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Global zonal flow eigen-mode with spatial localization due to the finite band width YASUAKI KISHIMOTO, Kyoto University, Japan, KEN UZAWA, NIFS, Japan, JIQUAN LI, Kyoto University, Japan — The zonal flow is characterized by a complicate radial structure in plasma experiments and turbulence simulations, which is represented by a radial spectrum. However, in the conventional theoretic analyses on the zonal flow generation such as the coherent mode coupling or wave kinetic equation method, a single zonal mode is usually sampled to interact with the ambient turbulence through a modulation process so that the zonal flow growth rate versus the radial wave-number is deterministically obtained.[1,2] In this work, we show based on Hasegawa-Mima turbulence that the finite band with effect of zonal flow changes the conventional characteristics of the zonal low generation, leading to a spatially localized wave packet with enhanced growth rate which is the same for all zonal components. We refer to it as a global zonal flow eigen mode, which originates from the successive cross coupling among spectral components of zonal flows and turbulent pumps with the production of sidebands. Most interestingly, the enhanced global growth rate is probabilistically determined by the drift wave structure with given spectral distribution and pump energy for different initial phase factors. A simplified theoretic model is advanced to clarify these new features.
1 A. I. Smolyakov, P. H. Diamond, and M. Malkov Phys. Rev. Letts 84, 491(2000)
2 L. Chen, Z. Lin and R. White Phys. Plasma 7, 3129(2000)

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