TECHNICAL REPORT

Contract Title:	Infrared Algorithm Development for Ocean Observations with EOS/MODIS
Contract:	NAS5-31361
Type of Report:	Quarterly
Time Period:	January-March 1998

Principal Investigator:	Otis B. Brown RSMAS/MPO University of Miami 4600 Rickenbacker Causeway Miami, Florida 33149-1098

INFRARED ALGORITHM DEVELOPMENT FOR OCEAN OBSERVATIONS WITH EOS/MODIS

Abstract

Efforts continue under this contract to develop algorithms for the computation of sea surface temperature (SST) from MODIS infrared measurements. These include radiative transfer modeling, comparison of *in situ* and satellite observations, development and evaluation of processing and networking methodologies for algorithm computation and data accession, evaluation of surface validation approaches for IR radiances, development of experimental instrumentation, and participation in MODIS (project) related activities. Activities in this contract period have focused on field campaigns, analysis of field data and the organization of and participation in two workshops held at RSMAS in early March.

MODIS INFRARED ALGORITHM DEVELOPMENT

A. Near Term Objectives

A.1. Continue algorithmic development efforts based on experimental match-up databases and radiative transfer models.

A.2. Continue interaction with the MODIS Instrument Team through meetings and electronic communications, and provide support for MCST pre-launch calibration activities.

A.3 Continue evaluation of different approaches for global SST data assimilation and work on statistically based objective analysis approaches.

A.4 Continue evaluation of high-speed network interconnection technologies.

A.5 Continue development of *in situ* validation approaches for the MODIS IR bands.

A.6 Provide investigator and staff support for the preceding items.

B. Overview of Current Progress

B.1 January-March 1998

Activities during the past three months have continued on the previously initiated tasks. There have been specific efforts in the areas of (a) IR calibration/validation as part of the MODIS Ocean Science Team cruise effort, (b) the organization and participation of two workshops in Miami to compare the quantitative performance of diverse infrared radiometers and to coordinate future validation campaigns; and to (c) test and evaluation of an experimental wide area network based on ATM technology. In addition, previously initiated activities such as team related activities continue.

Special foci during this three-month period have been:

1) Continue analysis of measurements from the DOE/NOAA/NASA ARM Combined Sensor Project cruise in the Tropical Western Pacific in the spring of 1996 and from the cruise of the *R/V Roger Revelle* in the Pacific Ocean in the autumn of 1997.
2) Participation in a research cruise at 24°N in the Atlantic Ocean on the *NOAA S Ronald H. Brown.*
3) Prepare to participate in the research cruise to the Canadian Arctic on the *CCGS Pierre Radisson.*
4) Prepare to participate in the Ocean-Atmosphere Carbon Exchange Study cruise in the North Atlantic Ocean on the *NOAA S Ronald H. Brown.*
5) Refinement of marine FTIR instrumentation for cal/val applications by UW/SSEC through a subcontract.
6) Organization and participation in the Miami IR Workshops.
7) Continue negotiations for ship-time for post-launch validation, and explore options for long-term validation from fixed platforms.
8) Wide area networking.

B.1.1 Combined Sensor Cruise of the NOAA S *Discoverer* & the Pacific Section on the *R/V Revelle*

As described in earlier reports, the Combined Sensor Cruise in the Tropical Western Pacific in March–April 1996, generated an unprecedented array of measurements of atmospheric boundary layer variables and sea surface temperature. Analysis of the prototype M-AERI data continues with emphasis on the response of the thermal skin layer to changes in the air-sea heat fluxes.

The measurements from the *Revelle* cruise from Hawaii to New Zealand, reported upon in the last semi-annual report, are currently undergoing quality control prior to detailed analysis.

B.1.2 The 24°N Atlantic Sections on the *NOAA S Ronald H. Brown*

Background

The NOAA Atlantic Oceanographic and Meteorological Laboratory offered ship time and berths on the NOAA's Ronald Brown on the Trans-Atlantic sections between Miami and the Canary Islands. This was offered as a cooperative venture with NOAA providing travel support for the two participants on the second, one-month leg from Las Palmas to Miami.

Details of the ship can be found at the URL http://www.pmc.noaa.gov/rb/ and of the cruise at URL http://www.aoml.noaa.gov/phod/24n. The cruise track is shown in Figure 1.

