J2.1 THE NATIONAL SEVERE STORMS LABORATORY HISTORICAL WEATHER DATA ARCHIVES DATA MANAGEMENT AND WEB ACCESS SYSTEM

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1. INTRODUCTION

The NOAA/National Severe Storms Laboratory Historical Weather Data Archive (NSSL HWDA) is a new web-based data portal that delivers surface and upper-air data to the online user through horizontal maps, vertical profiles on SkewT–logp charts, time series, and ASCII data listings. The data are primarily from the United States and Canada, but some worldwide data are available, especially after 1998 for surface data and 2000 for upper-air data. Previously, access to these data was limited to those at NSSL understanding GEMPAK (General Meteorology Package; Koch et al. 1983; desJardins et al. 1991; <http://www.unidata.ucar.edu /software/gempak>), an analysis, display, and product generation package for meteorological data. Recently an online data portal, the NSSL Historical Weather Data Archives (HWDA) (Fig. 1), is developed by NOAA/NSSL and NOAA/PMEL through funding from NOAA's now-defunct Environmental Services Data and Information Management (ESDIM) program. In its current configuration, HWDA is capable of plotting surface and upper-air horizontal maps, vertical profiles, and time series from the United States and the world. Observing station locations and other information are also available. The purpose of this article is to describe the datasets in the HWDA, provide some information about the software, and describe its functionality.

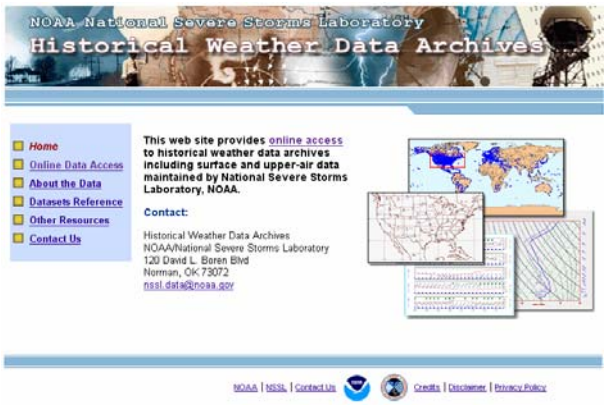

Figure 1. NSSL Historical Weather Data Archives Web Site: http://data.nssl.noaa.gov

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2. DATASETS

Currently, two of NSSL's most popular datasets are included in the portal: surface and upper-air data. Surface data before 20 April 1998 was obtained and assembled by scientists and computer programmers at NSSL for producing climatologies of winter precipitation (e.g., Robbins and Cortinas 2002; Cortinas et al. 2004). Two surface datasets from the NOAA/National Climatic Data Center (NCDC) were quality controlled and merged into a single format, as described in Robbins and Cortinas (2002). The first dataset is TD-3280, the United States surface airway hourly observations from NCDC. The second dataset is DATSAV2, a surface dataset from the U.S. Air Force Combat Climatology Center. Although data exists in this dataset as early as 1933, the earliest data are sparse and primarily from military bases. The most complete data for constructing surface maps are found for 1973 to present. Since 20 April 1998, the surface data come from the operational datastream over the Global Telecommunications System archived by NSSL and the NOAA/National Weather Service/Storm Prediction Center (SPC). Although some worldwide data exist in the dataset before 1998, the majority of the available worldwide data occurs after this time.

Upper-air data before 2000 come from the North American Radiosonde Database created by the NOAA/Forecast Systems Laboratory (FSL), now the Global Systems Division of the Earth System Research Laboratory. More information on this dataset can be found in Schwartz and Govett (1992) and at the FSL/NCDC Radiosonde Data Archive web site <http://raob.fsl.noaa.gov/Raob_Software.html>. Since 1 January 2000, the upper-air data come from the operational datastream over the Global Telecommunications System archived by NSSL and SPC.

3. DATA MANAGEMENT

Both surface and upper-air datasets are maintained on a NSSL data server computer. The data are stored as one GEMPAK file per day, where surface datasets contain hourly data and upper-air datasets contain data at least every 12 hours.

The metadata of the archives are managed using MySQL database and are available for both the surface and upper-air data. Data listings of station information contain latitude, longitude, elevation, time range of data availability, station identifier, and WMO number, all derived from GEMPAK station tables. The most recent data in the dataset are also part of this metadata. An

automated procedure has been setup to retrieve real-time data from the NOAA/National Weather Service/ Storm Prediction Center and load data into database.

