



DISPLAYING COMPOSITE AND ARCHIVED SOUNDINGS IN THE ADVANCED WEATHER INTERACTIVE PROCESSING SYSTEM (AWIPS)



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OVERVIEW

- In a previous task, the Applied Meteorology Unit (AMU) developed spatial and temporal climatologies of lightning occurrence based on eight atmospheric flow regimes. In a follow-on task, the AMU created composite soundings for each of the eight regimes at four rawinsonde stations: Jacksonville (KJAX), Tampa (KTBW), Miami (KMFL), and Cape Canaveral AFS (KXMR). The soundings, 32 in all, were delivered to NWS Melbourne, FL (MLB) for display using the NSHARP software program.
- Per request from MLB, the AMU made the composite soundings available for display in AWIPS. This allows forecasters to compare current soundings to climatology. In addition, the AMU discovered a way to archive soundings in AWIPS (e.g. for case studies).

HOW SOUNDINGS ARE RECEIVED AND STORED IN AWIPS

- AWIPS receives soundings in Binary Universal Form for the Representation of Meteorological data (BUFR) format, then decodes and stores them in Network Common Data Form (NetCDF) format. NetCDF files are in binary format, but can be converted to a text format: Common data form Description Language (CDL).
- Two NetCDF sounding files are generated per day: one with all soundings worldwide between 0000 and 1200 UTC, the other with all soundings between 1200 and 0000 UTC.
- Old soundings are purged each day by automated scripts. Approximately two weeks of soundings are stored, depending on the AWIPS version and local office policy.
- Each meteorological data type (e.g. soundings or surface observations) has a unique NetCDF format in AWIPS. Each format is described by a NetCDF template file. The sounding template file is normally in the `/data/fixa/point/raob/netcdf` directory.

ADDING COMPOSITE SOUNDINGS TO AWIPS

The AMU performed the following steps to add the composite soundings to AWIPS:

- Localize AWIPS so that composite soundings could be displayed,
- Create a test file in NetCDF format to verify composite soundings could be added to AWIPS, and
- Write a software program to convert the 32 composite soundings from NSHARP Archive to NetCDF format.

I. AWIPS Localization

- Create a new file directory to hold the composite soundings: `/data/fixa/point/raob/composite`. This ensures the soundings do not get deleted by the automated purge scripts.
- Modify the Upper Air menu. Edit the `LLL-siteRaobMenus.txt` file in the `/awips/fixa/data/localization/LLL` directory, where `LLL` is the localization identifier (e.g. MLB). In the file, create a "Composite" submenu. Inside the Composite submenu, create a submenu for each flow regime. For each flow regime, there should be four product button keys for the KJAX, KMFL, KTBW, and KXMR soundings.
- Add a product button for each sounding. Copy the `/data/fixa/nationalData/raobProductButtons.txt` file to `/data/fixa/customFiles`. Add the product button keys to the file. New 4-character identifiers were created for the soundings, as shown in the table:

Site identifiers for the 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	KMFB	KJAH	KTBH	KXMH

- Add a unique depict key for each sounding. Copy the `/data/fixa/nationalData/raobDepictKeys.txt` file to `/data/fixa/customFiles`. Add the depict keys and associated data keys to the file.
- Add a unique data key for each sounding. Copy the `/data/fixa/nationalData/raobDataKeys.txt` file to `/data/fixa/customFiles`. Add the data keys to the file. Change the directory name in the eighth field of each record, corresponding to the directory created in Step a).
- As user fxa, perform a full localization.
- Verify no errors occurred during the localization. For each composite sounding, there will be a new file added to `/awips/fixa/data/localizationDataSets/LLL/SKEWT`. If these files are removed, the soundings cannot be viewed in AWIPS.

