JP1.2 EASY WEB ACCESS TO A VARIETY OF ARCHIVED METEOROLOGICAL DATA

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1. INTRODUCTION

The Plymouth State College (PSC) Weather Center web portal (Koermer, 1998 and 2003) has always provided access to current weather information since it came online in April 1994. With the advent of the PSC Weather Center "Make Your Own…" page in 1998, users could interactively go back several days from the current date to display weather information. However, because of more recent collaborative research efforts between PSC and the University of New Hampshire (UNH) Climate Change Research Center (CCRC) on a variety of climate and air quality projects, the need developed to start and maintain a longer archive of surface/upper air meteorological data and to develop a user friendly interface to access and display these data.

As a prime example of this need, CCRC atmospheric chemists have several air quality observation sites throughout the state of New Hampshire. At these sites, some of the measuring instruments use filters to capture pollutants. These filters need to be removed from the site and brought back to UNH to be analyzed in CCRC laboratories. This analysis may not be done immediately, but is sometimes deferred for weeks or several months. If something interesting were to turn up, researchers want the means to go back and review the meteorological conditions.

PSC's archival of data started at the beginning of August 1998. Initially, the data only consisted of surface observations and upper air observations. Over the past several years, the archive has expanded to include radar summaries, additional radiosonde data, and some 40 years of the global NCEP/NCAR reanalysis upper air data.

In order to provide access to these data, PSC started with a limited access web page similar to the "Make Your Own…" page. As new data came online, the page was expanded. During the spring of 2002, access was opened up to the general public.

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This resource has been frequently used in research studies at PSC, UNH, and elsewhere. PSC students often access this site to support their own student research projects and case studies for various classes. The site allows them to spend more time on analyzing data rather than wasting time in data retrieval and extraction. Besides research activities, it also allows PSC faculty and the New Hampshire state climatologist at UNH to quickly provide detailed answers to frequent questions posed to them about recent weather events.

2. TYPES OF ARCHIVED DATA

Both hourly METAR and synoptic surface data and 00Z and 12Z upper air data are archived in their original raw format and decoded form as UNIX compressed files. The decoded files are used by WXP software for graphical and text products. The compression reduces file sizes by approximately one order of magnitude, thus reducing disk storage requirements. The initial archive of these data was started on August 1, 1998 and has continued on a daily basis. Data were initially acquired over a DDPLUS system where data were primarily confined to North and Central America. In early 1999, PSC began using a newly installed NOAAPORT system that provided these data on an expanded global basis.

In March 1999, PSC started archiving decoded (for WXP) hourly Manually Digitized Radar (MDR) summaries. Similar, but more detailed Radar Control Message (RCM) data was added in February 2002. Both types of files are also stored as compressed files.

During the summer of 2001, limited upper air data from NCEP/NCAR reanalysis CDROM set were extracted and reformatted into daily 00 UTC and 12 UTC files in "grib" format compatible with WXP file conventions and made available online. These datasets now span from 1953 through 2000.

The 00 UTC and 12 UTC radiosonde data from the National Climate Data Center (NCDC) "Radiosonde Data for North America" CDROM set and additional sounding data from the Forecast Systems Laboratory (FSL) Radiosonde Database Access site (http://raob.fsl.noaa.gov/) were

collected back through July 1957 in raw format and then decoded into WXP format to expand the upper air data base, so that it now covers the past 45 years.

Another dataset added to the archive is from the NCDC CDROM, entitled "Global Daily Summary - Temperature and Precipitation 1977-1991". This contains historical maximum/minimum temperature data, 24-hour precipitation, and recorded present weather information for thousands of sites from all over the world.

The only data archived in graphical format are global Sea Surface Temperature (SST) maps to save on disk storage requirements. These maps in lat/lon format go back to February 26, 2002.

The collection of data provides a wealth of materials for a wide variety of meteorological and climate research studies that can easily be accessed through a standard web browser.

