Complete list of programs and supplementary codes for mkcoapsimma process:

    BarretProgs.f
    GetsFromRead_netDoesAvm12.f90
    Makefile
    mkcoapsimma.f
    Module11.f90
    netcdf_inc.f
    NETCDF_INC.mod
    purge
    Read_netcdfm12.f90
    TimeProgs.f
    wrtimma_v003.f

All other programs necessary to this process are created upon running the Makefile with the command at the unix prompt "make". Please note that this entire process requires the use of locally present NetCDF libraries. COAPS local paths are noted in the Makefile and would need to be altered manually for this process to work.

Disclaimer:
This readme refers to mkcoapsimma and all processes involved therein. This code is open source and, as such, it is not operationally supported. Any questions may be forwarded to samos@coaps.fsu.edu.

Executing code:
mkcoapsimma is the executable of mkcoapsimma.f. It has three required input arguments and an optional fourth option:

1. The directory where mkcoapsimma and the rest of the auxiliary programs reside on the local system.
        e.g. ../makeimma/

2. The directory that contains the list files to be run
        e.g. ../datafiles/KCEJ/

3. This input has two options:
        (a) The listfile that contains all of the files of one minute data from which the hourly averages are created for each cruise.
        e.g. KCEJP__19C-00.list

        (b) When executed, the command 'all' will search the directory for all files named '*.list' and proceed to run mkcoapsimma all list files.

4. '-l' if the user would like to retain all intermediate files created through the process (for debugging purposes). As this is an optional input, it does not need to be entered for general use of the program; simply enter the required three arguments.

(NOTE: Below directory structure examples are from generic local directories)

Sample command line:
../makeimma/mkcoapsimma ../makeimma/ ../datafiles/KCEJ/ KCEJ__19C-00.list
Runs all data files in KCEJ__19C-00.list.

Sample command line:
../makeimma/mkcoapsimma ../makeimma/ ../datafiles/KCEJ/ all
Runs all data files in all list files within the /KCEJ/ directory.

Sample command line:
../makeimma/mkcoapsimma ../makeimma/ ../datafiles/KCEJ/ KCEJ__19C-00.list -l
Runs all data files in KCEJ__19C-00.list, retaining all intermediate files.

> NOTE: The contents of the *.list files provided to ICOADS for archival contain paths to local COAPS directories and files. These must be modified in order to run mkcoapsimma in a non-COAPS environment.

Compiling code:
To create the mkcoapsimma executable and all the other auxiliary executables, run the command "make" in the directory in which the FORTRAN programs reside. Running "make" once will create all the necessary programs.

After execution of mkcoapsimma, run "purge" to clean the working directory of all executable files, if desired. The executables are easily re-created by running "make".

Code steps:
mkcoapsimma calls 3 successive programs; Reads12.exec, GetsFrom12.exec, and wrtimma_v003. The first two programs were originally written by James Lamm at COAPS. Barrett Olafson at COAPS modified the first two programs and was the sole author of wrtimma_v003 and the mkcoapsimma wrapper. A schematic of the process is shown in Figure 1.

Reads12.exec is compiled from Read_netcdfm12.f90, TimeProgs.f, and Module11.f90. The purpose of this program is to extract the data values that comprise the super-obs for each 11 minute period at the top of each hour during a cruise. The superobs are created starting at 50 minutes past the hour and continuing to the top of the hour (the 00 minute). The data extracted include the values themselves (and their quality flags), the heights of the sensors, and the conversion units. This program searches each file looking for any parameter on a hard-coded list of variables and attributes that is specific to the original WOCE data files. If one of these hard-coded variables or parameters is not found, a netCDF error message prints to standard out. These error messages are benign and will not affect the resulting output of the mkcoapsimma procedure. These are output into three separate files, (w/example names): KCEJ__19C-00.list.DataFor.int, KCEJ__19C-00.list.HeightsFor.int, and KCEJ__19C-00.list.ConvUsFor.int, respectively; these are all used by GetsFrom12.exec. The *.int suffix signifies that the file will

be scrubbed upon completion of the processing (if the –l argument has not been passed to mkcoapsimma).

