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Electron scale structure of thin current sheets in collisionless magnetic reconnection NEERAJ JAIN, SURJALAL SHARMA, University of Maryland, College Park, MD-20742 — Cluster observations have shown highly structured electron-scale current sheets (CS), viz. bifurcated, filamented and triple peak structures during magnetic reconnection. An electron-magnetohydrodynamic model shows that these structures develop at various stages of time dependent reconnection. The Lorentz force on electrons due to the interaction of electron outflow velocity and normal component of magnetic field bifurcates the CS in the outflow regions, with scale sizes of the individual peak $\sim 3d_e$ (d_e being electron skin depth), similar to those observed by Cluster spacecraft. The bifurcation limits the length of the reconnecting CS which is further reduced by the secondary instabilities growing on the bifurcated CS. The secondary instabilities causes filamentation of the CS in the outflow region. Such filamentary structures have been observed by Cluster spacecraft in magnetopause. In the presence of many reconnection sites, triple peak structure of the CS forms at the secondary sites as a result of reconnection inside the bifurcated CS associated with the main reconnection site.

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