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Ion velocity structures within the reconnection ion diffusion region[1] LI-JEN CHEN, NAOKI BESSHO, University of New Hampshire, THE CLUSTER TEAM — Through space observations and particle-in-cell simulations of collisionless reconnection, we find that ion velocity distributions vary drastically from the inflow region to the electron-scale current sheet, and from boundaries of magnetic islands to the island center. Ions exhibit two counterstreaming beams along the current sheet normal within the electron-scale current sheet as well as near the separatrix region that is not too far away from the electron current sheet. The two counterstreaming beams are due to acceleration by the Hall electric field. Near the mid-plane of the reconnection exhaust, the ion outflow jet appears as the third component in addition to the two beam components. Further downstream into the exhaust toward center of magnetic islands, diffusion in the ion velocity space smears out the three components, leaving a half-ring shaped distribution that preserves the net outflow velocity. Near the center of ion-skin-depth-scale magnetic islands, the half-ring distributions mirror along the out-flow velocity axis and reflect a flow reversal. We discuss effects of these ion velocity structures within the ion diffusion region on the evolution of reconnection.

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Li-Jen Chen
University of New Hampshire

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