

On the relation between the neutral helium in the interplanetary space and the solar activity observed by ISA and XUV on NOZOMI

Atsushi Yamazaki[1], Wataru Miyake[1], Masato Nakamura[2], Toshio Terasawa[3], Ichiro Yoshikawa[4], Hajime Hayakawa[4], Yoshifumi Saito[4], Hiroto Noda[5]

[1] CRL, [2] Earth and Planetary Sci, Univ. Tokyo, [3] Dept. Earth Planetary Sci., Univ. of Tokyo, [4] ISAS, [5] IWF

NOZOMI is now in the cruising orbit to Mars after the swing-by operation around the earth at the end of 1998, and have made two and half rotation around the sun. During this period the Ion Spectrum Analyzer (ISA) instrument and the eXtreme UltraViolet (XUV) scanner have simultaneously observed the neutral helium in the interplanetary space by detecting the pick-up helium ions and the resonantly scattering emission of the helium atoms (He I). The phase space density of the pick-up ions and the He I emission rate are dependent on the column density along the line between the observation point and the sun and the line of sight, respectively. Since XUV's field of view direct outward from the satellite's orbit, each observation are complementary measurements as for the distribution of the neutral helium inside and outside the satellite's orbit.

The neutral helium originates from the local interstellar medium (LISM). The helium in LISM injects into the central solar system with the interstellar wind. In the solar system the helium moves along Keplerian trajectory due to the solar gravitational force and radiation pressure, and forms the region of the dense helium density to the downwind side respect to the sun. The region is called the helium cone. The distribution in the helium cone is decided by the temperature and density of the interstellar helium, the velocity of the interstellar wind, and the ionization rate in the solar system. Therefore the distribution of the helium in the cone brings the characteristics of the interstellar gas. The ionization rate is the loss rate for the formation of the helium cone, and also is the production rate for the pick-up ions.

During this observation period the sun has maximum activity, and the high ionization rate effect the distribution of the helium cone. According to the observation of the pick-up ions by the ACE satellite there is the anti-correlation between the solar activity and the helium density.

This presentation shows the NOZOMI observation for two years, and refers to the solar activity and the neutral helium in the interplanetary space.