The processing of calibrated AMSU data is achieved by the sequential application of programs which are divided into five logical groups:

(1) Pre-Processing: (./Src_IDL)
   (a) extract_noaa_amsu.pro
   (b) extract_aqua_amsu.pro
   (c) extract_gpsro_profiles.pro

(2) AMSU forward model: (./Src_fortran)
   (a) amsu_gps.exe

(3) Calculate Calibration Coefficients: (./Src_IDL)
   (a) match_gps_noaa.pro
   (b) match_gps_aqua.pro
   (c) offset_slope_multigps_noaa_month.pro
   (d) offset_slope_multigps_aqua_month.pro

(4) Apply Calibration: (./Src_IDL)
   (a) bin_noaa_monthlymean.pro
   (b) bin_aqua_monthlymean.pro
   (c) convert_amsu_bygps.pro
   (d) combine_amsu.pro
   (e) generate_climatology_anomaly.pro

(5) Write to V4 netCDF files: (./Src_fortran)
   (a) gen_netCDF_monthly.exe
   (b) gen_netCDF_climatology.exe
   (c) gen_netCDF_anomaly.exe

(6) Misc. Templates for reading in data (./Src_IDL)
   (a) read_amsu_netCDF_monthly.pro   (** template to read results **)
   (b) read_amsu_netCDF_anomaly.pro   (** template to read results **)
   (c) read_amsu_netCDF_climatology.pro (** template to read results **)

****

===

(1) Pre-Processing:

===

(1.a) extract_noaa_amsu.pro

SYNOPSIS:

For the Specified NOAA polar orbiter 'noaa1', this program loops over the specified range of months and years, and reads the L1B binary files from the specified input directory. (downloaded from NOAA-CLASS TOVS from from KLM 8.3.1.6.1) Values of brightness temperature and related data are stored for each julian day in ASCII files for later use.

USAGE:

For each NOAA orbiter {'noaa15',noaa16','noaa18','noaa19','noaam2'} the user needs to first edit the RUN parameters for the program to set the orbiter name, the range of days to process, and the input/output paths for the data.
The data is then processed by compiling and running the IDL program.

RUN PARAMETERS:

Polar satellite name
Begining year/month
Ending year/month
Path to Input data
Path to Output data

INPUTS:

AMSU Level 1B files fro each {noaa} orbiter should be stored with the following directory structure and file format:

```
$InPath/{noaa}/YYYYMM/NSS.AMAX.SS.Dyyddd.Snnnn.Ennnn.CC
```

OUTPUTS:

Output ASCII files are stored with the following directory structure and file format:

```
$OutPath/{noaa}/YYYY/amsu_{noaa1}_YYYY.DDD_ch5-12.dat
```

ALGORITHM:

```
*Loop over years
*Loop over months
*Loop over days in month
 -Construct the set of Input filenames
 -Construct the Output filenames
 *Loop over the input files for this day
  -Open input file
  -Read in header data
  *Loop over records
   -Read in record
   -Skip bad records
   *Loop over 30 scans
    *Loop over channels(5-12)
     -Calcualte Brightness Temperatures
    *
    -Write values to output file
   *
  *
  -Close input file
 *
```

```
        -Close output file
       *
       *
       *



---------------------------------------------------------
(1.a) extract_noaa_amsu.pro
---------------------------------------------------------
      SYNOPSIS:
      ---------
       For the AQUA polar orbiter, this program loops over the
       specified range of months and years, and reads the L1B
       HDF files from the specified input directory.
       (downloaded from NASA website:                    )
       ( http://disc.sci.gsfc.nasa.gov/AIRS/data-holdings/      )
       (                  by-data-product/amsuL1B_Rad.shtml  )
       Values of brightness temperature and related data are stored
       for each julian day in ASCII files for later use.

      USAGE:
      ------
       For the AQUA orbiter, the user needs to first edit the RUN
       parameters for the program to set the the range of dayes to
       process and the input/output paths for the data.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       Begining year/month
       Ending year/month
       Path to Input data
       Path to Output data
       Set maximum scan angle to allow

      INPUTS:
      ------
       The L1B HDF files for AQUA should be stored with the following
       directory structure and file format:

           $InPath/aqua/YYYYMM/AIRS.YYYY.MM.DD.SSS.L1B.AMSU_Rad.v5.*.hdf

      OUTPUTS:
      -------
       Output ASCII files are stored with the following directory
       structure and file format:

           $OutPath/aqua/YYYY/amsu_aqua_YYYY.DDD.dat

      ALGORITHM:
      ----------
       *Loop over years
       *Loop over months
       *Loop over days in month
```

```
    -Construct the Output filenames
    -Construct the set of Input filenames
    *Loop over the input files for this day
     -Read in AQUA data
     *Loop over scans
      -Write values to output file
     *
    *
    -Close output file
   *
   *
   *
```

