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Evolutions of wavenumber and frequency spectrum of gravity wave packets

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By using a 2-dimensional fully-nonlinear model, we numerically studied the upward propagations of a cluster of gravity wave packets, which is composed of a set of gravity waves with different spatial scales. In the simulation, we concentrate on the evolutions of wavenumber and frequency spectrum of gravity waves. The simulation results show that the background atmosphere (background wind and temperature fields, molecular viscosity et al.) impact a profound effect on the wave spectrum (wavenumber and frequency spectrum) formation and evolution, which can be understood qualitatively from the linear gravity wave theory. When the gravity waves propagate in an isothermal and still atmosphere, the wave spectrum also exhibit obvious variation: both the wavenumber and frequency spectrum spread; moreover, the dominant wavelengths and wave frequencies are shifted, which may result from the non-resonant interaction among gravity waves.