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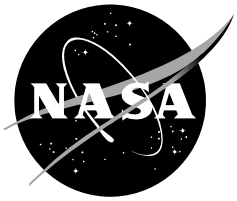

Situational Lightning Climatologies for Central Florida: Phase III

Joe H. Barrett III
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April 2008

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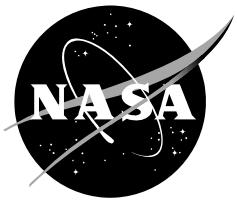

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Executive Summary

The threat of lightning is a daily concern during Florida's warm season. In Phases I and II of this work, the Applied Meteorology Unit (AMU) developed spatial and temporal climatologies of lightning occurrence based on eight atmospheric flow regimes. In Phase II, the AMU created climatological, or composite, soundings of wind speed and direction, temperature, and dew point temperature at four rawinsonde observation stations at Jacksonville, Tampa, Miami, and Cape Canaveral Air Force Station, for each of eight flow regimes. The composite soundings were delivered to the National Weather Service (NWS) Melbourne (MLB) office for display using the National version of the Skew-T Hodograph analysis and Research Program (NSHARP) software program.

This report describes Phase III of this work, in which NWS MLB requested the AMU make the composite soundings available for display in the Advanced Weather Interactive Processing System (AWIPS), so they could be overlaid on current observed soundings. This will allow the forecasters to compare the current state of the atmosphere with climatology.

The AMU first created a procedure to customize AWIPS so composite soundings could be displayed. This involved modifying and creating several configuration text files. A unique four-character site identifier was created for each composite sounding so each could be viewed separately. The AMU discovered a method of archiving soundings so old soundings do not get purged automatically. This method could provide an alternative way of customizing AWIPS for composite soundings. In addition, this would allow forecasters to use archived soundings in AWIPS for case studies.

The AWIPS stores soundings in Network Common Data Form (NetCDF) format. A test file was created in NetCDF format to verify the correct format for the soundings in AWIPS. The AMU then wrote a Tcl/Tk software program to convert the 32 composite soundings from NSHARP to NetCDF format. The composite soundings were viewed successfully in the AMU's AWIPS. The composite soundings, software program, and installation instructions were delivered to NWS MLB, and they installed the composite soundings into their AWIPS system.

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1. Introduction

The threat of lightning is a daily concern during the warm season in Florida. Recent research has revealed distinct spatial and temporal distributions of lightning occurrence that are strongly influenced by large-scale atmospheric flow regimes in Florida (Lericos et al. 2002). The first two phases of this work involved developing spatial and temporal climatologies of lightning occurrence based on the flow regime. In the first part of Phase II, the Applied Meteorology Unit (AMU) created climatological, or composite, soundings of wind speed and direction, temperature, and dew point temperature at Jacksonville (KJAX), Tampa (KTBW), Miami (KMFL), and Cape Canaveral Air Force Station (KXMR), Florida for each of eight flow regimes, resulting in 32 soundings (Short 2006). These soundings were displayed using the National version of the Skew-T Hodograph analysis and Research Program (NSHARP).

For Phase III, the National Weather Service (NWS) Melbourne (MLB) office requested that the AMU make these composite soundings available for display in the Advanced Weather Interactive Processing System (AWIPS) so they can be overlaid onto current soundings. This will allow the forecasters to compare the current state of the atmosphere with climatology. After comparing current soundings to composite soundings, the NWS MLB forecasters can make adjustments to the lightning forecast in their Hazardous Weather Outlook and lightning threat index products.

To accomplish this, the AMU first created a procedure to "localize" AWIPS so that composite soundings can be displayed. In AWIPS, soundings are stored in the Network Common Data Form (NetCDF) format. As a test, a NetCDF file was created from an existing sounding to verify that new soundings could be added to AWIPS. A software program was then written to convert the 32 composite soundings from NSHARP to NetCDF format. After all of the composite soundings could be displayed in the AMU's AWIPS, the composite soundings, software program, and installation instructions were delivered to NWS MLB. NWS MLB then installed the composite soundings into their AWIPS system.

2. Composite Soundings in NSHARP

In the first part of Phase II, the AMU used a 16-year database to create composite soundings of wind speed and direction, temperature, and dew point for four rawinsonde observation stations in Florida: KJAX, KTBW, KMFL, and KXMR (Short 2006). The composite soundings were for eight flow regimes, resulting in 32 soundings. Table 1 (adapted from Short 2006) shows the names of each flow regime, a short definition of each flow regime, and the number of days on which each flow regime occurred in the 16-year period of record. For each of the composite soundings, NSHARP was used to calculate the following commonly used stability parameters and thermodynamic variables:

- Convective Available Potential Energy,
- Convective Inhibition,
- Lifted Index,
- K-Index,
- Totals Index,
- Forecast maximum surface temperature,
- Forecast convective temperature,
- Height of web-bulb zero isotherm, and
- Precipitable water.

The stability parameters and thermodynamic variables for each of the composite soundings are available in tabular format in Short (2006).

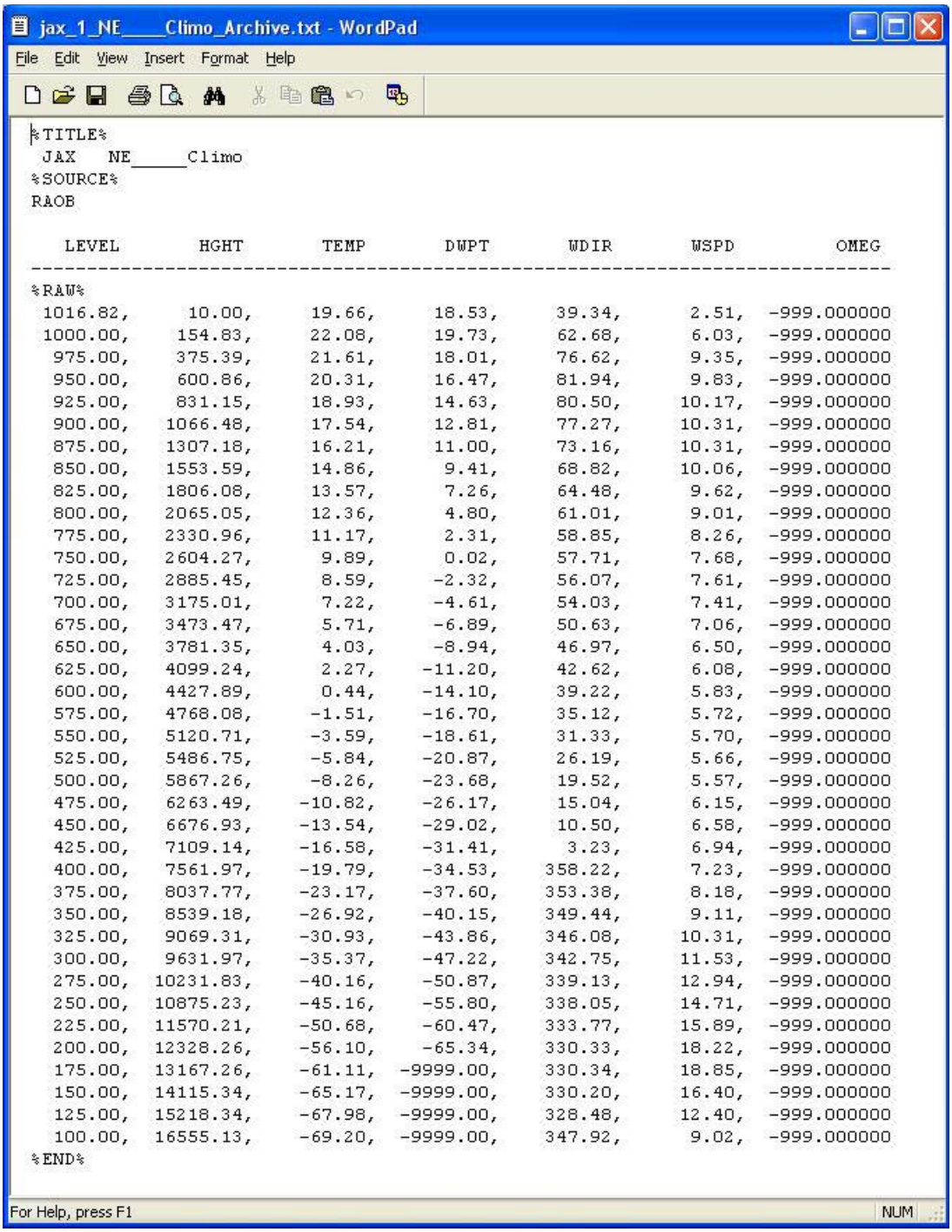
Table 1. Names of each flow regime as designated by Florida State University and the AMU, the definition of each flow regime, and the number of days in each regime during the warm seasons in 1989–2004.

FSU Naming Convection	***AMU Naming Convection***	***Flow Regime Definition***	***# Days in Regime***
r1	SE-2	Ridge north of Florida	225
r2	SW-1	Ridge south of Florida	271
r3	SE-1	Ridge between TBW and JAX	312
r4	SW-2	Ridge between TBW and MIA	242
r5	PAN	Possible ridge over Panhandle	111
f1	NW	Peninsular NW flow	94
f2	NE	Peninsular NE flow	172
	Other	Undefined Regime	828
	Missing	Missing sounding data	193

The AMU formatted the composite soundings for ingest, analysis and display by the NSHARP software program. A description of NSHARP is available in Unidata's GEMPAK Online Tutorial, at: http://www.unidata.ucar.edu/software/gempak/tutorial/nsharp.html. The composite soundings were stored in the NSHARP Archive format (Figure 1). The first line contains the text "%TITLE%", followed by the title of the sounding in the second line. The third line contains the text "%SOURCE%", followed by the source of the sounding in the fourth line. The sounding data is between the lines containing "%RAW%" and "%END%". The first line of data is for the surface data. After that, the data is in 25-mb increments from 1000 mb to 100 mb. The seven columns in the sounding data from left to right are:

1. Atmospheric pressure in mb,
2. Geopotential height in m,
3. Temperature in ^{o}C,
4. Dew point in ^{o}C,
5. Wind direction in degrees from true North,
6. Wind speed in kts, and
7. Omega, or vertical velocity, which is encoded as missing.

