Session: C39 Poster: TH157B

Past and future changes in extreme weather events in Hong Kong

Tsz-cheung Lee[†];
[†] Hong Kong Observatory, Hong Kong
Leading author: tclee@hko.gov.hk

Over the years, the Hong Kong Observatory has carried out scientific studies to evaluate the observed climate trends and project the future climate in Hong Kong, China under the combined effect of local urbanization and global warming. Analysis of the meteorological observations at the Observatory's Headquarters since 1885 reveals that the temperature rise in Hong Kong in the past century is in accord with the global rising trend. An increasing trend is also observed for annual rainfall. Studies of past occurrence of extreme temperature and rainfall in Hong Kong over the last 120 years or so have also been carried out using a suite of extreme indices adopted from the core indices developed by the Expert Team on Climate Change Detection, Monitoring and Indices under the auspices of the World Meteorological Organization, with appropriate modification to suit the sub-tropical climate of Hong Kong. Results show that cold episodes have become rarer while very hot days and heavy rain events are becoming more frequent. The warm spell duration in Hong Kong exhibited a statistically significant long-term rising trend whereas the cold spell duration had a statistically significant decreasing trend. Regarding rainfall, the frequency of occurrence of extreme hourly, 2- and 3-hourly rainfall amounts increased significantly. The contribution to the annual total precipitation by events exceeding the daily 95th percentile of the climatological normal (1971-2000) increased by 22 mm per decade, indicating that the contribution of heavy rain to the annual rainfall amount was increasing with time. Comparing the return periods in 1900 and 2000 determined by the time-dependent generalized extreme value distribution technique, the return period for the daily minimum temperature of 4^{o}C or lower had significantly lengthened from 6 years to longer than 160 years. The return period for the daily maximum temperature of 35^{o}C or higher had significantly shortened from 32 years to about 5 years. Regarding rainfall, the return period for an hourly rainfall of 100 mm or more had shortened from 37 years to 18 years. In respect of the future climate, the possible changes in the frequency of extreme temperature and rainfall events in Hong Kong in the 21st century were investigated by statistically downscaling a number of daily global climate model projections of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change for three greenhouse gas emission scenarios (A2, A1B and B1). The results suggest that the trends in temperature extremes that have been observed during the 20th century are expected to continue into the 21st century with a significant increase in hot nights and very hot days and a significant decrease in cold days. The rainfall in Hong Kong in the 21st century may become more extreme. The number of rain days is expected to decrease while the daily rainfall intensity in rainy days and the number of heavy rain days will increase. While most of the model-emission scenarios in general project consistent trends in the change of temperature and rainfall extremes in the 21st century, there is a large difference in the projections among different model/emission scenarios. This reflects that there are still large uncertainties in model simulations of future extreme temperature and rainfall events.