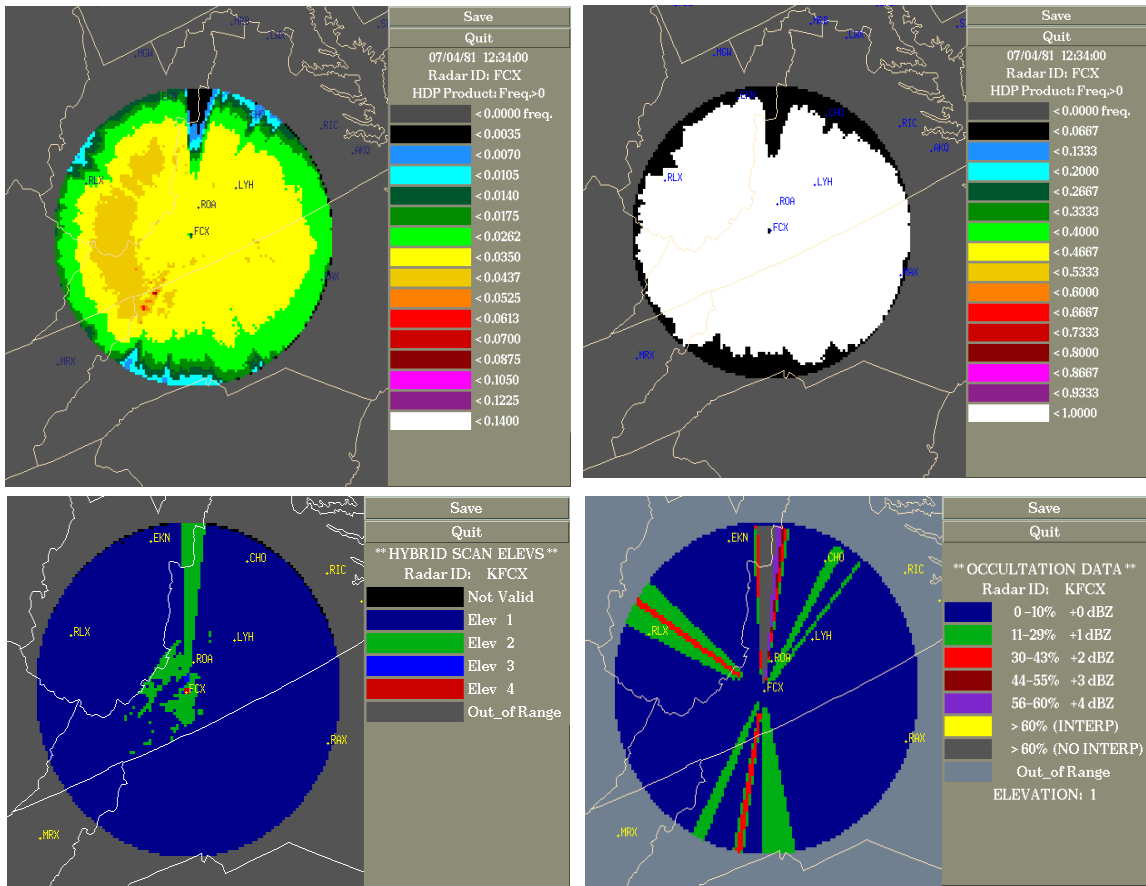# 3. Appendix

RADAR CLIMATOLOGY ANALYSIS AND DISPLAY

RADCLIM

Users Guide and Software Documentation
June 2001

INTRODUCTION

This software computes radar climatology and radar coverage maps to be used by the RFC-wide Multisensor Precipitation Estimateor (MPE). These programs and scripts collectively make up the Radar Climatology (RADCLIM) system and can be used to process, display and manage the data. A unix TAR file containing the software can be downloaded from the Hydrology Laboratory anonymous ftp site.