As an example, Figure 2 shows the NSHARP display for the KXMR composite sounding for the SE-1 flow regime.



jax_1_NE____Climo_Archive.txt - WordPad

File Edit View Insert Format Help

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%TITLE%
 JAX   NE_____Climo
%SOURCE%
RAOB

   LEVEL       HGHT       TEMP       DWPT       WDIR       WSPD          OMEG
-------------------------------------------------------------------------------
%RAW%
 1016.82,     10.00,     19.66,     18.53,     39.34,      2.51,  -999.000000
 1000.00,    154.83,     22.08,     19.73,     62.68,      6.03,  -999.000000
  975.00,    375.39,     21.61,     18.01,     76.62,      9.35,  -999.000000
  950.00,    600.86,     20.31,     16.47,     81.94,      9.83,  -999.000000
  925.00,    831.15,     18.93,     14.63,     80.50,     10.17,  -999.000000
  900.00,   1066.48,     17.54,     12.81,     77.27,     10.31,  -999.000000
  875.00,   1307.18,     16.21,     11.00,     73.16,     10.31,  -999.000000
  850.00,   1553.59,     14.86,      9.41,     68.82,     10.06,  -999.000000
  825.00,   1806.08,     13.57,      7.26,     64.48,      9.62,  -999.000000
  800.00,   2065.05,     12.36,      4.80,     61.01,      9.01,  -999.000000
  775.00,   2330.96,     11.17,      2.31,     58.85,      8.26,  -999.000000
  750.00,   2604.27,      9.89,      0.02,     57.71,      7.68,  -999.000000
  725.00,   2885.45,      8.59,     -2.32,     56.07,      7.61,  -999.000000
  700.00,   3175.01,      7.22,     -4.61,     54.03,      7.41,  -999.000000
  675.00,   3473.47,      5.71,     -6.89,     50.63,      7.06,  -999.000000
  650.00,   3781.35,      4.03,     -8.94,     46.97,      6.50,  -999.000000
  625.00,   4099.24,      2.27,    -11.20,     42.62,      6.08,  -999.000000
  600.00,   4427.89,      0.44,    -14.10,     39.22,      5.83,  -999.000000
  575.00,   4768.08,     -1.51,    -16.70,     35.12,      5.72,  -999.000000
  550.00,   5120.71,     -3.59,    -18.61,     31.33,      5.70,  -999.000000
  525.00,   5486.75,     -5.84,    -20.87,     26.19,      5.66,  -999.000000
  500.00,   5867.26,     -8.26,    -23.68,     19.52,      5.57,  -999.000000
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  400.00,   7561.97,    -19.79,    -34.53,    358.22,      7.23,  -999.000000
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  350.00,   8539.18,    -26.92,    -40.15,    349.44,      9.11,  -999.000000
  325.00,   9069.31,    -30.93,    -43.86,    346.08,     10.31,  -999.000000
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  275.00,  10231.83,    -40.16,    -50.87,    339.13,     12.94,  -999.000000
  250.00,  10875.23,    -45.16,    -55.80,    338.05,     14.71,  -999.000000
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For Help, press F1 NUM

Figure 1. NSHARP Archive file for the KJAX NE flow regime composite sounding.

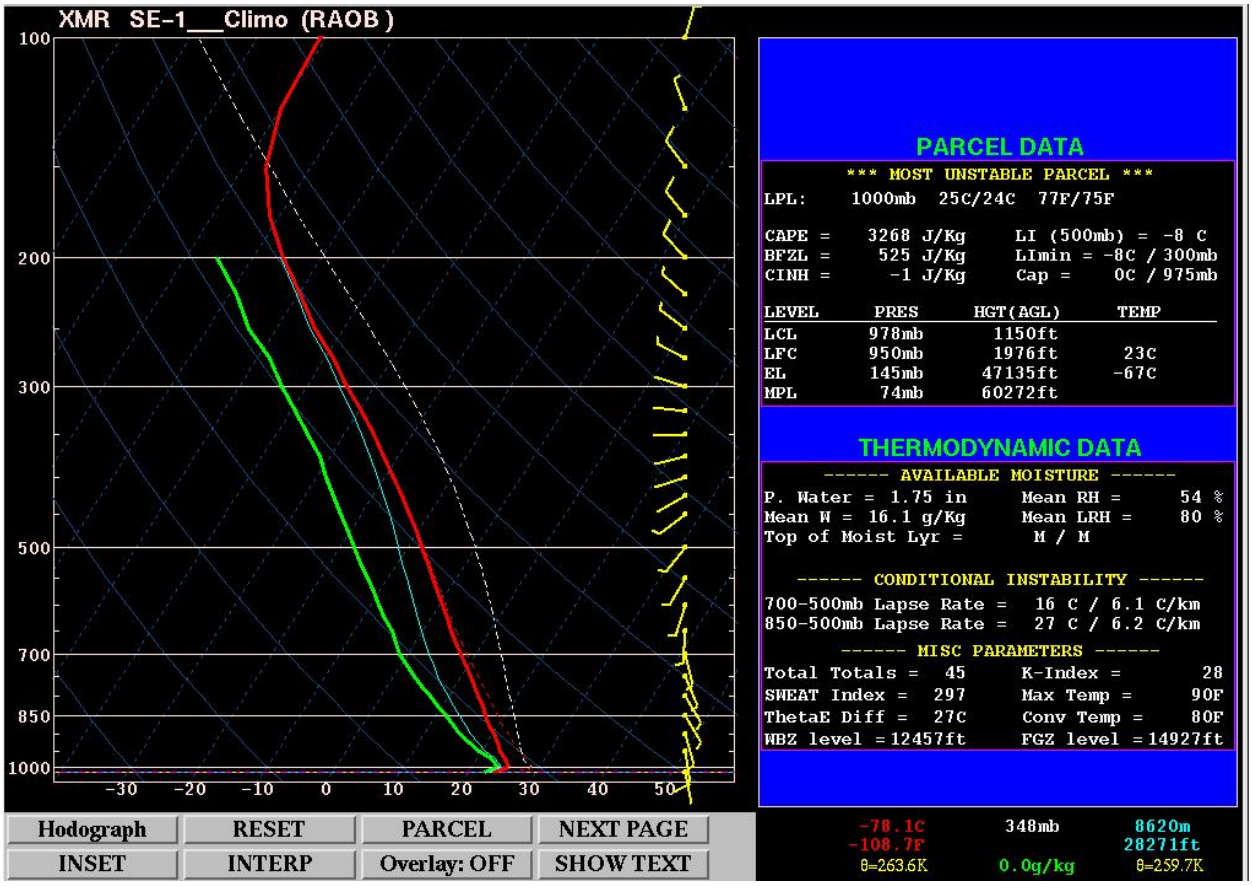

Figure 2. An NSHARP display of the composite sounding from KXMR for the SE-1 flow regime. Colored lines in the sounding on the left show temperature (red), dew point (green), and wet-bulb temperature (cyan) versus pressure. The wind profile is shown by the yellow wind barbs on the right-hand side of the sounding. The text data on the right-hand side shows stability parameters and other thermodynamic variables calculated from the sounding.

3. Adding the Composite Soundings to AWIPS

In AWIPS, soundings are stored in NetCDF format. NetCDF is a set of data formats, programming interfaces, and software libraries used to read and write scientific data files (Unidata 2007). While NetCDF files are in binary format, they can be converted to a text format called network Common data form Description Language (CDL). The software utility called ncgen is used to create a NetCDF file from a CDL file, while the ncdump utility is used to create a CDL file from a NetCDF file. In AWIPS, each meteorological data type, such as soundings or surface observations, has a unique NetCDF format. Each format is described by a NetCDF template file. The sounding template file is in the AWIPS directory **`/data/fxa/point/raob/netcdf`**.

AWIPS receives soundings in Binary Universal Form for the Representation of Meteorological data (BUFR) format (http://dss.ucar.edu/docs/formats/bufr/), and then decodes them into NetCDF format. Only two sounding files are generated in AWIPS per day. One file contains all of the soundings received worldwide between 0000 UTC and 1200 UTC, and the other includes all soundings between 1200 UTC and 0000 UTC. Old soundings are purged each day by automated scripts, so approximately two weeks of soundings are stored in AWIPS.

The AMU took the following steps so the composite soundings could be added to AWIPS:

- Localize AWIPS so composite soundings could be displayed (Section 3.1),
- Create a test file in NetCDF format to verify the composite soundings could be added to AWIPS (Section 3.2), and

- Write a software program to convert the 32 composite soundings from NSHARP Archive to NetCDF format (Section 3.3).

