Using the MJO to make Statistical Predictions of Weekly Tropical Cyclone Activity in the Southern Hemisphere

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Abstract

A statistical prediction scheme, employing logistic regression, is developed to predict the probability of tropical cyclone (TC) formation in zones of the Southern Hemisphere during forthcoming weeks. Through physical reasoning, examination of previous research, and our own initial analysis, five predictors were chosen for this purpose: one representing the climatological seasonal cycle of TC activity in each zone; two representing the eastward propagation of the Madden-Julian oscillation (MJO); and a further two representing the leading patterns of interannual sea-surface temperature (SST) variability in the Indo-Pacific. Cross-validated hindcasts were generated being careful to use the predictors at lags that replicate what can be performed in real time. All predictors contribute significantly to the skill of the forecasts for at least some leads in the majority of zones. In particular, we find that inclusion of indices of the MJO as predictors can lead to increased skill out to the third week. Beyond the third week, the skill asymptotes to that which can be achieved through consideration of the seasonal cycle and interannual variability alone. Further, we demonstrate the importance of a simple consideration of the seasonal cycle of TC activity for intraseasonal TC forecasts, for all forecast leads.

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