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Magnetosheath jets at the magnetopause: reconnection onset conditions

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Magnetosheath jets are localised pulses of high dynamic pressure plasma observed in Earth's magnetosheath. They are believed to form from the interaction between the solar wind and ripples in Earth's collisionless bow shock, before propagating into the turbulent magnetosheath. Upon impacting the magnetopause, jets can influence magnetospheric dynamics. In particular, previous studies have suggested that, by virtue of their internal magnetic field orientations, jet impacts may be able to trigger local magnetic reconnection at the magnetopause. This is most notable during traditionally unfavourable solar wind conditions, such as intervals of northward interplanetary magnetic field. This idea has been supported by a small number of case studies and simulations. We present a large statistical study into the properties of jets near the magnetopause. We examine the components of the magnetic reconnection onset condition – the competing effects of magnetic shear angle and plasma beta – to determine how jets may affect magnetopause reconnection in a statistical sense. We find that, due to their increased beta, jet plasma is typically not favourable to reconnection, often more so than the non-jet magnetosheath. Most jets do contain some reconnection-favourable plasma, however, suggesting that jets may be able to both trigger and suppress magnetopause reconnection. We complement this with new case studies of jets interacting with the magnetopause.