



## **Coalescence of magnetic flux ropes observed in the tailward high speed flows**

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We report a tailward high speed flow event observed by Cluster during 0203:00UT-0205:30UT on September 20, 2003. Within the flows, a series of three bipolar  $B_z$  signatures were observed. The first and third bipolar  $B_z$  signatures are identified as magnetic flux ropes while the middle one is found to result from the collision of the two flux ropes. A vertical thin current layer was embedded in the center of the middle bipolar  $B_z$  signature. Combining the plasma, electric field and wave data around the thin current layer, we conclude that the two magnetic flux ropes were coalescing. The observations indicate that coalescence of magnetic flux ropes can happen in the regions away from reconnection site, and can produce energetic electrons and waves. A basic criterion for identify the coalescence in the magnetotail is proposed also.