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Study on the energetics of the persistent heavy rainfall events during the meiyu season

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The meiyu season is a unique most important climatic phenomenon of East Asia due to its large variability on time and space scales. Studies and observations indicate that the meiyu front rainband is the result of interactions among multi-scale weather systems. In this study, the energy budgets of background circulations and subsynoptic perturbations were calculated to understand the energy characteristics during the interactions among multi-scale systems, and the main results are as follows: (a) the baroclinic energy conversion were very intense and this favored the sustainment of the lower-level and upper-level jet which were conducive to the persistent heavy rainfall; (b) downscale energy cascade processes of kinetic energy and available potential energy were very obvious, and this favored the sustainment of subsynoptic perturbations which directly caused the intense convections; (c) upscale energy cascade of APE mainly occurred at middle and lower troposphere, where the temperature advections and diabatic heating or cooling were intense, whereas the upscale energy cascade of kinetic energy mainly appeared at middle and upper troposphere, which was conducive to the maintenance of upper level jet; and (d) the short wave trough at lower troposphere and the South Asia high at upper troposphere were important to the transport of energy, and the low latitude regions mainly served as the energy sources.