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Understanding capillary wave turbulence using discrete quasi-resonant kinetic equation YULIN PAN, DICK YUE, Massachusetts Institute of Technology — Weak turbulence power-law spectrum can be physically understood from the the kinetic equation (KE), which governs the evolution of wave spectrum due to nonlinear resonant interactions. For capillary waves, KE yields a stationary solution of a power-law spectrum, with energy flux from large to small scales due to triad resonant interactions. The condition of triad resonance, however, may not be satisfied if wavenumber can only take discrete values. This happens physically when the wavefield is finite, or numerically when discrete waveumber grid is used. Under this situation, energy flux is governed by quasi-resonant interactions; KE is not directly applicable and the underlying physics is not fully understood. We conduct a numerical study of KE on a discrete grid, where the frequency mismatch $\Delta\omega$ of a triad is restrained from being nonzero. The energy transfer within such triads is accounted for by a generalized delta function $\delta_g(\Delta\omega)$, which obtains its maximum at $\Delta\omega = 0$ and rapidly decreases as $\Delta\omega$ increases. The width ϵ of $\delta_g(\Delta\omega)$ thus characterizes the nonlinear broadening. The simulation results elucidate the physics for different levels of nonlinear broadening relative to a given discrete grid.

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