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Association between torrential rainfall and tropical cyclone induced remote moisture transport over East Asia

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There is increasing attention to torrential rainfall remote from tropical cyclones (TCs). However, the relationship between precipitation and TC induced remote moisture transport over decades is still unknown. To find the relationship above, we used objective identification of TC induced remote moisture transport to obtain spatiotemporal evolution of clusters and rainfall characteristics inside the clusters. The contribution of TC induced remote moisture transport to annual mean rainfall over North China and surroundings are 5–15 % higher than that over South China and surroundings. TC cases that induced remote heavy rainfall over two regions are listed. The tracks of TC induced remote moisture transport are generated using spatiotemporal digraphs. We used double Gaussian function to fit the relationship heavy rainfall frequency and moisture transport height, and used sigmoid function for the relationship between heavy rainfall frequency and moisture transport intensity derived from thousands of clusters over decades. The moisture transport height of peak heavy rainfall frequency over TC induced remote moisture transport are significantly higher than the transport without TC effect. The moisture transport intensity threshold for heavy rainfall frequency over 20 % is smaller over South China and surroundings than that over North China and surroundings. Those results above have quantified the relationship between heavy rainfall and moisture transport inside clusters, which is beneficial to forecast of torrential rainfall remote from TCs.