Transport ratios of the kinetic Alfvén mode in space plasmas

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Electric field properties of the kinetic Alfvén mode are analytically studied by constructing the dielectric tensor of the plasma using the linear Vlasov theory and reducing (and identifying) the tensor elements into that of the fluid picture such as the polarization drift, the Hall current, and the diamagnetic current. Off-diagonal dielectric responses do not primarily contribute to the dispersion relation of the kinetic Alfvén mode, but play an important role in the electric field polarization (field rotation sense around the mean magnetic field) and parallel component of the field. The polarization becomes more circular and the parallel component enhances at larger perpendicular wavenumbers. Analytic expression of fluctuation sense serves as a tool to identify the kinetic Alfvén mode in space plasma observations.

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