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Explosive Turbulent Magnetic Reconnection: A New Approach of MHD-Turbulent Simulation

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Turbulent flows are often observed in association with magnetic reconnection in space and astrophysical plasmas, and it is often hypothesized that the turbulence can contribute to the fast magnetic reconnection through the enhancement of magnetic dissipation. In this presentation, we demonstrate that an explosive turbulent reconnection can happen by using a new turbulent MHD simulation, in which the evolution of the turbulent transport coefficients are self-consistently solved together with the standard MHD equations. In our model, the turbulent electromotive force defined by the correlation of turbulent fluctuations between v and B is added to the Ohm's law. We discuss that the level of turbulent can control the topology of reconnection, namely the transition from the Sweet-Parker reconnection to the Petscheck reconnection occurs when the level of fluctuations becomes of order of the ambient physical quantities, and show that the growth of the turbulent Petscheck reconnection becomes much faster than the conventional one.