Bimonthly Contractor Report for NAS5-99094

Period Covered: April though May, 2003

General Discussion

Contract NAS5-99094 was initiated on December 1, 1998. The first 1-year option, consisting of Tasks 1 - 5, was completed on November 30, 1999. A second 1-year option, consisting of Tasks 6 - 10, was initiated on December 1, 1999. The third 1-year option, consisting of Tasks 11 - 15, was completed on November 30, 2001. The fourth 1-year option, consisting of Tasks 16 - 20, was completed on November 30, 2002. The fifth 1-year option, consisting of Tasks 21 - 25, was initiated on December 1, 2002. Tasks 21 - 25 cover specific activities in support of 3 major sensor programs, each with a separate NASA Principal Investigator (PI). Accordingly, the bimonthly narrative is organized such that each of the programs are discussed separately with individual task activities presented within each of the programs. Acronyms are used throughout the report to keep the writing succinct. An attached glossary contains definitions for these acronyms.

Airborne Oceanographic Lidar (AOL) (Global Carbon Cycle)

Task 21 - Mission Planning and Execution and Sensor Operation and Calibration

Mission Planning

The memo-of-understanding between NASA GSFC and the NOAA Beaufort Marine Laboratory for cooperative field activities to commence in spring, 2003 that was being considered during the previous reporting period was delayed in the review process by the NOAA legal council. Therefore a MOU between the NOAA Aircraft Operations Center and NASA Wallops Flight Facility was initiated in order to directly pay for the aircraft flight time. The memo-of-understanding provided for approximately 50 hours of surveying.

The new calibration laboratory optical set-up was used in testing the ADAS and CDAS systems. Data was analyzed and some differences found between previous year's calibrations and this new calibration. Analysis of both ADAS and CDAS data taken during the Spring Mission post flight calibration showed that the differences were outlying data, and that the calibrations for previous years and the post mission for this year were in fairly good agreement.

The AOL3 system was mounted in the NOAA Twin Otter and ground tested in March and continued flying research mission into April. During this spring a total of 9 missions over the Delaware Bay, Chesapeake Bay, Pamlico Sound and Atlantic Ocean areas were flown. This spring has been plagued with cloudy conditions, as a result fewer missions were flown. The

AOL3 systems remained on the Twin Otter until the end of the aircraft availability window on April 15. The missions over the Pamlico Sound area were paid for from separate funds the NOAA Beaufort Marine Lab provided to the NOAA Aircraft Operations Center. Table 1 is a listing of the various missions along with the length of the mission and the staging areas utilized for conducting the various flight legs.

The WFF Aeronet CSPOT sensor is functioning properly. The unit is operational, and data is posted on the website.

Sensor Calibration

The new calibration laboratory optical set-up was used in testing the ADAS and CDAS systems. Data was analyzed and some differences found between previous year's calibrations and this new calibration. Analysis will continue after the post flight calibration of both instruments. In addition test were initiated on a micro-UV-spectrometer to be utilized in locating harmful algae blooms (HABs). Arrangements have been made to transfer the sensor to the University of North Carolina where software previously developed by UNC for a micro-visible-spectrometer will be adapted for operating the new sensor. Further testing of the micro-UV-spectrometer are expected in the next reporting period.

Field Missions

The NOAA Twin Otter transited from Florida to WFF on March 13. The loading of the AOL instrument suite was initiated on March 14 and completed on March 18. An initial mission to check instrument functionality was flown on March 19. Collaborative flights coordinated with Dr. Jon Sharp of the University of DE were conducted on March 22 and 24. A pair of missions to survey the Pamlico and Albemarle Sounds on March 23 was coordinated with Dr. Pat Tester of the NOAA Beaufort Marine Laboratory. A mission into the Mid Atlantic Bight was flown on March 25. This mission was designed to be flown during the late afternoon such that ambient radiation solar conditions were significantly different between the outbound and inbound passes in order to demonstrate the effects of ambient light saturation on laser-induced chlorophyll fluorescence. Results of this experiment as well as the Delaware Bay and Pamlico and Albemarle Sounds will be reported during the next reporting period. Preliminary results can be found at http://aol.wff.nasa.gov .

