

## Performance of Lamp Convection Probability and Categorical Forecasts

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The Meteorological Development Laboratory (MDL) has developed LAMP gridded 2-h probability and categorical forecasts of convection. The forecasts, which are issued hourly throughout the year in the 3- to 25-h range for the contiguous United States (CONUS), are intended for use as guidance for tactical and strategic air traffic decision making and for public forecasts. A convection event is defined as the yes/no occurrence of either radar reflectivity of  $\geq 40$  dBZ or  $\geq 1$  cloud-to-ground (CTG) lightning strikes (or both) in a 2-h period for a 20-km grid box. Where radar data are missing or not reliable, which is common in the western U.S., convection is defined from lightning data alone. This predictand, which is identical to the currently-operational LAMP CTG lightning (previously called "thunderstorm") predictand except for the incorporation of radar reflectivity, should be more useful for many applications since convective precipitation sometimes occurs with little or no CTG lightning.

The probability of occurrence of convection is the basic forecast element produced by the LAMP model. Objective scoring of the probabilities reveals substantially higher skill and sharpness than for operational LAMP lightning probabilities. The improved forecast performance of the convection probabilities is due to the broader definition of convective storms and to the incorporation of supplemental, high resolution predictors from the National Centers for Environmental Prediction (NCEP) Mesoscale Model [NMM; both LAMP products (CTG lightning and convection) use predictors from the large scale NCEP Global Forecast System (GFS)].

LAMP categorical convection "potential" forecasts (alternative terms for potential are "likelihood," "risk," "threat," etc.) are obtained from the probabilities through application of threshold probabilities (computed from historical samples). Specifically, four categories of convection potential ("no," "low," "medium," and "high") are specified with three thresholds. The thresholding-categorization procedure is designed such that low, medium, and high potential combined (a yes/no convection re-categorization) strongly overforecasts convection (average bias is 2.7 or 27 forecast events for every 10 observed events), medium and high potential combined slightly overforecasts convection (bias is 1.1), and high potential strongly underforecasts convection (bias is 0.4). These bias values do not vary with forecast projection, geography, season, time of day, etc.

Objective scoring of the convection potential shows that the Critical Success Index for medium and high potential combined is substantially higher (better) than that for operational yes/no LAMP lightning forecasts. Thus, the improved forecast accuracy of convection potential together with its known bias properties underlies its prospective forecast guidance utility.