3. PSC WEB ACCESS PAGE

Primary access to these archived data is through a web page that can be accessed through the PSC Weather Center web portal (http://vortex.plymouth.edu/) and selecting the link, entitled "Archived Data" or directly through the URL, http://vortex.plymouth.edu/umake.html. This will open the following window providing the access menu in Figure 1.

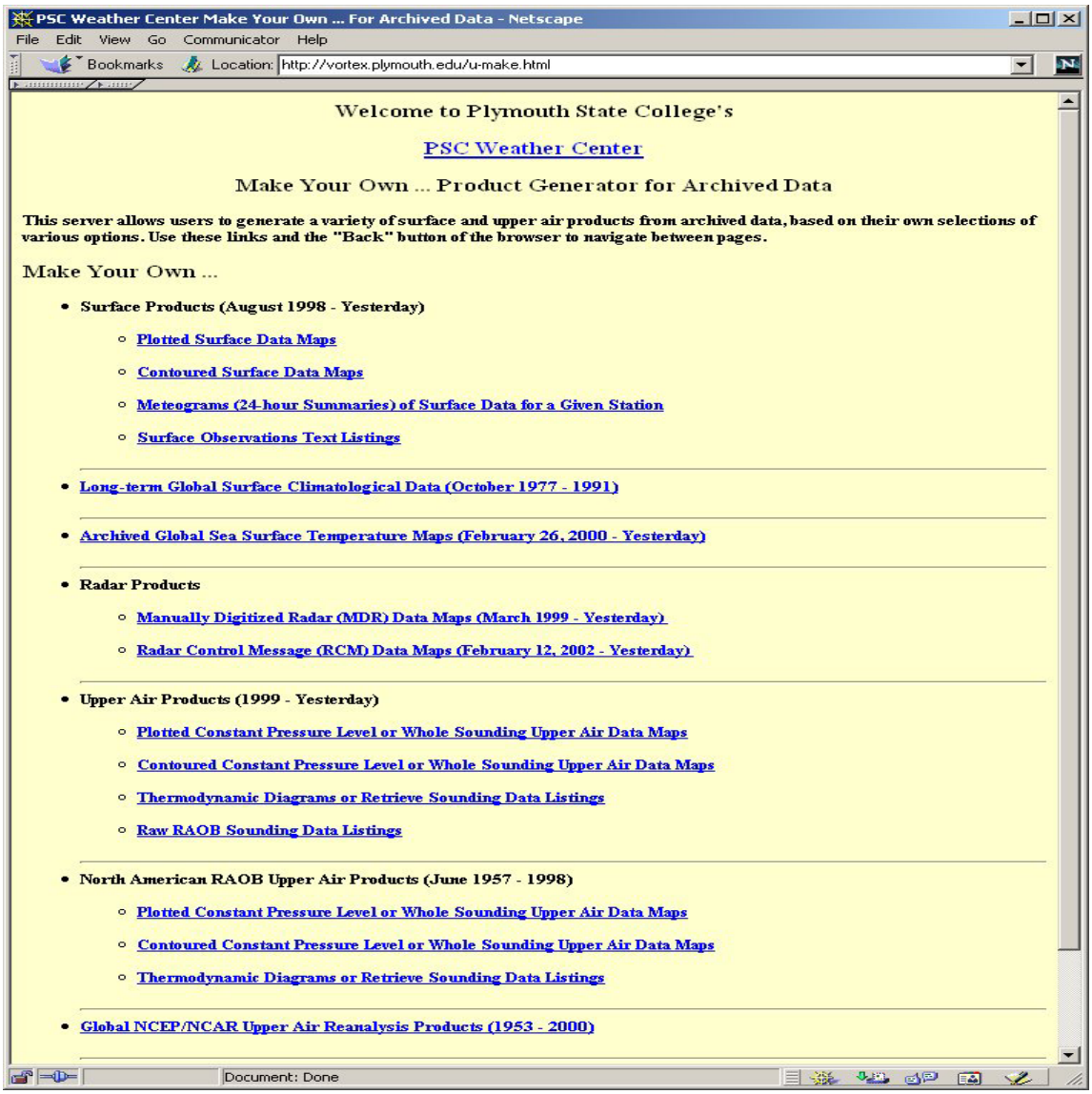


Figure 1. PSC Weather Center "Make Your Own … For Archived Data" menu.