Additional Activities

The WFF Aeronet CSPOT sensor is functioning properly. Minore antenna and alignment problems occurred during the reporting period and were fixed after consultations with GSFC. The unit is operational, and data is posted on the website.

Table 1

Flights During the 2003 Spring Campaign

Date	Airports	Survey Location	NASA Hours	NOAA Hours	Total Hours	Success
3/13/2003	SUA/CHS/WAL	Transit	2.6	2.6	5.2	NA
3/18/2003	WAL-WAL	Instrument Check	0.9		0.9	Yes
3/22/2003	WAL-WAL	Delaware Bay	3.0		3.0	Yes
3/23/2003	WAL/MRH/MRH/WAL	Pamlico/Albemarle	0.0	8.5	8.5	Yes
3/24/2003	WAL/DOV/WAL	Delaware Bay	6.2		6.2	Yes
3/25/2003	WAL-WAL	Mid Atlantic Bight	3.8		3.8	Yes
3/31/2003	WAL/MTN/WAL	Chesapeake Bay	3.4		3.4	Yes
4/1/2003	WAL/ESN/WAL	Chesapeake Bay	3.5		3.5	Yes
4/3/2003	WAL/MRH/SBY	Pamlico/Albemarle	0.0	8.0	8.0	Yes
4/4/2003	SBY/WAL	Reposition	0.0	0.3	0.3	NA
4/13/2003	SBY/GBK/WAL	New York Bight	6.2		6.2	Yes
4/14/2003	WAL-WAL	Mid Atlantic Bight	3.5		3.5	Yes
4/15/2003	WAK/CHS/AOC	Transit	2.6	2.6	5.2	NA
					0.0	
					0.0	
Total			**35.7**	**22.0**	**57.7**	

Task 22- Data Processing Cataloguing and Archiving

Data acquired during the field missions during spring, 2003 were backed up onto DVDs and placed in the AOL archiving system.

Task 23 - Data Analysis Interpretation and Reporting and Laboratory Analytical Support

Active laser data from the Spring 2003 data missions was rapidly processed, and results showed nominal instrument performance, and were posted on the website. The results from several missions were of interest, including repeated missions over the Chesapeake Bay and Pamlico Sound regions. Processed data from the missions flown within the Pamlico and Albemarle Sound complex have been distributed to the NOAA Marine Laboratory in Beaufort, NC.

Investigations studying the measurement of the Raman signal for dissolved carbonate ions were awaiting new instrumentation. More testing will occur when an improved spectrometer is received.

Ocean Color Satellite Analysis

Modifications were made to our existing SeaWiFS processing code to archive more of the satellite data needed for the analysis of IOPs matched to the global in-situ Chlorophyll data set. The entire SeaWiFS data set was reloaded and reprocessed through the updated IOP inversion code. The software used to produce IOP imagery was updated to work with the new archived data set format.

The SeaWiFS IOP image library was updated to catch up with data delivered to date.

An on-camera interview was conducted with the American Institute of Physics to discuss the results published in Geophysical Research Letters, on effects of Hurricanes and Typhoons on the optical properties of the upper ocean. Several days were dedicated to producing animations and figures for the interview, writing up answers to interviewer's questions, and fact checking the resulting script.

Proposal Writing

A considerable amount of proposal preparation and related examination of data needed to support the proposal writing was expended during the reporting period. Proposals were prepared for the National Polar Orbiting Operational Environmental Satellite System Preparatory Project (NPP) satellite mission, the MODIS Team Member Research Announcement, and the NASA Interdisciplinary Science Research Announcement. The NPP proposal was submitted as a no cost proposal in order to position the AOL program in a better position to propose to the National Polar Orbiting Operational Environmental Satellite System (NPOESS) Research Announcement expected to be released in approximately two years.

