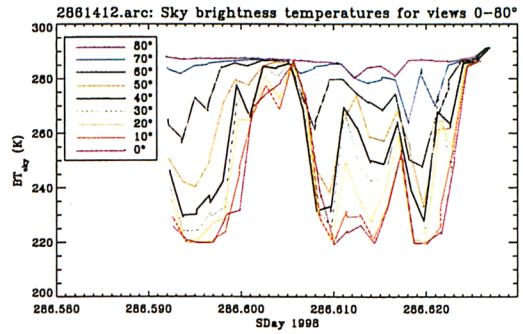
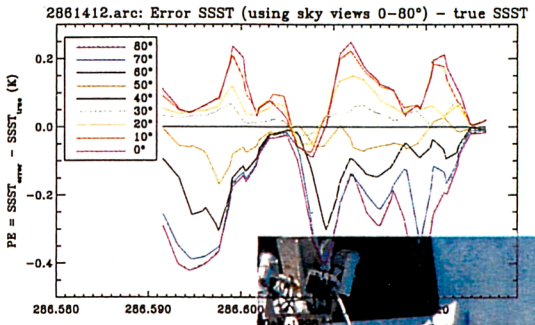
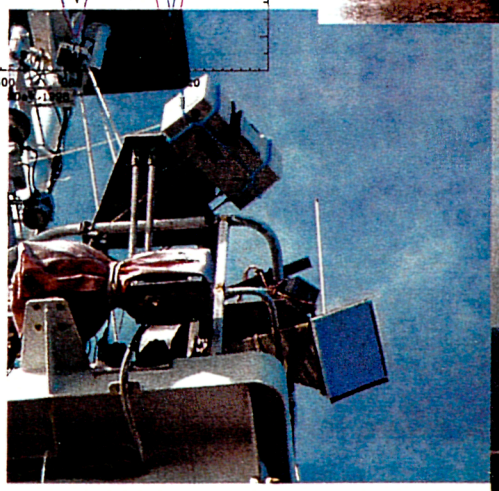
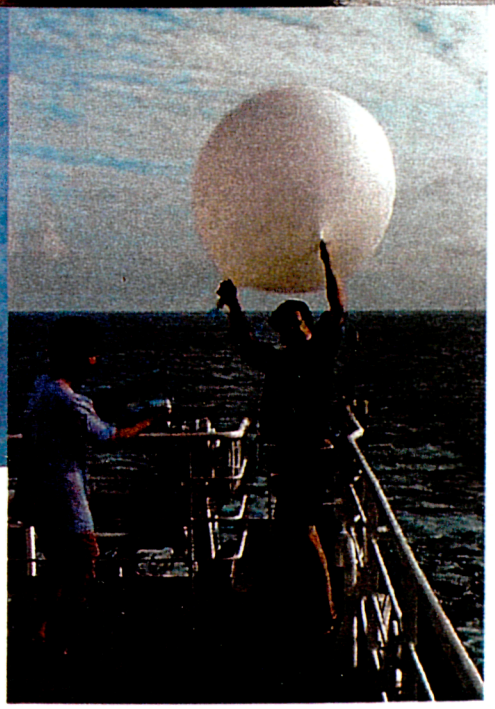
AMT-7 Radiometric Observations of the Sea Surface and Atmosphere (ROSSA) Cruise report and data summary.









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Marine Environment Unit

1999

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Atlantic Meridional Transect (AMT) 7/ Radiometric Observations of the Sea Surface and Atmosphere (ROSSA) September – October 1998 Cruise report and data inventory.

by

Craig Donlon

Space Applications Institute

JOINT RESEARCH CENTRE
EUROPEAN COMMISSION

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1.0 Introduction

The transfer of heat across the atmosphere-ocean interface is fundamental to the prediction of climate and a through understanding of this process is vital to the successful coupling of ocean - atmosphere models [Hadley center, 1994]. This is because sea surface temperature (SST) influences the exchange of heat, moisture and gases across the air-sea interface [e.g. Robinson et al, 1985]. Global sea surface temperature is routinely measured by several satellite infrared radiometer systems and the frequent, large spatial sampling capability characteristic of these instruments generates data sets potentially suitable for the direct detection of global climate change using a variety of techniques. If accurately validated non-biased satellite SST observations are available for a 10 year period there is a >80% probability of directly detecting global warming using such data alone [Allen et al, 1994]. Interpretation and validation of satellite observations is limited by the availability and quality of the data sets that are able to describe and quantify the physical processes occurring at the air - sea interface. Confidence in satellite derived global data sets demands that such data is regularly and comprehensively validated using high quality in situ atmosphere - ocean observations.

