repairs in the USA)**
- GNSS stations – 20 units
- Optical Imager
- FPI
- SOFIE
- SID monitors



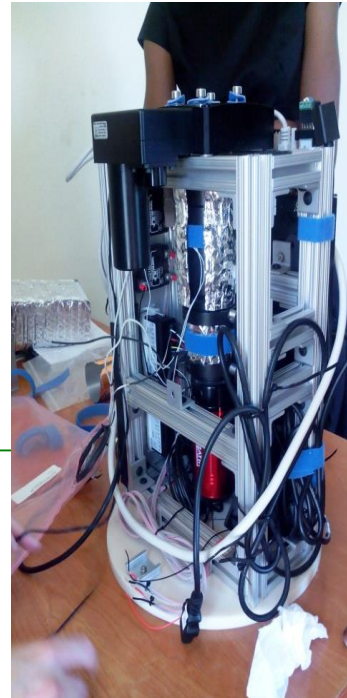
Space Weather Observation Network over Nigeria- SWONON

- Monitoring space environment including satellite altitudes
- Maintenance of existing stations
- Networking of existing stations
- 1 Station per state ~ 37 stations
- Data generation
- Secondary products

- Magnetometer
- GPS SW monitor
- Digisonde
- FPI
- All Sky Optical imager

www.nsa.gov.ng

Equipment



5-8 November 2013;
Sokoto

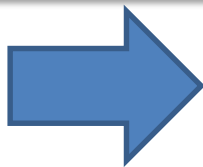
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Space Weather Observation Network over Nigeria- SWONON

- to monitor and nowcast space weather over Nigeria
- To develop in-country expertise for implementation, operations, processing and analyses of space weather processes.

Network of ground-based space observatories (facilities include magnetometers, digisondes, ionospheric GNSS monitors, optical imagers)



SWONOA





Atmospheric Research Software & Instrumentation Development - ARSID

- Development of software for atmospheric research
- Instrumentation
- Now-cast of space weather over Nigeria

6 locally-constructed magnetometers are now waiting for distribution



CAR Space Research Laboratories: Functions

- Shall **host assorted world-class scientific equipment** for monitoring space and earth environments
- **data from the equipment** shall be collected, stored and made **available for research purpose**
- shall serve as **training hub** for space science, technology & applications
- **Research laboratory** for investigations relevant to our mandate



Space Research Laboratories

- super observation points
- host extra equipment

National Air Quality Research Laboratory,
NAQRL, UNILORIN

Space Environment Research Laboratory
SERL, Abuja

Space-Earth Environment Research
Laboratory SEERL, Benin

Space Weather & Atmospheric Physics
Research Lab SWAP, BUK, Kano

CAR, Anyigba

Space
Research
Labs

Observational
points





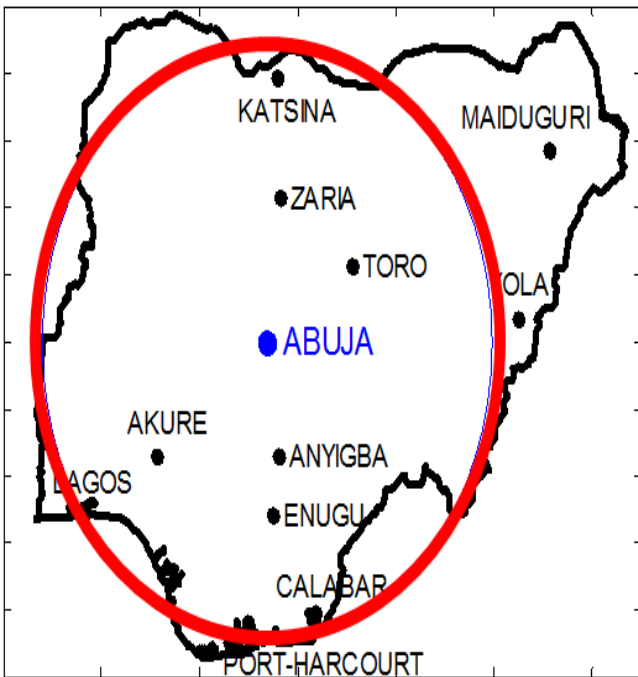
Space Environment Research Lab, Abuja

- June 2015.
- Optical Imager, FPI, Magnetometers (2), GNSS Space Weather Monitor
- SOFIE