Five proposals were prepared and submitted for the MODIS program. One of these proposal was designed to apply methods developed on SeaWiFS imagery to identify effects of hurricanes in downward mixing of the upper water column using images of absorption from choromophoric dissolved organic carbon (A_{CDOM}) to MODIS imagery. A publication describing this work, "Satellite Observation of Chromophoric Dissolved Organic Matter (CDOM) Variability in the Wake of Hurricanes and Typhoons" was published Geophysical Research Letters in October, 2002. A second proposal was designed to continue research on the implementation of a MODIS phycoerythrin product. Progress during the current MODIS Team Membership had been made on extracting phycoerythrin pigment from airborne ocean color radiance data but the application of this protocol to MODIS or SeaWiFS imagery was not successful. It was felt that there was some potential in getting the protocol to work with reprocessed MODIS imagery. The third MODIS proposal was designed to permit continued application of the AOL sensor suite to MODIS product validation. In this process, the laser-induced chlorophyll and CDOM fluorescence would be utilized as a surrogate for measurements of these constituents from research vessels. The fourth proposal would utilized overlapping MODIS chlorophyll and chlorophyll fluorescence line height scenes acquired under different levels of solar irradiance to determine the potential of the phytoplankton population for photosynthesis activity. The fifth proposal would utilize A_{CDOM} products from MODIS to predict the depth of the mixed layer.

Task 24 - Network Development and Maintenance

See the Task 14 discussion for the ATM sensor (below). Many tasks described in that section apply to the AOL sensor support in this section.

Task 25 - Instrument Maintenance, Engineering and Fabrication

Construction of optical baffle and improved optical rail post was completed and installed in the calibration lab.

Airborne Topographic Mapper (ATM)

Task 21 - Mission Planning and Execution and Sensor Operation and Calibration

During the previously reporting period the ATM equipment was installed onboard the NASA P3 aircraft for the Alaska seaice deployment. Missions from Fairbanks AK were successfully completed and the aircraft is now back at WFF. The ATM systems remained on the P3 at the end of that reporting period, in preparation for the Greenland deployment in late April.

Detailed flight plans for the Greenland flights, both the directed science flights and the ICESat cal/val flights, were prepared. The science flights included work over Jakobshavn, Kangerdlugssuaq, Helheim and Petermann glaciers, plus a repeat of a planned 2002 flight that was canceled then due to weather and schedule constraints. These flights could be and were planned well in advance of the flight day, but the ICESat cal/val flights were designed with little lead time. The intention was to fly these lines within a short time of the overflight by the satellite, but since

the GLAS instrument experienced major problems during our campaign and was not functioning, we simply pieced together ICESat lines as appropriate to accomplish other goals, such as overflying drill sites. In the end we flew at least one ascending and one descending ICESat ground track for each day of the 8-day cycle, with a minimum length of 100 km and an average length of closer to 250 km. We flew a total of 5150 km of ICESat tracks throughout Greenland, in addition to all the science lines.

The spring Arctic Ice Mission field campaign began on May 7 with the departure of the P-3 from WFF following the successful completion of an instrument checkout flight completed earlier in that week. Three missions were conducted from Sondrestrom Air Field at Kangerlussuaq, Greenland. Missions were flow over the Jakobshavn, Helheim, and Kangerdlugssuaq glaciers on two mission and the third mission was flown over outlet glaciers located around the southern tip of Greenland. During a number of these missions segments of ICESat 8-day repeat orbits were occupied to the extent practical. Additional segments were occupied during the transit mission from Kangerlussuaq to Thule Air Force Base. Three additional missions were conducted from Thule including one that occupied the Petermann Glacier. One of the planned mission over outlet glaciers and coastal areas south of Thule was not flown due to poor weather in that are that persisted throughout the deployment. It was decided to do that area during the 2004 field deployment. Three additional missions planned for occupying more ICESat 8-day repeat orbits were also postponed until the 2004 field deployment because the satellite was not functional during the 2003 field deployment. The deployment ended on May 16 with the return of the P-3B to WFF.