RADCLIM uses an archive of Hourly Digital Precipitation Array (DPA/HDP) data that can be downloaded from the Office of Hydrologic Development/Hydrology Lab home page. See <http://kingfisher.nws.noaa.gov/oh/hrl/hdsb/data/> The archive contains every DPA product from every radar for every hour for the period of record (1996-Present) excluding missing data. The data is arranged by RFC name and month.

The hybrid scan and occultation data play an important roll in defining the "true" radar coverage and should be displayed and compared with the radar climatologies. The hybrid scan and occultation data can be displayed in native radar polar coordinates, or remapped to HRAP for better comparison with the climatologies which are mapped to the HRAP grid. The hybrid scan and occultation display programs are also available on the Hydrology Laboratory anonymous ftp site

GETTING THE SOFTWARE FROM ANONYMOUS FTP SITE

(1) ftp   .ftp.nws.noaa.gov
(2) cd /oh/precip_proc
(3) binary
(4) get radclim.tar
(5) get hybridscan.tar

INSTALLING SOFTWARE AS A LOCAL APPLICATION

(1) Copy tar file to a directory that can hold a large amount of data and then untar it. In this document we will show how to install and setup the software in a directory called /users/hmet. You will likely choose something other than /users/hmet

(2) cd /users/hmet
(3) tar -xvf radclim.tar

       -This will set up the radclim directory tree under the /users/hmet subdirectory.
       -Some of the important radclim subdirectories include:

(4) Setup Apps_defaults using ctlfile

       Edit the /users/hmet/radclim/ctlfile so that root_dir is set properly.

For example: (root_dir   : /users/hmet/radclim)

(5) Edit all scripts in /users/hmet/radclim/scripts (setupRFC, process, showimage, sthresh, sumscript, pthresh, mergedata, and RunDecodedHDP) so that APPS_DEFAULTS_USER points to the ctlfile.

     For example:
     (APPS_DEFAULTS_USER=/users/hmet/radclim/scripts/ctlfile)

(6) Set up all of the subdirectories needed to hold the radar climatologies and intermediate files by running /users/hmet/radclim/scripts/**setupRFC**.

     This script will prompt you to enter the 5 letters name of your rfc. Enter the name in all caps (i.e. SERFC).

     The script will then create numerous subdirectories under /users/hmet/radclim/data/SERFC   including a directory for each month

     The directory structure is shown here:

```
/users/hmet/radclim
                ../data
                        ../XXRFC
                                ../WINTER
                                        ../freqs
                                        ../misbins
                                                ../saved
                                                ../straight
                                        ../picts
                                ../SUMMER
                                ../JAN
                                ../FEB
                        ../SiDATA
                        ../decoded_data
                        ../raw_data
                        ../backup
                        ../supplementary

                ../logs
                ../scripts
```

DOWNLOADING HDP/DPA FILES

 Download monthly tar files from HRL website containing HDPs/DPAs and place
in /users/hmet/radclim/data/Si_DATA_dir.

Each monthly tar file contains every HDP/DPA product collected from every radar from
every hour in the month for a given RFC. This is an extremely large file and can be
larger than 50 MB for a single month. If you have enough disk space to download the
entire period of record for your RFC go ahead and do it. If disk space is going to be a
problem, you can download and process several months at a time and then delete the tar
files before downloading additional files.

Before you can process the data you will need to setup the
/hmet/radclim/scripts/ctlfile for the RFC and climatology that you wish to create.

> For example: To compile and view the summer climatologies for SERFC the
> following tokens should be set in the ctlfile:
>
> compile_rfc   :   SERFC
> compile_month :   JAN
> view_rfc   :   SERFC
> view_month   :   JAN

PROCESSING MONTHY DPA/HDP TAR FILES

To process the monthly TAR files downloaded from HL web site run the **process** script
located in the scripts directory.   The process script will run other scripts and programs
which do the following:

> - Untars monthly tar file (i.e. Si0196SEraw.tar)
> - Decode HDP/DPAs
> - Count number of times each grid point is above threshold (0, 1 mm,
>   2.5 mm, 5 mm, etc)
> - Count total number of hours (total number of HDP products)
> - Compute Cumulative Sum of rainfall at each grid point.

