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Influence of current-aligned instabilities on the 3D evolution of magnetic reconnection V. ROYTERSHTEYN, W. DAUGHTON, LANL, H. KARIMABADI, UCSD — Understanding of the interplay between collisionless magnetic reconnection and current-aligned instabilities represents a long-standing problem in reconnection research. Apart from its significance as a basic plasma physics issue, a better theoretical grasp on this problem is called for by an increasing availability of *in-situ* observations of the electron-scale structure of the diffusion region, both in space and in dedicated laboratory experiments. In this work we present the results of fully kinetic 3D particle-in-cell (PIC) simulations of collisionless magnetic reconnection in various geometries that have been recently made possible by the advent of petascale computing and highly scalable PIC codes. We demonstrate that while the reconnection layers are almost always unstable against a spectrum of electromagnetic instabilities in the lower-hybrid range $\omega_{ci} < \omega < \omega_{ce}$, the saturation amplitude and the role played by those instabilities varies greatly depending on the local parameters (electron beta, degree of asymmetry, etc). The implications of these results for space observations and laboratory experiments are discussed.

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