Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

PCG040-04 Room: 301A Time: May 28 11:30-11:45

Plasma environment of Venus controlled by IMF directions : Observations of high energy O+ around a terminator

Kei Masunaga[1*], Yoshifumi Futaana[2], Masatoshi Yamauchi[2], Masato Kagitani[1], Yasumasa Kasaba[3], Shoichi Okano[1]

[1]PPARC, Tohoku Univ, [2]IRF, [3]Dep. Geopysics, Tohoku Univ

Venus has quite a different plasma environment from the Earth. The lack of intrinsic magnet field for Venus results in direct interaction between its upper atmosphere and the solar wind. Oxygen and other heavy ion species escaping from the upper atmosphere to space are observed in the vicinity of Venus.
Recently, it is reported that the Venusian plasma environment highly depends on the direction of the interplanetary magnetic field (IMF) [e.g. Du et al., 2009]. Usually IMF has a component perpendicular to the Venus-Sun line. However, sometimes the IMF direction only has a parallel component to the Venus-Sun line. In this circumstance, the magnetic barrier of Venus appears to be vanished from magnetometer observations. The disappearance of the magnetic barrier was reproduced by a global simulation of Venus [e.g. Zhang et al., 2009]. It is also suggested by the global simulation that the IMF direction controls the atmospheric escape flux by the global change of the Venusian plasma environment [e.g. Liu et al., 2009].
The purpose of this study is to understand how the global structure of the Venusian plasma environment depends on the IMF direction. We investigated plasma environment around a terminator of Venus while 2006 and 2008 by using velocity distribution functions measured by ASPERA-4 instrument onboard VEX. We found that the disappearance of magnetic barrier is not always measured even the IMF is parallel to the Venus-Sun line. More frequent high energy O+ flux (~1keV) could be identified when the IMF is parallel to the Venus-Sun line rather than when the IMF is perpendicular. The O+ flux is confined in plane of the convection electric field under the perpendicular IMF condition. The result is consistent with previously reported observations [e.g. Barabash et al., 2007], and the pick up process can explain the signature. On the other hand, the O + fluxes were found independently of the direction of the convection electric field under the parallel IMF condition. It indicates that there are physical mechanisms which resulting in escape of planetary ions in addition to the pick up process. We will discuss the mechanism in this presentation.

Keywords: Venus, plasma, Venus Express, ASPERA