To process the entire month of January 1996 for SERFC type:

> **process** 0196 SE

Note that after August 1997 the tar files use a 4 digit year. This means that the process
script must be run using a 4 digit year. Therefore to add the entire month of January 1998
to the SERFC winter climatology you would enter the following command:

> **process** 011998 SE

DISPLAYING RADAR CLIMATOLOGIES

After you have compiled all of the months which you wish to include in your climatology by running the process script for each month, you are ready to compute and display frequencies. The showimage script will divide the (number times a grid box exceeded a threshold) by the (total number of hours (HDP) products in the climatology) and display an image of the frequency of precipitation

(1) type **showimage**
(2) select radar site
(3) select type of climatology you want to view (total rain, frequency, etc.)
(4) select scaling factor (default is usually fine)*
(5) save (saves a gif image in the pict directory)

> * The climatology is displayed using a 16 data level scale. The scaling algorithm selects yellow for the category which is ½ of the maximum data value in the climatology. This color is approximately the midpoint in the data scale. Occasionally, an extremely high or low maximum value will cause the color scale to not show the climatology very well. In this case, you may need to experiment with selecting a new category for the midpoint of the data scale which is colored yellow.

CREATING RADAR COVERAGE MAPS

Once you have created an image of the climatology that you are satisfied with, you can apply a threshold to the climatology below which the radar data should not be trusted. An upper climatology may be selected to try to filter out grid points which are contaminated with ground clutter a significant portion of the time.

> From the scripts directory:

(1) type **sthresh**
(2) select radar site
(3) select type of climatology you want to view
(4) select scaling factor
(5) wait for image to display
(6) save image of climatology
(7) quit
(8) select lower threshold
> -grid boxes less than or equal to threshold will be excluded from radar coverage map
(9) select upper threshold if necessary
> -grid boxes greater than upper theshold will be excluded from radar coverage map
(10) save image of radar coverage map

-gif image file and binary misbin array file will be saved

MERGING MONTHLY CLIMATOLOGIES

If you have created individual climatologies for each month (i.e. JAN, FEB, etc), they can be merged into longer seasonal or annual climatologies. For example, a winter climatology could be created by merging DEC, JAN, FEB, and MARCH together. The merge program simply takes the monthly sums at each grid point and adds them together to create files for the seasonal climatology

      From the scripts directory

(1) type **mergedata**
(2) enter RFC name in all caps (i.e. NWRFC)
(3) enter the name of the merged climatatology that you wish to create (i.e. WINTER)
      -If you enter the name of a climatology that already exists, the program will overwrite everything in that climatology.
(4) Start adding months to your new climatology
      -enter the month that you would like to add
      -after program has finished adding a month to the climatology, it will ask you if you would like to add another month (Y/N)
      -If you answer (Y), the program will ask you to enter another month
      -Continue this procedure until you have added all the months that you would like to add to the new merged climatology

(5) After you have created the new climatology, you can display individual radar climatologies and create radar coverage maps using the showimage and sthresh scripts and setting the view_month token to the name of the new climatology (i.e view_month: WINTER).

INSTALLING HYBRID SCAN AND OCCULTATION DISPLAY PROGRAM

(1) Copy the hybridscan.tar file to the same root directory in which you installed RADCLIM (i.e. /users/hmet)

(2) tar -xvf hybridscan.tar

      This will create the folllowing directory structure

```
/users/hmet/
        ../bin
        ../scripts
        ../data
                ../hybrid
                        ../ascii_hys
                        ../gifs_hys
                        ../raw_hys
                ../occul
                        ../ascii_occ
                        ../gifs_occ
                        ../raw_occ
                ../pol2hrap
                        ../geo_data
                        ../p2h_hys_gifs
                        ../p2h_occ_gifs
```

DISPLAYING HYBRID SCAN IN POLAR COORDINATES

From the scripts directory type:

(1) **hybridscans**
(2) enter site ID when prompted (i.e. kfcx)
(3) click on save button to save GIF image

