
Hybrid Models for Extreme Meteorological Events

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Abstract

Our hybrid forecasting model is based on numerical simulation codes and machine learning algorithms. The numerical codes can be global or limited-area meteorological models. Our focus is mainly addressed to aviation meteorology. The global model is the Global Forecast System (GFS) - National Centers for Environmental Prediction (NCEP), and the limited area model used is the Weather Research and Forecasting (WRF) - National Center for Atmospheric Research (NCAR). Some atmospheric attributes from a meteorological model are selected by the p-value statistical method to reduce the dimension of the data without losing information. The selected attributes are employed to feed some machine learning algorithms. The hybrid strategy is applied to predict extreme convective events in the Rio de Janeiro (Brazil) metropolitan area by using WRF model and random forest algorithm. A hybrid model using data from the GFS global model and multi-layer perceptron neural network is applied to predict the clear air turbulence (CAT) over Brazilian territory. Both hybrid schemes show better predictions than only physics-based models.

Keywords: Hybrid model, Physics, based models, machine learning, Convective events, Clear air turbulence

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