

Characteristics of sudden commencements observed by Van Allen Probes in the inner magnetosphere ($L < 6$)

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It has been known that sudden commencement (SC) is produced by an interplanetary shock passing over the Earth's magnetosphere. Understanding its characteristics in the electric and the magnetic fields is one of the important research topics. Until now, there are many studies for SC using the data on the ground at high to low latitudes and in space at and beyond geosynchronous orbit. However, few SC studies have been done using the data obtained in the inner magnetosphere ($L < 6$). In this study we use the magnetic and electric field data acquired from the Van Allen Probes in the inner magnetosphere. During two year intervals from September 2012 to September 2014, 55 SC events were identified. The local time variations of SC-associated magnetic field perturbations in the inner magnetosphere are similar to those at geosynchronous orbit. Unlike previous studies at geosynchronous orbit, however, we observed only few numbers of negative perturbation (ΔB_H) 15% (3 of 19 events) in the B_H component (positive north) in the VDH coordinates near midnight (MLT = 21-03), while the majority of nighttime GOES 67% (12 of 18 events) showed negative perturbation. This indicates that main contribution of SC near midnight in the inner magnetosphere is the dayside magnetopause current rather than nightside SC-associated cross tail current. Regardless of the L-value, the dayside electric field revealed a dawnward(negative) direction with higher amplitude around the noon, while nightside electric field showed a slightly duskward(positive) amplitude for all events, which is consistent with previous studies.