Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)
©2013. Japan Geoscience Union. All Rights Reserved.

PPS23-21 会場:201A 時間:5 月 23 日 16:45-17:00

Type-II entry of solar wind protons into the lunar wake as a general phenomenon

Type-II entry of solar wind protons into the lunar wake as a general phenomenon

Masaki N Nishino[1*], Masaki Fujimoto[1], Yoshifumi Saito[1], Mariko Kawamura[2], Hideo Tsunakawa[3], Yoshiya Kasahara[4], Masaki Matsushima[3], Futoshi Takahashi[3], Hidetoshi Shibuya[5], Hisayoshi Shimizu[6], Yoshitaka Goto[4], Kozo Hashimoto[7], Yoshiharu Omura[7], Atsushi Kumamoto[8], Takayuki Ono[8], Shoichiro Yokota[1]
Masaki N Nishino[1*], Masaki Fujimoto[1], Yoshifumi Saito[1], Mariko Kawamura[2], Hideo Tsunakawa[3], Yoshiya Kasahara[4], Masaki Matsushima[3], Futoshi Takahashi[3], Hidetoshi Shibuya[5], Hisayoshi Shimizu[6], Yoshitaka Goto[4], Kozo Hashimoto[7], Yoshiharu Omura[7], Atsushi Kumamoto[8], Takayuki Ono[8], Shoichiro Yokota[1]

[1]JAXA, [2]The University of Tokyo, [3]Tokyo Institute of Technology, [4]Kanazawa University, [5]Kumamoto University, [6]ERI, The University of Tokyo, [7]RISH, Kyoto University, [8]Tohoku University
[1]JAXA, [2]The University of Tokyo, [3]Tokyo Institute of Technology, [4]Kanazawa University, [5]Kumamoto University, [6]ERI, The University of Tokyo, [7]RISH, Kyoto University, [8]Tohoku University

We study a type of solar wind entry into the lunar wake under various interplanetary magnetic field (IMF) conditions using SELENE (Kaguya) data. Our recent observations around the Moon revealed that so-called type-II (T2) entry of the solar wind protons into the near-Moon wake occurs when the IMF is dominated by the non-radial components (i.e. B_Y and/or B_Z). Under this condition a part of the solar wind protons scattered/reflected at the lunar dayside surface subsequently enters the central region of the near-Moon wake after a large-scale cycloid motion, which gives rise to electron acceleration and wave generation. The situation handled in the previous studies is that the magnetic field line around which the solar wind protons entering the wake are gyrating is detached from the lunar surface, and thus a possibility of the T2 proton entry into the region where field lines are connected to the lunar surface has not been considered yet. Here we report that the T2 entry process takes place under various IMF conditions, and that the protons can access the central wake region that is magnetically connected to the lunar nightside surface, which we categorize into the T2 entry with magnetic connection to the lunar surface (T2MC). Furthermore we show that the energy of the electron beams associated with the entered protons depends on the magnetic connectivity to the lunar nightside surface. Strong electron acceleration (up to several hundred eV to 1 keV) along the magnetic field associated with the T2 entry is prominent when the field line has its both ends in the solar wind, that is, when the magnetic field is detached from the lunar surface (i.e. the ”original” T2 entry that we rename to T2MD). On the other hand, no significant electron acceleration is found in the T2MC cases, although an enhancement of the electron flux associated with the T2 proton entry is evident. Our results indicate that, while the T2 entry of solar wind protons into the wake itself does not require a special IMF condition but is a rather general phenomenon, the characteristic energy of associated electrons does show a strong dependence on the magnetic connectivity to the lunar surface.

キーワード: Solar wind-Moon interaction, Lunar wake, SELENE, Wave-particle interaction, Plasma entry into wake
Keywords: Solar wind-Moon interaction, Lunar wake, SELENE, Wave-particle interaction, Plasma entry into wake