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# 2D fully kinetic simulations of dayside magnetic reconnection in the presence of cold ions and a moderate guide field

The standard conditions for magnetic reconnection are usually antiparallel magnetic field configurations with a shear angle of $180°$. Reconnection is often observed with an additional out-of-plane component of the magnetic field (guide field). We performed two sets of 2D fully kinetic simulations using SMILEI code of asymmetric reconnection. The first set was performed initially by Dargent et al., 2017 with and without cold ions. While the second set with and without cold ions each conducted in the presence of a moderate guide field. The simulation domain size is set to ($x_{max}$, $y_{max}$) = (320, 128) $d_i$, enabling us to study these effects in the electron diffusion region (EDR) as well as the coupling across different scales, including ion diffusion region (IDR), outflow jets, and extended separatrices far from diffusion region. When the density gradient is combined with a guide field component at the magnetopause, it was suggested by Swisdak et al., 2003 that the electron diamagnetic drift governs the motion of the X-line. Our simulations reveal the development of an asymmetry in the reconnection plane as expected and a motion of the X-line in the opposite direction of the electron diamagnetic drift. This finding challenges the previously proposed explanation. We also report our progress in investigating the impact of cold ions in reinforcing the electron dynamics and further investigate the impact of adding a moderate guide field in their presence. These effects are expected to influence the energization, energy partitioning across scales, and potentially the suppression of reconnection. Fluid scales coupling with smaller ion scales aligns with the primary objective of the Plasma Observatory (PO) mission which aims to study plasma energization and energy transport. Our findings will contribute to the preparation of the PO mission and aim at improving its science return.

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