Satellite infrared radiometer systems give an estimate of the SST from a depth equal to the infra-red extinction depth: this is ~10 - 60 μm deep for wavelengths of 10-12 μm. Thus, the derived SST measurement is a 'skin' SST (SSST). Although having an extremely small depth, it is the SSST layer that not only controls the exchange of heat and moisture between the atmosphere and ocean. It also controls the exchange of temperature soluble gases such as CO_2 [Hasse and Liss, 1981; Robertson and Watson, 1992; Van scoy et al., 1995; Stephens et al., 1995]. At night, The SSST is typically 0.3 - 0.5 K cooler [e.g. Coppin et al., 1991; Schluessel et al., 1990] than the water immediately beneath (which is referred to as the bulk SST or BSST. Extreme skin temperature deviations, (ΔT, defined here as the SSST-BSST) of greater than ±1.0 K have been reported [Donlon and Robinson, 1997] and a ΔT reformation time scale of the order 10 seconds has been quoted based on thermal images of the sea surface [Jessup, 1992]. A new generation of satellite radiometer systems such as the ERS Along Track Scanning Radiometer (ATSR) [Edwards et al., 1990] are now capable of achieving a SSST precision to better than 0.3 K [Mutlow et al., 1994]. Such accuracy is well within the extreme magnitude expected for ΔT and it is no longer acceptable to ignore the difference between the SSST measured by satellite infrared radiometers and the BSST conventionally measured by ships and buoys in the upper 1 - 10 m of the water column.

It is in this context that the Atlantic Meridional Transect-7/ROSSA 1998 field campaign was undertaken. In collaboration with the Colorado Center for Astrodynamics Research (CCAR, USA), the Rutherford Appleton Laboratory (RAL, UK), Southampton Oceanography Center (SOC, UK) and the European Joint Research Centre (JRC, Italy) a series of atmospheric and oceanic measurements along a transect from the UK to the Falkland Islands has been made. Figure 1 shows the ship track made by the RRS *James Clark Ross* (JCR) on her southerly passage from the UK to the Falkland islands made during the period 13th September - 16th October 1998.

1.1 Experiment Objectives

The objectives of the AMT-7/ROSSA1998 experiment are as follows

- To provide high quality continuous observations of SSST for the on-going validation of thermal infrared satellite observations obtained from the ERS Along Track scanning Radiometer-2 (ATSR-2), the NOAA Advanced Very High Resolution Radiometer (AVHRR) and the GOES-8 geostationary radiometers.
- To investigate the dynamic variability and regionality of ΔT in the Atlantic Ocean and its role on the exchange of heat, moisture, gas and momentum between the atmosphere and the ocean.
- To derive and validate a set of algorithms suitable for the conversion of SSST to BSST applicable at a global scale using in situ observations coupled to model fields of diurnal warming and sea surface roughness/turbulence in the upper layers of the ocean.
- To assess the influence of surface biological features on the ΔT.
- To assess the importance of ΔT as a climate indicator in a number of different climatic regions.
- To develop and refine techniques for the validation of satellite infrared satellite observations.
- To develop algorithms for the synergistic use of such data sets to produce long-term non biased estimates of satellite derived SSST and BSST.
- To determine the importance of using SSST (rather than BSST) when investigating the atmosphere - ocean exchange of temperature soluble gasses such as CO_2.
- To validate recently developed in situ infrared instrumentation aimed at providing a low cost solution for the measurement of SSST.

In order to achieve the above objectives and extensive suite of instrumentation was deployed operating near continuously for the duration of the cruise. The AMT7/ROSSA 1998 team is building on extensive experience from prior AMT and ROSSA experiments facilitating the mobilization and operational elements of the AMT-7/ROSSA1998 experiment. This document describes the instrumentation deployed, the data sets generated, and the problems encountered during the experiment and is meant to serve as a basic reference for the cruise data set.

