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Momentum Theorems for Zonal Flow Evolution in Drift Wave Turbulence PATRICK DIAMOND, University of California, San Diego, O.D. GURCAN, CEA Cadarache, T.S. HAHM, Princeton University, Plasma Physics Laboratory, K. MIKI, University of California, San Diego — We present the derivation of an *exact* momentum conservation theorem which rigorously constrains the evolution of zonal flows in drift wave turbulence. The theorem is based on the interplay between potential enstrophy conservation and zonal momentum balance, facilitated by the Taylor identity, and constitutes a generalization of the Charney-Drazin theorem, well known in GFD. We present applications to Hasegawa-Wakatani, resistive interchange and fluid ITG systems. The significance of fixed driving flux, dynamic alignment and non-unity Prandtl number (i.e. dynamic alignment) are discussed. Implications for transition models are discussed. This material is based upon work supported by the Department of Energy under Award Numbers DE-FG02-04ER54738 and DE-FC02-08ER54959.

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