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Identifying and Quantifying the Role of Magnetic Reconnection in Space Plasma Turbulence

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One of the outstanding open questions in space plasma physics is the heating problem in the solar corona and the solar wind. In-situ measurements, as well as MHD and kinetic simulations, suggest a relation between the turbulent nature of plasma and the onset of magnetic reconnection as a channel of energy dissipation, particle acceleration and a heating mechanism. It has also been proven that non-linear interactions between counter propagating Alfvén waves drives plasma towards a turbulent state. On the other hand, the interactions between particles and waves becomes stronger at scales near the ion(electron) gyroradious ρi (ρe), and so turbulence can enhance conditions for reconnection and increase the number of reconnection sites. Therefore, there is a close link between turbulence and reconnection. We use fully kinetic particle in cell (PIC) simulations, able to resolve the kinetic phenomena, to study the onset of reconnection in a 3D simulation box with parameters similar to the solar wind under Alfvénic turbulence. We identify in our simulations characteristic features of reconnection sites as steep gradients of the magnetic field strength alongside with the formation of strong current sheets and inflow-outflow patterns of plasma particles near the diffusion regions. These results will be used to quantify the role reconnection in plasma turbulence.