LAMP Convection Objective Forecast Guidance: Technical Description

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Part 1 – Mission Statement

1. Brief Product Description

Objectively-produced LAMP convection forecast guidance consists of probability and multi-categorical 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 lightning strikes (or both) during the 2-h valid period. Convection probability is the basic model forecast from which a multi-categorical "convection potential" forecast 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+40 min.

Note that the LAMP convection predictand definition is identical to the predictand 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 derived categorical forecast consists of only two categories ("yes/no" occurrence) rather than four categories for convection.

2. Purpose/Intended Use

The LAMP convection product has forecast guidance for tactical and strategic air traffic management, agricultural operations, public safety, and recreation activities.

3. Audience/Users

Targeted users of the LAMP convection forecasts include the National Weather Service (NWS) National Centers for Environmental Prediction (NCEP) Aviation Weather Center (AWC) as guidance for preparation of national convection forecast products; also the forecasts should serve NWS Weather Service Forecast Offices (WFOs) as guidance for the 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 probability and potential grids are issued every hour for 14 forecast projections in the 3 – 25 hour range. The forecast projections are in hourly increments for the first seven or eight hours (depending on the LAMP model cycle) and in two hour increments thereafter. 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.nws.noaa.gov/mdl/lamp/cnvltg_downloads.php.

5. Feedback Method:

The LAMP convection product is currently being produced experimentally on the NCEP Weather and Climate Operational Supercomputing System (WCOSS). In the near future (date to be determined), a Public Notification 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 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. In particular, the skill and sharpness is much better than that for operational LAMP CTG lightning probabilities (noted above) even though the convection and lightning models have a similar design. The superior performance for LAMP convection is attributed to supplemental MOS predictors from the NCEP North American Mesoscale (NAM) model, as both the convection and lightning models use MOS predictors from the (large scale) NCEP Global Forecast System (GFS)]. The NAM MOS predictors also provide enhanced spatial resolution in the convection product.

The four-category convection potential forecasts are derived from the probabilities through the 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 narrow, prescribed bias range. With this procedure, the average bias is about 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. Thus, the threshold probability for L potential is the lowest among the three thresholds, and it is the highest for H. Finally, the three threshold probabilities vary by season of the year, geographical location, forecast projection, and LAMP cycle, but the average bias is fixed. Thus, the bias properties of the convection potential (over a long sample) do not vary as a function of season, geographical location, time of the day, etc., which is an important attribute.

Information on forecast skill for the LAMP convection probabilities and accuracy of the potential forecasts (and additional information about the convection product) is available at http://www.nws.noaa.gov/mdl/pubs/Documents/Papers/CharbaSamplatskyShafer_2011.pdf and http://www.nws.noaa.gov/mdl/gfslamp/docs/LAMP_convec_newltg.pptx.

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 at http://www.weather.gov/mdl/lamp/convection.php are available experimentally 24/7 and updated each hour (H) at approximately H + 40 min. Downloadable GRIB2 files are available at http://www.nws.noaa.gov/mdl/lamp/cnvltg_downloads.php