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Statistical study of the GPS phase scintillation associated with plasma blobs

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We present a study of the space weather effect of GNSS scintillation in the auroral/polar cap ionosphere with multi-instrument observations, including GNSS scintillation receiver, all-sky imager, and EISCAT radar. We focus on the period when polar cap patches (islands of high density F region plasma with density enhanced more than twice above the surrounding) exit the polar cap. When the patch exits into the nightside auroral region (and then it is termed blob), the GNSS phase scintillation can be enhanced; indicating that the blob is important for the scintillation study [Jin et al., 2014]. In the present study, we expand the data set to see how representative it is. From November of 2010 to February of 2014, 41.4 hours of data from all-sky imager were collected in 16 days when the airglow patches were observed to hit the nightside aurora and when the aurora covered a quarter of the all-sky imager field of view at Ny-Ålesund. The collocated GNSS scintillation receiver is used to study the scintillation impact. This study clearly shows that the scintillation level of a blob is higher than the scintillation level of the corresponding patch. However, no clear relation between the blob scintillation and the pre-conditioning of polar cap patches is found. Furthermore, the aurora alone did not produce strong scintillation. This implies that the aurora plays a role in structuring of the blob and increases its scintillation level. We also look into possible instability mechanisms which produce the plasma density irregularities.