



Estimation of 4-hour probable maximum precipitation in Hong Kong using the revised statistical method and storm transposition

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In this paper, a revised statistical method by judging the annual maximum precipitation data series under some conditions for a reliable estimation value is utilized to estimate the 4-hour Probable Maximum Precipitation (PMP) in Hong Kong based on historical hourly data of 74 local rainfall stations. In addition, the four outstanding storms (Kalmaegi, Morakot, Fanapi and Herb) in Taiwan are divided into convergence component and orographic component by using step-duration-orographic-intensification-factor (SDOIF) method, respectively. In combination with the depth-area relationship of Kalmaegi, the most severe storm in short duration, the convergence components from the four storms are jointly used to develop a generalized convergence pattern. The pattern is transposed to superpose onto the gridded local orographic intensification factor (OIF) map of Hong Kong to get the embryonic PMP. The L-moment frequency analysis method is applied to get the 100-year return period of the historical 12-hour maximum persisting dew point at the Hong Kong station while the representative maximum 12-hour persisting dew point is obtained by averaging over Yongkang and Gaoxiong stations located in the Southwest moisture inflow route during Kalmaegi storm. Under the consumption of pseudo-adiabatic moisture profile, the precipitable water used to get the moisture maximization factor is calculated and converted to the 1000hPa dew point based on the representative maximum 12-hour persisting dew point at the target area (Taiwan) and the study area (HK), separately. Furthermore, final PMP estimates is achieved by multiply the embryonic PMP with moisture maximization factor. It is found that the result by the revised statistical method is about 558.5mm for 4-hour PMP in Hong Kong, while the result via the storm transposition with adjustment is about 718.2 mm. Both of them are higher than the 4-hour storm record in Hong Kong, which was 384mm of 7 June 2008 at Lantau, therefore they are reasonable and of reference value. However, in the design practice of a project, the result of statistical method is just used for reference while the result of storm transposition with adjustments will come into the practical use of design study.