

A Multi-Constellation Analysis of Global Navigation Satellite System (GNSS) Signals in the Equatorial Region

Recent advances in the availability of Global Navigation Satellite System (GNSS) constellations provides new opportunities to perform Ionospheric scintillation studies using different signal structures and increased spatial diversity. In this paper, we present an analysis of multi-constellation, multi-frequency GNSS receiver data acquired in the Equatorial Region during a recent minor geomagnetic storm.

The objectives of this research were to investigate the frequency and constellation dependence of scintillation in order to gain insight into the propagation environment and to aid in the future development of mitigation strategies. The observations in this work show that GPS frequency band L1 scintillates less than L2 while L5 is comparable to L1. It is also shown that newer, more advanced signals such as those utilized by Galileo have lower scintillation than GPS while GLONASS routinely has higher levels of scintillation.

In order to investigate the underlying reasons for the reduced scintillation observed in these newer signals GPS Gold code and Galileo tiered sequence signal models are developed and their correlation properties subsequently analyzed using a phase screen scintillation sequence generator.