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Three-dimensional fast magnetic reconnection in solar flares and geomagnetotail

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In recent our MHD numerical studies, it was revealed that the classical 2d Petschek-type fast reconnection process is unstable for 3d-perturbations. In that study, even in exactly 1d current sheet, 3d fast reconnection can be caused by any 3d weak disturbance. The resulting reconnection jets are strongly localized in the sheet current direction and intermittently ejected in random, which is similar to the intermittent downflows observed in solar flares. Since the current sheet in geomagnetotail is also almost 1d, our numerical result will be also applicable for the fast reconnection in substorms. In this presentation, our MHD numerical studies are introduced and those applications for solar flares and substorms are shown.

Keywords: magnetic reconnection, three-dimensional, solar flare, geomagnetotail, substorm