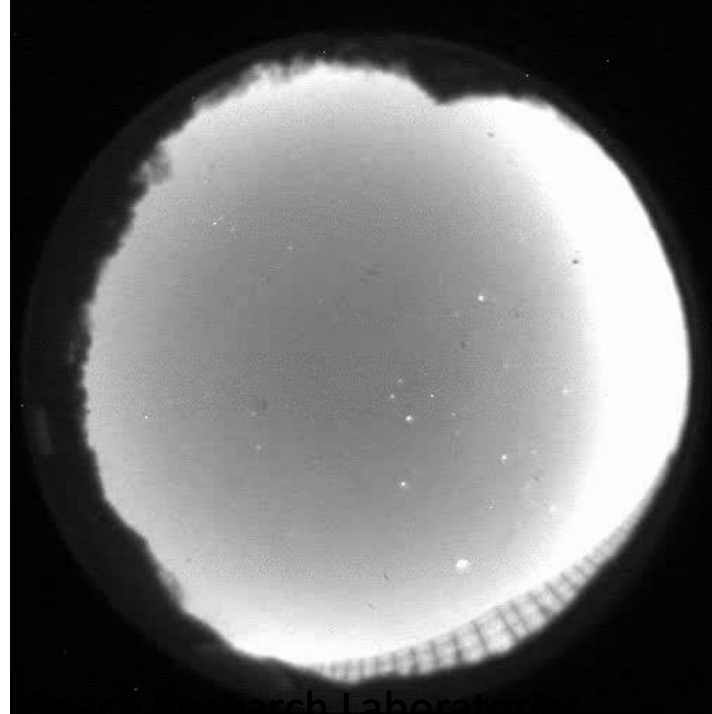


Some data



Abuja, Nigeria

June 21, 2015



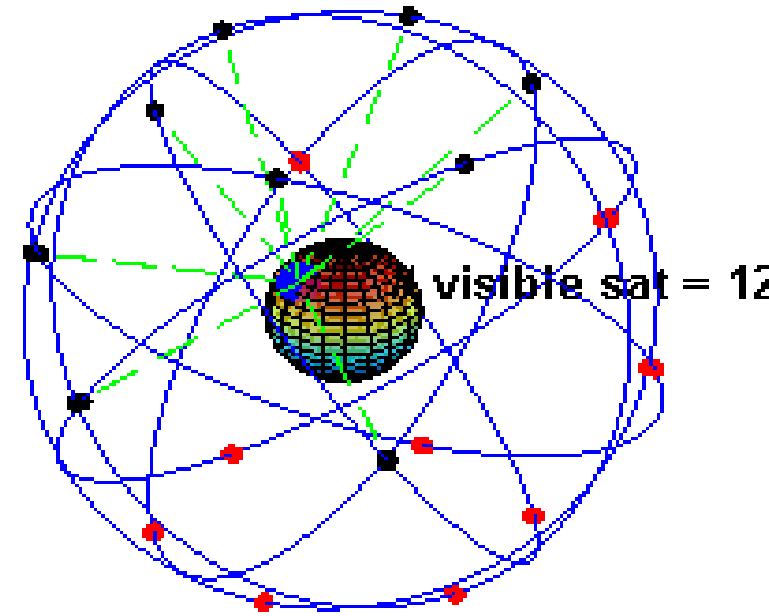
captures the space environment up to 500 km over a radial distance of up to 500 km and gives information about travelling ionospheric disturbances, gravity waves and plasma bubbles among other ionospheric phenomena



Space-Earth Environment Research Lab. SEERL

□ Located at the University of Benin

Activity began on 1st
September 2016





Most Recent School

VarSITI

Meeting Report 4:



2nd International School on Equatorial and Low-Latitude Ionosphere (ISELLI-2)

K. Shiokawa¹ and B. Rabi²

¹Institute for Space-Earth Environmental Research, Nagoya University, Nagoya, Japan

²Center for Atmospheric Research (CAR), National Space Research and Development Agency (NASRDA), Anyigba, Nigeria

- ✓ 60 participants
- ✓ 10 countries
- ✓ 1-week long activities
- ✓ 10-16 Sept 2017
- ✓ CU, Ota, near Lagos



Kazuo Shiokawa



Babatunde Rabi



Figure 1. Participants of ISELLI-2.

Cote D'Ivoire, and Nigeria introduced ionospheric dynamics, measurement techniques, Spread-F/ plasma bubbles, and space weather. A training of SPEDAS GUI system under IUGONET was held on Thursday. Participants enjoyed lively discussions with the lecturers and mutual communications during this one-week school. This school was supported by Centre for Atmospheric Research (CAR) of NASRDA, Covenant University, Institute for Space-Earth Environmental Research (ISEE) of Nagoya

The 2nd International School on Equatorial and Low-Latitude Ionosphere (ISELLI-2) was held



Our collaborators

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SMHI



www.carnasrda.com

others



MoU with over 25 Nigerian Universities



Thanks

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