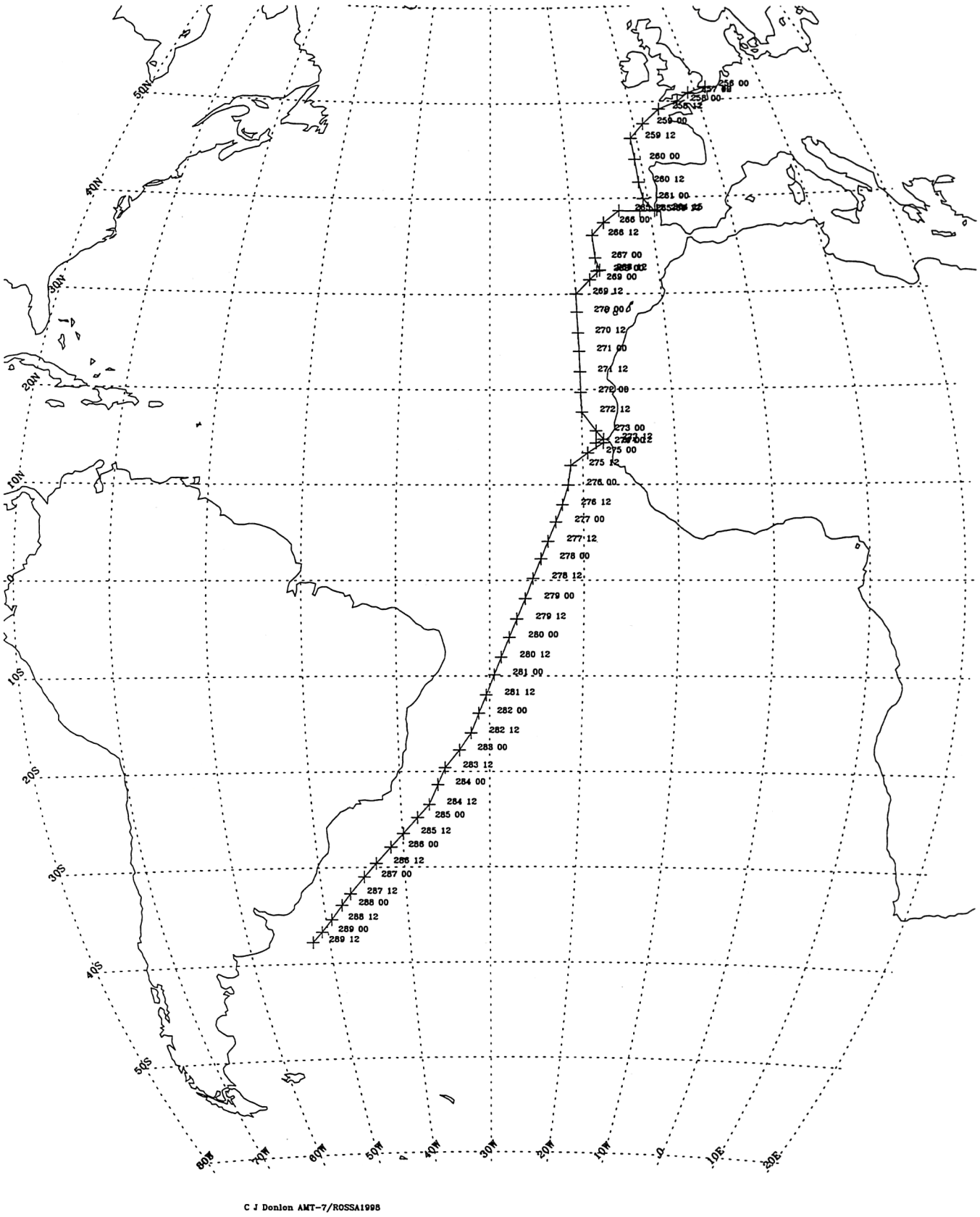

Figure 1. Cruise track of the Grimsby (UK) – Montevideo (Uruguay) leg of the AMT-7/ROSSA1998 experiment, September 13th - October 16th 1998

2.0 Instrumentation

Table 1 describes the instrumentation that was deployed/available on the JCR during the AMT7/ROSSA1998 experiment. The following sections describe the individual systems used together with a summary of their deployment, operation and problems encountered during the experiment.

