MODIS QUARTERLY REPORT
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Due to the interlocking nature of a number of projects, this and subsequent reports will contain coding to reflect the funding source. MODIS funded activities are designated with an M, SeaWiFS with an S, and Pathfinder with a P. There are several major sections within this report; Database, client/server, matchup database, and DSP support.

A. NEAR TERM OBJECTIVES

A.1 MODIS Objectives (M)
A.1.1. Continue to develop and expand the processing environment

a. increase computational efficiency through concurrent operations
b. determine and apply more efficient methods of data availability for processes

A.1.2. Begin extensive testing using global CZCS and AVHRR GAC data with database processing to test the following:

a. algorithm capability
b. machine and operating system stability
c. functionality required for the processing and analysis environment

A.2 SeaWiFS Objectives (S)
A.2.1. Continue testing of processing methodology.
A.2.2. Continue to develop relationship between database and in-situ environment.

A.3 Pathfinder Objectives (P)
A.3.1. Expand matchup database as applicable.
A.3.2. Continue testing of methodology.
A.3.3 Train and integrate new personnel into Matchup Database processing scheme.

A.4 DSP Objectives (M)

A.4.1. Continue testing of processing methodology.
A.4.2. Continue to expand the number of sites supported.
A.4.3. Expand the supported hardware/software platforms

B. OVERVIEW OF CURRENT PROGRESS

B.1 Automatic Processing Database (P)

B.1.1 Processing -Pathfinder

B1.1.1 January Processing

A set of new processing machines was installed and used for the operational processing, which required frequent shutdowns of the processing to accommodate the new hardware and software used with the upgraded equipment. (These adjustments were needed to test/assimilate the use of ATM between machines, replacing the slower FDDI links.)

The pf2b run noted earlier was run for weeks 9401 through 9321, then processing was paused while hardware and software were adjusted, and this run was analyzed.

B.1.1.2 February Processing

B.1.1.3 March Processing

The pfad version of the processing was performed on the 1994/NOAA-11 files (through day 256). To further investigate the scan angle effects, a special run of for sets of two weeks of processing was performed, keeping the value for channel 4 minus channel 5 (ch4m5) for six ranges of scan angles: below 10, 10-20. 20-30. 30-40. 40-50. 50-69, and greater than 60.

B.1.1.4 April Processing

The new pfv3 run started with 94001 through 94256 (the end of NOAA-11 data). Processing was slow due to the numbers of adjustments that were required to operate in the new paradigm (alpha running the post-processing, and set-up of the automatic archiving procedures).

B.1.1.5 May Processing

A re-run of pfv3 for 94001-94265 was made, and also the first pfv3 run for 1993 and late 92.

Several two-week runs were made of the scan angle files, both SST and ch4m5, but these files need further development.

B.1.1.6 June Processing

Most of 91 and 92 were processed, as well as 88315-88365 (the beginning of the NOAA-11 data)/

B.1.2 Development

B.1.2.1 January

APServer Development

The APServer system is, for all practical purposes, complete. All source and, command files have been checked into CVS, and the only anticipated changes that are needed are to the orbit scanner program(s), to better identify and cope with input file problems.

Processing was largely performed using the aps/AutoSys software. The APServer system was used as backup and to perform short processing jobs (a few days' of orbits at a time), so no additional work was needed for the APServer system. Note that the APServer system was used for producing daily files from the orbits, and for all cloud-masking and product production.

Pathfinder Development

In early January, it was discovered that the change in internal coefficient was resulting in an abnormally low temperature cutoff in the most recent Pathfinder processing, and would need to be reprocessed. (This reprocessing was already planned, due to further changes and testing concerning the pathfinder algorithm.)

A new run was made termed "pf2b," and used not only the most current pathfinder coefficients, but also had a second SST estimate, calculated from a set of "experimental" coefficients determined separately for ascending and descending data. In this run, the value for channel 4 minus channel 5 was stored, and also segregated by scan angle, that is, the ch4m5 value was stored four times per pixel, once for scan angles less than 30 degrees, between 30 and 45 degrees, greater than 40 degrees, and one for all angles.

B.1.2.2 February t

The APS/AutoSys software again controlled the basic processing, and now also the production of the daily files. Cloud-masking and product production either used the APServer system, or was done by hand. The APServer system was used quite a bit for short runs (2-3 days' worth of orbits at a time).

The orbit pre-scanner was modified slightly to attempt to better identify orbits containing missing or bad blocks of scan lines. These adjustments improved the ability of the scanner to catch the bad blocks, but some are still remaining in the final processing. The scanning and processing both need to better identify these blocks.

A new task to be performed is the ability to extract SST data, and other requested fields (quality, number of input points, etc.) from the binned data, and store it either as matchup data to a set of input points in space and time (x, y, t matchups) or as time series at a point (ts at x, y). A number of small tools will be needed for this, both to prepare the "query" ability, and to sort/assemble the output into the desired format.

