

## Hall effect on flow structure in counter-helicity spheromak merging

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Counter-helicity spheromak merging[1] is an alternative method for forming a field-reversed configuration (FRC). The characteristic of the merging method is generation of strong toroidal sheared-flow due to magnetic reconnection of toroidal magnetic flux, and strong Hall effect in both merging[1] and relaxation[2] processes. For investigating the global Hall effect on formation of flow during merging process, we executed Hall-MHD simulation of merging counter-helicity spheromaks with various  $S^*$  parameter ( $S^*$  is the ratio of plasma characteristic length to ion skin depth). The simulation code adopts 2nd-order Adams-Bashforth scheme for time advancing, and 4th-order spatial central difference with 4th-order spatial smoothing (numerical diffusion). It was found that generated flow pattern in Hall-MHD cases were significantly different from that of MHD cases, and Hall current in downstream region of the magnetic reconnection generated the toroidal flow. In Hall-MHD case, negative toroidal flow is generated near the reconnection current sheet, and positive toroidal flow is generated in the downstream region by Hall current, while toroidal flow is generated at the edge of the current sheet in MHD case. The current sheet structure and flow acceleration region also changes with Hall parameter. We will talk about the characteristics of counter-helicity merging with the Hall effect.

### References:

1. M. Inomoto *et al.*, Phys. Rev. Lett., **97**, 135002, (2006).
2. E. Kawamori and Y. Ono, Phys. Rev. Lett. **95**, 085003, (2005)