Multi-Constellation and Multi-Frequency GNSS Studies of Ionospheric Scintillation

Yu Morton, Dongyang Xu, Mark Carroll, Yu Jiao, Jun Wang, Steve Taylor
Electrical and Computer Engineering Department
Miami University, Oxford, OH

Xiaolei Mao
Samsung Semiconductor Inc.
Cedar Rapids, IW

The recent proliferation of multi-constellation Global Navigation Satellite Systems (GNSS) is offering a great opportunity for ionosphere scintillation studies. Since 2009, our research team has established permanent and temporary portable ionosphere scintillation monitoring and data collection systems in Alaska, Ascension Island, Hong Kong, Peru, and Singapore to collect multi-constellation multi-frequency GNSS scintillation data. Raw wideband IF samples were recorded during scintillation events at these locations. Advanced GNSS receiver signal processing algorithms have been developed and applied to post-process these data with the objective to preserve GNSS signal parameters in their distorted state due to scintillation. Quantitative analysis of the impact of conventional GNSS receiver signal processing on the scintillation signal parameters will be presented, followed by approaches to correct receiver processing effect to reveal the true state of signals experiencing scintillation. Scintillation signals parameters obtained using these approaches for GPS, Beidou, Galileo, and GLONASS from the locations listed above will be presented to highlight the differences between high latitude and equatorial regions.