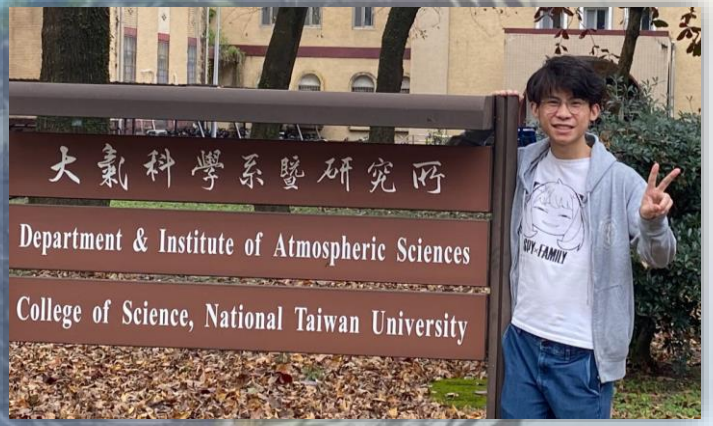
Prediction of Tropical Cyclogenesis Based on Machine Learning Methods



Mr. LOI Chi Lok
（呂智樂先生）
National Taiwan University

Predicting Tropical Cyclogenesis (TCG) has long been a challenging research task. Machine learning methods recently have been shown withholding high prediction skill for forecasting tropical cyclogenesis. In this study, we first use Kalman filters applied on the Gaussian-smoothed 850-hPa vorticity field to label tropical disturbances. Physical variables, such as wind shear, vorticity, precipitation and sea surface temperature, are extracted following disturbance centers to train three machine learning models: random forest, support vector machine and neural network that classify developing and non-developing tropical disturbances. SHAPley values analysis shows that the vorticity at 500 hPa is the most important feature. All of the three models have displayed consistently good performance, with the neural network having the highest f1-scores of 0.79. Our results suggest that rich mid-level cyclonic vorticity in a mesoscale convective vortex is instrumental in the subsequent low-level spin-up of the disturbance and is an essential sign for the prediction of TCG.

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ID: 992 4969 9833 Passcode: 983837

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Enquires: 3943 5494 eesc@cuhk.edu.hk