Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

PEM28-P06 Room:Convention Hall Time:May 20 13:15-15:15

Long-term variation of the solar wind acceleration

HAKAMADA, Kazuyuki[1*], TOKUMARU, Munetoshi[2], FUJIKI, Ken'ichi[2]

[1]Chubu University, [2]Solar-Terrestrial Environment Laboratory

We calcurate the three-dimensional sructure of the coronal magnetic field during the time interval of 1800 Carrington rotation (CR 1800) through CR 2075 by the Radial-Field model dvised by Hakamada with synoptic maps of Kitt Peak photospheric magnetic field data. This time interval covers almost two solar activity cycles of about 20 years. We constructed synoptic maps of Log10|Br_sou|, the common logarithm of the radial component of the coronal magnetic field on the source surface of 2.5 solar radii. We also constructed synoptic maps of Log10|Br_pho|, the common logarithm of the radial component of the photospheric magnetic field projected on the source surface along the coronal magnetic field line. We, further, constructed synoptic maps of the solar wind speed, V, estimated by the CAT method with results of IPS observations. Those three values can be compared directly with each other because of the values on the synoptic maps of the same format. We draw the disribution of V in xyz space; x-axis corresponds to Log10|Br_sou|, y-axis corresponds to Log10|Br_pho|, and Z-axis corresponds to V. It is found that the distribution of V has a planar structure in xyz space. We, thus, assume the empirical equation of V = a + b $*$ Log10|Br_sou| + c $*$ Log10|Br_pho|, and calculate the multiple correlation coefficient, r, and the multiple regression oefficients, a, b, and c. It is found that, although the r has smaller value, around 0.3, during the solar minimum phase, r is very high, around 0.7, during the solar maximum phase. These results suggest that the solar wind is accelerated not only by the mechanis related to the coronal magnetic field and photospheric magnetic field but also by an unknown mechanism which shows the long-term variations.

Keywords: solar wind, acceleration, long-term variation