Canadian High Arctic Ionosphere Network (CHAIN) GPS data are used to build probability density distribution for the amplitude and phase scintillation indices. For the phase scintillation index, we found that the distribution fits well the Landau distribution. The magnitude of the distribution scale parameter is modulated by the diurnal, seasonal and the solar cycle fluctuations in the ionosphere. Through a comparison with the phase screen theory, we can infer the global spatial length, as well as the magnitude of the turbulence strength of the ionospheric irregularities that cause radio wave phase variations.

The probability density of the amplitude scintillation index noticeably departs from the Gaussian distribution. In this case, the derived distribution scale parameter does not follow the variation patterns seen in the phase index. These results suggest that refractive effects mainly dominate phase scintillations.