

# **Trends of hourly rainfall characteristics observed at the Hong Kong Observatory 1885-2009**

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## **Abstract**

There is an need to quantify changes in the water cycle in the context of global change. Hourly rain gauge data collected at the Hong Kong Observatory for the period 1884-2009, except for the period 1940-1946 missing due to World War II, were analyzed for trends using both linear regression and Empirical Mode Decomposition analyses. Five rain rate categories: trace (T), light rain (LR), medium rain (MR), and heavy rain (HR), and the total detectable rain occurrence (p, which is the sum of LR, MR and HR), were considered. Overall, there are significant decreases in p (-14%) and LR (-10%, significant at 99.9%) and an increase in HR (+42%). The data were analyzed separately for the winter monsoon (DJF), summer monsoon (AMJ) and summer and typhoon rain season (JAS). This general change pattern persists throughout the seasons. Significant increases of 17%, 19%, and 49% in T, MR and HR, respectively, occurred in JAS. The increases in HR were further collaborated with significant increases in the decadal 90-percentile rainfall. We further examined rain event statistics which include the total number of rain events, event duration, intensity, and separation for each season. There is a decrease in the number of rain events, with significant increase in the event duration, intensity and separation, especially for the wet seasons (AMJ and JAS). The decrease of detectable rain frequency and light rain occurrence and increase of heavy rain are consistent with GCM results under a global warming scenario, which points to more extreme hydrologic events, such as flood and drought. We also noted a general increasing trend in the trace amount through the data record. However, the trend is negative for the dry season (DJF). This opposite change pattern may be related to the aerosol effect on precipitation.