process_avhrr_scan_segments.sh

process_avhrr_scan_segments.sh arguments: YYYY MM satname
YYYY: 4-digit year
MM: 2-digit month of year
satname: NOAA##, ##=satellite number, i.e. NOAA18

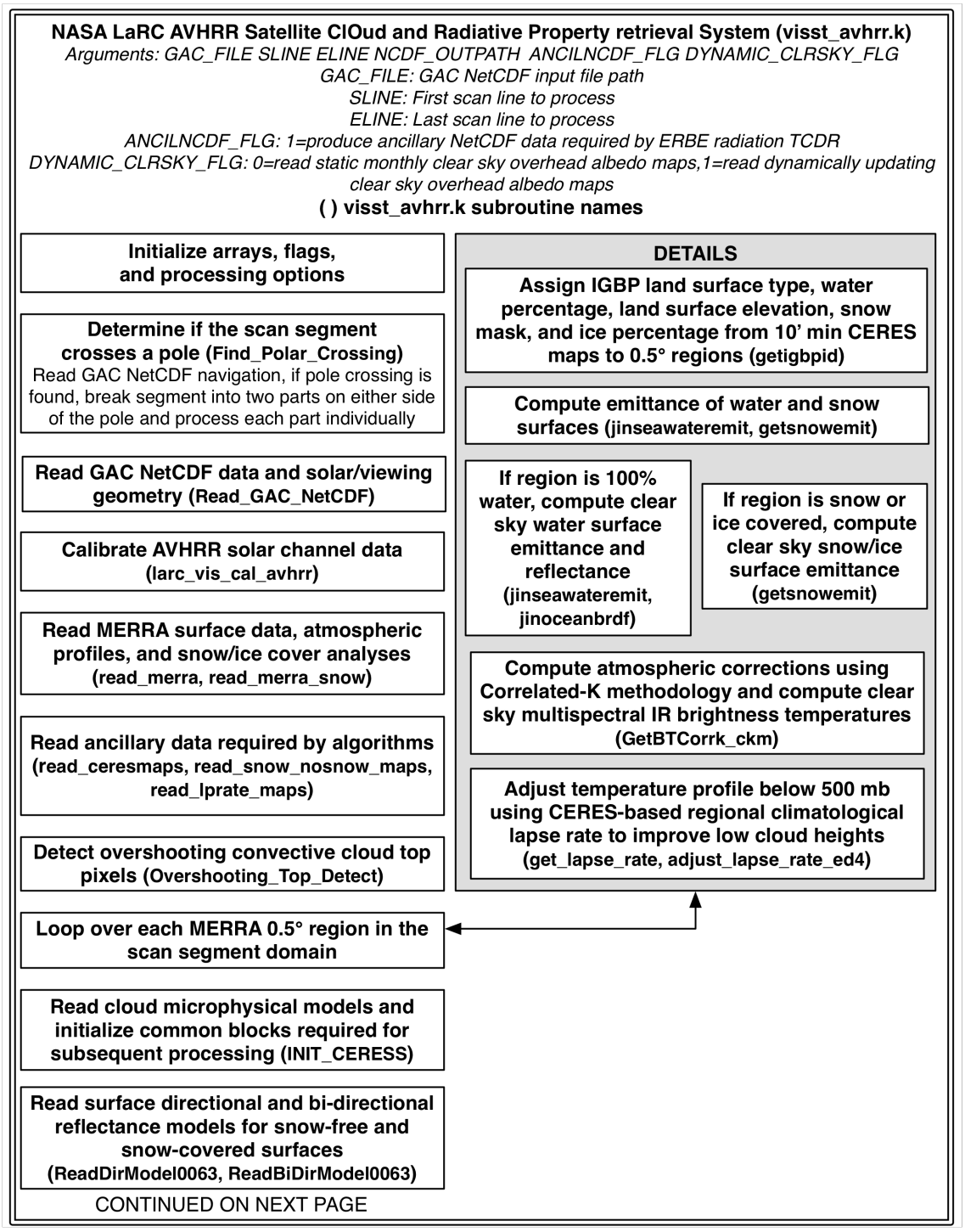
Create list of AVHRR GAC Level 1B format files for the desired year, month, and NOAA satellite

