Dependence of magnetopause reconnection events on interplanetary parameters

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Magnetic reconnection permits topological rearrangements of the interplanetary and magnetospheric magnetic fields and the entry of solar wind mass, energy, and momentum into the magnetosphere. Thus, magnetic reconnection is a key issue to understand space weather. However, it has not been fully understood yet under which interplanetary/magnetosheath conditions magnetic reconnection takes place more effectively at the dayside magnetopause. For this purpose, in the present study 25 dayside magnetopause reconnection events are investigated using the Time History of Events and Macroscale Interactions during Substorms (THEMIS) spacecraft observations. It was found, (1) that the reconnection electric field is proportional to the interplanetary electric field, (2) that the reconnection electric field is inversely proportional to the solar wind Alfvén Mach number, (3) that the reconnection outflow speed is proportional to the solar wind Alfvén speed, and (4) that the reconnection outflow speed is inversely proportional to the magnetosheath plasma beta. Finally, it is shown that the range of magnetic shear angles for which magnetic reconnection should occur is restricted to large shears as the magnetosheath flow direction becomes more perpendicular to the direction of the local magnetopause normal vector. Since these results refer to fairly typical solar wind-Alfvén Mach number condition, they may not apply to more extreme cases.