GPS support was provided for an abbreviated Greenland ice mapping mission. Seven missions were flown out of Kangerlussuaq and Thule Greenland, continuing the outlet glacier monitoring program as well as mapping ICESat orbit lines. New to this deployment was our first field usage of the Ashtech Eurocard GPS receivers which will be used to augment the Z-12 receivers that have been a mainstay for the past ten years. The Eurocards have the advantage of higher data output rate (5 times more frequent than a Z-12). Still in development, the software used for data collection is just now available for testing. The high latitude nature of the Greenland work, which affects the maximum number of satellites in view, made this an ideal time to test the limits of software and computers.

Three GPS receivers were left in Kangerlussuaq Greenland for Dr. Ken Jezek of Ohio State University as part of his long-standing cooperative program with NASA. Dr. Jezek will be performing land based surveys of several areas on the ice cap that were overflown by the P-3 in the course of missions to the south of the island this year. Comparisons between the air and ground data will be done as a way of checking for aircraft system biases, as well as for longer term assessment of icecap thinning.

Planning for the 2004 Gulf of Tehuantepec Wavemapping project is underway, with approval of the ATM transceiver by NCAR for C130 mission being negotiated. Due to mounting considerations, it was decided to use the ATM2 unit instead of ATM3. Drawings of the assembly are being produced for NCAR approval processes.

Planning was begun for deployment of the NASA P-3 to Chile, scheduled for August, 2003. The sea ice mapping missions are being planned with desired flightlines being assessed for feasibility from a time-aloft vs. time-for-data viewpoint.

Ashtech GPS Eurocard receiver systems originally designed by Wayne Wright of GSFC are under consideration for redesign to meet current and future needs of the ATM project. Three receiver systems will be assembled for primary use on board the P-3 aircraft, and three others will be configured for use in the field, as either high rate mission systems or low rate base station systems. All units will be configured to use input and output connectors used commonly by the remainder of our GPS units. The reworking of these units and the development of software capable of collecting data from both the Z-12 and Eurocard receivers will be a major step toward converting all of the GPS data recording requirements from a DOS to LINUX operating system.

Task 22 - Data Processing Cataloguing and Archiving

```
Global Carbon Cycle (CO) - No archiving or processing activity
for this time period.
```

Topographic Mapping, Antarctic (TO) - Performed Level 0^1 archiving of Sea Ice Mapping experiment in Alaska 3/7-22/03. Performed Level 1^2 processing on all pre- and post-calibration data. Distributed 1 set of CAMBOT photos from Alaska missions. Performed Level 0 archiving of Arctic Ice Mapping (A.I.M.'03) mission in Greenland 5/5-20/03. Performed Level 1 processing of all pre- and post-calibration data. Distributed Level 2 data (various) from A.I.M.'02 to several persons. Distributed Level 2 data from A.I.M.'99 mission 5/23/99.

Topographic Mapping, Land (TA) - No archiving or processing activity for this period.

Topographic Mapping, Beach (TB) - Distributed Level 2^3 data from Gulf Coast 10/22-25/02 flights. Processed Level 1 ATM3 data from pre- and post-missions of A.I.M.'03.

Topographic Mapping, Antarctic (TO) - Reprocessed Level 1 and Level 2 data from Chilian-Antarctic missions 11/22/02 - 12/14/02. Performed Level 3^4 processing on missions 11/26/02 - 12/12/02.

Topographic Mapping, ICESat (GL) - Archived and processed data from Actic Ice Mapping (A.I.M.'03) experiment in Greenland 5/5 - 20/03. See (TA) report above.

---

[1]Level 0 consists of copying the raw data to CDROMS and entering the field notes and file names into computer retrievable information files.

[2]Level 1 preprocessing the raw data through program newvalT to calibrate the range data and calculate the scan azimuth and timing corrections.

[3]Level 2 data is combined with differential GPS trajectories and inertial navigation system attitude and heading data to produce individual laser spot elevations.

[4]Level 3 data is higher level analytical processing such as graphics and combining the topographic mapping data with information from other sources or sensors.

