MODIS QUARTERLY REPORT
- April 15, 1998 -

UNIVERSITY OF MIAMI
RSMAS/MPO

DR. ROBERT H. EVANS

NAS5-31362

==========

CONTENTS

C.1.3 SeaWiFS
C.1.3.1 General
C.1.3.2 Processing
C.1.4 Automatic Processing Development
C.2 Matchup Database
C.2.1 Historical Matchup Database
C.2.2 Real-time Matchup Database
C.2.3 Ocean Color Matchup Database
C.3 Systems Support
C.3.1 Systems/COTS
C.3.1.1 Autosys
C.3.2 ATM Local area networking
C.3.3 Tape library
C.3.4 Software Support
C.4 Team Interactions

D. Future Activities
D.1 Processing Development
D.2 Matchup Database
D.3 Systems Support
D.4 Team Interaction

E. Problems Encountered
E.1 Processing Development
E.2 Matchup Database
E.3 Systems Support
E.4 Team Interaction

A. PERSONNEL

Personnel supported for this quarter include:
B. Evans (Jan, Feb, Mar)
V. Halliwell (Jan, Feb, Mar)
K. Kilpatrick (Jan, Feb, Mar)
Kroger (Jan, Feb, Mar)
A. Kumar (Jan, Feb, Mar)
J. Splain (Jan, Feb, Mar)
S. Walsh (Jan, Feb, Mar)
R. Kolaczynski (Mar)
Wilson-Diaz (Feb, Mar)
J. Brown (Jan,)

E. Kearns (Jan
A. Li (Jan)
Harrington (Jan)

B. NEAR TERM OBJECTIVES

B.1 Processing Development

B.1.1 Pathfinder

B.1.1.1 Complete reprocessing the 1985-1998 AVHRR using version 4.2 algorithms for both the global day/night 9km fields and the new 4km fields

B.1.1.2 A document containing a detailed description of the processing used for Pathfinder GAC V4.0 is in the final development and should be available to the public within the next few weeks.

B.1.1.3 Present results of Pathfinder/OIReynolds/GOSTA comparisons at the May AGU meeting in Boston.

B.1.1.4 Perform daily Pathfinder-TOMS-SSMI comparisons to track atmospheric features through regions with typically high residuals.

B.1.1.5 Compare recent MAERI data with Pathfinder data.

B.1.2 MODIS Objectives (M)

B.1.2.1 Establish Q/A procedures using test MODIS data.

B.1.2.2 Establish MOCEAN web site.

B.2 Matchup Database

B.2.1 Correct NOAA-7 decision discrepancies and produce new set of coefficients

B.2.2 Establish new ocean color matchup database.

B.3 Systems Support

B.3.1 Establish new FloridaNET network connection to GSFC.

B.4 Team Interaction

B.4.1 MODIS-MOCEAN team meeting

B.4.2 QA testing using SeaWiFS/MODIS products

C. OVERVIEW OF PROGRESS FOR THIS QUARTER

C.1 Processing Development

C.1.1 Pathfinder processing

C.1.1.1 General

Near real-time 9km global SST derived from AVHRR is now available via the RSMAS MPO/RRSL web page, and Pathfinder products have been expanded to include a 4km coastal day and night field. Progress is continuing on reprocessing the 1985-1998 AVHRR using the version 4.2 algorithms. This effort will generate both the global day/night 9km fields and a new 4km coastal field. Pathfinder processing will be used to implement MODIS-like product resolution. Daily SST maps will be produced at 4km resolution within 800 km of the coasts using the current Pathfinder algorithm. Cloud masks will be maintained separately from the data; masks will be applied at the quality level selected by the user when the images are presented at the web site.

Vicki Halliwell has produced navigated and calibrated radiance and brightness temperatures for a sequence of NOAA-14 pass segments defined by W. Barnes for comparison with contemporaneous TRMM retrievals.

Pathfinder v 4.2 SSTs were computed for 1994 and 1985. Version 4.2 pathfinder SSTs for 1996 were delivered to JPL in January. In March, Pathfinder v 4.2 SSTs were sent to JPL for the following years: 1994 through 1995, 1997 week 38 to 1997 week 47, and 1998 week 01 to 1998 week 09.

The DLT tape archive used in the processing was moved from machine *apple* to *monstera* , and is functioning well.

Twenty weeks of new coastal Pathfinder AVHRR SST 4km product were calculated in January. Produced scan segregated files for 1991 week 20 to

1992 week 30. The Arabian Sea 4km remap was recalculated, and an InterAmeriacan Sea/Gulf of Mexico 4km remap was developed.

C.1.3 Processing

Set up automatic loading of real-time Pathfinder AVHRR SST files onto the local web site.

The three jobs required for the real-time processing have now been combined, and can be done in one pass: the regular 9km global, the 4km coastal (new), and the 4km Ron Brown-MAERI cruise section.

Dual processing streams/double spoolers/double day processors were implemented and tested.

Current versions of Autosys and auto-processing command files were put into CVS. Ran multiple sstypes from the same Autosys jobs.

C.1.4 Algorithm Development

The initial phase of estimating coefficients for NOAA-7 (mid 1981 – 1984) has been completed. A trial set of coefficients is now available that will serve as a basis for generating a data quality acceptance tree. The tree then will be used to re-estimate coefficients. This procedure is iterated until the coefficients and quality tree are stable. A final set of coefficients should be available during Spring, 1998.

Extensive evaluation of Pathfinder V4.0 algorithm results is presently being undertaken in regards to understanding trends in the global Pathfinder fields. The analysis makes use of the matchup database, daily and weekly GAC images , comparison to ship and buoy data (using binned, Reynolds OI and GOSTA climatologies), TOMS aerosols, and SSMI water vapor. Any trends which are discovered may be used in modifying the Pathfinder algorithm to minimze residuals in problematic regions of the ocean/atmosphere system.

