Geophysical Research Abstracts
Vol. 15, EGU2013-3738, 2013
EGU General Assembly 2013

Analysis of changes in extreme temperature and precipitation using quantile regression

Kyoungmi Lee (1), Hee-Jeong Baek (2), and ChunHo Cho (3)

(1) Korea, Republic Of (leekm80@korea.kr), (2) Korea, Republic Of (heejbaek@korea.kr), (3) Korea, Republic Of (choch0704@korea.kr)

One of the important research areas in climatology is to identify whether the long-period tendencies of change in meteorological variables appear. In the past, the analysis has been limited by the estimation of long-period trends for annual or seasonal average values on meteorological variables. However, recently, the interest in the trends regarding the whole range of values for meteorological variables, including the extreme ones, has arisen. The quantile regression is the regression analysis method for estimating the regression slopes for the values of any quantile from 0 to 1 of dependent variable distributions. This method provides a more complete picture for the conditional distribution of the dependent variable given the independent variable when both lower and upper or all quantiles are of interest.

This study examines the changes in regional extreme temperature and precipitation in South Korea using quantile regression, which is applied to analyze trends, not only in the mean but in all parts of the data distribution. The results show considerable diversity across space and quantile level in South Korea. For daily temperatures in winter, the slopes in lower quantiles generally have a more distinct increase trend compared to the upper quantiles. The time series for daily minimum temperature during the winter season only shows a significant increasing trend in the lower quantile. In case of summer, most sites show an increase trend in both lower and upper quantiles for daily minimum temperature, while there are a number of sites with a decrease trend for daily maximum temperature. It was also found that the increase trend of extreme low temperature in large urban areas (0.80°C/decade) is much larger than in rural areas (0.54°C/decade) due to the effects of urbanization.

Extreme climate events can have greater negative impacts on society, economy and natural environments than changes in climate means. The fast growth of population and industrialization in Seoul metropolitan area on recent decades has increased the damage potentials by extreme climate events because of the great potential for the loss of life and property. In the time series of annual precipitation, the slopes in the upper quantiles had a more distinct increase trend compared to the lower quantiles. For the time series of daily precipitation from June to September, the slopes of the upper quantiles recently showed a abrupt increase, indicating that the intensity of extreme daily precipitation in Seoul has increased recently.

This work was supported by a project "NIMR-2013-B-2 (Development and Application of Methodology for Climate Change Prediction)" of National Institute of Meteorological Research.