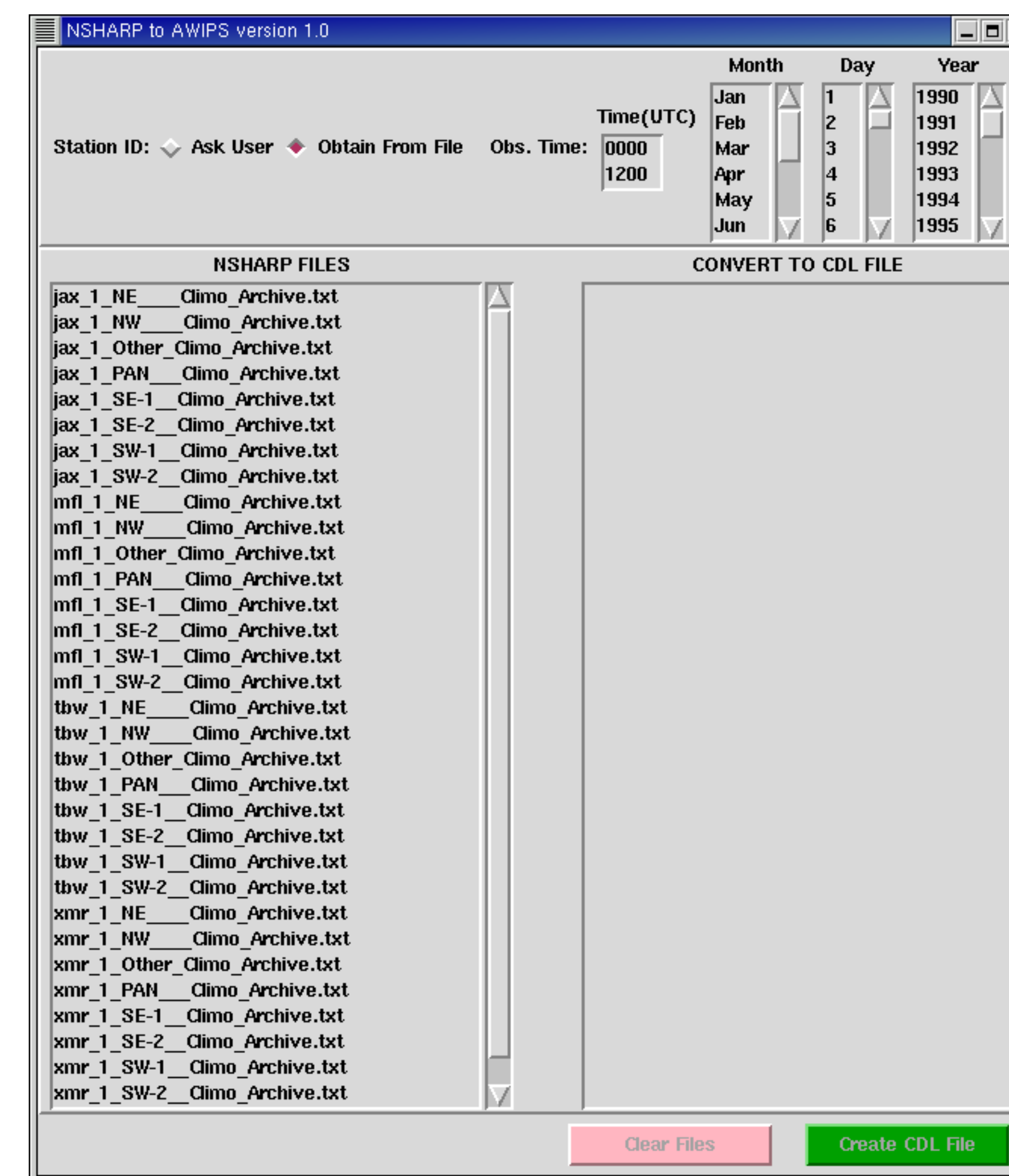
ADDING COMPOSITE SOUNDINGS TO AWIPS (continued)

II. Create Test File in NetCDF format

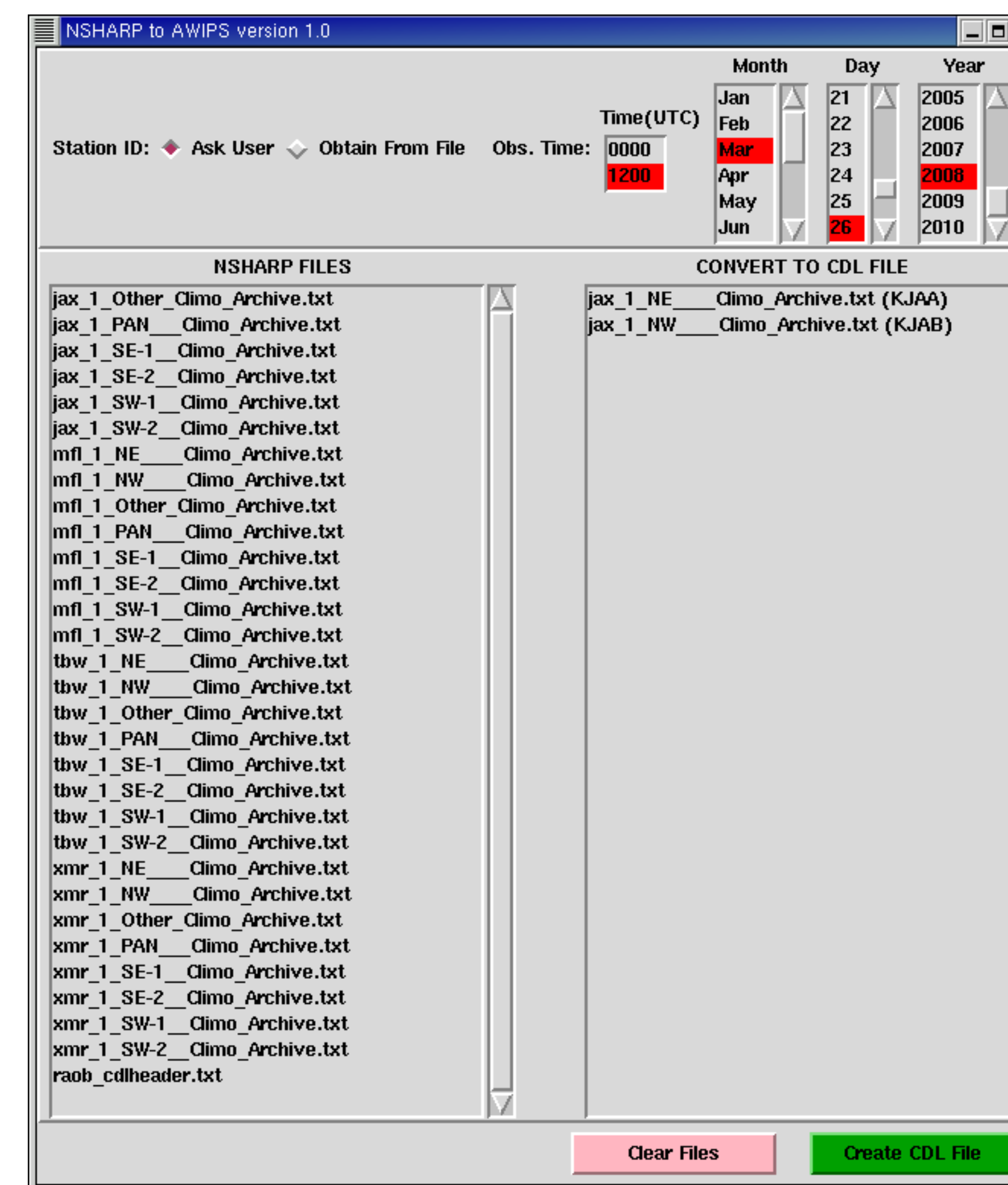
The AMU manually created a test file in NetCDF format to verify the correct format for soundings in AWIPS. The file was based on the KMFL observed sounding from 1200 UTC on 1 October 2007. It was successfully viewed in AWIPS as a composite sounding.

