

The South African Ionosonde Network: Past and Present

Lee-Anne McKinnell^{1,2}, Nicholas Ssessanga^{1,2}, Hannes Coetzee³ and Daniel Okoh⁴

¹Hermanus Magnetic Observatory (HMO), P O Box 32, Hermanus, 7200, South Africa
Email: LMckinnell@hmo.ac.za

²Department of Physics and Electronics, Rhodes University, Grahamstown, 6140, South Africa

³GrinTek Ewation, Pretoria, South Africa

⁴Center for Basic Space Science, University of Nigeria, Nsukka 410001, Nigeria

Abstract

The South African ionosonde network has played an extensive role in African Space Physics studies since 1973. However, this network has really become a major contributor to ionospheric science since the year 2000 when the network expanded to 3 stations. In 2008, this network was further expanded to a fourth location, and now the South African ionosonde network has grown to 4 real time contributors of ionospheric data. The stations are located at Grahamstown, Louisvale, Madimbo and Hermanus.

This paper will describe the growth of this network, and the various practical projects that the network has been involved in, and indeed, made possible over the past decade. Future planned projects will also be discussed, and will include endeavors to grow the network into Africa. In addition, the South African ionospheric map will be used as an example of successful practical applications for the data collected from this network.

1. The Ionosonde Network

The South African ionosonde network consists of four DPS-4D digisondes, located at Hermanus (34.4°S, 19.2°E), Grahamstown (33.3°S, 26.5°E), Louisvale (28.5°S, 21.2°E) and Madimbo (22.4°S, 30.9°E). Figure 1 shows a map depicting the location of the stations within the South African ionosonde network. The database from Grahamstown includes continuously collected data from 1973 to the present, while Madimbo and Louisvale include data from 2000 [1]. The Hermanus ionosonde was installed in 2008.

2. Discussions

Data recorded by the South African ionosonde network has been used primarily for High Frequency (HF) radio communication studies over the African region. In addition, this highly valuable data resource has also provided extensive opportunities for researching the variability and predictability of various ionospheric parameters. Several students from different places in Africa have received their degrees for projects undertaken utilizing data from this network, and the network has also, in recent years, contributed data to the International Reference Ionosphere (IRI) global modeling effort.

This paper presents a series of past projects that included data from this network, including the latest ionospheric map [2] currently being validated for inclusion in a direction finding Single Site Location (SSL) system. The contribution made by this network to ionospheric modeling efforts is also highlighted, as well as the practical application of the models generated by the database created with this network. The ionospheric map of South Africa developed recently will be used as an example.

The current status of the network and future plans reveal the need for a co-location of additional radars with the ionosonde network to investigate irregularities and a discussion on these plans are also included.

South African Ionospheric Stations

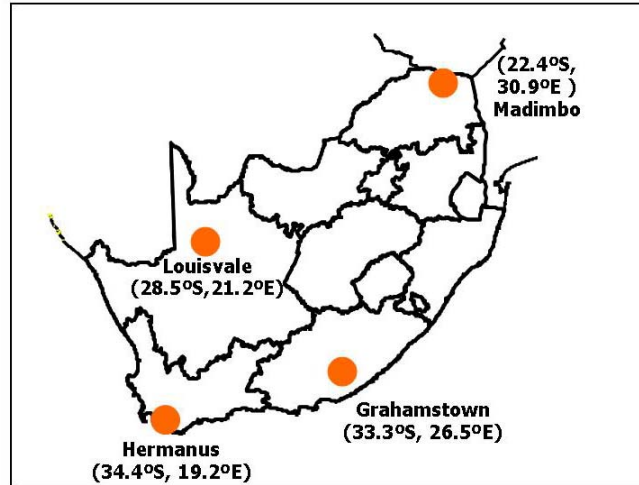


Figure 1: A map depicting the locations of the stations within South Africa.

2. References

1. McKinnell L.A., "The progress of the South African Ionosonde network, American Institute of Physics Conference Proceedings, Radio Sounding and Plasma Physics, ISBN 978-0-7354-0493-9, pp. 47-52, 2008.
2. Okoh DI., McKinnell L-A, Cilliers PJ, Developing an ionospheric map for South Africa, Ann. Geophys., 28, 1431-1439, 2010, doi:10.5194, 2010