Global Geodesic Acoustic Mode in an Ideal Magnetohydrodynamic Tokamak Plasma

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A concise and transparent second order ordinary differential equation (ODE) describing the radial structure of global geodesic acoustic mode (GAM) is analytically presented in a low-β tokamak plasma. The large-ratio-aspect and circular cross-section are assumed to linearize the ideal magnetohydrodynamic (MHD) equations. We show clearly how finite β-dependent terms affect the global GAM frequency and radial mode structure. A typical Wentzel-Kramers-Brillouin (WKB) form of solution is found for some reversed shear equilibria. For some other equilibria with lower β, even also in a reversed shear tokamak, the GAM continuum is upraised by the high order β-dependent terms so that its maximum is beyond ω_G, where ω_G is the classical local frequency of GAM. As a result, no self-consistent solution to the ODE can be found.

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