DISPLAYING HYBRID SCAN IN HRAP COORDINATES

From the scripts directory type:

(1) p2h_hys
(2) enter site ID when prompted (i.e. kfcx)
(3) click on save button to save GIF image

DISPLAYING OCCULTATION DATA IN POLAR COORDINATES

From the scripts directory type:

(1) occultations
(2) enter site ID and elevation angle when prompted (i.e. kfcx 1)
(3) click on save button to save GIF image

DISPLAYING OCCULTATION DATA IN HRAP COORDINATES

(1) p2h_occ
(2) enter site ID and elevation angle when prompted (i.e. kfcx 1)
(3) click on save button to save GIF image

DISPLAYING GEOGRAPHIC DATA

State boundaries, cities, and towns will be displayed on the radar climatologies, hybrid scan maps, and occultation maps when the geo_data files (XXRFC_state.bin, and XXRFC_town) are copied into the geo_data directory which is defined by the geo_dir token in the control file.   The lat/lon of the radar must also be listed in the file latlon.txt.

CONTROL FILE FOR RADCLIM

ds_system_levels : "radclim precip_proc util ofs my"

tokens used below

compile_rfc   : MARFC
compile_month   : TST
view_rfc   : CBRFC
view_month   : SUMMER
root_dir   : /fs/hmet/radclim
geo_dir   : /fs/hmet/hybridscan/data/pol2hrap/geo_data/

tokens for decoding and compiling files

data_dir   : $(root_dir)/data/

Si_DATA_dir   : $(data_dir)/SiDATA/
data_raw_dir   : $(data_dir)/raw_data/
data_decoded_dir   : $(data_dir)/decoded_data/

supplementary_dir : $(data_dir)/supplementary/
backup_dir   : $(data_dir)/backup/

compile_dir   : $(data_dir)/$(compile_rfc)/$(compile_month)/
compile_data_dir   : $(compile_dir)/freqs/
compile_misbin_dir : $(compile_dir)/misbins/
compile_pict_dir   : $(compile_dir)/picts/
script_dir   : $(root_dir)/scripts/
bin_dir   : $(root_dir)/bin/RELEASE/

view_dir   : $(data_dir)/$(view_rfc)/$(view_month)/
view_data_dir   : $(view_dir)/freqs/
view_picts_dir   : $(view_dir)/picts/
view_smisbins_dir : $(view_dir)/misbins/straight/
view_pmisbins_dir : $(view_dir)/misbins/polar/
saved_misbins_dir : $(view_dir)/misbins/saved/
view_merge_dir   : $(data_dir)/$(view_rfc)/MERGED/
read_geo   : $(geo_dir)/$(view_rfc)

CONTROL FILE FOR HYBRID SCAN AND OCCULTATION PROGAM

ds_system_levels : "radclim precip_proc util ofs my"

tokens used below
view_rfc   : OHRFC
root_dir   : /fs/hmet/hybridscan
geo_dir   : /fs/hmet/hybridscan/data/pol2hrap/geo_data

tokens for decoding and compiling files

data_dir   : $(root_dir)/data/
hybrid_dir   : $(data_dir)/hybrid/
occul_dir   : $(data_dir)/occul/
polar_dir   : $(data_dir)/pol2hrap/

raw_hys_dir   : $(hybrid_dir)/raw_hys/
raw_occ_dir   : $(occul_dir)/raw_occ/
ascii_hys_dir   : $(hybrid_dir)/ascii_hys/
ascii_occ_dir   : $(occul_dir)/ascii_occ/
gifs_hys_dir   : $(hybrid_dir)/gifs_hys/
gifs_occ_dir   : $(occul_dir)/gifs_occ/
p2h_hysgifs_dir   : $(polar_dir)/p2h_hys_gifs/
p2h_occgifs_dir   : $(polar_dir)/p2h_occ_gifs/

radll_dir   : $(root_dir1)/supplementary/
script_dir   : $(root_dir)/scripts/
bin_dir   : $(root_dir)/bin/
read_geo   : $(geo_dir)/$(view_rfc)