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ADVANCING AFRICAN IONOSPHERIC RESEARCH AND SPACE WEATHER MONITORING: THE NORISK PROJECT

Abstract

The low-latitude ionosphere over Africa remains inadequately explored despite its significance in understanding global ionospheric dynamics. Challenges in establishing and maintaining ionospheric observatories, coupled with limited networking opportunities outside Africa for young African scientists, have contributed to this gap in research.

In response to these challenges, the Italian Space Agency (ASI) and the Instituto Nazionale di Geofisica e Vulcanologia (INGV) forged a collaborative project named "New Observatory for Real-time Ionospheric Sounding over Kenya (NORISK)" project. NORISK has seeked to address these gaps by establishing a new ionospheric observatory, which includes a GNSS Ionospheric Scintillation Monitor Receiver (ISMR) and an Advanced Ionospheric Sounding ionosonde built at the Istituto Nazionale di Geofisica e Vulcanologia (AIS-INGV), while also developing tools for ionospheric monitoring and training future space weather scientists in Eastern Africa, elevatating the Luigi Broglio – Malindi Space Centre (BSC) in Kenya as a focal point for ionospheric research in Africa and to promote the growth of Space Weather expertise within the Kenyan scientific community.

This work aims to report the results obtained during a three-year project, both in the scientific and capacity building fields. Initially we reports early scientific results provided by the only ionospheric observatory operating at present in Kenya, located in the Luigi Broglio Malindi Space Center (Malindi, Kenya; 3.22S, 40.12E), as part of the NORISK project. We present some examples of possible analyses that can be performed thanks to this new observatory based on the data collected from August 1, 2023 until today. Specifically, the analyses focus on several topics including: the reliability of the AIS-INGV

autoscaling system; the equivalent thickness of the ionospheric slab; the presence of the sporadic E layer; the vertical drift of the plasma estimated from the ionosonde measurements and its relation with the occurrence of L-band scintillation phenomena acquired by the ISMR receiver.

Secondly, the NORISK project represents a pivotal step towards ongoing capacity building efforts, empowering young scientists from developing countries to actively contribute to the international research endeavor aimed at unraveling the complexity of Sun-Earth interactions. In fact, through the deployment of ionosondes and GNSS receivers at BSC, the project facilitated two Capacity Building Workshop on Space Weather and Low-latitude Ionosphere, one in Malindi (Kenya) and another Trieste (Italy). Each of the two-week workshops provided more 30 postgraduate students with valuable opportunities to engage with international experts, attend theoretical lectures and gain practical experience in data analysis.