Relative Role of Different Large-Scale Structures of Solar Wind in Energy, Momentum, and Mass Transport from the Sun to the Geospace

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Large-scale solar wind structures (ICME, Sheath, CIR and others) play important role in solar and heliospheric physics and space weather. On the basis of the OMNI database of interplanetary measurements we identified large-scale structures of solar wind (SW types) for all time intervals during 1976–2000. Our classification includes quasi-steady types: (1) Heliospheric current sheet (HCS), (2) Slow and (3) Fast SW streams, respectively, from closed and open magnetic field structures in the solar corona, and disturbed types: (4) Corotating interaction regions (CIR – compressed regions between slow and fast SW streams), (5) Sheath (compressed regions ahead of MC/Ejecta) and (6) Magnetic cloud (MC) and (7) Ejecta as well as (8) direct and (9) reverse interplanetary shocks (see [1] and catalogue on site ftp://ftp.iki.rssi.ru/pub/omni/). We discuss several preliminary results obtained with our catalogue (see more details in http://www.iki.rssi.ru./people/yyermol_inf.html) including energy, momentum and mass transport from the Sun to the Geospace. Yearly numbers of different structures are 124±81 for HCS, 8±6 for MC, 99±38 for Ejecta, 46±19 for Sheath before Ejecta, 6±5 for Sheath before MC, and 63±15 для CIR. Taking into account that average durations of phenomena are 5±2 h for HCS, 24±11 for MC, 29±5 h for Ejecta, 16±3 h for Sheath before Ejecta, 9±5 h for Sheath before MC, and 20±4 h for CIR, solar wind observations consist of 6±4% of total time of observations for HCS, 2±1% for MC, 20±6% for Ejecta, 8±4% for Sheath before Ejecta, 0.8±0.7% Sheath before MC, 10±3% for CIR. Geoeffectiveness (number of selected type of solar wind resulted in magnetic storm with Dst < - 50 nT divided by total number of this type) of MC with Sheath is the largest (61%), geoeffectivenesses for CIR and Ejecta with Sheath are medium (20-21%) and types of Sheath and Ejecta without Sheath have the lowest geoeffectiveness (15 and 8%, respectively) [2]. We discuss solar cycle variation of these parameters during 1976-2000. Paper is supported in part by Physical Department of Russian Academy of Sciences, Program N 16, Presidium of Russian Academy of Sciences, Program N 16, and by RFBR, grant 07-02-00042.

References

[1] Yu. Yermolaev et al., Cosmic Research, **47**, 81 (2009).
[2] Yu. Yermolaev et al., Cosmic Research, **48**, 1 (2010).