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A statistical model of magnetic islands in a large current layer: validation from Hall MHD simulations and Cluster FTE observations
RAYMOND FERMO, JAMES DRAKE, MARC SWISDAK, University of Maryland, KYOUNG-JOO HWANG, YONGLI WANG, NASA Goddard Space Flight Center — Magnetic islands have been observed in large current layers for various space plasmas, including the magnetopause and solar corona. Since the direct simulation of very large systems is not possible, we have developed a statistical model which describes the formation, growth, convection and coalescence of these magnetic islands. An integral- differential equation is derived for the island distribution function, which characterizes islands by the flux they contain ψ and the area they enclose A. We use Hall MHD simulations to validate the model and to benchmark its parameters. The steady- state solution of the evolution equation predicts a distribution of islands. A database of 1,098 flux transfer events observed by Cluster between 2001 and 2003 is shown to be consistent with the model's predictions.

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