Geophysical Research Abstracts, Vol. 7, 01806, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01806

Solar cycle evolution of the magnetic structure of magnetic clouds during 1997-2003

K.E.J. Huttunen (1), H.E.J. Koskinen (1,2), R. Schwenn (3), and V. Bothmer (4)

(1) University of Helsinki, Finland (Emilia.Huttunen@helsinki.fi), (2) Finnish Meteorological Institute, Helsinki, Finland (3) Max-Planck Institute für Sonnensystemforschung, Katlenburg-Lindau, Germany, (4) University of Göttingen, Germany

The magnetic structures of 73 magnetic clouds detected by the WIND and ACE satellites in solar cycle 23 are examined. The axial orientation of the magnetic clouds with respect to the ecliptic plane has been determined from the magnetic field measurements using the minimum variance analysis. The flux rope type for a given magnetic cloud depends on how the magnetic field Z-component rotates within the cloud. For low-inclined clouds, whose axes lie approximately in the ecliptic plane, B_Z rotates either from the south to the north (SN) or vice versa (NS). Within magnetic clouds, which have their axes highly inclined with respect to the ecliptic, B_Z maintains the same sign during the whole passage of a cloud (S or N type). Our statistical analysis confirms the systematic solar cycle variations in the leading polarity of magnetic clouds found earlier for solar cycles 21-22. In the ascending activity phases of cycles 21 and 23 SN type magnetic clouds clearly dominate whereas during the ascending cycle 22 NS type dominates. During years of high solar activity and in the declining phases a mixture SN and NS type clouds is observed. For solar cycles 21-22 highly-inclined MCs were observed mainly during the declining activity phase. However, we did not find clear trend in the axial inclination of magnetic clouds during cycle 23. We also show, based on the 1-h Dst index, that the magnetospheric response depends greatly on the associated flux rope type.