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Three-dimensional development of the Kelvin-Helmholtz instability in asymmetric boundary layers T.K.M. NAKAMURA, W. DAUGHTON, LANL, H. KARIMABADI, SciberQuest, S. ERIKSSON, LASP, University of Colorado — The Kelvin-Helmholtz instability (KHI) is a key process for the transport of solar wind plasmas into the Earth's magnetosphere. In the presence of both magnetic and velocity shear, the resulting KHI leads to generation of vortices and subsequent triggering of magnetic reconnection. Our initial 3D fully kinetic simulations of this process at the symmetric boundary layers demonstrated the copious formation of oblique flux ropes which leads to enhanced mixing of the plasma. Here, we further consider the density and temperature asymmetries which always exist across the magnetopause. Past 2D simulations in such asymmetric cases showed that these asymmetries lead to an excitation of secondary instabilities along the edge of the vortex. While in the 2D limit, these secondary instabilities are strongly suppressed by the magnetic field component parallel to the k-vector of the KHI which would generally exist at the realistic magnetopause, our recent 3D fully kinetic simulations show that the three-dimensionality allows these instabilities to grow over a range of oblique angles even when a moderate strength of the parallel field exists. The non-linear growth of these instabilities disturbs the structure of the edge layer of the vortex and further enhances the mixing of the plasma.

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