Task 23 - Data Analysis Interpretation and Reporting and Laboratory Analytical Support

Processing and analysis continued on the December 2002 ATM Chilean campaign. An improved reprocessing (as described last period) was completed using improved laser range calibrations, mounting biases, and GPS trajectories. Surface elevation (from ATM) was merged with ice-thickness (from CARDS ice-penetrating radar) and with Digital Elevation Models (DEMs) of surface and bedrock to make profiles showing elevation of the ice surface and ice bottom (bedrock). Profiles on Pine Island Glacier were then used for modelling the glacier dynamics. A draft manuscript describing the results is being prepared for submission to a scientific journal.

The Greenland ice mapping mission took place May 7-16. Six missions and two transits were flown in ten days. On board the NASA P3 were installed ATM2, ATM3, and ATM4 lidars, the GPS loggers and steering systems, and a Litton LN100 inertial navigation system (INS). Instrument operation was verified, and a quick check was made of test/calibration flights over the WFF ramps prior to departure. As part of the planning for the mission over Jakobshavn glacier, Landsat images were used to plot a flight track along the main channel of the glacier as well as estimating its velocity, which has increased from 10km/yr to 12km/yr during years 2001 to 2002. Upon return, the calibration of the March Alaska mission and May Greenland mission was initiated.

Analysis continued of data collected by the new developmental ATM4 waveform-based altimetry system. Some synchronization problems were found in some March flight data which led to some modifications of the data system (i.e. rearranging the use of several counters) before additional data was acquired in May. A processing program was developed to convert ATM4 data into a standard form ("valid"), which could then be run through qfit to make a georeferenced product. Maps were made from some data collected during the Wallops test flight of May 5. The maps compared well with those made from ATM3.

The October, 2002 ATM survey of the shores of Tampa Bay were sent to NOAA. Prior to delivery, the survey was checked for consistency between overlapping passes and filtered to remove hits on clouds.

A pair of papers were submitted to Journal of Glaciology: "Force balance in a sliding glacier" and "Force balance: application to Jakobshavn Isbrae" by R. H. Thomas. Figures were created and the paper formatted according to the journals guidelines for electronic submissions.

A number of quite dated survey marks on the Antarctic Peninsula were compared with ATM surveys. Some confusion exists regarding these survey marks and their coordinate frames and ellipsoids. Much of the confusion resulted from liberal use of the term "WGS72", which is both an ellipsoid and a coordinate system. We located a transformation from WGS72 into

WGS84/ITRF coordinate systems, and used this to express the positions in a way compatible with ATM. Discussions regarding this issue are ongoing.

Work continued in the processing of ICESat data. In addition to data from Greenland and the Mojave desert calibration/validation site, that of Svalbard, Norway, the Antarctic Dry Valleys, Antarctica's Pine Island glacier and the Antarctic Peninsula (the latter two mapped in 2002 by the ATM equipment) have been added to the processing schedule. Earl Frederick and Abby Mason have collaborated to automate the collection of the downloaded files of satellite data and the comparison to ATM data from all study areas.

Mounting biases were estimated for the Greenland mission for ATM2, ATM3, and ATM4 using pre-campaign and post-campaign ramp passes at Wallops. Mounting biases were reasonably consistent for all systems. The major uncertainties were in INS lags. ATM2, using the normal Honeywell INS, had negligibly small lag errors. For ATM3 and ATM4, which used ltn100 attitude data, lag errors estimated from ramp passes were on the order of 30 msec. However, the bit weights for the data used was ~0.04 deg, even courser than Honeywell data. Considering that ltn100 data was separately recorded by Richard Mitchell ("1551" data) - with a bit weight smaller by about a factor of 14, an attempt was made to evaluate the differences between Richard's recording and that recorded with ATM3 and ATM4. Initially, the *cres* program, normally used to evaluate ramp pass data, was modified to substitute the 1551 data for the valid attitude data. In addition to obtaining different lags (as expected), the lags appeared to vary between passes (or with time). To perform further evaluations, programs were written to difference the attitude data and calculate biases and lag differences using files of data rather than the few seconds of data with the aircraft over the ramp. From these programs, it was verified that lags were indeed time varying. Understanding the source of these timing problems with the 1551 data is an ongoing effort. Several trajectories for the Chilean mission were recomputed for a longer time span for utilization in processing radar data.