(1.c) extract_gpsro_profiles.pro

SYNOPSIS:

For the specified GPSRO mission, this program loops over the specified range of julian days and years, and reads in all of the WET/ATM profiles for each day.
The daily profiles DRY temperatures from 'atmPrf' files and profiles of water vapor from 'wetPrf' files are interpolated to the 100 fixed pressure levels used by the AMSU forward model. Missing data values are replaced using Standard atmosphere values.
The resulting interpolated profiles are related values for each Julian day are stored for later use.

USAGE:

For each GPSRO mission {'champ', 'cosmic', 'grace', 'metopa'}, the user needs to first edit the RUN parameters for the program to set the mission name, the range of days to process and the input/output paths for the data.
The data is then processed by compiling and running the IDL program.

RUN PARAMETERS:

Path to standard atmosphere (Ancillary) data
GPSRO mission name
begining year/Julian day
ending year/Julian day
Path to GPSRO input data
Path to output files

INPUTS:

GPSRO level2 profile files should be stored with the following directory structure and file format:

```
$InPath/{gps}/level2/atmPrf/YYYY.DDD/atmPrf_MMMM.YYYY.DDD.*_nc
$InPath/{gps}/level2/wetPrf/YYYY.DDD/wetPrf_MMMM.YYYY.DDD.*_nc
```

```
        ** This program requires that matched 'atm' and 'wet' profiles
           are used. To achieve this, the set of ATM files are read
           from the $InPath directory. Then the 2 occurances of 'atm'
           in each full file name are replaced with 'wet'. The resulting
           WET profile must exist to be included. Because of this,
           the user must be careful not to include 'atm' anywhere in the
           $InPath directory name or the program will fail.

    OUTPUTS:
    -------
     Output ASCII files are stored with the following directory
     structure and file format:

        $OutPath/{gps}/YYYY/Prf_YYYY.DDD.dat'

    ALGORITHM:
    ----------
     -Read in Standard Atmosphere data interpolated to
       AMSU forward model pressures.
     *Loop over the years
     *Loop over juilan days
      -Construct the set of ATM input files
      *Loop over the number of input files
       -Construct the corresponding WET input file name
       -Read in data (Temperature) from ATM file
       -Interpolate profiles to AMSU forward model pressures
       -Read in data (Water Vapor) from WET file
       -Interpolate profiles to AMSU forward model pressures
      *
      -Sort profiles by latitude
      -Load Standard atmosphere profiles for 5 seasonal latitude bands
      -Replace missing profile data using standard atmosphere values
      -Open Output file and write profile data for the current day
     *
     *


=================================================================
(2) AMSU forward model:
=================================================================



-------------------------------------------------------------
(2.a) amsu_gps.exe
-------------------------------------------------------------
    SYNOPSIS:
    ---------
     For the specified GPSRO mission, this program loops over
     the specified range of julian days and years, and reads
     in all of the GPSRO profiles for each day.
     Each profile is passed to an AMSU forward model routine
     which calculates the brightness temperatures for 15
     AMSU channels. The resulting brightness temperatures for
```

each day are written to an ASCII file for later use.

USAGE:

For each GPSRO mission {'champ', 'cosmic', 'grace', 'metopa'}, the user needs to first edit the RUN parameters for the program contained in the file 'CONFIG.amsu_gps' to set the mission name, the range of days to process and the input/output paths for the data.

