

A study of the Pc1 pearl structure using conjugate ground-satellite observations A study of the Pc1 pearl structure using conjugate ground-satellite observations

JUN, Chae-woo^{1*}; SHIOKAWA, Kazuo¹; TAKAHASHI, Kazuo²; PAULSON, K.⁴; CONNORS, Martin⁴; SCHOFIELD, I.⁴; PODDELSKY, I.⁵; SHEVTSOV, B.⁵; KLETZING, C.⁶; WYGANT, J.⁷
JUN, Chae-woo^{1*}; SHIOKAWA, Kazuo¹; TAKAHASHI, Kazuo²; PAULSON, K.⁴; CONNORS, Martin⁴; SCHOFIELD, I.⁴; PODDELSKY, I.⁵; SHEVTSOV, B.⁵; KLETZING, C.⁶; WYGANT, J.⁷

¹Solar-Terrestrial Environment Laboratory, Nagoya University, ²Space Physics Group (SRP), Johns Hopkins University Applied Physics Laboratory, USA, ³Space Science Center, University of New Hampshire, Durham, NH, USA, ⁴Center for Science, Athabasca University, Athabasca, Canada, ⁵Institute of Cosmophysical Research and Radiowave Propagation, Russian Federation, ⁶Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa, USA, ⁷of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota, USA

¹Solar-Terrestrial Environment Laboratory, Nagoya University, ²Space Physics Group (SRP), Johns Hopkins University Applied Physics Laboratory, USA, ³Space Science Center, University of New Hampshire, Durham, NH, USA, ⁴Center for Science, Athabasca University, Athabasca, Canada, ⁵Institute of Cosmophysical Research and Radiowave Propagation, Russian Federation, ⁶Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa, USA, ⁷of Physics and Astronomy, University of Minnesota, Minneapolis, Minnesota, USA

We have investigated the generation mechanism of the pearl structure of Pc1 geomagnetic pulsations using conjugate observations of an event with the ground induction magnetometers located at Athabasca (ATH, $L = 4.3$) in Canada and Magadan (MGD, $L = 2.7$) in Russia and the Van Allen Probes (RBSP) A and B satellites located in the inner magnetosphere. The event was observed at ATH and MGD from 1500 to 1700 UT on October 6, 2012. During this event, the footprints of RBSP-A and -B were located near ATH and MGD, respectively. However, EMIC waves having frequencies close to that of the ground Pc1 waves were detected only at RBSP-B, from 1632 to 1640 UT as it crossed the $L=4$ magnetic shell in the morning sector. On the ground, the Pc1 waves exhibited a classical pearl structure with a repetition period of about 15 s. At both stations, the polarization angle exhibited a large standard deviation, and a cross correlation analysis using the upper envelopes of the wave amplitude reveals that the correlation coefficient between the two stations is higher than 0.7-10% of the time. The EMIC waves at RBSP-B also exhibited a periodic variation in amplitude, but its period (about 5 s) differed significantly from that observed on the ground. The direction of the Poynting vector parallel to the magnetic field alternated between northward and southward. This result indicates that bouncing wave packet can generate a Pc1 pearl structure in the magnetosphere. We suggest that Pc1 pearl structures can be generated in the magnetosphere in the early stage but the beating of waves propagating in the ionospheric duct is responsible for the pearl structure observed on the ground.

キーワード: Pc1 pearl structures, Pc1 pulsations, EMIC waves, Multi-Point observations at the ground and space
Keywords: Pc1 pearl structures, Pc1 pulsations, EMIC waves, Multi-Point observations at the ground and space