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Self-Organized Zonal Flows and Large Scale Magnetic Field Structures in Flute-Mode Turbulence of High-Beta Plasma[1] J. KINDEL, V.I. SOTNIKOV, O.G. ONISHCHENKO, E. YASIN, University of Nevada at Reno, NV 89557, J.N. LEBOEUF, JNL Scientific, Casa Grande, AZ 85222 — Generation of zonal flows with spatial scales of the order of the ion Larmor radius by flute mode turbulence of plasmas with large ratio of the thermal plasma energy to the magnetic field energy is investigated. Nonlinear equations describing the interaction of small-scale flute turbulence with large scale zonal structures and the evolution of the zonal structures are derived. These nonlinear equations are applicable for arbitrary ratio of spatial scales to the ion Larmor radius in the presence of effective gravitational field. It is shown that such a turbulent plasma is the result of a modulation instability of flute waves self-organized into zonal structures. The growth rate of the modulation instability and its dependence on the spatial scales of the pump wave and zonal structures are analyzed when the Rayleigh-Taylor instability (RTI) is suppressed by the effects of finite ion Larmor radius.

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