M28b Investigation on guide field dependence of "shock-evoking positive-feedback" model of magnetic reconnection

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Our previous study proposed a "shock-evoking positive-feedback" model, which could achieve fast magnetic reconnection using one 3D current sheet with finite guide field in uniform resistivity environment. The enhancement of reconnection rate originates from the zigzag pattern that goes across the current sheet center. This weblike pattern comes from the primary tearing mode that works on shear magnetic structure. In this presentation, we will report a study on importance of the third component relaxation checked by 2.5D simulations with the same setup. In 2.5D simulations, since the variation along z-direction has been neglected, single chain of flux tubes are formed right at the center of current sheet thus no "positive-feedback" system is built. The resulting reconnection rate is less than half of the 3D case before the secondary instability (plasmoid instability) starts. Dependence of the guide field magnitude is also checked in 3D box. With smaller B_z, resonance layers approach current sheet center while the reconnection rate reduces.