



**Polar Cap Potential Saturation and Ionospheric Convection Patterns during Superstorms**

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Five super intense magnetic storms (with minimum Dst < -200 nT) were examined to investigate the relationship between polar cap potential (PCP) saturation and ionospheric convection patterns. A quantitative method was used to determine whether or not PCP was saturated by applying both linear and nonlinear (exponential) fits for each event. The results showed that PCP saturation occurred for two of five. The two events with saturation had distorted ionospheric convection patterns (D-CONV) with asymmetric vortices, while for the other three events without PCP saturation had well-known standard convection (S-CONV) with quasi-symmetric twin vortices. The authors conclude that sporadic midnight sector substorm electric fields may contribute to the asymmetric convection patterns and PCP saturation, in agreement with previous speculations. Further analyses are needed to confirm this hypothesis.