B.1.2.3 March Development

Matchup/Time Series Extraction

A program was written to extract the count, quality and SST value from an input binned file for either a single bin, or a set of bins contained in an input file.

A file was created containing all *in-situ* data matchups for NOAA-11. This file contains the time, lat, lon, buoy/reference for all previously identified satellite/buoy matchups.

A command file was written to separate this file into separate files for each year. Further work was carried out on the 1993 file.

A program was written to convert lat, lon into RSMAS or ISCCCP bin number for any resolution binned file.

A command file was written to add this bin number to the matchup file.

Another command file was written to separate the yearly file by day and ascending or descending time. This results in one ascending file and one descending file for each day. These files constitute the "SST query" files and will be used to extract matchup data from the ascending and descending daily binned files from the AVHRR/GAC processing. The output will be stored in corresponding extraction files, and will be recombined into a single matchup file for analysis.

To construct time series at a point, a file was created in "DIM" format (a DSP-recognized data format for lat/lon pairs), and the bin numbers associated with them.

A command file was written to extract these points from a set of binned files, and another was written to recombine these into time series files.

B.1.2.4 April Development

Another modification was made to the pahtnlc processing, see details This version is to be the "official" version three, so processing will use the ssttype/extension pfv3.

All post-processing functions (daily file making, cloud masking, product production, archiving) was moved from the SGI, andrew, to an Alpha 2100, apricot.

The autosys environment was modified to perform the daily job and two weekly jobs. The first weekly job just makes a "pre-declouded" weekly file. The second weekly job take three-weeks' worth of these, produces a reference file for the middle week, uses the reference to cloud mask the daily files for that week, produces the various products (cloud-masked weekly files, and spatially-reduced daily files), and archives the daily and weekly files.

A command file was written to extract histogram data from a DSP history file, to be used for plotting.

B.1.2.5 May Development

A new test run of the six-scan angle was produced. It was found that one of the post-processing programs, pathspc, was not handling these files correctly, and was modified. The previous version kept the ch4m5 (channel 4 minus channel 5) information. A new version was written to keep SST as a function of scan angle.

B.1.2.6 June Development

The most recent version of the pathfinder software was made available to JPL.

The files used to track the ascending\descending nodes for each pass, and to define the data-days had previously been kept in files for each satellite for each year. These files

were further broken down to produce a separate file for each yearday, to eliminate lengthy reads of ASCII data to retrieve the information.

Halfway through the month, major changes in computer networking produced numerous problems for the processing. These have been overcome, but interfered with the processing and development.

B.2 Processing Systems Status (M)

B.2.1 MODIS V1

- A description of the processing required for the daily and weekly ocean color and SST products was submitted to SDST for review. This document listed each program, it's inputs and outputs an activation rule. It was intended help SDST understand how these products are produced and to serve as a starting point for discussion between Miami and SDST about requirements for the Miami PGE scripts.

- MODIS Science Data Processing Version 1 Requirements Specification was reviewed and comments submitted to SDST.

- Interface Specifications for MODIS Operational Software was reviewed and comments submitted to SDST.

- Interface Control Document Between EOSDIS Core System and Science Computing Facilities was reviewed.

- MODIS Beta Product Generation Executive Script Design Document was reviewed.

- Production Rules White Paper was reviewed and requirements submitted to ECS and SDST.

- Version 1 Metadata Dictionary white paper was reviewed and comments submitted to SDST.

B2.1.1 MOCEAN IO Library

Efforts to develop a proof-of-concept IO interface to HDF which is not dependent on the data content or file organization have continued. This interface is modeled after the DSP I/O library and supports legacy code as well as MODIS HDF formats.

Activities during the past three months were focused on integrating the library with MODIS V1 deliverables. This required finding a short term solution for dealing with metadata (since the SDP Toolkit did not yet support it) and providing access to the geolocation file.

The metadata issues were addressed by enhancing the library to support writing and reading global and SDS level HDF attributes. This allows direct access to the ECS core Metadata string which is stored as a single global HDF attribute. Software provided by SDST is then used to parse the metadata string. These routines were developed to provide access to metadata stored as HDF attributes:

Mocean_WriteImageAttr(HDFILE **fimgptr,char *attr_name,void *attr)
Mocean_ReadImageAttr(HDFILE **fimgptr,char *attr_name,void *attr)
Mocean_WriteAttr(HDFILE **fimgptr,char *band_name,char *attr_name,void *attr)
Mocean_ReadAttr(HDFILE **fimgptr,char *band_name,char *attr_name,void *attr)
Mocean_AttrSize(HDFILE **fimgptr,char *band_name,char *attr_name,int32 *size)
Mocean_ImageAttrSize(HDFILE **fimgptr,char *attr_name, int32 *size)

A routine was written to provide access to the modis geolocation file:

Mocean_GeolocReadElemt(void *buff,int32 *line,int32 *vpline,char *elename,
HDFILE **fimgptr);

B.2.1.2 HDF-EOS

At the present time, the MOCEAN IO library uses HDF directly. It is our intent to incorporate HDF-EOS as soon as possible.

