Recent Developments/Improvements in Objective Analyses of Observations/Forecasts for Localized Aviation MOS Products at the Meteorological Development Laboratory

Jung-Sun Im* and Bob Glahn
Meteorological Development Laboratory, NWS, NOAA

1. Introduction

As part of the Localized Aviation MOS Program (LAMP), the Meteorological Development Laboratory (MDL) is providing gridded observations (0-h proj.) and gridded LAMP forecast guidance (1-25 h-proj.) for 2-m surface temperature (T), 2-m dewpoint temperature (Td), ceiling height (C), and visibility (V) at each hour for forecasters in preparing the National Digital Forecast Database (NDFD). This presentation focuses on improvements over operational LAMP T/Td gridded products and new developments of LAMP 10-m wind gridded products covering 0-25 h.

We describe the intensive effort needed to assure temporal consistencies between gridded observations (0 h) and the first projection (1 h) of gridded LAMP forecasts and also from 1 h to 25 h by showing a method developed with an augmentation algorithm. In the current operational augmentation procedures, data derived from the Short-Range Ensemble Forecast (SREF) system are used to augment the station LAMP T/Td forecasts; this augmentation was necessary to provide detail for the 2.5-km resolution grid. For this new development, we instead use observations and MOS forecasts for augmentation, which are adjusted with LAMP forecasts and weighted by projection (i.e., with higher weights of observations in earlier projections and higher weights of MOS forecasts in later projections). Another important capability required in our objective analysis scheme is the effective computation of vertical changes with elevation (VCE). In the SREF suite, the lapse rate for each station point is computed by using neighboring pairs of stations and then used to make vertical adjustments over grid points. To compute wind's VCE at each station point, we use surface and Global Forecast System (GFS) upper level data.

2. BCDG Scheme & Pre-Processors

Berghorston-Cressman-Dossey-Glahn (BCDG) Objective Analysis Scheme (Glahn et al. 2009, Glahn and Im 2011, Im and Glahn 2012)

• Successive Correction: Correcting each grid pt on each pass with the stn data in the immediate vicinity
• Land/Water Sep. (Land, Ocean, Lake)
• Vertical Changes
• Variable Radius of Influence R (varies with data density)
• Buddy Checks (QC)
• Terrain-Following Smoother
• Spot Remover (Variable Radius Smoother)

3. Fitting Observations in BCDG Scheme

Wyoming/Colorado/Nebraska

4. GLM Suit

GOBS (00 h) + GLMP (01-25 h)

Nowcasting
Forecasting

GOBS: Nowcasting grids issuing at ~12:30 UTC
GLMP: Forecasting grids issuing at ~00:00 UTC (GOBS Only 06 09 12...

“Critical for Aviation Operations” LAMP has been shown to be an improvement over MOS; new wind products as a result.

5. Problem in Current Operational GLM Suit

Temperate Discontinuity between GOBS and GLMP

Why?
Used Short Range Ensemble Forecast (SREF) to fill LAMP Spatial Gaps

6. New Augmentation Method

Distributions of LAMP/MOS/OBS data

LMP (1,445 stns) MOS (3,245 stns) OBS (25,326 stns)

Base Stns: No Water Points No Canad Points
Aug. Stns: Helpful in later projections & useful because MOS data always available
Aug. Stns: Very helpful in earlier projections & useful due to large # of OBS

7. Results: Improvements (Cont.)

7.1. TEMPERATURE SUITE

GOBS (00 h) = GLMP 01 h

Lamp/GLMP/MOS/OBS MAE for T (00Z, Warm Season, 2003)

MOS*: .6
LMP: 1
OBS*: .01

Improved Consistency

MAE

Lamp/GLMP/MOS/OBS MAE for T (00Z, Warm Season, 2003)

MOS*: .6
LMP: 1
OBS*: .01

Improved Consistency

8. Scheduled Implementations

The Upgraded MDL GOBS/GLMP (00-25 h) T/Td/C/V and New Wind/Cloud Cover sets will be available at NCEP Central Operations.

References