



# FORMOSAT-7/COSMIC-2 GNSS Radio Occultation Mission: The role of the University of Energy and Natural Resources and Capacity Building on RO data in Africa.

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## Background

- The University of Energy & Natural Resources (UENR) is situated in Sunyani, Ghana. This strategic location, coupled with the existence of key infrastructure owned and managed by the Earth Observation Research & Innovation Centre (EORIC) for the acquisition of remote sensing (satellite and in-situ) based data, provides a suitable environment for research and education in areas of meteorology, climate, weather, disaster, health, agriculture and energy. The university is one of nine (9) sites selected to host the COSMIC-2 (Equatorial) downlink stations. This gave rise to further collaborations with the University Corporation and Atmospheric Research (UCAR), USA to install a Global Navigation Satellite System (GNSS) reference station at UENR.
- In Europe, Asia and America, the utilization of GNSS ground networks of continuously operating reference stations for space geodesy, satellite orbit determination, weather, and research and operations in other areas are already in place under different initiatives and organizations. In Africa, the situation appears to be different. UENR as part of efforts to leverage expertise and seeks to spearhead capacity building initiatives by establishing a GNSS Lab through collaboration and partnership arrangements for training of Scientists, Researchers, and Meteorologists in the use of GNSS data in support of science and operational applications such as numerical weather prediction in Africa.

## Project Objectives

- The primary objective of the GNSS reference receiver station at UENR is to support the Atmospheric and Geodetic Sciences in line with the FORMOSAT-7/COSMIC-2 GNSS Radio Occultation Mission.
- Other prospective areas include listing the station as part of the African Geodetic Reference Frame (AFREF) and the International GNSS Service (IGS) network.

## Facilities

Current Data Acquisition Infrastructure at UENR, Ghana:

- EOS-DB Ground Receiving Station
- GEONETCast Reception Station
- GNSS reference receiver station jointly installed and operated by UCAR and UENR
- COSMIC-2 Ground Station



Fig 1: Earth Observing System – Direct Broadcast Ground Receiving Station (1), GEONETCast Reception Station (2), GNSS Referencing Station(3), COSMIC-2 Ground Station (4)

## Operations and Preliminary findings

Using Ghana as a case study area:

- We identified existing and active GNSS ground networks of continuous stations owned and managed by other organisations which are not utilised for weather forecast purposes.
- Integrating the GNSS reference station installed at UENR into the existing stations which are already part of AFREF and IGS network.
- Developing capabilities to effectively utilise these GNSS ground networks to monitor atmospheric Precipitable Water Vapour (PWV) to improve the accuracy of numerical weather forecasts.
- Identified key areas of a capacity building to improve weather forecast using data from GNSS ground networks, COSMIC-2 and other satellites providing GNSS-RO data.

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## The Way Forward and the Role of UENR

- Integrated a GNSS reference station installed at UENR. This station will increase the coverage of the GNSS ground networks to monitor atmospheric PWV for improving numerical weather forecast.
- We propose to establish a GNSS Lab for retrieving, processing and analyzing data from GNSS ground networks, COSMIC-2 and other satellites providing GNSS-RO data.
- The lab will also be responsible for training and innovations in using GNSS remote sensing techniques to provide more accurate numerical weather forecast and enhance engineering and scientific research in Africa.

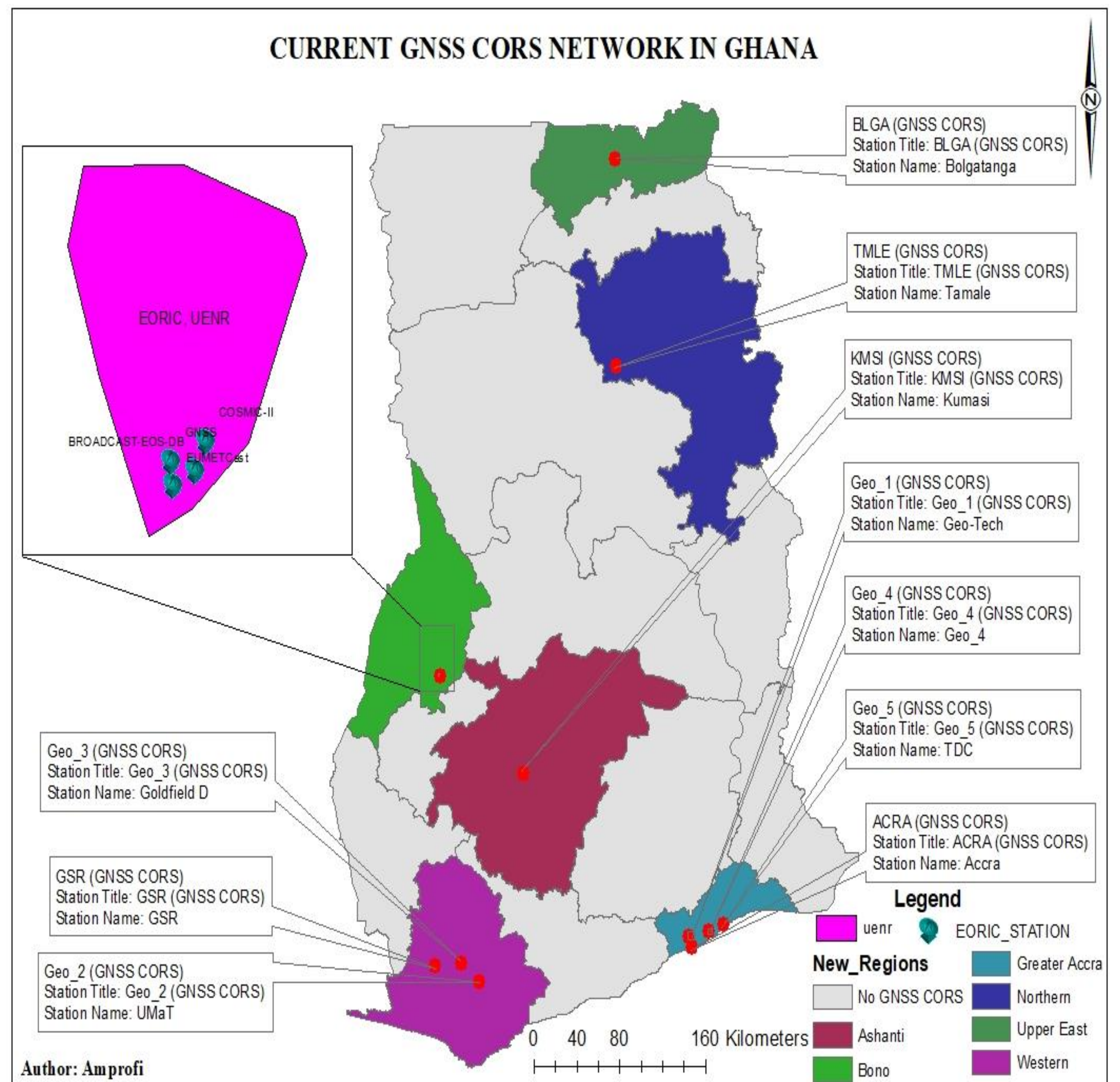


Fig 2: Current and active GNSS CORS Network in Ghana showing the number of stations, the regions their located and the current one installed at UENR in 2018 in collaboration with UCAR. Data from these stations will be utilized for weather forecast in the country and also research work.

## Conclusion

This poster presents an overview on how UENR will leverage on the collaborations and partnerships with institutions like UCAR and other organizations to immensely contribute to GNSS research, accurate weather forecast, and training in the use of GNSS technology in Ghana and Africa.

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