B.2.1.4 Near Term Objectives

Integrate SDP Toolkit metadata handling routines into the MOCEAN IO library.

Upgrade to HDF 4.0r1p1.

Install and evaluate HDF-EOS Version 1.

Begin integration of HDF-EOS into the MOCEAN IO library.

B.2.2 AVHRR SST retrospective processing

B.2.2 .1 AutoSys and DECnsr Integration

During the past three months we have extended the use of AutoSys in retrospective SST processing to automate the generation of weekly reference maps, declouded weekly and daily products, and the archiving to DLT tape (via the TL820) of declouded 9k daily and weekly product. The programs and procedures which support this function use Reynolds tables for the week definition and break the post-orbit processing into two "weekly" jobs:

1) WKLY1 - create raw global L3 file for week.
2) WKLY2 - create three week reference and use it to generate declouded daily and weekly products; create 18k and 36k maps and archive data to tape.

AutoSys controls the execution of these jobs based on the dependencies which are a part of the job's definition. The following is output from the autosys utility 'job_depends' and illustrates the relationship in AutoSys between the daily job and the first and second weekly jobs:

Job Name
---
wkly1-8919

Condition:
success(dday-89124) and success(dday-89125) and success(dday-89126) and

success(dday-89127) and success(dday-89128) and success(dday-89129) and success(dday-89130)

Dependent Job Name	Condition
wkly2-8918	SUCCESS(wkly1-8919)
wkly2-8919	SUCCESS(wkly1-8919)
wkly2-8920	SUCCESS(wkly1-8919)

Job Name
---
wkly2-8919

Condition: success(wkly1-8918) and success(wkly1-8919) and success(wkly1-8920)

Atomic Condition

SUCCESS(wkly1-8918)
SUCCESS(wkly1-8919)
SUCCESS(wkly1-8920)

B.2.2.2 DLT Tape Archive

An important enhancement to the automated processing procedures has been the integration of DECnsr. This allows data to be archived to DLT tape as soon as it is created and without manual intervention, freeing the disk for the next round of processing. We evaluated several approaches to automated data archiving and determined that the DECnsr Archive Server software best met the requirements. The nsr archive has two advantages over the standard nsr backup. It does not write to the on-line index file, and it has a switch to delete from disk after verifying the tape copy. Nsr archive also allows the archives to be browsed and retrieved by keyword.

B.2.2.2.3 Near Term Objectives

Continue work on improving system durability by automating the process of redistributing work assigned to a machine that is no longer available to the processing system.

Bring the programs and procedures under control of a source code management system (CVS).

B.2.3 Networking

- DEC ATM hosts were upgraded to v1.11 for Digital UNIX T4.0-2.

- SGI ATM hosts upgraded to 2.0-Beta for IRIX 6.2

- Two DEC 2100s, orange and apricot, were added to the ATM network.

- Patch for QAR 45279 that includes all ATM signaling related fixes has been applied to all Digital UNIX 4.0-2 machines.

- DEC Gigaswitch was upgraded to v1.4eft firmware. This version includes UNI 3.1 and LAN emulation support.

- Problems were discovered with the initialization scripts provided with T4.0-2. There is a limitation of the Gigaswitch/ATM that only allows it to register eight ESIs. CLIP now tries to register its own ESI and the switch rejects this (other switches don't have this limitation). DEC has added this information to the final release notes. Additionally, the 'wait' argument to atmsig command will hang instead of returning as it should when signaling has been initialized.

- ATM system initialization scripts were enhanced to deal with the v1.4eft firmware and also to eliminate the need to customize the script for individual hosts. The procedure relies on the fact that the atm ip host name ends with "-a" and looks in the /etc/hosts to get the atm ip address for ifconfig. It also allows the arp server to be specified in rc.config as long as there is a valid entry in /etc/atmhosts for the server.

The ATM network remained stable while a majority of the hosts were upgraded to DIGITAL UNIXV4.0.

B.2.4 Systems/COTS

B.2.4.1 VMS systems

- CHINOK and MISTRL were upgraded to OpenVMS AXP v6.2. MARIAH remains at V6.1 until the Sony device driver can be updated and test on V6.2.

- Three DEC 3000s were configured with 4 GB (ST Barracuda) disks, DCT-1100 DRQ3B DMA I/O modules and VMS AXP V6.2. They were named KONA, HABOOB and SIROCO.

- XDELTA proves inadequate for debugging device drivers written in C so KONA and SIROCO were configured for kernel debugging using the AXPsystem-code debugger. These machines must be dedicated to debugging since SDA uses a private Ethernet protocol and requires the host and target be standalone and on the same Ethernet segment.

- Support for OpenVMS AXP V6.2 was added to the Sony jukebox device driver. OpenVMS V6.2 included the final version of the SCSI port interface for VMS AXP and contained changes in the names SPDT entry points and data structures.

