Guidelines for WFO Delivery of Local 3-Month Temperature Outlook

Climate Services Division
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1. INTRODUCTION

The National Weather Service's (NWS) Climate Services Division (CSD) has developed a Local 3-Month Temperature Outlook (L3MTO) to compliment the Climate Prediction Center's (CPC) National 3-Month Temperature Outlook, at individual stations. The L3MTO is scheduled for operational release in January 2007. This document will provide guidance to field offices on staff roles and responsibilities in L3MTO dissemination.

1.1. Overall L3MTO definition and format

The L3MTO will be available via the Internet through links on the NWS national climate homepage (www.weather.gov/climate/l3mto.php) as well as through individual Weather Forecast Office (WFO) homepages. The L3MTO will be released coincident with the Climate Prediction Center's (CPC) National 3-Month Temperature Outlook at 8:30AM ET on the third Thursday of each month. The product will be available in three primary formats (figure 1): a pie chart, a temperature range, and the probability of exceedance (POE). Pie charts display the expected chance for the average 3-month Temperature to fall within 3 categories: Below-, Near- and Above-Normal as compared to 1971-2000 observations. The temperature range graph represents expected annual range of average 3-month temperature with confidence intervals, which can be selected by the user. The POE plot shows the expected chance that the average 3-month temperature will exceed (to be higher than) specified temperature values.

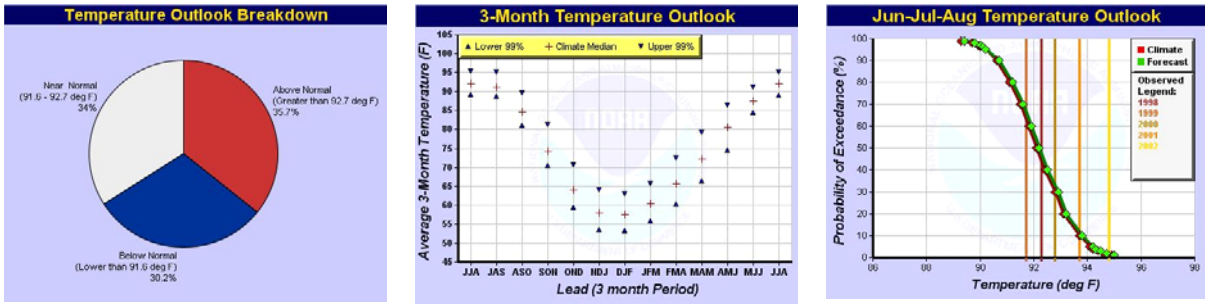

Figure 1: L3MTO main formats: Pie Chart (left); Temperature Range Graph (center); Probability of Exceedance Plot (right)

All product formats are complimented with numeric tables and supporting text interpretation. Also available is probability of non-exceedance information that compliments the POE. Additional information on formats is available in the Product Description Document available on: http://products.weather.gov/viewliste.php

1.2. Process for L3MTO computation and dissemination:

- The National Climatic Data Center (NCDC) provides and updates the database that is used to build the L3MTO product
- CPC provides 3-month outlooks for forecast divisions
- The Local Forecast Products Specialist (LFPS), Annette Hollingshead, produces the forecast, provides primary quality control, fixes appropriate trouble ticket items and archives the L3MTO
- The Climate Services Web Specialist (CSWS), John Bollinger, posts the product on the Web and ensures data flows through appropriate channels
- Data will be hosted at the national web farm level at NWS Headquarters (NWSHQ)
- NWS Regional Headquarters (RHQ) collect trouble tickets
- NWS Weather Forecast Offices (WFO) select forecast sites within WFO county warning area, ensure a link to the L3MTO is found on their web pages, provide secondary quality control of the product, provide local value-added information augmenting the product (guidelines on the latter will be included in a later version of this document), and provide customer services

1.3. Primary Quality Control (QC) actions

The LFPS provides primary quality control of L3MTO (Figure 2), which includes:

- Ensuring correctness and consistency in computational routines
- Random checks of xml files to ensure issue date and forecast date are correct
- Ensuring values exist and make logical sense
- Ensuring forecast values are within two standard deviations of climatology
- Running random site climatology checks
- Ensuring climatology values do not equal forecast values (where inappropriate)
- Ensuring current forecast is different from last month's forecast

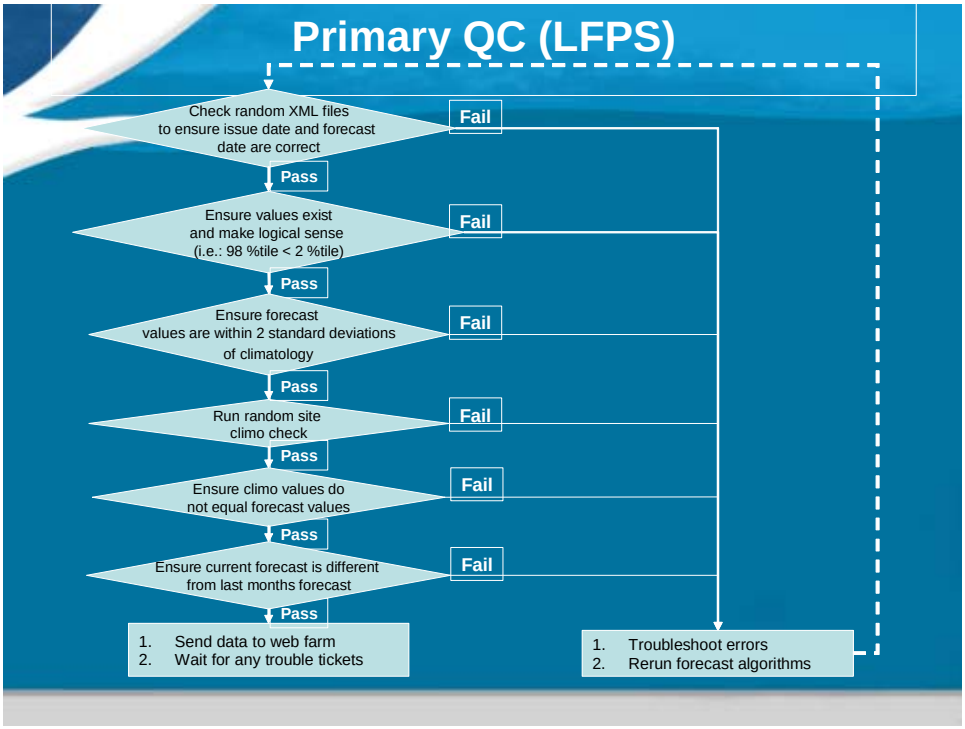

Figure 2. Primary QC procedures.

Following these checks, the LFPS:

- Troubleshoots any errors that fail the quality control check
- Re-runs forecast algorithms when necessary

2. WFO OPERATIONAL DUTIES ON L3MTO DISSEMINATION

This section describes the operational duties that should be undertaken by the Weather Forecast Offices with respect to L3MTO.

2.1. Secondary QC

WFOs should perform monthly secondary QC of the L3MTO product for stations in their area of responsibility. A quality control procedure shown in Figure 3 and detailed below should be accomplished by each WFO with each forecast release.

