

The Status of Global Navigation Satellite System (GNSS) Technology in Tanzania

SULUNGU Emmanuel Daudi

**Department of Physics, School of Physical Sciences,
College of Natural and Mathematical Sciences,
The University of Dodoma,
Dodoma, Tanzania**

Outlines

- Introduction
- Current Status
- Data use
- Future Plans
- Challenges
- Opportunities
- Conclusion
- Acknowledgement

Introduction

- Space weather includes any and all conditions and events on the Sun, in the solar wind, in near-Earth space and in our upper atmosphere that can affect space-borne and ground-based technological systems and through these, human life is affected
- Space weather research and related ionospheric studies require broad international collaboration in sharing databases, developing analysis software and models

Introduction cont.....

- Tanzania being one of the developing countries needs the GNSS technology for space weather monitoring.
- Before 2006, there were no any installed equipments for space weather monitoring in Tanzania
- This contributed to lack of people who were ready to study Space Science
- Today we have no any expert with at least a PhD in this area

Current Status

- First GPS receiver in Tanzania was installed in 2006 in Dar es Salaam.
- Currently there are eight (8) stations with GPS receivers, although most of these are for tectonic monitoring.
- In 2008, One MAGDAS station was installed at University of Dar es Salaam by the Space Environment Research Center (SERC), today known as International Center for Space weather Science and Education (ICSWSE) of the Kyushu University, Japan

Current Status cont....

STATION NAME	STATION CODE	LATITUDE/ LONGITUDE	EARLIEST DATA	LATEST DATA
Arusha Ministry of Energy and Minerals	ARSH	3.387°S/36.698°E	Feb 27, 2013	Oct 29, 2014
Dodoma	DODM	6.186°S/35.748°E	Sept 22, 2010	May 27, 2014
Dodoma continuous	DODC	6.170°S/35.748°E	May 21, 2009	Aug 11, 2010
Geita	GETA	2.881°S/32.217°E	Aug 03, 2011	Sept 09, 2012
Mbeya Ministry of Energy and Minerals	MBEY	8.912°S/33.459°E	Feb 22, 2013	Oct 28, 2013
Mtwara	MTVE	10.260°S/40.166°E	Aug 11, 2011	Nov 10, 2013
Tanzania CGPS	TANZ	6.766°S/39.208°E	Aug 13, 2006	Jan 07, 2014
Tukuyu	TUKC	9.332°S/33.752°E	Oct 15, 2008	Jul 24, 2012

Current Status cont.....



UN/ICTP Workshop on the Use of GNSS for Scientific Applications,
1 - 5 December 2014, Trieste, Italy

Data use

- Master's students (M.Sc.) use MAGDAS data to do research in Space Weather
- I was the first, although under minimum supervision because of lack of Experts.
- No any study within the country has been done using GPS data for space science studies
- Other studies using GPS data are done, eg. geomatics

Future Plans

- Already started my PhD at University of Dar es Salaam on

“Total Electron Content Variability Over the Eastern Africa Region”

- use of the available GPS data
 - ✓ Although supervision from an expert on the area of space science at University of Dar es Salaam, Tanzania, is a main challenge

Future Plans cont.....

- ✓ Thanks to Dr. Patrick Sibanda of University of Zambia who basically has accepted to assist in Supervision
- ✓ Request from other experts to support in Supervision, preferably through sandwich program
- There is growing realization that Space Science is an important tool for development, thus
- Significant progress in introducing Space Science – related activities

Future Plans cont.....

- GPS receiver network in Tanzania
 - presents opportunities for development that cannot be ignored, and there is need to establish collaborations with other African countries who have advanced in space technology, and the world at large
 - will promote coordinated upper atmospheric research and applications in space science and technology that will be essential in addressing the development needs of the country.

Future Plans cont.....

- To make space science develop in Tanzania, there is a need
 - To introduce space science programs in both undergraduate and postgraduate (M.Sc.) curriculum in the country, starting with my University
 - To encourage more students to do research using the available data.

Challenges

- While space science & technology is rapidly increasing and advancing worldwide, yet Tanzania lack the

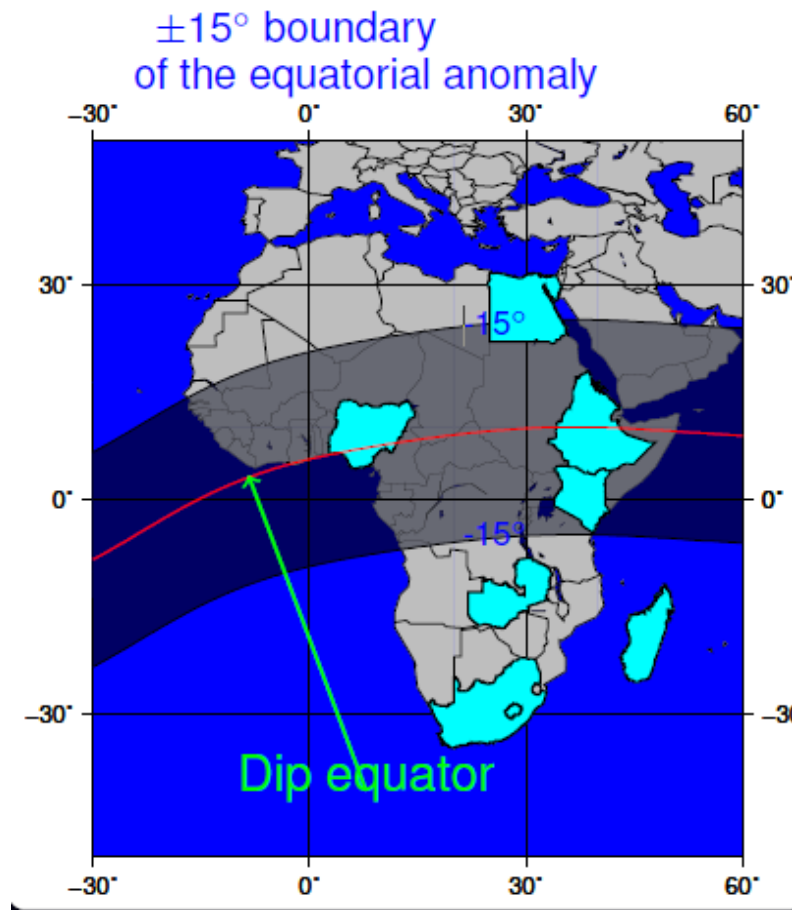
- human,
- technical
- financial resources

to utilize existing space-based infrastructure for the space and related ionospheric studies.

Challenges cont.....

- Space science is viewed by many as a subject for developed countries with capabilities in space technology
- Until this year, nothing to do with Space Science is available in our education system

Opportunities



- Tanzania is in low latitude region, northern part is within equatorial anomaly
- Good region for space and related ionospheric studies

Conclusion

- Understanding the importance of Space Science today;
 - More instruments for monitoring Space weather are needed today in Tanzania to develop interest among students in this important area of study.
 - Request to organizations which involve in space weather monitoring and education to support Tanzania in this field of study through;
 - instrumentation
 - Human resources development

Acknowledgement

- To Workshop Organizers
 - International Centre for Theoretical Physics (ICTP) and
 - United Nations
- My Employer – The University of Dodoma (UDOM), Tanzania

Thank you