The influence of magnetospheric substorms on SuperDARN radar backscatter

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The SuperDARN ionospheric radar network is a leading tool for investigating the near-Earth space environment. However, reductions in ionospheric backscatter have been reported during magnetospheric substorms. We have therefore investigated the impact of substorms upon SuperDARN backscatter during 3005 substorms and find that the global level of scatter maximizes just prior to substorm onset. In the nightside ionosphere, backscatter poleward of ~70 deg magnetic latitude is reduced, with radar echoes shifting to lower latitudes. An examination into the frequency-dependence of nightside backscatter evolution during substorms reveals that although most backscatter data is based upon operations in the 08–14 MHz range, higher operating frequencies may offer improved performance in the period just prior to and immediately following expansion phase onset. We suggest that the SuperDARN array of high-frequency coherent-scatter radars, and in particular those radars with the ability to simultaneously operate at dual frequencies, will play a key role in future space- and ground-based studies of substorms.