Dynamics of the inner magnetosphere during September 2005 storms

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We report the dynamics of the ring current ions and radiation belt electrons during September 2005 storms, particularly focusing on the large-scale solar wind structures driving an intense storm on Sep. 11 (minimum Dst = -123 nT) and a moderate storm on Sep. 15 (minimum Dst = -74nT). The sun and solar wind origins of the ring current enhancements of these two storms are identified as shocked (or sheath) southward magnetic fields associated with high-speed halo-type CMEs on Sep. 9 and Sep. 13 when X6.2 and X1.5 flares blasted at AR808, respectively. Therefore, comparing these two storms provide an excellent opportunity to examine the different responses of energetic ions and electrons in the inner magnetosphere to somewhat similar large-scale solar wind structures. The intense flux enhancement of energetic electrons was seen at the slot region at L˜3 during the Sep. 11 storm, supporting our previous result that the flux at the slot region tends to increase during the CME-driven intense storms [Miyoshi and Kataoka, 2005, GRL]. On the other hand, the moderate storm on Sep. 15 produced an extremely large flux enhancement of energetic electrons at geosynchronous orbit without significant flux enhancement at the slot region. In fact, the enhancement during the recovery phase of the Sep.15 storm is one of the largest event during solar cycle 23, exceeding 10ˆ5 PFU level. As a driver source for this largest enhancement, we further discuss an important role of the high-speed stream following the CME material after Sep. 17, possibly associated with a coronal hole located at east side of the AR808.