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Geodesic Acoustic Modes Induced by Energetic Particles
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— A global geodesic acoustic mode driven by energetic particles (EGAM) has been observed in JET[1, 2] and DIII D[3, 4]. The mode is to be treated fully kinetically. The descriptions of the background electrons and ions are based on standard high and low bounce frequency expansion respectively with respect to the mode frequency. However, the energetic ions must be treated without any expansion of ratio between their bounce frequency and the mode frequency since they are comparable. Under electrostatic perturbation, we construct a quadratic form for the wave amplitude, from which an integro-differential equation is derived. In the limit where the drift orbit width is small comparison with the mode width, a differential equation for perturbed electrostatic field is obtained. Solution is obtained both analytically and numerically. We find that beam counterinjection enhances the instability of the mode. Landau damping due to thermal species is investigated.

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