Statistical Study on Jovian Magnetospheric Response to Solar Wind Dynamic Pressure

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Structures and dynamics of planetary magnetospheres depend on magnitude of their planetary magnetic field, inner plasma source, and plasma wind from stars, and hence magnetospheres show a wide variety. Past observations have revealed the typical structures/dynamics of the Jovian magnetosphere, which represents distinctive plasma environmentscompared to the Earth's magnetosphere. However, the magnetospheric response to the variable solar wind is still unclear, due to the absence of the solar wind monitor at the Jovian orbit. I approach this issue by using the calculated solar wind parameters via MHD equations whose input parameters are based on the observation at the Earth's orbit. Referring the propagated solar wind parameters, I investigate the variability of the Jovian magnetotail. Through statistical analyses using data obtained from Jovian orbiter Galileo, I find the tendency that the structure of nightside current sheet changes, magnetic field north-south component is disturbed, and the energetic particle fluxes enhance, responding to the increase of the solar wind dynamic pressure. On the other hand, energetic particle beams were often observed even when solar wind dynamic pressure is low. Furthermore, when energetic particle beams are absent, north-south magnetic field disturbances and energetic particle enhancements were not significant. Assuming that such beams are generated by transient magnetic reconnection in Jovian magnetotail, I argue that (1) Jovian tail reconnection can occur without solar wind dynamic pressure increase, whereas (2) tail reconnection is not a sufficient but a necessary condition for large north-south magnetic field disturbance and energetic particle enhancement at the location of Galileo.