

Study of ionospheric disturbances during solar flare events with the SuperDARN Hokkaido Radar

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Ionospheric disturbances during solar flare events have been studied by various kinds of observation instrument in the last few decades. Hosokawa et al. (2000) showed that during solar flare events sudden fade-out of ionospheric backscatter echoes are registered by the high-latitude SuperDARN Radar. This indicates that electron densities in the E- and D-region ionosphere increase, leading to radio wave absorption. Kikuchi et al, (1986) reported on the positive Doppler shift in the HF Doppler system data during solar flare events, and indicated that there are two possible factors of Doppler shift, i.e., (1) apparent ray path decrease by changing refraction index due to increasing electron densities at D-region ionosphere, and (2) ray path decrease due to descending reflection point associated with increasing electron density at F-region ionosphere.

In this study, we use the SuperDARN Hokkaido Radar to investigate the detailed characteristics of solar flare effects on ionospheric disturbances.

We focus on positive Doppler shift of ground / sea scatter echoes just before sudden fade-out of echoes. Since the factors (1) and (2) discussed above have different dependence of Doppler velocities on echo range or elevation angle, we can analyze carefully Doppler velocity of radar echoes with their dependences on echo range and elevation angle to obtain information on the electron density changes in the D- and F-region ionosphere. Initial results of the analysis will be presented.

Keywords: solar flare, ionospheric disturbance, doppler shift, SuperDARN Hokkaido Radar