かぐやのモノポールアンテナで観測された月周辺静電孤立波 (ESW) の解析

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Analyses of electrostatic solitary waves (ESWs) observed by Kaguya monopole antennas near the Moon

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In KAGUYA (SELENE) LRS[1], WFC-L [2] observes waveforms of plasma waves in 100Hz-100kHz and a lot of electrostatic solitary waves (ESWs) have been observed. Some results have been reported [3]. Although the orthogonal dipole antennas are generally used in the observations, sometimes a pair of monopole antennas were used. We analyze observations mainly by the latter antennas.

Observed waveforms are fitted to ideal ESW waveforms. The waveforms observed by the monopole mode are susceptive to noises and generally they are not similar each other. Since the waveforms observed by the dipole mode are less affected by noises, we re-analyzed the data by fitting these waveforms to the ideal ESW waveforms. The observed ESWs have often components perpendicular to the background magnetic field. This means that the ESW potential structure has two dimensions and they are observed near the generation regions. The propagation velocity, the potential width, the potential depth, etc. of each ESW are also evaluated.

References
[1] Takayuki Ono, Atsushi Kumamoto, Yasushi Yamaguchi, Atsushi Yamaji, Takao Kobayashi, Yoshiya Kasahara, and Hiroshi Oya, Instrumentation and observation target of the Lunar Radar Sounder (LRS) experiment on-board the SELENE spacecraft, Earth Planets Space, 60, 321-332, 2008.
[2] Y. Kasahara, Y. Goto, K. Hashimoto, T. Imachi, A. Kumamoto, T. Ono, and H. Matsumoto, Plasma Wave Observation Using Waveform Capture in the Lunar Radar Sounder on board the SELENE Spacecraft, Earth, Planets and Space, 60, 341-351, 2008.
[3] K. Hashimoto, M. Hashitani, Y. Kasahara, Y. Omura, M.N. Nishino, Y. Saito, S. Yokota, T. Ono, H. Tsunakawa, H. Shibuya, M. Matsushima, H. Shimizu, and F. Takahashi, Electrostatic solitary waves associated with magnetic anomalies and wake boundary of the Moon observed by KAGUYA, accepted for publication in Geophys. Res. Lett., 2010.

月周回衛星「かぐや（SELENE）」搭載 LRS[1] の WFC-L 波動観測装置 [2] では，100Hz-100kHz の波形を観測でき、多数の静電孤立波 (ESW) が観測されている。観測された ESW については、一部報告済みである [3]。通常は直交ダイポールアンテナで観測しているが、モノポールアンテナ対による ESW の伝搬速度等の解析を続けてきている。

観測された波形を理想の ESW 波形で近似するわけであるが、モノポールで観測された波形は、雑音の影響を受けやすく、お互いにあまり似ていないことも珍しくない。そこで、ダイポールモードで受信された波形を理想の ESW 波形で近似したものの方が雑音の影響が少ないので、これを基本として解析をやり直した。ESW の波形は外部磁場に対して垂直成分を多く含んでおり、ポテンシャルは 2 次元構造をしていること。このことは、ESW は発生領域に近いことを意味する。これを元に、伝搬速度、ポテンシャルの空間スケール、ポテンシャル深さ等の解析も行った。

References

[1] Takayuki Ono, Atsushi Kumamoto, Yasushi Yamaguchi, Atsushi Yamaji, Takao Kobayashi, Yoshiya Kasahara, and Hiroshi Oya, Instrumentation and observation target of the Lunar Radar Sounder (LRS) experiment on-board the SELENE spacecraft, Earth Planets Space, 60, 321-332, 2008.
[2] Y. Kasahara, Y. Goto, K. Hashimoto, T. Imachi, A. Kumamoto, T. Ono, and H. Matsumoto, Plasma Wave Observation Using Waveform Capture in the Lunar Radar Sounder on board the SELENE Spacecraft, Earth, Planets and Space, 60, 341-351, 2008.
[3] K. Hashimoto, M. Hashitani, Y. Kasahara, Y. Omura, M.N. Nishino, Y. Saito, S. Yokota, T. Ono, H. Tsunakawa, H. Shibuya, M. Matsushima, H. Shimizu, and F. Takahashi, Electrostatic solitary waves associated with magnetic anomalies and wake boundary of the Moon observed by KAGUYA, accepted for publication in Geophys. Res. Lett., 2010.