The program is then compiled to generate an executable:

```
bash> make amsu_gps.exe
bash> vi CONFIG.amsu_gps
bash> ./amsu_gps.exe
```

RUN PARAMETERS:

Name of GPSRO mission to process
Begining year/julian day
Ending year/julian day
Path to interpolated GPSRO profiles
Path to output brightness temperature files

INPUTS:

Input ASCII files containing the {gps} profile data should be stored with the following directory structure and file format:

```
$InPath/{gps}/YYYY/Prf_YYYY.DDD.dat'
```

OUTPUTS:

AMSU brightness temperatures are stored in the files:

```
$OutPath/{gps}/YYYY/AMSU_{gps}_atmBt_YYYY.DDD.dat
```

ALGORITHM:

```
*Loop over years
*Loop over Julian days
 -Open input and output files
 *Loop over input profiles
  -Read in GPSRO profiles
  *Loop over 15 AMSU channels
   -Calculate brightness temperatures
   -Write results to output file
  *
 *
 -Close input/output files
*
*
```

(3) Calculate Calibration Coefficients:

(3.a) match_gps_noaa.pro

SYNOPSIS:

For the given range of Julian days, read in AMSU data extracted from the specified NOAA dataset and simulated AMSU brightness temperatures from profiles of the specified GPSRO mission.
Find colocated measurements satisfying the matchup criteria and then save the matched values in an ASCCI file for later use.

USAGE:

For each combination of GPSRO mission {'champ', 'cosmic', 'grace', 'metopa'} and polar orbiter {'noaa15', 'noaa16', 'noaa18', 'noaa19', 'noaam2'} the user needs to first edit the RUN parameters for the program to set the GPSRO mission name and polar orbiter name, the range of days to process, and the input/output paths for the data. The user also needs to the criteria for matching coincident values.
The data is then processed by compiling and running the IDL program.

RUN PARAMETERS:

Name of GPSRO mission to use
Name of NOAA polar orbiter to use
Begining year/julian day
Ending year/julian day
Path to GPSRO input data
Path to NOAA input data
Path to output file of matched values
Match Criteria: Time
--------------- Distance
                 Scan Angle

INPUTS:

NOAA AMSU data should be stored with the following directory structure and file format:

`$InPath_noaa/{noaa}/YYYY/amsu_{noaa}_YYYY.DDD_ch5-12.dat`

GPSRO simulated AMSU data should be stored in the format:

`$InPath_gps/{gps}/YYYY/AMSU_{gps}_atmBt_YYYY.DDD.dat`

OUTPUTS:

```
       -------
        Matched AMSU values are stored in ASCII files with the following
        directry structure and file format:

               $OutPath/{noaa}_{gps}/YYYY/match_{gps}_{noaa}_YYYY.DDD.dat

       ALGORITHM:
       ----------
        *Loop over the years
        *Loop over julian days
         -Open Output file
         -Read in GPSRO data
         -Read in NOAA data
         *Loop over GPSRO values
          -Determine indices of NOAA data that satisfy
            the specified match criteria
          -Write matched data to output file
         *
         -Close output file
        *
        *



--------------------------------------------------------------
(3.b) match_gps_aqua.pro
--------------------------------------------------------------
       SYNOPSIS:
       ---------
        For the given range of Julian days, read in AMSU data
        extracted from the AQUA dataset and simulated
        AMSU brightness temperatures from profiles of the
        specified GPSRO mission.
        Find colocated measurements satisfying the matchup
        criteria and then save the matched values in an ASCCI
        file for later use.

       USAGE:
       ------
        For each GPSRO mission {'champ', 'cosmic', 'grace', 'metopa'},
        the user needs to first edit the RUN parameters for the program
        to set the GPSRO mission name, the range of days to process, and
        the input/output paths for the data. The user also needs to the
        criteria for matching coincident values.
        The data is then processed by compiling and running the IDL program.

       RUN PARAMETERS:
       ---------------
        Name of GPSRO mission to use
        Begining year/julian day
        Ending year/julian day
        Path to GPSRO input data
        Path to AQUA input data
        Path to output file of matched values
        Match Criteria:  Time
```

--------------- Distance
Scan Angle
Brightness Temperature

INPUTS:

AQUA AMSU data should be stored with the following directory structure and file format:

```
$InPath_noaa/aqua/YYYY/amsu_aqua_YYYY.DDD.dat
```

GPSRO simulated AMSU data should be stored in the format:

```
$InPath_gps/{gps}/YYYY/AMSU_{gps}_atmBt_YYYY.DDD.dat
```

OUTPUTS:

