# Spatial Distribution of Irregularity Occurrence Rate in the Subauroral F Region as Observed by the SuperDARN Radars

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We have investigated the scattering occurrence rate distribution of northern hemisphere SuperDARN HF radars. Most significant result is that the distribution of scattering occurrence rate(which is almost identical to the irregularity occurrence rate) peaks in the duskside subauroral region around the terminator as mapped into geographical coordinate system. The location of this irregularity enhanced region is located in the dusk sector subauroral region whose invariant latitude is slightly lower than the equatorward edge of the auroral oval in geomagnetic coordinate system. The area coincides the position of the plasma density depleted region known as the mid-latitude trough.

We have investigated the scattering occurrence rate distribution of northern hemisphere SuperDARN HF radars. All available common time operation data of northern hemisphere SuperDARN radars are used in the statistical analysis and the study period encompassed 39 months (from July 1995 to September 1998). Most significant result is that the distribution of scattering occurrence rate(which is almost identical to the irregularity occurrence rate) peaks in the duskside subauroral region around the terminator as mapped into geographical coordinate system. The location of this irregularity enhanced region is located in the dusk sector subauroral region whose invariant latitude is slightly lower than the equatorward edge of the auroral oval in geomagnetic coordinate system. The area coincides the position of the plasma density depleted region known as the mid-latitude trough. In addition, the characteristics of the peak region have a little difference between the months around winter(Period B : January, February, October, November and December) and the rest months(Period A : from March to September). The location of the peak region is closely related to both the terminator and the mid-latitude trough in the case of Period A. On the contrary, the relationship of the peak region with the mid-latitude trough is more intense than that with the terminator in the Period B. Adding to the results above, the dependence of the peak region on the level of geomagnetic disturbance as estimated by Kp index was examined. In the Period A, the peak region disappears with the increase of Kp index and the occurrence rate in that area is intensified with the decrease of Kp index. On the other hands, scattering occurrence rate becomes larger with the increase of Kp index and smaller with the decrease of Kp index in the case of Period B. These statistical results suggest that the enhancement of irregularity occurrence is associated with both the terminator and the mid-latitude trough in the Period A and is mainly related to the mid-latitude trough in the case of Period B. In the Period A, we propose the mechanism of irregularity formation due to the gradient-drift instability with the localized polarization electric field around the terminator and density gradient in the poleward "wall" of the mid-latitude trough. This localized polarization electric field is supposed to be produced by the gradient of the electric conductivity due to the plasma density gradient around the terminator. In the case of the Period B, the irregularities are produced mainly in the gradient-drift instability with the longitudinal(westward) density gradient at the duskside edge of the mid-latitude trough and poleward electric field within the trough. Of course, the mechanism proposed for the Period A plays a role for the irregularity enhancement to some extent even in the Period B. In addition, it is supposed that the asymmetry of irregularity occurrence betwee

n dawn and dusk is owing to the equatorward shift of the mid-latitude trough in the dawn meridians and the difference of density gradient in magnitude around th e terminator.