인간활동 증가에 따른 몬순지역의 기후변동성 증대

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Changes in variability and extremes over monsoon dominated area due to anthropogenic forcings

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Several modeling and observational studies have shown that the Earth's Climate is changing. Most of the studies have focused mainly on temperature and precipitation changes in order to show the evidences for climate change. The global average temperature has increased by 0.6 ± 0.2^0C since the late 19th century. While annual precipitation over land has continued to increase in the middle and high latitudes of the northern hemisphere (very likely to be 0.5 to 1% decade), except over Eastern Asia. Over the sub-tropics (10N-30N), land surface rainfall has decreased on average (about 0.3%/decade), although this has shown signs of recovery in recent years. Most powerful agents that caused climate change are an increase in the atmospheric concentrations of green houses gases (CO_2 etc.) and aerosols. The atmospheric concentration of CO_2 has increased from 280ppm in 1750 to 367ppm in 1999. By 2100, carbon cycle models projected atmospheric CO_2 concentration of 540ppm to 970ppm (SRES Scenarios).

In this study, a dynamical downscaling techniques are used to get the current climate change information using a regional climate (MM5) model (Pennsylvania State University / National Centre for Atmospheric Research meso-scale model) nested within the Max-Planck Institute for Meteorology Model and Data Group's Atmosphere - Ocean General Circulation Model (AOGCM) ECHAM-4. Simulated surface air temperature and precipitation over East Asia and its 4 sub-regions namely (1) North China, (2) Central China, (3) Korea and (4) Japan are investigated in detail. The MM5 results are compared with ECHAM-4 global model and observed (CRU) data sets. Results indicate that ECHAM-4 model shows cold biases especially over North China and Central China as compared with CRU observation. The cold biases become largest in spring and winter by -3.6℃ and -2.9℃ over North China and -3.7℃ and -3.6℃ over Central China.

We have also presented an analysis of multi-decadal simulation of future climate change over the East Asia. Changes in temperature and precipitation on inter-annual and decadal time scales are discussed in details for the period of 2001-2100 with respect to the period of 2001-2010 under forcing from the IPCC (Intragovernmental Panel on Climate Change) SRES (Special Report on

Emission Scenario) A2 scenario. Results show that under A2 forcing scenario, the East Asian region under goes substantial warming in the range of 0.3 to 5.5^{0}C during 2001-2100. Analysis of simulated precipitation shows an increase in the rate of annual precipitation by 0.07mm/day in the year of 2100. In other words, the precipitation increases by 2.6% annually in comparison with the current climate (2000s) rate of 2.68mm/day.