The Pathfinder algorithm was checked for sensitivity to inaccuracies in the relative spectral positions of the AVHRR bands 3,4, and 5. This experiment was driven by similar problems with the new MODIS instrument. After reprocessing NOAA-11 matchup data, no evidence of a significant discrepancy was discovered.

In continuation of the Pathfinder diagnostic analysis for the improvement of existing sea surface temperature residual accuracy, we looked at sst residual and difference between channel 4 and 5 temperatures for various SSMI water vapor conditions. We chose the Northern Indian Ocean as the study region as this region is known to experience a large seasonal water vapor variation due to the monsoons. Also this region was a site of a series of cruises as part of the JGOFS program.

We chose five transects; three along each of the coast and one each along the equator and across the center of the Arabian sea. Along each of these transects we extracted and computed residuals (pathfinder - OIReynolds) SST, channel4 - channel5(T45) and SSMI water vapor for 1995. We also extracted data along the JOGF's cruise track's for 1995. There were six cruises along the same cruise track and in this case we calculated the sst residual as the difference between pathfinder and the ships' thermosalinographs.

The water vapor values range from about 10 to 70 mm in this region and is distributed seasonally. We observed that during periods of high water vapor (exceeding 45 mm) the error in the sst residuals tend to be negative, i.e. the satellite pathfinder data appears to underestimate the sst. The relative t45 values also appear to decrease.

We also analyzed GOES geostationary data for specific regions including Gulf of Mexico and Gulf of California. The main advantage of GOES is the higher frequency at which it samples compared to AVHRR and therefore more probability for cloud free data. We produced hovmuller diagrams for different time periods along many transects. The cloud free periods showed differential heating of the sea surface during the day and night. This diurnal signal was stronger near the coast and appears to decrease in strength offshore.

We also extracted a time series on a number of Tower Horn positions, expected to be fitted with the MAERI. The MAERI also measures sea surface radiances at very high spatial and temporal resolutions. The diurnal signal obtained from the GOES along with the MAERI will provide new and different aspect of sea surface temperature.

C.1.1.4 Documentation

Released a Pathfinder SST web-based document which includes a detailed description of the Pathfinder V4.0 sea surface temperature algorithm .

C.1.2 MODIS

C.1.2.1 General

A vBNS proposal to the NSF was submitted to establish FloridaNET that initially will include UF, FSU and Miami with an OC3 link from Gainesville to Georgia and DS3 links from FSU, Miami to UF. This network, when connected to vBNS and NREN, will provide network capability sufficient to exchange daily MODIS L1A and selected products between GSFC and UMiami. Discussions were held with NSI to provide an additional T1 to serve EOS data requirement. An alternative high speed network option was explored via NREN at cost 27k/month for DS-3. A question to be explored: does acceptable use policy include transit of EOS data across the NREN network?

Processing and archival capability for the MOCEAN SCF will be enhanced through addition of 3 DEC 4100 multi-processor computers; archival capability will be extended by addition of slave towers to the existing DLT jukeboxes. These units will be served by the existing 4100 computers due to the high I/O rates and the need to serve data to the remainer of the facility. The fiber channel disk arrays have arrived and will be interfaced to the 4100 computers. Integration of the new disks is dependent on receipt of a fiber channel raid controller and appropriate system drivers. Warner Baringer is experimenting with Hierarchical Storage Manager to better manage tapes in the DLT jukebox.

The 4100 computers arrived and were installed in March; the first DLT slave unit arrived in late March.

C.1.2.1.1 MODIS Version 2 (at-launch algorithms)

Current versions of PGE09 (ocean color), PGE10 (sst), PGE20 (L3 interim daily) were submitted to SDST on March 31 for acceptance testing. This delivery contained bug fixes, additional and improved diagnostic messages, and support for processing SeaWiFS data converted to MODIS format.

PGE20 was expanded to include the production of global maps of each data product in HDF-EOS gridded format (GCTP Geographic projection) at 36km and 9km resolution.

Also included with this delivery were programs and procedures developed to automate testing of level 3 processing.

C.1.2.1.1.1 Product File Specifications (EOS-HDF file format)

SDST requested separate ESDTs for each product and resolution due to the limited utility of product-specific metadata to disciminate betwen the various products and resolutions. These ESDT specifications have been delivered.

C.1.2.1.1.2 PGEs/ESDTs

Testing of the MODIS PGES continued. During this quarter, a 240 GB (2 days) data set of simulated MODIS data was generated using the L1A simulator developed by SDST, and archived to DLT tape. This data set was used for testing PGE49 (interim weekly/tbin) and PGE50 (reference file/mfill). We planned on creating a week of simulated data, but due to the processing time (over a week on the 16 processor SGI Origin to produce the 2 day dataset) and the storage requirements we created only two days. SeaWiFS data converted to MODIS L1B format was used for additional testing.

During this quarter we continued to develop programs and procedures to support automated processing of synthetic MODIS data and expanded to include PGE20. These procedures manage the staging of synthetic level 1 data and ancillary data, the creation of PCF and MCF files, and the execution of the MODIS PGEs (PGE09/PGE10 and PGE20).

C.1.2.2 Processing

Jim Brown is developing a program, CALEPS, to compute Rayleigh, aerosol, and water leaving radiances for SeaWiFS and MODIS. This program will permit calculation of radiances from matchup database L1 data for comparison with *in situ* observations. A separate program is now operational to extract L1 data at a specified (Lat, Lon, Time) location.

