

Relationship between solar wind dynamic pressure and amplitude of geomagnetic sudden commencement (SC)

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Although the primary cause of the geomagnetic sudden commencement (SC) is the enhanced magnetopause current, induced field aligned currents, ionospheric currents and earth currents produce a complex global distribution of the amplitude and waveform of SC. As the result the SC amplitude shows a clear latitudinal and local time variation. These variations have not been taken into account in the Siscoe's linear relationship ($dH = C \cdot d(Pd^{0.5})$) which connects the SC amplitude (dH) with the corresponding dynamic pressure (Pd) variation of the solar wind.

By considering the physical background of SC we studied which local time is best to extract the information of the solar wind dynamic pressure and concluded that the SC amplitude at 4-5h local time of middle- and low-latitude stations most directly reflects the dynamic pressure effect. This result is used to re-check the order of magnitude of the largest 3 SCs (dH > 200 nT at Kakioka) observed since 1868 (Araki, 2015). The SC occurred on March 24, 1940 still keeps the first rank even if the LT variation is taken into account.

Keywords: geomagnetic sudden commencement(SC), solar wind dynamic pressure, ionospheric current, field aligned current, LT variation, Siscoe's relationship