Parameter	Instrument	Accuracy	Precision	Height (m)
SSST	RAL SISTeR	0.05 K	0.05 K	16.5
SSST	SOSSTR	0.1 K	0.1 K	6.5
IR sky temperature	RAL SISTeR	0.05 K	0.05 K	16.5
IR sky temperature	SOSSTR	0.1 K	0.1 K	6.5
BSST	Trailing PRT	0.02 K	0.02 K	-0.1
BSST	Hull thermistor	0.2 K	0.1K	-2.5
BSST	SeaBird TSG	0.005 K	0.001 K	-5.5
BSST	CTD	0.005 K	0.001 K	-1 to -100
BSST	XBT	0.1 K	0.5 K	-5 to -2000
Dry bulb temperature	PRT	0.002 K	0.005 K	16
Wet bulb temperature	PRT	0.002 K	0.005 K	16
Solar radiation	CM-5 Solarimeter	1 W/m^2	1 W/m^2	16
Solar radiation	Eppley Solarimeter	1 W/m^2	1 W/m^2	26
LW radiation	Eppley Pyrgeometer			26
Wind speed	Sonic Anemometer	0.1 m/s	0.1 m/s	26
Wind direction	Sonic Anemometer	5°	0.1°	26
Sea surface roughness	X band radar	?	?	16
Video images	CCTV camera	N/A	N/A	16
Atmospheric pressure	Vaisala DM 12	0.1mb	0.1mb	5
Salinity	Sea bird TSG	0.002	0.002	-7
Fluorescence	Turner systems			-7
Upper atmosphere	Vaisala RS80	P 1mb; T 0.5 K; RH 2%	P0.1mb T 0.1K; RH 1%	N/A

Table 1 Summary of the measurements made during AMT-7/ROSSA 1998 September - October 1998.

2.1 IOS trailing thermistor

Past cruises have demonstrated that the BAS thermosalinograph unit on board the *James Clark Ross* suffers from particulate contamination and flow rate changes resulting in small-scale temperature offsets. Further, the pumped intake for this particular instrument is located at a depth of ~7m below the sea surface. Pump warming of the drawn seawater occurs throughout the cruise and is a function of the BSST itself. In order to obtain a BSST measurement in the upper 1m of the water column and to check the TSG data, we have deployed a precision IOS trailing thermistor unit (SOAP). This has been deployed from the port side beneath the foreword flank of the *James Clark Ross*. The sensor is trailed from a 3m scaffold pole to which is attached a 16mm steel cable. The sensor cable is attached to the steel cable using duct - tape which has been found superior to cable ties that tend to slip during use. A large ships shackle is attached to the steel cable 0.1m above the waterline, which is stayed off forward using polyrope. Figure 2 shows a photograph of the deployed SOAP instrument. The sensor is signal conditioned to raw digital counts by a deck unit and passed to the BAS oceanlogger system (channel SP3) via expansion ports on RhoPoint modules located on the foremast island. The oceanlogger system logs and archives data at typically 5s intervals. Due to power restriction n the RS485 chain, the SOAP is independently powered via a 24DC supply located in the main laboratory. Power was fed to the forward mast main island junction box via the ships internal wiring ("air-sampler cable") that runs directly from the JCR main laboratory. The instrument was successfully configured and tested prior to sailing from Grimsby.

Unfortunately, the 24VDC-power supply used to power the deck unit was de-mobilised by PML technicians without permission. The cables were cut from the PSU in such a way that the deck unit was short circuited/power surged rendering the unit unserviceable. A replacement unit was borrowed from the Ocean Technology Division of the SOC and successfully installed during the Portsmouth call. As the sensor and electronics require end to end calibration (each SOAP-electronics package requires individual calibration), all pre-cruise calibrations were now void for the 3 SOAP units on board the JCR. However, we were able to acquire a satisfactory calibration of one SOAP using a CASOTS calibration blackbody water bath, precision PRT units (accurate to 0.02 K) over a typical range of ocean temperatures prior to deployment and at the end of the cruise. New calibration coefficients have been derived from these data and are presented as part of Appendix C.