Note that the archived data can be retrieved in a variety of graphical and text formats including plotted maps, contoured maps, charts, diagrams, and raw or formatted reports. Most maps and charts can be generated with white backgrounds to make printing them easier, especially on non-color printers. WXP software is used to generate all graphical and most text outputs.

On most of access interface pages to the datasets, users set the date and time. For maps, they also select the map domain (e.g. CONUS, Central America, etc.) and select the type of data desired; both have from a wide variety of options. Users can also increase or decrease the density of data coverage on plotted surface maps. On contoured maps, users can select the contour interval and type of contours (e.g. line, dashed line, color-filled, etc.). They can also choose an output option that produces plotted gridpoint data. For the NCEP/NCAR reanalysis data, they can also overlay two different contoured maps. These could be for different times or models—nice for viewing system progression or model differences.

A summary of surface observations of 24-hour can be retrieved as a graphical meteogram or a tabular text summary. Users can also obtain a listing of raw METAR or decoded observations for a given date/hour by U.S. state, Canadian province, or for Central America.

Upper air data can be plotted, contoured, or gridded much like surface data, but can also be plotted on four types of thermodynamic diagrams or a hodogram. Users have the option to retrieve raw radiosonde observations (post 1998) for a given US station or a decoded tabular listing (for all upper air datasets) that includes many stability indices and other derived whole sounding parameters.

4. SOME EXAMPLES

In PSC mesoscale meteorology classes, an instructor often wants to have students review the observational data leading up to a notable severe weather event. One example, could be the case of the May 3, 1999 Oklahoma City F5 tornado. Surface data are often important to check for items, such as, well-defined drylines, moist advection, etc. By selecting "Plotted Surface Maps" from the archive menu and setting the interface page as shown in Figure 2, the user can generate a plotted map for the southern plains as shown in Figure 3.

