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From Tropical Cyclone Tracks to Flood lead-time Predictions over a Mesoscale Mountainous Watershed

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Typhoon rainfall characteristics over a mesoscale mountainous watershed (drainage area of 620 km2) were analyzed to fill the gaps in our knowledge concerning the linkage between typhoon track, rainfall patterns, and flood peak time. This study used spatially high-resolution radar-derived rainfall estimates from 38 storm events ($\sim$2800 h) to investigate this linkage. The effect of spatial rainfall patterns on the timing of flood peak for the selected events was examined with the aid of a diffusive wave model. The results show that the typhoon rainfall was spatially aggregated and that the relative variations in the rainfall became smaller at higher rainfall rates. The maximum hourly rainfall was approximately twice the areal mean rainfall. Three major rainfall types were identified statistically, and different typhoon tracks appeared to have preferable rainfall types. This finding is presumably due to the interaction of the typhoon circulation and precipitation with the mountainous landscape. Flood lead times were derived for the different rainfall types, and it was found that differences in their lead times could be as large as $\sim$3 h over the studied mesoscale watershed. It is recommended that this empirical approach be incorporated into flood forecasting and warning systems.