4. ONLINE DATA ACCESS

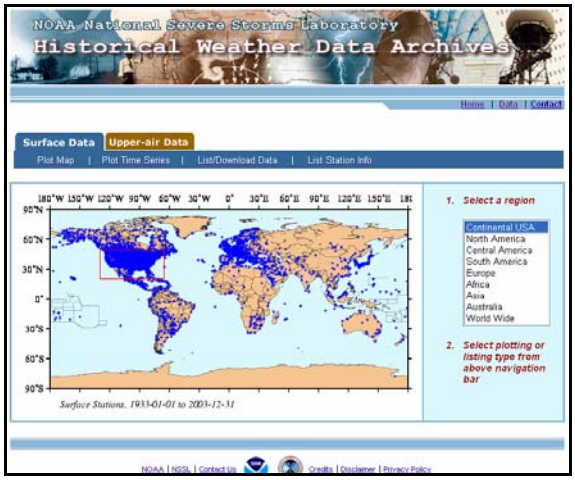

Figure 2: The NSSL Historical Weather Data Archives Web Data Selection Page.

The NSSL HWDA (Fig. 1 & Fig 2) was developed to provide convenient access to these historical surface and upper-air weather data. The NSSL HWDA Web site offers interactive data access selection features. The world is divided into several major regions (e.g., continental United States, Europe, Africa). Users select a region of interest and then can zoom in to a smaller domain by dragging a "rubberband box" over the map. By selecting the button "Load station info" and reloading the page, users can view station information when the mouse is positioned over a station (Fig. 3). Station data can also be listed for all stations within the plotted domain.

GEMPAK serves as a backend plotting and listing tool. The NSSL HWDA web site initiates GEMPAK programs through scripts to make various plots and lists of data. Another piece of graphic software, Generic Mapping Tools (GMT; http://gmt.soest.hawaii.edu), generates geographic station location maps to provide web interactive station/area selection.

Dynamic HTML (DHTML) technologies have been implemented in the NSSL HWDA Web interface system. These include JavaScript, dynamic styles, cascading style sheets, and other technologies to dynamically change HTML displays. In particular, the DHTML technologies are used to show and hide a HTML layer dynamically. When users move the mouse toward or away from the station location on map, the layer containing information about that station is shown or hidden, respectively. The station information is loaded dynamically by accessing the backend database. DHTML is a modern replacement for Java applets as an improved, fast-response, interactive user interface for the web.

PHP (a server-side scripting language) is used to communicate with the backend database, initiate graphic tools and scripts, and generate the desired page dynamically. PHP provides reusable components for the web site. The HWDA has been tested successfully on Internet Explorer and Firefox on PCs and using Netscape on Macintosh. Macintosh's Safari and Firefox browsers are not fully compatible with the HWDA.

5. CAPABILITIES OF THE HWDA

The current configuration of the HWDA delivers surface and upper-air data to the user through horizontal maps, vertical profiles on SkewT–logp charts, time series, and ASCII data listings (Fig. 4). Users arriving at the HWDA to view or download data are first asked to select a