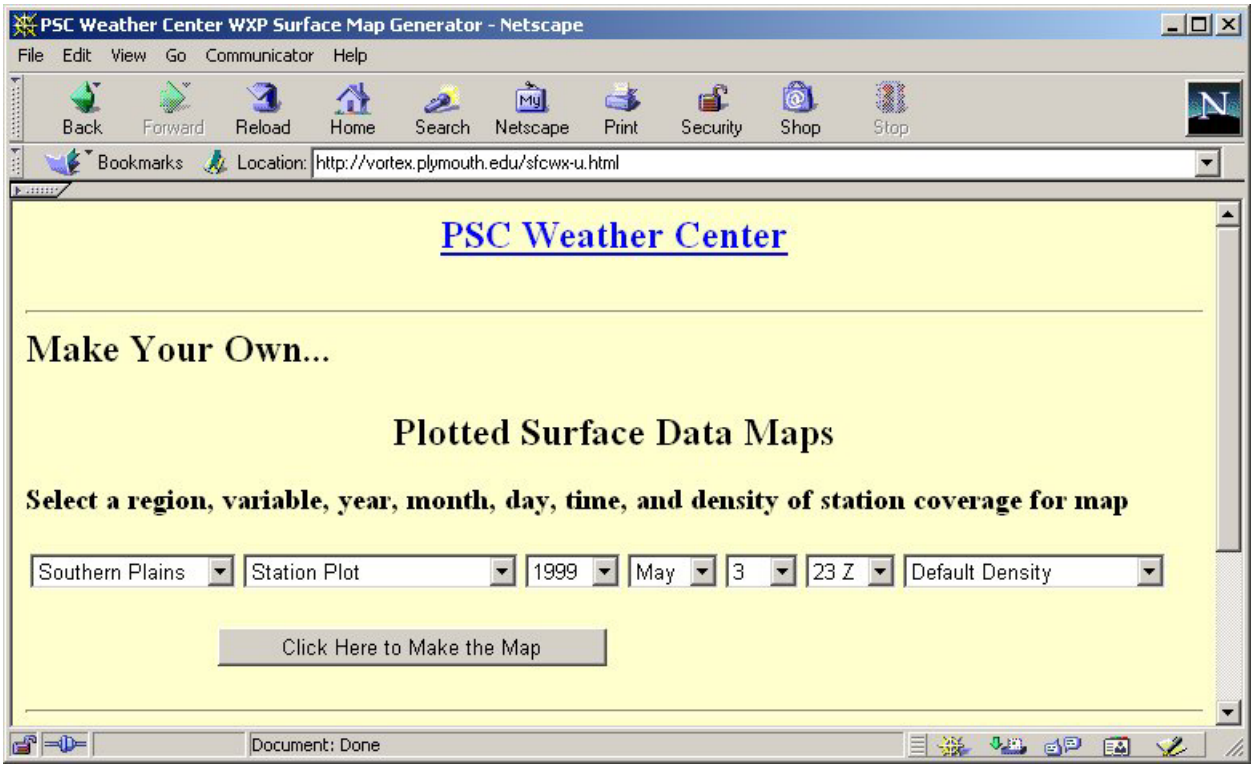


Figure 2. Interface page for plotting surface maps. Options are set to make a map with station plot data just prior to the Oklahoma City F5 tornado event.