GetsFrom12.exec is compiled from GetsFromRead_netDoesAvm12.f90, BarretProgs.f, and Module11.f90. This program will take the 11 minute observations and create one super ob for each hour. The program also makes some logic decisions based on the "goodness" of the flags attributed to each value. If the value has a bad flag, it is excluded from the averaging calculation. All periods must have at least 5 good values to create a super ob, except for latitude and longitude, which need only one observation. The standard deviation of each period is also calculated. A time stamp of the hourly super-ob period is output first. These values are all output in the following order:

CC   - Two character variable for type of value (e.g. LA = latitude).
- Number of records for the variable. This option allows for up to 3 values for a single variable type (e.g. LA, LA2, LA3).
####### - 5 to 7 digit value of the 11-minute averaged data value.
- 4 digit value of the standard deviation for the 11 minute period.
- Two digit value of the number of values from the 11 minute period used in the average.
- Two digit value of the conversion unit from COAPS netCDF files. Only values with a one-to-one map to an ICOADS indicator value are inserted into the core IMMA record.
- Three digit value of the height/depth for the variable's sensor.
- Two digit value of the number of G-flagged values used in the average.

Once each record is written, the program places a sentinel value into the file, to signify what wrtimma_v003 should do as it reads in the values. sentinel values:

-1   - A new variable for the same time period.
-9898   - A new entry (i.e. new time w/new LA, LO, etc.).
-9777   - End of cruise (i.e. end of file).

The output file, e.g. KCEJ__19C-00.IMMA.int, also gets scrubbed (if the -l argument has not been passed to mkcoapsimma).

If any errors occur in the first two steps of the program, the errors are written out to a *.err file; e.g. KCEJ__19C-00.IMMA.err. If there are no errors in there two steps, the error file is deleted.

wrtimma_v003 is compiled from wrtimma_v003.f. This program is a modified version of rdimma0:01G originally written by the ICOADS group and altered by Shawn Smith. wrtimma_v003.f is thoroughly commented, as such this mention will be brief. wrtimma_v003 takes the file, e.g. KCEJ__19C-00.IMMA.int, and actually writes the data into the ICOADS IMMA format, filing the portions of the core and supplementary blocks, including the C6. If there are multiple values for a single variable, the program decides which is the best value via the decision making process outlined in "Procedure for placing hourly super-observations from FSU

Data Assembly Center's (DAC) Research Vessel data files into ICOADS" by Shawn Smith, et al. The final outputs of the entire process are created at this step; the *.sum and *.out files.

The two output files; *.sum and *.out will be placed in the directory from which the program is run (this should be the directory that contains the list files, e.g., ../datafiles/KCEJ/) The *.sum file is a statistical summary file detailing the creation of COAPS IMMA records. The *.sum files are created by code in the original rdimma0:01G code. The *.out file contains the actual IMMA records created from COAPS data. Both of these files will contain the name of the original file w/o *.list as an ending. The naming structure is: (filename).IMMA.(sum or out).

  e.g. KCEJ__19C-00.IMMA.sum and
    KCEJ__19C-00.IMMA.out

After the entire process has completed, either for a single list file or for all files in a directory, mkcoapsimma scrubs all *.int files (if the -l argument has not been passed to mkcoapsimma). The only files that will remain are the original list files, *.sum and *.out files, as well as any *.err files that may have been created during the process. If the -l option has been entered all *.int files created throughout the running of mkcoapsimma will remain for debugging purposes.

Procedure for placing hourly super-obs from FSU DAC's Research Vessel data files into ICOADS

CruiseFile.list

mkcoapsimma program

Reads12.exec program

CruiseFile.IMMA.err

Error file created if any errors or warnings occur during this step

CruiseFile.list.HeightsFor.int

Height (or depth), if they exist, for all instruments

CruiseFile.list.DataFor.int

All values for all valid instruments within 11 minute super-ob period

CruiseFile.list.ConvUsFor.int

Conversion units (or type), if they exist, for all instruments

GetsFrom12.exec program

CruiseFile.IMMA.err

Error file created if any errors or warnings occur during this step

CruiseFile.IMMA.int

ASCII formatted intermediate file with computed 11-minute super-ob values, standard deviation of the period, number of values in the period, conver sion units, heights of instruments, and the number of g-flagged values used in calculation of the super-ob

