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How often do jets of geoeffective size hit the dayside magnetopause?

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Magnetosheath high-speed jets are characterized by a larger dynamic pressure with respect to the surrounding plasma. In the subsolar sheath, they occur much more frequently under quasi-radial, i. e., low interplanetary magnetic field (IMF) cone angle conditions. Jets transport mass, momentum, and energy from the bow shock to the magnetopause in a concentrated manner. It has been shown that these jets can cause large amplitude boundary indentations, if they impinge on the dayside magnetopause, and trigger magnetopause surface waves and inner-magnetospheric ULF waves. These waves may then be able, e. g., to modify the drift paths of radiation belt electrons and/or to remove electrons from the radiation belts by magnetopause shadowing. Clearly, the severity of the downstream consequences of impacting jets scales with their size. An important question is: How often do jets of geoeffective size hit the dayside magnetopause? We are able to address this question, for the first time, by inferring scale size distributions of magnetosheath high-speed jets from THEMIS multi-spacecraft observations. We find that a reference area of $100\,R_{\mathrm{E}}^2$ (Earth radii squared) of the subsolar magnetopause should be hit almost 3 times per hour, in general, by jets with cross-sectional diameters of $2\,R_{\mathrm{E}}$ or larger. Under low IMF cone angle conditions (less than 30°) that rate increases to 9 times per hour, which emphasizes the significance of the magnetosheath jet phenomenon within the framework of solar wind-magnetosphere-ionosphere coupling.