

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)

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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 orthogonal dipole antennas are generally used in the observations, sometimes a pair of monopole antennas were used. We reports observations mainly by the latter antennas.

The velocities and spatial scales of ESWs are evaluated from waveforms observed by the monopole mode. Generally their velocities are from several 100km/s to several 1000km/s. Their spatial scales are several 10m and the potential depths were less than 0.05 eV. Their velocities are very slow near the wake boundaries. The ESW waveforms have often components perpendicular to the background magnetic field and the potential structure is perpendicular to the background magnetic field. This means that the observations were close the source regions.

References

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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も可能である。今回は、後者のアンテナを用いた解析結果を中心に報告する。

モノポールモードにおける波形解析により、ESW の伝搬速度やポテンシャルの空間スケールを評価した。その結果、伝搬速度は数 100km/s ~ 数 1000km/s で、ポテンシャルの空間スケールは数 10m、ポテンシャル深さは 0.05eV 以下となった。ウェイク境界付近では非常に伝搬速度が速いものも存在することが分かった。また、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。

References

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