Matched AMSU values are stored in ASCII files with the following directry structure and file format:

```
$OutPath/aqua_{gps}/YYYY/match_{gps}_aqua_YYYY.DDD.dat
```

ALGORITHM:

```
*Loop over the years
*Loop over julian days
 -Open Output file
 -Read in GPSRO data
 -Read in AQUA data
 *Loop over GPSRO values
  -Determine indices of NOAA data that satisfy
    the specified match criteria
  -Write matched data to output file
 *
 -Close output file
*
*
```

(3.c) offset_slope_multigps_noaa_month.pro

SYNOPSIS:

For each month in the specified range, read in the matched AMSU temperatures between the specified polar orbiter and for all specified GPSRO missions. Calcualte the linear fit coefficients for each month. Save the resulting monthly values in an ASCII file for later use.

USAGE:

For each NOAA polar orbiter {'noaa15', 'noaa16', 'noaa18', 'noaa19', 'noaam2'} the user needs to edit the RUN parameters

to set the orbiter name, and the set of GPSRO missions to use
for calibration. {'champ', 'cosmic', 'grace', 'metopa'}.
The range of days to process, the input/output paths for the data,
and the criteria values for matched coincident values also need
to be set. [the criteria enable the use to strengthen the
requiremnts that were used in previous steps]
The data is then processed by compiling and running the IDL program.

RUN PARAMETERS:

```
---------------
 Name of NOAA orbiter to use
 Set of names for GPSRO missions to use
 Begining year/month
 Ending year/month
 Path to matched NOAA/GPSRO data sets (input)
 Path to output file of linear fit coefs
 Match Criteria:  Time
 ---------------  Distance
                  Scan Angle
                  Brightness Temperature
```

INPUTS:

```
------
```

Matched AMSU values are read from the ASCII files with the
following directory structure and file format:

```
$InPath/{noaa}_{gps[*]}/YYYY/match_{gps[*]}_{noaa}_YYYY.DDD.dat
```

OUTPUTS:

```
-------
```

Linear fit coefficients are written to the ASCII file:

```
$OutPath/timeseries_offset_slope_{noaa}_gpsro.dat
```