III. Write a software program to convert the composite soundings from NSHARP Archive to NetCDF format.

The AMU wrote a software program in the Tool Command Language/Tool Kit (Tcl/Tk) language to automate the conversion of the soundings to NetCDF format. The "NSHARP to AWIPS" program creates a CDL file containing the data for all of the composite soundings. The user then converts the CDL file to a NetCDF file with the `ncgen` command-line utility. After the NetCDF file is copied to the `/data/fixa/point/raob/composite` directory, the soundings can be viewed in AWIPS.

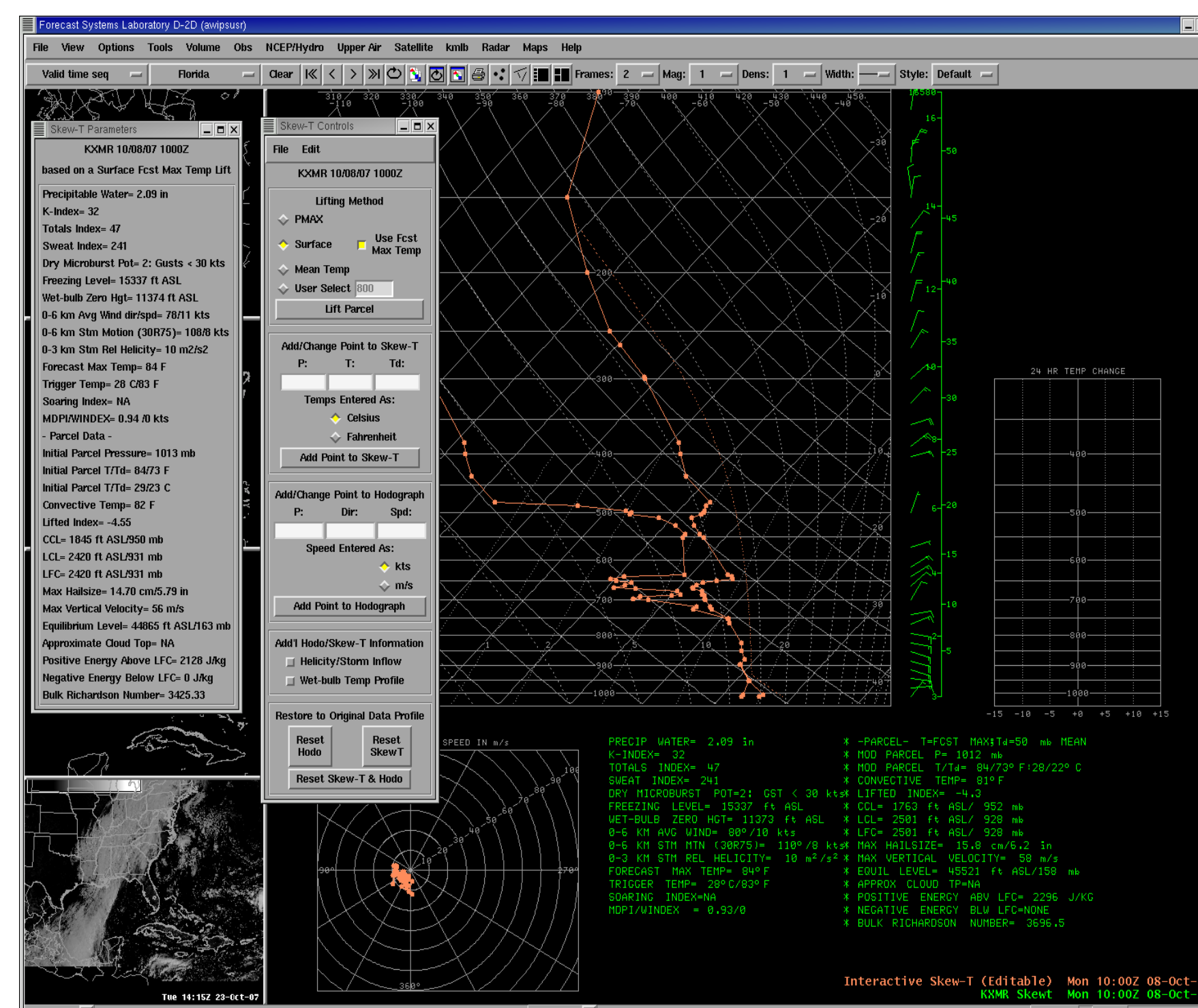


NSHARP to AWIPS application at start-up.

