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Identifying Typhoon Tracks based on Event Synchronization derived Spatially Embedded Climate Networks

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Complex networks are commonly used for investigating spatiotemporal dynamics of complex systems, e.g. extreme rainfall. Especially directed networks are very effective tools in identifying climatic patterns on spatially embedded networks. They can capture the network flux, so as the principal dynamics of spreading significant phenomena. Network measures, such as network divergence, bare the source-receptor relation of the directed networks. However, it is still a challenge how to catch fast evolving atmospheric events, i.e. typhoons.
In this study, we propose a new technique, namely Radial Ranks, to detect the general pattern of typhoons forward direction based on the strength parameter of the event synchronization over Japan. We suggest to subset a circular zone of high correlation around the selected grid based on the strength parameter. Radial sums of the strength parameter along vectors within this zone, radial ranks are measured for potential directions, which allows us to trace the network flux over long distances. We employed also the delay parameter of event synchronization to identify and separate the frontal storms' and typhoons' individual behaviors.