6 RAWINS

6.1 Purpose

Improve meteorological analyses (the *first-guess*) on the mesoscale grid by objective analysis of surface and upper-air observations. The analyses input to RAWINS as the first-guess are generally the low-resolution analyses output from program REGRID. RAWINS may also use an MM5 forecast (as processed through program INTERP) as the first-guess.

RAWINS capabilities include:

- Choice of Cressman-style or Multiquadric objective analysis.
- Various tests to screen the data for suspect observations.
- Procedures to input bogus data.
- Expanded Grid: If you used an expanded grid in TERRAIN and REGRID, RAWINS can incorporate data from outside your grid to improve analyses near the boundaries. RAWINS cuts down the expanded grid to the unexpanded dimensions on output.
- Additional levels: RAWINS can interpolate from mandatory pressure levels to additional levels you specify for an analysis with higher vertical resolution.

RAWINS output used to:

- Provide fields for Initial and Boundary conditions (through program INTERP).
- Provide 3-d fields for analysis-nudging FDDA (through program INTERP).
- Provide surface fields for surface-analysis-nudging FDDA.

6.2 Source of Observations

- NMC operational global surface and upper-air observations subsets as archived by the Data Support Section at NCAR.
  - Upper-air data: RAOBS (ADPUPA), in NMC ON29 format.
  - Surface data: NMC Surface ADP data, in NMC ON29 format.

- Real-time (or recent) surface and upper-air observations from Unidata, in NetCDF format.

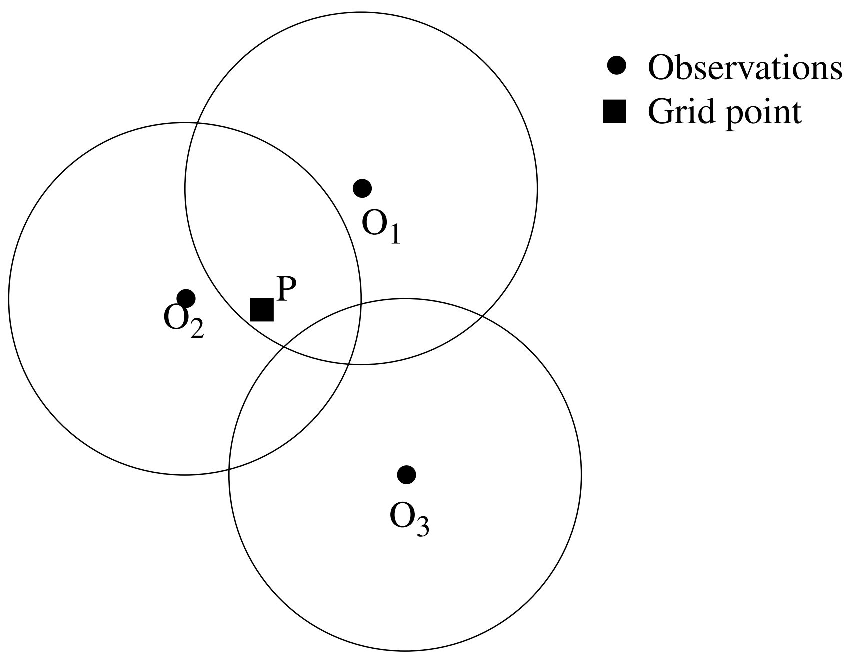
6.3 Objective Analysis in RAWINS

6.3.1 Cressman Scheme

The objective analysis performed in RAWINS is based on the Cressman scheme, in which several successive scans nudge a first-guess field toward the observations.

The standard Cressman scheme assigns to each observation a circular radius of influence R. The first-guess field at each gridpoint P is adjusted by taking into account all the observations which influence P.

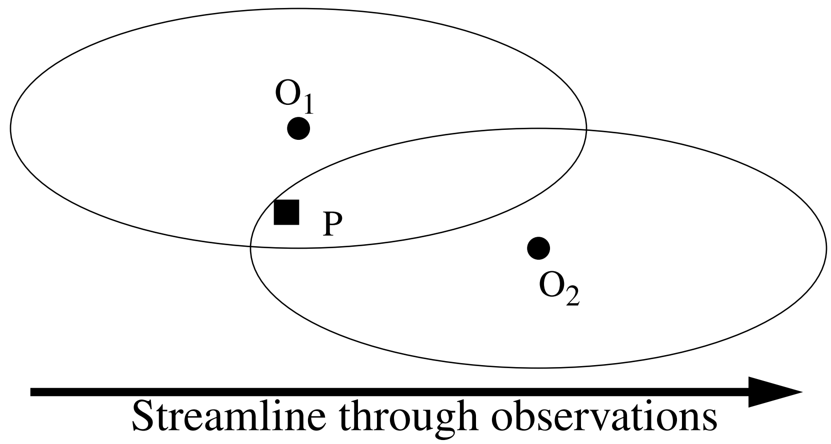
The differences between the first-guess field and the observations are calculated, and a distance-weighted average of these difference values is added to the value of the first-guess at P. Once all gridpoints have been adjusted, the adjusted field is used as the first guess for another adjustment cycle. Subsequent passes each use a smaller radius of influence.