- Sony jukebox device driver was enhanced to support the WDA-330 and WDA-610 jukeboxes using the same code base.

- HABOOB was connected to WDA-610 Sony jukebox previously connected to JESSE in order to test the V6.2 driver. Test runs with the new driver uncovered problems with the robotic commands. The default SCSI connection for the V6.2 port driver does not have disconnects enabled. Testing showed that the WDA-610 jukebox would hang the SCSI bus on certain robotic commands unless disconnects are enabled on the connection.

- DCL command procedures that automate the distribution of data using juke manager were configured for HABOOB and a copy of the juke manager RDB database was exported from JESSE.

B.2.4 UNIX Systems

- These processing machines were upgraded to Digital UNIX T4.0-2: apricot, orange, imbe rambutan, enuka, ugli, canoe, guanabana. Pineapple, apple and modis remain at V3.2C.

- Andrew was upgraded to IRIX 6.2.

- Compatibility issues with Digital UNIX T4.0-2:

Sybase release 10.0 is not certified on V4.0 and the dataserver does not start on T4.0-2.

Networker client 3.1a does not work on Advfs disks under T4.0-2 and the 3.1 client does not work with a 3.1a server. Since both pineapple and apple have been upgraded to Networker 3.1a and modis is the only networker client running 3.2C modis is the only working client. This means files must be ftped to apple or pineapple or backed up using NFS.

AutoSys was upgraded to V3.2 Rel 3.

Platinum has indicated that an AutoSys client for IRIX 5.3 has been certified. IRIX 6.2 is not certified, but is not a known problem. Platinum has asked us to participated in a beta software evaluation of the next client release for IRIX should we acquire a license for the SGI Challenge.

- Compatibility issues with IRIX 6.2:

Sybase is not certified on IRIX 6.2 and we have not tested it.

Legato's ClientPak for UNIX rel 4.1.3, the latest release, does not support IRIX 6.2 so we are left without a Networker client for SGI.

The SDPTK does not build on IRIX 6.2. The problem appears related to the use of the ANSI compiler switch.

- A problem was discovered under V3.2C with sharing a StorageWorks raid disk between Sybase and Advfs when one partition allocated to Sybase and the rest to an Advfs domain. The raid disks work fine when used exclusively by either Advfs or Sybase.

- Sybase Release 10.0 was installed and the AutoSys database was moved to modis, running 3.2C, due to the problems Sybase under T4.0-2. Sybase Rel 10 is not compatible with DIGITAL UNIX4.0. We continue to run the dataserver at DIGITAL UNIX3.2c for compatibility. Sybase has indicated certification of DIGITAL UNIX4.0 is in progress for Rel 11.

B.3 Matchup Database (P)

1. Pathfinder Matchup Data Base

During this period we continued the compilation of *in situ* sea surface temperature (SST) data from moored and drifting buoys in order to build a co-temporal, co-located set of *in situ* and AVHRR data. The ÒmatchupsÓ are being used to estimate SST algorithm coefficients and to characterize algorithm performance. We have now completed the production of 1994 matchups for NOAA-11. This gives us a complete database of matchups for the entire lifetime of the AVHRR aboard NOAA-11 (November 1988 to September 1994).

We had previously generated matchups for the complete NOAA-9 cycle (January 1985 to November 1988), therefore only matchups for NOAA-7 are missing to have continuous temporal coverage of the period 1981_1994. *In situ* data corresponding to the NOAA-7 period have already been assembled and a list of times and locations at which to extract NOAA-7 data has been generated.
We have obtained optical disks for the period from mid 1981 through to the end of the 1984 NOAA-7 record.2 (day 360). These platters have been copied and matchups generated through 1983. The remainder of 1983 and all of the NOAA-7 period ((January to October, 1984) will be copied and matchups produced. It is anticipated that this phase will be completed by the end of Summer.

We are in the process of acquiring optical disks with NOAA-7 GAC data from NASA, and as soon as those become available, satellite data extractions will begin and matchups will be assembled. Finally, we have completed the compilation of *in situ* SST data for 1995, the first step towards developing NOAA-14 matchups and have copied the 1995 AVHRR data to the TL820 tape jukebox. The gap period from the end of NOAA-11 to the beginning of NOAA-14 will be filled using data from NOAA-9. Matchups will be produced for the gap period followed by generation of matchups for NOAA-14 in 1995..

Beginning with the 1994 NOAA-11 matchups, we incorporated a new source of in situ SST data: moored buoys in the northeast Atlantic operated by the United KingdomÕs Meteorological Office. These buoys provide much-needed data in high-latitude regimes, as the matchups are dominated by data from tropical and temperate regions. Also, a previously unavailable set of drifting buoy data for the Greenland-Iceland region has been obtained from NATO, and will be used in future matchup data bases.