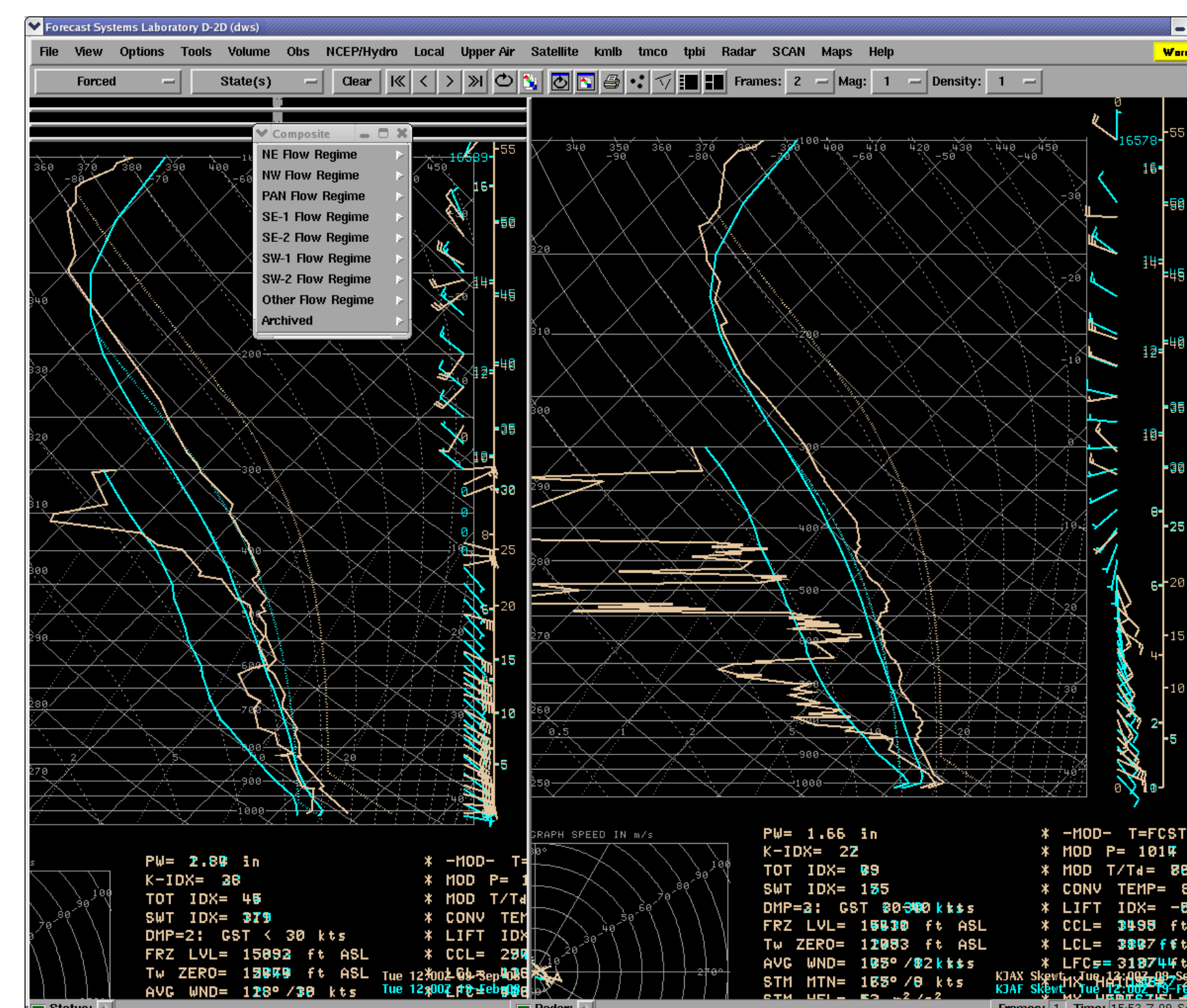


Two NSHARP files are being added to a CDL file.

