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Transverse MHD waves as signatures of braiding-induced magnetic reconnection in coronal loops

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A major coronal heating theory based on magnetic reconnection relies on the existence of braided magnetic field structures in the corona, where numerical simulations of stress-induced reconnection in braided loop-like structures have shown to invariably lead to low-amplitude transverse MHD waves. In this small-angle reconnection scenario, the reconnected magnetic field lines are driven sideways by magnetic tension but overshoots from their new rest position; thereby leading to transverse waves. This provides an efficient mechanism for transverse MHD wave generation in the corona, and also constitutes substantial direct evidence of reconnection from braiding. However, this wave-generation mechanism has never been directly observed. For the signature of small-angle reconnection, this has been identified through the recent discovery of nanojets. Nanojets are small, short-lived and fast jet-like bursts in the nanoflare range transverse to the guide-field. As for the waves, magnetic tension has been invoked to explain their characteristic transverse directionality. We present for the first time IRIS and SDO observations of transverse MHD waves in a coronal loop that directly results from braiding-induced reconnection identified by the presence of nanojets. This discovery provides major support to existing theories that transverse MHD waves can be a signature of reconnection and the coronal reconnection scenario identified by nanojets. Additionally, we will also review the latest observations from the IRIS nanojet observing programme, which suggests that this phenomenon is more common than expected and that the reconnection process has an energy flux on the same order as the necessary AR energy balance requirements.

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