Shock-Aurora: FAST and DMSP Observations

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Interplanetary shocks and pressure pulses can trigger intense dayside aurora and very fast anti-sunward auroral expansion along the auroral oval. We call this auroral phenomenon "shock-aurora". Here we investigate the shock-aurora from low altitudes using FAST and DMSP observations. Out of 148 SSCs that occurred in 1996-2000 we found 7 events for which the FAST spacecraft crossed the dayside auroral oval within 10 min after the shock or pressure pulse arrived at the nose of the magnetosphere. Both FAST and DMSP observations shown that downward electron and ion energy fluxes increased significantly in magnitude and latitudinal extent after shock compressions. At FAST altitudes the increased electron energy deposition was attributed to two causes, depending on latitude. Electrons precipitating at lower latitudes had energy >= 1 keV indicating a plasma sheet origin. These electrons showed little evidence of additional field-aligned acceleration, and we attribute the enhanced fluxes to adiabatic compression associated with the shock passage. At higher latitudes, the precipitating electrons generally had energies less than ~1 keV and were observed within regions of highly structured field-aligned currents. The intensified field-aligned currents could result from enhanced magnetic field shearing near the boundary of closed and open field lines during the shock compression. We conclude that shock-aurora are mainly discrete aurora at higher latitudes, near the polar cap boundary, and diffuse aurora at lower latitudes.