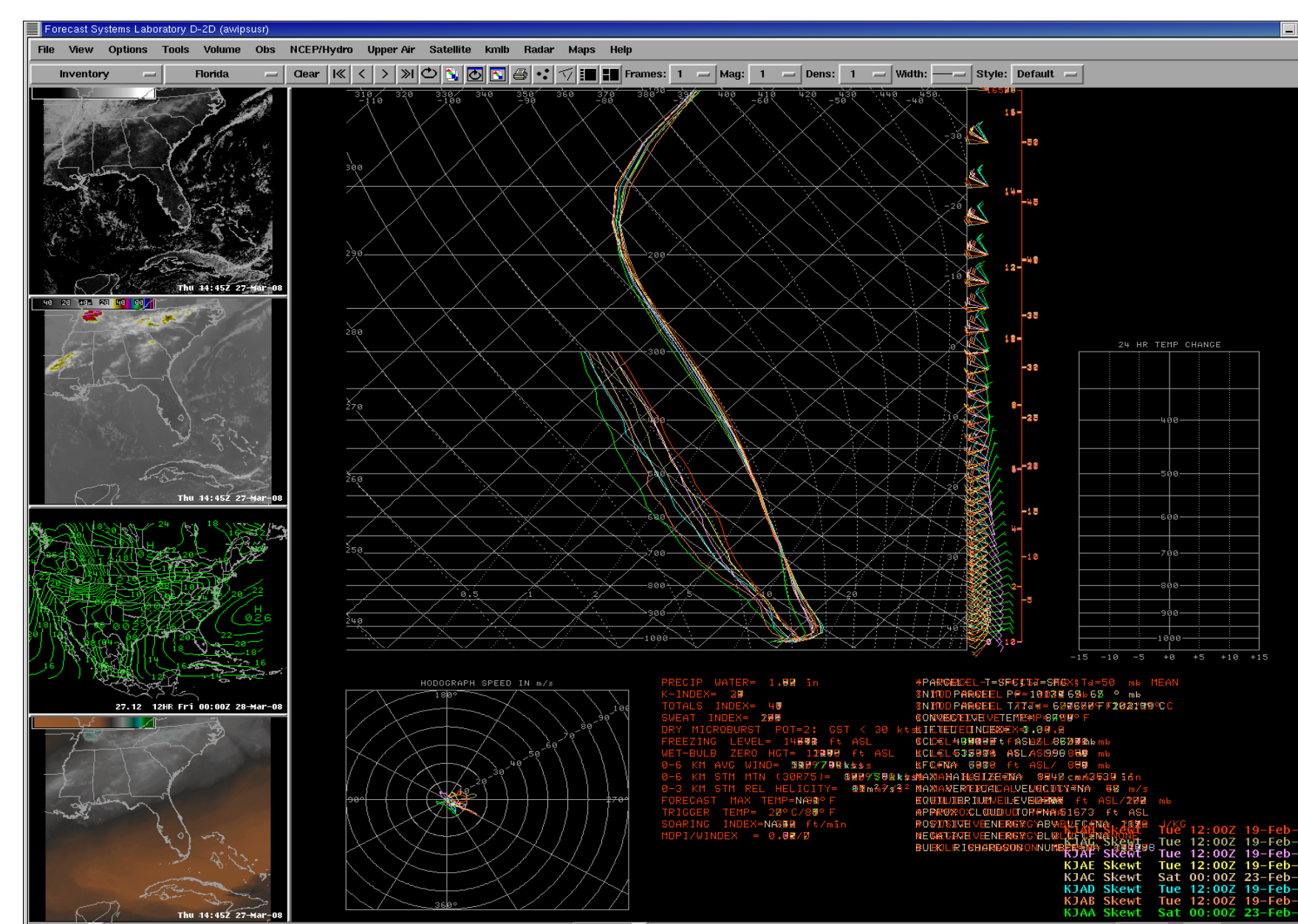
EXAMPLES OF COMPOSITE AND ARCHIVED SOUNDINGS IN AWIPS



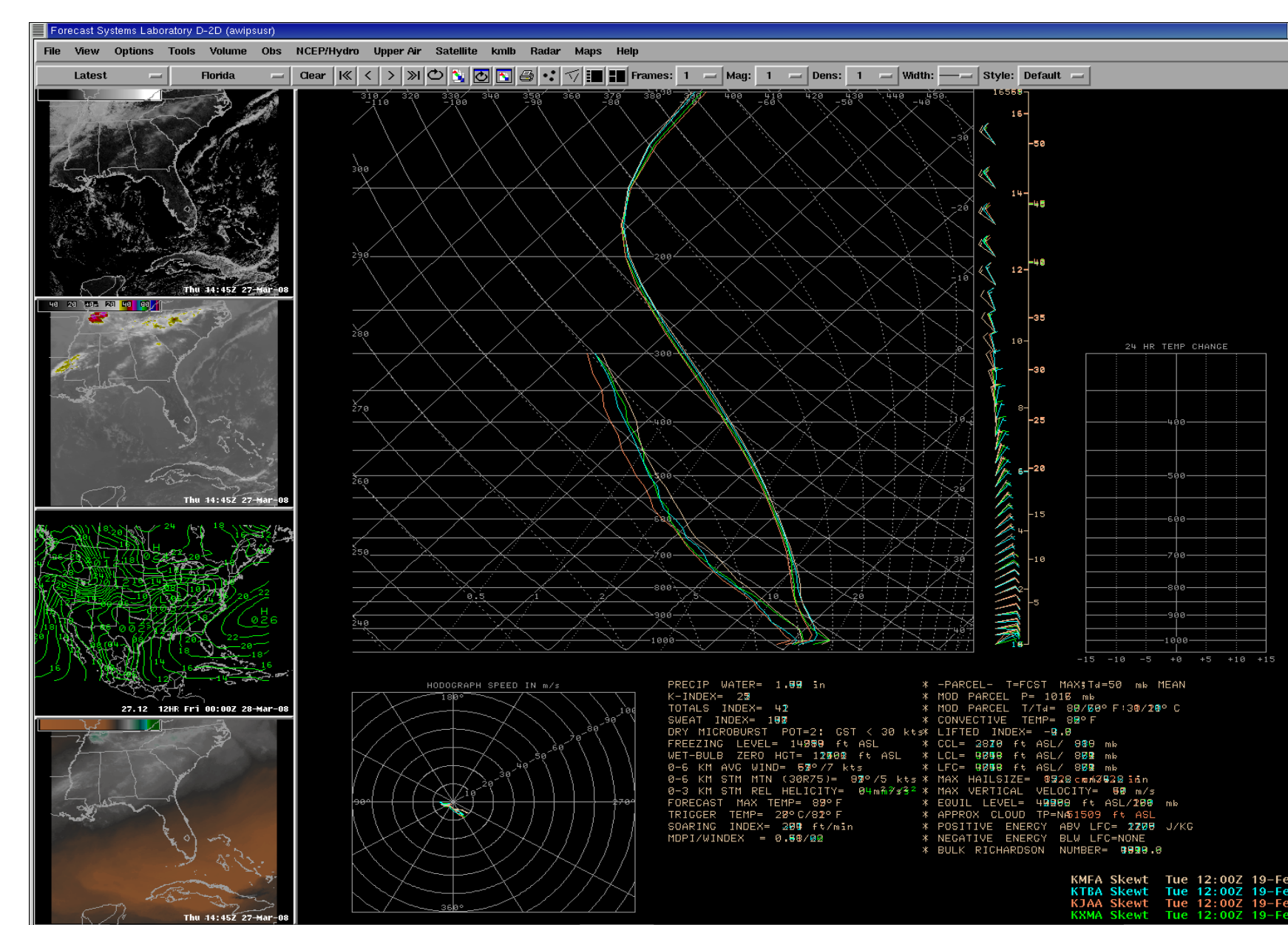
An archived KXMR sounding being edited with the AWIPS Interactive Skew-T program.



