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Turbulent saturation and transport in global 3D two-fluid simulations of the tokamak edge BARRETT ROGERS, Dartmouth, Hanover NH , PAOLO RICCI, Centre de Recherches en Physique des Plasmas (CRPP), Lausanne, Switzerland — Based on nonlinear, global, three-dimensional two-fluid simulations, we explore the physics of turbulent saturation and transport in the tokamak scrape-off layer and other magnetic geometries. We find that the global simulations can produce larger relative fluctuation amplitudes and more Bohm-like (versus Gyro-Bohm-like) transport scalings than those of non-global (flux-tube) simulations. In both the global and local simulations, small-scale primary instabilities such as drift-waves or resistive ballooning modes produce radial streamers, which grow until they are broken up by secondary modes such as the Kelvin-Helmholz instability or related modes. In a local simulation with fixed, radially constant equilibrium gradients and periodic boundaries, for example, the radial elongation of these primary-mode streamers is, in principle, unlimited. In the global simulations, however, the radial extent of the primaries is truncated by the nonlocal radial variations of the equilibrium profile gradients, typically to the geometric mean of the equilibrium profile scale-length and poloidal scale-length of the primary modes. This radial truncation can have a strongly stabilizing effect on the KH mode, leading to larger primary-mode fluctuation levels and non-Gyro-Bohm transport scaling.

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