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Investigation of mild and weak geomagnetic storms' origin

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Statistical investigations show that mild and weak geomagnetic storms are not produced by the changes of solar wing parameters, typical for exciting of severe ones (like high solar wind velocity in combination with strong negative Bz-component). This fact is main cause of low quality of middle-term prognosis of magnetic storms, based on prediction and detection of CME-like conditions in solar wind (this method works very well for short-term prognosis, but meets with failure at the attempts of its extension for alert time from 1 day to several days). Meanwhile, interest to less intense storms is not pure academic because moderate storms often produce much higher increases of relativistic electron fluxes near the geosynchronous orbit than intense storms do and can lead to the satellite's anomalies and failures; it was shown also most significant biological reaction is manly associated with weak and moderate storms. Several lists of geomagnetic storms years were used for analysis: list of geomagnetic storms with sudden commencement, McPherron's list of magnetic storms in the space age (1964-2003), list of major geomagnetic storms. The studies show that the solar wind density plays a more significant geoeffective role than it was previously assumed. A sharp density increase and consequent negative Bz can produce weak, moderate and even strong magnetic storms without any significant changes of the solar wind velocity. So, the well-known rule: "High speed + long-lasting negative Bz + compression = severe geomagnetic storm" must be supplemented with the rule for weak and moderate geomagnetic storms: "sharp solar wind density increase + negative IMF Bz = weak or moderate geomagnetic storm". It is possible to explain the second rule by prevailing of "loading-unloading mechanism" of magnetospheric energy

transfer from the solar wind in the most of cases of mixed type solar wind streams' interaction with magnetosphere over the "directly driven magnetosphere" mechanism, which is more appropriate for explanation of solar wind – magnetosphere interaction during the streams like ICME's and CIR's crossing the Earth's orbit.