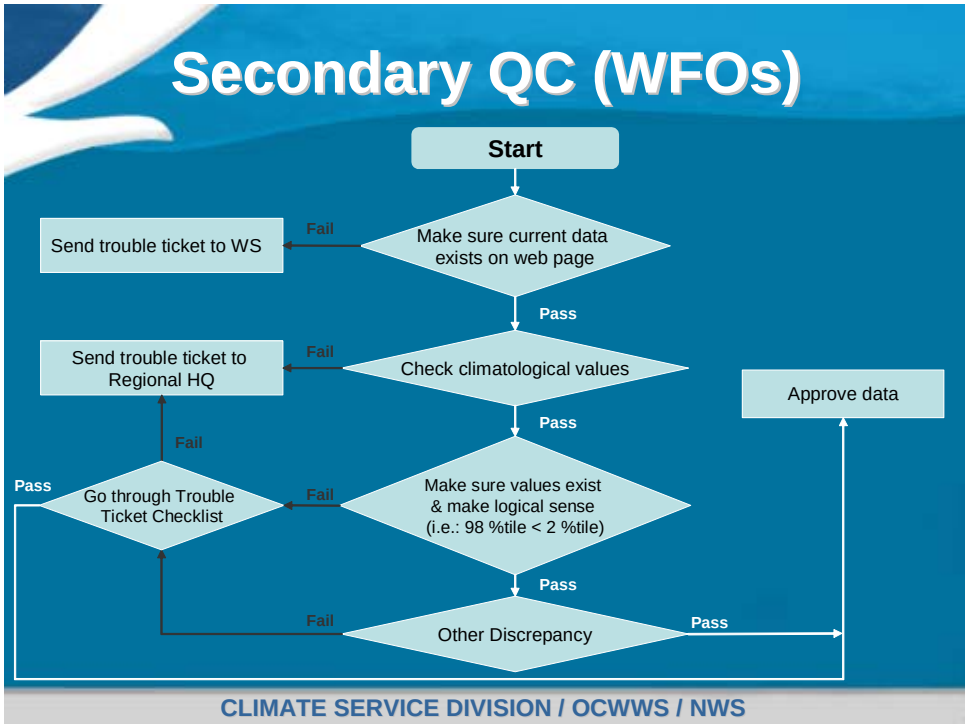

Figure 3. Secondary QC procedures

2.1.1. QC Timeframe

Each month all climate focal points will be notified, via email, that the current release of the L3MTO is available for QC.

2.1.2. QC Location

L3MTO data will be published each month at http://www.weather.gov/climate/l3mto.php.

2.1.3. Regular monthly QC

Each month, three basic quality control procedures should be conducted by each WFO for L3MTO. If all three regular monthly quality control checks pass, the detailed monthly QC (section 2.1.4) is NOT necessary. A checklist outlining the following QC procedures is available on the L3MTO-ARC website (http://ww2.wrh.noaa.gov/hsd/climate/L3MTO/ARC/).

Section A: Web & Functionality Error Check (should complete within 24 hours after public release)

1. Ensure links to sites in your County Warning Area (CWA) work properly. Test at least 3 sites using different navigational options, e.g. access to a station from links in the National Outlook Map, pull down menu, or navigation map. Ensure:
   a. There are no broken links
   b. There are no broken images
   c. Issue dates are correct
   d. Season leads are correct (i.e: if issue date is January 2006, lead 1 is Feb-Mar-Apr 2006)
   e. Map plotting looks accurate
   f. General function of site is working
2. Randomly choose various links within the sites and ensure similar proper function

Assign a **PASS/FAIL**

If **PASS**, move on to Section B

If **FAIL**, submit a detailed email to the L3MTO CMS at mailto:l3mto.cms@noaa.gov?subject=L3MTO Web Trouble Ticket. Please include a thorough description of the problem including a link (links) to the questionable page (pages). You will be issued a tracking number by the CMS via email. Your trouble ticket will be placed in the CMS queue and a response and rectification will follow shortly.

   i. If the web problems are minor (i.e. a missing title or broken image links), continue on to Section B.
   ii. If the web problems are major (i.e.: no data available or illegible values), stop here. When you are notified by the CMS that the errors have been corrected, start from Section A again.

Section B: Erroneous Data Check (should complete within 2-4days after public release)

1. Randomly choose 3 sites within your CWA (alternate these from month to month)
2. For each site:
   a. Click on 'Probability of Exceedance' thumbnail near the bottom of the page
   b. Choose and click on a season
   c. Once at the POE graphic, mouse over the Red (climate) Curve at the 50%tile and the climatological mean value will appear; Write this number down and continue the process for your other 2 chosen sites
   d. Open the L3MTO-ARC site (http://ww2.wrh.noaa.gov/hsd/climate/L3MTO/ARC/) and refer to Section C: Downscaling Statistics
      i. Select your 3 sites and choose the Statistics table
      ii. Listed in the table is the climatological mean for each season for the station
   e. Check that the climatological means in #c for those stations (seasons) are equal to #d.ii

