



Cluster multi-point measurements in the auroral return current region

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Cluster electric and magnetic field measurements from a number of perigee passes of auroral field lines have revealed that large electric fields are encountered in the nightside auroral return current region, indicating that the potential structures (earlier encountered by the Freja and FAST satellites at lower altitudes) associated with these regions extend all the way up to altitudes of $4-5 R_E$.

A number of such passes are studied in detail in order to use the multipoint measurements to draw conclusions about the spatial and temporal behaviour of the return current region. In particular for events with large current densities, there is some indication that the temporal evolution of structures can be associated with ionospheric modification caused by evacuation of current-carrying ionospheric electrons, as earlier simulations have suggested.