In above figure, O_1 and O_2 influence P. O_3 does not.

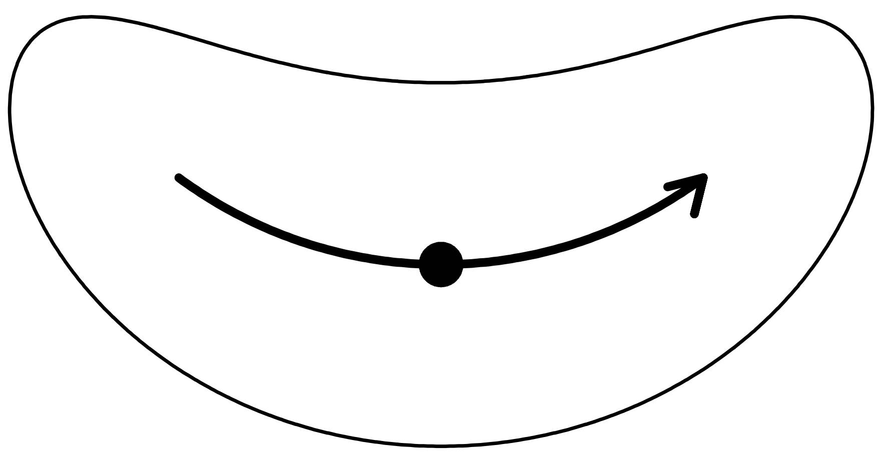
6.3.2 Ellipse Scheme

When RAWINS analyzes wind and relative humidity (fields strongly deformed by the wind) at pressure levels, the circles from the standard Cressman scheme are elongated into ellipses oriented along the flow. The stronger the wind, the greater the eccentricity of the ellipses. This scheme reduces to the circular Cressman scheme under low-wind conditions.



6.3.3 Banana Scheme

When RAWINS analyzes wind and relative humidity at pressure levels, the circles from the standard Cressman scheme are elongated in the direction of the flow and curved along the streamlines. The result is a banana shape. This scheme reduces to the Ellipse scheme under straight-flow conditions, and the standard Cressman scheme under low-wind conditions.



6.3.4 Multiquadric scheme

The Multiquadric scheme uses hyperboloid radial basis functions to perform the objective analysis. Details of the multiquadric technique may be found in Nuss and Titley, 1994: "Use of multiquadric interpolation for meteorological objective analysis." *Mon. Wea. Rev.*, **122**, 1611-1631. The Multiquadric scheme takes considerably more time and memory than the Cressman-based schemes, but many users have been quite impressed with the results. This scheme is a recent addition to RAWINS, and since it does not have as long a history in RAWINS as the Cressman-based schemes, it has not been as well tested. A more careful inspection of the analyses is therefore warranted if you select the Multiquadric scheme.

6.4 Quality Control for Observations

6.4.1 Vertical tests (Individual soundings)

- No user control over data removal.
- Remove spikes from temperature and wind profiles.
- Adjust temperature profiles to remove superadiabatic layers.
- Several other simple tests on individual soundings.
- No comparisons to other soundings or to the first-guess field.
- The vertical tests are the first quality-control checks performed.

6.4.2 The ERRMX test

- Limited user control over data removal. The user may set a threshold which varies the tolerance of the error check.
- Observations are compared to the first-guess field.
- If the difference value (obs - first-guess) exceeds a certain threshold, the observation is discarded.
- Threshold varies depending on the field, level, and time of day.
- Works well with a good first-guess field.
- The ERRMX test is performed after the Buddy test.

6.4.3 The Buddy test

- Limited user control over data removal. The user may set a weighting factor which varies the tolorance of the error check.
- Observations are compared to both the first guess and neighboring observations.
- If the difference value of an observation (obs - first-guess) differs from the distance-weighted average of the difference values of neighboring observations, the observation is discarded.
- Works well in regions with good data density.
- The Buddy test is performed before the ERRMX test.

6.4.4 Autobogus

- Maximum user control over data removal.
- Same as ERRMX test, except that discarded observations are saved to an ASCII file for user perusal.
- User decides which observations are discarded and which are to be used in a subsequent submittal of RAWINS.
- Requires two submittals of RAWINS.

6.5 Bogus Options

See examples in the appendices of the RAWINS/DATAGRID Tech Note.

KBOGUS: Change Existing Observations.
- Requires an additional input file, the KBOGUS file, called KBOG_REMOTE in your local working directory.

NBOGUS: Insert Station Reports.
- Requires an additional input file, the NBOGUS file, called NBOG_REMOTE in your local working directory.

