Coronal and Stellar Mass Ejections
Proceedings IAU Symposium No. 226, 2005
K. P. Dere, J. Wang & Y. Yan, eds.

doi:10.1017/S1743921305000505

Solar Cycle Variation of the Internal Magnetic Field Structure of CMEs

Volker Bothmer

[1]Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, D 37191, Germany

Abstract. The internal magnetic field structure of CMEs and the field structure of the solar source regions were systematically investigated during different phases of the solar cycle in cycles 19-23 based on plasma and magnetic field measurements sampled by various satellites and through multi-wavelength remote sensing observations. It is found that: 1. To first order, the internal magnetic structure of CMEs varies systematically from one solar cycle to the next with respect to the prevailing hemispheric magnetic patterns of bipolar regions following the law of hemispheric helicity dependence. 2. To second order, the field structure in CMEs varies with respect to the complex spatial evolution of the magnetic flux in the photosphere in both hemispheres over the course of the cycle itself. The two effects can naturally explain the cyclic behavior of the SN, NS variations of the internal magnetic fields in CMEs in the solar wind as well as intermittent periods of mixed distributions.

Keywords. Sun: coronal mass ejections (CMEs)

Discussion

KOUTCHMY: To talk about a magnetic cloud I suspect that you need a lot of measurement made in 3-D to get the topology of the cloud and say if the magnetic cloud is really disconnected from the Sun?

BOTHMER: Yes, I fully agree. It is very dangerous to make conclusions on overall topology. That's also why we can't get proper values for helicity.

NINDOS: Comment on Dr. Koutchmy's comment: when we observe bi-directional flows in a MC, it is probable that the MC is rooted on the solar surface.

BOTHMER: Yes, but there is no unique interpretation. Flare particles (after impulsive onsets) suggest that some parts are still connected to the Sun.

YOUSEF: In a Beijing meeting 8 years ago I published a paper predicting that cycle 23 and the following 3 cycles would be weak cycles like those occurring around 1800 cycles 5, 6, 7 and 1900 cycles 12, 13. As a matter of fact, cycle 23 became weak and solar induced climate change occurred in 1997. Can you find evidence from your work on cycle 23 that it is different from the previous cycles 22 and 21?

BOTHMER: I have not studied this issue so far. So I can't give you a good answer right now.