Abstract Submitted
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**Coherent Structures in Magnetic Confinement Systems**[1] W. HORTON, University of Texas at Austin, IFS — Coherent structures are long-lived, nonlinear localized solutions of the selfconsistient plasma-electromagnetic field equations. They contain appreciable energy density and control various transport and magnetic reconnection processes in plasmas. These structures are self-binding from the nonlinearity balancing, or overcoming, the wave dispersion of energy in smaller amplitude structures. The structures evolve out of the nonlinear interactions in various instabilities or external driving fields. The theoretical basis for these structures are reviewed giving examples from various plasma instabilities and their reduced descriptions from the appropriate partial differential equations. A classic example from drift waves is the formation of monopole, dipole and tripolar vortex structures which have been created in both laboratory and simulation experiments. For vortices, the long life-time and nonlinear interactions of the structures can be understood with conservation laws of angular momentum given by the vorticity field associated with dynamics. Other morphologies include mushrooms, Kelvin-Helmholtz vorticity roll-up, streamers and blobs. We show simulation movies of various examples drawn from ETG modes in NSTX, H-mode like shear flow layers in LAPD and the vortices measured with soft x-ray tomography in the GAMMA 10 tandem mirror. Coherent current-sheet structures form in driven magnetic reconnection layers and control the rate of transformation of magnetic energy to flow and thermal energy.

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