Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Analysis of Reynolds number scaling for viscous vortex reconnection QIONGLIN NI, Peking University, FAZLE HUSSAIN, University of Houston, JIANCHUN WANG, SHIYI CHEN, Peking University — A theoretical analysis of viscous vortex reconnection based on scale separation is developed, where the Reynolds number (Re = circulation/viscosity) scaling for reconnection time Trec is derived. The scaling varies from $T_{rec} \sim Re^{-1}$ to $T_{rec} \sim Re^{-0.5}$, and the direct numerical simulation (DNS) data from Garten [Garten et al, J. Fluid Mech. 426, 1 (2001), cited hereinafter as GW] and Hussain [Hussain et al, Phys. Fluids 23, 021701 (2011) cited hereinafter as HD] collapse well within the range of the asymptotic scalings. Moreover, our analysis predicts two Reynolds numbers, namely, a characteristic $Re_{theory} \in [O(10^2), O(10^3)]$ for the $T_{rec} \sim Re^{-0.75}$ scaling given by HD, and the critical Reynolds number $Re_c \sim O(10^4)$ for the transition after whom the large-scale vortex reconnection does no longer occur.

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Date submitted: 02 Aug 2011 Electronic form version 1.4