Geophysical Research Abstracts
Vol. 20, EGU2018-6157-2, 2018
EGU General Assembly 2018

Application of Storm Separation Technique SDOIF to PMP Estimation in Mountainous Area

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The key issue of Probable Maximum Precipitation (PMP) estimation in orographic region is how to estimate the effects of topography on storm rainfall, and how to separate a storm into two components, the convergence component and the orographic component, as well. The Step-Duration-Orographic-Intensification-Factors (SDOIF) method introduced here is a quantitative method of estimating the effects of a particular terrain on landing storm rainfall which separates the mountainous storm rainfall into convergence components caused by atmospheric force and orographic components caused by terrain feature. Only convergence component can be transposed onto a study area, which is within climatologically consistent region, for estimation of PMP. Furthermore, it can estimate the variations of rainfall both in space and time. SDOIF is a combined engineering hydrologic-meteorological approach based on long-term rainfall statistics, synoptic analysis of storms and topographic features in a gridded design area. In this paper, the real time storm rainfall data of Xiazhanglong on 9th October 1999 and historical rainfall data of Fujian were first used to estimate the variation of Orographic- Intensification-Factors (OIF) with time. To study the reliability of OIF, the orographic effect of Ali Mountain in Taiwan on Typhoon Storm Morakot of 8th August 2009 was also investigated through different categories of extreme rainfall, the annual maximum precipitation and the quantiles of 100-year return period, based on vast data available in both time and space in Taiwan. The results show that the enhancement effect of topography on rainfall increases with the increase of time period. Although the OIF for the same duration calculated by 100-year return period value is almost the same with that by annul maximum precipitation serial with respect to space distribution. It still recommends that it's better to use the quantiles of 100-year return period to estimate the OIF instead of using annul maximum precipitation serial in terms of its preferable stability and rationality as long as historical rainfall data available in space and time.