wrtimma_v003 program

Note: Upon completion, mkcoapsimma scrubs all *.int files

CruiseFile.IMMA.out

Complete IMMA-formatted record of FSU DAC super-obs for each cruise

CruiseFile.IMMA.sum

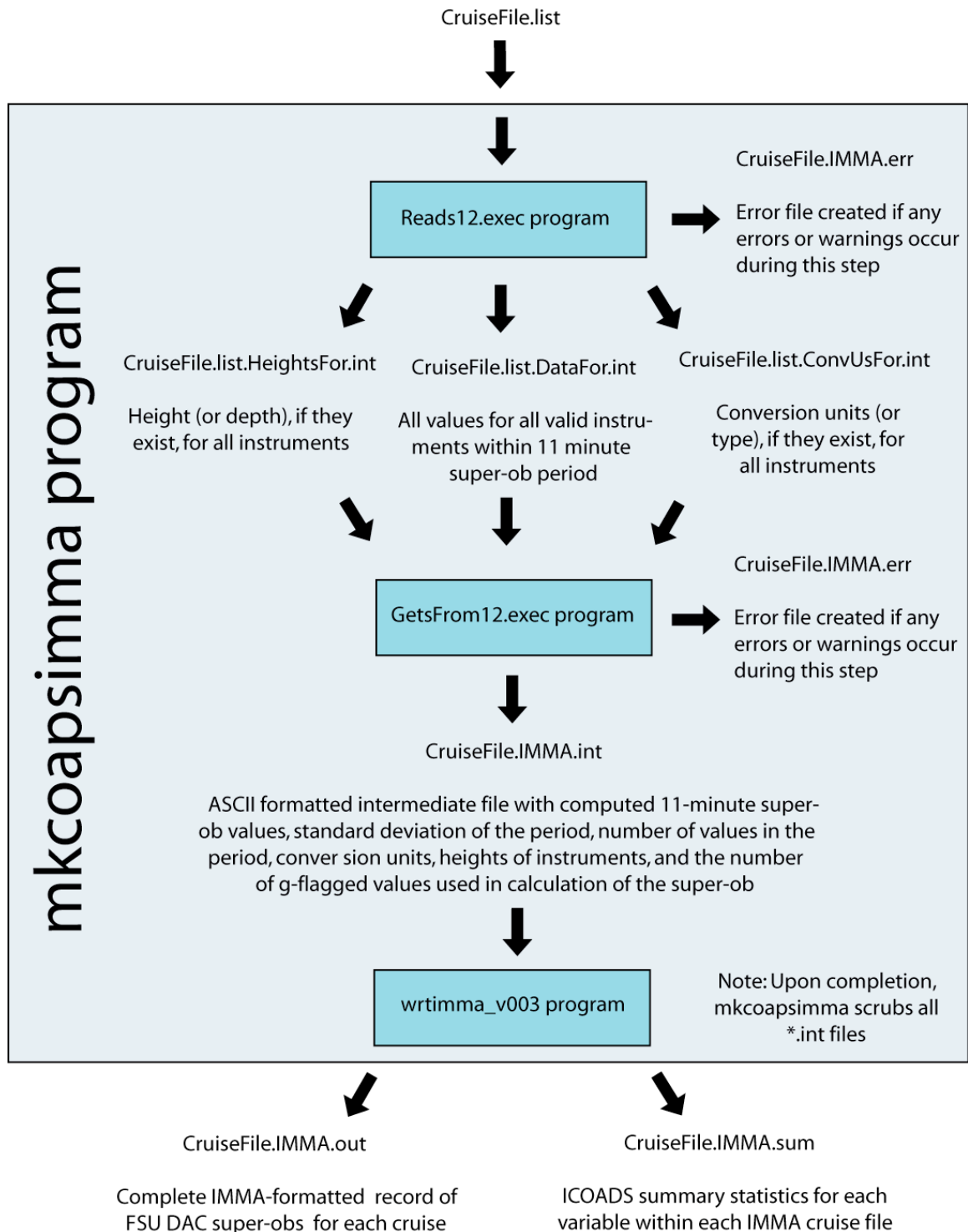ICOADS summary statistics for each variable within each IMMA cruise file

Figure 1: Flow diagram showing steps in the process to convert one-minute sampled WOCE research vessel data from FSU to hourly super-observations for ICOADS. The single input file to mkcoapsimma contains a list of one-minute netCDF files for the cruise to be processed (must be modified to correspond to local file system). The intermediate files (*.int) will be scrubbed unless the -l option is chosen.