# Real-time Scintillation Monitoring in the Auroral Zone from a Longitudinal Chain of ASTRA's SM-211 GPS TEC and Scintillation Receivers

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Amplitude and phase scintillation can cause serious difficulties for GPS receivers. Intense scintillation can cause loss of lock. High latitude studies generally show that phase scintillation can be severe, but the amplitude scintillation tends to be small. The reason for this is not yet understood. Furthermore, the actual causes of the ionospheric irregularities that produce high latitude scintillation are not well understood. While the gradient drift instability is thought to be important in the F-region, there may be other structures present in either the E- or F-regions. The role of particle precipitation is also not well understood.

An array of ASTRA's CASES GPS receivers were deployed in Alaska to demonstrate our ability to map scintillation in realtime, to provide space weather services to GPS users, and to initiate a detailed investigation of these effects. These dual-frequency GPS receivers measure total electron content (TEC) and scintillation. The scintillation monitors were deployed at sites in Kaktovik (70.1° N, 143.6° W) Fort Yukon (66.6° N, 145.2° W), Poker Flat (65.1° N, 147.4° W), and Gakona (62.4° N, 145.2° W), Toolik Field station (68.6° N, 149.6° W), and Eagle (64.8° N, 141.2°W). Scintillation statistics show phase scintillations to be largest at Kaktovic and smallest at Gakona. We present GPS phase scintillation and auroral emission results from the Alaska CASES array to characterize the correspondence between scintillation and auroral features, and to investigate the role of high latitude auroral features in driving the phase scintillations. We will also present data showing how phase scintillation can cause other GPS receivers to lose lock. The data and results are particularly valuable because they illustrate some of the challenges of using GPS systems for positioning and navigation in an auroral region like Alaska. These challenges for snowplough drivers were recently highlighted, along with the CASES SM-211 space weather monitor, in a special video in which ASTRA and three other small businesses were presented with an entrepreneurial award from William Shatner (http://youtu.be/bIVKEQH_YPk).