NSELIM: Remove Station Reports.
- Uses NBOGUS file

AUTOGBOGUS: Subjective Examination of Suspect Data
- Gives the user maximum control over data removal.
- Two submittals of RAWINS are required.
- First submittal:
  - Screens the data (ERRMX check) and creates analyses.
  - Plots analyses with suspect observations overlaid (file AB.PLT).
  - Creates Autobogus file listing suspect observations (called AUBG_OUT in your local working directory).
- User Control:
  - Examine plots and the list of suspect observations.
  - Decide which of the suspect observations should be included in the final analyses.
  - Edit the Autobogus file AUBG_OUT (T,F,B).
- Second Submittal:
  - Reads the edited Autobogus file AUBG_OUT from your local working directory..
  - Creates a new analysis including all observations flagged T or B in the Autobogus file.

6.6 Script Variables

Submit 0 = Not an Autobogus submittal.
1 = First autobogus submittal.
2 = Second Autobogus submittal.

InObs ARCHIVE = use archived NMC observations.
UNIOBS = use more recent observations from unidata.

SFCsw Flag to indicate whether surface observations are to be accessed (**SFCsw** = SFC, recommended) or not (**SFCsw** = NoSFC).

BOGUSsw Flag to indicate the type of bogus data to be used:

NoBOG:	Not a bogus job.
Konly:	kbogus data available (no nbogus).
Nonly:	nbogus data available (no kbogus).
KandN:	nbogus and kbogus data available.

InDatg Pathname for the REGRID output used as input to RAWINS.

InRaobs Pathname for the RAOB data (see ~mesouser/catalog/catalog.raob file; for pre-1984 cases, see ~mesouser/catalog/catalog.raob.1973-1985).

InSfc6h Pathname for the 6-hrly surface data and ship data (see ~mesouser/catalog/catalog.sfc, LIST A).

InSfc3h Pathname for the 3-hrly surface data (see ~mesouser/catalog/catalog.sfc, LIST B).

upa_unidate 8 digit date (YYMMDDHH) for upper-air data from Unidata. If more than one time period of data is to be input, **upa_unidate** may have more than one date.

sfc_unidate 8 digit date for surface data from Unidata. Like **upa_unidate**, **sfc_unidate** may have more than one date.

6.7 Parameters

IMX, JMX Must be equal to the I and J dimensions of the domain being processed. Must include expansion if the expanded grid is processed.

LMX Must be greater than or equal to the maximum number of levels (mandatory plus new plus surface).

IRB Must be greater than the number of rawinsonde reports which will be processed.

IRS Must be greater than **IRB** + the number of surface stations which will be processed.

6.8 Namelist Variables

NNEWPL Number of new pressure levels to interpolate to.

GNLVL The pressures at the new levels (bottom to top, mb).

IWTSCM Type of weighting scheme for objective analysis:
1 = Cressman (circular).
2 = Ellipse.
3 = Banana (recommended).
4 = Multiquadric (worth a try, but use with caution).

IWIND 1= Use the surface wind as output from REGRID for first guess (except for TOGA data, the surface wind output from REGRID is surface geostrophic, rotated for frictional effects).

2 = Use the 1000 mb wind as output from REGRID as the first guess.

UNIOBS T/F: Use Unidata observations (do not touch).

RWSUBM Same as script variable SUBMIT (do not touch).

IUINTVL Time interval of raob data in hours (should be 12).

ISFCS3 T/F: Use 3-hrly surface data (recommended).

ISFCS6 T/F: Use 6-hrly surface and ship data (recommended).

F4D T/F: Create a surface FDDA file.

INTF4D Time interval (hours) for FDDA output (either 3 or 6).

LAGTEM T: Use a 3 hour lag-time for FDDA first guess.

F: Use a first guess interpolated from the 12-hour surface first guesses for FDDA first guess.

NSELIM T/F: Specific raobs (Nbogus option) are to be deleted (one flag for each time). Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

NBOGUS T/F: Nbogus data are included (One flag for each time) Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

KBOGUS T/F: Kbogus data are included (One flag for each time) Flags refer to 12-hour intervals for non-FDDA jobs; Flags refer to INTF4D intervals for FDDA jobs.

BUDWGT Weighting factor for the BUDDY test.

ERRMXW Maximum difference allowed (m/s) for the ERRMX check for winds.

ERRMXT Maximum difference allowed (K) for the ERRMX check for temperature.

ERRMXP Maximum difference allowed (mb) for the ERRMX check for pressure.

IPLOT T/F: Plot the raobs (One flag for each time period).

ISKEWT Plot the raobs as skew-T (ISKEWT=1) or Stuve (ISKEWT=2) diagrams.

ISPRINT T/F Print surface input observations.

IFPRNT T/F Print out samples of analyses and first-guess.

6.9 How to Run Rawins

Rawins program only works with NCAR archived ADP data. If you run the program on non-NCAR machine, you will need to access data from NCAR in order to use this program.

To obtain the data used for Rawins, you may either check the catalogs from any mesouser/catalog directory, or use the fetch.job from Templates/ directory inside terrain tar file.

If you run Rawins job on a non-Cray machine, use the following command to obtain data files from MSS:

msread -f BI local-file-name /DSS/Yxxxxx

where Yxxxxx (or Kxxxxx) is the name you find in the catalog files.