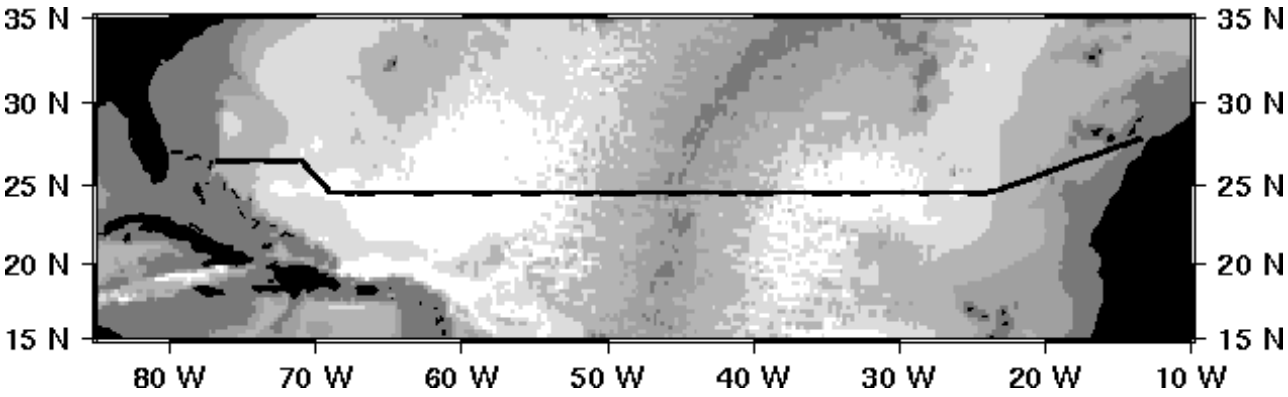

Figure 1.

Objectives

To gain more ship-time experience with M-AERI's prior to the EOS-AM Launch; to gather data for the study of the thermal skin effect at the ocean surface, and b) diurnal temperature signals; to test satellite validation schemes using data from the AVHRR.

Personnel involved

A. Cruise Leg 1 from Miami to Las Palmas
   –Ms. J. Hanafin and Ms. E. Key
B. Cruise Leg 2 from Las Palmas to Miami (with NOAA support)
   –Dr. R. Sikorski and Ms. Deanna Wilson-Diaz
C. In-port instrument maintenance in Las Palmas
   –Dr. P. J. Minnett

Narrative:

The NOAA Ship *Ronald H. Brown* sailed from Miami on January 8 and progressed along a section at about 24°N, arriving in Las Palmas on January 21. After two days in port, the ship returned to Miami, arriving on February 24. The outward journey involved measurements taken with the ship underway, and the return journey included 127 oceanographic stations.

The Marine-Atmospheric Emitted Radiance Interferometer (M-AERI-01) was embarked on the ship in Miami, together with a Coastal Environmental Systems "Weatherpack" boundary-layer meteorological station, an all-sky camera and an *in-situ* SST float. This float, which takes measurements at a depth of a few centimeters was deployed on the second leg during the oceanographic stations. NOAA supplied radiosondes. AVHRR data were supplied by the University of La Laguna, Tenerife, Canary Islands, which has an HRPT receiving station.

The M-AERI was mounted on the 02 deck forward (Figure 2). At view the sea-surface ahead of the bow wave in water undisturbed by the presence of the ship. The instrument took measurements at zenith and at 55° to zenith and nadir. Apart from periods when it was covered to avoid contamination of the scan mirror by sea-spray in conditions of high winds, the M-AERI operated continuously.