The compilation of the matchup data base was documented. This document was made available through the World Wide Web. The documentation includes a description of the fields included in the matchup files, matchup procedures, and preliminary cloud-flagging filters. +++

2. Pathfinder SST algorithm

During this period we experimented with numerous alternative formulations for a Pathfinder SST algorithm. In close collaboration with the SST Science Working Group, we are close to defining a consensus algorithm for the Pathfinder processing. The algorithm is based on the non-linear SST formulation (NLSST) originally proposed by C. Walton (NOAA-NESDIS). In order to minimize temporal trends detected in the residuals (defined as in situ minus satellite SST), the algorithm coefficients are estimated on a monthly basis, using matchups for a 5-month window centered on the month for which coefficients are being estimated.

One of our goals during the algorithm experimentation has been to minimize the amount of bias or systematic error in Pathfinder SST estimates throughout a wide range of environmental and sensor conditions (e.g., all latitudes, all satellite zenith angles). We expect that in the next 2_3 weeks, a final consensus will be reached on a Pathfinder algorithm, and this formulation will be recommended by the Science Working Group. Once the algorithm is approved, we will immediately provide coefficient sets for NOAA-9 and NOAA-11 to JPL, so Pathfinder global SST fields can be produced in a consistent manner.

3. Transition to near-real time coefficient estimation

Until now, the compilation of in situ SST data to be used in developing the matchups has been based on historical data from archive centers (e.g., the National Oceanographic Data Center). In the last few months, we have been exploring a collaboration with the Naval Oceanographic Office to obtain near-real time SST data from multiple sources. This would allow a timely estimation of coefficients. This effort is just beginning and we expect to invest more effort in it during the second year of the Pathfinder grant.

B.4 DSP Support (M)

B.4.1 Testing:

None reported

B.4.2 Modifications/Additions to DSP:
Add MODIS prologs to source files.
Use "__unix__" when looking for UNIX systems.

B.4.3 PROBLEMS FIXED:
LIB/IO/UNPACK.C: Correct structure indexing (bp) when accessing a single band in a BIP record. Correct structure indexing (bp) when accessing a single band in a BIP record.
RATFOR: Clean up to make more portable.
Don't use getopt.c anymore, use the C runtime's.
STBIN-HDF: Fix setting of start and end orbits.
Fix use of proc_con, proc_log, and infiles.
ANLY8D: Correct type of FORTRAN function secnds. Remove minimum chlorophyll output value code. Account for cut line when interpolating APHI and APHI0 to ZPHI and ZPHI0. Add albedo to QC file temporarily as field 19.
Remove progress records from proc_log. Change ';' to '|' in proc_con.
Do not set Bad_Atmos or Bad_Lw if channel 6 <= 0.
Divide albedo by cos(theta0). Output albedo to QC file slot 19.
Set albedo to -1 if cos(theta0) is invalid (e.g. night).
Remove old version of Carder chlorophyll algorithm.
Implement latest chlorophyll algorithms from Ken Carder.
PATHNLC: Reference SST field was incorrectly interpolated (off by 0.5 deg in lat/lon). Add routines to read other coefficient files.
COLORSHR8/COLORSUB8.C: Move b00 (and c00) calculations to second loop where they are used. Correct documentation for APHI, APHI0, ATHET0.
COLORSHR8/MAKEFILE: Add logic for VMS build
BINLOC: Convert lon,lat to bin number. Writes bin number to workspace

variable WBIN.
CALLER: Re-enable code that reaps dead child processes.
LIB/VMSFORLIB: Change the check for __STDC__.
MAKE-BSD: Fix ^C handling on VMS. Use the C runtime's getopt.
LIB/WRKTLK,SPHLIB,SCREEN,SATELLITE,FB,DISPLYSHR/MAKEFILE:
Include "make.arch" instead of "make.0", it's cleaner.
LIB/HDF: Change declaration of memcpy for Irix6.2
LIB/CDFIO,RTLIB,IO: Switch over to the new way of building shareable libraries.
VMSLIB: Move the RANLIB call to the main makefile for libraries.
MIA2HDF: Test for both __unix__ and unix keywords to be certain.
DSP: Fix month output for _GDAT. It never worked right.
INC/RPC-TYPES.H: Add conditionals for the DECC headers.
LIB/RTLIB,IO,CDFIO: VMS builds shared library directly
LIB/IO: DEC C emits a new global common area.
ORBITSHR: Only extract 'geolat' from goes library.
Move calling constant into local variable.
Normal version of dfloc for orbitshr, orbit uses special version.
Add test program, remove unused routines, pass FOPTS to other makes, use correct version of dfloc.f.
Add modules used by findpole to library: satasn, timadd, xyz2ll.
ORBIT: Convert timadd.f to timadd.rat. Improve algorithm to be more robust.
Change comment character to 'c'. Change include to "miami".
Correct typo in constant (from conversion).
Clean up source formatting.
FINDPOLES: Routine timadd.f converted to timadd.rat.
Use orbitshr library instead of individual source files.
Reverse change to makefile, findpoles must build like orbit.
SSBIN-HDF: Fix use of proc_con, proc_log, infiles. Add debugs for testing.
Make sure all command line parameters are written to proc_con; add debugs for testing.
Disable testing debugs; enable Mike Darzi's "invalid" messages.
SMAP9-HDF: Fix use of proc_con and proc_log.
SCRIPP: Fix calculation of length of ingested data for Dundee format data.
Check for unsupported combination of options.
Add byte stream input logic and global variable.
Create scripp.doc which explains the various input options.
Read Dundee files which have been ftp'd (disk files, not tapes).
EXAMIN: Change defaults to dump everything; add ability to show pathnlc version information.
PATHBIN: Let mask input be optional; Change grid spacing default to 8 (from 16); handle data by scan angle; pass pathnlc version information to output file; change use of flags for quality determination.
PATHTIME: Allow for more bands due to scan angle option; make sure all inputs have same pathnlc version number; write pathnlc version number to output file.
PATHMAP: Handle data by scan angle; allow input file which contains bin number for each output pixel to save calculation time.

