Improvement of cloud fraction scheme via radiative budget analysis

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Simulation of clouds in both of numerical weather predicting models and climate models is important beacuse clouds can directly and indirectly affects global radiative budget. However, improvement of cloud simulation is difficult because evaluations of clouds properties are limited due to poor observations of clouds. In this study, radiaton budget in a global model was diagnozed and predicted cloud fraction were analyzed based on the radiative budget analysis. The cloud fraction in our global model is predicted as a summation of increment of cloud fraction calculated in each physical process. To improve the prognostic cloud fraction scheme, a budget analysis of cloud fraction was conducted. The systematic bias of cloud fraction at polar regions and at high altitude of tropics was investigated and the prognostic cloud fraction scheme was modified in order to reduce the systematic bias of predicted cloud fraction. Modified cloud fractions are more realistic compared to the satellite observations and the radiation budget with modified prognostic cloud fraction scheme is also closer to observations. Based on this study, improvement of physical schemes in numerical models can be designed via radiative budget analysis.