Cloud Feedbacks on Greenhouse Warming in a Multi-scale Modeling Framework with a Higher-order Turbulence Closure

Anning Cheng[1,2] and Kuan-Man Xu[2]

1. Science Systems and Applications, Inc., Hampton, VA
2. Climate Science Branch, NASA Langley Research Center, Hampton, VA

Five-year simulation experiments with a multi-scale modeling Framework (MMF) with a advanced intermediately prognostic higher-order turbulence closure (IPHOC) in its cloud resolving model (CRM) component, also known as SPCAM-IPHOC (super parameterized Community Atmospheric Model), are performed to understand the fast tropical (30S-30N) cloud response to an instantaneous doubling of CO_2 concentration with SST held fixed at present-day values. SPCAM-IPHOC has substantially improved the low-level representation compared with SPCAM. It is expected that the cloud responses to greenhouse warming in SPCAM-IPHOC is more realistic. The change of rising motion, surface precipitation, cloud cover, and shortwave and longwave cloud radiative forcing in SPCAM-IPHOC from the greenhouse warming will be presented in the presentation.