

## Spatial index based on Optimal Stratification technique of ROTI maps for ionospheric irregularities characterization and monitoring

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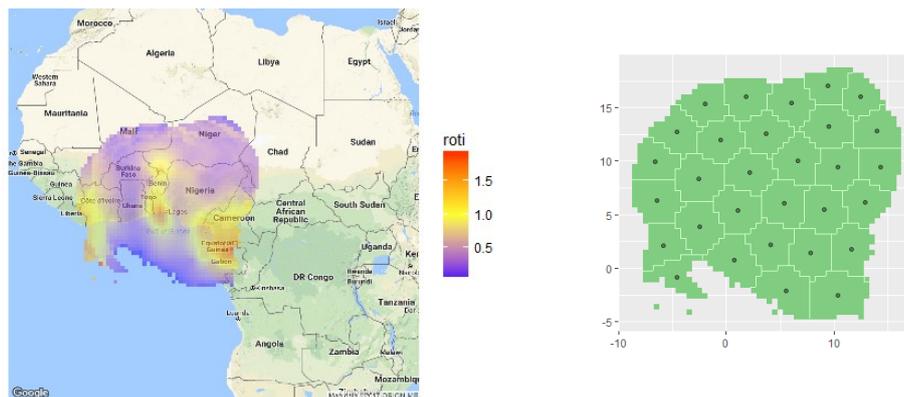
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For more than two decades now, the rate of change of TEC index (ROTI) has been identified to be an important parameter to characterize the occurrence and magnitude of ionospheric electron density variations. This has been found to be a good proxy to the ionospheric scintillation, a common radio propagation phenomenon in the equatorial ionization anomaly (EIA) region. However, evaluate effectively ROTI over a complex region like the low and equatorial African region is difficult. The reason being that ground-based data to estimate ionospheric plasma irregularities are limited and ROTI over a specific region can be obtained only by interpolation of the available measurements due to sparsity of the useful data. Even though there are many interpolation algorithm models, the accuracy of the estimated point will generally diminish as the distance between the pierce points increases.

To evaluate the spatial distribution of the ionospheric irregularities over African sector, we mapped ROTI over small sectors using ordinary Kriging technique at the grid resolution of 0.5 by 0.5 degrees in longitude and latitude. The regional maps of ROTI were further reduced to the densest area of ionospheric pierce points (IPPs).

This paper reports first results on the application of cluster analysis based on a well-established method which is the k-means algorithm [1] for determining mapping samples and spatial indexes aimed to characterize the mapped irregular structures of ROTI values under disturbed conditions. A spatial coverage sampling technique [2] to obtain spatial means in the West African region has been implemented for selected test cases.



**Figure 1.** Left: ROTI Map projected on West African map for an epoch with irregularities. Right: example of spatial coverage sample to estimate spatial means in centroids.

In the cases analyzed, the clusters' centroids are taken as sample points together with the corresponding ROTI value. An estimation of the spatial mean and standard error in the area can be obtained from the stratified samples and they can be used as indicators of the occurrence and intensity of large scale fluctuations in the ionosphere.

## References

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