3.1 AWIPS Localization

The AMU's AWIPS system was localized so composite soundings could be displayed. This involved modifying and creating several configuration text files through trial and error. However, two NWS documents provided useful guidance, "AWIPS System Manager's Manual for Operational Build 4" (NWS 2004) and "AWIPS Localization Training and Reference Manual Volume I, AWIPS Release 5.1.2" (NWS 2002). The localization process consisted of the following steps:

- Create a new directory to hold the NetCDF files,
- Add menus to AWIPS,
- Add the product buttons that are displayed by the menus,
- Add "depict" keys that are referenced by the product buttons, and
- Add "data" keys that are referenced by the depict keys.

A unique four-character site identifier was created for each composite sounding so each could be viewed separately. The first three characters were based on the site identifier of the observed sounding, while the last character was based on the flow regime (Table 2).

While researching the localization process, the AMU discovered a method of archiving soundings so old soundings would not get purged automatically. Instead of creating 32 new site identifiers, the original site identifiers (KMFL, KJAX, KTBW, and KXMR) would be kept the same. A separate directory would be created for each flow regime. This method, described in Appendix B, could provide an alternative way of localizing AWIPS for composite soundings. In addition, this would allow forecasters to use archived soundings in AWIPS for case studies. Figure 3 shows an archived KXMR sounding in AWIPS. Appendices A and B contain installation instructions for localizing AWIPS for composite and archived soundings, respectively.

Table 2. Site identifiers for the 32 composite soundings.

Flow Regime	KMFL	KJAX	KTBW	KXMR
NE	KMFA	KJAA	KTBA	KXMA
NW	KMFB	KJAB	KTBB	KXMB
Other	KMFC	KJAC	KTBC	KXMC
PAN	KMFD	KJAD	KTBD	KXMD
SE-1	KMFE	KJAE	KTBE	KXME
SE-2	KMFF	KJAF	KTBF	KXMF
SW-1	KMFG	KJAG	KTBG	KXMG
SW-2	KMFH	KJAH	KTBH	KXMH

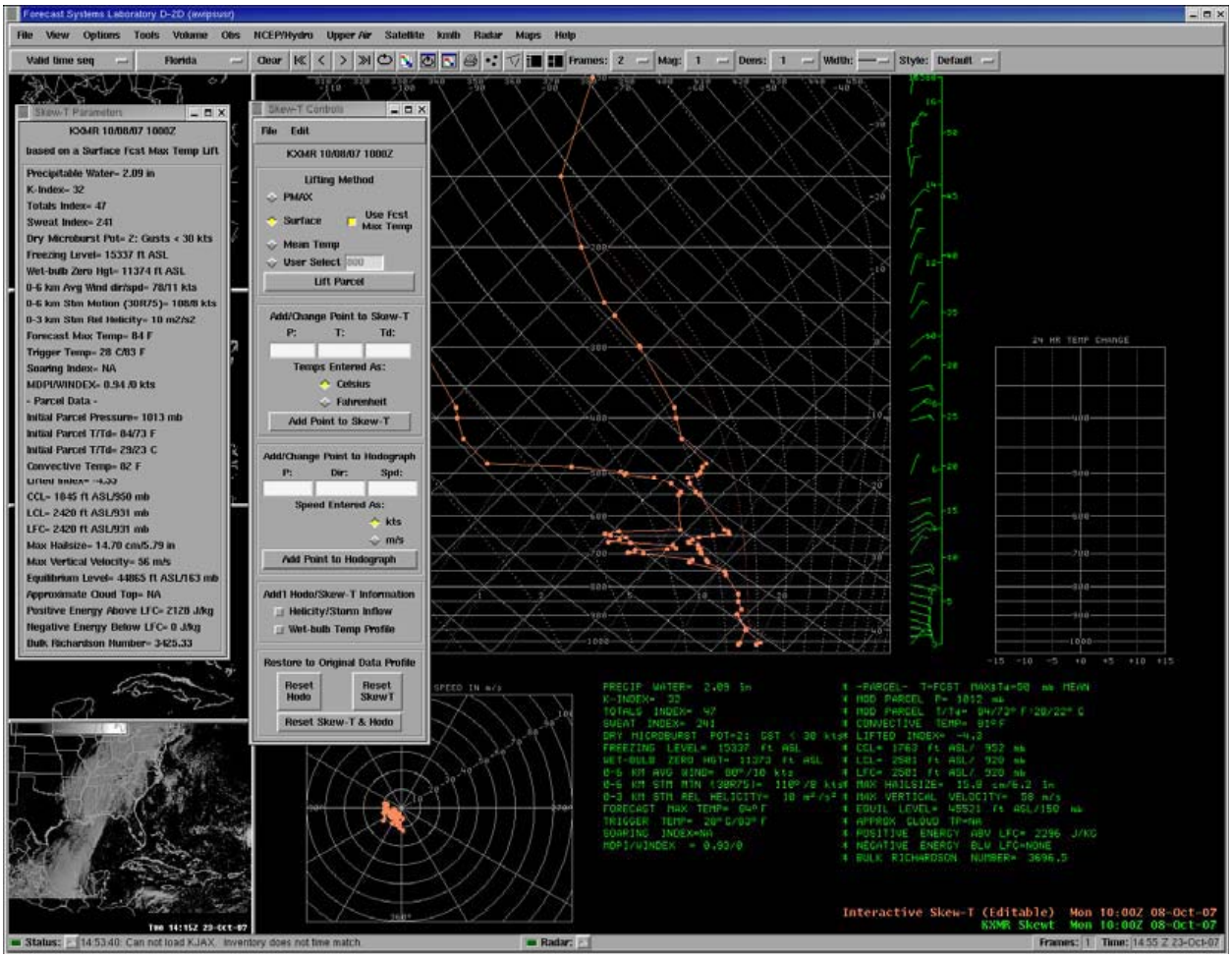

Figure 3. An archived KXMR sounding being edited with the AWIPS Interactive Skew-T program.

3.2 Test NetCDF File

Before creating software to convert the composite soundings from NSHARP Archive to NetCDF format, the AMU created a test file in NetCDF format in order to verify the correct format for soundings in AWIPS. The test file contained the KMFL sounding data from 1200 UTC on 1 October 2007. Since the sounding could be viewed as a composite sounding, this verified that all 32 composite soundings could be added to AWIPS. Appendix C describes how the NetCDF test file was created.

3.3 Software Program to Convert Composite Soundings to NetCDF Format

The AMU wrote a software program in the Tool Command Language/Tool Kit (Tcl/Tk) language to convert the 32 composite soundings from NSHARP Archive to NetCDF format. Appendix D describes how to install and run the program. After the composite soundings were converted to NetCDF format, they were viewed successfully in the AMU's AWIPS. The composite soundings, software program, and installation instructions were delivered to NWS MLB, and they installed the composite soundings into their AWIPS system. Figures 4-6 provide examples of how the composite soundings can be displayed. Figure 4 shows the KJAX composite soundings for all eight flow regimes. Figure 5 shows the KMFL, KTBW, KJAX, and KXMR composite soundings for the NE flow regime. Figure 6 compares an observed KXMR sounding to the KXMR sounding for the SE-1 flow regime.

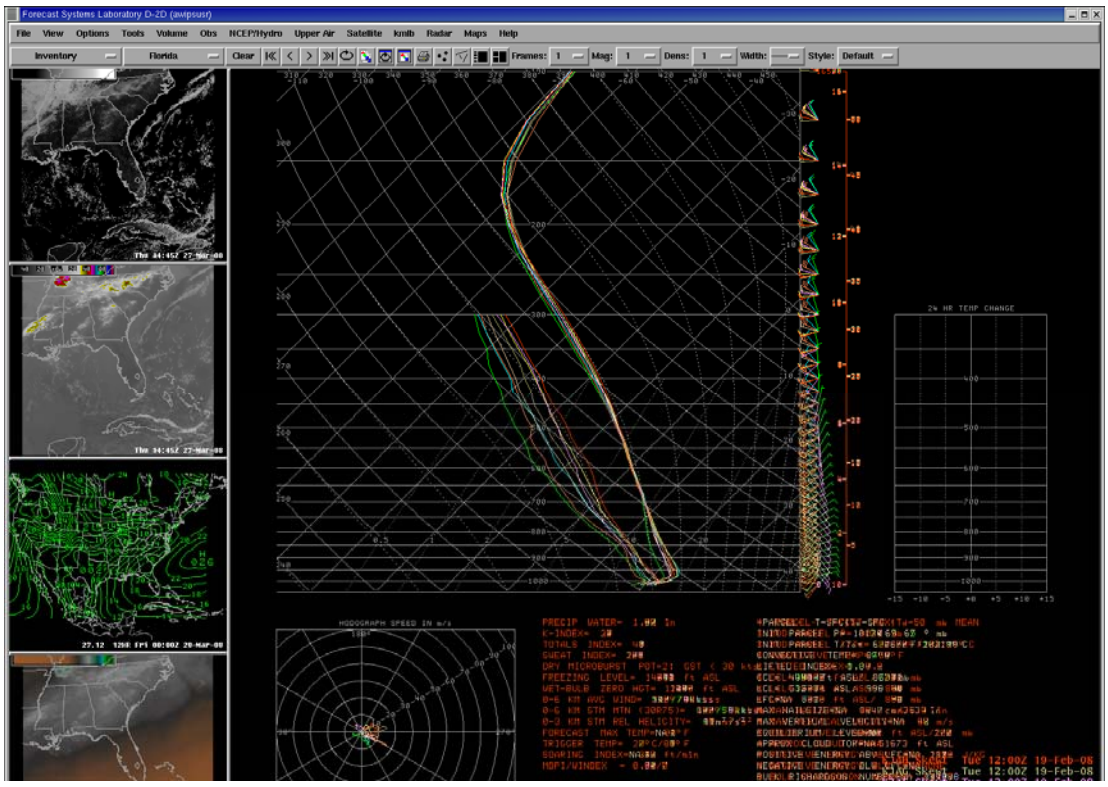

Figure 4. The AWIPS display of the KJAX composite soundings for all eight flow regimes.