Assign a **PASS/FAIL**

If **PASS**, move on to Section C

If **FAIL**, complete the Trouble Ticket form on the L3MTO-ARC website and submit the form as directed in Section 2.2 of this document

Section C: Conspicuous Data Check (should complete within 2-4days after public release)

1. Make sure forecast values make logical sense
   a. For example: A **JJA** temperature forecast for Miami of -60ºF would not be logical
   b. Look at the POE curve, the temperature should increase from the 99%tile to the 1%tile
   c. Is the CPC forecast probability category (ABOVE, BELOW, EC) extremely different from the station forecast? (Note: this is quite possible, however detailed monthly QC (2.1.4) might be used to double check and/or explain these discrepancies)
   d. Open the L3MTO-ARC (http://ww2.wrh.noaa.gov/hsd/climate/L3MTO/ARC/) website and refer to Section C: Downscaling Statistics
      i. Select your 3 sites and choose the Threshold text product
      ii. Does the forecast in question fall within the acceptable threshold levels according to these values?

Assign a **PASS/FAIL**

If **PASS**, secondary QC is complete; no further action is necessary
If **FAIL**, continue with Detailed Monthly QC (section 2.1.4)

2.1.4. Detailed monthly QC (only needs to be completed if Regular Monthly QC fails)

Section A: Check L3MTO compatibility with current Monitoring and Observations*

a. Review CPC 30- and 90-day temperature analyses located in the L3MTO-ARC Section A
b. What is current climate state of your specified area? Above normal / Below normal
c. Does the current climate state coincide with the proposed seasonal forecast? YES/NO

Assign a **PASS/FAIL**

If **PASS**, you may stop here, or if you still question the forecast, continue to Section B
If **FAIL**, continue to Section B

Section B: Check L3MTO compatibility with CPC outlook tools used in National 3-Month* Temperature Outlook

a. Review CPC, CDC, and IRI model output tools located in the L3MTO-ARC Section B
b. What forecast category do the tools suggest for your area Above normal / Below normal
c. Are the tools in agreement about the forecast? YES/NO

Assign a **PASS/FAIL**

If **PASS**, you may stop here, or if you still question the forecast, continue to Section C
If **FAIL**, continue to Section C

Section C: Check L3MTO Development Facts*

Regression Analysis:

a. Using Section C: Downscaling Statistics, open the Statistics table for the station in question
b. What is the correlation coefficient (R) for the season of the forecast in question? _____
c. If $R < 0.5$, then the correlation between the station and climate division is too weak and confidence in downscaling is low. In such instances an equal chances forecast is appropriate and information displayed should not be different from 1971-2000 climatology. If this is not the case, and the forecast differs from climatology, issue a trouble ticket located on the L3MTO-ARC site with comments to substitute the forecast with climatology information for the season and submit the form as directed in section 2.2 of this document
d. Use the Statistics table information for 1971-2000 tercile limits. If those limits do not match those displayed on the Pie Chart, issue a trouble ticket located on the L3MTO-ARC site and submit the form as directed in section 2.2 of this document

*Detailed instructions and descriptions are available on the L3MTO-ARC website to help guide you through the detailed monthly QC process

2.1.5. Supporting Data

1) Each WFO will be supplied with valuable information, data, and statistics on the L3MTO-ARC website that will aid in the secondary QC process
    a. Regression statistics (1 text file per station)
    b. Scatter plots (12 graphics per station)
    c. Trend Plots (12 graphics per station)
    d. Thresholds (1 text file per station)
    e. Verification Statistics
        i. Skill score tables
        ii. Skill score plots
    f. xmACIS data is provided at http://xmacis.nrcc.cornell.edu if you would like to perform local study analyses in your area to investigate a station's climatology

2.2. Trouble ticket

Problems with and errors in the L3MTO should be communicated via trouble tickets.

2.2.1. When to issue

A trouble ticket should be issued only when the specified quality control checks in section 2.1 fail.

2.2.2. What to report

Necessary information is found in the trouble ticket online at the L3MTO-ARC site (http://ww2.wrh.noaa.gov/hsd/climate/L3MTO/ARC/). Trouble tickets must be filled out completely.

