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Hot plasma waves in a time-varying plasma flow[1] MIN UK LEE, Pohang University of Science and Technology, JEONG-YOUNG JI, Utah State University, GUNSU S YUN, Pohang University of Science and Technology — Excitations of electromagnetic (EM) waves in magnetically confined plasmas are often coincident with a time-varying plasma flow. Examples of abrupt generation of a localized plasma flow include the burst of edge localized mode (ELM) and the explosion of coronal loops in the solar surface. This work aims to investigate the wave dynamics in the existence of a background time-varying flow. The simplest model of the background flow that can be deduced from the fluid equations is a cold wave. To derive the wave dispersion relation, we decompose the particle trajectory into a time-average drift, the cold wave motion, and the cyclotron motion. Adopting the method of characteristics along the particle trajectory in the background flow and an EM field, we integrate the linearized Vlasov equation to obtain the perturbed distribution function. Then we take the first moment of the distribution function to obtain the perturbed current density and combine with Maxwells equations to derive a generalized hot plasma wave dispersion relation. Since the cold wave frequency is determined by the wavelength, the characteristic scale length of the flow phenomena determines the spectrum of coupled waves. The analytic dispersion relations are shown and corroborated by the 1D particle-in-cell simulation.

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