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**Radial structures and nonlinear excitation of Geodesic Acoustic Modes**[1] LIU CHEN, Department of Physics and Astronomy, University of California, Irvine, FULVIO ZONCA, Associazione EURATOM-ENEA sulla Fusione — In this paper, we show that GAMs constitute a continuous spectrum due to radial inhomogeneities. The existence of singular layer, thus, suggests linear mode conversion to short-wavelength kinetic GAM (KGAM) via finite ion Larmor radii. This result is demonstrated by derivations of the GAM mode structure and dispersion relation in the singular layer. At the lowest order in $k_r\rho_i$, with $k_r$ the radial wave vector and $\rho_i$ the ion Larmor radius, the well known kinetic dispersion relation of GAM is recovered. At the next relevant order, $O(k_r^2\rho_i^2)$, we show that KGAM propagates in the low-temperature and/or high safety-factor domain; i.e., typically, radially outward, and a corresponding damping rate is derived. In this work, we also show that, while KGAM is linearly stable due to ion Landau damping, it can be nonlinearly excited by finite-amplitude DW turbulence via 3-wave parametric interactions. The resultant 3-wave system exhibits the typical prey-predator self-regulatory dynamics.

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