To run Rawins:

1) Obtain the source code tar file from one of the following places:

Anonymous ftp:
ftp://ftp.ucar.edu/mesouser/MM5V2/Rawins/rawins.tar.gz

On NCAR MSS:
/MESOUSER/MM5V2/RAWINS/NEW-RAWINS.TAR.gz

2) gunzip the file, untar it, and edit configure.make file to select appropriate RUNTIME_SYSTEM and compile options. Comment out the ones not appropriate to your machine.

3) Type ‘make rawins.deck’ to create a job deck for your platform.

4) Edit rawins.deck to select script option, set parameter statements, and select namelist options.

5) Type rawins.deck to compile and execute the program. It is usually a good practice to pipe the output to an output file so that if the program fails, you can take a look at the log file. To do so, type: rawins.deck >& rawins.log, for example.

The input file for Rawins is either from Datagrid (datagrid.out.1) or Regrid (datagrid_old_format), and observational files.

The output file for input to Interp is rawins_domain1.

6.10 Check Your Output

Always check the printout returned by RAWINS. You should check for at least the following:

- The “STOP 99999” print statement is the signal that RAWINS completed without crashing. This does not necessarily mean, however, that RAWINS did what you expected it to.

- Print statements soon after rawins.exe has begun executing echo many of the settings from your namelist, describe the files that are read, and describe what RAWINS expects to do.

- Number of stations found. Check to see if this number is reasonable for your area of interest.

- "DATA REMOVED BY ..." will list the data points which have been removed in the analysis procedure by the ERRMAX check and the BUDDY check.

6.11 RAWINS didn't Work! What Went Wrong?

Various problems may cause RAWINS to crash. Careful examination of the printout will often reveal the problem and the solution. Some common problems:

- Read past end-of-file: Check all the input filenames to make sure that the proper files were read. Double-check that the original files are the right ones.

- Double-check parameter settings. Remember the expanded dimensions if you used an expanded domain for TERRAIN and REGRID.

- "REPORT TYPE IRTYP = ### NOT KNOWN. STOPPING": The most likely problem is that observations input files have not been correctly specified. Check that the InRaobs script variable refers to an upper-air observation file, and that the InSfc6h and InSfc3h script variables refer to files from list A and B respectively from the catalog.sfc file.

6.12 What is Missing from RAWINS?

What RAWINS does not do:

- RAWINS does not do upper-air analyses at hours other than 00 or 12 Z. Even if you have access to observations at other hours (e.g., from a field experiment), RAWINS cannot currently use them to make an analysis.

- If you run RAWINS for more than one domain, RAWINS does not currently do anything to insure that fields are consistent between a coarse domain and a fine domain. This can cause problems if you use both domains as input to MM5. Therefore, we do not suggest running more than one domain through RAWINS for input to MM5.

- RAWINS can only make use of an expanded grid for the coarse domain. If you run RAWINS on a subdomain, an observation immediately outside the subdomain will have no effect on the analysis.

- There is no easy way to input observations from other sources. You can use the Nbogus option, but this gets cumbersome if you have many observations. Also, the bogus data are assumed to be of good quality, so limited quality control is done.

- RAWINS analyzes only on pressure levels.

6.13 RAWINS Files and Unit Numbers

RAWINS reads and writes to and from a number of different files. RAWINS acesses most files by referring to the fortran unit numbers Unit numbers are assigned as follows:

Table 6.1 Shell names, fortran unit numbers and their description for RAWINS.

Shell name	Unit number	Description
datagrid_old_format	fort.4	First-Guess fields output from REGRID (input)
rawins.namelist	fort.14	namelist for user options (input)
raobsA, B, etc.	fort.15, 16, etc.	Input upper-air observations
sfc3hrA, B, etc.	fort.20, 21, etc.	Input 3-hourly surface observations
sfc6hrA, B, etc.	fort.25, 26, etc.	Input 6-hourly surface observations
shpvolA, B, etc	fort.30, 31, etc.	Input ship and bouy observations
autobog	fort.10	Input autobogus list as edited by user
kbogus	fort.12	Input kbogus list
nbogus	fort.13	Input nbogus list
rawins_domain1	fort.2	Main output file: Analyzed fields
rawobs_domain1	fort.11	Upper-air observations as read by RAWINS (output)
upr4dobs_domain1	fort.61	Upper-air observations processed by RAWINS (output)
raw4dsfc_domain1	fort.39	Output surface analyses for FDDA
rawab_domain1	fort.40	Output autobogus list of suspect stations
sfc4dobs_domain1	fort.60	Surface observations processed by RAWINS (output)

6.14 RAWINS tar File

The rawins.tar file contains the following files and directories:

CHANGES	Description of changes to the Rawins program (not yet present).
Diff/	Contain difference files between consecutive releases (not yet present).
Makefile	Makefile to create Rawins executable.
README	General information about the Rawins directory.
Templates/	Job deck directory
con.tbl	Table used in plotting autobogus plots.
configure.make	Compile optoins for various computer platforms.

configure.make.CRAY	Complie options for Cray
map.tbl	Table used in plotting autobogus plots.
src/	Rawins source code.

