M08b Parameter survey of mode coupling in a single sheared current sheet

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Magnetic reconnection is a strong supporting mechanism to explain various energy release events in the universe. But how to reach fast reconnection in an enormous 3D system is still unresolved. In our previous research, we noticed that when multiple tearing layers coexist in the same sheared current sheet, inflow and outflow regions tend to couple with each other across the layer and form a positive-feedback system (PFS), which enhances the reconnection rate overall. In order to understand more details on the mode coupling, we applied 4 different sets of rotational-symmetric tearing eigenmodes to the same sheared current sheet and solve 3D resistive MHD equations. The resulting reconnection rate is not a monotonic function of the PFS aspect ratio, namely the ratio between the vertical size of PFS and the distance between two tearing layers. When the ratio is small, the PFS does not build. On the other hand, the reconnection reduces with PFS aspect ratio when it is larger than a certain threshold. Due to the coupling, strong cascading of energy to the smaller scale are observed. The cascading at first concentrate along the initial mode direction but afterwards inclined to be along the initial guide field direction. No inverse cascade is found thus no large structure is reproduced.