ALGORITHM:

```
----------
 -Open Output file
 *Loop over the years
 *Loop over months
  *Loop over days in the month
   *Loop over GPSRO missions
    -Read in colocated GPSRO/NOAA data
    -Accumulate meatch data
   *
  *
  -For channel 9 data
   -Get matched data values which satisfy the specified criteria
   -Calculate the linear fit coefficients
   -Write linear fit coefs to output file
 *
 *
 -Close output file
```

```
------------------------------------------------------------
(3.d) offset_slope_multigps_aqua_month.pro
------------------------------------------------------------
        SYNOPSIS:
        ---------
         For each month in the specified range, read in the matched
         AMSU temperatures between the AQUA polar orbiter and
         for all specified GPSRO missions. Calcualte the linear fit
         coefficients for each month. Save the resulting monthly
         values in an ASCII file for later use.

        USAGE:
        ------
         For the AQUA polar orbiter, the user needs to edit the RUN
         parameters to set the orbiter name, and the set of GPSRO missions
         to use for calibration. {'champ', 'cosmic', 'grace', 'metopa'}.
         The range of days to process, the input/output paths for the data,
         and the criteria values for matched coincident values also need
         to be set. [the criteria enable the use to strengthen the
         requiremnts that were used in previous steps]
         The data is then processed by compiling and running the IDL program.

        RUN PARAMETERS:
        ---------------
         Set of names for GPSRO missions to use
         Begining year/month
         Ending year/month
         Path to matched AQUA/GPSRO data sets (input)
         Path to output file of linear fit coefs
         Match Criteria:  Time
         ---------------  Distance
                          Scan Angle
                          Brightness Temperature

        INPUTS:
        ------
         Matched AMSU values are read from the ASCII files with the
         following directory structure and file format:

              $InPath/aqua_{gps[*]}/YYYY/match_{gps[*]}_aqua_YYYY.DDD.dat

        OUTPUTS:
        -------
         Linear fit coefficients are written to the ASCII file:

              $OutPath/timeseries_offset_slope_aqua_gpsro.dat

        ALGORITHM:
        ----------
         -Open Output file
         *Loop over the years
         *Loop over months
          *Loop over days in the month
           *Loop over GPSRO missions
          -Read in colocated GPSRO/AQUA data
          -Accumulate meatch data
         *
        *
        -For channel 9 data
         -Get matched data values which satisfy the specified criteria
         -Calculate the linear fit coefficients
         -Write linear fit coefs to output file
       *
       *
       -Close output file


============================================================
(4) Apply Calibration:
============================================================

------------------------------------------------------------
(4.a) bin_noaa_monthlymean.pro
------------------------------------------------------------
      SYNOPSIS:
      ---------
       For the specified polar orbiter and AMSU channel and range
       of months, AMSU values are averaged on a 2.5 degree grid.
       Monthly gridded values are written to ASCII files for later
       use.

      USAGE:
      ------
       For the each NOAA polar orbiter {'noaa15', 'noaa16', 'noaa18',
       'noaa19', 'noaam2'}, the user needs to edit the RUN parameters
       to set the orbiter name, the AMSU channel to use, the range of
       days to process, and the input/output paths for the data.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       Name of NOAA orbiter
       AMSU channel number
       Begining year/month
       Ending year/month
       Path to input NOAA data
       Path to output gridded data

      INPUTS:
      ------
       Daily values of AMSU are read from the files:

            $InPath/{noaa}/YYYY/amsu_{noaa}_YYYY.DDD_ch5-12.dat

      OUTPUTS:
      -------
       Monthly gridded means are written to the files:
          $OutPath/{noaa}/bin_{noaa}_YYYYMM_chan{chan}.dat

      ALGORITHM:
      ----------
       *Loop over years
       *Loop over months
        *Loop over days in month
         -Read in input data for NOAA orbiter
         -Accumulate values
        *
        -Open output file
        -Bin data according to lat/lon gridpoints
        -Calulate average values ato each gridpoint
        -Write gridded averages to output file
        -Close output file
       *
       *



----------------------------------------------------------
(4.b) bin_aqua_monthlymean.pro
----------------------------------------------------------
      SYNOPSIS:
      ---------
       For the AQUA polar orbiter and AMSU channel and range
       of months, AMSU values are averaged on a 2.5 degree grid.
       Monthly gridded values are written to ASCII files for later
       use.

      USAGE:
      ------
       For the AQUA polar orbiter, the user needs to edit the RUN
       parameters to set the AMSU channel to use, the range of
       days to process, and the input/output paths for the data.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       AMSU channel number
       Begining year/month
       Ending year/month
       Path to input AQUA data
       Path to output gridded data