A SeaWiFS to MODIS L1 converter has been updated to work with MODIS V2 format files.

Updated file format description document and prologs to reflect changes made to MOCEAN code during this quarter. Began the task of documenting all OCEAN PGE error code messages listing the error code, associated string
,
source file or function, message meaning, and action to be taken by the DAAC. This document is required for PGE certification. Verified scaling

and unit consistency for all 36 ocean color products. Units were traced through each of the routines which derive ocean color products to certify that the dimensions of coefficients and scaling factors used within the routines were consistent. Several problems were detected and these have been corrected.

C.1.2.3 Algorithm development

It has been discovered that the MODIS infrared channels have a problem with cross talk. In order to find the extent of this cross talk interfering with the actual signal, we analyzed a relatively clear AVHRR image of full swath width(2048 X 512) and included in it a 6 pixel noise at temperature of 290k and calculated a new channel 4 temperature that has a cross talk of 0.01 percent from channel 5. We analyzed the difference between the cross talk affected channel 4 temperature and the original channel 4 temperature. The results showed that the cross talk does introduce noise that effects channel 4 temperature.

Jim Brown is investigating improvements in PGS run times using SGI 7.2 compilers. Has encountered a number of bugs in new compiler, requested patches. Jim has implemented a number of science code efficiencies to reduce PGE run time requirements. These changes involve analysis the rate of change of various coefficients calculated and used within the atmospheric correction codes. Where these coefficients change slowly relative to the 1km MODIS pixel spacing, results are carried between pixels and recomputed as necessary. The present version of the code computes coefficients on a 5x5 grid assuming 1 km pixels. Another enhancement assumes the aerosol type is uniform over a local neighborhood. Before all possible aerosol types are tested, the choice made for the previous pixel is checked to determine if it remains valid. If this assumption is valid, only 2 aerosol models are needed for the pixel, otherwise the complete suite of models (currently 12) is examined. The run time for to produce a typical L2 granule is now about 27 minutes.

The SeaWiFS/MODIS converter is being used to process a series of days, 97-265 to 97-267 to check the MODIS PGE for L2 and L3 by comparison with equivalent SeaWiFS results. This includes both space and time binning programs. This capability will be used to generate reference fields for comparison to the same products derived using MODIS observations.

An agreement with H. Gordon has been reached to generate SeaWiFS sensor tables compatible with the MODIS MODCOL PGE. This will permit generation of MODIS color products, except for fluorescence related

products, using the MODIS PGE, SeaWiFS radiances and full ancillary input data. The MODIS PGE will be modified to include SeaWiFS out-of-band and 765mn O_2 corrections. Generation of the new MODIS and MODIS/SeaWiFS tables requires the processing of approximately 200,000 radiative transfer simulations. These runs will be processed on the new DEC 4100 processors controlled by an AUTOSYS script authored by Warner Barringer and supervising data scripts produced by H. Gordon's group.

C.1.2.4 Documentation

Kay Kilpatrick has developed a draft MOCEAN Q/A plan and delivered to Wayne Esaias for comments. The document describes an initial version of the MODIS OCEANS (MOCEAN) quality assurance plan.

C.1.2.5 Quality Control

The MODIS OCEANS quality assurance plan is still in a process of development. The plan is currently being reviewed by the MOCEANS science team. The plan incorporates experiences gained with run-time and post runtime QA for CZCS global processing, SeaWiFS , and AVHRR SST Pathfinder. This effort follows a meeting at GSFC with W. Esaias, Mike Jones, A. Fleig and others to discuss finalizing a MOCEAN Q/A plan. The Q/A activities will involve a combination of activities, near real-time tracking of PGE status at GSFC, comparison of L2 and L3 granules with a running climatology at UMiami and more detailed algorithm performance checks at the individual algorithm developer's SCF. Briefly, this work will include monitoring for failed PGEs, checks for whether all available granules have been processed and included in L3 and comparison of L3 product files with reference fields. The reference fields initially will computed using input from other sensors (SeaWiFS and AVHRR) with future comparisons including MODIS AM and PM.

MOCEAN QA procedures will be performed operationally during product generation at the MODIS Processing Center (run time science QA) and some period after product generation at the MOCEAN RSMAS SCF and team member institutions (post run time science and validation QA). A MODIS OCEAN QA facility (MODAT) will be formed to provide a coordination mechanism for MOCEAN's QA activities. The goal of MOCEAN QA activities is to understanding differences due to instrumental, code/algorithm, geophysical, and biological effects.

Run time science QA results will be derived within the product generation code by:

1) analysis of selected L2 granules
2) examination of the input data and its associated QA data
3) monitoring the computational stability of the code
4) documentation of the code processing history
5) science decision making performed within the code
6) application of computational analysis of the 40 daily L3 products
7) comparison of L3 products to climatologies when available.

Post run time science QA results will be derived by:

1) application of visualization and statistical analysis procedures to generated products
2) examination of run time QA results stored in generated data products
3) analysis of temporal, zonal, meridional, secular, and regional trends of L3 generated products.

Post run time validation QA results will be derived by:

1) comparison of L3 products to in-situ observations
2) long term trend analysis of the L3 products
3) cross validation studies with SeaWiFS and AVHRR data.

The results of QA procedures will be stored within the MOCEAN standard data products following a MOCEAN protocol described in Section 6.0 of the MOCEAN QA Plan. MOCEAN QA procedures will focus on analysis of pixel level QA which contain science and quality level information.

