

The Possibility of Using GNSS Quality Control Parameters to Assess Ionospheric Scintillation Errors

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SUMMARY

Global Navigation Satellite Systems are affected by a variety of errors that can influence the quality and reliability of the position information calculated using their signals. One of the major sources of error experienced by GNSS signals is caused by the atmospheric effects of the ionosphere. The ionospheric error on GNSS signals is particularly degrading to the quality and integrity of GNSS positions by a phenomena known as ionospheric scintillation. This phenomena is more prevalent at areas close to the magnetic equator as well as close to the Polar Regions. Currently, these effects are primarily studied using specialised ionospheric scintillation GNSS receivers that calculate the effects on the phase and amplitude of the GNSS signals by 2 parameters: S4 and $f_{min}^{(3000)MUF}$. However, these specialised receivers are more expensive than normal GNSS receiver and the networks that contain these are sparser than existing GNSS networks. The study of this phenomena would therefore be aided if scintillation effects could be investigated both in the past (from archived data sets) and in the future by utilising the huge number of Continuously Operating Reference Stations (CORS) found around the world. In previous studies a possible correlation between quality control parameters that can be calculated using any GNSS receiver and the scintillation parameters S4 and $f_{min}^{(3000)MUF}$; has been noted. This paper uses dedicated scintillation monitoring receivers and normal CORS GNSS network receivers in Hong Kong to investigate the usefulness of using the quality control parameters calculated using TEQC as a method of evaluating the effects of ionospheric scintillation. The results show that there is some agreement between the scintillation and the quality control parameters and that it may be possible to use quality control parameters as a means of assessing ionospheric scintillation effects.

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