P15 A new prognostic cloud cover scheme for mesoscale models

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Cloud cover is a critical variable in weather/climate models, because of its role in various feedback processes, and dominant contributor to the wide range of climate sensitivity estimates among models. In this study, we incorporate a new prognostic cloud cover scheme into WRF and its climate extension CWRF. This scheme represents sources and sinks of cloud cover explicitly and links them to physical processes including radiation, microphysics, and cumulus. Each tendency term is derived from a statistical probability density function (PDF) based scheme that consistently estimates cloud cover and cloud water in a grid. Unlike previous formulations, our new scheme includes those heterogeneous forcings as well as the turbulent effects calculated with the aid of a high-order moment model (CLUBB) that achieves closure by using a sophisticated joint PDF of vertical velocity, temperature, and moisture. Given the lack comprehensive observations, we will follow the "perfect model approach" to evaluate the new scheme, by treating the cloud-resolving model (CRM) as a virtual reality. Driving the new scheme by high-resolution CRM data, we can compare the predicted cloud cover and cloud water with CRM data averaged over coarse grid. Sensitivity of the new scheme on weather and climate prediction will be discussed.