The QA protocol developed is adaptive enough to accommodate a changing QA data stream over the life of MOCEAN while satisfying the needs of the algorithm developers, personnel performing routine QA of generated products, and the data users. The protocol includes examination of both production information and pixel level QA results stored in science data sets (SDS) generated at the time of execution (non-searchable) to perform run-time processing and post run-time science QA. The status of QA results for a granule/product will be communicated by frequent updates to searchable granule/product level ECS QA metadata as a granule/product moves end-end through the QA procedures.

Progress has started on the MOCEAN Strawman Test Plan for DAAC System Certification. In conjunction with Mike Jones at the Goddard DAAC, we worked on the test plan for MOCEAN system certification. This test plan covers 3-5 days in the life of MODIS Oceans and involves:

1.0 System certification plan
    1.1 System certification to test PGEs
    1.2 GSFC DAAC test production
    1.3 GSFC DAAC test production schedule
    1.4 Test data requirements
2.0 MOCEAN testing of ECS QA interfaces
    2.1 Data order / browse test schedule
    2.2 Subscription test schedule
    2.3 QA metadata update test schedule

C.1.3 SeaWiFS

C.1.3.1 General

During this quarter we continued to develop programs and procedures to support automated processing of SeaWiFS data and expanded processing to include the generation of daily maps. These procedures manage the transfer and archiving of files from the DAAC, staging of data and ancillary data and the execution of the SeaWiFS programs.

C.1.3.2 Processing

The SDST SeaWiFS-to-MODIS l1a converter was added to the standard processing stream to generate additional test data for the MODIS PGES.

C.2 Matchup Database

C.2.1 Historical Matchup Database

Continued to assemble near real time in situ buoy data from 1997 for the archive SST Matchups. Began analysis of NOAA-7 matchups to develop cloud tests. Decision trees developed using the same input parameters as NOAA-14, and NOAA-11 did not perform well (misclassified ~20%) for NOAA-7. We are exploring the use of other input parameters in NOAA-7 tree models and attempting to understand the differences in the response of this sensor.

C.2.2 Real-time Matchup Database

Real-time matchup creation and analysis continued to operate smoothly.

C.2.3 Ocean Color Matchup Database

Continued to collect in situ optical data from validation sites and develop scripts for processing and analysis of in situ data. We are presently processing the SeaWiFS L1A LAC collected over the MOBY site in Hawaii with MODIS algorithms. When this is complete, a matchup data set with the in situ data from the MOBY buoy will be created and analyzed.

C.3 Systems Support

C.3.1 Systems/COTS

C.3.1.1 Autosys

Added procedures to process SeaWiFS/MODIS and MODIS-simulated data sets.

C.3.2 ATM Local area networking

Planning and preparations for the DS3 circuit to VBNS via FloridaNet are in progress. Cisco Lightstream ATM switch and 7507 router have been installed. An OC3 link between the campus ATM network and the Lightstream is up and communicating over PNNI-0 (IISP). We have started testing with LANE and RCF1577 ATM on the 7507.

C.3.3 Tape library

The two original TL893 tape jukeboxes were moved from Alpha 200's to the 4100's in order to accommodate an additional two slave jukeboxes. Each master and slave combination will function as one virtual jukebox with a storage capacity of 20 TB.

C.3.4 Software Support

Angel Li is implementing EOS/HDF support for mapped L3 files, and will support Plate Carree projection.

Updated algorithms and coefficients files were received and integrated into the MOCEAN PGEs. Sue Walsh has tested the V2 PGEs using both simulated MODIS L1b (V2) data files and the converted SeaWiFS L1 data. The MODIS input is used to verify format compliance and the SeaWiFS data used to verify execution times and functionality of the various product algorithms. The V2 code base has been delivered to SDST.

C.3.4.1 Modifications/Additions to DSP

MSPC: MODIS version of pathspc.
LOCATE8D: Determine scan/element for lat/lon (SeaWiFS).
CALEPS8D: Displays radiance info for given scan/element (SeaWiFS).
DIVC: New program to divide files using calibrated values.

C.3.4.2 DSP Problems Fixed

BINSHR/STRIPANDAPPEND: Correct string constants (‘ ‘ should be “ “).

BINSHR/SETUPL3B: Fix size of level 3 bands (3 bytes of flags are really in a 4 byte field).

BINSHR/MAKETIME: Remove extra parameter. Fix time string.

Change date part of string to be yyyyddd. Make date part: yyyy-mm-dd

BINSHR/SETTBINMETA: Move routine from mtbin since all other level 3 programs use it. Change metadata value geolocation to Geolocation. Fix dataday string in metadata.

BINSHR/PGS-UTIL: Use version properly.

BINSHR/OPENMASK: Reference functions as functions.

BINSHR/L3IN,L3OUT,MAKEFILE,LEN_STR: Move len_str.f from atmcorshr. Change attribute “L2 Flag Usage” to “Common L2 Flag Usage”. Change 3 byte flag fields to 4.

BINSHR/L3IN,L3OUT: Put both “L2 Flag Names” and “Common L2 Flag Names” attributes in all L3 files.

BINSHR/L3IN: Fix prologs. Put more info in error messages.

BINSHR/L3OUT: Don’t write out ‘orbit’.

BINSHR: Add quality bit flag descriptions. Remove orbit, just use start and end orbit numbers.

BINSHR: Move some constants from sum_structure to bindefs so sum_structure doesn’t conflict with the mspc version.

BINSHR/BINDEFS: New include file for common constants so sum_structure doesn’t have to be included in library routines.

BINSHR/BIN9KMF: Move common block initialization into block-data routine.

BINSHR/SUM_STRUCTURE: Some structure changes so msbin can bin all bands in a file at the same time.

