LAMP Convection Objective Forecast Guidance: Technical Description

Part 1 – Mission Statement

1. **Brief Product Description**

   Objectively-produced LAMP convection forecast guidance consists of probability and multi-category forecasts of convection occurrence in 20-km grid boxes for 2-h periods in the 3- to 25-h range over the CONUS. Convection in a grid box is defined as the occurrence of either radar reflectivity of ≥ 40 dBZ or ≥ 1 cloud-to-ground (CTG) lightning strikes (or both) during the 2-h valid period. The probability of convection occurrence is the basic model element from which the multi-category potential element is derived. The latter consists of four objectively defined "convection potential" categories consisting of "no," "low," "medium," and "high." The forecasts are produced each hour year round, where the issue time for a given clock hour (H) is approximately H+45 min (presently).

   Note that the convection predictand definition is identical to that for operational LAMP cloud-to-ground (CTG) lightning guidance forecasts ((http://www.nws.noaa.gov/mdl/gfslamp/tstorm.php), except for the (supplemental) inclusion of radar reflectivity in the convection predictand. Another difference for LAMP CTG lightning is that the similarly-derived categorical forecast element consists of only two categories ("yes/no" occurrence) rather than four.

2. **Purpose/Intended Use**

   The LAMP convection forecasts should have multiple applications, which include tactical and strategic air traffic management, agricultural operations, public safety, and recreation activities.

3. **Audience/Users**

   Aviation applications users of the LAMP convection forecasts include the National Weather Service (NWS) National Centers for Environmental Prediction (NCEP) Aviation Weather Center (AWC) for preparation of national convection forecast products; also the forecasts should serve NWS Weather Service Forecast Offices (WFOs) as guidance for preparation of aviation terminal forecasts. Finally, the forecasts may aid WFOs in the preparation of short range forecasts for the general public, which benefit the welfare of society, agricultural, and recreation activities.

4. **Product availability**

LAMP convection forecast probability and potential grids are issued every hour for 14 forecast projections that fall in the range from 3 hours to 25 hours. The forecast projections are in hourly increments for the first seven or eight hours (depending on the LAMP model cycle) and two hour increments thereafter, and the geographical coverage spans the contiguous United States borders and slightly beyond. Graphical forecast maps are available at http://www.weather.gov/mdl/lamp/convection.php, and gridded data in GRIB2 format are available for downloading at http://www.mdl.nws.noaa.gov/~glmp/conv_grib/.

5. **Feedback Method:**

In the near future (date to be determined), LAMP "experimental" convection forecasts will be produced in the parallel job stream of the NWS Central Computing System at NCEP. A Public Information Statement will be issued to advise users of the availability of the experimental forecasts and to provide a mechanism for feedback during a public comment period. Also, opportunities for face-to-face user feedback will be provided through occasional workshops, interactive web presentations, etc. For further information please contact:

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Part 2 – Technical Aspects

1. **Science Basis**

Objective scoring of the LAMP convection probabilities reveals substantial forecast skill and sharpness, and good reliability. For instance, the skill and sharpness is much better than that for operational LAMP cloud-to-ground lightning probabilities even though the convection and lightning models have a similar design. The superior performance for convection is attributed to supplemental dynamical predictor input from the NCEP North American Mesoscale (NAM) model, as both LAMP (CTG and convection) models use dynamical predictors from the large scale NCEP Global Forecast System (GFS). The NAM predictor input also provides additional spatial resolution.

The four-category convection potential forecasts are derived from the probabilities through application of three previously-derived threshold probabilities. A given probability threshold is derived (through an iterative process) such that the associated threat score (same as Critical Success Index) is maximized within a very narrow, prescribed bias range. With this procedure, the average bias is specified as 2.7 (27 forecast events for every 10 observed events) for low (L), medium (M) and high (H) potential combined, 1.1 (11 forecast events

for every 10 observed events) for M and H potential combined, and 0.4 (4 forecast events for every 10 observed events) for H potential. It is noted the three threshold probabilities vary by geographical location, forecast projection, and LAMP cycle, but the average bias values are fixed. Thus, the convection potential has the same meaning regardless of geographical location, forecast projection, or cycle. Finally, note that the threshold probability for L potential is the lowest among the three thresholds, and it is highest for H.

Further information about the LAMP convection forecasts is available at http://www.nws.noaa.gov/mdl/pubs/Documents/Papers/CharbaSamplatskyShafer_2011.pdf

2. **Training**

Training in the guidance use of the LAMP convection elements may be provided through occasional workshops, webcasts, and web-based training modules.

3. **Availability**

Graphical LAMP convection forecast maps are available experimentally 24/7 and updated each hour (H) at approximately H + 45 min at http://www.weather.gov/mdl/lamp/convection.php . Downloadable GRIB2 files are available at http://www.mdl.nws.noaa.gov/~glmp/conv_grib/.