

Projection of Climate Change in 21st Century by the Time-slice Experiment with High Resolution AGCM

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Climate represents an average physical state of atmosphere for a long-term period, however, every year a series of unexpected extreme weather events has occurred around the world. Since the climate system is controlled by the atmosphere and surrounding ocean and lakes, snow and ice, ecosystem and land and mountains through complicated interactions, which are mainly based on the energy radiated from the sun, the earth's climate has been changed by numerous interactions and feedbacks existing in the climate system of the earth.

One of major issues is the rapid change of the earth's environment due to industrialization. A rapid climate change has been detected during the 20th century, which cannot be treated as natural phenomenon. The global average temperature was increased significantly since the 1990's. The IPCC predicted that the global temperature would increase as much as 1-3.5°C by the end of the 21st century, if we keep using the fossil fuel alike current trend. In Korea, the warm days have increased and the cold days have diminished rapidly after 1980's. The extreme days increase significant since middle of 1990's.

The climate may not be changing gradually but suddenly. Considering the frequency of occurrence of a serious of unexpected severe weather phenomena this prediction may have been realized already. At the moment we do not have enough knowledge and skill to predict the future climate yet, the monuments and ruins of the earth may give us the answer for the future climate.

Time-slice simulations with high resolution atmospheric general circulation model (GCM) have been used for regional detail climate projections over Asia. This method has used prescribe sea surface temperature (SST) obtained from observed data as well as projected data by 4 Coupled GCMs reported in IPCC AR4. For present-day integration, AMIP SST data has been used to force the high resolution AGCM to produce present climate. The simulated climate has been examined in comparison with observed climate data. For future climate change experiment, two

sets of time-slice experiments have been performed for mid-21st century and end-21st century. To force AGCM for future climate a superimposing monthly mean SST anomalies, which is derived from 4 different coupled GCMs simulation based on the A1B reference scenario, onto present-day SST boundary conditions.

Although none of these sets of time-slice experiments is able to capture accurately the response of regional climate change, the results may provide an essential data to estimate regionally detail temperature increase and changes in precipitation pattern over East Asia including East Asia monsoon. The results might be utilized to set up both national and regional adaptation strategies for CO₂ induced global warming.