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 $T_{rec}$ 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 $Re_c \sim O(10^3)$ for the transition after whom the large-scale vortex reconnection does no longer occur.

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