Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

AAS004-P03 Room: Convention Hall Time: May 27 17:15-18:45

Future change of precipitation-altitude relationship over the Asian monsoon region in a high-resolution climate model

Osamu Arakawa[1*], Akio Kitoh[1]

[1]Meteorological Research Institute

We examine the possible future change of precipitation-altitude relationship over the Asian summer monsoon region simulated by a high-resolution atmospheric GCM with a time-slice technique. In order to estimate statistical robustness, we conduct a set of ensemble simulations for both present-day and future climate by the combination of different initial conditions and different SSTs from atmosphere-ocean coupled global climate models (CGCM) with different climate sensitivities derived from CMIP3 datasets.
Possible future change of precipitation-altitude relationship, described by the ratio of mean precipitation in future climate to that in present-day in each altitude bands, shows that mean precipitation in future climate increases in all altitudes but that the change depends on altitude. The change in low altitudes (<1,500m) and high altitudes (>4,000m) is larger than that in middle altitudes (1,500-4,000m). The change in low altitudes may be attributed to the increase of precipitable water due to air temperature warming. In high altitudes, we may attribute the change to the mechanisms below: (1) snowfall changes into rainfall due to temperature warming, (2) temperature warming plus rainfall increase lead to a reduction of snow cover, (3) reduction of snow cover results in the increase of evaporation from the surface, (4) the increase of surface evaporation, as well as the increase of precipitable water, leads to precipitation increase in high altitude.

Keywords: climate change, precipitation, atmosphere-land interaction, climate model, precipitation-altidude relationship