

**Abstract Submitted for the 50th Annual Meeting
Division of Plasma Physics
November 17–21, 2008, Dallas, Texas**

Category Number and Subject:

Theory Experiment

Gyrokinetic Simulation Tests of Tracer and Quasilinear Transport* R.E. Waltz, *GA*, A. Casati, *EURATOM/CEA*— The GYRO gyrokinetic code is used to test quasilinear theory via a one-step plasma-tracer simulation and additionally via two-step linear and nonlinear plasma simulations convoluting the quasilinear and field spectral weights. The one-step simulations have ion and electron "plasma species" at full densities and "tracer species" at trace densities making no contribution to the Poisson field equation. If the tracer and plasma gyrokinetic equations are identical, then so are their respective (energy and particle channel) diffusivities. Comparing tracer and plasma diffusivities when the tracer equation nonlinearity is deleted provides a quantifiable test of the quasilinear transport approximation (QLTA). [Similarly, other approximations like "passive scalar transport" can be tested by plasma-tracer simulations.] The two-step test preserves ambipolarity but includes only the leading linear modes at each wave number. Quasilinear transport spectra appear to breakdown first at high wave numbers. Net quasilinear energy diffusivities are typically 1.4-1.8 larger. Possible nonlinear modifications to improve QLTA are explored.

*Work supported by US DOE under DE-FG03-95ER54309.