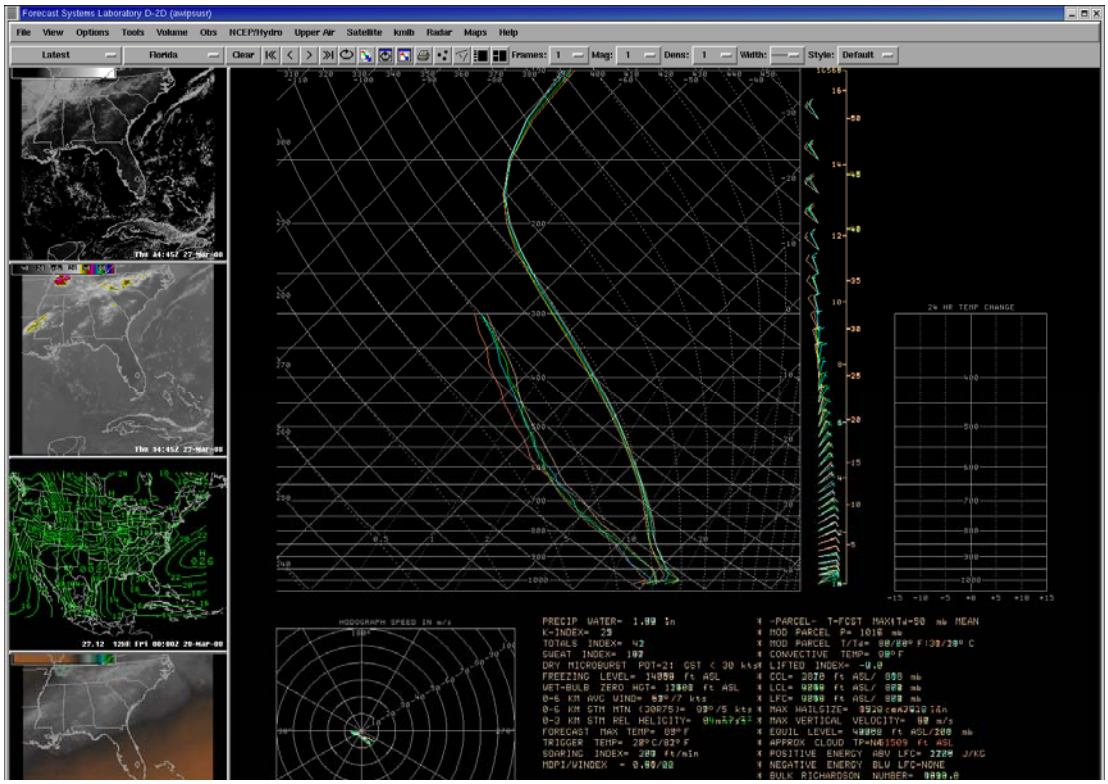

Figure 5. The AWIPS display of the KMFL, KTBW, KJAX, and KXMR composite soundings for the NE flow regime.

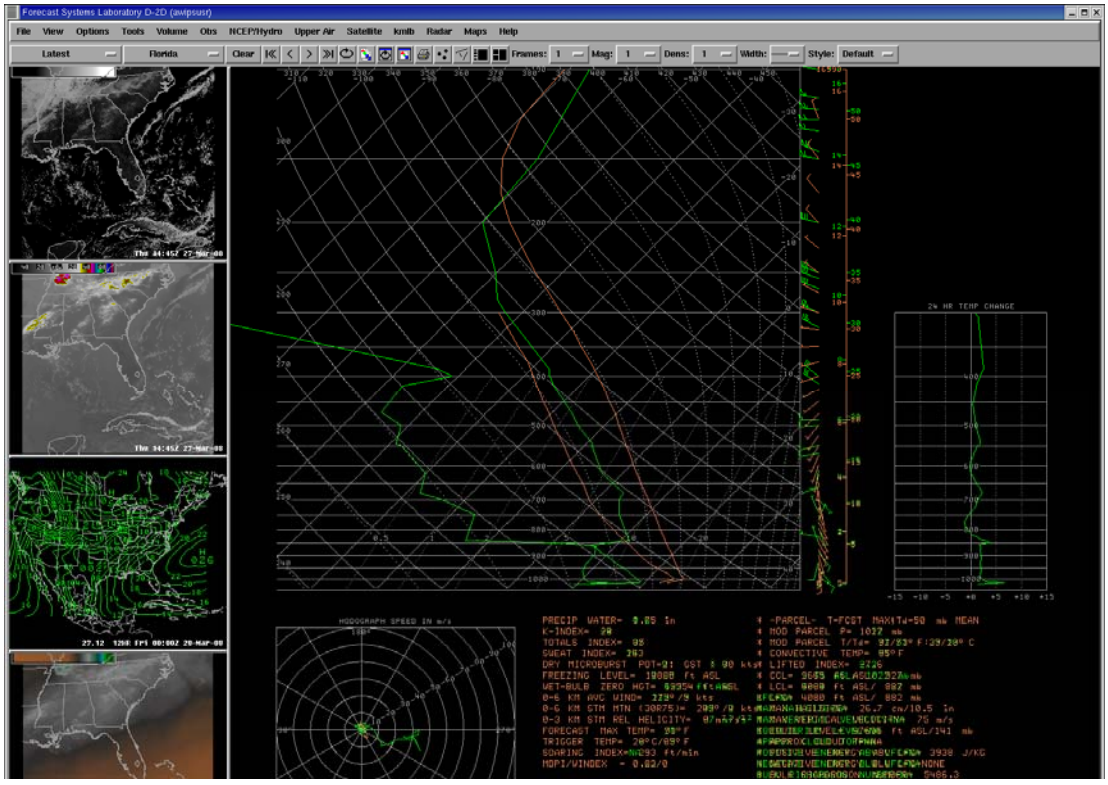

Figure 6. The AWIPS display of the KXMR observed sounding at 1000 UTC 27 March 2008 (green) and the KXMR composite sounding for the SE-1 flow regime (orange). The observed sounding is cooler and drier, because the composite sounding is based on the warm season (May - September).

4. Summary

The threat of lightning is a daily concern during Florida's warm season. In Phase I and II of this work, the AMU developed spatial and temporal climatologies of lightning occurrence based on the flow regime. In Phase II, the AMU created climatological, or composite, soundings of wind speed and direction, temperature, and dew point temperature at KJAX, KTBW, KMFL, and KXMR, for each of eight flow regimes. The composite soundings were delivered to NWS MLB for display using the NSHARP software program. In Phase III, NWS MLB requested that the AMU make the composite soundings available for display in AWIPS so they could be overlaid on current soundings. This will allow the forecasters to compare the current state of the atmosphere with climatology.

The AMU first created a procedure to localize AWIPS so that composite soundings can be displayed.

A unique four-character site identifier was created for each composite sounding so each could be viewed separately. The AMU discovered a method of archiving soundings so old soundings do not get purged automatically. This method could provide an alternative way of localizing AWIPS for composite soundings. In addition, this would allow forecasters to use archived soundings in AWIPS for case studies.

A test file was created in NetCDF format from an observed sounding, to verify the correct format for the soundings in AWIPS. Since the sounding could be viewed as a composite sounding, this verified that all 32 composite soundings could be added to AWIPS. The AMU then wrote a Tcl/Tk software program to convert the 32 composite soundings from NSHARP Archive to NetCDF format. After the composite soundings were viewed in the AMU's AWIPS, the composite soundings, software program, and installation instructions were delivered to NWS MLB where they were installed into their AWIPS system.

Appendix A
AWIPS Localization to Add Composite Soundings

1. Create a new directory in AWIPS to hold the composite soundings, for example: **`/data/fxa/point/raob/composite`**. This should ensure the composite soundings do not get deleted by the purge scripts that run on a regular schedule to remove old AWIPS data. The directory should be executable and readable by both the awipsusr and fxa user accounts.