      INPUTS:
      ------
       Daily values of AMSU are read from the files:

          $InPath/aqua/YYYY/amsu_aqua_YYYY.DDD.dat

      OUTPUTS:
      -------
       Monthly gridded means are written to the files:
          $OutPath/aqua/bin_aqua_YYYYMM_chan{chan}.dat

      ALGORITHM:
      ----------
       *Loop over years
       *Loop over months
        *Loop over days in month
         -Read in input data for AQUA orbiter
         -Accumulate values
        *
        -Open output file
        -Bin data according to lat/lon gridpoints
        -Calulate average values ato each gridpoint
        -Write gridded averages to output file
        -Close output file
       *
       *



------------------------------------------------------------
(4.c) convert_amsu_bygps.pro
------------------------------------------------------------
      SYNOPSIS:
      ---------
       For the specified AMSU dataset, Read in GPSRO correction
       coeffcients from the specfied file, read in gridded AMSU
       data, apply the correction, and write the converted data
       to the given output file.

      USAGE:
      ------
       For each polar orbiter {'noaa15', 'noaa16', 'aqua',
       'noaa18', 'noaa19', 'noaam2'}, the user needs to edit the
       RUN parameters to set orbiter name, the path to the offset_slope
       calibration coefficients, and the input/output paths for the data.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       Name of NOAA or AQUA polar orbiter
       Path to linaer fit coefficient files
       Path to input gridded AMSU data
       Path to output converted gridded AMSU data

      INPUTS:
      ------
       Monthly linear fit coefs between NOAA and GPSRO data
       are read from:

          $InPath_coef/timeseries_offset_slope_{noaa}_gpsro.dat

       Gridded NOAA AMSU values are read from:

          $InPath_noaa/bin_{noaa}_YYYYMM_chan9.dat
      OUTPUTS:
      -------
       Converted NOAA AMSU values are written to the
       ASCCI file:
          $OutPath_noaa/bin_{noaa}_YYYYMM_chan9_converted.dat

      ALGORITHM:
      ----------
       -Read in linear fit coefficients for specified orbiter
       *Loop over the months in the coefficient file
        -Read in gridded orbiter data for the month
        -Apply linear correction to each gridpoint
        -Save converted gridded AMSU data to output file
       *



------------------------------------------------------------
(4.d) combine_amsu.pro
------------------------------------------------------------
      SYNOPSIS:
      ---------
       Read in gridded data for the specified set of polar
       orbiters, combine data by a simple average of the data
       from each satellite at each gridpoint, and write out
       the results in an ASCII file.

      USAGE:
      ------
       For each polar orbiter {'noaa15', 'noaa16', 'aqua',
       'noaa18', 'noaa19', 'noaam2'},
       The user needs to edit the RUN parameters to list the set of polar
       orbiters to combine {'noaa15', 'noaa16', 'noaa18', 'noaa19',
       'noaam2','aqua'}, the path to the indvidutal gridded datasets, ant
       the path for the combined gridded data.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       Names of polar orbiter to combine
       AMSU channel name
       Begining year/month
       Ending year/month
       Path to monthly gridded data for orbiters (Input)
       Path to combined gridded data files

      INPUTS:
      ------
       Gridded polar orbiter data values are read from file with
       the following directory structure and file format:

          $InPath/bin_{noaa[*]}_YYYYMM_{chan}.dat

      OUTPUTS:
      -------
       Gridded combined polar orbiter data values are written to an
       ASCII file:

          $OutPath/bin_YYYYMM_{chan}_noaqua.dat

      ALGORITHM:
      ----------
       *Loop over years
       *Loop over months
        *Loop over polar orbiters
         -Read in gridded data
        *
        -Open output file
        -Average values from each orbiter at each gridpoint
        -Sum number of orbiter data values at each gridpoint
        -Write averages to output file
        -Close output file
       *
       *

-------------------------------------------------------------
(4.e) generate_climatology_anomaly.pro
-------------------------------------------------------------
      SYNOPSIS:
      ---------
       For the given range of months/years, generate a mean monthly
       climatology and save the results. For an atlerante range of
       months, read in gridded ASCII data for the specified months,
       subtract the climatological mean for the data and write out
       anomaly values.

      USAGE:
      ------
       The user needs to edit the RUN parameters to set the path to
       the combined gridded datasets, the path for the climatology, the
       path for the monthly anomaly datasets, and the range of months
       to be used.
       The data is then processed by compiling and running the IDL program.

      RUN PARAMETERS:
      ---------------
       AMSU channel name
       Climatology Begining year/month
       Climatology Ending year/month
       Anomaly Begining year/month
       Anomaly Ending year/month
       Path to combined gridded data files (Input)
       Path to climatology
       Path to anoamaly gridded data files

      INPUTS:
      ------
       Gridded calibrated polar orbiter data values are read from
```