The SOAP performed well throughout the cruise and on only one occasion was a minimum service required. In this case, some of the duct tape had fouled on the sensor outer casing. The SOAP was retrieved, all of the old duct tape removed and new tape applied. 2 turns of tape about the steel cable are required to anchor the tape before the SOAP cable is attached. SOAP data have been obtained for most of the entire cruise with notable exceptions being when the JCR was close to port. In these cases, for the safety of the instrument, the SOAP was stowed inboard.

2.2 IOS Psychrometer

The *James Clark Ross* provides no continuous underway humidity measurements. Consequently, an Institute of Oceanographic Science (IOS) World Ocean Circulation Experiment (WOCE) rated electronic aspirated psychrometer unit (on loan from the Southampton Oceanography Centre Ocean Technology Division) was deployed on the JCR foremast. This instrument was attached to a stub scaffold ensuring that the air from the mast island area (that may become locally warmed in hot weather) was not drawn over the sensors. The instrument is shown in Figure 3. It has on board signal conditioning electronics and the output is logged to the BAS oceanlogger system (channels SP1 and SP2) via RhoPoint expansion ports located on the foremast island. Due to the JCR RS485 power restrictions, the unit was independently powered from the power supply unit located in the JCR main laboratory as discussed in the previous section. Pre cruise calibrations have been obtained for each of the PRT sensors used by the instrument and are presented in Appendix C. The instrument was successfully configured and tested prior to sailing from Grimsby. Periodic checks on the instrument were undertaken to ensure that there is a sufficient volume of distilled water available for the wet bulb wick and the instrument continuously functioned without fault for the duration of the experiment.