2. There are several upper-air files in AWIPS that do not need to be modified, since the composite sounding data is not ingested by AWIPS or viewed as text products (e.g. MANXMR or SGLXMR). The following files do not need to be edited:

   - **`/awips/fxa/awipsusr/afosMasterPIL.txt`** (contains text product identifiers)
   - **`/awips/fxa/data/awips2afos.txt`** (used to convert from AWIPS to AFOS identifiers)
   - **`/awips/fxa/data/station_table.dat`** (maps 5-digit WMO station identifiers to four-letter identifiers)
   - **`/awips/fxa/data/raobStationInfo.txt`** (contains 5-digit WMO station identifiers, station names, latitude/longitude values, elevations and locations of rawinsonde observation sites)
   - **`/awips/fxa/data/upair_table.dat`** (contains WMO headers for upper-air text products)
   - **`/data/fxa/nationalData/raob.goodness`** (contains the product button key, latitude/longitude, elevation, and "goodness" value for each sounding; the goodness value controls which stations are plotted on a plan-view when stations are close together)

3. Modify the Upper Air menu. Edit the **`LLL-siteRaobMenus.txt`** file in the **`/awips/fxa/data/localization/LLL`** directory, where LLL is the localization identifier. For example, LLL would be MLB at Melbourne, FL or ER at Cape Canaveral Air Force Station (CCAFS). In the **`LLL-siteRaobMenus.txt`** file, create a "Composite" submenu. Inside the Composite submenu, there should be a submenu for each flow or climatological regime. There are eight flow regimes. For each flow regime, there should be four product button keys, for the KJAX, KMFL, KTBW, and KXMR soundings. Make sure that the product button keys are not being used for other AWIPS products. It is recommended that the product button keys be between 9000 and 9999. Here is a snippet from an example file:

```
submenu: "Composite"
  submenu: "NE Flow Regime"
    productButton: 9584 # KXMR_NE
    productButton: 9568 # KJAX_NE
    productButton: 9576 # KTBW_NE
    productButton: 9560 # KMFL_NE
  endSubmenu
  submenu: "NW Flow Regime"
    productButton: 9585 # KXMR_NW
    productButton: 9569 # KJAX_NW
    productButton: 9577 # KTBW_NW
    productButton: 9561 # KMFL_NW
  endSubmenu
  submenu: "PAN Flow Regime"
    productButton: 9587 # KXMR_PAN
    productButton: 9571 # KJAX_PAN
    productButton: 9579 # KTBW_PAN
    productButton: 9563 # KMFL_PAN
  endSubmenu
  submenu: "SE-1 Flow Regime"
    productButton: 9588 # KXMR_SE1
    productButton: 9572 # KJAX_SE1
    productButton: 9580 # KTBW_SE1
    productButton: 9564 # KMFL_SE1
  endSubmenu
```

```
  submenu: "SE-2 Flow Regime"
    productButton: 9589 # KXMR_SE2
    productButton: 9573 # KJAX_SE2
    productButton: 9581 # KTBW_SE2
    productButton: 9565 # KMFL_SE2
  endSubmenu
  submenu: "SW-1 Flow Regime"
    productButton: 9590 # KXMR_SW1
    productButton: 9574 # KJAX_SW1
    productButton: 9582 # KTBW_SW1
    productButton: 9566 # KMFL_SW1
  endSubmenu
  submenu: "SW-2 Flow Regime"
    productButton: 9591 # KXMR_SW2
    productButton: 9575 # KJAX_SW2
    productButton: 9583 # KTBW_SW2
    productButton: 9567 # KMFL_SW2
  endSubmenu
  submenu: "Other Flow Regime"
    productButton: 9586 # KXMR_Other
    productButton: 9570 # KJAX_Other
    productButton: 9578 # KTBW_Other
    productButton: 9562 # KMFL_Other
  endSubmenu
endSubmenu
```

4. Add a product key for each composite sounding (32 product buttons for the flow regime soundings). Copy the **`/data/fxa/nationalData/raobProductButtons.txt`** file to the **`/data/fxa/customFiles`** directory. Add the product button keys to the text file. Only use product button and depict keys that have not been used by other AWIPS products. For convenience, use the same numbers for the product button and depict keys. The depict keys should be between 9000 and 9999. Use a new 4-character or 5-digit number as the identifier. The AMU used KMF as the first three characters of the composite Miami, FL soundings. The fourth character indicates the flow regime. For example, “A” is for NE Flow Regime, “B” is for NW Flow Regime, “C” is for Other Flow Regime, “D” is for Panhandle Flow Regime, “E” is for SE-1 Flow Regime, “F” is for SE-2 Flow Regime, “G” is for SW-1 Flow Regime, and “H” is for SW-2 Flow Regime. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file; names were abbreviated so that each record would fit on one line in this document:

```
9560  |  9560, 9560, 9560, 9560, 9560, 9560 |Miami, FL (KMFA) |KMFA Skewt  |  0
9561  |  9561, 9561, 9561, 9561, 9561, 9561 |Miami, FL (KMFB) |KMFB Skewt  |  0
9562  |  9562, 9562, 9562, 9562, 9562, 9562 |Miami, FL (KMFC) |KMFC Skewt  |  0
9563  |  9563, 9563, 9563, 9563, 9563, 9563 |Miami, FL (KMFD) |KMFD Skewt  |  0
9564  |  9564, 9564, 9564, 9564, 9564, 9564 |Miami, FL (KMFE) |KMFE Skewt  |  0
9565  |  9565, 9565, 9565, 9565, 9565, 9565 |Miami, FL (KMFF) |KMFF Skewt  |  0
9566  |  9566, 9566, 9566, 9566, 9566, 9566 |Miami, FL (KMFG) |KMFG Skewt  |  0
9567  |  9567, 9567, 9567, 9567, 9567, 9567 |Miami, FL (KMFH) |KMFH Skewt  |  0
9568  |  9568, 9568, 9568, 9568, 9568, 9568 |Jack., FL (KJAA) |KJAA Skewt  |  0
9569  |  9569, 9569, 9569, 9569, 9569, 9569 |Jack., FL (KJAB) |KJAB Skewt  |  0
9570  |  9570, 9570, 9570, 9570, 9570, 9570 |Jack., FL (KJAC) |KJAC Skewt  |  0
9571  |  9571, 9571, 9571, 9571, 9571, 9571 |Jack., FL (KJAD) |KJAD Skewt  |  0
9572  |  9572, 9572, 9572, 9572, 9572, 9572 |Jack., FL (KJAE) |KJAE Skewt  |  0
9573  |  9573, 9573, 9573, 9573, 9573, 9573 |Jack., FL (KJAF) |KJAF Skewt  |  0
9574  |  9574, 9574, 9574, 9574, 9574, 9574 |Jack., FL (KJAG) |KJAG Skewt  |  0
9575  |  9575, 9575, 9575, 9575, 9575, 9575 |Jack., FL (KJAH) |KJAH Skewt  |  0
9576  |  9576, 9576, 9576, 9576, 9576, 9576 |Tampa, FL (KTBA) |KTBA Skewt  |  0
9577  |  9577, 9577, 9577, 9577, 9577, 9577 |Tampa, FL (KTBB) |KTBB Skewt  |  0
9578  |  9578, 9578, 9578, 9578, 9578, 9578 |Tampa, FL (KTBC) |KTBC Skewt  |  0
9579  |  9579, 9579, 9579, 9579, 9579, 9579 |Tampa, FL (KTBD) |KTBD Skewt  |  0
9580  |  9580, 9580, 9580, 9580, 9580, 9580 |Tampa, FL (KTBE) |KTBE Skewt  |  0
9581  |  9581, 9581, 9581, 9581, 9581, 9581 |Tampa, FL (KTBF) |KTBF Skewt  |  0
9582  |  9582, 9582, 9582, 9582, 9582, 9582 |Tampa, FL (KTBG) |KTBG Skewt  |  0
```

```
9583  |  9583, 9583, 9583, 9583, 9583, 9583 |Tampa, FL (KTBH) |KTBH Skewt  |  0
9584  |  9584, 9584, 9584, 9584, 9584, 9584 |CCAFS, FL (KXMA) |KXMA Skewt  |  0
9585  |  9585, 9585, 9585, 9585, 9585, 9585 |CCAFS, FL (KXMB) |KXMB Skewt  |  0
9586  |  9586, 9586, 9586, 9586, 9586, 9586 |CCAFS, FL (KXMC) |KXMC Skewt  |  0
9587  |  9587, 9587, 9587, 9587, 9587, 9587 |CCAFS, FL (KXMD) |KXMD Skewt  |  0
9588  |  9588, 9588, 9588, 9588, 9588, 9588 |CCAFS, FL (KXME) |KXME Skewt  |  0
9589  |  9589, 9589, 9589, 9589, 9589, 9589 |CCAFS, FL (KXMF) |KXMF Skewt  |  0
9590  |  9590, 9590, 9590, 9590, 9590, 9590 |CCAFS, FL (KXMG) |KXMG Skewt  |  0
9591  |  9591, 9591, 9591, 9591, 9591, 9591 |CCAFS, FL (KXMH) |KXMH Skewt  |  0
```