MCLOUD: Use common level 3 i/o routines. Use parameter constants for pcf LUNs.Change program name from msstcloud to mcloud. Use commoninout include file. Remove unused variables. Use v2 metadata stuff. Fix prologs.Trim spaces from the end of the flag names. Fix use of PGS_SMF_*. Use both common and l2 flag strings. Fix check for end of file. Fix quality value change (modis values are backwards, 0 is good, not bad). Library

hdfeos must be before Gctp. Fix use of orbit numbers. Correct string constants (change ‘ ‘ to “ “).
MFILL: Use common level 3 i/o routines. Use parameter constants for pcf LUNs. Use commoninout include file. Remove unused variables. Use v2 metadata stuff. Add new flag bands. Comment out code that is ifdef’d out. Use
WATBINS for assumed output size (global, water only). Fix use of PGS_SMF_*. Fix end of file handling; fix array parameters for forcheck. Library hdfeos must be before Gctp. Change input and output LUNs so can run in same PGE as mtbin. But mmap can’t input mfill output (reference image) in same PGE as mfill. Fix use of flag_names. Remove debugs.
MMAP: Use common level 3 input routines. Add calculation of missing pixels for QA metadata. Update metadata. Allow mapping of new flag bytes. Use commoninout include file. Remove unused variables. Add new flag bands. Comment out code that is ifdef’d out. Use proper pcf lun for input. Fix prologs and some little stuff for the fortran checker. Some silly changes to quiet the modis forcheck. Initialize file identifier. Only close file if it was opened. Use both common and l2 flag strings. Fix handling of lunin; and fix check for quality level. Fix use of orbit numbers. Use HDFEOS grid for output file type. Library hdfeos must be before Gctp. Fix use of LUNs so can run mmap in same PGE as mtbin and most other L3 programs (except mfill). Fix use of orbit numbers. Use temp file to find LUNs for input, output, and parameter files. Use parameter file to specify which value to output, and the pixel and line size of the output map. Don’t scale the data (output reals instead of bytes) if the equation is zero. Fix sds name in output file; fix declaration of qualdesc. Output WQ.
MODCOL: Make sure the output to iaddr is defined as PTR. Change attribute name to “Common L2 Flag Usage”. Properly reference the geolocation information. Call ascdscsub with the correct line number. Fix use of land/sea mask. Add code/input variables to allow pixels to be unprocessed (common flag bit 1). Add pixel subsampling code. Still have to fix FLH/CFE averaging section. Use PGS_SMF_* as functions not subroutines. Make cldmsk (MOD35) optional. Add comment indicating ‘aersol’ array is not used. Change MAX_INPUT to MAX_INPUT_L2 because of compiler complaint somewhere else. Use ftrim as a function, not a subroutine. Put Carder chlorophyll in DR2 file. Finish implementing value check when reading
data file. Correct spelling of contributor. Implement changes to work with SGI F90 7.2. Correct parameter to PGS_IO_GEN_OPENF (recordlength) for formatted file. Correct internal reads. Move libanc into source tree. Modify options for F90 7.2. Correct error in calling

PGS_IO_GEN_OPENF (must initialize RECORD_LENGTH). Move initialization of common block variables into BLOCK DATA module. OZONE2 and OZONE3 entries in mice table had incorrect OZONE#_LUN constants. Add flags3/flags4/flags5 pixel summary variables (for various debugging tests). Add saturated pixel test. Set bits in flags5 as needed. Disable setcolqual routine (not finished). Correct text in output messages. Change subroutine to function. Declare un-typed variables. Move input count tests earlier in sequence. Don't do aerosol calculations if 765 or 865 is invalid. Change way GOODLWX/GOODLWY are computed. Add more parameterization of array sizes/loop bounds on such arrays. Use f90 btest/ibset functions (if f90 compilation) instead of iand/ior. Fix initialization of some flag arrays (index variable wasn't being used in array reference .. was a constant subscript). Remove or comment out unused code. Upgrade bit setting to use f90 functions. Use f90 bit set function. Set B_Lw_Counts_Lw when input counts are negative. Set all 3 B_*_Cloudy at the same time. Set B_Dr2_Carder_In. Use setcolqual to set quality values. Set B_Dr1_Base_In. Fix the L2_flag bit names for the Dr1 (MODOCL2A) file. Add Cloudy to dr1 and dr2. Pass a parameter to exit. Move local function declarations to remove C compiler warnings. Change cosd(x) to cos(rad(x)) to remove compiler warnings. Optimize rad(x)/ang(x) ASF functions. Make Aer_Model* names consistent between L2 and QC files. Change metadata value geolocation to Geolocation. Use constants for units - U_* from commoninout. Move LUNs to start of common area. Library hdfeos must be before Gctp. Change value of reprocessing metadata from "none" to "processed once". Correct calibration/units of output products. Correct conditionalization of bit testing. Detect SeaWiFS input file, pass flag to atmospheric correction. Correct FLH/CFE calculation (scaling problems). Added functions to correct SeaWiFS 765 data. Add SeaWiFS specific calculations enabled by input flag Seawifsinput. Use SeaWiFS aerosol files with SeaWiFS input data; MODIS with MODIS. Add additional diagnostic output for certain errors. Use SeaWiFS Rayleigh tables with SeaWiFS input data. Improve error messages. Add missing call arguments (SeawifsInput) to Rayleigh routines. Add additional diagnostic message. Add comments on 13L/13H and 14L/14H band order in L1A file. Correct string constants in calls ('.' should be "."). Correct a# string format in format statement (was too small). Remove part of a compiler work-around. It was only needed for f90. Don't print statistics if exiting due to error, just close files. Fix generic descriptions of units.

