Turbulence Suppression in a coherent structure of localized current and vorticity

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Motivated by the quasi-single helicity state of reversed field pinches, we examine turbulence suppression by a localized coherent structure of electric current and flow vorticity within the framework of reduced MHD. Assuming that the coherent structure evolves on a slower time scale than an Alfv́en time scale of turbulent fluctuations, the boundary layer forms through the balance of the turbulent decorrelation rate and shearing rates as an interface between turbulent fluctuations and the coherent structure. The boundary layer is characterized by applying a variant of eddy-damped quasinormal Markovian (EDQNM) closure to the turbulent fluctuation and applying asymptotic analysis for strong shear. The coherent structure of localized current and flow vorticity can suppress ambient turbulence through magnetic field shear or flow shear. Also, both shear effects may combine to suppress the turbulence. Qualitative criteria will be estimated for flow shear dominated, and magnetic field shear dominated suppression of turbulence. The life time of the coherent structure is discussed further.