

Abstract: "Improved Algorithms for Amplitude- and Phase-Scintillation Indices of GPS Signals"

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Disturbances in the ionosphere can lead to irregularities in electron density. These irregularities can cause scintillations (or fluctuations) of GPS signals. The scintillation can manifest itself as rapid variations in GPS signal's amplitude or phase. Conventional understanding of GPS signals suggests that amplitude scintillation occurs more frequently at low latitudes and phase scintillation is more prominent at high latitudes. Scintillation studies at high latitudes have reported high σ_ϕ (phase scintillation index) and lower S4 (amplitude scintillation index) leading to "phase scintillations without amplitude scintillations." Arguments have been made that this condition of "phase scintillation without amplitude scintillation" is a result of improper detrending at high latitudes. At lower and mid latitudes, receivers often use a high pass filter with a constant cutoff frequency to detrend the GPS signals. These same detrending methods are often used at high latitudes. In a recent paper, Mushini, et al. (2012) used wavelet based detrending methods to investigate the relative strength of amplitude and phase scintillations in the Canadian Arctic region. The wavelet base detrended data from Mushini, et al. (2012) showed a greater correlation between S4 and σ_ϕ . In this study, we implement a wavelet-based detrending scheme and analyze data from ASTRA CASES GPS receivers in Alaska to estimate S4 and σ_ϕ . We compare these results with previous estimates of scintillation indices to identify the differences between the two processing schemes.