5. Add the depict keys for the composite soundings (32 depict keys for the flow regime soundings). Copy the **`/data/fxa/nationalData/raobDepictKeys.txt`** file to the **`/data/fxa/customFiles`** directory. Add the depict keys and associated data keys to the text file. Only use depict and data keys that have not already been used. Depict keys should be between 9000 and 9999, and data keys must be between 9000 and 9999. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file:

```
9560 |7 |9560,27503 |KMFAraob|9000|1 |KMFA Skewt    |KMFA    |1 |0 |0 |
9561 |7 |9561,27503 |KMFBraob|9000|1 |KMFB Skewt    |KMFB    |1 |0 |0 |
9562 |7 |9562,27503 |KMFCraob|9000|1 |KMFC Skewt    |KMFC    |1 |0 |0 |
9563 |7 |9563,27503 |KMFDraob|9000|1 |KMFD Skewt    |KMFD    |1 |0 |0 |
9564 |7 |9564,27503 |KMFEraob|9000|1 |KMFE Skewt    |KMFE    |1 |0 |0 |
9565 |7 |9565,27503 |KMFFraob|9000|1 |KMFF Skewt    |KMFF    |1 |0 |0 |
9566 |7 |9566,27503 |KMFGraob|9000|1 |KMFG Skewt    |KMFG    |1 |0 |0 |
9567 |7 |9567,27503 |KMFHraob|9000|1 |KMFH Skewt    |KMFH    |1 |0 |0 |
9568 |7 |9568,27503 |KJAAraob|9000|1 |KJAA Skewt    |KJAA    |1 |0 |0 |
9569 |7 |9569,27503 |KJABraob|9000|1 |KJAB Skewt    |KJAB    |1 |0 |0 |
9570 |7 |9570,27503 |KJACraob|9000|1 |KJAC Skewt    |KJAC    |1 |0 |0 |
9571 |7 |9571,27503 |KJADraob|9000|1 |KJAD Skewt    |KJAD    |1 |0 |0 |
9572 |7 |9572,27503 |KJAEraob|9000|1 |KJAE Skewt    |KJAE    |1 |0 |0 |
9573 |7 |9573,27503 |KJAFraob|9000|1 |KJAF Skewt    |KJAF    |1 |0 |0 |
9574 |7 |9574,27503 |KJAGraob|9000|1 |KJAG Skewt    |KJAG    |1 |0 |0 |
9575 |7 |9575,27503 |KJAHraob|9000|1 |KJAH Skewt    |KJAH    |1 |0 |0 |
9576 |7 |9576,27503 |KTBAraob|9000|1 |KTBA Skewt    |KTBA    |1 |0 |0 |
9577 |7 |9577,27503 |KTBBraob|9000|1 |KTBB Skewt    |KTBB    |1 |0 |0 |
9578 |7 |9578,27503 |KTBCraob|9000|1 |KTBC Skewt    |KTBC    |1 |0 |0 |
9579 |7 |9579,27503 |KTBDraob|9000|1 |KTBD Skewt    |KTBD    |1 |0 |0 |
9580 |7 |9580,27503 |KTBEraob|9000|1 |KTBE Skewt    |KTBE    |1 |0 |0 |
9581 |7 |9581,27503 |KTBFraob|9000|1 |KTBF Skewt    |KTBF    |1 |0 |0 |
9582 |7 |9582,27503 |KTBGraob|9000|1 |KTBG Skewt    |KTBG    |1 |0 |0 |
9583 |7 |9583,27503 |KTBHraob|9000|1 |KTBH Skewt    |KTBH    |1 |0 |0 |
9584 |7 |9584,27503 |KXMAraob|9000|1 |KXMA Skewt    |KXMA    |1 |0 |0 |
9585 |7 |9585,27503 |KXMBraob|9000|1 |KXMB Skewt    |KXMB    |1 |0 |0 |
9586 |7 |9586,27503 |KXMCraob|9000|1 |KXMC Skewt    |KXMC    |1 |0 |0 |
9587 |7 |9587,27503 |KXMDraob|9000|1 |KXMD Skewt    |KXMD    |1 |0 |0 |
9588 |7 |9588,27503 |KXMEraob|9000|1 |KXME Skewt    |KXME    |1 |0 |0 |
9589 |7 |9589,27503 |KXMFraob|9000|1 |KXMF Skewt    |KXMF    |1 |0 |0 |
9590 |7 |9590,27503 |KXMGraob|9000|1 |KXMG Skewt    |KXMG    |1 |0 |0 |
9591 |7 |9591,27503 |KXMHraob|9000|1 |KXMH Skewt    |KXMH    |1 |0 |0 |
```

6. Add the data keys for the composite soundings (32 data keys for the flow regime soundings). Copy the **`/data/fxa/nationalData/raobDataKeys.txt`** file to the **`/data/fxa/customFiles`** directory. Add the data keys to the text file. Change the directory name in the eighth field of each record, corresponding to the directory created in step 1. Use only data keys that have not already been used. Data keys must be between 9000 and 9999. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file:

```
9560 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFA
9561 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFB
9562 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFC
```

```
9563 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFD
9564 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFE
9565 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFF
9566 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFG
9567 |      |  |   |  |      |  |point/raob/composite    |    |   |KMFH
9568 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAA
9569 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAB
9570 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAC
9571 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAD
9572 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAE
9573 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAF
9574 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAG
9575 |      |  |   |  |      |  |point/raob/composite    |    |   |KJAH
9576 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBA
9577 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBB
9578 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBC
9579 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBD
9580 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBE
9581 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBF
9582 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBG
9583 |      |  |   |  |      |  |point/raob/composite    |    |   |KTBH
9584 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMA
9585 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMB
9586 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMC
9587 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMD
9588 |      |  |   |  |      |  |point/raob/composite    |    |   |KXME
9589 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMF
9590 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMG
9591 |      |  |   |  |      |  |point/raob/composite    |    |   |KXMH
```

7. As user fxa, perform a full localization. At a command prompt, enter**:**
   `/awips/fxa/data/localization/scripts/mainScript.csh LLL` (LLL is the localization identifier**)**

8. Verify no errors occurred by viewing the output on the screen or the localization log. Note there will be a new file added for each composite sounding in the **`/awips/fxa/data/localizationDataSets/LLL/SKEWT`** directory. For example, the KMFA composite sounding uses the **`KMFAraob.thermo`** file and the KMFL sounding uses the **`KMFLraob.thermo`** file. These filenames are derived from the **`raobDepictKeys.txt`** file. The contents of the **`.thermo`** files for the composite soundings are identical to their corresponding real-time sounding. For example, the **`KMFLraob.thermo`** file is identical to the following eight files: **`KMFAraob.thermo`**, **`KMFBraob.thermo`**, **`KMFCraob.thermo`**, **`KMFDraob.thermo`**, **`KMFEraob.thermo`**, **`KMFFraob.thermo`**, **`KMFGraob.thermo`** and **`KMFHraob.thermo`**. If these files are removed, the soundings cannot be viewed in AWIPS. As an example, here are the contents of the **`KMFLraob.thermo`** file (last two values are latitude and longitude):

```
2
100000.000000
273.149994
0.000339
-36.601677
43.313728
-1.686267
78.398323
11.512925
33.899998
25.75472
-80.38389
```

Appendix B
AWIPS Localization to Add Archived Soundings

1. Create a new directory in AWIPS to hold archived or old soundings, for example: **`/data/fxa/point/raob/archive`**. This should ensure the archived soundings do not get deleted by the purge scripts that run on a regular schedule to remove old AWIPS data. The directory should be executable and readable by both the awipsusr and fxa user accounts.

2. There are several upper-air files in AWIPS that do not need to be modified, since the composite soundings are not ingested by AWIPS or viewed as text products. The following files do not need to be edited:

   - **`/awips/fxa/awipsusr/afosMasterPIL.txt`** (contains text product identifiers)
   - **`/awips/fxa/data/awips2afos.txt`** (used to convert from AWIPS to AFOS identifiers)
   - **`/awips/fxa/data/station_table.dat`** (maps 5-digit WMO station identifiers to four-letter identifiers)
   - **`/awips/fxa/data/raobStationInfo.txt`** (contains 5-digit identifiers, station names, latitude/longitude values, elevations and locations of rawinsonde observation sites)
   - **`/awips/fxa/data/upair_table.dat`** (contains WMO headers for upper-air text products)
   - **`/data/fxa/nationalData/raob.goodness`** (contains the product button key, latitude/longitude, elevation, and "goodness" value for each sounding; the goodness value controls which stations are plotted on a plan-view when stations are close together)

3. Modify the Upper Air menu. Edit the **`LLL-siteRaobMenus.txt`** file in the **`/awips/fxa/data/localization/LLL`** directory, where LLL is the localization identifier. For example, LLL would be MLB at Melbourne, FL or ER at CCAFS. In the **`LLL-siteRaobMenus.txt`** file, create an "Archived" submenu. Inside the Archived submenu, there should a product button key for each upper-air site that contains archived soundings. Make sure the product button keys are not being used for other AWIPS products. Use pre-existing identifiers for the upper-air sites. For example, use "KMFL" for Miami, Florida archived soundings. The product button keys should be between 9000 and 9999. In their AWIPS system, the AMU created archived sounding menu items for all of the Florida upper-air sites. Here is a snippet from an example file:

```
submenu: "Archived"
    productButton: 9600 # KJAX
    productButton: 9601 # KTAE
    productButton: 9602 # KXMR
    productButton: 9603 # KTBW
    productButton: 9604 # KMFL
    productButton: 9605 # KEYW
endSubmenu
```

4. Add a product button key for each site containing archived soundings. Copy the **`/data/fxa/nationalData/raobProductButtons.txt`** file to the **`/data/fxa/customFiles`** directory. Add the product button keys to the text file. Only use product button and depict keys that have not been used by other AWIPS products. For convenience, use the same numbers for the product button and depict keys. The depict keys should be between 9000 and 9999. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file (names were abbreviated so that each record would fit on one line in this document):

```
9600  | 9600, 9600, 9600, 9600, 9600, 9600 | Jack., FL (KJAX) |KJAX Skewt  |  0
9601  | 9601, 9601, 9601, 9601, 9601, 9601 | Tall., FL (KTAE) |KTAE Skewt  |  0
9602  | 9602, 9602, 9602, 9602, 9602, 9602 | CCAFS, FL (KXMR) |KXMR Skewt  |  0
9603  | 9603, 9603, 9603, 9603, 9603, 9603 | Tampa, FL (KTBW) |KTBW Skewt  |  0
9604  | 9604, 9604, 9604, 9604, 9604, 9604 | Miami, FL (KMFL) |KMFL Skewt  |  0
9605  | 9605, 9605, 9605, 9605, 9605, 9605 | KeyW., FL (KEYW) |KEYW Skewt  |  0
```

5. Add a depict key for each site containing archived soundings. Copy the **`/data/fxa/nationalData/raobDepictKeys.txt`** file to the **`/data/fxa/customFiles`** directory. Add the depict keys and associated data keys to the text file. Only use depict and data keys that have not already been used. Depict keys should be between 9000 and 9999, and data keys must be between 9000 and 9999. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file:

```
9600 |7 |9600,27503 |KJAXraob|9000|1 |KJAX Skewt    |KJAX    |1 |0 |0 |
9601 |7 |9601,27503 |KTAEraob|9000|1 |KTAE Skewt    |KTAE    |1 |0 |0 |
9602 |7 |9602,27503 |KXMRraob|9000|1 |KXMR Skewt    |KXMR    |1 |0 |0 |
9603 |7 |9603,27503 |KTBWraob|9000|1 |KTBW Skewt    |KTBW    |1 |0 |0 |
9604 |7 |9604,27503 |KMFLraob|9000|1 |KMFL Skewt    |KMFL    |1 |0 |0 |
9605 |7 |9605,27503 |KEYWraob|9000|1 |KEYW Skewt    |KEYW    |1 |0 |0 |
```

6. Add a data key for each site containing archived soundings. Copy the **`/data/fxa/nationalData/raobDataKeys.txt`** file to the **`/data/fxa/customFiles`** directory. Add the data keys to the text file. Change the directory name in the eighth field of each record, corresponding to the directory created in step 1. Use only data keys that have not already been used. Data keys must be between 9000 and 9999. The keys in the first column should be in increasing numerical order.