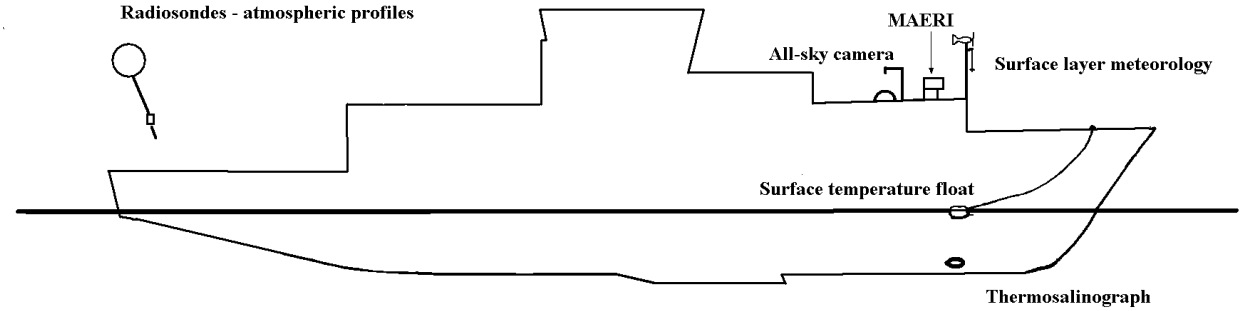

Figure 2.

A list of radiosonde launches is given in Table 1 and of AVHRR images supplied by the University of La Laguna in Table 2. AVHRR images over the western part of the ship's track will be extracted from the AVHRR data archive at RSMAS.

The M-AERI was mounted on the port side of the ship for the eastward-going first leg to avoid contamination of the data by sun-glint. It was moved to the starboard side for the westward-going second leg. During the port call the instruments were examined, cleaned and two M-AERI cables that showed signs of deterioration were repaired.

***Conclusions*:**

All instruments worked well and returned good quality data. Initial analysis of the skin temperature effects shows characteristics similar to those found on earlier cruises in the Pacific Ocean, but more detailed analysis is expected to reveal differences in behavior from more varied ocean-atmosphere flux regimes.

B.1.4 The North Water cruise of the *CCGS Pierre Radisson*

The Canadian Coast Guard ice-breaker Pierre Radisson left Quebec City on March 26 to head north to the area of the North Water Polynya between Greenland and Ellemere Island at the north of Baffin Bay (abut 77°N, 75°W). The ship will remain in the area until late July to facilitate the study of the physics, chemistry and biology of the polynya throughout its development from late winter to high summer. This period is divided into four cruises and a berth has been made available to Dr. Minnett on all of these to make M–AERI (and other) measurements. This will provide the opportunity to collect M–AERI data over a wide range of Arctic conditions. These will be used to validate AVHRR sea-surface temperatures through very dry, cold atmospheres. AVHRR data are being collected at a satellite data receiver installed at Alert on the north of Ellesmere Island by the Royal Military College of Canada (see http://www.rmc.ca/academic/physics/www/staff/marsden/avhrr.html). Plans are being made to mount a smaller expedition to the same area in summer 1999, which will provide an opportunity to validate MODIS SST retrievals. (Minnett's participation in these cruises is supported, in part, by another NASA grant for AVHRR validation, and by the NSF to measure the surface heat budget).

Table 1. Time and positions of radiosonde launches.

