Effects of different cloud overlapping parameters on simulated total cloud fraction over the globe and East Asian region

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The cloud overlapping parameter (vertical decorrelation length, L_{cf}) from CloudSat/CALIPSO is implemented in Beijing Climate Center’ s GCM (BCC_AGCM2.0) to reduce the uncertainly in radiation field. Comparing the climate simulation results obtained by using the constant L_{cf} of 2 km with those using the above retrieved L_{cf}, it is found that the total cloud fraction simulation has been obviously improved by using the satellite-based L_{cf}. The error of global mean total cloud fraction between simulations and CERES (Clouds and the Earth's Radiant Energy System) satellite data is decreased by 1.6% in both the winter and summer, of which the positive deviation of total cloud amount at tropical convection area and the negative deviation in subtropical region both are significantly reduced. These improvements are helpful for better simulation of energy budget differences between different regions. In East Asia, using the satellite-based L_{cf} can decrease the error of average total cloud fraction (compared to the CERES) by 1.8% (1.4%) in the winter (summer).Overall, using L_{cf} from CloudSat/CALIPSO satellite data can improve the simulation of total cloud fraction and thus obtain more accurate simulation of radiation field.

Keywords: Cloud overlapping parameter, Vertical decorrelation length, Total cloud fraction