Geophysical Research Abstracts
Vol. 14, EGU2012-6381-1, 2012
EGU General Assembly 2012

Deep Solar Activity Minimum 2007-2009: Solar Wind Properties and Major Effects on the Terrestrial Magnetosphere

C.J. Farrugia (1), B. Harris (1), M. Leitner (1), C. Möstl (2,3,7), A. B. Galvin (1), K. D. C. Simunac (1), R. B. Torbert (1), M.B. Temmer (2,3), A. M. Veronig (2), N. V. Erkaev (4,5), A. Szabo (6), K. W. Ogilvie (6), J. G. Luhmann (7), and V. A. Osherovich (6)

(1) Space Science Center and Department of Physics, University of New Hampshire, Durham, New Hampshire, (2) Institute of Physics, University of Graz, A-8010, Austria, (3) Space Research Institute, Austrian Academy of Sciences, Graz A-8042, Austria, (7) Space Sciences Laboratory, Berkeley, California, USA, (4) Institute for Computational Modeling, Russian Academy of Sciences, Krasnoyarsk, Russia, (5) Siberian Federal University, Krasnoyarsk, Russia, (6) NASA/Goddard Space Flight Center, Greenbelt, Maryland, USA

We discuss the temporal variations and frequency distributions of solar wind and interplanetary magnetic field parameters during the solar minimum of 2007- 2009 from measurements returned by the IMPACT and PLASTIC instruments on STEREO-A. We find that the density and total field strength were considerably weaker than in the previous minimum. The Alfvén Mach number was higher than typical. This reflects the weakness of magnetohydrodynamic (MHD) forces, and has a direct effect on the solar wind-magnetosphere interactions. We then discuss two major aspects that this weak solar activity had on the magnetosphere using data from Wind and ground-based observations: (a) the level of solar wind driving and the associated dayside contribution to the crosspolar cap potential (CPCP), and (b) the shapes of the magnetopause and bow shock. For (a) we find very weak interplanetary electric field (V_xB_z = -0.05 $\pm$ 0.83 mV/m) and a CPCP of 36.6 $\pm$ 18.2 kV. The auroral activity is closely correlated to the prevalent stream-stream interactions.We argue that the Alfvén waves in the fast streams and Kelvin-Helmholtz instability were the predominant agents mediating the transfer of solar wind momentum and energy to the magnetosphere during this 3-year period. For (b) we determine 328 magnetopause and 271 bow shock crossings made by the Cluster 1, Themis B and C spacecraft during a 3-month interval when the daily averages of the magnetic and kinetic energy densities attained their lowest value during the 3 years under survey. We use the same numerical approach as in Fairfield's (1971) empirical model and compare our findings with his classic result. The stand-off distance of the subsolar magnetopause and bow shock were 11.8 R_E and 14.35 R_E, respectively, making the subsolar magnetosheath thinner by $\approx 1RE$. This is mainly due to the low dynamic pressure which result in a sunward shift of the magnetopause The magnetopause is more flared than Fairfield's result. By contrast the bow shock is less flared, and the latter is the result of weaker MHD forces.