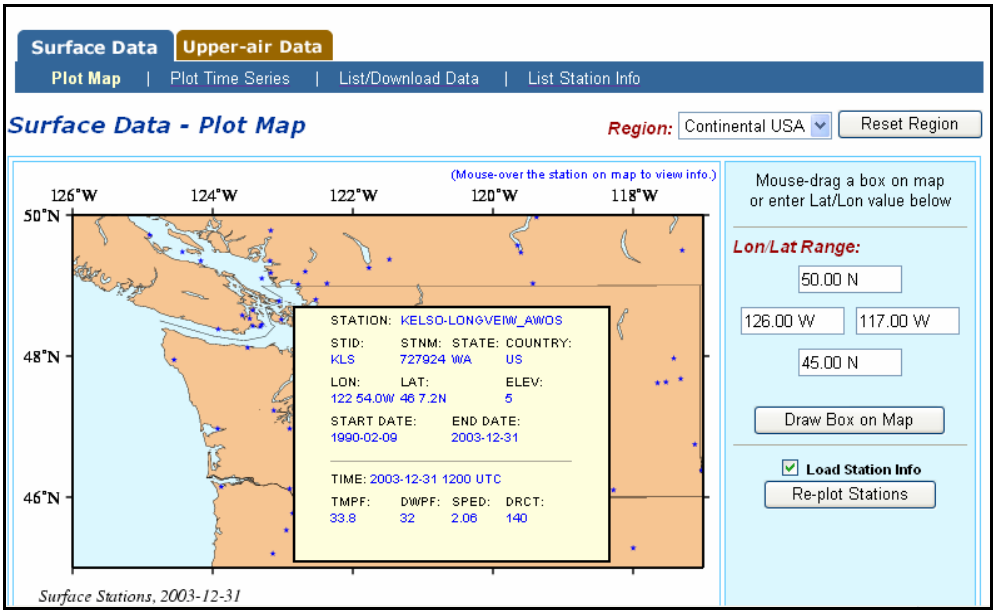

Figure 3: Moving the mouse over a station reveals a listing of information about the station.

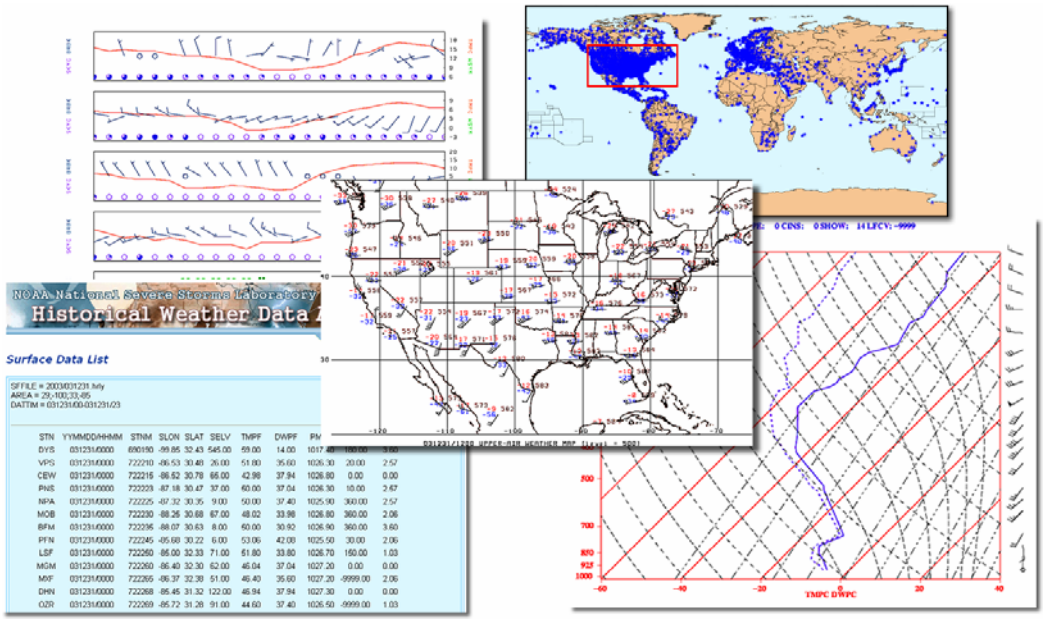

Figure 4: Examples of output from NSSL HWDA (from left to right and clockwise): listing of surface data, time series, upper-air constant-pressure map, selection window for choosing region of world, and Skew*T*–log*p* chart.

region of the world from a drop-down menu of choices. Users can later subset the map for smaller domains, focusing just on a state or region by drawing a box around the area of interest. Because the amount of plotted data is filtered for legibility for larger domains, plotting smaller domains is useful for seeing data from a greater number of stations, especially at the surface. Users then select surface or upper-air data and their choice of plot type or data listing. For surface data, users can create a surface map with plotted station models, time series, or data listing. For upper-air data, users can create upper-level maps (in height, pressure, or isentropic coordinates), time series, vertical profiles on SkewT–logp charts, or data listings.

One advantage of the HWDA is that users can make a minimum of selections and get plots and data listings quickly, yet more sophisticated users familiar with GEMPAK commands have the ability to exert some control over the manner in which the plots are presented, altering the standard station model, for instance, or requesting nonstandard fields, like equivalent potential temperature. Links to those GEMPAK commands are provided on the web page.

6. CONCLUSION

The NSSL Historical Weather Data Archives interactive Web access system provides an easy and convenient way for scientists and other users to access historical weather data. The system is customized for GEMPAK, but can be extended to support other data formats with different applications and tools.

7. Acknowledgments

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