Relationship between the intensity variations with a time scale of several days in interplanetary and solar Lyman alpha emissions

Yoshitaka Okazaki[1]; Hiroshi Fukunishi[1]; Yukihiro Takahashi[1]; Makoto Taguchi[2]; Shigeto Watanabe[3]

[1] Dept. of Geophysics, Tohoku Univ.; [2] NIPR; [3] Earth and Planetary Sci., Hokkaido Univ.

The ultraviolet imaging spectrometer (UVS) on board the Nozomi spacecraft measured interplanetary (IP) Lyman alpha emission at 121.6 nm on the routine basis for the period from January 1999 to April 2002. There is a flow of IP H and He atoms called the interstellar wind. These H atoms induce resonant scattering of solar Lyman a emission. One of the significant factors causing temporal variations of the IP Lyman alpha emission is the enhanced solar Lyman a emission from active regions on the Sun.

. In the previous case study for the period from January to March 2000, we demonstrated that IP Lyman alpha intensity distributions mapped on both the front side and the far side of the Sun correlate closely with solar EUV intensity maps obtained by the EUV Imaging Telescope (EIT) on-board the SOHO, and that IP Lyman alpha emission exhibits a striking intensity modulation synchronized with 27-day solar rotation.. It was also shown that a change in the 27-day periodicity of solar EUV intensity due to the growth of a new active region on the far side of the Sun can be successfully detected from IP Lyman alpha emission observations two weeks in advance of front-side EUV observations.

Variations with a time scale of several days which are not synchronized with the 27-day solar rotation can be seen in the variations of the IP Lyman alpha intensity. To statistically investigate the source of these rapid IP Lyman alpha intensity variations, we compare the IP Lyman alpha emission data with the solar Lyman a emission data obtained by Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) on-board the Upper Atmosphere Research Satellite (UARS). The analyzed periods are June 1999 to July 2000 and August 2001 to January 2002. It is shown that IP Lyman alpha emission data obtained from the far-side measurements can reproduce solar Lyman a intensity variations better than the solar Lyman a emission data shifted forward by 27 days. In addition, a relationship between the absolute intensity of IP Lyman alpha emission and that of solar Lyman a emission will be discussed to demonstrate that the far-side measurement of IP Lyman alpha emission is a practical tool for forecasting the coming solar activity.