9 January 98 11:7 GMT	25.90 N	78.00 W
9 January 98 22:39 GMT	26.50 N	75.80 W
10 January 98 10:45 GMT	26.50 N	73.00 W
10 January 98 22:40 GMT	25.90 N	70.50 W
11 January 98 10:44 GMT	24.50 N	68.30 W
11 January 98 22:45 GMT	24.50 N	65.50 W
12 January 98 10:46 GMT	24.50 N	62.60 W
12 January 98 21:40 GMT	24.50 N	60.00 W
13 January 98 10:45 GMT	24.50 N	56.80 W
13 January 98 22:39 GMT	24.50 N	53.90 W
14 January 98 10:43 GMT	24.50 N	50.90 W
14 January 98 22:40 GMT	24.30 N	48.00 W
15 January 98 11:0 GMT	24.50 N	45.10 W
15 January 98 22:41 GMT	24.50 N	42.40 W
16 January 98 10:44 GMT	24.50 N	39.70 W
16 January 98 22:42 GMT	24.50 N	36.50 W
17 January 98 10:44 GMT	24.50 N	33.50 W
17 January 98 23:5 GMT	24.50 N	26.40 W
18 January 98 10:53 GMT	24.50 N	27.70 W
18 January 98 22:45 GMT	24.50 N	24.80 W
19 January 98 22:45 GMT	25.80 N	19.60 W
20 January 98 10:42 GMT	26.70 N	16.90 W
20 January 98 22:48 GMT	27.60 N	14.20 W
23 January 98 22:49 GMT	27.90 N	13.60 W
24 January 98 10:54 GMT	27.80 N	13.90 W
24 January 98 22:55 GMT	27.20 N	15.60 W
25 January 98 10:47 GMT	26.80 N	16.70 W
25 January 98 22:52 GMT	26.40 N	18.10 W
26 January 98 10:53 GMT	25.90 N	19.40 W
27 January 98 11:18 GMT	25.20 N	21.50 W
28 January 98 10:57 GMT	24.50 N	24.20 W
29 January 98 10:46 GMT	24.50 N	26.40 W
30 January 98 10:45 GMT	24.50 N	29.20 W
31 January 98 10:47 GMT	24.50 N	31.90 W
1 February 98 10:46 GMT	24.50 N	34.40 W
2 February 98 10:44 GMT	24.50 N	36.90 W
3 February 98 10:48 GMT	24.50 N	39.70 W
3 February 98 22:52 GMT	24.50 N	40.90 W
4 February 98 10:42 GMT	24.50 N	41.90 W
5 February 98 17:56 GMT	24.50 N	44.90 W
5 February 98 22:51 GMT	24.50 N	45.50 W
6 February 98 10:49 GMT	24.50 N	47.10 W
6 February 98 22:45 GMT	24.50 N	48.20 W
7 February 98 10:43 GMT	24.50 N	49.30 W
7 February 98 22:43 GMT	24.50 N	50.00 W
8 February 98 10:47 GMT	24.50 N	50.90 W
8 February 98 23:6 GMT	24.50 N	52.10 W
9 February 98 10:42 GMT	24.50 N	52.90 W
9 February 98 22:44 GMT	24.50 N	53.80 W
10 February 98 10:53 GMT	24.50 N	55.20 W
10 February 98 22:43 GMT	24.50 N	56.00 W
11 February 98 22:44 GMT	24.50 N	58.60 W
12 February 98 10:52 GMT	24.50 N	59.60 W
12 February 98 22:42 GMT	24.50 N	61.10 W
13 February 98 10:48 GMT	24.50 N	62.20 W
13 February 98 22:45 GMT	24.50 N	63.30 W
14 February 98 22:46 GMT	24.50 N	65.90 W
15 February 98 10:50 GMT	24.50 N	66.90 W
15 February 98 22:47 GMT	24.50 N	68.40 W
16 February 98 11:1 GMT	24.90 N	69.40 W
16 February 98 22:37 GMT	25.50 N	70.00 W
17 February 98 10:42 GMT	26.20 N	70.60 W
17 February 98 22:49 GMT	26.50 N	71.50 W
18 February 98 10:39 GMT	26.50 N	72.50 W
18 February 98 22:50 GMT	26.50 N	73.20 W
19 February 98 10:45 GMT	26.50 N	73.90 W
19 February 98 22:47 GMT	26.50 N	74.80 W
20 February 98 10:46 GMT	26.50 N	75.50 W
20 February 98 22:47 GMT	26.50 N	75.90 W
21 February 98 10:42 GMT	26.50 N	76.30 W
21 February 98 22:43 GMT	26.50 N	76.60 W
22 February 98 10:46 GMT	26.50 N	76.80 W

Table 2. AVHRR HRPT overpasses for the eastern part of the NOAA Ship Ronald H. Brown cruises at 24°N. Supplied by Dr. F. Herrera the University of La Laguna, Tenerife, Canary Islands.

