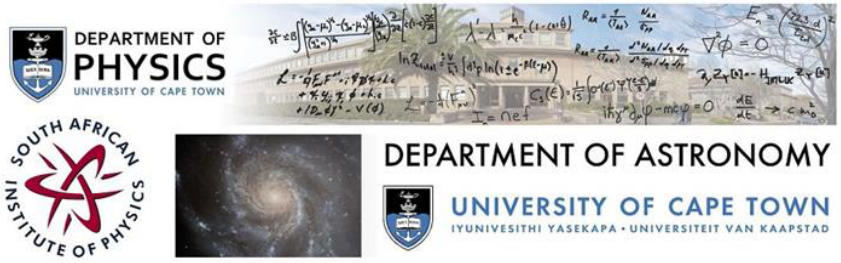

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Ionospheric characterisation of the South Atlantic Magnetic Anomaly using a ship-based dual-frequency GISTM receiver

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Abstract content
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The South Atlantic Magnetic Anomaly (SAMA) is the region in the South Atlantic Ocean where the Earth's magnetic field is weakest at comparable latitudes. It is of interest due to the precipitation of high energy particles into the ionosphere over this region during geomagnetic storms.

This paper reports the novel use of a geodetic-grade, dual-frequency GPS Ionospheric Scintillation and Total Electron Content Monitor (GISTM), located on the polar research vessel SA Agulhas II, in combination with a modified algorithm to characterise the ionosphere over the SAMA during voyages through this region.

Ionospheric Scintillations are rapid fluctuations in the phase and amplitude of trans-ionospheric radio signals resulting from electron density variations along the ray path. Identification of the ionospheric structures that cause these scintillations and characterising the effect they have on satellite communications requires measuring the Total Electron Content (TEC) along ray paths from GPS satellites to terrestrial receivers to determine the spatial distribution of ionospheric electrons.

Traditional TEC and scintillation measurements are done using dedicated dual-frequency GPS receivers at fixed terrestrial locations. SANSA operates several receivers in Southern Africa, at Marion Island, Gough Island, and SANAE-IV in Antarctica. However, most of the SAMA lies beyond the reach of these land-based sensors.

The GISTM installed on board the SA Agulhas II in 2012 has enabled for the first time the terrestrial measurement of scintillation in the SAMA. In this project, the amplitude (S4) and phase scintillation (&sigma_{&Phi}) indices from 50Hz L1 signals recorded during the 2014 and 2015 voyages of the SA Agulhas II will be analysed for the first time.

Mobile TEC measurements will be verified with stationary TEC measurements in intersecting areas. The SA Agulhas II is additionally equipped with vibration sensors that will be used to determine the possible coincidence of the observed scintillation events with ship-generated vibrations.

Apply to be
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Level for award
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MSc

Main supervisor (name and email)
and his / her institution

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