MODSST: Use PGS_SMF_* as subroutines, not functions. Change the attribute "L2 Flag Usage" to "Common L2 Flag Usage". Put bad pixel count into QA % missing data, instead of QA % out of bounds data. Fix use of land/sea mask. Fix calculation of ascending/descending lines. Add code to not process every other line and/or pixel. Make cldmsk (MOD35) optional. Use

PGS_SMF_* as functions. Use list directed reads, and fix error message handling. Fix subroutines/functions and bit handling to satisfy forcheck. Fix a day/night check. Set the common flags B_Hi_Sat_Zen,B_Hi_Sol_Zen. Fix check for ok pixels. Fix setting of QA %'s. Fix record length for fortran formatted read. Pass a parameter to exit. Add subsample[xy] parameters. Add comment in mice table to show that subsample[xy] are taken from the mice table and not the params file. Change metadata value geolocation to Geolocation. Use constants for units - U_* from commoninout. Library hdfeos must be before Gctp. Add coefficients for sst4 product. Fix equation for SST4. Only check asc/desc at normal end (not after an error). Only output statistics at normal end. Add coeffs for sst4. Change reprocessing metadata from "none" to "processed once". Change comment in mice table about parameter file and pcf. Check in routine to set the quality values. Fix bit checking and setting. Correct string constants (' ' should be " ").
MSBIN: Change the attribute "L2 Flag Usage" to "Common L2 Flag Usage". Remove output filenames from the mice table. Remove unused variables. Fix 3 byte flag fields, since they are actually stored in 4 bytes. Use PGS_SMF_* as
subroutines, not functions. Convert %loc(x) to iaddr(x). Make sure iaddr and things receiving its value are declared as 'PTR'. *.rin files shouldn't be checked in. Fix size of flag bands. Try to fix dateline/pole/data-day splitting problem. Don't declare subroutines. Remove some debug print statements. Fix subroutines to declare array parameters properly. Fix time string parsing. Fix looping problem to bin all bands correctly. Fix some old, incorrect changes in the grid calculations. Fix grid point calculations. Don't bin 'unprocessed' pixels. Write pieces to correct output file. Reference functions correctly. Add more info to error messages. Fix loop bounds for reading l2_data. Make internal reads compatible with SGI 7.2 F90 compiler. Fix usage of RECLENGTH parameter in call to PGS_IO_GEN_OPENF. Fix integer*2/integer*4 problem. Fix compiler complaint. Move local declaration. Indicate variable is static. Work around bug in SGI F90 7.2 (can be restored later). Fixes so iand() call arguments are of same type (kind). Update for SGI F90 7.2. Fully optimize program. Handle variant input data for time. Improve checking for value sizes. Fix metadata for split pieces. Pass a parameter to exit. Bin all bands in a file at the same time. Fix string length logic. Cache last result (gets re-used several times). Check for put_l3b_recordf errors correctly. Fix use of sums array. Comment out some old ifdef'd out code. Put both "L2 Flag Names" and "Common L2 Flag Names" attributes in all L3 files. Change metadata value geolocation to Geolocation. Describe use of quality bits in output file. Change units for sum_squared band to show they've been

squared. Library hdfeos must be before Gctp. Change metadata value for reprocessing from “none” to “processed once”. Fix bit handling; fix dataday stuff. Correct strings in certain calls (‘ ‘ should be “ “).
MTBIN: Use PGS_SMF_* as subroutines, not functions. Use common level 3 i/o routines. Fix C style comments. Fix format statement. Move settbinmeta.rat to binshr. Fix prolog (again?!?). Use temp file with output and input LUNs and versions. Fix 3 byte flag fields, since they are actually stored in 4 bytes. Remove unused variables. Fix QA % calculations. Convert %loc(x) to iaddr(x). Make sure iaddr and things receiving its value are declared as ‘PTR’. First attempt to read temporary list file with which inputs and output to use from pcf. Read temporary list file for input and output luns and versions. Reference functions properly. Convert ftrim to a function. Change read to list directed. Correct reclength parameter value. Fix bit handling. Put both “L2 Flag Names” and “Common L2 Flag Names” attributes in all L3 files. Change input parameters for start and end datadays. Library hdfeos must be before Gctp. Fix use of orbit numbers. Add quality bit flag descriptions. Begin and end dataday are now strings, not integers. Update prolog. Use binning period for file start time. Fix use of single and double quotes. Input was changed from yyyymmdd to yyyyddd. Fix use of single and double quotes. Use $COMSIZ for the length of qualdesc.
SCRVERIFY: Handle end-of-year rollover.
lO/DSPLIB: Release memory allocated by MakeOneLine.
MODISlO/OCEANS_SMF_SetDynamicMsg: Use PGS_SMF_* as functions not subroutines.
MODISlO/L1B_Geo_Cld_Interface: Make MAPI optional (default without). Fix comment delimeter. Add check for error from Vend.
MODISlO/mod_get_l1b_attr_v2: Changed calculation of yearday and msec to account for leapsecs. Fix smsec and emsec calculation (they are int not short int).
MODISlO/V2_META: Changes to work with new mcf files. Add values to failure print statement. Fix string lengths to be long enough for any PSA name.
Fix some metadata values. OrbitNumber is no longer in level 3 files.
Fix string for ReprocessingPlanned metadata, and update a comment.
MWRAP: Use PGS_SMF_* as functions not subroutines.
MOCEAN/MOCEANCLOSE: Fix spelling in comment.
MOCEAN/MOCEANREAD: Return unique error values.
MOCEAN: Add HDFEOS grid file type.
ANC/GETANC: Add clarifying error message. Return additional diagnostic information to caller in qc vector.
ANC/JULIAN: Change from f77 to f90. Use parens to emphasize result. Define variables, instead of relying on implicit statement. Put type

