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Kinetic feature of dipolarization fronts produced by interchange instability in the magnetotail

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A two-dimensional extended MHD simulation is performed to study the kinetic feature of depolarization fronts (DF) in the scale of the ion inertial length / ion Larmor radius. The interchange instability, arising due to the force imbalance between the tailward gradient of thermal pressure and Earthward magnetic curvature force, self-consistently produces the DF in the near-Earth region. Numerical investigations indicate that the DF is a tangential discontinuity, which means that the normal plasma velocity across the DF should be zero in the reference system that is static with the DF structure. The electric system, including electric field and current, is determined by Hall effect arising in the scale of ion inertial length. Hall effect not only mainly contributes on the electric field normal to the tangent plane of the DF, increases the current along the tangent plane of the DF, but also makes the DF structure asymmetric. The drifting motion of the large-scale DF structure is determined by the FLR effect arising in the scale of ion Larmor radius. The ion magnetization velocity induced by the FLR effect is towards to duskward at the subsolar point of the DF, but the y component of velocity in the region after the DF, which dominantly results in the drifting motion of the whole mushroom structure towards the dawn.