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Magnetic reconnection due to Kelvin-Helmholtz waves at the magnetopause during northward interplanetary magnetic field

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The Kelvin-Helmholtz (K-H) instability is predominantly excited during northward interplanetary magnetic field (IMF), and reconnection due to K-H waves has been suggested to break the frozen-in condition and transport solar wind plasma into the magnetosphere. We investigated the magnetopause boundaries of a K-H wave case observed by the new Magnetospheric Multiscale (MMS) mission, and found ion jets in the trailing edges of the K-H waves along both the positive and negative directions relative to the magnetosheath ion flow. The ion jets satisfy the Walen test. The high-energy magnetospheric electrons are observed on the magnetosheath side of the jets, and the pitch angle distributions are consistent with the magnetic field configuration of both positive and negative jets. The magnetosheath ions mix with magnetosphere ions on the magnetospheric side of the jets, and there are flat-top electron distributions near the jets. We concluded that these observations are unambiguous pieces of evidence for reconnection due to K-H waves during northward IMF.