6.15 NBOGUS example

In the following example, the following namelist options are assumed:

RAWINS Settings:

F4D	=	T
INTF4D	=	6
NBOGUS	=	T, F, T, T, F

Sample NBOGUS file:

```
                       94012600  00001   1   4    40.2 -103.2
        1000.0    99999.0    99999.0    99999.0    99999.0    99999.0
         850.0     1441.2        6.0       -3.3      100.1       14.2
         700.0     3011.3       -2.5      -12.7      184.6       13.8
         500.0     5599.8      -19.8      -35.9      192.6        9.3
                       94012600  00001  -1   2    40.2 -103.2
         852.0     1422.0        5.3       -3.3       99.2        5.8
         795.0     1988.6        5.0       -5.9      143.8       15.5
                       94012600  00002   1   5    41.2 -103.7
        1000.0    99999.0    99999.0    99999.0    99999.0    99999.0
         850.0    99999.0    99999.0    99999.0    99999.0    99999.0
         700.0     3020.7       -2.8      -13.9    99999.0    99999.0
         500.0     5602.4      -20.8      -37.9    99999.0    99999.0
         400.0     7204.8      -34.7      -41.5    99999.0    99999.0
                       94012600  00002  -1   3    41.2 -103.7
         844.5     1501.0        6.2       -4.9    99999.0    99999.0
         780.0     2152.1        4.0       -7.1    99999.0    99999.0
         685.0     3192.0       -3.5      -20.1    99999.0    99999.0
                            999
                            888
                       94012612  00001   1   4    40.2 -103.2
        1000.0    99999.0    99999.0    99999.0    99999.0    99999.0
         850.0    99999.0    99999.0    99999.0    99999.0    99999.0
         700.0     2909.9       -8.8      -10.0      111.3       14.9
         500.0     5467.3      -21.5      -25.9       74.0       24.3
                       94012612  00001  -1   1    40.2 -103.2
       99999.0    99999.0    99999.0    99999.0    99999.0    99999.0
                            999
                            888
                       94012618  00002            41.2 -103.7
         841.4                  -7.3       -8.2       68.7        4.2
                       94012618  00003            41.6 -104.8
         812.4                  -5.9       -6.6       26.1        2.6
                            888
```

NBOGUS Notes:

- See Appendix D of the DATAGRID/RAWINS document for further details.
- The NBOGUS file is a read with formatted read statements. Any misplaced numbers are likely to cause RAWINS to fail, or worse, to misinterpret the NBOGUS file without failing. It is thus extremely important to carefully examine the RAWINS output for an NBOGUS submittal.
- Mandatory and significant-level data from a given upper-air report are separated.
- Mandatory levels below ground are filled with 99999.0
- For an upper-air report with mandatory-level data only, insert one significant level with all fields filled with 99999.0
- Namelist variable NBOGUS refers to ITIMINT hourly intervals if F4D option is not used. NGOGUS refers to INTF4D hourly intervals if F4D option is used.
- For times when NBOGUS is false, no information is included in the NBOGUS file (not even the 888 and 999 lines discussed in the following two items).
- 999 in the date column denotes the end of upper-air data for a particular time.
- 888 in the date column denotes the end of surface data for a particular time.
- If no surface data are available, a line with 888 in the date column immediately follows the line with 999 in the date column.
- For times when upper-air data would normally be expected, but there are only surface bogus reports, inlude a line with 999 in the date column before starting with the surface reports.
- For times when no upper-air data are expected, start with the surface data (without inserting a line with 999 in the date column).