   Here is a snippet from an example file:

```
9600 |        |  |   |  |      |  |point/raob/archive    |    |   |KJAX
9601 |        |  |   |  |      |  |point/raob/archive    |    |   |KTAE
9602 |        |  |   |  |      |  |point/raob/archive    |    |   |KXMR
9603 |        |  |   |  |      |  |point/raob/archive    |    |   |KTBW
9604 |        |  |   |  |      |  |point/raob/archive    |    |   |KMFL
9605 |        |  |   |  |      |  |point/raob/archive    |    |   |KEYW
```

7. As user fxa, perform a full localization. At a command prompt, enter **`/awips/fxa/data/localization/scripts/mainScript.csh LLL`** (LLL is the localization identifier).
8. Verify that no errors occurred by viewing the output on the screen or the localization log.
9. To archive soundings (prevent them from being automatically purged), copy the NetCDF files from the **`/data/fxa/point/raob/netcdf`** directory to the **`/data/fxa/point/raob/archive`** directory. The archived soundings can then be viewed as a Skew-T plot in AWIPS.

Appendix C

Creating New AWIPS Soundings in NetCDF Format

1. Perform an ncdump of an existing sounding. At a command prompt, enter:

   ```
   cd /data/fxa/point/raob/netcdf
   ncdump 20071010_1200 > 20071010_1200.out
   ```

2. The output file will be in CDL format. Open it in a text editor.
3. Do not modify the dimensions, variables, or global attributes section of the output file.
4. The existing soundings should be deleted from the output file in order to reduce the size of the file. Note that for each field, commas are used to separate values. However, the last value in a field is followed by a space and semicolon.
5. Change the value of nStaticIds to the number of station IDs used in the file. For example, only count KMFL once if there are two or more KMFL soundings in the file.
6. Edit the staticIds field to only include the sites that are needed. The staticIds should be in alphanumerical order (digits come before letters).
7. The lastRecord field contains numbers that point to the location of the last record for a particular site. The first value in the field corresponds to the first value in the staticIds field, the second value corresponds to the second value in the staticIds field, and so on.
8. The invTime field corresponds to the time when the sounding was received by the NWS. The invTime is the number of seconds past midnight on 1/1/1970.
9. The prevRecord field can be deleted.
10. The inventory field indicates whether there is a sounding available for each staticId value.
11. The globalInventory, firstOverflow, isOverflow, firstInBin, lastInBin, and wmoStaNum fields can be deleted.
12. Edit the staName values to only include soundings that are needed. The order of the values corresponds to the order of the values in other fields (such as numMand, prMan, htMan, etc.). If there are multiple soundings for a particular staticId (e.g. KMFL), then there will be multiple instances of the staticId in the staName field.
13. The staLat, staLon, and staElev fields can be deleted.
14. The synTime field corresponds to the observation time of the sounding. The synTime is the number of seconds past midnight on 1/1/1970.
15. The numMand field contains the number of mandatory levels for each sounding. The values are normally 12, and the maximum value is 22.
16. The numSigT field contains the number of significant temperature levels for each sounding. The value varies, but the maximum value is 150.
17. The numSigW field contains the number of significant wind levels for each sounding. The value varies, but the maximum value is 76.
18. The numMwnd, numTrop, relTime, and sondType fields can be deleted.
19. The prMan field contains the pressure, in mb, of the mandatory levels for each sounding.
20. The htMan field contains the geopotential height, in m, of the mandatory levels for each sounding.
21. The tpMan field contains the temperature, in Kelvin, of the mandatory levels for each sounding.
22. The tdMan field contains the dew point temperature depression, in Kelvin, of the mandatory levels for each sounding.

23. The wdMan field contains the wind direction, in degrees, of the mandatory levels for each sounding.
24. The wsMan field contains the wind speed, in m/s, of the mandatory levels for each sounding.
25. The prSigT field contains the pressure, in mb, of the significant temperature levels for each sounding.
26. The tpSigT field contains the temperature, in Kelvin, of the significant temperature levels for each sounding.
27. The tdSigT field contains the dew point temperature depression, in Kelvin, of the significant temperature levels for each sounding.
28. The htSigW field contains the geopotential height of the significant wind levels, in m.
29. The wdSigW field contains the wind direction, in degrees, of the significant wind levels for each sounding.
30. The wsSigW field contains the wind speed, in m/s, of the significant wind levels for each sounding.
31. The prTrop, tpTrop, tdTrop, wdTrop, wsTrop, prMaxW, wdMaxW, and wsMaxW fields can be deleted.
32. After the CDL-formatted file has been edited, create a NetCDF file from it, using the ncgen utility. The output file name should be in the format YYYYMMDD_TTTT, where TTTT is either “0000” or “1200”. For example:

    `ncgen –o 20071010_1200 20071010_1200.out`

Appendix D
Installing the NSHARP-to-AWIPS conversion software

This software is used to convert one or more NSHARP Archive files into one CDL file. The ncgen utility is run from the command prompt in AWIPS to convert the CDL file into an AWIPS-compatible NetCDF file. The software consists of a text file (**`nsharp2awips_v1.tcl`**) written in the Tcl/Tk programming language and another text file (**`raob_cdlheader.txt`**) used to create the header section of the CDL file.

1. Copy the **`nsharp2awips_v1.tcl`** file to the **`/awips/fxa/bin`** directory. The file should be executable by the awipsusr and fxa user accounts.
2. Create the **`/data/fxa/point/raob/nsharp`** directory. The directory should be readable and executable by the awipsusr and fxa user accounts.
3. Copy the **`raob_cdlheader.txt`** file to the **`/data/fxa/point/raob/nsharp`** directory. The text file should be readable by the awipsusr and fxa user accounts.

Running the NSHARP-to-AWIPS conversion software

1. Copy all of the NSHARP Archive files to the **`/data/fxa/point/raob/nsharp`** directory. Create this directory if it does not already exist, and make sure it is readable and executable by the awipsusr and fxa user accounts.
2. Start the program at the AWIPS command prompt: **`/awips/fxa/bin/nsharp2awips_v1.tcl`**
3. The program's graphical user interface (GUI) will be displayed on the screen (Figure 7). The NSHARP FILES listbox is populated with all of the files in the **`/data/fxa/point/raob/nsharp`** directory.

