A Tropical Cyclone Similarity Search Algorithm Based on Deep Learning Method

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The tropical cyclone (TC) track forecast is still a challenging problem. For operational TC forecasts, it is useful for forecasters to find the similar TC in history and reference its data to improve TC forecasting. Considering the vast number of historical TC cases, it is necessary to design a suitable search algorithm to help forecasters find similar TC cases. A historical TC similarity search algorithm (named as SA_DBN) used deep learning approaches based on 500-hPa weather patterns was proposed in this study. Various weather features were automatically extracted by a deep belief network (DBN) without subjective influences. The Chebyshev distance was used to measure the similarity between two TCs. In order to show that similar-TCs retrieved by SA_DBN are helpful for forecasting, a modified WPCLPR method based on the standard WPCLPR and similar-TC track is designed. The modified WPCLPR improved the forecast result (at 85% confidence level) when the lead time was 54H, 60H or 66H. These results showed that the proposed algorithm could effectively retrieve similar TCs and be helpful to forecasters.