AVHRRSHR5/MAKEFILE:
No longer need to build ephs, refrac, etc. They are in SPHLIB.
MCSST/MAKEFILE:
No longer need to build ephs, refrac, etc. They are in SPHLIB.
PATHBIN:
Fix to handle last box on line properly.

Fix REV2LF, which converts integer row,column to lon, lat.
Correct multiple bin per pixel use of scale and ndist.
Remove portability problems.

IMG2BIT:
Map input image to bins (pixel by pixel) instead of locating input pixel associated with each output bin. Also only set a bit if land found, don't clear the bit if water (array is pre-cleared to all water).
Enhance algorithm to make sure that all the data in the input image is represented in the output image and that all bins in the output image represent pixels in the input image.
Check for needed space in output array (output grid dependent).
Check for enough space for input image.
Reformat some declarations.

IMGTOFMT:
Remove declaration of Dsp_CalEvl.

QRMPACK/QRMPACK.RAT:
Remove declaration of variable APPEND.

RATF90:
Initial version. Derived from 'ratfor'.

CONVRT/CONVRTOP.RAT:
Fix typo with end of line character.

ORBITSHR/PCAPSUB.RAT:
Declare "scopy" as external, fix typo with end of line character.
Link with libsatellite and libgoe from DSP_LIB: instead of LIB_USER:.

PATHFILL/PATHFILL.MICE:
Remove calls to "secnds", they don't do anything.

INGEST/LIB/SCANBACK.RAT:
Fix loop bounds (previous fix was wrong).

MODSST:
MODIS version of PATHNLC.

LIB/SATELLITE/ISLEAP.RAT GREJUL.RAT JULGRE.RAT:
Use ISLEAP, a new function to determine if a year is a leap year, instead of in line code.

B.5 Direct Project Support

B.5.1 SeaWiFS (S)

SeaWiFS

SSBIN-HDF:
Do statistics according to TM 32.
Fix binning algorithm (loop through width of pixel properly); add one bin per pixel binning algorithm (for SeaWiFS); put invalid value in sums (1e30) if pixel value is zero and write warning message.
Change default grid size to 8 (instead of 16); add one bin per pixel binning algorithm (for SeaWiFS). Fix "invalid data" messages; comment out mask file option; fix check for seam crossing. Attempt to fix splitting at seam for data day. It still isn't quite right for images which include the north pole. Fix use of loop index for 'this' or 'other' data day.
Fix declaration of BITS to be long instead of short. Fix check for UNIX system. Update to work with SeaWiFS I/O v4.4.
Fixed use of proc_con and proc_log. Assume a minimum value (0.001).

Use double precision in statistics calculations.
Fixed setting of binning period start and end dates.

STBIN-HDF/STBIN.MICE:
Do statistics according to TM 32. Fix error messages for SeaWiFS.
Set time trend: for daily bits start at first orbit for the day; for weekly bits start at first day of that 8-day period; for monthly bits start at first day of that month period; for year bits represent the month of the year (bit one is Jan.). Fix check for UNIX system.
Update to work with SeaWiFS I/O v4.4.
Get start and end orbits and infiles from input files to set output fields properly. Use new function DAYSINMONTH to check inputs for month products.
Use ISLEAP to determine if a year is a leap year instead of in line code.
Fix setting of input file names the time trend field, and start and end orbits. Add ability to create an "OTHER" product. New function to calculate the number of days in a given month for the give year.

SMAP9-HDF/SMAP9.MICE:
Do statistics according to TM 32. Output very large value (1e30) if input is invalid. Fix check for UNIX system. Fix spelling of CHLOR_A_K_490 input band name, and fix calibration information for CHLOR_A_K_490.
Output zero (not 1e30) for pixels not in output projection.
Update to work with SeaWiFS I/O v4.4. Fix use of proc_con and proc_log.
Add Mode and Median products. Assume a negative variance up to -1.0d-4 is really zero. Use double precision in statistics calculations.

