Characteristics of CME and CIR driven ion upflows in the polar ionosphere

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Abstract

We investigated how velocity and flux of ionospheric ion upflows vary during CIR and CME driven storms, using data from the European Incoherent Scatter (EISCAT) Tromsø UHF and Svalbard radars between 1996 and 2015. The characteristics of ion upflows were compared with ion and electron temperature variations measured with EISCAT, and also joule heating rate and field-aligned current distribution derived from Weimer model. Upward ion velocity increases in the night-time at 66 deg magnetic latitude just after the CIR and CME driven storms, corresponding to electron temperature enhancements due to soft particle precipitation and also ion temperature enhancements in the auroral electrojet region. CME driven storms have larger upward ion flux (~1.7×10^{13} $m^{-2}s^{-1}$) than those under CIR driven storms (~0.3×10^{13} $m^{-2}s^{-1}$). In the dayside, ion upflows are seen at 75 deg magnetic latitude, with an upward flux of typically 10^{13} $m^{-2}s^{-1}$ for small CIR and CME storm cases. The dayside ion upflows under small CIR storms continue for a few days after storm onsets, whereas those under small CME storms have a large enhancement only on the first day of the storms.