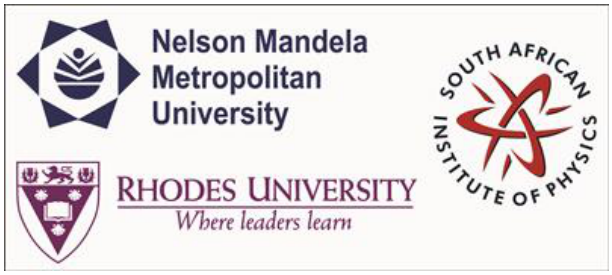

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Characterization of the Multipath Environment of Ionospheric Scintillation Receivers

Wednesday, 1 July 2015 14:40 (20 minutes)

Abstract content
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Global Navigation Satellite Systems (GNSS) are used to provide information on position, time and velocity all over the world at any time of the day. Accuracy of the output or even the availability of the system depends on the current condition of space weather, which can contribute to the random fluctuation of the received signal's phase and amplitude called scintillation. Severe ionospheric scintillation due to multipath effect can lead to cycle slip and loss of lock on the satellite or degradation in the accuracy of position determination. Interference of GNSS signals that are scattered and diffracted by stationary objects on the ground, with signals that travel along a direct path via the ionosphere to the antenna, will contribute to the errors in the measured amplitudes and phase. These are known as multipath errors. Higher elevation cut off angles used for filtering GNSS signals, usually 15-30°, can eliminate non-ionospheric related interference especially multipath errors that are coming from the horizon. At the same time, a fixed elevation threshold can result in significant loss of valuable data since this method does not take into consideration the surrounding environment of each GPS station.

In this project we studied the multipath environment of Gough Island GISTM receiver antenna installed by SANSA (South African National Space Agency) by plotting azimuth-elevation maps of scintillation indexes averaged over one year. This was used to identify objects that regularly scatter signals and cause high scintillation resulting from multipath effects. After identifying the multipath area from the azimuth-elevation map, an azimuth dependent elevation threshold was developed using MATLAB curve fitting tool. Using this method we are able to reduce the multipath errors without losing important data. The azimuth dependence elevation threshold typically gives 19 % more useful data than by using 20° fixed elevation threshold.

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