



The north-south asymmetry of LLBL structures under radial IMF conditions

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The Low-Latitude boundary layer (LLBL) is a boundary layer located between the magnetosheath and the magnetosphere. The LLBL can be subdivided into the outer and the inner LLBL. The LLBL has been well studied under the southward and the northward IMF Interplanetary magnetic field (IMF) conditions. However, the structure of LLBL under the radial IMF conditions is still unknown. Here we use the OMNI data to identify the radial IMF events and their corresponding magnetopause crossings using the THEMIS data for the period of 2007 to 2009. We find that the outer LLBL is missing in half of the events of the earthward radial IMF, but the outer LLBL exists for all events of sunward radial IMF. Whether the outer LLBL exists or not are controlled by the magnetic reconnection. It is well known that antiparallel magnetic fields are necessary for the magnetic reconnection. Under the earthward radial IMF condition, the reconnection only occurs in the southern hemisphere where the THEMIS probes are located during the summer, observing dayside magnetopause crossings. As a result, the reconnection removes the outer LLBL. For the sunward radial IMF, the reconnection does not occur in the southern hemisphere. Thus, the outer LLBL is observed.