



Annexure VI

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



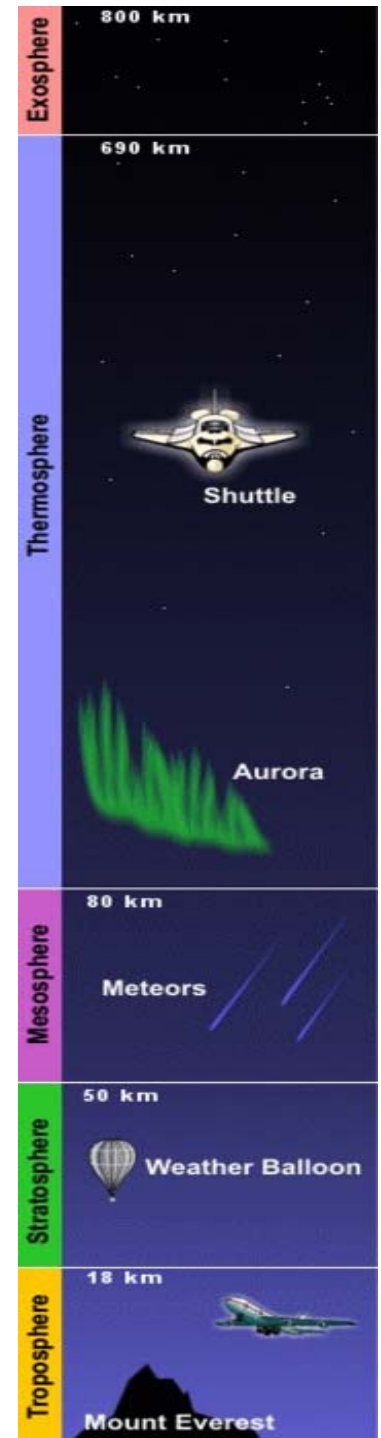


Center for Atmospheric Research

- 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

01/02/2018

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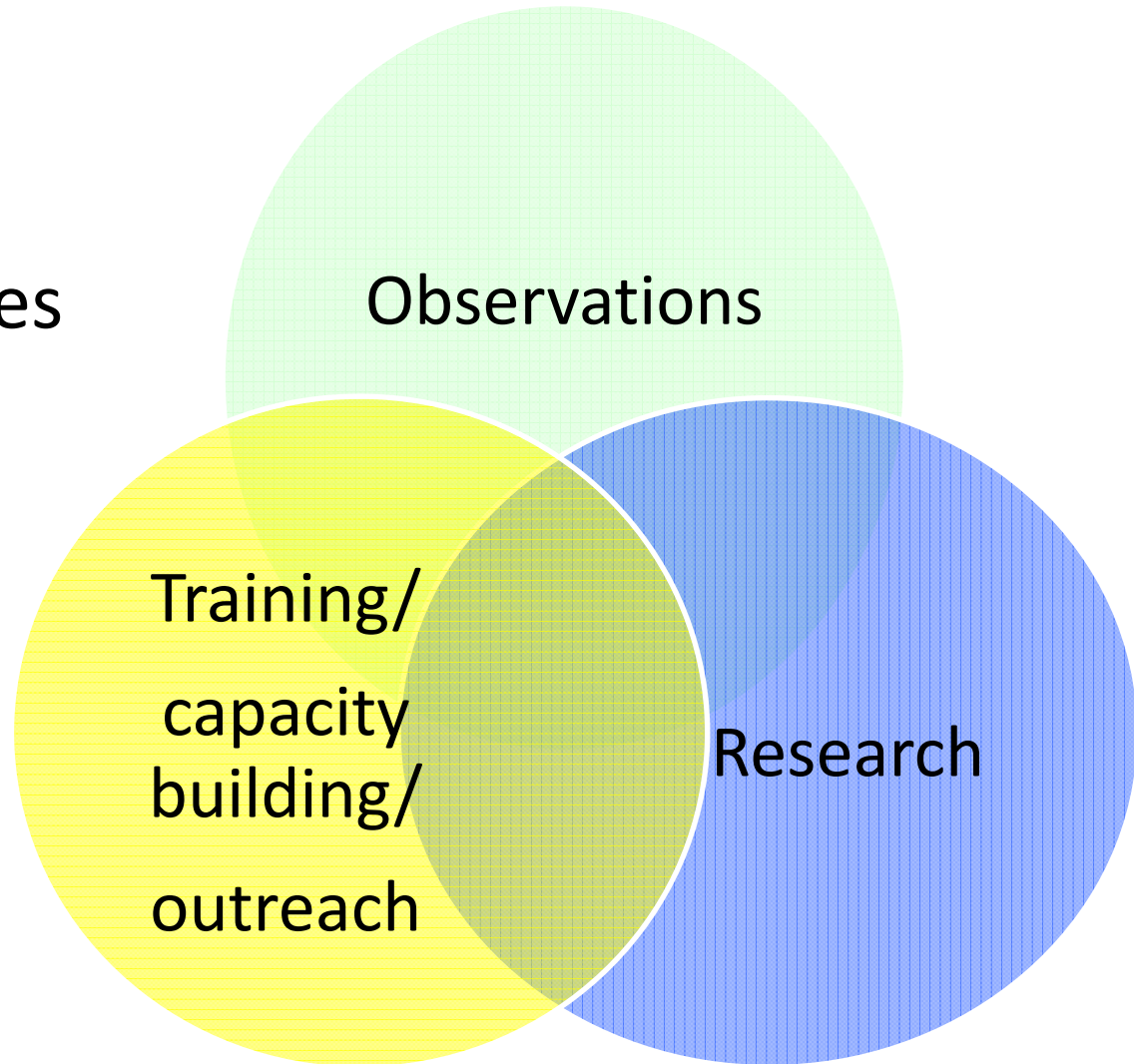
Focus Areas

