

ACCELERATION AND EXTREME DISTORTION WITHIN THE VAN ALLEN RADIATION BELTS DURING THE “HALLOWEEN” SOLAR STORMS OF 2003

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The center of the outer Van Allen radiation belt is usually about 20000 to 25000 km away from Earth. This belt of high-energy electrons that are trapped on magnetic field lines in near-Earth space was enhanced and driven into a highly unusual configuration during the solar activity in late October and November – known by scientists as the “Halloween Storm” of 2003. During and following the Halloween Storm, the Van Allen belt electron population was powerfully accelerated and redistributed inward. From November 1 to November 10, the outer belt had its center only about 10000 km from Earth’s equatorial surface. As shown in this talk using IMAGE spacecraft data, the Earth’s ionized outer atmosphere (plasmasphere) was displaced inward (to an unprecedented degree) in October-November 2003, and concurrently the whole radiation belt structure was transformed. The region between the Van Allen belts, normally devoid of particles, became the location of highest radiation belt particle intensities. Such a remarkable deformation of the entire magnetosphere has not previously been witnessed and implies surprisingly powerful acceleration and loss processes deep within Earth’s magnetosphere.