6.16 rawins.csh

```
#
#       type of rawins job
#
   set Submit  = 0           # 0 = no autobogus; 1 = autobogus 1; 2 = autobogus 2
#
   set INOBS   = ARCHIVE
#  set INOBS   = UNIOBS
#
#  set SFCsw   = NoSFC
   set SFCsw   = SFC
#
   set BOGUSsw = NoBOG
#  set BOGUSsw = Konly
#  set BOGUSsw = Nonly
#  set BOGUSsw = KandN
#
#       locations for datasets
#
   set InDatg  =  DATAGRID_DOMAIN1
#
#
#       Find MSS names for observations from the following catalogs:
#            upper air: /fs/othrorgs/home0/mesouser/catalog/catalog.raob
#              surface: /fs/othrorgs/home0/mesouser/catalog/catalog.sfc
#
if ( $INOBS == ARCHIVE ) then
   set IfUni = F
   set InRaobs   =  ( RAOBS_B RAOBS_C )
   if ( $SFCsw  == SFC ) then
      set InSfc6h   =  ( SFC6HR_A SFC6HR_B )   # see catalog.sfc, list A
      set InSfc3h   =  ( SFC3HR_A SFC3HR_B )   # see catalog.sfc, list B
   endif
else
   set IfUni = T
   set upa_unidate = ( xxxxxxxx )        # YYMMDDHH
   set sfc_unidate = ( xxxxxxxx )        # YYMMDDHH
endif
#
#    ------ RAWINS PARAMETER STATEMENT ---------------------------
#
if ( -e src/paramdim.incl ) rm src/paramdim.incl
cat > src/paramdim.incl << EOF
C
C  IMX,JMX, MUST CORRESPOND TO THE DIMENSIONS IN THE INPUT FILE.  THESE
C  WILL BE THE EXPANDED DIMENSIONS IF THIS IS THE COARSE GRID, AND THE
C  EXPANDED OPTION WAS SELECTED.
C
C  LMX MUST BE GREATER THAN OR EQUAL TO THE MAXIMUM NUMBER OF LEVELS
C  (PRESSURE LEVELS + SURFACE).
C
      PARAMETER(IMX=45,JMX=51,LMX=22)
C-----------------------------------------------------------------
EOF
#
#       parameters for rawins, user adjustable for core constraints
#
if (-e src/paramirb.incl ) rm src/paramirb.incl
cat > src/paramirb.incl << EOF
C-------------------------------------------------------------------
```

```
C    IRB MUST BE AT LEAST THE MAXIMUM NUMBER OF RAOB STATIONS
C
      PARAMETER(IRB=500)
EOF
if (-e src/paramirs.incl ) rm src/paramirs.incl
cat > src/paramirs.incl << EOF
C-----------------------------------------------------------------------
C    IRS MUST BE AT LEAST THE MAXIMUM NUMBER OF SFC. + RAOB STATIONS
C
      PARAMETER(IRS=3000)
EOF
#
#     ------ RAWINS LOCAL NAMELIST ----------------------------------
#          (you need not change anything of the form: ${____})
#          (Comments in the namelist are removed during execution)
#
if ( -e rawins.namelist ) rm rawins.namelist
cat << End_Of_Namelist | sed -e 's/#.*//; s/  *$//' > ./rawins.namelist
 &LOCMIF #---------LOCAL NAMELIST FOR PROGRAM RAWINS--------------------
 NNEWPL = 11, #  NUMBER OF NEW PRESSURE LEVELS
 GNLVL = 975.,950.,925.,900.,800.,750.,650.,600.,550.,450.,350.,
 #                    PRESSURES AT THE NEW PRESSURE LEVELS (BOTTOM TO TOP)
 #
 #----------OBJECTIVE ANALYSES OPTIONS FOLLOW--------------------------
 IWTSCM = 3,     # 1:  CIRCULAR WEIGHTING FUNCTION (CRESSMAN)
 #               # 2:  ELLIPTICAL WEIGHTING FUNCTION
 #               # 3:  BANANA-SHAPED WEIGHTING FUNCTION
 #               # 4:  MULTIQUADRIC INTERPOLATION
 IFAC = 1,       # 1:  FIRST-GUESS FIELD EXISTS, RAWINS ALTERS IT.
 #               # 2:  FIRST-GUESS FIELD DOES NOT EXIST, RAWINS CREATES IT.
 IWIND=2,        # 1:  USE SURFACE GEOSTROPHIC WIND FOR SFC WIND 1ST GUESS
 #                     IF USING NMC/OLD ECMWF 1ST GUESS;
 #                     USE ACTUAL SURFACE WIND IF USING ECTOGA 1ST GUESS
 #               # 2:  USE 1000 MB WIND FOR SURFACE WIND FIRST GUESS
 #
 #----------DATA INPUT OPTIONS ------------------------------------------
 UNIOBS=.${IfUni}.,        # TRUE FOR UNIDATA OBS, FALSE FOR ARCHIVED OBS
 #          RWSUBM=0...ONLY ONE SUBMITTAL INTENDED FOR RAWINS
 #          RWSUBM=1...FIRST RAWINS SUBMITTAL--TWO ARE INTENDED
 #          RWSUBM=2...SECOND RAWINS SUBMITTAL
 RWSUBM=${Submit}, #..SET TO 0,1, OR 2
 IUINTVL=12,        # TIME INTERVAL (HOURS) FOR RAOB DATA (USUALLY 12).
 ISFCS3 = T,        # ACQUIRE AND ANALYZE SHIPS AND BUOYS
 ISFCS6 = T,        # ACQUIRE AND ANALYZE SFC LAND DATA
