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A split in the outer radiation belt by magnetopause shadowing: Test particle simulations

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We developed a three-dimensional relativistic test particle code and used it to calculate the trajectories of relativistic electrons in the outer radiation belt. By applying time-varying magnetic field data calculated from the Tsyganenko model, and by using observed solar wind data and the Dst index, we examined the drift loss of relativistic electrons by magnetopause shadowing (MPS). Since other loss processes such as wave-particle interactions are not included in this simulation, the pure MPS effect can be discussed. A split was found in the outer radiation belt after the enhancement of the solar wind dynamic pressure. Isolated electrons outside of the split have a narrow pitch angle distribution around 90? and are confined to a narrow range of the L-shell. We found that the existence of the isolated electrons depends on the large geomagnetic tilt angle. These findings indicate that the split can be seen during summer and winter after MPS occurs. We suggest that this split in the outer radiation belt during summer and winter is evidence that MPS actually causes the loss of the outer radiation belt.

Keywords: radiation belt, outer belt, loss process