In May, the ICESat Cal/Val Data Analysis and Reporting effort was supported with the development of *Perl* programs that automate the GLAS satellite data processing. The programs that processed the data had been launched manually on a file by file basis. Using the existing programs, the new program automatically detects new data, notifies appropriate parties of new data via email, launches the existing processing programs, delivers the processed data to the appropriate parties, and notifies appropriate parties of the output using cron jobs which run in conjuction with saltellite data downloading.
Because of laser failure which limited data, the testing of the programs is not yet complete.

GPS Data Processing

GPS data for all the Greenland missions was gathered and preprocessed while in the field. The data was then screened for cycle slips and other problems and repaired where appropriate. Ground station
positions were computed with Gipsy in the non-fiducial mode, which uses a "free-floating" reference frame to perform the positioning computations in. It then transforms the positions into

ITRF00 at the final step. This method seems both more robust and more repeatable than the fiducial method which has been in use previously.

A precise trajectory for the Oct 10, 2003 SRA mission was computed and released. The flight had an unusual number of data problems, the cause for which is unknown. The resulting trajectory, however, should be up to the usual 10-cm level quality, but has a number of sizeable data gaps due to the problems.

Task 24 - Network Development and Maintenance

Work continued on network maintenance of the AOL/ATM data processing network that serves these programs and their data processing laboratory. In addition recently developed software to record the output of a Litton LTN-100 inertial navigation system was flight tested during the survey missions of Tampa Bay in October. The data recording system seemed to work well. Results of the analysis of this data will be reported in the next contract period.

A number of specific activities were addressed during the reporting period. Theses are listed below.

Wrote a program to repair *icess_segmented* files.

Wrote a program to create in index file for mail files.

Modified the *oscope* software program to write the waveform data out as a text file.

Continued development of a program to allow operators to communicate to each other via their computers while working at their stations in flight. Through the use of multiple channels and logging to a file, event data could also be shared and recorded between multiple sensors.

Post processed CAMBOT and LN100G data in preparation for DVDs.

Replaced harddrive on aol5 for Dr. Hoge.

Setup machines for John Moisan's summer hires.

Various program, system and network maintenance.

Task 25 - Instrument Maintenance Engineering and Fabrication

ATM4 development activities continued throughout the reporting period.

Started writing software to process data from mission to Alaska. The aim of the processing software was to generate ranges based on a simple centroid calculation and produce a file output compatible with our current processing software. *Kxvalid*, the name of the first iteration of the processing software, was created in C++ using QT for the user interface. Features that were added to *kxvalid* included:
- Centroid calculation
- Plots of transmit energy(tx), receive energy(rx), tx vs rx, GPS pulse interval time, range vs shot number, and range vs rx energy. These are the most common plots to verify good data during a ground test or data collection.
- Ability to open individual files or batch files
- Code to sort the fields in the data files, match time stamps to events, compute scanner position, and compute fields for and create ôvalidö format big or little endian binary files
Status messages to indicate errors in the data and current processing time

The 'valid' files generated from ramp passes and the Alaska missions indicated a critical flaw in the time tags recorded by ATM4. Two separate, identical cards were used to time-tag all system events. Both cards were started synchronously. However, an apparent time drift was observed in the valid data created by *kxvalid*. Consequently, an investigation into the time stamps and several plots verified that there was indeed a linear drift between the clocks of one board versus the other board.

In order to fix this problem, the original driver written to control both boards was modified to use only a single board, as it was found that clocks on a single board were always synchronous with each other and showed no drift. This meant that the number of counters used was cut in half, with the high bits of the counter being kept track of in software.

Also investigated as a result of having this software were the scanner azimuth position and laser range comparisons with ATM3.

