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## **Characteristics of High-latitude and Equatorial Ionospheric Scintillation of GNSS Signals**

Abstract:

In this paper, several years of multi-constellation global navigation satellite scintillation data collected at Alaska, Peru, and Ascension Island are analyzed to characterize scintillation features observed at high latitude and equatorial locations during the current solar maximum. Recognizing that strong scintillation data are often lost due to the lack of robustness in conventional GPS receivers used for ionosphere scintillation monitoring (ISM), an autonomous event driven scintillation data collection system using software-defined raw RF sampling devices have been developed deployed at a number of strategically selected high latitude and equatorial locations since 2009. This unique scintillation data recording system is triggered by indicators computed from a continuously operating ISM receiver and the raw RF data is post processed using advanced receiver signal processing algorithms designed to minimize carrier phase cycle slips and loss of lock of signals during strong scintillations.

Based on scintillation events extracted from the raw data, several statistical distributions are established to characterize the intensity, duration and occurrence frequency of scintillation. Results confirm that scintillation at low latitudes is generally more intense and longer lasting, while high-latitude scintillation is milder and usually dominated by phase fluctuations. Results also reveal the impacts of solar activity, geomagnetic activity and seasons on scintillation in different areas. Combining measurements from a co-located geo-magnetometer and corresponding global geomagnetic activities, qualitative and quantitative correlations between scintillation and both local and global geomagnetic activities have been obtained.

Results show that in Alaska, the occurrence frequency and intensity of scintillation, especially phase fluctuations, have strong correlations with geomagnetic field intensity disturbances, while in equatorial stations, the correlation is not obvious.