- 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



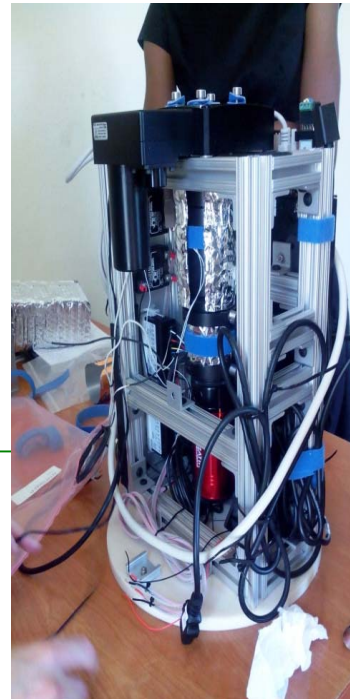
Space Weather Observation Network over Nigeria- SWONON

- 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

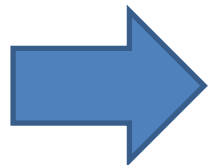
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Space Weather Observation Network over Nigeria- SWONON

- 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



Daily Space Weather Nowcasts

- started on 16th January 2018

www.carnasrda.com/nowcasts



Navigation icons: Home, About Us, Services, Contact Us, News, Downloads, etc.

Date: 28 January 2018; 11:52UT

Summary of Space Weather

Solar activity very low with a spotless sun and the solar wind speed still declining. Geomagnetic conditions at all levels are quiet.

Space Weather parameters / observations;

Sunspot Number: 0

10.7cm Flux: 69 sfu

Solar wind speed: 362.1 km.s-1

Solar wind density: 9.4 proton.cm3

Kp: 0

Bz: -2.1 nT (South)

Bt: 4.2 nT

Dst: 0 nT

[Download Data](#)

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1/28/2018

carnasrda - Center for Atmospheric Research, ...