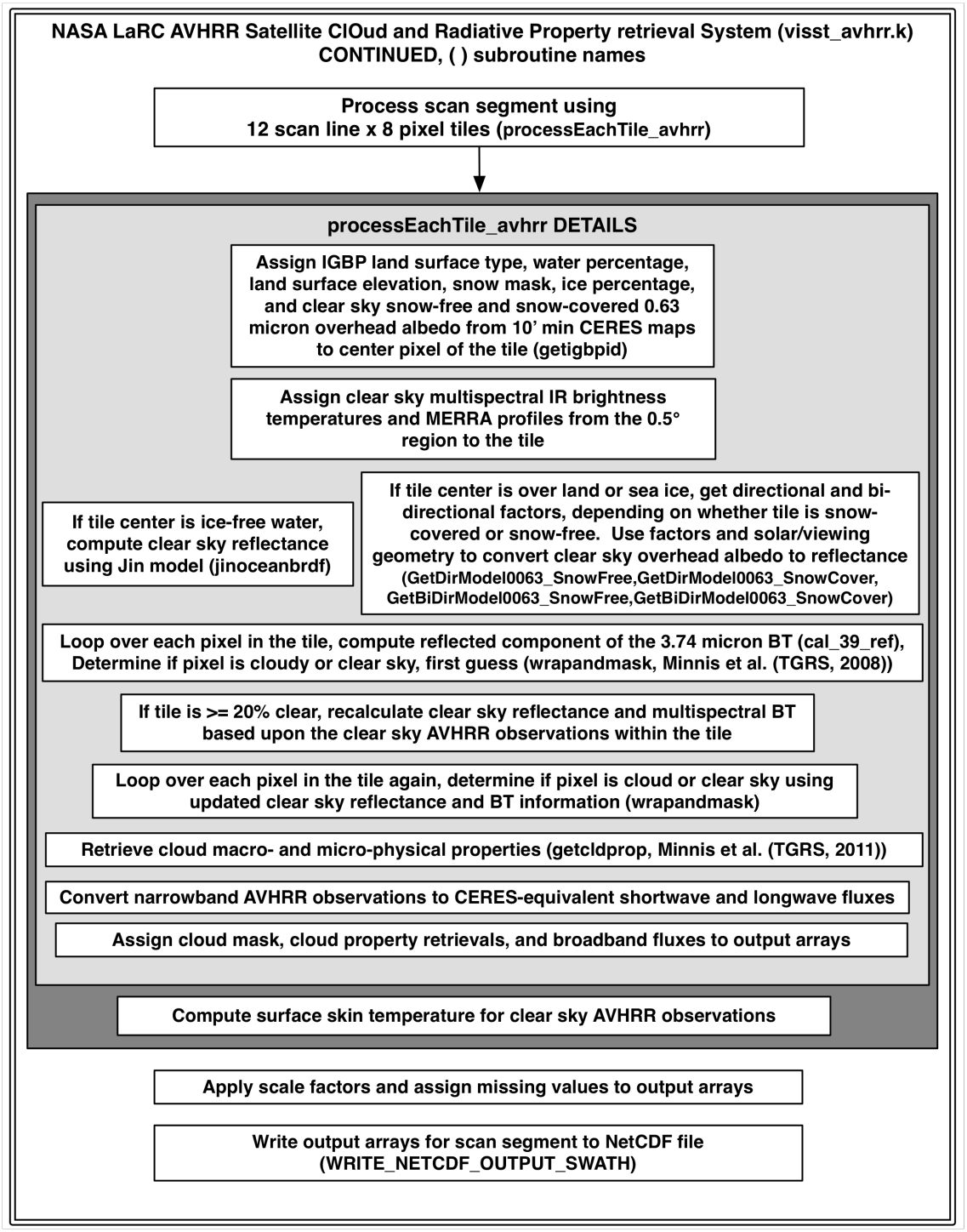
Process the month of data in 2-day batches
Maximum number of simultaneous jobs=200

Process each AVHRR GAC Level 1B file using SAPS
SAPS Arguments: -noutpath level1Bfilename
outpath: directory where the GAC NetCDF output file is produced
level1Bfilename: name of AVHRR GAC Level1B file to be processed
SAPS corrects navigation, filters noise, and creates an output NetCDF file containing scan line time, pixel navigation, Channel 1, 2, and 3a raw counts, Channel 3b, 4, and 5 brightness tempertures, and viewing and solar geometry

Process AVHRR NetCDF file in 1000 (maximum) scan line segments within NASA LaRC AVHRR Satellite ClOud and Radiative Property retrieval System (SatCORPS) using run_cloud_property_retrievals.sh
run_cloud_property_retrievals.sh arguments: startline endline GAC_NetCDF_filename ancil_NetCDF_flag
startline: first scan line to process
endline: last scan line to process
GAC_NetCDF_filename: path and name of GAC NetCDF file to be processed
ancil_NetCDF_flag: 1=produce ancillary NetCDF data
run_cloud_property_retrievals.sh is a wrapper that calls the SatCORPS executable program visst_avhrr.k. The AMCPRS performs cloud mask, cloud property retrievals, and clear sky surface temperature retrievals. A set of NetCDF output files are produced for each scan line segment

