



Changes in the precipitation mechanism under global warming – global hotspots

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The global mean temperature has risen substantially since the mid-20th century. An increase in global mean temperature alters the intensity and frequency of weather events as well as the mean climate. Subsequently, the focus of climate research has shifted toward assessing the ability of numerical models to reproduce weather and climate events in a changing climate. Their accurate simulation and prediction largely depend on the model reproducibility of both atmospheric large-scale flow and atmospheric internal dynamics. Previous studies have mainly concentrated on the first issue since warming trend may modulate large-scale circulations over the globe, which in turn may potentially change the predictability (Goswami 2004; Nakaegawa et al. 2004; Kang et al. 2006). Despite the plausible modulation of internal dynamics of the atmosphere embedded within large-scale forcings under global warming, its quantitative assessment and some possible changes in hydroclimate predictability relating to it have not been addressed with its regional characteristics. To examine this, a dynamical global downscaling (Yoshimura and Kanamitsu 2008) is performed for 1979-2009. The ratio of the convective precipitation to the total precipitation in the downscaled output is employed as the indicator for the transition of precipitation internal mechanisms.

By the virtues of near-perfect large-scale forcing in the downscaled system, accuracy assessment of modeled precipitation over the gauge observation enables us to visualize the global map of representative regions where the changes in precipitation predictability are attributable to the change in precipitation mechanism in conjunction with global warming. From the analysis using the downscaled precipitation dataset, the climate shift during the past decades enhances producing precipitation by convective instability over Asian monsoon regions, whereas suppresses that over south America and a part of middle Africa.