Participated in preparation and execution of the Greenland 2003 missions aboard the NASA P-3. Operated ATM equipment aboard the P-3 for the duration of the mission.

Data sets collected on ATM4 from ramp passes conducted over Wallops Island were compared with data from the ATM3 system. Initial findings were that the data seemed to agree closely, with minor differences that could be accounted for.

The ATM4 system was also tested using two Lasers for a combined rate of 10kHz, with each laser alternating the production of adjacent laser pulses. A limitation of the digitizers was discovered using this setup that indicates that achieving a rate of 10kHz will require a somewhat different

approach than the one used now. A program was written to control the Laser via the 9-pin external connection on the back of the laser.

The software written in-house for controlling the Litton 100 needed conversion to work on the Linux-based ATM4 data system. The original code was written on a big-endian machine and needed some data field conversions and other changes to compile and work properly on the ATM4 platform. After completion and proper operation can be verified, new code must be written to incorporate the 1553 INS data stream into the ATM4 data system.

The new Linlogger GPS data system was installed on a laptop Linux computer and operated on the ground, as well as aboard the aircraft. In one instance the ground Linlogger system actually saved most of a full mission, when it stably logged data while the two legacy DOS systems both locked up. With these overall successful results, a couple of problems were noted. Aboard the aircraft, the host computer which ran Linlogger and, simultaneously, the backup Soxmap navigation system, crashed a few times, especially early on in the campaign. This is thought to be caused by a hardware problem in the computer, though the exact cause is still being investigated. On the ground, the system at times failed to log significant numbers of records when running at the highest (10 Hz) rate. This may be due to old serial port hardware on the computer, but a more robust way of handling the serial port in software is being investigated as a way of eliminating this problem.

Other Mission Support Activities

Task 21 - Mission Planning and Execution and Sensor Operation and Calibration

No activity during the current reporting period.

Task 22 - Data Processing Cataloguing and Archiving

No activity during the current reporting period.

Task 23 - Data Analysis Interpretation and Reporting and Laboratory Analytical Support

Modeling Activities:

During the months of April and May, support for the ocean modeling effort continued with work on the water quality analysis. The changes to the existing analysis programs necessitated by recent changes in the streamflow data format and the desired water quality parameters were completed. Then the water quality data for the Atlantic and Gulf coasts were processed. At this time the linear relationships which express nutrient loads in terms of streamflow for the Atlantic and Gulf coasts are complete. However, there may be some further constraints put on the data in the future which would entail reprocessing.

Also, the streamflow data analysis continued on the Pacific coast. At this time the ArcView phase of streamflow site selection is completed and the data is being edited.

Task 24 - Network Development and Maintenance

No activity during reporting period.

Task 25 - Instrument Maintenance Engineering and Fabrication

EAARL Activities:

Gathering parts, schematics etc. for the last (4) GPS Rcvr's to be completed for Earl B./Bill Krabill. These and previously mf'd chassis are to be modified for their use without on-board CPU's/Hard drives. We ordered (7) 'Bud' chassis after working up a prototype unit with an old 'Bud' chassis, also ordered (7) type 'N' feed-thru bulkhead connectors, that will be needed in the new configuration GPS receivers. Assembled only (3) rcvr. assy. boards, as we are still short one Eurocard/rcvr.board.

Scanning Radar Altimeter (SRA)

Bench checkout of (2) new Sorensen power supplies that were purchased for replacement/spare use in the SRA system. Both units checked out O.K. after changing a couple of jumpers that put the supplies into a remote mode, such that they wouldn't respond to front panel control input. Installed one new power supply in the SRA, and checked out the system with the new supply driving the antenna drive motor, which is where the original supply failed. System checkout was O.K.

Work continued during a visit by Ed Walsh and Gerry McIntire for the shipping of the SRA to the NOAA Aircraft Operations Center in Tampa, FL in preparation for this years' hurricane season. System checkout again went O.K.

Down-Looking Scatterometer (DLS)

No activity during reporting period.