2.2.3. Whom to send to

There are five trouble ticket forms available online on the L3MTO-ARC site, one for each region. Please click on the appropriate form, complete, and submit it as directed.

2.3. Station list maintenance

2.3.1. Edit Stations

Any corrections necessary to station data (e.g.: elevation, latitude, longitude, etc.) can be conducted through the L3MTO CMS by following the instructions described in the L3MTO_CMS.pdf (page 20) that can be accessed at: https://dev.enable-us.com/nwscms/pdf/L3MTO_CMS.pdf

2.3.2. Add Stations

Stations additions are conducted quarterly. Any field office or region that wishes to add a station to the L3MTO list may do so at anytime by following the instructions described in the L3MTO_CMS.pdf (pages 15-18) that can be accessed at: https://dev.enable-us.com/nwscms/pdf/L3MTO_CMS.pdf Please note that it may take up to three months for a new station to appear on the web depending when in the station update cycle the station was requested.

2.3.3. Delete Stations

WFOs may delete stations as they see fit by following the instructions described in the L3MTO_CMS.pdf (pages 18-19) that can be accessed at: https://dev.enable-us.com/nwscms/pdf/L3MTO_CMS.pdf

2.4. Customer services

2.4.1. What to do

The job of the WFO with respect to customer service is to answer questions and inquiries from customers and partners. WFO also can incorporate L3MTO information in public statements on relevant climate related topics. Each WFO should also make the L3MTO part of their routine customer outreach efforts with regards to cultivating NWS customers and stakeholders.

If a question or inquiry cannot be answered by WFO staff, it can be referred to the technical support team found in section 3.2.2. Other services a WFO wishes to provide can be done at their discretion, without the support of the technical support team.

2.4.2. When to do it

When answers to questions and inquiries are requested by customers and partners. Ideally, these should be either answered, or if they cannot be answered, referred, on the day the question is received. Questions and inquiries must be addressed within one week.

2.4.3. How to do it

Answers to questions and inquiries should be handled in the same manner as the questions are received. Example: If a question is sent via Email, it should be answered via Email. The answer should provide correct information expressed in brief language avoiding extensive use of technical terms.

3. RESOURCES

3.1. Training

3.1.1. Residence Training:

- Residence Training on Operational Climate Services offered in NWS TC, Kansas City, MO, provides an overview of L3MTO methodology as well as detailed training with hands on exercises involving L3MTO secondary QC and customer services. All current NWS WFO Climate Services Focal Points (CSFP) have been trained at this residence course in FY 2005 and FY2006. These CSFPs can use their training materials (e.g., CD rom and lecture notes) to refresh their memories. New CSFPs should enroll in the course at earliest convenience; contact your regional CSPM for details.
- Residence Training on Climate Variability offered in UCAR COMET, Boulder, CO, provides complimentary training to the course on Operational Climate Services and broadens the understanding of climate variability and its use in NWS operations.

3.1.2. Online training:

Online training will be available imminently. This training will take the form of the following:

- Webcasts on L3MTO:
  - Webcast on L3MTO Interpretation (http://www.nws.noaa.gov/om/csd/pds/pcu4/L3MTO_Interpretation/player.html)
  - Webcast on L3MTO Methodology (http://www.nws.noaa.gov/om/csd/pds/pcu4/L3MTO/player.html)
- Webcasts on CPC Long Range (Monthly and Seasonal/3- Month) Forecast:
  - Scientific basis for CPC Long Range Forecasts (download Visit View presentation) (http://www.nws.noaa.gov/om/csd/pds/pcu3/LLO/part1/SEASlectFINAL.zip)
  - CPC Long Range Forecast Case Study (http://www.weather.gov/om/csd/pds/pcu3/LLO/part3/webcast_module_lrf/player.html)
- Webcast on CPC Monitoring Products (http://www.weather.gov/om/csd/pds/pcu3/IC5/climate_monitoring/player.html)
- Webcasts on El Nino Southern Oscillations:
  - ENSO Life Cycles (http://meted.ucar.edu/climate/enso/)
  - ENSO and Beyond (http://meted.ucar.edu/climate/enso_beyond/)