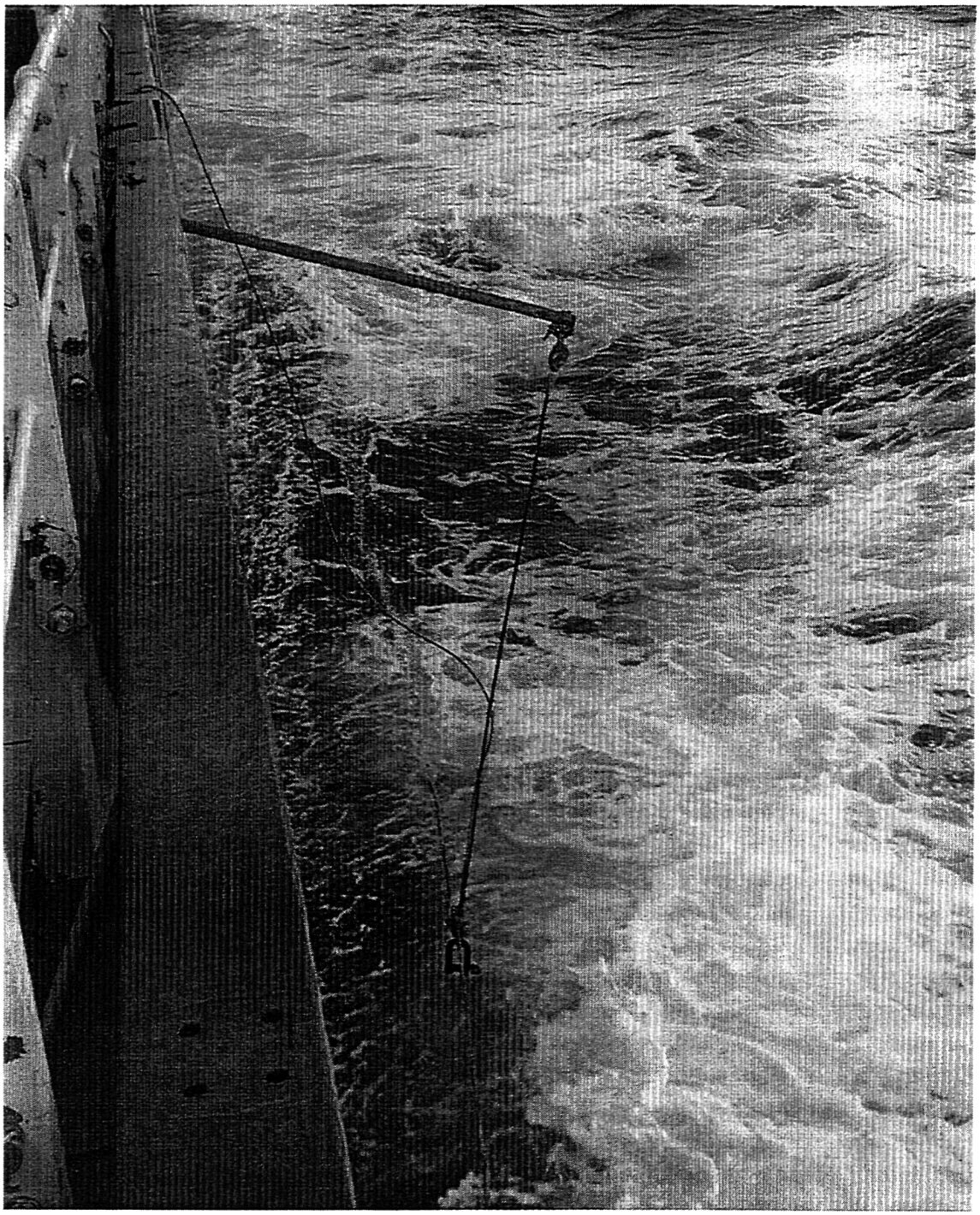

Figure 2. IOS SOAP sensor as deployed on the James Clark Ross during AMT-7/ROSSA 1998.

2.3 Eppley Pyranometer and Pyrgeometer

An Eppley pyranometer and pyrgeometer on loan from the University of Colorado (CCAR) were attached to dedicated gimbal mounts and deployed on the JCR fore mast 'bird table' as shown in Figure 3. Deployment of these instruments requires use of the ships main crane to lift up a "maintenance cage" from which the instruments can be safely attached to the mast. The instrument outputs were logged by a Campbell Scientific CR10x data logger located on the JCR fore mast. Data were recorded in real time to a dedicated PC computer (running Linux) using the Windows Application Binary Interface (WABI) over a RS488 communication link. The connection was led through the ships scientific wiring ("air sampler" cable). An extension cable is taken

into the main scientific wiring of the laboratory space and patched into the UIC room where a second extension cable is led to the logging PC computer. Following BAS policy, the wiring is documented in the master cable document located in the electronics workshop of the UIC room (entries listed as C. Donlon/ROSSA).

Although this arrangement has proven satisfactory, simple but essential improvements can be made to the existing wiring. In particular, the junction box on the foremast required extensive cleaning due to salt-water contamination and a thorough service has been suggested. The ships cable termination in the main lab is extremely unsatisfactory. It was worrisome to have to work with this termination as bare wires inside the ship sensor repeater cabinet where there is considerable exposure of the electronics/cabling. As there are other groups wishing to use this cable, it has been suggested that a proper termination block within a plastic box be provided outside the repeater cabinet.

The Eppley instruments have functioned well throughout the cruise. A cable service was required shortly after sailing involving the sensor cable being detached and cleaned with WD40 due to noisy signals. After this, the sensors have performed without problem. Data logging via the WABI interface sometimes fails and communication is lost to the CR10x. This has resulted in a small amount of data loss. The CR10x has 512K on board memory which provides a buffer of ~4 hours of data storage limiting data loss in such events. The CR10x code used to log this system is given in Appendix A1.

2.4 X band RADAR system

During AMT-3/ROSSA 1996, the University of Michigan supplied a parabolic HH polarized X band RADAR system in order to measure the surface roughness characteristics of the sea surface coincident with the infrared radiometer systems. The objective was to establish a relationship between the surface roughness (via sigma-0 calculations using the RADAR data) and the SSST-BSST temperature deviation. Unfortunately, post processing of the 1996 data has shown that significant contamination of the RADAR signal had occurred most probably related to the wide beam parabolic antennae configuration we adopted. Consequently, a more directional horn antennae having HH and VV polarization was provided by the University of Michigan for deployment during AMT-7/ROSSA 1998. This unit has been attached to the JCR foremast using a dedicated scaffold mounting viewing the sea surface at an angle of 45°. The installation is shown in Figure 5. The instrument is powered and controlled via a PC located in the JCR mailroom having the cable led through the foredeck gooseneck vent.

