

## Relationships between heavy rainfall in East/Southeast Asia and track, intensity, duration patterns of tropical cyclones

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Tropical cyclones (TCs) have considerable impacts to many areas in East/Southeast Asia. For instance, TCs accompanied with heavy precipitation could cause floods, and the strong winds of TC also could induce huge damages on their track and surrounding environment. In addition, Intergovernmental Panel on Climate Change (IPCC) 5th assessment report mentions possible increasing of both global mean tropical cyclone maximum wind speed and rain rates. Thereby, it would be very important to deepen our understanding on the relation between TCs and their impacts to local climate in East/Southeast Asia.

This study aims to extract observed TC patterns by employing a nonlinear classification method, and also examine relations between extracted TC patterns and heavy rainfall in East/Southeast Asian cities. The classification method used in this study is the self-organizing maps (SOM). The SOM has been recently used in climate science and have shown significant performance for analysis of high dimensional climate data.

In this study, we utilized the TC data provided by JTWC (Joint Typhoon Warning Center). The data period used in this study is 62 years from 1951-2012. Then, we extracted longitude, latitude, maximum sustained wind speed, and duration from TC genesis in order to make input for the SOM. Consequently, each TC is represented as 39 dimension vector, and total 1,837 TCs are utilized as input for the clustering by the SOM. We set the map size of the SOM as 3x3 hexagonal grids.

By the SOM algorithm, total 1,837 TCs were classified in nine nodes (i.e. nine patterns). As a result, several distinguishable TC patterns were extracted by the SOM, according to their track, intensity and duration. Then, we extracted the TCs classified in each pattern, and subsequently examined relations between the extracted TC patterns and rainfall at 21 meteorological stations in East/Southeast Asian cities. Our analysis confirmed clustering method is quite useful in identifying TC properties. The result also suggested extracted TC patterns are highly related with heavy rainfall in some of the target cities.

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