Space weather nowcasts at CAR

mail

Space weather is fast becoming a global concern. Space weather refers to the conditions in space environment that have impact on space-dependent technological systems. Today's world is driven by Space Technology, Communication, Satellite, Navigational, Aviation, and Information Technologies, are some of the mostly patronized space-dependent technologies in the world today. Millions of Nigerians have continued to patronize space-dependent technologies whose functionality and efficiency are prone to space weather hazards.

The Centre for Atmospheric Research has 'Space Weather' as one of her main agenda and has hereby set up a daily space weather nowcasts for the benefits of the public and in particular patrons of space technology dependent systems/ operations.

This platform starting from 16th January 2018 shall present daily space weather nowcasts for global usage.

Space Weather Nowcasts

Date: 28 January 2018; 11:52UT

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[Download Data](#)

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Further information and data: Send email to: - spaceweather@carnasrda.com

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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

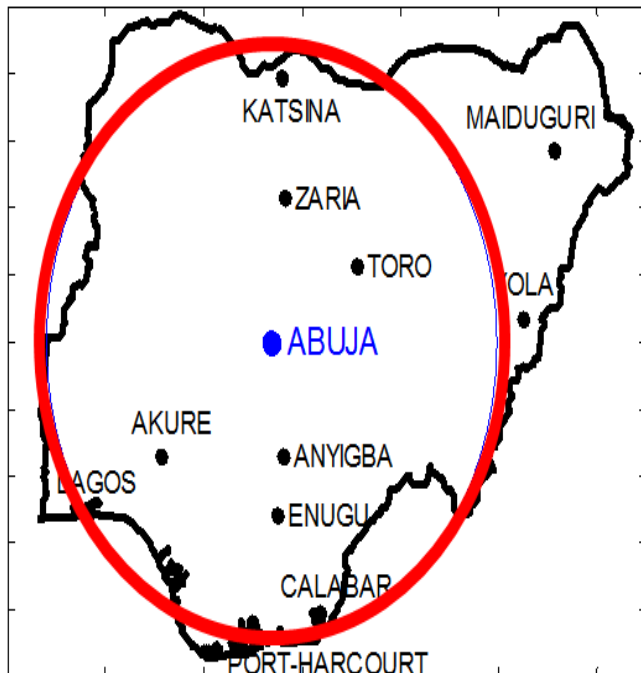
- June 2015.
- Optical Imager, FPI, Magnetometers (2), GNSS Space Weather Monitor
- SOFIE