The instrument has been logging data near continuously for the duration of the cruise. Periodic down time of ~4 hrs is required to back up the data files which fill the PC hard disk in ~3-4 days. Although an Exabyte tape drive was included with the logging PC, this has been unable to generate a reliable back up of the data. Consequently, moving it to the UIC room and establishing an ftp transfer to the main ships system backs up the PC unit. Unfortunately, it has not been possible to make use of the 50-Ohm coax cables located in the mailroom to establish a thin Ethernet connection to

the logging PC. It is recommended that this be further investigated by BAS for future connection to the ships Ethernet LAN.

All of the RADAR data will be post processed using software specifically written for this application after the cruise to retrieve a Doppler velocity spectrum of the sea surface and the radar roughness parameter, sigma-0.

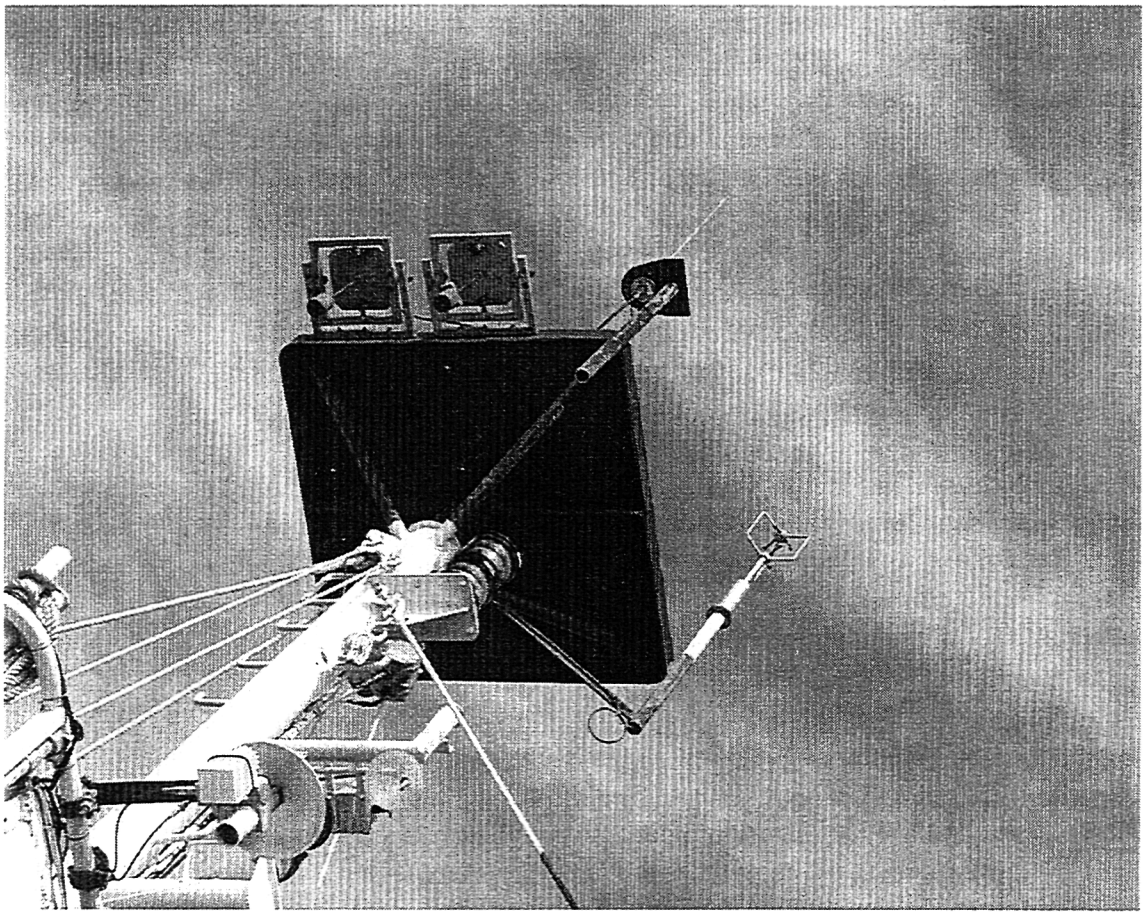

Figure 3 Eppley LW and SW radiometers with glimball mounts and the IOS psychrometer unit as mounted on the James Clark Ross during AMT-7/ROSSA 1998. The psychrometer is the circular pipe with cap and bottle in the lower left of the picture.

