AOGS 2006

Corotating Solar Wind Streams and Recurrent Geomagnetic Activity

BRUCE TSURUTANI[1], WALTER GONZALEZ[2], ALICIA CLUA DE GONZALEZ[2], FERNANDO GUARNIERI[2], NAT GOPALSWAMY[3]

[1] *Jet Propulsion Lab*

[2] *INPE*

[3] *GSFC*

[4] *RAL*

[5] *STEL*

Solar wind fast streams emanating from solar coronal holes cause recurrent, moderate intensity geomagnetic activity at Earth. Intense magnetic field regions called Corotating Interaction Regions or CIRs are created by the interaction of fast streams with upstream slow streams. Because of the highly oscillatory nature of the GSM magnetic field z component within CIRs, the resultant magnetic storms are typically only weak to moderate in intensity. CIR-generated magnetic storm main phases of intensity Dst < - 100 nT (major storms) are rare. The elongated storm "recovery" phases which are characterized by continuous AE activity that can last for up to 27 days (a solar rotation) are caused by nonlinear Alfven waves within the high streams proper. Magnetic reconnection associated with the southward (GSM) components of the Alfvén waves is the solar wind energy transfer mechanism. The acceleration of relativistic electrons occur during these magnetic storm "recovery" phases. The magnetic reconnection associated with the Alfvén waves cause continuous, shallow injections of plasmasheet plasma into the magnetosphere. The asymmetric plasma is unstable to wave (chorus and other modes) growth, a feature central to many theories of electron acceleration. It is noted that the continuous AE activity is not a series of substorm expansion phases. Arguments are also presented why these AE activity intervals are not convection bays. The auroras during these continuous AE activity intervals are less intense than substorm auroras and are global (both dayside and nightside) in nature. Due to the continuous nature of this activity, it is possible that there is greater average energy input into the magnetosphere/ionosphere system during far declining phases of the solar cycle compared with those during solar maximum. The discontinuities and magnetic decreases (MDs) associated with interplanetary Alfven waves may be important for geomagnetic activity. In conclusion, it will be shown that geomagnetic storms associated with high speed streams/CIRs will have the same initial, main and