Non-stationarity of magnetic holes based on two-dimensional hybrid simulations

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In the previous meeting, we have reported several kinetic properties of magnetic holes (MHs), localized depression of magnetic field magnitude in interplanetary space, which give the similar behaviors of macroscopic processes deduced from magnetohydrodynamics simulations [Tsubouchi, 2009]. We have numerically examined the nonlinear evolution of large-amplitude Alfvenic field fluctuations (AW) which are carried into corotating interaction regions (CIRs). Local amplification of the AW field component within the transition layer of the reverse shock (RS) results in the generation of the current reversal, which plays the role of MH formation. In a kinetic view from one-dimensional hybrid simulations, the effect of this current reversal is shown to be analogous to the presence of field-aligned counterstreaming protons within MHs. Such counterstreaming beams are caused by the large-angle scattering of particles during the interaction of the AW with the RS, and are less efficient in the development of beam-type micro-instabilities. In the present study, we perform hybrid simulations in the two-dimensional space. One striking result is that non-uniformity and non-stationarity in the MH growing process can be identified in the transverse direction to the RS, which seems to exhibit KH-like behavior. We will investigate such features in association with particle kinetics (acceleration, and energy diffusion).