Statistical analysis of responses of D region electron density to solar flares

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The perturbations of D region electron density can cause many problems in radio wave propagating. Generally, solar flare is considered as a main perturbation source of electron density. To study the effect of flares on electron density in D region, the data observed by MF radar, installed at Kunming station with latitude of 25.6^{o}N and longitude of 103.8^{o}E, are analyzed to understand the variations during large solar flares.

A total of 24 solar flares, including 01 C-class, 22 M-class, 01 X-class, occurred during daytime from local time 8:00 to 16:00 in high solar activity period. So the D region reference height (H') and sharpness factor (β) for each class of solar flares (C, M, X) have been estimated. We can find that the two parameters are positively correlation with the local time of flare's occurrence and their classes. For example, the valid reference height (H') sharply decreases from about 71 km to about 60 km, with the maximum correlation of 0.9607. At the same time the parameter of β has an obvious increase during flares. Though the level of effect has strong correlation with flare class, it is not very strict linear relation between H' and class, which is confirmed by response results of X1.1 flare. I considered the observation principle and estimation rules of MF radar may be the main cause, which must be further investigated in future work.

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