NOAA-14 on 1998-January-15 at 0433
NOAA-12 on 1998-January-15 at 0830
NOAA-14 on 1998-January-15 at 1551
NOAA-12 on 1998-January-15 at 1943
NOAA-14 on 1998-January-16 at 0422
NOAA-12 on 1998-January-16 at 0807
NOAA-14 on 1998-January-16 at 1540
NOAA-12 on 1998-January-16 at 1921
NOAA-12 on 1998-January-17 at 0746
NOAA-14 on 1998-January-17 at 0411
NOAA-14 on 1998-January-17 at 1529
NOAA-12 on 1998-January-17 at 1859
NOAA-12 on 1998-January-17 at 2040
NOAA-14 on 1998-January-18 at 0400
NOAA-14 on 1998-January-18 at 0541
NOAA-12 on 1998-January-18 at 0724
NOAA-12 on 1998-January-18 at 0904
NOAA-14 on 1998-January-18 at 1518
NOAA-14 on 1998-January-18 at 1700
NOAA-12 on 1998-January-18 at 1837
NOAA-12 on 1998-January-18 at 2017
NOAA-14 on 1998-January-19 at 0349
NOAA-14 on 1998-January-19 at 0530
NOAA-12 on 1998-January-19 at 0702
NOAA-12 on 1998-January-19 at 0842
NOAA-14 on 1998-January-19 at 1507
NOAA-12 on 1998-January-19 at 1955
NOAA-14 on 1998-January-20 at 0338
NOAA-12 on 1998-January-20 at 0820
NOAA-14 on 1998-January-20 at 1456
NOAA-14 on 1998-January-21 at 0327
NOAA-12 on 1998-January-21 at 0758
NOAA-14 on 1998-January-21 at 1445
NOAA-12 on 1998-January-21 at 1911
NOAA-14 on 1998-January-24 at 0434
NOAA-12 on 1998-January-24 at 0652
NOAA-14 on 1998-January-24 at 1553
NOAA-12 on 1998-January-24 at 1945
NOAA-14 on 1998-January-25 at 0423
NOAA-12 on 1998-January-25 at 0810
NOAA-14 on 1998-January-25 at 1542
NOAA-12 on 1998-January-25 at 1923
NOAA-14 on 1998-January-26 at 0412
NOAA-12 on 1998-January-26 at 0748
NOAA-14 on 1998-January-26 at 1530
NOAA-12 on 1998-January-26 at 1901
NOAA-14 on 1998-January-27 at 0401
NOAA-12 on 1998-January-27 at 0726
NOAA-14 on 1998-January-27 at 1519
NOAA-12 on 1998-January-27 at 1839
NOAA-14 on 1998-January-28 at 0350
NOAA-12 on 1998-January-28 at 0704
NOAA-14 on 1998-January-28 at 1508
NOAA-12 on 1998-January-28 at 1957
NOAA-14 on 1998-January-29 at 0339
NOAA-12 on 1998-January-29 at 0822
NOAA-14 on 1998-January-29 at 1639
NOAA-12 on 1998-January-29 at 1935
NOAA-14 on 1998-January-30 at 0509
NOAA-12 on 1998-January-30 at 0800
NOAA-14 on 1998-January-30 at 1628
NOAA-12 on 1998-January-30 at 1913
NOAA-14 on 1998-January-31 at 0458
NOAA-12 on 1998-January-31 at 0738
NOAA-14 on 1998-January-31 at 1616
NOAA-12 on 1998-January-31 at 2032
NOAA-14 on 1998-February-01 at 0447
NOAA-12 on 1998-February-01 at 0856
NOAA-14 on 1998-February-01 at 1605
NOAA-12 on 1998-February-01 at 2010
NOAA-14 on 1998-February-02 at 0436
NOAA-12 on 1998-February-02 at 0834
NOAA-14 on 1998-February-02 at 1554
NOAA-12 on 1998-February-02 at 1947
NOAA-14 on 1998-February-03 at 0425
NOAA-12 on 1998-February-03 at 0812
NOAA-12 on 1998-February-05 at 0909
NOAA-14 on 1998-February-05 at 1703
NOAA-12 on 1998-February-05 at 2022
NOAA-14 on 1998-February-06 at 0533
NOAA-12 on 1998-February-06 at 0846
NOAA-14 on 1998-February-06 at 1651
NOAA-14 on 1998-February-07 at 0522
NOAA-14 on 1998-February-08 at 0511

B.1.4 OACES cruise in the North Atlantic Ocean on the *NOAA S Ronald H. Brown*

In May-July 1998, the NOAA ship *Ronald H. Brown* will be used to conduct an observational program northwest of the Azores in the North Atlantic as part of the Ocean-Atmosphere Carbon Exchange Study. Dr. P. Minnett was successful in obtaining NOAA funding to participate in this

cruise. This will provide a further opportunity to use the M–AERI at sea. Use will also be made of the transit cruises between Miami, Lisbon and the Azores. These data will complement the winter-season data to be collected in the Atlantic in January and February (see above). Preparations for this cruise are underway.

B.1.5 M-AERI Refinements.