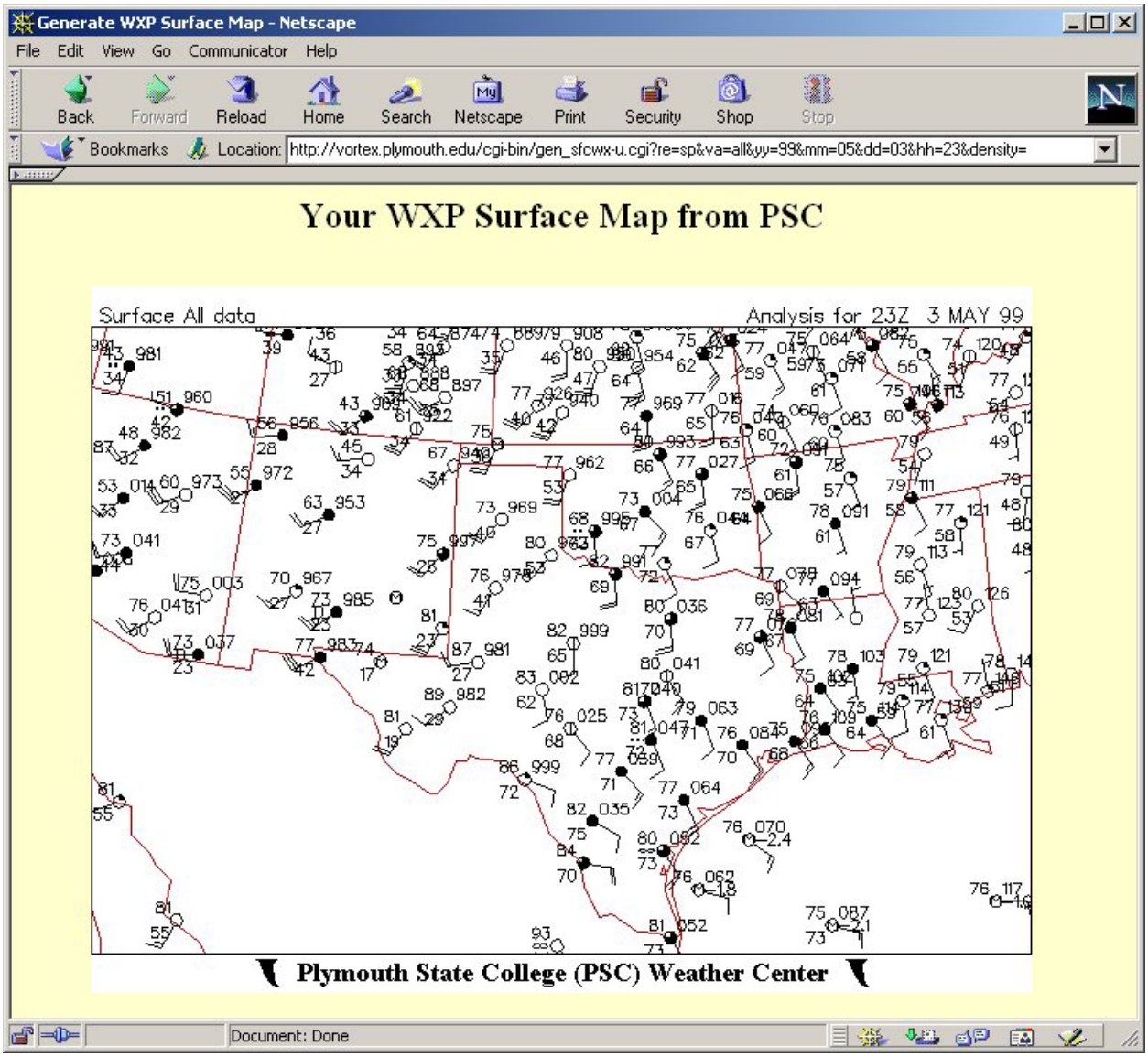
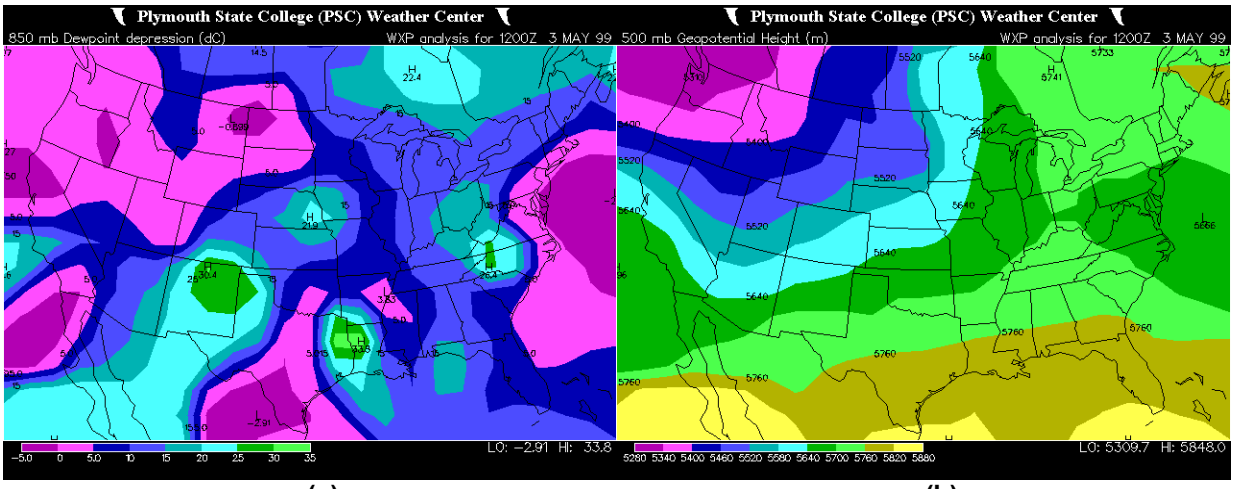


Figure 3. Station plot map valid for 2300 UTC on 3 May 1999 obtained from setting in Figure 2.