AWIPS display of KMFL (left) and KJAX (right) observed (beige) and composite (blue) soundings, for the SE-2 flow regime. The observed soundings were at 1200 UTC on 9/9/08.



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



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

ADDING ARCHIVED SOUNDINGS TO AWIPS

The AMU performed the following steps to add archived soundings to AWIPS:

- Localize AWIPS so that archived soundings could be displayed, and
- Copy soundings from `/data/fixa/point/raob/netcdf` to `/data/fixa/point/raob/archive`, before they get deleted by the AWIPS purge scripts.

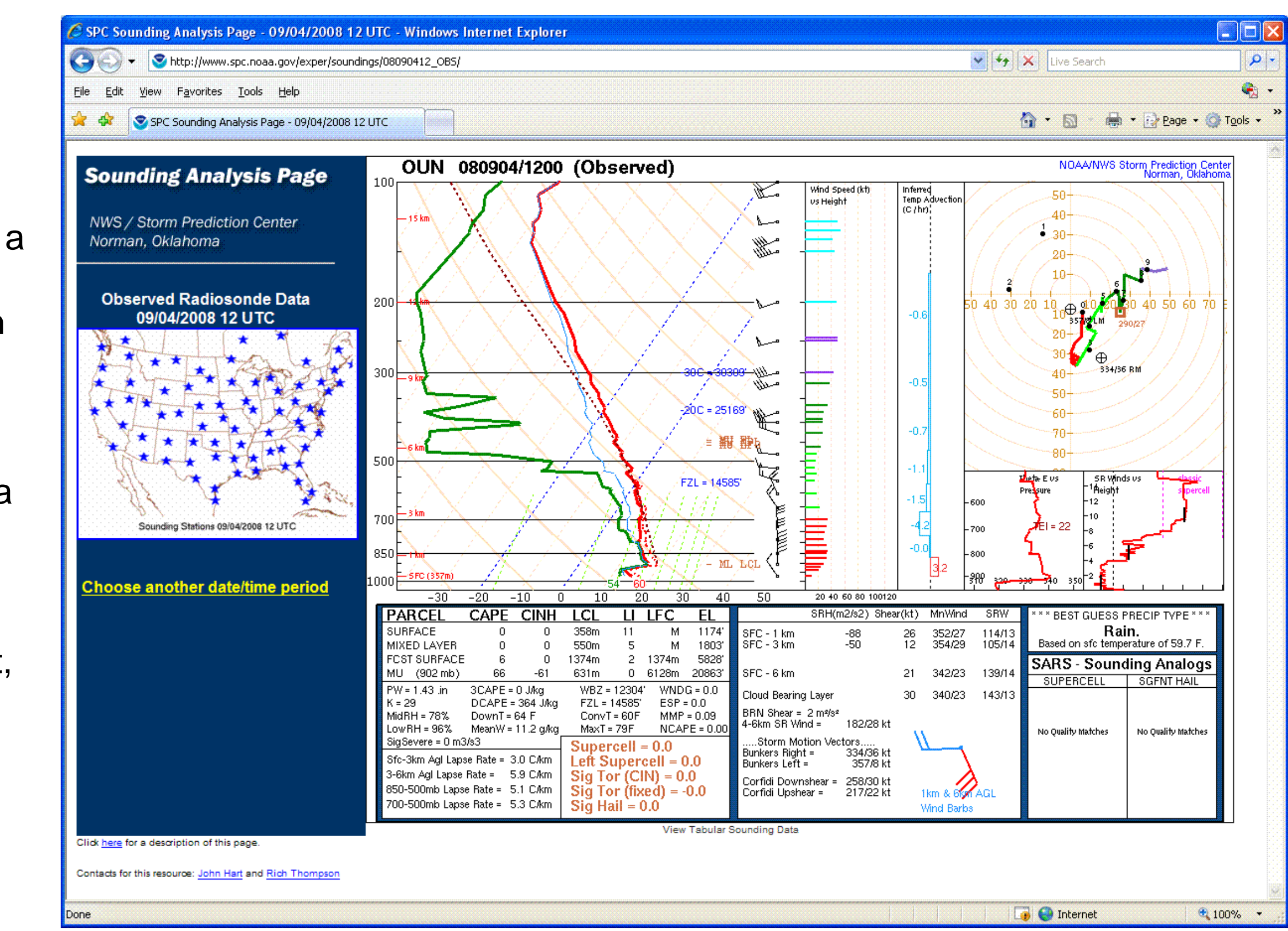
I. AWIPS Localization

- Create a new file directory to hold archived soundings: `/data/fixa/point/raob/archive`. This ensure the soundings do not get deleted by the automated purge scripts.
- Modify the Upper Air menu. Edit the `LLL-siteRaobMenus.txt` file in the `/awips/fixa/data/localization/LLL` directory, where `LLL` is the localization identifier. In the file, create an "Archived" submenu. Inside the Archived submenu, create a product button key for each upper-air site that contains archived soundings.
