Transport of Parallel Momentum during Reconnection Events in the Madison Symmetric Torus Reversed Field Pinch*

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Transport of parallel momentum during reconnection events has been investigated in the Madison Symmetric Torus reversed field pinch (MST RFP). The events are characterized in part by a sudden increase of resistive tearing magnetic fluctuations and generation of toroidal magnetic flux, ion heating, and change in the plasma rotation. The plasma parallel velocity abruptly decreases in the core and speeds up in the edge which results in the flattening of the parallel momentum profile. The parallel velocity is reconstructed from the poloidal velocity of bulk plasma measured with the Rutherford scattering diagnostic (core) and Mach probe (edge), and the toroidal phase velocity of resistive tearing modes measured with an edge array of magnetic pickup coils. It was verified in the past that the mode rotation velocity agrees well with the toroidal plasma rotation speed measured using passive Doppler spectroscopy. The transport of parallel momentum can be understood within the framework of two-fluid turbulent relaxation theory and from detailed calculations of fluctuation induced Maxwell and Reynolds stresses resulting from multiple tearing modes. Edge and core measurements of the torque due to the fluctuation induced Maxwell stress suggest that it can not explain the observed relaxation, therefore other momentum transport mechanisms, including Reynolds stress, are being explored.

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