Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Chaotic Neo-Classical Transport and Damping[1] C.F. DRISCOLL, A.A. KABANTSEV, D.H.E. DUBIN, UCSD, YU.A. TSIDULKO, Budker Inst. — A novel *chaotic* form of Neo-Classical Transport has now been characterized experimentally and theoretically, as distinct from the traditional *collisional* NCT. Experimentally, an electrostatic or magnetic trapping separatrix is applied to pure electron plasma columns, and this separatrix is given controlled $\cos(m\theta)$ variations (ruffles). Equilibrium plasma drift rotation across the ruffles then causes dissipative separatrix crossings, giving enhanced particle transport and wave damping. Similar chaotic separatrix effects occur from wave-induced separatrix θ-ruffles and temporal variations. For spatially separated trapping regions ("superbanana" regime), traditional NCT scales with collisionality ν as $\nu^{1/2}B^{-1/2}$, whereas the chaotic NCT scales as $\nu^0 B^{-1}$. Fortunately, the chaotic particle transport has a distinctive $\sin^2(\alpha)$ signature, where α is the angle between the θ-ruffle and the global θ-asymmetry (error field) which drives the transport. Quantitative correspondence with theory has now been obtained for particle transport, diocotron (drift) wave damping, and dissipative wave-wave couplings; also observed is chaotic damping of higher frequency Langmuir waves. This chaotic separatrix dissipation may occur in low-collisionality stellarator and tokamak plasmas also.

[1]Supported by NSF PHY-0903877 and DoE DE-SC0002451.

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Date submitted: 17 Jul 2010

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