- Add a unique product button key for each site containing archived soundings. Copy `/data/fixa/nationalData/raobProductButtons.txt` to `/data/fixa/customFiles`. Add product button keys.
- Add a unique depict key for each sounding. Copy the `/data/fixa/nationalData/raobDepictKeys.txt` file to `/data/fixa/customFiles`. Add the depict keys and associated data keys to the file.
- Add a unique data key for each sounding. Copy the `/data/fixa/nationalData/raobDataKeys.txt` file to `/data/fixa/customFiles`. Add the data keys to the file. Change the directory name in the eighth field of each record, corresponding to the directory created in Step a).
- As user fxa, perform a full localization.
- Verify no errors occurred during the localization.

II. Copy soundings before they get purged

To archive soundings before they get purged, copy the NetCDF files from `/data/fixa/point/raob/netcdf` to `/data/fixa/point/raob/archive`. The archived soundings can then be viewed as a Skew-T plot in AWIPS.

OBTAINING SOUNDINGS IN N-SHARP ARCHIVE FORMAT

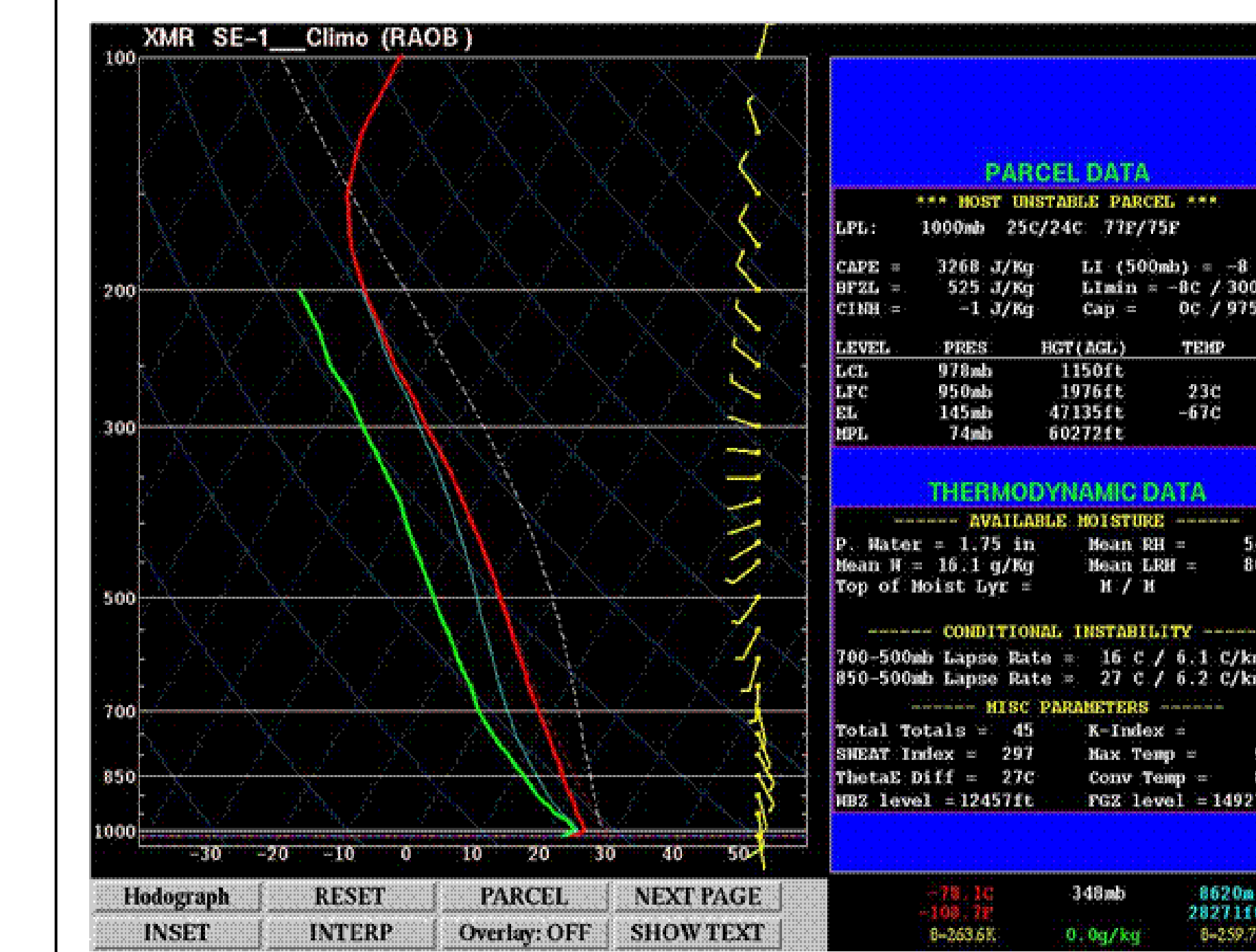


The NWS Storm Prediction Center maintains a 7-day archive of observed soundings at <http://www.spc.noaa.gov/exper/soundings/> on an experimental basis.

