

磁気圏シース領域のミラー構造内の磁場極小付近での小スケールのホイッスラーモード波動

Small scale whistler mode waves near the magnetic field intensity minimum in the magnetosheath

*北村 成寿¹、天野 孝伸¹、大村 善治²、中村 紗都子²、梅垣 千賀¹、Boardsen Scott^{3,4}、Ahmadi Narges⁵、Ergun Robert⁵、Le Contel Olivier⁶、Lindqvist Per-Arne⁷、斎藤 義文⁸、横田 勝一郎⁹、Gershman Daniel³、Giles Barbara³、Moore Thomas³、Paterson William³、Pollock Craig¹⁰、Russell Christopher¹¹、Strangeway Robert¹¹、Burch James¹²

*Naritoshi Kitamura¹, Takanobu Amano¹, Yoshiharu Omura², Satoko Nakamura², Chika Umegaki¹, Scott A Boardsen^{3,4}, Narges Ahmadi⁵, Robert E Ergun⁵, Olivier Le Contel⁶, Per-Arne Lindqvist⁷, Yoshifumi Saito⁸, Shoichiro Yokota⁹, Daniel J Gershman³, Barbara L Giles³, Thomas E Moore³, William R Paterson³, Craig J Pollock¹⁰, Christopher T Russell¹¹, Robert J Strangeway¹¹, James L Burch¹²

1. 東京大学大学院 理学系研究科 地球惑星科学専攻、2. 京都大学 生存圏研究所、3. NASAゴダード宇宙飛行センター、4. メリーランド大学、5. コロラド大学 大気宇宙物理研究所、6. フランス国立科学研究センター プラズマ物理学研究所、7. スウェーデン王立工科大学、8. 宇宙航空研究開発機構 宇宙科学研究所、9. 大阪大学 理学研究科 地球惑星科学専攻、10. デナリサイエンティフィック、11. カリフォルニア大学ロサンゼルス校 地球惑星物理学専攻、12. サウスウェスト研究所
1. Department of Earth and Planetary Science, Graduate School of Science, The University of Tokyo, 2. Research Institute for Sustainable Humanosphere, Kyoto University, 3. NASA Goddard Space Flight Center, 4. University of Maryland, 5. Laboratory for Atmospheric and Space Physics, University of Colorado, 6. Laboratoire de Physique des Plasmas, UMR7648 CNRS/Ecole Polytechnique/UPMC/Université Paris-Sud/Observatoire de Paris, 7. Royal Institute of Technology, 8. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 9. Department of Earth and Space Science, Graduate School of Science, Osaka University, 10. Denali Scientific, 11. Institute of Geophysics and Planetary Physics, University of California, Los Angeles, 12. Southwest Research Institute

Wave-particle interactions are thought to play a crucial role in energy transfer in collisionless space plasmas in which the motion of charged particles is controlled by electromagnetic fields. In the terrestrial magnetosheath, intense whistler mode waves, called 'Lion roars', are often detected by spacecraft around minima of semi-periodic fluctuations of magnetic field intensity due to mirror mode structures and motion of the structures. It is expected that whistler mode waves are efficiently generated near a local minimum of magnetic field intensity due to the smallest cyclotron resonance velocity. We report the detailed characteristics of such whistler mode waves using the data obtained by the four MMS (Magnetospheric Multiscale) spacecraft. Because reversals of field-aligned component of Poynting flux around minima in mirror mode structures correspond to reversals of gradient of magnetic field intensity along the magnetic field, whistler mode events with reversals of the field-aligned component of Poynting flux are good candidates of observations of effective wave generation regions along field lines. Even in such events, phase difference and change of amplitude of whistler mode waves observed by the four spacecraft do not have a clear correlation in cases of ~40 km separation, which is much smaller than the spatial scale of magnetic field depression due to mirror mode structures and is even smaller than the local thermal ion gyro scale. This result indicates that the coherent whistler wave generation in mirror mode structures has very limited spatial scale across field lines and is probably affected by any electron scale process. A plane wave approximation can be usable only in a very small scale. Because some events in cases of ~7 km separation showed good correlation among four spacecraft, the typical scale of coherent whistler wave across field lines can be at least an order of 10 km in mirror mode structures in the terrestrial

magnetosheath. The whistler mode waves observed by a spacecraft in a mirror mode structure are a cluster of waves from multiple spatially small sources.

キーワード：ホイッスラーモード波動、プラズマ波動、MMS衛星、波動粒子相互作用

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