 F4D = F,           # CREATE FDDA VOLUME AT NON-STANDARD TIMES.
 INTF4D = 3,        # TIME INTERVAL FOR FDDA FILE.  IF INTF4D > 3, LAGTEM IS SET
 #                  # TO FALSE AUTOMATICALLY IN THE PROGRAM (i.e. USE TEMPORAL
 #                  # INTERPOLATION FOR NON-STANDARD TIME FIRST GUESS.)
 LAGTEM = T,        # TRUE--3 HOUR LAG TIME FOR NON-STD TIME 1ST GUESS
 #                    FALSE--TEMPORAL INTERPOLATION FOR NON-STD TIME 1ST GUESS
 NSELIM=F,F,F,F,F,F,F,F,F,F,F,          # DELETE RAOBS-T,F
 NBOGUS=F,F,F,F,F,F,F,F,F,F,F,          # BOGUS STAT-T,F
 KBOGUS=F,F,F,F,F,F,F,F,F,F,F,          # BOGUS PTS-T,F
 #
 #---------------- DATA QUALITY CONTROL OPTIONS -----------------------
 #       BUDWGT IS A PARAMETER THAT VARIES THE TOLERANCE OF TH BUDDY
 #       CHECK. A VALUE OF 1.0 GIVES AN ESTIMATE OF NORMAL TOLERANCE.
 #       A VALUE > 1.0 INCREASES THE TOLERANCE WHILE A VALUE < 1.0
 #       DECREASES THE TOLERANCE. A 2.0 WOULD REMOVE ONLY HIGHLY
 #       SUSPECT DATA WHILE 0.5 WOULD REMOVE SOME GOOD DATA ALONG
```

```
 #       WITH ALL SUSPECT DATA. A VALUE OF 0. OMITS THE BUDDY CHECK.
 #       IF USING AUTOBOGUS (SUBMIT = 1 OR 2), SET BUDWGT TO ZERO.
 BUDWGT=0.85,          #    1.25,
 #
 #       ERRMX PARAMETERS MAX DIFF ALLOWED BETWEEN FIRST GUESS AND STATION DATA
 #       IF USING BUDDY CHECK (BUDWGT>0.1), ONLY ONE SUBMITTAL IS EXPECTED.  SET
 #       LARGER DEFAULT VALUES FOR ERRMX (SUGGESTED VALUES ARE ERRMXT=15,
 #       ERRMXW=14, AND ERRMXP=8.
 ERRMXT=6.,        # MAX TEMP DIFF ALLOWED (1ST GUESS MINUS OB)
 #                  # 0Z DATA OVER LOW TERRAIN (<500m) FACTORED BY 1.25
 #                  # 0Z DATA OVER HIHG TERRAIN (>=500m) FACTORED BY 1.75
 #                  # 12Z DATA FACTORED BY 1.5
 #                  # ALL DATA OVER WATER FACTORED BY 0.75
 ERRMXW=7.,        # MAX WIND DIFF ALLOWED (1ST GUESS MINUS OB)
 #                  # DATA LEVEL .LE. 1000.1 IS FACTORED BY 1.25
 #                  # DATA LEVEL ABOVE 500 MB IS FACTORED BY 1.5
 ERRMXP=3.,         # MAX PRES DIFF ALLOWED (1ST GUESS MINUS OB)
 #                  # NO LEVEL OR TERRAIN FACTORING
 #
 #---------- SET PLOT OPTIONS -----------------------------------------
 #
 IPLOT=F,F,F,F,F,F,F,F,F,F,F,     # PLOT VERTICAL RAOBS (As directed
 #                                # by ISKEWT).
 #
 ISKEWT=1,                        # Active only if IPLOT = T
 #                                # 1: Skew-T plots.  2: Stuve Diagrams.
 #
 ABFLAG=T,T,T,T,T,T,T,T,T,T,T,    # CONTOUR GRID FIELDS
 ABOVER=T,T,T,T,T,T,T,T,T,T,T,    # OVERLAY OBSERVATIONS
 #
 #---------- PRINT OPTIONS --------------------------------------------
 ISPRNT=F,        # PRINT SFC INPUT OBS
 IFPRNT=T,        # PRINT HORIZONTAL FIELDS (FIRST-GUESS AND ANALYSIS)
 & #------------------------------------------------------------------
End_Of_Namelist
#
########################################################################
####################                             ######################
####################    END USER MODIFICATION    ######################
####################                             ######################
########################################################################
#
if ( $INOBS == UNIOBS ) then
if ( -e unidata.namelist ) rm unidata.namelist
cat << End_Of_Unamelist | sed -e 's/#.*//; s/  *$//' > ./unidata.namelistcat
 &UNILIF #--------NAMELIST INPUT SPECIFICALLY FOR UNIDATA---------------
 UNIUANM = ${#upa_unidate}    # NUMBER OF UPPER-AIR UNIDATA FILES
 UNISFNM = ${#sfc_unidate}    # NUMBER OF SURFACE UNIDATA FILES
 & #------------------------------------------------------------------
End_Of_Unamelist
cat unidata.namelist >> rawins.namelist
endif
#
#    The make rules are contained in the file configure.make
#
# --------- create datagrid executable -------------------
#
set echo
if ( ! -e src/paramdim.tmp) then
   cp src/paramdim.incl src/paramdim.tmp
```

```
else
   /usr/bin/diff src/paramdim.incl src/paramdim.tmp
   if ($status == 0) then
      rm src/paramdim.incl