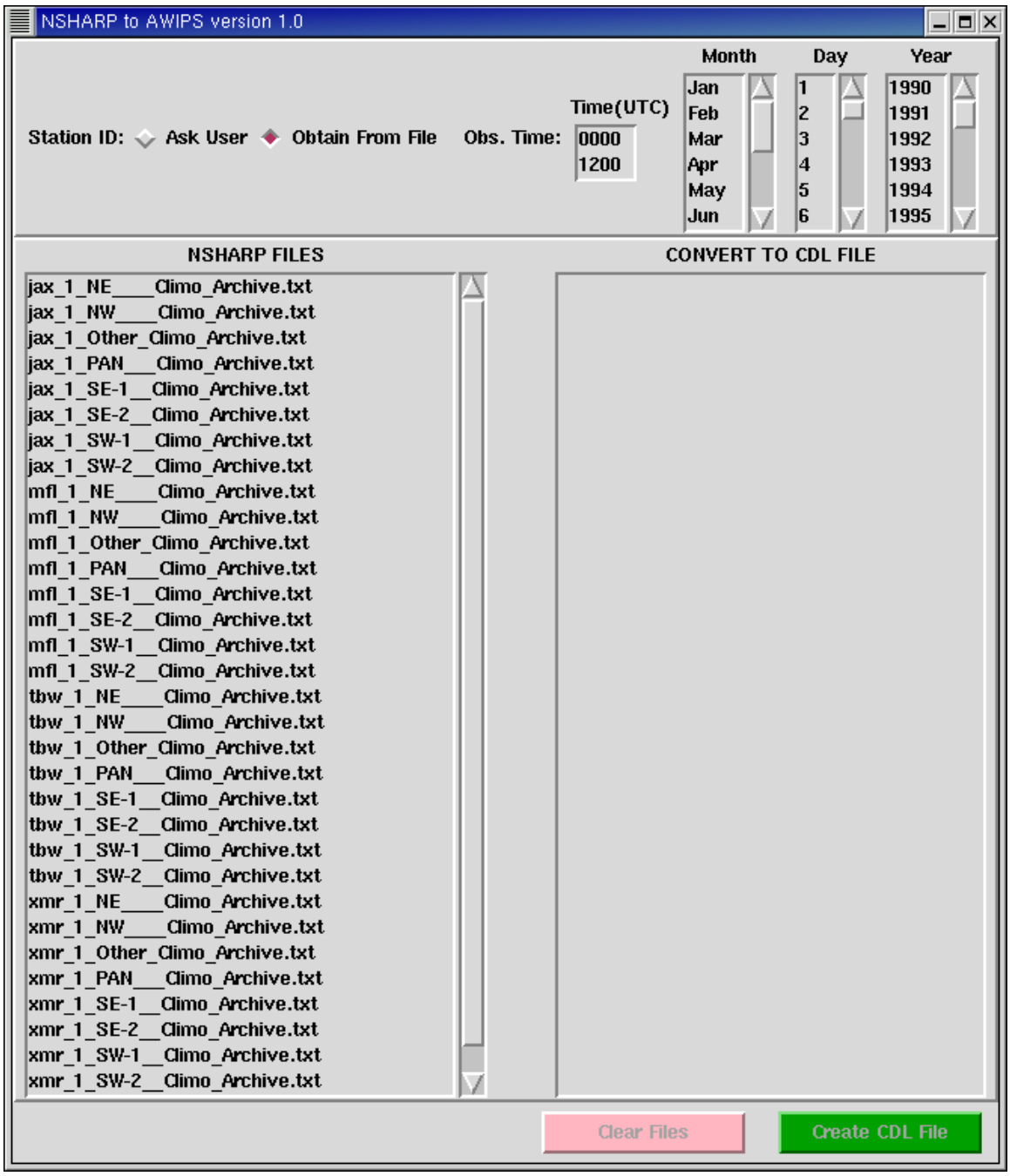

Figure 7. The NSHARP to AWIPS application at start-up.

4. If the correct station identifiers are in the title section of the NSHARP files (view the NSHARP files to verify this), select the “Obtain From File” radiobutton. Otherwise, select the “Ask User” radiobutton. The AMU’s composite soundings do not have the correct station identifiers in the title section.

5. Select the observation time and date for the CDL file, using the Time, Month, Day, and Year listboxes. If the full time/date is not selected before the CDL file is created, then a default time/date of 0000 UTC on January 1, 1990 is used. The time/date is used in the header section of the CDL file, as well as the CDL filename. For composite soundings, use the current date and 1200 UTC for the time.

6. From the NSHARP FILES listbox, select the NSHARP files to be added to the CDL file, by left-clicking on them in the NSHARP FILES listbox (Figure 8). If double-clicked, a file will be added correctly, but an error message will be displayed. Ignore the error message. If the “Ask User” radiobutton is selected, a dialog box will open. Enter a station identifier between 3 and 5 characters long into the dialog box. If the station identifier is not the correct length, an error message will be displayed and the NSHARP file will not be added to the “CONVERT TO CDL FILE” listbox. Before adding it, the program verifies that the file is a valid NSHARP Archive file. If it is not valid, the program will display one or more of the following error messages: “Invalid file: title not read”, “Invalid file: RAW substring not found”, and “Invalid file: END substring not found”.

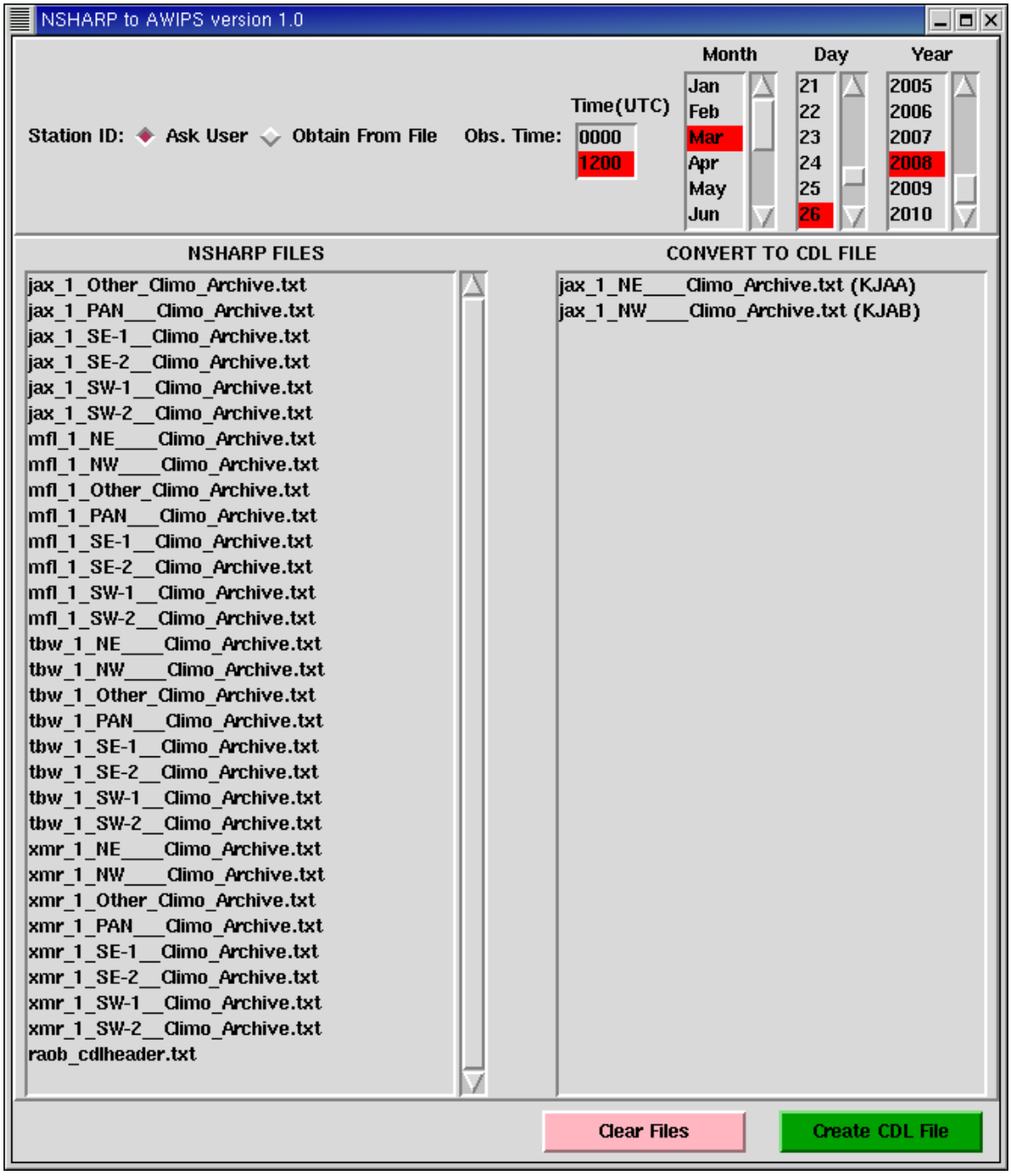

Figure 8. Two NSHARP files are being added to a CDL file.

7. To clear out all files from the “CONVERT TO CDL FILE” listbox, left-click on the Clear Files button.
8. To create a CDL file, left-click on the Create CDL file button. The observation time for the soundings in the CDL file is displayed in a pop-up dialog box. The filename is created by appending “.out” to the date/time (e.g. **`20080223_1200.out`**). A pop-up dialog box with the filename is displayed. The CDL file is written to the **`/data/fxa/point/raob/nsharp`** directory. The “CONVERT TO CDL FILE” listbox is then cleared.
9. Close the program by left-clicking on the X button in the upper-right corner of the GUI.
10. At a command prompt, move the CDL file to the directory where the NetCDF files are stored.
11. Create the NetCDF file with the ncgen program. Be careful not to overwrite an existing file. For example, assume that the CDL filename is **`20080223_1200.out`**. At the command prompt, enter:

    ```
    ncgen -o 20080223_1200 20080223_1200.out
    ```

    In this example, the NetCDF filename is **`20080223_1200`**.

References

Lericos, T. P., H. E. Fuelberg, A. I. Watson, and R. L. Holle, 2002: Warm season lightning distributions over the Florida Peninsula as related to synoptic patterns. *Wea. Forecasting*, **17**, 83 – 98.

National Weather Service, 2002: AWIPS Localization Training and Reference Manual Volume I, AWIPS Release 5.1.2. National Weather Service Training Center, Kansas City, MO.

National Weather Service, 2004: AWIPS System Manager's Manual for Operational Build 4.

Short, D., 2006: Situational Lightning Climatologies for Central Florida, Phase II. Applied Meteorology Unit Memorandum, 8 pp. [Available from ENSCO, Inc., 1980 N. Atlantic Ave., Suite 230, Cocoa Beach, FL 32931]

Unidata, The NetCDF Tutorial, July 2007. http://www.unidata.ucar.edu/software/netcdf/docs/netcdf-tutorial.html. Accessed March 27, 2008.

List of Acronyms

Term	Description
AMU	Applied Meteorology Unit
AWIPS	Advanced Weather Interactive Processing System
BUFR	Binary Universal Form for the Representation of Meteorological data
CCAFS	Cape Canaveral Air Force Station
CDL	network Common data form Description Language
ER	AWIPS Localization Identifier for the Eastern Range
KJAX	Jacksonville, FL rawinsonde 4-letter identifier
KMFL	Miami, FL rawinsonde 4-letter identifier
KTBW	Tampa, FL rawinsonde 4-letter identifier
KXMR	CCAFS rawinsonde 4-letter identifier
MLB	AWIPS Localization Identifier for Melbourne, Florida
NetCDF	Network Common Data Format
NSHARP	National version of the Skew-T Hodograph analysis and Research Program
NWS	National Weather Service
Tcl/Tk	Tool Command Language/Tool Kit

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