3.2. Technical Support Team

A support team has been established to address technical questions related to L3MTO

3.2.1. Function of the Team

The Technical Support Team for L3MTO:

A. Answers customer and partner questions and inquiries that cannot be addressed by other NWS personnel in the protocol list in 3.2.3.
B. Provides technical expertise and guidance to WFOs in interpreting L3MTO and comparing L3MTO to CPC National 3-Month Temperature Outlooks

3.2.2. List of Team members

The Technical Support Team consists of the following individuals who may be contacted following the protocol in 3.2.3.

Alaska Region:

Richard Thoman (FAI WFO) richard.thoman@noaa.gov (907)458-3708	Scott Lindsey (AKRFC) scott.lindsey@noaa.gov (907)266-5157	Brian Tassia, (JNU WFO) brian.tassia@noaa.gov (907)790-6824

Central Region:

Barbara Mayes (CASC) barbara.mayes@noaa.gov (563)391-7094	William Marino (CASC) william.marino@noaa.gov (616)949-0643 x677	Jeff Boyne (ARX) Jeff.Boyne@noaa.gov (608)784-8275

Eastern Region:

Ingrid Amberger (ALY) ingrid.amberger@noaa.gov (518)435-9571 x273	Larry Brown (AKQ) larry.brown@noaa.gov (775)673-8107	Joseph Calderone (CHS) joseph.calderone@noaa.gov (843)744-0211
Eric Seymour (RLX) eric.seymour@noaa.gov (304)746-0188	Joshua Watson (ERH) joshua.watson@noaa.gov (631)244-0130	

Southern Region:

Nicole Kempf Nicole.Kempf@noaa.gov (918)832-4115	Victor Murphy victor.murphy@noaa.gov 817-978-2652 x 130	Robert Ricks robert.ricks@noaa.gov 985-645-0565

Western Region:

Andrea Bair (WR HQ) Andrea.Bair@noaa.gov (801)524-5137 x285	Jenna Meyers (WR HQ) Jenna.Meyers@noaa.gov (801)524-5137 x232	

National Team Members:

Dr. Robert E Livezey Chief, NWS Climate Services Division Robert.E.Livezey@noaa.gov (301)713-1970 x182	Dr. Marina Timofeyeva Local Climate Outlook Developer/Trainer Marina.Timofeyeva@noaa.gov (301)713-1970 x131	Annette Hollingshead Local Forecast Product Specialist Annette.Hollingshead@noaa.gov (808)734-2361
Dave Unger Meteorologist David.Unger@noaa.gov 301-763-8000, ext 7569		

3.2.3. Protocol for contact

The protocol for contacting personnel for assistance with L3MTO is:

A. Local WFO staff attempts to answer customer inquiries using training material on L3MTO (see section 3.1 above) as well as fact sheet/outreach materials
B. In the event the question is beyond the scope of the training, local WFO staff contacts the appropriate ***Regional Team*** members of the Technical Support Team (see list of members in section 3.2.2. above)
C. If questions go beyond expertise of regional members of the Technical Support Team, they, or local WFO staff, should contact the National Team members (see section 3.2.2. above)

3.3. Documentation:

Additional documentation on L3MTO is available to assist WFOs in interpreting L3MTO and in answering customer and partner questions and inquiries. Sources of documentation are provided in this section.

3.3.1. Outreach Fact Sheets

Outreach Facts Sheets are available for L3MTO for both the WFO and the general public. Facts Sheets, developed specifically for WFO use, provide additional information to assist WFO personnel in addressing L3MTO actions. They should not be distributed to the public. Facts Sheets are available from regional Climate Services Program Managers after July 20, 2006. A link will be provided from the L3MTO-ARC center to these pages.

3.3.2. Technical description of product development and delivery

An L3MTO Product Description Document is available from:
http://products.weather.gov/viewliste.php

This document will be superseded by a Policy Directive in the near future. Additional technical documentation will be available in the near future as well. Details will be provided as they are available.