Aviation Products from the Localized Aviation MOS Program (LAMP)

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Outline

- LAMP Overview
- Brief LAMP Verification
- Current Status and Products
- Example of LAMP Application
- Future Plans
LAMP Overview
Localized Aviation MOS Program (LAMP) Background

- LAMP is a system of objective analyses, simple models, regression equations, and related thresholds which together provide guidance for sensible weather forecasts.

- LAMP acts as an update to GFS MOS guidance.

- Guidance is both probabilistic and non-probabilistic.

- LAMP provides guidance for aviation elements.

- LAMP bridges the gap between the observations and the MOS forecast.
Theoretical Model Forecast Performance of LAMP, MOS, and Persistence

LAMP outperforms persistence for all projections and outperforms MOS in the 1-12 hour projections.

The skill level of LAMP forecasts begin to converge to the MOS skill level after the 12 hour projection and become almost indistinguishable by the 20 hour projection.

The decreased predictive value of the observations at the later projections causes the LAMP skill level to diminish and converge to the skill level of MOS forecasts.
LAMP Guidance Details

LAMP guidance is in the range of 1-25 hours in 1 hour projections

- LAMP provides station-oriented guidance for:
  - all LAMP forecast elements
  - ~1600 stations
  - CONUS, Alaska, Hawaii, Puerto Rico

- LAMP provides grid-oriented guidance for:
  - Thunderstorms:
    - Probability of thunderstorm occurrence in a 2 hour period in a 20-km grid box
    - Best Category Yes/No of thunderstorm occurrence in a 2 hour period in a 20-km grid box
  - CONUS only

- As of November 13, 2008, LAMP is running 24 times a day (every hour) in NWS operations

- Temperature and dewpoint
- Wind speed, direction, and gusts
- Probability of precipitation (on hr)
- Probability of measurable precipitation (6- and 12-h)
- Precipitation type
- Precipitation characteristics
- Thunderstorms
- Ceiling height
- Conditional ceiling height
- Total sky cover
- Visibility
- Conditional visibility
- Obstruction to vision
Example of blending Observations and MOS
1-3 hr LAMP Thunderstorm forecast

Predictor: 12 UTC MOS Thunderstorm
Prob – Valid 22–00 UTC

Predictor: 21 UTC lightning strike data
13-15 hr LAMP Thunderstorm forecast

12 UTC MOS Thunderstorm Probability
– Valid 10 – 12 UTC (next day)

21 UTC LAMP Thunderstorm Probability
– Valid 10 – 12 UTC (next day)
Brief LAMP Verification
0900 UTC LAMP compared to MOS
Categorical Visibility < 3 miles

0900 UTC threat for visibility < 3 miles
Cool Season (October 2007 - March 2008); 1523 stations

0900 UTC LAMP verified against 0000 UTC GFS MOS
Current Results

LAMP in Stats on Demand:

National TAF sites
IFR and lower conditions
July 01 - December 31, 2008

Score
POD
FAR
CSI
0-6 hours, Scheduled Only

GFS MOS  LAMP  TAF
0  0.1  0.2  0.3  0.4  0.5  0.6  0.7  0.8

Current Status and Products
Current Status and Products

- Guidance sent out from NCEP on SBN/NOAAPort and NWS FTP Server
  - ASCII text bulletin
  - BUFR data
  - GRIB2 thunderstorm data

- Available Products:
  - Guidance viewable in AWIPS D2D and AvnFPS
  - Website products:
    - Text bulletins
    - Station plots
    - Meteograms
    - Probability/Threshold images
    - Gridded Thunderstorm images
Overview of Available AWIPS Products

- Available to NWS forecasters via AWIPS
  - Guidance is viewed as text or graphically by forecasters
  - Guidance is input into software for preparing TAFs
Website: LAMP Station Plots

Elements
- Flight Category
- Ceiling Height
- Visibility
- Obstruction to Vision
- Total Sky Cover
- Precipitation Type
- Probability of Precipitation
- Wind Speed
- Wind Gust
- Wind Direction
- Temperature
- Dewpoint

Click an element name on this slide to see its plot
Website: LAMP Station Meteograms

Features

- Up to 12 displayable LAMP forecast elements
- Real-time verification of current and past cycles
- Verification of completed past cycles including the corresponding GFS MOS forecast
Website: LAMP Thunderstorms
Probabilities and Best Category (Y/N)
All Projections
New website graphics

New LAMP probability/threshold graphics available on LAMP website:

• Goal is to depict the LAMP probabilities and information about the related thresholds so that users can have more information about the probabilities underlying the best category forecasts from LAMP.

• One would have more confidence in a chosen category if the probability exceeded the threshold by a large amount, compared to the probability just barely exceeding the threshold.

• Graphics for stations:
  ▪ Line plots show probabilities and thresholds by element
  ▪ Color coded bar charts indicate the confidence in choosing a category by indicating how close the probability was to the threshold.

• Aviation probabilities and associated thresholds easily viewable for all LAMP stations and cycles.
The probability of “few” exceeds the threshold value for “few” – therefore LAMP categorical forecast is “few”
Depicting Probabilistic Information

Purpose: indicate to user the uncertainty associated with the Best Category forecasts given the probabilistic information.

Threshold = dashed black line
Probability < thres = green line
Probability ≥ thres = red line

- San Francisco – very small chance of precip
- St. Louis – slight chance of precip
- Chicago – slight chance yes and slight chance no precip
- St. Cloud – high chance of precip
LAMP Probabilities and Thresholds for Flight Categories
Uncertainty Plot Tab – looking at vis ≤ 5 miles

Red = Yes
Probability exceeds threshold by more than 10%

Orange = Likely
Probability exceeds threshold but NOT by more than 10%

Yellow = Chance
Probability is less than the threshold but more than 10% less

Cyan = No
Probability is less than the threshold by more than 10%

Note that this shows you one condition (e.g., vis ≤ 5 miles). To determine the most likely condition, you should consider rarer conditions first.
Example of LAMP Application
LAMP/CCFP Hybrid

- Customers can access LAMP guidance and develop products from it.
- Example: Customers are retrieving LAMP thunderstorm grids from NDGD and producing a LAMP/CCFP Hybrid thunderstorm product:
  
  http://www.lampccfp-hybrid.com/LAMP.swf

**Background** ([http://www.avmet.com/LCH/](http://www.avmet.com/LCH/)):

“The Collaborative Decision Making (CDM) stakeholders chartered the Weather Evaluation Team (WET) to evaluate and recommend an 8-24 hour convective forecast product to be used for operational planning. For the 2009 convective season, the WET proposed to evaluate the use of LAMP as a complement to the CCFP for convective forecasting. The LAMP-CCFP Hybrid webpage is the outcome of this proposal and is currently a prototype product.”
No Canadian or Gulf LAMP data 50 miles outside of the US Border.
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Future Plans
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• Minimize inter-element inconsistencies in anticipation of gridding forecasts

• Gridded LAMP forecasts of:
  • Temperature and dewpoint
  • Winds
  • Probabilities of Ceiling Height
  • Ceiling Height
  • Probabilities of Visibility
  • Visibility
Future Plans

- Redevelop LAMP station guidance of ceiling height and opaque sky cover
- Inter-hour station-based LAMP using SPECI observations
- Convective cloud tops?
Questions?

• **LAMP Website:**

• **Training Materials:**
  - Powerpoint Presentations, each one should take less than 1 hour to complete
  - http://www.nws.noaa.gov/mdl/gfslamp/docs/presentations.shtml
    - Training on LAMP Background: “An Introduction to The Localized Aviation MOS Program (LAMP)” by David Rudack.

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