PLASMA TRANSPORT DUE TO KELVIN-HELMHOLTZ INSTABILITY: 2-D AND 3-D MHD SIMULATIONS AND CLUSTER OBSERVATIONS

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Our previous 2-D simulations have shown that reconnection in Kelvin-Helmholtz vortices can be a major plasma transport mechanism during periods of strongly northward IMF, producing a diffusion coefficient of the order 10^9 m^2/s, consistent with the formation of the low latitude boundary layer. On 3 July 2001, the four Cluster satellites traversed along the dawnside magnetospheric flank and observed large variations in all plasma parameters. Comparisons with 2-D MHD simulations indicate that Cluster encountered reconnected flux tubes generated by Kelvin-Helmholtz instability. We estimate a wave length of 6 R_E and a wave vector with a significant z-component. Double population ion distribution functions with accelerated ion beams were observed during reconnection intervals which may be particle signatures of reconnection in thin current layers generated by KHI. Our new 3-D simulations indicate that reconnection due to 3-D dynamics of the KHI is able to capture even more plasma to the closed geomagnetic field lines. This produces diffusion coefficient of 2-4 10^9 m^2/s.