declarations before data statement.
VMSFORLIB/EXIT: Upgrade makefile to conditionally compile module for SGI 7.2 compilers. Add parameter to exit, even though it isn't used, to satisfy modis fortran checker. Fix variable declaration.
MSPC: Use proper lun for output file. Fix use of pgs_smf_*. Change use of sx and sxx to be like binner. Library hdfeos must be before Gctp. Fix use of byte, short int, and integers. Use parameter file instead of pcf forcommand line variables. Use temp file to get input and output and parameter file LUNs and versions. Use $COMSIZ for the length of qualdesc.
Check for end of input file (don't process bin zero). Stop at last populated bin.
DAYBOUNDS: Fix lun for Reynolds file. Fix use of PGS_SMF_*. Pass a parameter to exit. Library hdfeos must be before Gctp.
MCOLSHR8/GET_CLIMATOLOGY: New version of hdfio/Anc_Files requires changes in get_ancillary parameters.
MCOLSHR8/COLORSUB8: Don't call hmf8 routine. Results not used by caller of coloop. Keep good humidity values. Correct format of output value. Add diagnostic prints. Fix calculation of ianchr. Ifdef out debugs.
MCOLSHR8: Update location of ancillary include files.
MCOLSHR8: SGI F90 7.2 doesn't like ',' except in list context.
MCOLSHR8/CALLCW: Put return statment inside error test conditional.
ATMCORSHR: Don't build hmf8.f. No longer used by colorsub8.c.
ATMCORSHR/COLORIN1: Restore pixel subsampling (MULT > 1).
ATMCORSHR/ACOSS,ASINN: Fix prologs.
MSSTSHR5/AVHRRSUB5: Remove subroutine hmf8. Stop using arrays AERSOL and AERMLT. Correct conditional compilation. Pass a parameter to exit.
MODINC/OCEAN_LUN*: Add more luns to include files. Parameters must be typed.
MODINC/COMMONINOUT: Change flag names to upper case. Use first common flag to mark unprocessed pixels. Change MAX_INPUT to MAX_INPUT_L2 because of
compiler complaints. Fix BD_Dr1_# comments. Add Cloudy flag in output files. Add size for cloud flag array. Add flag name for Dr1's, L2_flags, Chl_a_in bit (B_Dr1_Chl_a_In). Make Aer_Model* names consistent between L2 and QC files.
MODINC/CVTCOMGOE: Add filler to common area to match other include file.
MODINC: Fix prologs. Save common areas.
PATHDR: Use correct type for variables holding an address.
Correct format of subimagepassdate value (YYYYMMDD instead of YYDDD).
L3M2MIA: Set the start time and dates in the subimage header and nav block.
MOSAIC9: Increase number of input bands.
PATHQUAL: Handle 3 bit quality values.
PATHREF: Handle 3 bit quality values.

PATHLOAD: Handle 3 bit quality values.
PATHNLC: Change bands for allb == 6. Fix tree test for noaa14.
Check in Arthur's (old) stuff. Add -Nn option for SGI.
PATHBIN: Increase optimizer table size.
PATHBINANG: Add 3 bit quality values. Change some of the output bands for various allb's.
STATS: Increase maximum lines in internal array (from 1024 to 2048).
PATHBIN4K: Larger value of AABINS for 4k binning.
PATHSPC4K: Larger value of AABINS for 4km binning. Use the include file from pathbin4k for all *4k programs so there is only one copy.
RATF90: Add blank between "include" and "'filestring'". SGI f90 7.2 gets confused. Underscore is an allowed name character. Don't split line inside an identifier.
RATFOR: Add whitespace between "include" and "'filename'".
COLORSHR8/COLORSUB8: Correct prolog.
IMG2BIT: Update documentation.
MINMAXS: Correct program name.
STBIN-HDF: Correct seawifs library paths.
SMAP9-HDF: Correct seawifs library paths.
SSBIN-HDF: Update seawifs library paths.
ANLY8D: New land mask support routines. Update seawifs l1/l2 i/o interfaces.
Misc. corrections and changes. Replacement chlorophyll routines (replaces swf*.c). Merge newest parameter changes. Merge in newest functional changes. Fail pixels that have Lt-Lr <= 0. Flag any pixel with any corrected total radiances <= 0 with atmos corr fail. Change hightau1 default to match operational default. nLw670 was computed wrong (2 divides by tstar) this is fixed. Remove logic that sets the cloud flag if there is
negative nLw and not shallow. Use the SeaBAM pigment instead of the older algorithm's pigment in determining the turbid regions. The change marginally increases the # of turbid flagged pixels in the data. 02Mar98 seawifs project change. Use new diffuse transmittance files. Change sign of second parameter (sense different in new files).
RECLEN: Remove limit on record scanning.
CALEPS8D: Add logic to select area of interest. Fail points that have Lt - Lr <= 0. Add bit flags variable to mirror flags2_pc. Disable more output code. Add pixel summing variables. Disable more output code. Add initial tabular output. Add rms calculation. Revise output formatting. Add position and geometry data to output. Merge changes from anly8d: nLw670 was computed wrong (2 divides by tstar) this is fixed; Remove logic that sets the cloud flag if there is negative nLw and not shallow. Use operational default for hightau1. Output uncorrected L_t values. Exchange