Although both M-AERI 1 and M-AERI 2 performed well during the *Revelle* cruise a number of software and hardware improvements were identified. Following discussions with the M-AERI designers at SSEC - U. Wisconsin, some of these are being developed upon for inclusion in the M-AERI 3 and for retro-fit on M-AERIs 1 and 2. In addition to correcting some software bugs that have come to light with more extensive use, these refinements include higher capacity disk drives, software improvements to alert the user to anomalous instrument status and software refinements to make single-operator control less burdensome.

B1.6 Miami Workshops.

Two international workshops were held sequentially at RSMAS during early March. The first, from March 2 to 4, was designed to provide the opportunity for researchers using quantitative infrared radiometry to validate satellite retrievals to compare to calibrate their instruments in the laboratory against standard blackbody targets, to compare field-deployable black-body targets against reference standards, and to compare the data from the various radiometers taken under conditions similar to those at sea by mounting them on the roof of the Marine Science Center at RSMAS. The second workshop, on March 5 and 6, was under the auspices of the Committee on Earth Observation Science and was focused on coordinating the efforts of various groups intending to use infrared radiometry to validate current and planned satellite instruments, over land as well as sea. The participants at the workshops represented groups in Australia and the UK as well as the US (see Table 3), and the instruments they brought are listed in Tables 4 and 5.

Table 3.

Workshop Participants

Name	Address	Telephone	Fax	Email address
Dr. Ali Abtahi	Jet Propulsion Laboratory MS 183-501 4800 Oak Grove Drive Pasadena CA 91109 USA	+1 818 354 5353	+1 818 354 0966	ali@aster.jpl.nasa.gov
Dr. Ian Barton	CSIRO Marine Labs PO Box 1538 Hobart	+61 3 62325481	+61 3 62325123	ijb@ml.csiro.au

Name	Address	Telephone	Fax	Email address
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Dr. Fred Best	Space Science and Engineering Center University of Wisconsin 1225 W. Dayton St. Madison WI 53706 USA	+1 608 263 6777	+1 608 263 6738	fred.best@ssec.wisc.edu
Dr. Otis Brown	RSMAS-MPO University of Miami 4600 Rickenbacker Causeway Miami FL 33149 USA	+1 305 361 4000	+1 305 361 4711	obrown@rsmas.miami.edu
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Dr. Craig Donlon	CCAR. University of Colorado Campus Box 431 Boulder CO 80402 USA	+1 303 492 0955	+1 303 492 2825	cjdn@colorado.edu
Jennifer Hanafin	RSMAS-MPO University of Miami 4600 Rickenbacker Causeway Miami FL 33149 USA	+1 305 361 4628	+1 305 361 4622	jhanafin@rsmas.miami.edu
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Dr. Andy Jessup	Applied Physics Lab. University of Washington 1013 NE 40th St Seattle WA 98105-6698 USA	+1 206 685 2609	+1 206 543 6785	jessup@apl.washington.edu
Dr. Carol Johnson	NIST B204/221 Gaithersburg MD 20899 USA	+1 301 975 2322	+1 301 869 5700	cjohnson@nist.gov

Name	Address	Telephone	Fax	Email address
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Dr. Joe Rice	NIST Bldg. 221, Rm. B208 Gaithersburg MD 20899 USA	+1 301 975 2133	+1 301 975 2950	joe.rice@nist.gov
Dr. Goska Szczodrak	Atmospheric Sciences Programme	+1 604 822 2269	+1 604 822 6150	goska@geog.ubc.ca

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Dr. E. Theocharous	National Physical Laboratory Teddington TW11 OLW UK	+44 181 943 6977	+44 181 943 6935	et@npl.co.uk
Dr. Gary Wick	Campus Box 449 University of Colorado Boulder CO 80309 USA	+1 303 492 6466	+1 303 492 2468	gaw@cdc.noaa.gov

