

Global observations of high-m poloidal waves in the magnetosphere during the recovery phase of the June 2015 magnetic storm

*Guan Le¹, Peter Chi², Robert J Strangeway², Christopher T Russell², James Slavin³, Kazue Takahashi⁴, Howard Singer⁵, Vassilis Angelopoulos², Brian Anderson⁴, Kenneth Bromund¹, David Fischer⁶, Emil Kepko¹, Werner Magnes⁶, Rumi Nakamura⁶, Ferdinand Plaschke⁶, Roy Torbert⁷

1. NASA Goddard Space Flight Center, USA, 2. University of California, Los Angeles, USA, 3. University of Michigan, USA, 4. The Johns Hopkins University Applied Physics Laboratory, USA, 5. National Oceanic and Atmospheric Administration/SEC, USA, 6. Space Research Institute, Austrian Academy of Sciences, Austria, 7. University of New Hampshire, USA

In this paper, we report global observations of high-m poloidal waves occurred during the recovery phase of the magnetic storm starting on 22 June 2015. The long lasting waves are observed by a constellation of widely spaced satellites from 5 missions including MMS, Van Allen Probes, THEMIS, Cluster, and GOES, covering L-values between 4 and 12 in a large range of local times. These observations have demonstrated that storm-time high-m poloidal waves can occur globally. High-resolution data from four MMS satellites enable us to detect the azimuthal phase shifts and determine the m number to be ~ 100 . The mode identification suggests that the observed poloidal waves are associated with the second harmonic of the field line resonance. The wave frequencies range from 8 to 22 mHz and decrease as the L-value increases. Detailed examinations of instantaneous wave frequency show discrete spatial structures with step-like changes along the radial direction. In each discrete structure the wave has a steady frequency and spans about 1 Re in the radial direction. Our observations suggest that storm-time high-m poloidal waves are different from the single-frequency global poloidal mode waves that are common during periods of low-level of geomagnetic activities.

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