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Comment on "Interplanetary origin of intense geomagnetic storms ($Dst < -100$ nT) during solar cycle 23" by W. D. Gonzalez et al.

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[1] *Gonzalez et al.* [2007] studied the interplanetary causes of 87 intense geomagnetic storms ($Dst < -100$ nT) that occurred during solar cycle 23 (1997–2005). Their classification of interplanetary causes of storms includes CIR (corotating interaction region associated with a high speed stream), MC (magnetic cloud), "Sh" (sheath field with southward component of interplanetary magnetic field), "Sh + MC" (sheath field followed by a magnetic cloud), SBC (a sector boundary crossing), "S + MC" (magnetic cloud compressed by a shock), and "Complex" (for a case in which none of the other cases were identified). The category of "ICMEs" (interplanetary coronal mass ejections) corresponds to several types of structures that are not magnetic clouds, namely that they have not the typical signatures for magnetic clouds [*Burlaga et al.*, 1987]. They found that the most common interplanetary structures leading to the development of an intense storm were magnetic clouds, sheath fields, sheath fields followed by a magnetic cloud and corotating interaction regions leading high speed streams and presented the relative importance of each of those driving structures in three phases of solar cycle: rising, maximum and declining phases.

[2] However, the interaction between two CMEs close to the Sun [*Gopalswamy et al.*, 2001, 2002] and between magnetic clouds near the Earth [see, e.g., *Burlaga et al.*, 2001; *Berdichevsky et al.*, 2003; *Gonzalez-Esparza et al.*, 2004; *Farrugia et al.*, 2006a; and references therein] has been reported. A number of papers showed that several strong magnetic storms (see, for instance, events on 31 March, 2001, minimum *Dst* value of −387 nT, 11–13 April, 2001, $Dst_{min} = -271$ nT [*Wang et al.*, 2003]; 28–30 October, 2003, $Dst_{min} = -363$ nT [*Veselovsky et al.*, 2004; *Skoug et al.*, 2004]; 20 November, 2003, $Dst_{min} = -472$ nT [*Ermolaev et al.*, 2005]; 8–10 November, 2004, $Dst_{min} = -373$ nT [*Yermolaev et al.*, 2005]) have been generating by multiple interacting magnetic clouds. Recently *Farrugia et al.* [2006b] studied interplanetary conditions for magnetic storms during 1995–2003 and found "that a significant number of our large events (6 out of 16) consisted of ICMEs/magnetic clouds interacting with each other forming complex ejecta." *Xie et al.* [2006] studied 37 long-lived geomagnetic storms (LLGMS events) with $Dst < -100$ nT and the associated CMEs which occurred during 1998–2002 and found that 24 of 37 events were caused by successive CMEs and number of interacting magnetic clouds was observed from 2 up to 4.

[3] Thus, classification of interplanetary sources of strong magnetic storms used by *Gonzalez et al.* [2007] is not complete and does not contain the important category of sources (interacting magnetic clouds) widely discussed in the literature. Therefore, though the obtained results are of limited interest, the used classification excludes from consideration the important mechanism on the solar-terrestrial physics resulting in strong Space Weather events.

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