Tropical Rain Measuring Mission (TRMM)

Assisted on TRMM project with removing and recoating antenna array.

Bimonthly Progress Reports for Contract NAS5-99094
Glossary of Acronyms

<Current as of June 16, 2003>

ADAS   Airborne Diode Array Spectrometer

AGC   Automated Gain Control

AGL   Altitude Above Ground Level

ALACE   Airborne Lidar Assessment of Coastal Erosion (joint NASA/NOAA/USGS program to measure changes in coastal morphology)

AIM   Arctic Ice Mapping (NASA program to measure the mass balance of arctic ice sheets such as the massive ice sheet covering Greenland)

AOC   NOAA Aircraft Operations Center (Macdill AFB, Tampa, FL)

AOL-3   Airborne Oceanographic Lidar (version 3 put into service in March, 1998)

ASA   Airborne SeaWiFS Simulator

ATM   Airborne Topographic Mapper (Versions 1 and 2 are both in current use)

CAMBOT   The high resolution Kodak cameras utilized on ATM missions

CDAS   Cosine Diode Array Spectrometer

CDOM   Chromophoric dissolved organic carbon

CIMEL   Automated Sun-tracking photometer

CCG   USGS Center for Coastal Geology (St. Petersburg, FL)

CSC   NOAA Coastal Services Center (Charleston, SC)

DAAC   Distributed Active Archive Center

DEM   digital elevation model

DLS   Down-Looking Scatterometer

EAARL   Experimental Advanced Airborne Research Lidar sensor

EstHab	Estuarine Habitat Project - joint NOAA/NASA initiative to study coastal waters and to evaluate remote sensor performance in these environments.
EEQ	Excessive Energy Quenching
FRRF	Fast Repetition Rate Fluorometer (shipboard instrument)
GAC	Global Area Coverage (ocean color satellite imagery)
GLAS	Geodetic Laser Altimeter System
GPS	Global Positioning System
GSFC	Goddard Space Flight Center
ICEsat	Ice Cloud and Land Elevation Satellite
IOP's	Oceanic Inherent Optical Properties (chl absorption, CDOM absorption and total constituent backscatter)
JGOFS	Joint Global Ocean Flux Studies
ICESat	Ice, Cloud, and land Elevation Satellite
IR	Infrared
IOP's	Inherent Optical Properties (of sea water)
LAC	Local Area Coverage (ocean color satellite imagery)
MAB	Middle Atlantic Bight (of the western North Atlantic Ocean)
MODIS	Moderate Resolution Imaging Spectrometer
NEGOM	Northeast Gulf of Mexico (Texas A&M Cruise)
NOAA	National Ocean and Atmospheric Administration
NRC	National Research Council (personnel)
OSD	Operations and Safety Directive (required by GSFC Safety for all airborne programs)
PARCA	NASA Program for Arctic Regional Climate Assessment

P&P	Pump and Probe (lidar methodology for measuring photo synthetic rate parameters)
PRF	Pulse Repetition Frequency
ROWS	Radar Ocean Wave Scatterometer
R/V	Research Vessel
SAFire	A shipboard spectrometer for measuring CDOM fluorscence
SAS	SeaWiFS Airborne Simulator (NOAA CSC sensor)
SeaWiFS	Sea-viewing Wide Field-of-View Sensor (satellite ocean color scanner)
SeaDAS	SeaWiFS Data Analysis System (processing and display software)
SLF	Shipboard Laser Fluorometer
SP-P&P	short pulse Pump and Probe
SST	Sea Surface Temperature (captured from the Heimann IR Radiometer)
TRMM	Tropical Rain Measuring Mission
USGS	U.S. Geological Survey
UV	Ultraviolet
WEIRDO	Wallops Enhanced Imaging Rain Drop Observer
WFF	Wallops Flight Facility

Computer Programs

gitar	ATM project software for phase code tracking differential GPS data
gypsy	Jet Propulsion Laboratory software for positioning a fixed GPS receiver
mplot	AOL project plotting software to produce multiple plots per page