ZPHISA and ZPHI. Had them mixed up. Add comments to source. Use new diffuse transmittance files. Change sign of second parameter (sense different in new files).
TROUTC: Pass output image size to drawing routine (call VBUFSZ). Add new entry point VBUFSZ. Add code to check for line segment wrapping horizontally from right image edge to left image edge when start/end points are close to their respective edges. When this happens break the line into two pieces (start,first-edge) and (second-edge,end).
LOCATE8D: Took out too much. Restore sensor calibration file logic. Missed another initialization. Outputs more reasonable now. Enhance printouts. Additional debugging output. Construct matrix of closest points and determine relative weights. Solve for (fractional) line/pixel of specified location. Correct matrix filling. Add more fill cases. Test for too much data. Correct indexing for np>nl case in find_pct. Disable some outputs. Add result line. Script to generate extractions from images given date/locations/images. Add test for no intersections (point not found). Add more output to shell script. Fix syntax error in echo command. Summarize output of generate.pl. Some images return 4 pairs of points. Clean up output. Test for error condition. Add missing header item. Add delta-phi calculation. Rename delphi to satphi. Compute delphi. Adjust precision of outputs to keep everything within 80 characters. Adapt to new output format from locate8d. input files moved.
IMG2HDFBIT: Library hdfeos must be before Gctp.
IO/VAX_EXTRACT: Solve problem with extract_float accessing data unaligned—use extract_long as a model of how to fetch input data.
VHRR: Set Variable INRDLY to TRUE for read-only input file (was wrong).
DISPLYSHR: Explicitly initialize note() signal handling routine from cc_comint.
CALLER: Improve diagnostic messages for process termination.
MAKE-BSD: Change status from wait_t to pid_t. Modify conditionalization. Fix entry for DEC OSF. Adjust include paths.
ANLY6F: Merge in appropriate pieces from other directories (the other source areas are diverging from what anly6f expects). Remove unnecessary items from makefile. Add sources from other directories so we have known versions. Add missing arguments to coloop calls (alon, alat).

C.4 Team Interactions

Attended SeaWiFS meeting Baltimore 5-9. Discussed upcoming SeaWiFS initialization cruise and subsequent calibration procedure.

Participated in SST Miami SST workshop. Observed calibration and comparison of radiometers and standards utilized by various laboratories.

Discussions with DAAC for SeaWiFS and MODIS data delivery via DLT tapes. GDAAC personnel agreed to distribute SeaWiFS L1 data to Miami via DLT tape for bulk reprocessing; ongoing data deliveries will utilize the NSI T1 link. Miami will copy and return the DLT tape to the GDAAC.

Dennis Clark, H Gordon and R Evans met at NESDIS to discuss SeaWiFS initialization. Dennis provided station (MOCE) and buoy (MOBY) observations. C. McClain has arranged for the corresponding SeaWiFS LAC passes to be transferred to Miami. Jim Brown has developed an extraction procedure to acquire satellite pixels that correspond to the surface observations. Jim has created a program CALEPS that computes surface, Rayleigh and aerosol radiances for each of the aerosol models. These radiances are then compared to the surface observations to help determine sensor calibration adjustments.

Following discussions with MOCEAN team members and Ed Masuoka, we have defined required channels for ocean product processing based of L1A input. Discussed reduced number of channels for L1A data, will need 19 channels: 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 20, 22, 23, 26, 30, 31. In addition, we will need PGEs to compute cloud mask, geolocation since is will be less expensive to recompute these fields as needed rather than archive on tape.

NOAA Ron Brown cross-Atlantic MAERI cruise along 24N during January was supported by computation of daily 4km SST fields for the subtropical Atlantic.

Set up exchange with Italy for Emanuele Bohm to work part time at RSMAS, Viva Bazon will work with H Gordon and us to review ocean color products produced using CZCS and SeaWiFS data. The data sets will be processed using equivalent algorithms to produce a baseline time series. These fields will complement the MODIS fields produced using the SeaWiFS/MODIS converter.

D. FUTURE ACTIVITIES

D.1 Processing Development

D.1.1 Pathfinder

Search and display capabilities on the RSMAS Pathfinder AVHRR SST page will be enhanced over time to include selected-area movie loops and the

ability to display SST at a selected quality level. This approach will be expanded to include MODIS products.

D.1.2 MODIS

Continue testing MODIS PGEs, interact with MOCEAN PIs to analyze product fields.

Submission of final version of MOCEAN Q/A plan.

Integration of next generation ocean algorithms (from Carder and Gordon). The Carder algorithm utilizes SST to select absorption coefficients in the chlorophyll algorithm. The new Gordon algorithm includes code to discriminated between absorbing and scattering aerosols.

D.2 Matchup Database Future Work

Finalize first version of SeaWiFS calibration derived from initialization cruise and MOBY mooring data.

D.3 Systrems Support

Startup of FloridaNet/vBNS; startup of second NSI T1 circuit.

Receipt and integration of second DLT slave unit.

Receipt of fiber channel raid controller, fiber channel system driver and integration of disk system.

Examine SST retrieval algorithm to extend into higher water vapor concentrations. Present algorithm becomes negatively biased at integrated column water vapor levels of 40mm.

Processing of available SeaWiFS L1 data through MODIS PGEs. Produce first version of reference fields.

D.4 Team Interactions

MOCEAN Meeting

MODIS Team meeting

Spring AGU meeting

MODIS/ECS meeting

E. Problems Encountered

E.1 Processing Development

E.1.1 Pathfinder

Equipment problems affected real-time data transfers in January.

Orbital elements have not be automatically updating (September-January), so real-time files were recalculated.

Tried to add two new processing machines - failed to behave properly - later found that their names were too long.

E.2 Matchup Database

Decision trees developed using the same input parameters as NOAA-14 and NOAA-11 did not perform well for NOAA-7.

E.3 Software Support

None reported seprately.

E.4 Team Interaction

None reported separately.