PATHBIN-HDF:
Pathbin using MODIS HDF routines.

SPHLIB/SPHSHR.MAR SPHSHR-ALPHA.OPT:
Create external entry points for REFLEC and SUNANG.

SPHLIB/EPHS.F SUNANG2.F:
Make all constants double or single where appropriate, and use functions to specifically convert types.
Small changes to double precision code to preserve more accuracy.
Bring up to date with bin/colorshr versions.

COLORSHR/MAKEFILE EPHS.F RAYLEI.F REFLEC.F SUNANG2.F:
Reconcile duplicate files in bin/colorshr and lib/sphlib in favor of sphlib.

COLORSHR/EPHS.F:
Small changes to double precision code to preserve more accuracy.

COLORSHR5/MAKEFILE:
Reconcile duplicate files in bin/colorshr and lib/sphlib in favor of sphlib.

COLORSHR7/MAKEFILE:
Reconcile duplicate files in bin/colorshr and lib/sphlib in favor of sphlib.

COLORSHR8/MAKEFILE:
Reconcile duplicate files in bin/colorshr and lib/sphlib in favor of sphlib.

COLORSHR8/COLORSUB8.C:
Use fractional day in f0var call.
Use scan line date instead of starting date for data that crosses midnight.
Add missing declaration for ffmod().
Modify Rayleigh result to reflectance.
Calculate different atmospheric correction coefficients to facilitate removal of ozone from aerosol radiance.
Correct white cap reflectance equation.
Remove unnecessary term from 'abst' coefficient.

ANLY8D/ANLY8DBL.RAT:
Use fractional day in f0var call. Add debug code to set minimum values

for mout/pout. Add debug code to use entries 13/14/15/16 in FLAGS2_PC. Update counters for any bits set in l2flags returned by get_l1a_record. Move calls to set_calibration/set_climatology _before_ routines that use their results. Test return status of set_calibration (missing sensor calibration file is now an error). Change Fresnel calculation. Was using incorrect angle (azimuth vs. zenith). Another correction to Fresnel calculation: use correct zenith angle (satellite) and only recompute when sensor tilt changes. Change Rayleigh to reflectance. Separate atmospheric coefficients to allow ozone aerosol correction to be done and to make clear other corrections. Add alternate Carder chlorophyll algorithm when regular Carder calc fails. Remove code related to older aerosol correction calculation. Adjust usage of proc_con and proc_log to conform with specs. Add commas to format statements for f90. Interpolation of delta phi angle was improper across cut line. Change when ozone correction is applied (do it earlier). Correct white cap adjustment to radiance. Correct albedo calculation. Discard epsilon carry over result if too many pixels since last good result. Fix atmospheric calculations to more correctly apply various corrections. Yet another try at the 865 albedo calculation based on Vol. 28, pgs 8--12.

ANLY8D/HDF-IO1.RAT HDF-IO2.C:
Compute current year/day to allow day crossing by satellite data. Do not default sensor calibration file. Return error from set_calibration/get_l1a_openf if no sensor calibration file.

ANLY8D/ANLY8INOUT.RAT:
Remove explicit limit values from satellite/solar zenith angle messages. Fix spelling in RCS line.

ANLY8D/CARDER_ALT_CHLOR.C:
Initial version. Substitute algorithm if main one fails.

ANLY8D/MAKEFILE:
Add alternate chlor calc: carder_alt_chlor.c

ANLY8D/WANG2.F:
Change Rayleigh to reflectance. Modify associated calculations. Remove portability problems. Correct interpolation of rho_a(765) and rho_a(865) using ratio_x. Fix comments. Remove duplicate code. Simplify epsilon carry over check.

ANLY8D/TEST_WANG2.F:
Add in-band/out-of-band Rayleigh optical thickness information. Correct 670 Rayleigh optical thickness. Disable epsilon carry over test. Update to HowardÕs latest test suite.

ANLY8D/SeaWiFS_test_NO_Oz_wc.dat SeaWiFS_test_Oz_wc.dat:
Add new data files for updated test_wang2.f.

B.5.2 MODIS (M)
MODIS

B.5.2.1 Jim Brown has been integrating the latest MODIS Ocean Team science algorithms into the processing package for the Oceans SCF.
Jim Brown has been integrating the MODIS I/O algorithms into the processing package for the Oceans SCF. To complete this effort, valid test data files must be received to be able to verify the routines.

B.5.2.2 In the first quarter of 1996, Richard Sikorski focused on testing and updating a VMS version of the RAL model, starting from a version originally supplied by the Rutherford Appleton Laboratory.

He used the model to translate the atmospheric attenuation data into ASCII for future portability, and compared that data to published emissivities to test code and data integrity. Our data matched the published data, with our data showing better resolution.