Table 4. Details of instruments at Workshop

A. Radiometers

Participant	Name	Wavelength range	Aperture size (diameter)	Beamwidth (full angle)
Ian Barton	CSIRO radiometer			
Ian Barton	TASCO radiometer			
Craig Donlon	SOSSTR	8-12 um	100x50mm	~10deg
Andy Jessup	Heimann KT19	8 - 14 um	39mm	~4 deg
Andy Jessup	Heimann KT15	8 - 14 um	20mm	~4 deg
Andy Jessup	Everest 4000.4GL	8 - 14 um	10mm	~4 deg
Andy Jessup	Amber Radiance HS imager	3 - 5 um		
Peter Minnett	M-AERI	3-18 um	~5cm	32 mrad
Peter Minnett	Heimann KT19 (x2)	9.6 - 11.5 um	39mm	~4 deg
Tim Nightingale	SISTeR radiometer			13 degr
Frank Palluconi	Broadband Field radiometer	8 - 14 um	12.7mm	15deg
Fred Prata	5-ch filter radiometer (AHDS)	8 - 12 um	55mm	50mrad (4deg)
Fred Prata	TASCO radiometer	8 - 12 um	14mm	200mrad (4deg)
Fred Prata	EVEREST radiometer	8 - 14 um	30mm	70mrad (4deg)

Table 5. B. Black Body calibration targets

Participant	Name	Temperatures	Aperture size
Ian Barton	Portable BB		
Craig Donlon	CASOTS BB		
Carol Johnson	NIST WBBB	20C & 30 C	10cm dia
Andy Jessup	APL Water bath BB - similar to NIST		
Robert Knuteson & Fred Best	MAERI BB		
Frank Palluconi	Water bath BB	0 - 50 C	6cm dia
Tom Sheasby	CASOTS BB		

There were two activities in the first workshop - laboratory measurements by the radiometers of the six black-body calibration targets and comparisons of measurements of the sea-surface temperature in Bear Cut of Biscayne Bay made by the various radiometers from the roof-top instrument platform. These data are currently being analyzed and will be discussed in subsequent reports.

A World Wide Web page has been set up at RSMAS (http://www.rsmas.miami.edu/ir) which is being used for information exchange between the participants. The minutes and conclusions of the RSMAS-CEOS workshop are also available athttp://www.rsmas.miami.edu/ir/ceos-minutes.html. Robert Kannenberg of the MODIS Administrative Support Team attended the workshops and is preparing an article for the *Earth Observer* on these workshops.

B.1.7 Post launch validation cruises

There have been no significant developments since the last report regarding the prospect of post launch validation cruises; which are currently expected to be:

a) *USCGC Polar Sea* --November-December 1998. Pacific Ocean , from Seattle to New Zealand.

b) *RV Mirai* -- summer 1999. Tropical Western Pacific Ocean.

c) *PFS Polarstern* -- December 1999. Atlantic Ocean from Bremerhaven to Cape Town.

B.1.8 Wide Area Networking

Preparations for a DS3 circuit to VBNS via SUNCOM/FloridaNet are in progress: Cisco Lightstream 1010 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 are testing LANE 1.0 and RCF1577 ATM on the 7507 to support routing to the RSMAS ATM network.

C. Investigator Support

January	W. Baringer	A. Mariano
	J. Brown	R. Sikorski

	O. Brown	J. Splain
	K. Kilpatrick	S. Walsh
	A. Li	D. Wilson-Diaz
February	W. Baringer	A. Mariano
	J. Brown	R. Sikorski
	O. Brown	J. Splain
	M. Graham	S. Walsh
	K. Kilpatrick	
March	W. Baringer	K. Kilpatrick
	J. Brown	R. Kolaczynski
	O. Brown	J. Splain
	R. Jones	W. Walsh

D. Future Activities

D.1 Algorithms

a. Continue to develop and test algorithms on global retrievals
b. Evaluation of global data assimilation statistics for SST fields
c. Participate in research cruises
d. Analyze data taken at radiometer and validation workshops
e. Continue radiative transfer modeling using RAL code
f. Continue analysis of research cruise data
g. Continue to study near-surface temperature gradients
h. Continue planning of post-launch validation campaigns
i. Validation Plan updates (as needed)
j. EOS Science Plan updates (as needed)
k. Define and implement an extended ATM based network test bed
l. Continued integration of new workstations into algorithm development environment
m. Continued participation in MODIS Team activities and calibration working group

D.2 Investigator support

Continue current efforts.

E. Problems

No new problems to report.

F. Publications and Presentations

Robert Evans, Richard Sikorski and Peter Minnett are co-authors on an invited keynote presentation to be given at the Spring AGU Meeting in Boston.