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A Quasilinear Formulation of Turbulence Driven Current C.J. MCDEVITT, X.Z. TANG, Z.H. GUO, Los Alamos National Laboratory, Los Alamos, NM 87545, USA — Non-inductive current drive mechanisms such as the familiar bootstrap current correspond to an essential component to the realization of steady state tokamak operation. In this work we discuss a novel collisionless mechanism through which a mean plasma current may be driven in the presence of microturbulence (as seen in [1]). In analogy with the traditional bootstrap current drive mechanism, in which the collisional equilibrium established between trapped and passing particles results in the formation of a steady state plasma current, here we show that velocity space scattering by drift wave microturbulence is capable of modifying the equilibrium between trapped and passing particles leading to the generation of a mean plasma current. In the collisionless limit, this current drive mechanism can in turn be balanced either by turbulence mediated electron-ion momentum exchange or radial electron momentum transport. A mean field formulation is utilized to incorporate the above components into a unified framework through which both collisional as well as collisionless current drive mechanisms may be self-consistently treated.

[1] W. X. Wang et al., 53rd APS-DPP, Salt Lake City, Utah, 2011

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