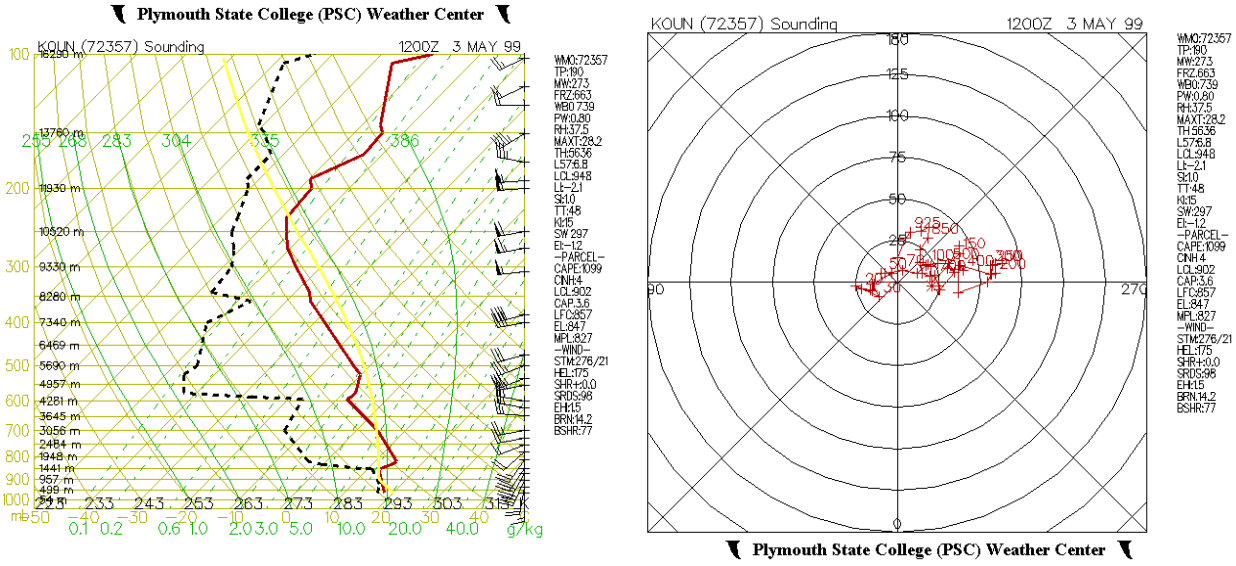
From the data plots, the dryline is quite evident in the Texas panhandle and west Texas with widespread moist south-southeasterly flow from the Gulf of Mexico and a broad area of low level convergence along the dryline. Much colder air is approaching from the northwest. Other parameters can be plotted for manual analysis or surface data can be contoured or winds can be streamlined or vectorized by the software. There is a wide variety of observed and derived surface parameters and options from which to select.

Besides surface data, upper air data would also be important to review. From the archive menu, a user can select the "Contoured Constant Pressure Level or Whole Sounding Upper Air Data Maps" option to generate such things as an 850 hPa dewpoint depression analysis or a 500 hPa height analysis, etc. By using the "Thermodynamic Diagrams or Retrieve Sounding Data Listings" selection, entering the radiosonde identifier, and setting the appropriate options, the user can also produce a skew-T log-p diagram or a hodogram. Example outputs for all these products are shown in Figure 4.

Although the MDR radar data leaves much to be desired, it can still give an investigator some insight into the evolution of convection. Examples of MDR radar maps corresponding to just before and just after the May 3, 1999 Oklahoma City outbreak is shown in Figure 5. More recently archived RCM data would have yielded much better definition.

