



Mid-altitude cusp properties: simultaneous Cluster observations at different MLT sectors

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The magnetospheric cusp plays a crucial role in the transfer of the solar wind plasma into the magnetosphere and ionosphere and is populated mainly by plasma of the magnetosheath origin entering the magnetosphere due to reconnection between the Interplanetary Magnetic Field (IMF) and geomagnetic field lines. Therefore characterisation of the cusp region, including cusp morphology, dynamics and plasma properties inside, is an important step in the understanding of the solar-wind-magnetosphere-ionosphere coupling. These observations can also be used for distant monitoring of the magnetopause reconnection properties, such as location, extension, temporal variability and effectiveness in the plasma acceleration.

In this talk we present results of the Cluster Guest Investigator campaign on the mid-altitude cusp crossings in 2015. During this campaign, Cluster, in a string-of-pearl configuration, crossed the cusp along the dusk-dawn orbit, and gave us a unique opportunity to study the cusp properties based on the simultaneous observations of this region at different MLT sectors by four spacecraft. Analysis of the collected events shows that the mid-altitude cusp region was observed simultaneously in the pre-noon and post-noon sectors with the cusp longitudinal width being at least 2.7-4.5 hours MLT depending on the event. At different locations, cusp was populated by repetitive plasma injections with periodicity of 5-8 minutes. Such observations indicate that the cusp injections came from the extended or/and multiple X-line(s), and that the reconnection rate variations are similar along the X-line. There were strong differences in the cusp plasma convection and densities when observed at different MLT sectors, which could be explained by combination of a few factors, which we will discuss. Due to the special longitudinal Cluster orbit, it was also possible to observe motion of the cusp proper as a whole structure, in agreement with the IMF By effect noted in the previous studies.