

Space Weather Activities in Nigeria



Director & Chief Executive Center for Atmospheric Research CAR, National Space Research & Development Agency NASRDA, Federal Ministry of Science & Technology, Anyigba, Nigeria.

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Institutions involving in Space Weather Research in Nigeria

- Universities
- Centre for Atmospheric Research



Centre for Atmospheric Research

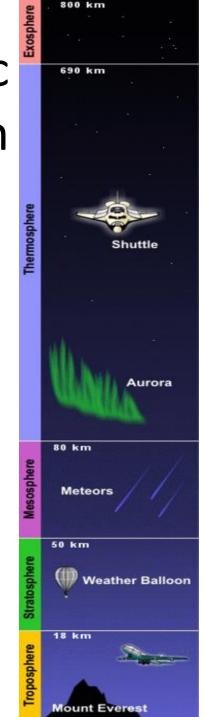
- Established in January 2013
- R & D Establishment of the Federal Government
- Located at Anyigba, Kogi State, Nigeria





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





Focus Areas

- Lower atmosphere: micrometeorology, BDL
- Upper Atmosphere: lonosphere/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

Observations

Training/
capacity
building/
outreach

Research



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

Equipment d.com







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, lonospheric GNSS monitors, optical imagers)







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



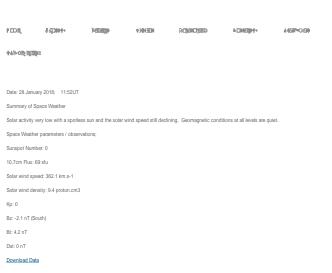
Daily Space Weather Nowcasts

1/28/2018

started on 16th January 2018

www.carnasrda.com/nowcasts





www.carnasrda.com

carnasrda - Center for Atmospheric Research

<u>♦ ♦0) 11930(11,200) | 000011 | 11900</u>



mail Space weatner nowcasts at CAH 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 nmary of Space Weather lar activity very low with a spotless sun and the solar wind speed still declining. Geomagnetic conditions at all levels are quiet. ace Weather parameters / observations Sunspot Number: 0 10.7cm Flux: 69 sfu 9 D 100 200 9 200 Solar wind speed: 362.1 km.s-1 F-11KHE + 9.939 Further information and data: Send email to: - spaceweather@carnasrda.con



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

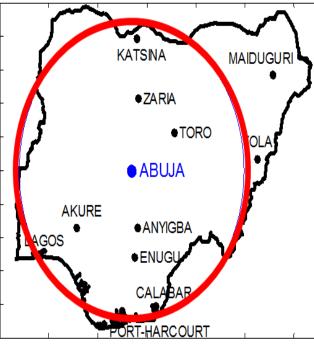
• June 2015.

Optical Imager, FPI,
Magnetometers (2), GNSS Space
Weather Monitor

SOFIE

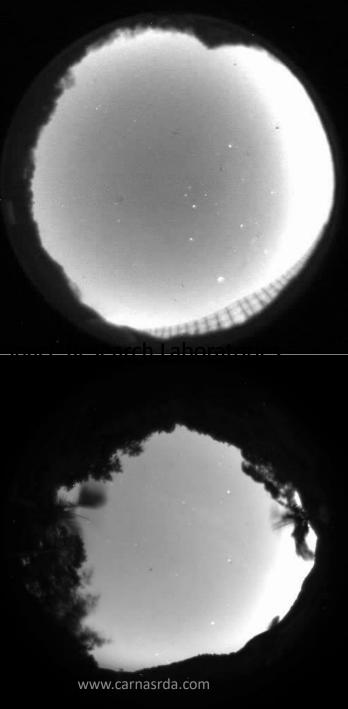






Abuja, Nigeria

June 21, 2015



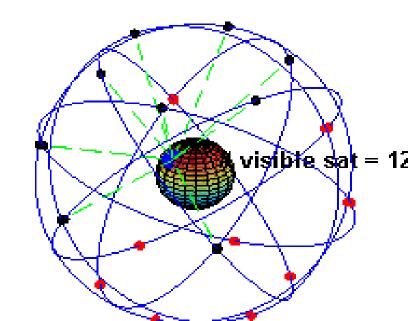
captures the space environment up to 500 km over a radial distance of up to 500 km and gives information about travelling ionospheric disturbances, gravity waves and plasma bubbles among other ionospheric phenomena

29/10/2018 www.carnasrda.com 16

Space-Earth Environment Research Lab. SEERL

Located at the University of Benin

Activity began on 1st September 2016







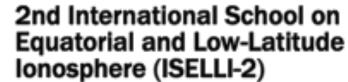
Most Recent School

Meeting Report 4:









K. Shiokawa1 and B. Rabiu2

*Institute for Space-Earth Environmental Research, Nagoya University, Nagoya, Japan ²Center for Atmospheric Research (CAR),

✓ 60 participal Space Research and Development

√ 10 countries

√ 1-week long activities

✓ 10-16 Sept 2017

✓ CU, Ota, near Lagos





Babatunde Rabiu

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



Figure 1. Participants of ISELLI-2.

Cote D'Ivore, 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

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Our collaborators





































MoU with over 25
Nigerian Universities



Thanks

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