The possible role of ion-neutral slip velocity in the formation of decametre-scale irregularities in the high-latitude ionosphere

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Abstract. Many of the SuperDARN radars are located under or near the nightside auroral oval and echoes recorded by them can not necessarily be used to infer a complete picture of irregularity occurrence in this region. This is because of the loss of backscatter caused by enhanced radio-wave absorption due to particle precipitation and because the auroral oval expands equatorward of their fields of view. The Tasman International Geospace Environment Radar (TIGER) (43.4°S, 147.2°E; –54.5°Λ) may be located sufficiently equatorward to provide a more "objective" inference of irregularity occurrence in the nightside auroral oval during quiet and moderately disturbed conditions. The ionospheric scatter at ranges >630 km is thought to emanate from F-region irregularities drifting at the $\boldsymbol{E}\times\boldsymbol{B}/B^2$ convection velocity. There is a strong tendency for the echo occurrence rates and average backscatter power to maximise post-midnight. This implies more intense decametre-scale irregularities occur post-midnight since ionospheric absorption due to energetic electron precipitation should increase then. This important aspect of the observations requires an explanation. Here we consider the possible role of the ion-neutral slip velocity in regulating the formation of irregularities via the gradient drift instability in the high-latitude ionosphere, as explained in Tsunoda, Rev. Geophys., 26(4), 719–760, 1988.