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Characteristics of DC electric fields in the inner magnetosphere

Harri Laakso, C.P. Escoubet, M.G.G.T Taylor, and A. Masson
ESA, RSSD, Noordwijk, Netherlands (Harri.Laakso@esa.int)

The inner magnetosphere contains two plasma regimes, the plasmasphere and radiation belts, that are weakly coupled to each other. The structure and dynamics of the cold dense plasmasphere is driven by magnetospheric convection E-fields that can cause a variety of irregularities in the plasmapause region. In particular large-scale plasmaspheric plumes are regularly formed at the dusk sector where they can be observed in nearly all times, although their characteristics depend upon the level of geomagnetic activity. Plumes are usually 1-2 L shell wide and the plasma drift velocity within the plume is 5-20 km/s westward/noonward and the related dc electric fields are normally of the order of 5 mV/m which is larger in magnitude than the normal co-rotation electric field. The dynamics of the radiation belt/ring current region is also associated with a growth of dc electric fields that is usually related to the dynamics of the near-Earth plasma sheet. These electric fields can grow up to several 100 mV/m. Such events are difficult to observe as they are transient and related to short-living dynamical features. These events can occur in various situations, e.g., during the steepening of the radiation belt edge or the occurrence of region 2 currents.