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Fragmentation of CME-generated current sheets via cascading reconnection

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Its is now commonly assumed, that magnetic flux ropes on the Sun can become unstable when the amount of their twist exceeds some limit giving rise to CMEs. As a consequence, current layers are formed behind CMEs where reconnection can take place causing the effects connected with solar flares. While a lot of attention has been paid to CME/flux-rope dynamics, not too much effort is devoted to the question of the current-layer formation and its subsequent fragmentation.

We studied this issue earlier using high-resolution 2.5D MHD simulations, assuming the current layer is already formed. We have found, that the current layer decays in a cascade of processes leading to the consecutively smaller magnetic-field and current-density structures. In the current contribution, using combined approach of moderately resolved 3D with highly resolved 2.5D MHD models we address these two issues - current layer formation and its fragmentation - simultaneously. We start with Titov-Demoulin equilibrium for twisted flux rope. Then, adding some extra twist via foot-point motions the flux rope becomes unstable. We study formation of the current layer and its fragmentation by processes of cascading reconnection. Namely, the role of kink-mode for the dynamics of secondary plasmoids is investigated.