Ionospheric ground based monitoring network in low-latitude regions: Africa

Towards Mapping of Electron Density, Scintillation and Total Electron Content (MEDSTEC)

Executive Summary

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Picture:

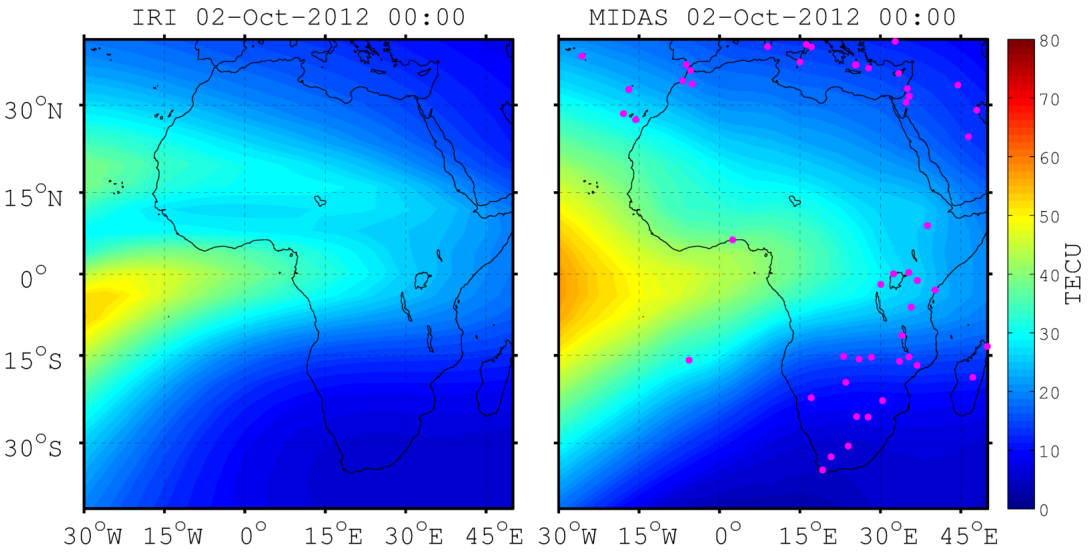

Figure. IRI model and simulation of GPS TEC reconstruction based upon the sparse network of receivers over Africa.

Motivation:

The aims of the project were to network with the current ionospheric researchers across Africa and demonstrate improvements to ionospheric mapping that could be made through the strategic placement of further ground-based sensors across the continent.

Methodology:

Initially a consortium was formed between a group of partners with strong links across the African region. A workshop was convened and held in Hermanus, South Africa. This brought together a number of researchers from across Africa with the focus of working on a paper that would demonstrate the benefit of additional ionospheric sensors to map the equatorial and mid-latitude ionosphere over Africa.

The approach was to represent the ionosphere using the IRI model and then to simulate measurements from different subsets of ground-based GPS receivers. The reconstruction of the ionosphere, using the MIDAS software algorithms, allowed the advantage of additional sensors to be evaluated.

The project had the benefit of bringing new researchers together and in addition, in identifying new additional sites to host GPS receivers that could be run by committed and experienced research staff.

Results:

Outcomes of the project were:

- A new and enthusiastic network of ionospheric researchers across Africa have been connected to international partners.
- Simulation studies showed that the African ionospheric monitoring could be improved by having additional ground-based sensors.
- Priority sites for TEC mapping were identified in: Algeria, Egypt, D. R. Congo and Niger.

Publications:

Chartier, A. T., J. Kinrade, C. N. Mitchell, J. A. R. Rose et al. (Submitted, May 2013), 'Ionospheric Imaging in Africa', *Radio Sci.*

Highlights:

The main new finding was that there is great enthusiasm from scientists across Africa towards further improving the capability of ionospheric monitoring across the region. There are vast areas across Africa that do not host any kind of ionospheric monitoring equipment and the installation of more monitoring facilities would provide considerable improvements in understanding and characterising the low-latitude African ionosphere.