Merge cloud property retrieval scan segment NetCDF files into one file for the entire AVHRR orbit using fortran_netcdf_merge
fortran_netcdf_merge arguments: outpath GAC_NetCDF_filename numlines ancil_NetCDF_flag
outpath: path for TCDR NetCDF output file
GAC_NetCDF_filename: path and name of GAC NetCDF file for the particular orbit
numlines: total number of scanlines in GAC NetCDF file
ancil_NetCDF_flag: 1=Merge scan segments for ancillary field NetCDF files
fortran_netcdf_merge reads each 1000-line cloud property retrieval NetCDF, merges the files together, and adds all necessary metadata to produce a CF-compliant NetCDF TCDR output file


NASA LaRC AVHRR Satellite ClOud and Radiative Property retrieval System (visst_avhrr.k)
Arguments: GAC_FILE SLINE ELINE NCDF_OUTPATH ANCILNCDF_FLG DYNAMIC_CLRSKY_FLG
GAC_FILE: GAC NetCDF input file path
SLINE: First scan line to process
ELINE: Last scan line to process
ANCILNCDF_FLG: 1=produce ancillary NetCDF data required by ERBE radiation TCDR
DYNAMIC_CLRSKY_FLG: 0=read static monthly clear sky overhead albedo maps,1=read dynamically updating clear sky overhead albedo maps
( ) visst_avhrr.k subroutine names
Initialize arrays, flags, and processing options
Determine if the scan segment crosses a pole (Find_Polar_Crossing)
Read GAC NetCDF navigation, if pole crossing is found, break segment into two parts on either side of the pole and process each part individually
Read GAC NetCDF data and solar/viewing geometry (Read_GAC_NetCDF)
Calibrate AVHRR solar channel data (larc_vis_cal_avhrr)
Read MERRA surface data, atmospheric profiles, and snow/ice cover analyses (read_merra, read_merra_snow)
Read ancillary data required by algorithms (read_ceresmaps, read_snow_nosnow_maps, read_lprate_maps)
Detect overshooting convective cloud top pixels (Overshooting_Top_Detect)
Loop over each MERRA 0.5° region in the scan segment domain
Read cloud microphysical models and initialize common blocks required for subsequent processing (INIT_CERESS)
Read surface directional and bi-directional reflectance models for snow-free and snow-covered surfaces (ReadDirModel0063, ReadBiDirModel0063)
CONTINUED ON NEXT PAGE
DETAILS
Assign IGBP land surface type, water percentage, land surface elevation, snow mask, and ice percentage from 10' min CERES maps to 0.5° regions (getigbpid)
Compute emittance of water and snow surfaces (jinseawateremit, getsnowemit)
If region is 100% water, compute clear sky water surface emittance and reflectance (jinseawateremit, jinoceanbrdf)
If region is snow or ice covered, compute clear sky snow/ice surface emittance (getsnowemit)
Compute atmospheric corrections using Correlated-K methodology and compute clear sky multispectral IR brightness temperatures (GetBTCorrk_ckm)
Adjust temperature profile below 500 mb using CERES-based regional climatological lapse rate to improve low cloud heights (get_lapse_rate, adjust_lapse_rate_ed4)


NASA LaRC AVHRR Satellite ClOud and Radiative Property retrieval System (visst_avhrr.k)
CONTINUED, ( ) subroutine names
Process scan segment using
12 scan line x 8 pixel tiles (processEachTile_avhrr)
processEachTile_avhrr DETAILS
Assign IGBP land surface type, water percentage, land surface elevation, snow mask, ice percentage, and clear sky snow-free and snow-covered 0.63 micron overhead albedo from 10' min CERES maps to center pixel of the tile (getigbpid)
Assign clear sky multispectral IR brightness temperatures and MERRA profiles from the 0.5° region to the tile
If tile center is ice-free water, compute clear sky reflectance using Jin model (jinoceanbrdf)
If tile center is over land or sea ice, get directional and bi-directional factors, depending on whether tile is snow-covered or snow-free. Use factors and solar/viewing geometry to convert clear sky overhead albedo to reflectance (GetDirModel0063_SnowFree,GetDirModel0063_SnowCover, GetBiDirModel0063_SnowFree,GetBiDirModel0063_SnowCover)
Loop over each pixel in the tile, compute reflected component of the 3.74 micron BT (cal_39_ref), Determine if pixel is cloudy or clear sky, first guess (wrapandmask, Minnis et al. (TGRS, 2008))
If tile is >= 20% clear, recalculate clear sky reflectance and multispectral BT based upon the clear sky AVHRR observations within the tile
Loop over each pixel in the tile again, determine if pixel is cloud or clear sky using updated clear sky reflectance and BT information (wrapandmask)
Retrieve cloud macro- and micro-physical properties (getcldprop, Minnis et al. (TGRS, 2011))
Convert narrowband AVHRR observations to CERES-equivalent shortwave and longwave fluxes
Assign cloud mask, cloud property retrievals, and broadband fluxes to output arrays
Compute surface skin temperature for clear sky AVHRR observations
Apply scale factors and assign missing values to output arrays
Write output arrays for scan segment to NetCDF file
(WRITE_NETCDF_OUTPUT_SWATH)