運用自組織映射圖辨識東亞季風春夏季節轉變與季風演變異常年份

Using Self-Organizing Map Method to Identify East-Asian Spring to Summer Low-level Circulation and Precipitation Transition and the Abnormal Years

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Abstract

East Asia monsoon exists substantial changes of low-level wind and precipitation from April to July. To examine the spring to summer seasonal evolution of circulation patterns, the self-organizing map (SOM) is used in this study to classify the daily 850-hPa horizontal wind field during 1979-2022 AMJJ into a 3×3 map. Nine circulation types and corresponding precipitation fields show clear time preference for their appearance. Subsequently, a SOM spring-to-summer monsoon calendar is constructed. The transition from spring to summer can be separated into three stages. In the pre-development stage, the low-level wind fields are characterized by weak south-westerly at Bay of Bengal. During the developing stage, the wind fields show stronger south-westerly over Bay of Bengal and South China Sea. These patterns often occurred during Taiwan mei-yu season. In the developed stage, the monsoon trough type of low-level winds dominate East Asia, showing the typical circulation patterns in summer. Based on the monsoon calendar, we can objectively identify the abnormal years and explore the potential application to predict rainfall extremes in East Asia weeks ahead.

Key word: East Asia monsoon, self-organizing map, seasonal transition, cluster analysis

關鍵字：東亞季風、自組織映射圖、季節轉變、聚類分析