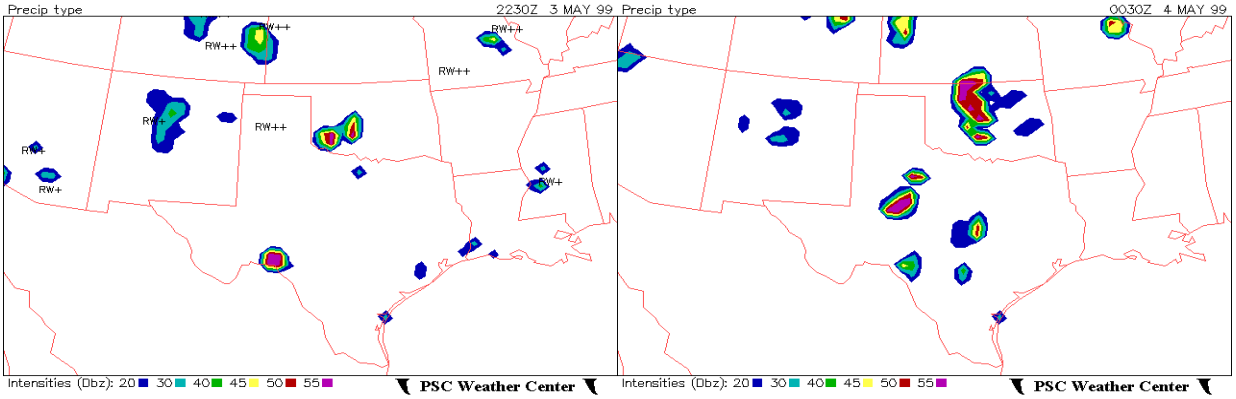


(a) (b)



(c) (d)

Figure 4. Examples of upper air products for 1200 UTC on 3 May 1999 that can quickly be retrieved through the archive site: (a) 850 hPa dewpoint depression analysis; (b) 500 hPa height analysis; (c) skew-T log-p diagram for KOUN; and (d) the corresponding hodogram for KOUN.



(a) (b)

Figure 5. MDR summary maps for (a) 2230 UTC on 3 May 1999 and (b) 0030 UTC on 4 May 1999.

The explosive growth and movement of the blizzard of March 1993 can quickly be recalled by selecting the "Global NCEP/NCAR Upper Air Reanalysis Products (1953 - 2000)" menu item. This will bring up a window as shown in Figure 6 that allows a user to display a single field or an overlay of two fields. If an overlay is selected, the user only has to set items that are different from the underlay map. Here the 1000 hPa geopotential fields for 13 March 1993 will be plotted on a CONUS map using a contour interval of 25. The 00 UTC contours will be color-filled and the overlaid 12 UTC contours will be plain line contours. The resulting map is shown in Figure 7.

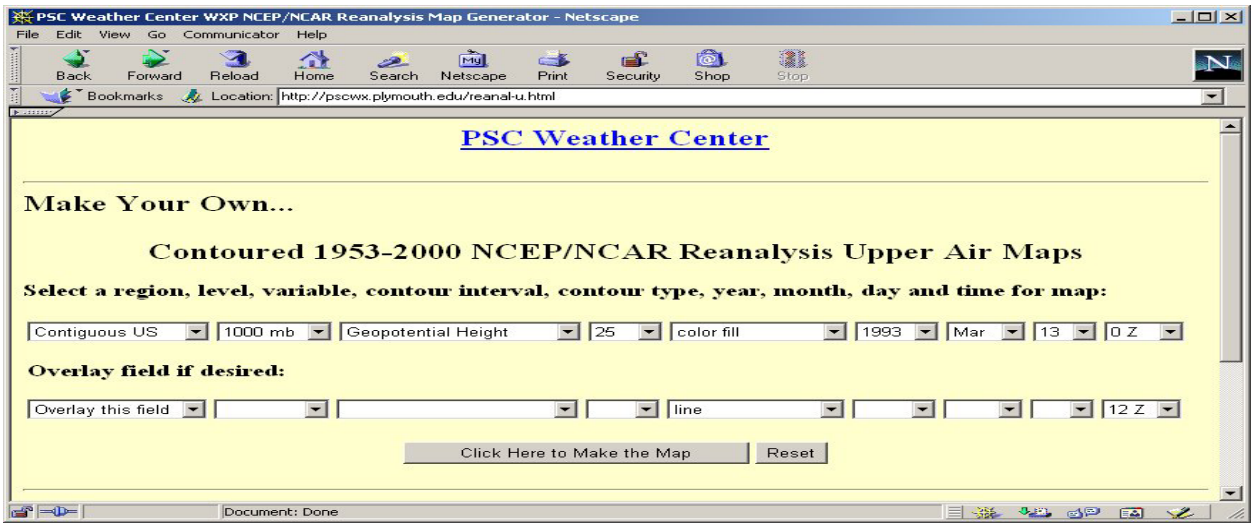


Figure 6. NCEP/NCAR reanalysis selection menu. Options are set to retrieve a CONUS map for 13 March 1993 of 1000 hPa height contours at 25 m intervals with 00 UTC data being color contoured and 12 UTC data being overlaid as line contours.

