EPSC Abstracts
Vol. 9, EPSC2014-806, 2014
European Planetary Science Congress 2014

Oscillations in the magnetic field and magnetic holes in the vicinity of dipolarisation fronts

M.A. Balikhin
SSL, ACSE, University of Sheffield, Sheffield, United Kingdom

Abstract

Measurements from the closely spaced Cluster spacecraft are used to study the structure of the magnetic and electric fields within the magnetic ramp of dipolarisation fronts (DF). The finite value of the magnetic field along the minimum variance direction for the events studied indicates that the dipolarisation front structure was distinct from a tangential discontinuity. In addition to the main increase of the magnetic field in the maximum variance component, strong oscillations were observed in the intermediate component. The presence of this oscillatory structure results in an expansion of the region in which a change of magnetic pressure occurs, the size of which is typically an ion Larmor radius or greater. This widening is important in maintaining the pressure balance at the edge of the DF and provides implicit evidence of field align currents associated with DF. This phenomenon resembles observations of intense current sheets in the magneto-tail and also laboratory experiments of current sheet formation, in which a similar widening of the ramp region has been observed. In this paper we argue against the idea that an electron temperature anisotropy, resulting in electron curvature currents, can explain the formation of the oscillatory structures and suggesting an alternative model.

In addition magnetic holes filled with isotropic energetic electrons have been observed in the vicinity of dipolarization fronts are reviewed. These structures can partially contribute to the initial seed population of energetic electrons within the magnetosphere. Previously, these structures have been interpreted as the result of the mirror instability due to the similarity in their appearance with mirror dips observed in the terrestrial magnetosheath and solar wind. The THEMIS data shown here prove that the measured properties of these structures contradict to the interpretation as mirror waves. In the present study it is shown that these waves do not exhibit the effects on the ion population that are expected due to mirror wave structures. It is argued that the tearing instability can be responsible for their generation.