ASCII files:

`$InPath/bin_YYYYMM_{chan}.dat`

OUTPUTS:

Climatological mean values are written to an ASCII file with the structure and file format:

`$CoutPath/$ClimatologyName`

Monthly Anomaly values are written to ACSII files with the structure and file format:

`$AoutPath/tls_anamoly_YYYY_1.0`

ALGORITHM:

```
 *Loop over Climatology years
 *Loop over Climatology months
  -Read in monthly gridded data
 *
 *
 *Loop over months
  *Loop over lat/lon
   - Calculate mean monthly value
  *
 *
 -Open Climatology output file
 *Loop over months
  - Write out Climatology values
 *
 -Close Climatology output file

 *Loop over Anomaly years
  *Loop over Anomaly months
   -Read in monthly gridded data
  *

  *Loop over Anomaly months
   -Subtract Climatological mean
  *

  -Open Anomaly output file
  *Loop over Anomaly months
   - Write out Anomaly data
  *
  -Close Anomaly output file
 *
```

==

(5) Write to V4 netCDF files: (./Src_fortran)

(5.a) gen_netCDF_monthly.exe

SYNOPSIS:

Read in gridded ASCII data for the specified months,
write out desired final results values to netCDF files.

USAGE:

The user needs to first edit the RUN parameters for the program to
set the AMSU channel data to process, the range of months to process,
and the input/output paths for the data.
The Makefile must have $(LIBDIRS) and $(INCDIRS) set to appropriate
values to use the netCDF libraries.
After compiling the program using the Makefile, execute the program.

```
prompt> make
prompt> ./gen_netCDF_monthly.exe
```

RUN PARAMETERS:

AMSU channel name {'chan9', 'chan9_converted'}
Begining year/month
Ending year/month
Path to combined gridded data files
Path to final netCDF data files

INPUTS:

Gridded combined polar orbiter data values are read from
an ASCII file:

```
$InPath/bin_YYYYMM_{chan}.dat
```

OUTPUTS:

netCDF files are written with the following directory
structure and file format:

```
$OutPath/AMSU_{proc}_{chan}_V1.0_YYYYMM.nc
```

ALGORITHM:

```
-Set grid values
*Loop over years
*Loop over months
 -Read in combined/converted ASCII data
 -Convert data into lat/lon format
 -Create output netCDF file
 -Write averages to output file
 -Close output file
*
```

```
     *


---------------------------------------------------------
(5.b) gen_netCDF_climatology.exe
---------------------------------------------------------
    SYNOPSIS:
    ---------
     Read in gridded ASCII climatology data and
     write out desired final results values to netCDF files.

    USAGE:
    ------
     The user needs to first edit the RUN parameters for the program to
     set the AMSU channel data to process, the range of months to process,
     and the input/output paths for the data.
     The Makefile must have $(LIBDIRS) and $(INCDIRS) set to appropriate
     values to use the netCDF libraries.
     After compiling the program using the Makefile, execute the program.

       prompt> make
       prompt> ./gen_netCDF_climatology.exe

    RUN PARAMETERS:
    ---------------
     AMSU channel name {'chan9', 'chan9_converted'}
     Begining year/month
     Ending year/month
     Path to combined gridded data files
     Path to final netCDF data files

    INPUTS:
    --------
     Gridded combined polar orbiter climatology data values are read from
     an ASCII file:
                $InPath/tls_climatology_1.0

    OUTPUTS:
    ---------
     netCDF files are written with the following directory
     structure and file format:

                $OutPath/AMSU_{proc}_{chan}_V1.0_MM.nc

    ALGORITHM:
    ----------
     -Set grid values
     *Loop over months
      -Read in combined/converted ASCII data
      -Create output netCDF file
      -Write averages to output file
      -Close output file
     *
```

(5.c) gen_netCDF_anomaly.exe

SYNOPSIS:

Read in gridded ASCII amonaly data and
write out desired final results values to netCDF files.

USAGE:

The user needs to first edit the RUN parameters for the program to
set the AMSU channel data to process, the range of months to process,
and the input/output paths for the data.
The Makefile must have $(LIBDIRS) and $(INCDIRS) set to appropriate
values to use the netCDF libraries.
After compiling the program using the Makefile, execute the program.

```
prompt> make
prompt> ./gen_netCDF_anomaly.exe
```

RUN PARAMETERS:

AMSU channel name {'chan9', 'chan9_converted'}
Begining year/month
Ending year/month
Path to combined gridded data files
Path to final netCDF data files

INPUTS:

Gridded combined polar orbiter climatology data values are read from
an ASCII file:

```
$InPath/tls_anomaly_YYYY_1.0
```

OUTPUTS:

netCDF files are written with the following directory
structure and file format:

```
$OutPath/AMSU_{proc}_{chan}_V1.0_YYYYMM.nc
```

ALGORITHM:

```
-Set grid values
*Loop over years
 -Open anomaly file
 *Loop over months
  -Read in combined/converted ASCII data
  -Create output netCDF file
  -Write anomaly data to output file
  -Close output file
 *
 -Close anomaly file
```

```
      *


=======================================================
(6) Misc. Programs to read netCDF files: (./Src_IDL)
=======================================================

--------------------------------------------------------------
(a) read_amsu_netCDF_monthly.pro      (** template to read results **)
--------------------------------------------------------------

--------------------------------------------------------------
(b) read_amsu_netCDF_anomaly.pro      (** template to read results **)
--------------------------------------------------------------

--------------------------------------------------------------
(c) read_amsu_netCDF_climatology.pro  (** template to read results **)
--------------------------------------------------------------
```