

Using weather pattern recognition to classify and predict summertime heavy rainfall occurrence over the Upper Nan river basin, northwestern Thailand

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In this study, the Self-Organizing Maps in combination with K-means clustering are used to objectively classify the anomalous weather patterns (WPs) associated with the summertime (May–June, MJ, and July–August–September, JAS) heavy rainfall days during 1979–2007 over the Upper Nan river basin, northwestern Thailand. The results show that in MJ, intensive rains are mainly brought by the remarkable enhancement of westerly summer monsoon. Meanwhile, westward-propagating tropical disturbances including tropical cyclones are the primary factors reproduce heavy rainfall over the Upper Nan in JAS. It also suggests that the occurrence time of local heavy rainfall is strongly related to the seasonal transition of summer monsoon over the Indochina Peninsula. The classification results are then implemented with the perfect prognosis and analogue method to predict the occurrence (yes/no) of heavy rainfall days over the studied basin in summer 2008–2017 using prognostic WPs from the operational Japan Meteorological Agency Global Spectral Model (GSM). In general, the forecast skills of this approach up to 3-day lead times are significantly improved, in which it not only outperforms GSM with same forecast ranges but also its 3-day forecast is better than 1–2-day forecasts from GSM. However, the false alarms ratio is still high, particularly in JAS. Nevertheless, it is expected that the new approach will provide warning and useful guidance for decision-making by forecasters or end-users engaging in water management and disaster prevention activities.