

# Co-located Space Weather Radar Studies over Southern Africa

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## Abstract

Over the past decade considerable attention has been given to increasing the geophysical infrastructure within the African region with particular emphasis on data collection for the purpose of enhancing our knowledge of ionospheric events that result from adverse Space Weather. South Africa continues to contribute to this effort through the expansion of its own networks, the assistance with networks into other African countries, and the training of young researchers from Africa. Currently, the South African network includes four DPS-4D digisondes, approximately 50 Global Positioning System (GPS) receivers, 1 GPS Scintillation **Receivers**, 1 High Frequency (HF) Doppler Radar and 2 permanent Magnetic Observatory Sites. At least 4 sites in South Africa currently host, or will in the future host, co-located radar systems. This paper will demonstrate the ability to enhance scientific investigation of Space Weather events over South Africa using co-located radar systems. The examples will be given for the Hermanus, South Africa location, which was the first African site to host a DPS-4D digisonde, HF Doppler Radar and GPS Scintillation receiver at the same location. The benefits of this site in assisting with event analysis, particularly for Space Weather forecasts and predictions, will be shown.

## 1. South African Space Weather Observatory

The South African network includes four DPS-4D digisondes, approximately 50 Global Positioning System (GPS) receivers, 1 GPS Scintillation **Receivers**, 1 High Frequency (HF) Doppler Radar and 2 permanent Magnetic Observatory Sites. The four main observing sites are located at Hermanus, Louisvale, Madimbo and Grahamstown all within the South African border. The magnetic observatories are located at Hartebeesthoek and Hermanus. Currently, Hermanus is the only site that hosts co-located radar systems, and the results presented in this paper will mostly be from that site. However, plans are in place to increase infrastructure at the Louisvale, Madimbo and Grahamstown sites creating co-located centers in these regions. So, by the end of 2012, at least 4 sites in South Africa will host co-located radar systems. In addition a programme is under way to establish 17 magneto-telluric sites within South Africa, to install an additional HF Doppler Radar centered on Madimbo and 3 GPS Scintillation receivers co-located with the ionosonde network. The aim is to create a South African Geophysical Laboratory for Space Weather studies using the entire country as the footprint.

## 2. Discussions

Currently underway are event analysis scenarios looking for correlations between Doppler Radar signatures and ionosonde and magnetometer data, as well as mid latitude GPS scintillation effects. This paper will show initial results from this kind of analysis, and, in addition will include the kind of space weather information that is expected to be derived from the expanding South African network. Advantages to the continuous endeavour to map the near earth space environment over Africa will also be presented.