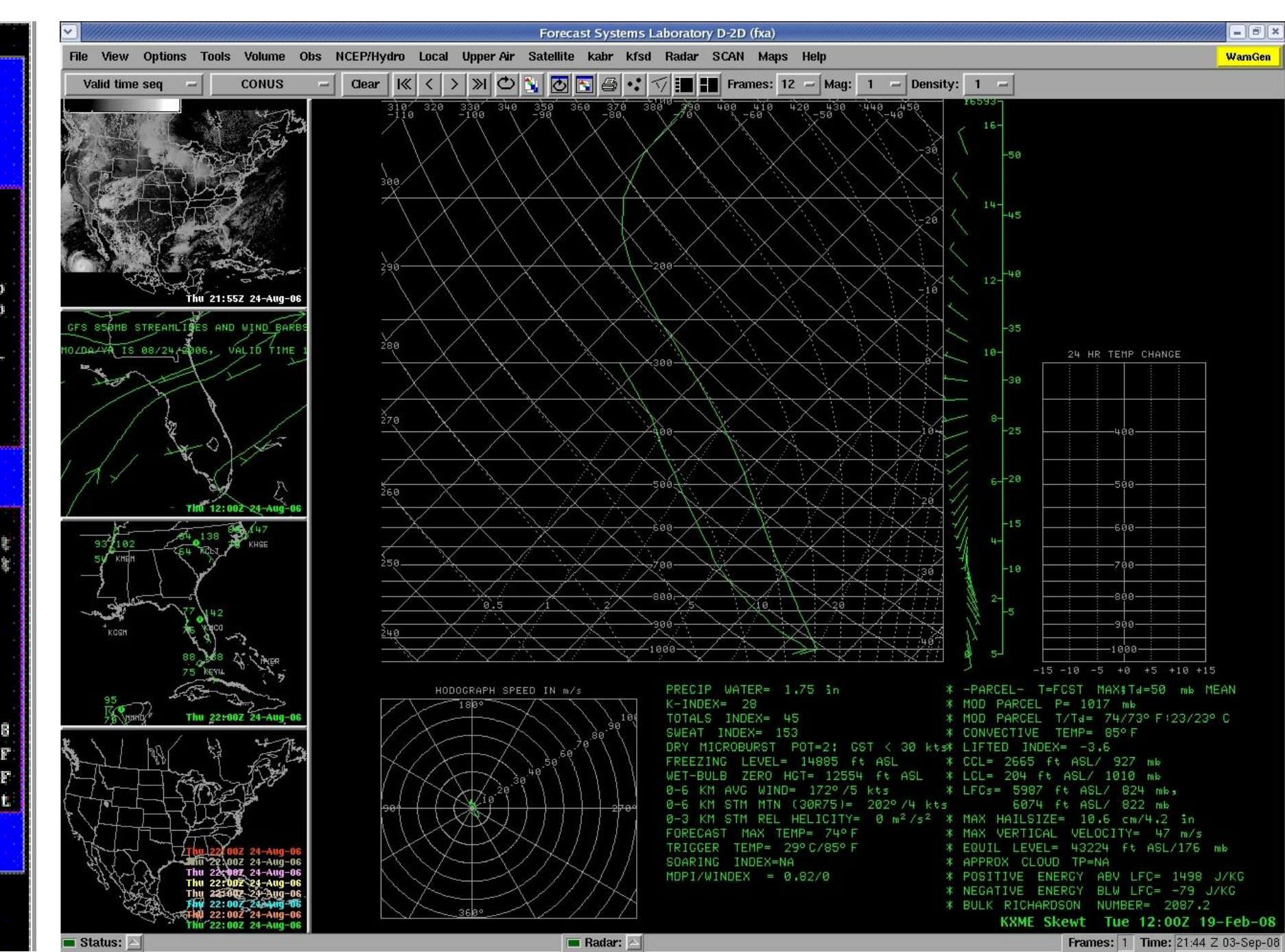
From the website, a sounding can be downloaded in N-SHARP Archive format, as a text file.

The NSHARP to AWIPS application can be used to convert the text file to NetCDF format, for viewing in AWIPS.

COMPARISON OF SOUNDINGS IN AWIPS AND N-SHARP



NSHARP display of the composite sounding from KXMR for the SE-1 flow regime.



AWIPS display of the composite sounding from KXMR for the SE-1 flow regime.

REFERENCES

Barrett, J.H., 2008: Situational Lightning Climatologies for Central Florida: Phase III Final Report. NASA Contractor Report CR-2008-214742, Kennedy Space Center, FL, 30 pp. [available at <http://science.ksc.nasa.gov/amu/final.html>]