How do the parameter variations in the moist processes affect the temperature and circulation simulations in the lower-troposphere?

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In this study, the grid-point atmospheric model developed at IAP LASG (GAMIL2) is used to investigate the effect of three selected parameters in the moist processes on the simulations of the lower-tropospheric temperature and circulation. Two experiments were performed: the control experiment (CNTL) with the default parameter values and the sensitivity experiment (EXP) with the values obtained from a "two-step" parameter optimization method, which applied a full factor sampling scheme and the simplex downhill algorithm. Results show that parameter changes lead to variation of diabatic heating and affect the lower tropospheric temperature and circulation through the interaction and mutual responses between dynamical and physical processes. Furthermore, the interactions of dynamical and physical processes are different in the tropics and high latitudes. In the tropics, dynamical processes mainly resulted from vertical motion balance the variation of diabatic heating, both of which are negatively correlated to offset each other and play significant roles in the simulation of temperature. However, in the high latitudes, dynamical processes mainly due to horizontal advection dominate the total temperature tendency compared to physical processes. The variation of dynamical effects can overcompensate the diabatic heating from physical processes, thus affecting the geopetential height and wind fields.

Key words: model simulation, parameter, interaction