Initially, the model produced brightness temperatures that were significantly different from expected model results. We corrected three problems:

1) Channel filters were not applied correctly to NOAA-9 channel 3, and were not applied at all to NOAA-11 channel 3. We corrected the code.

2) The set of profiles in ALBIN.2 with the VMS code was truncated. We obtained a complete version.

3) The program for reading these profiles contained a default that removed all water-vapor data from the profiles. We removed that default.

Our current VMS version of the RAL model now successfully accomplished these goals:

1) It reproduces test results that were supplied with the original model code.

2) It calculates brightness temperatures:
   Using Bramson's emissivities.
   From radiosonde profiles or supplementary SST data.
   For channels 3, 4, & 5.
   For NOAA 9 and 11.
   For pathlengths of 1 to 2 air-masses.

In addition to work on the RAL model code, we've been systematically reviewing radiosonde datasets, instrumentation, and data handling strategies. We've identified some shortcomings and resources worth attention.

1) Radiosondes for marine atmospheres are sparse (compared to terrestrial data). This is particularly true in the southern hemisphere.

2) Sensor behavior is problematic under some conditions. e.g.
   The recovery-time of the humidity sensor from saturation, and the possible effects of insolation or evaporation on the temperature sensor is not well-characterized and should be studied.

3) The standard methods for reducing radiosonde data remove some of the information needed to solve sensor and advection problems. Some non-reduced radiosondes are available, and should be used to address sensor questions.

4) Other techniques, such as GPS (UCAR/JPL) and Raman LIDAR (NASA), can deliver additional data on atmospheric composition and properties, and may develop into rich sources of profile data or corrections.

We have also located additional sources of atmospheric data that can be used with the RAL model, including:

1) The NASA/Goddard Distributed Active Archive Center
   The Assimilated 4-D Climate Data
   The Earth Science data sets e.g. TOGA/Coare Data
   The Interdisciplinary Data Collection e.g. NOAA/NASA

Pathfinder/TOVS

2) The NASA/Goddard Data Assimilation Office
The GEOS-1 Multiyear Assimilation
The Upper Atmosphere Research Satellite (UARS) Data Set
TOGA COARE Assimilations

3) The NASA/Langley Distributed Active Archive Center
The Liquid Water (lwp) data set
The Cloud Liquid Water (lwpcld) data set
The Water Vapor (pwc) data set

4) The NASA/Marshall Distributed Active Archive Center
The NASA Water Vapor Project (NVAP) Data Set

5) The NCAR Atmospheric Technology Division Research Data Program
The Tropical Ocean/Global Atmosphere (TOGA-COARE) data set

6) The NOAA Forecast Systems Laboratory (FSL) National RAOB database

7) The TIGR Radiosonde database

8) The University of Colorado
The Arctic Water Vapor Characteristics Data Set
The TOVS Pathfinder Path-P Arctic Atmospheric Data

B.6 Team Interactions

C. FUTURE ACTIVITIES

C.1 Database Future Work

C.2 Client/Server Future Work

C.3 Pathfinder (P)

C.3.2 Continue algorithm tests and Pathfinder-Reynolds comparisons.

C.4 MODIS (M)
C.4.1. Delivery of prototype ocean code to MODIS team.
Work will be oriented to finalizing V1 code for delivery to the SDST. Discussion will be held with Ocean team members to obtain changes to the science code for incorporation into the L2 programs.

C.4.2. Work with team to update product algorithms.
A significant outcome of finalizing the V1 source code will be to define the L2 and L3 file structures. These definitions are impacted more by EOSDIS system constraints than by requirements of the science code. In addition we need to finalize the QC/QA flags and their application to binning the data during production of the L3 files.

C.4.3. Work with Hughes on processing rules/scenarios.
Another impact on file definition will come from the types of support available during planning and subsequent production/file staging. This is due to the method that the OES system uses to name and track files and how these names are propagated into the PCF files. A further complication stems from the number of PGE activations that will be

practical from a system efficiency standpoint. We must devise a scheme that in within the capability of the planning system to identify the required files, for the staging and PCF file generation to be able to located the required data files and transfer this information into the PCF file and finally minimize the total number of PGE activations. The outcome of these considerations constrains the size and number of files that can be managed by the system.

C.5 SeaWiFS (S)
C.5.1 Continue testing of Gordon's algorithms and its interaction with HDF ancillary routines.
C.5.2 Continue timing tests with CZCS and SeaWiFS algorithms.

D. PROBLEMS

D.1 Database Problems

None listed separately

D.2 Processing rules.
Need to work with the SDST, DAAC and Hughes to define a processing scenario for Ocean L2 and L3 products.

D.3 Matchup Database Problems
Need to work with Hughes to define how to construct a processing scenario to extract satellite data needed by the matchup data base (a V2 issue). In addition, will the subsetting tool allow extraction of the needed L1 information or will we need to write an extraction program.

D.4 DSP Related Problems

None listed separately