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Large-scale solar wind structures impacting the magnetosphere

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Large-scale solar wind structures such as magnetic clouds or other periods of steady solar wind parameters on one hand often drive a specific type of activity in the magnetosphere - ionosphere system, and on the other hand allow us to examine the various parameters separately when the driving remains approximately constant for periods longer than typical transport times in the magnetosphere. Both observational and global MHD simulation studies have revealed the specific role of the solar wind speed in the driving: larger solar wind speed tends to cause more spurious activity both in the magnetotail and in the ionosphere than lower speed. Furthermore, it seems that the magnetosphere develops from steady convection to periodic oscillations (sawtooth events) to full-scale magnetic storms for increasing solar wind speed. We present observational evidence of the role of the solar wind speed in determining the type of activity that occurs. Furthermore, we use global MHD simulations to examine the impact at the shock, in the magnetosheath, and in the magnetosphere and ionosphere to deduce the factors that contribute to the determination of the dynamic state of the magnetosphere.