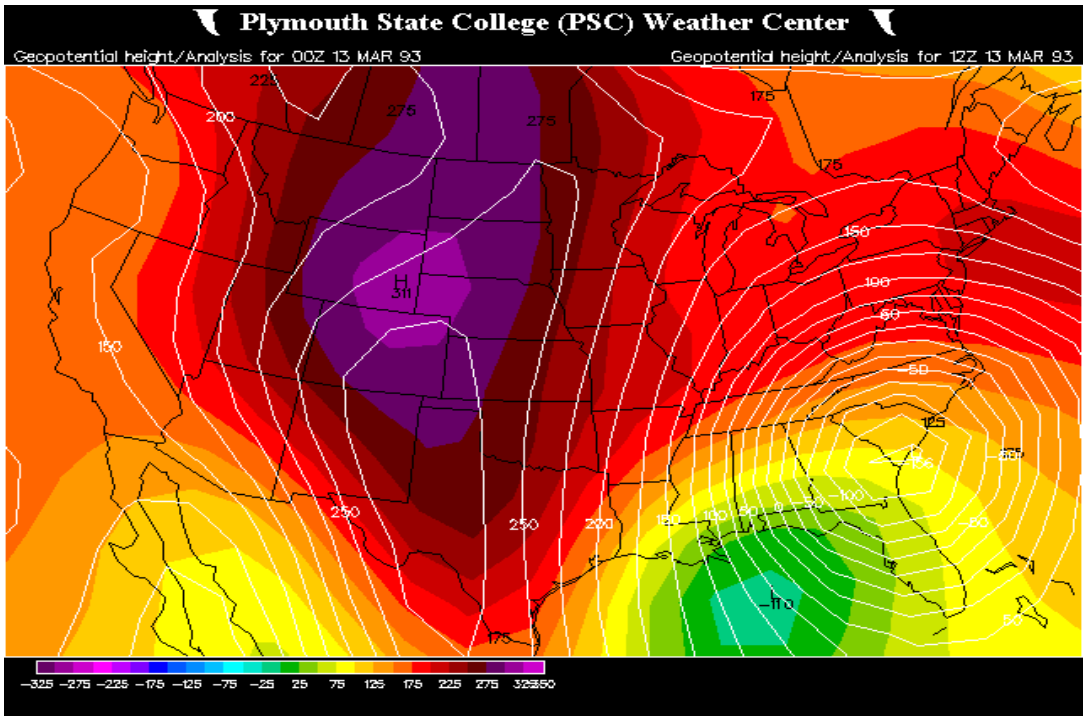


Figure 7. NCEP/NCAR 1000 hPa geopotential height output for 13 March 1993 generated from selections in Figure 6. Color contours are for 00 UTC and line contours for 12 UTC.

5. SUMMARY

The PSC Weather Center's "Make Your Own ... Product Generator for Archived Data" provides an easy-to-use online resource to retrieve and display archived meteorological data. The page is now available to the public and provides access to nearly 5 years of hourly surface data, 45 years of 00 and 12 UTC upper air data, some hourly MDR and RCM data, surface climatological summaries, and a subset of the global NCEP/NCAR reanalysis dataset covering 1953-2000.

This capability provides a tool for educators, researchers, or another interested party to quickly access and display past data. The page has allowed researchers and students to spend more time on studying and reviewing data and less time on collecting and deciphering datasets. Users can quickly bring up a wide variety of data in various formats and as a result, can become more productive. This resource has become an important part of the PSC Meteorology Program.

6. REFERENCES

Koermer, J.P., 1998: The PSC Weather Center, Preprints, *14th International Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Amer. Meteor. Soc., Phoenix, 400-401.

Koermer, J.P., 2003: The PSC Weather Center web portal. Preprints, *19th International Conference on Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography, and Hydrology*, Amer. Meteor. Soc., Long Beach, 8 pp., submitted.