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Evaluation of clouds and radiative fluxes in CCSR/NIES FRCGC GCM using ISCCP data

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We have conducted a multi-model intercomparison of cloud-water in five state-of-the-art AGCMs run for control and doubled carbon dioxide climates, the most notable feature of the differences between the control and doubled carbon dioxide climates is in the distribution of cloud-water in the mixed-phase temperature band. The difference is greatest at mid and high latitudes. We found that the amount of cloud ice in the mixed phase layer in the control climate largely determines how much the cloud-water distribution changes for the doubled carbon dioxide climate. Therefore evaluation of the cloud ice distribution by comparison with data is important for future climate sensitivity studies. For the control climate there is a clear relationship between the differences in cloud-water and relative humidity between the different models, for both magnitude and distribution. On the other hand the ratio of cloud ice to cloud-water follows the threshold temperature which is determined in each model. We have also evaluated cloud cover in CCSR/NIES/FRCGC GCM using the ISCCP simulator. It is found that cloud distribution in high, middle, low level is well represented in our model. Comparison of cloud optical thickness distribution in each level shows that our model tends to have thicker clouds than thinner clouds, while the ISCCP data shows the larger amount of thinner clouds. Comparative analysis of vertical radiative flux with ISCCP FD and the relevance to the distribution of humidity and mixed-phase clouds are discussed.