.com

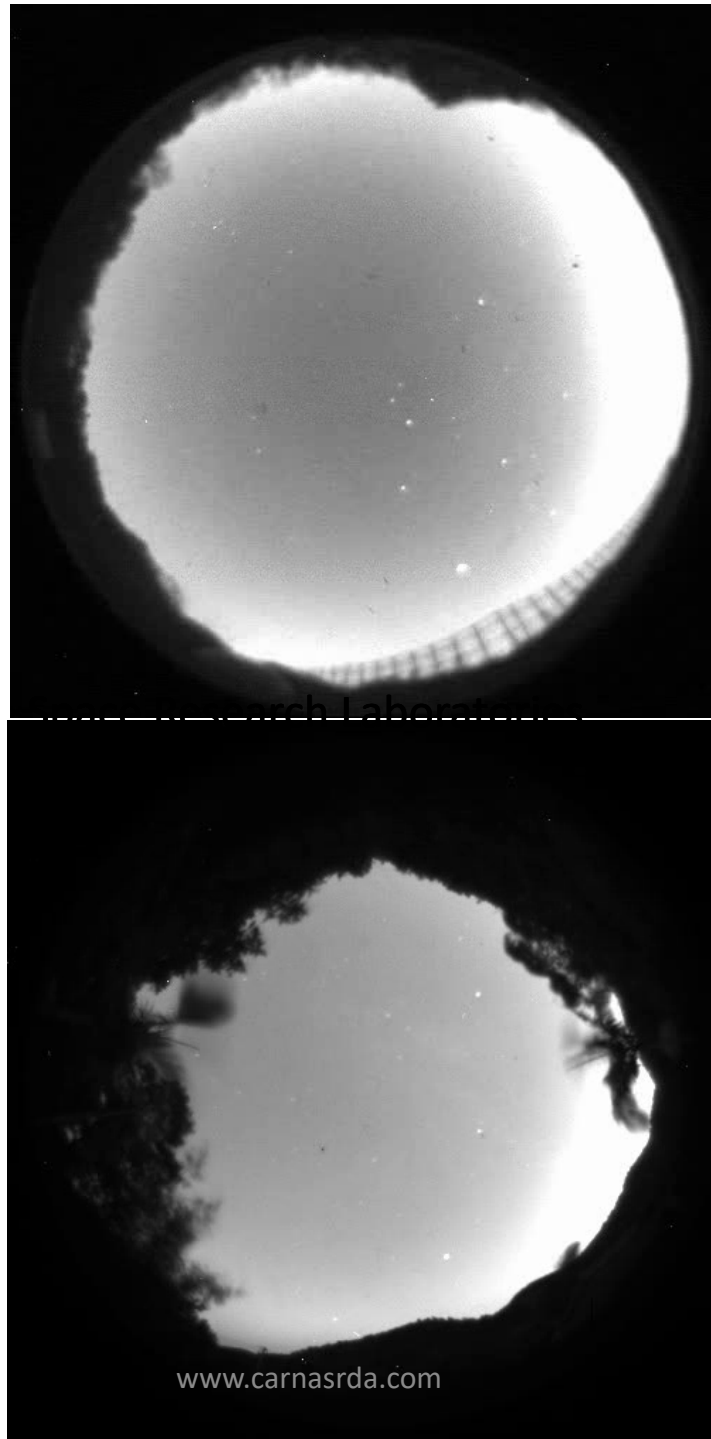


Some data



Abuja, Nigeria

June 21, 2015



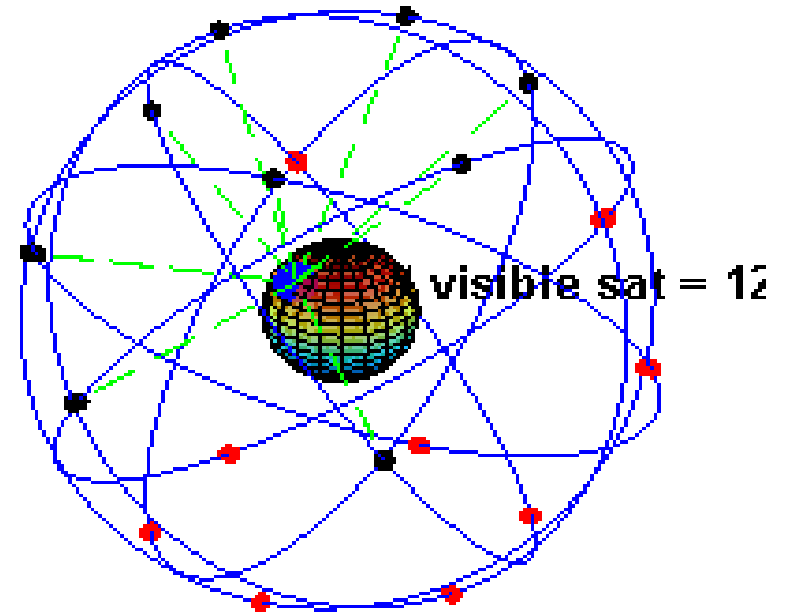
captures the space environment up to 500 km over a radial distance of up to 500 km and gives information about travelling ionospheric disturbances, gravity waves and plasma bubbles among other ionospheric phenomena



Space-Earth Environment Research Lab. SEERL

- Located at the University of Benin

Activity began on 1st
September 2016





Most Recent School

BR1

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

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



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



Our collaborators



SMHI



www.carnasrda.com

others



MoU with over 25 Nigerian Universities



Thanks

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