Department of Atmospheric Sciences Joint Seminar Announcement

Department of Atmospheric Sciences, S.O.E.S.T., University of Hawai'i at Mānoa
2525 Correa Road, HIG 350; Honolulu, HI 96822 ☎956-8775
&
International Pacific Research Center, S.O.E.S.T., University of Hawai'i at Mānoa
1680 East-West Road, POST 401; Honolulu, HI 96822 ☎956-5019

GCMs with implicit and explicit representation of cloud microphysics for simulation of extreme precipitation frequency

Young-Min Yang
International Pacific Research Center (IPRC), S.O.E.S.T.
University of Hawai'i at Mānoa

Date: **Wednesday, October 22, 2014**
Refreshments: **3:00pm – 3:30pm at MSB Lanai.**
Free Cookies, Coffee, & Tea Provided
Seminar Time: **3:30pm**
Location: **Marine Sciences Building, MSB 100 Auditorium**

Abstract:

The present study aims to develop a general circulation model (GCM) with improved simulation of heavy precipitation frequency by improving the representations of cloud and rain processes. GCMs with conventional convective parameterizations produce common bias in precipitation frequency: they overestimate light precipitation and underestimate heavy precipitation with respect to observed values. This frequency shift toward light precipitation is attributed here to a lack of consideration of cloud microphysical processes related to heavy precipitation. The budget study of cloud microphysical processes using a cloud-resolving model shows that the melting of graupel and accretion of cloud water by graupel and rain water are important processes in the generation of heavy precipitation. However, those processes are not expressed explicitly in conventional GCMs with convective parameterizations. In the present study, the cloud microphysics is modified to allow its implementation into a GCM with a horizontal resolution of 50 km. The newly developed GCM, which considers cloud microphysics explicitly, produces more heavy precipitation and less light precipitation than conventional GCMs, thus simulating a precipitation frequency that is closer to that observed. This study demonstrates that the GCM requires a full representation of cloud microphysics to simulate the extreme precipitation frequency realistically. It is also shown that the coarse-resolution GCM with cloud microphysics requires an additional mixing process in the lower troposphere.