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On background density dependence of non-stationary collisionless magnetic reconnection.

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Even the simplest 2D configuration susceptible to magnetic reconnection (namely, Harris current sheet), possesses a number of "free parameters" that determine the dynamics and energetics of the process. Among such parameters are T_i/T_e ratio, guide field value, current sheet thickness, etc. In this presentation we systematically study the effect of changing the background density (from $n_b/n_0 = 0.5$ to $n_b/n_0 = 0.003$), which covers the range of lobe density values observed in the Earth's magnetotail.

Two-dimensional Particle-in-Cell (PIC) simulations are performed using implicit parallel code iPIC3D with double-periodic configuration. Increase of the jet front magnetic field (B_z) with n_b decrease is in agreement with simulations by [Wu 2012]. The elevated B_z region is several times larger (in the Z direction) than the initial current layer thickness, whereas large normal electric field (E_x) area is focused between the front and current sheet edge. Normal electric field has a bipolar profile (in the X direction), intensity scales roughly as $(n_b/n_0)^{-1/2}$ with changing n_b. Intense waves are generated at magnetic reconnection separatrices in the low density case. The waves can be excited either by separatrix electron flow disruption or by EH propagation.

We conclude that the 'standard' picture of GEM-type reconnection is retained for various n_b/n_0 ratios in two-dimensional configurations, with minor quantitative differences attributed to steeper front shape and faster propagation at low n_b densities.