      cp src/paramdim.tmp src/paramdim.incl
      touch -r src/paramdim.tmp src/paramdim.incl
   endif
endif
if ( ! -e src/paramirb.tmp) then
   cp src/paramirb.incl src/paramirb.tmp
else
   /usr/bin/diff src/paramirb.incl src/paramirb.tmp
   if ($status == 0) then
      rm src/paramirb.incl
      cp src/paramirb.tmp src/paramirb.incl
      touch -r src/paramirb.tmp src/paramirb.incl
   endif
endif
if ( ! -e src/paramirs.tmp) then
   cp src/paramirs.incl src/paramirs.tmp
else
   /usr/bin/diff src/paramirs.incl src/paramirs.tmp
   if ($status == 0) then
      rm src/paramirs.incl
      cp src/paramirs.tmp src/paramirs.incl
      touch -r src/paramirs.tmp src/paramirs.incl
   endif
endif
unset echo
#
#
#
set LETTERS = (A B C D E F G H I J K L M N O P Q R S T U V W X Y Z)
#
if ( ! -e configure.make ) cp configure.make.f77 configure.make
#
   make
   set toast = $status
   if ( $toast != 0 ) then
   echo "error in the compile, stopping"
   exit(1)
   endif
#
if ( ! -e rawins.exe ) ln -s src/rawins.exe rawins.exe
#
# --------- get input files ----------------------------
#
if ( ! -e datagrid ) then
#    echo "  msread datagrid $InDatg"
#    msread datagrid $InDatg
     ln -s $InDatg datagrid
endif
#
#        get RAOB data sets from MS
#
   if ( ! $?InRaobs ) then
      echo "acquiring no RAOB sounding files"
      exit (1)
   else if ( ${#InRaobs} >= 1 ) then
      echo "attempting to acquire ${#InRaobs} RAOB sounding file(s)"
```

```
   endif
set NUMFIL = 1
while ( $NUMFIL <= ${#InRaobs} )
   set Local  = raobs$LETTERS[${NUMFIL}]
   set Remote = $InRaobs[${NUMFIL}]
#       echo "  msread $Local $Remote "
#       msread $Local $Remote
                          ln -s $Remote $Local
   @ NUMFIL ++
end
#
#        get 6-hourly data sets from MS
#
if ( ! $?InSfc6h ) then
   echo "acquiring no 6-hourly surface analysis input files"
   set InSfc6h
else if (( $SFCsw == SFC ) && ( ${#InSfc6h} >= 1 )) then
   echo "attempting to acquire ${#InSfc6h} 6-hourly surface analysis input file(s)"
endif
set NUMFIL = 1
while ( $NUMFIL <= ${#InSfc6h} )
   set Local  = sfc6hr$LETTERS[${NUMFIL}]
   set Remote = $InSfc6h[${NUMFIL}]
#       echo "  msread $Local $Remote "
#       msread $Local $Remote
                          ln -s $Remote $Local
   @ NUMFIL ++
end
#
#        get 3-hourly data sets from MS
#
if ( ! $?InSfc3h ) then
   echo "acquiring no 3-hourly surface analysis input files"
   set InSfc3h
else if (( $SFCsw == SFC ) && ( ${#InSfc3h} >= 1 )) then
   echo "attempting to acquire ${#InSfc3h} 3-hourly surface analysis input file(s)"
endif
set NUMFIL = 1
while ( $NUMFIL <= ${#InSfc3h} )
   set Local  = sfc3hr$LETTERS[${NUMFIL}]
   set Remote = $InSfc3h[${NUMFIL}]
#        echo "  msread $Local $Remote"
#        msread $Local $Remote
                          ln -s $Remote $Local
   @ NUMFIL ++
end
#
#        set up fortran input files for RAWINS
#
if ( -e assign.rawins ) rm assign.rawins
setenv FILENV assign.rawins
   ln -s datagrid              fort.4
   ln -s autobog               fort.10
   ln -s kbogus                fort.12
   ln -s nbogus                fort.13
   ln -s rawins.namelist       fort.14
set NUMFIL = 1
if ( $INOBS != UNIOBS ) then
   while ( $NUMFIL <= 5 )
      @ UNIT = 14 + $NUMFIL
```

```
      ln -s raobs$LETTERS[${NUMFIL}] fort.$UNIT
      @ UNIT = 19 + $NUMFIL
      ln -s sfc3hr$LETTERS[${NUMFIL}] fort.$UNIT
      @ UNIT = 24 + $NUMFIL
      ln -s sfc6hr$LETTERS[${NUMFIL}] fort.$UNIT
      if ( -e sfc3hr$LETTERS[${NUMFIL}] ) cp sfc3hr$LETTERS[${NUMFIL}]
shpvol$LETTERS[${NUMFIL}]
      @ UNIT = 29 + $NUMFIL
      ln -s shpvol$LETTERS[${NUMFIL}] fort.$UNIT
      @ NUMFIL ++
   end
endif
#
#       set up fortran output files for RAWINS
#
ln -s rawanl.out            fort.2
ln -s rawobs.out            fort.11
ln -s raw4dsfc.out          fort.39
ln -s rawab.out             fort.40
ln -s sfc4dobs.out          fort.60
ln -s upr4dobs.out          fort.61
#
# -------- run RAWINS
#
date
#
   rawins.exe >! rawins.print.out
   date
#
```