2.5 Closed Circuit Television (CCTV) camera system

During the processing of the ROSSA1996 RADAR data it was realised that significant insight into the surface roughness characteristics of the ocean surface could be gained by the use of regular video images of the sea surface. Several systems were investigated as candidates for an appropriate solution including auto ranging aperture systems. Due to budgetary constraints, a low cost solution was chosen based on a PC computer videoconference system. The camera unit was mounted into a rugged alluminium box having a Plexiglas window that was powered and logged via a dedicated ISA PC card located in a PC computer in the mailroom. The unit was deployed above the RADAR system on the JCR foremast as shown in Figure 5. The data were logged via Linux videoconference software at regular intervals of 20s. Initial backups were made using a CD-write unit that unfortunately was unable to function properly in the sub-tropics and tropical regions. It is suspected that the high

temperature and humidity environment of the ships mailroom was the cause of this failure as the unit functioned well once moved to the cooler laboratories. The system has been operated near continuously during daylight hours. Data has not been collected during rainy days. The data have been backed up each night via ftp to the ships computer system.

Figure 4 shows an example image generated by the CCTV system. The image is a negative of the original image and clearly shows sea surface structure. The RADAR antennae horn is seen in the lower right of the image. The first 40 image data lines are corrupted in all images because the frame grabber utility requires time to sync with the camera data. The camera was deployed so that this region of the image views the ship superstructure and is therefore redundant. Note that the camera tends to saturate towards the top of the frame as direct reflection from the sun increases. Although the raw image data have a 24 bit full colour depth, the data are processed in real time to 8 bit greyscale images for storage. The advantages of data reduction far outweigh the slight reduction in image quality.

A calibration image has been generated back in the laboratory that will be used to account for the wide-angle lens used by the camera. The data will be post-processed using standard image geolocation algorithms accounting for the ship roll and pitch movements.

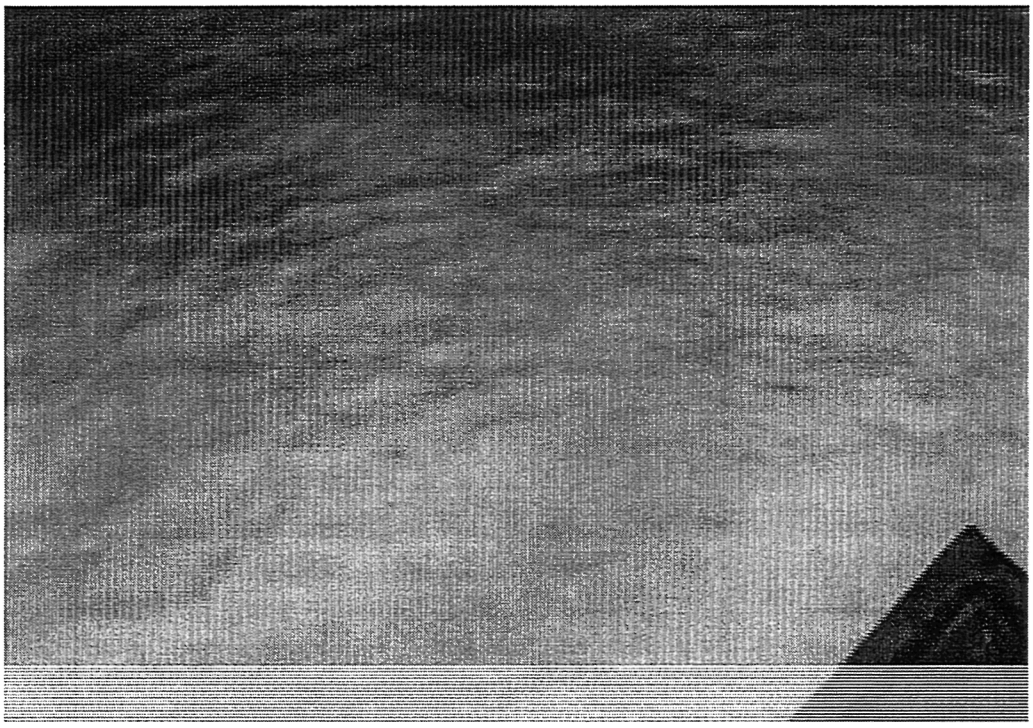

Figure 4 Example CCTV image of the sea surface taken using the PC videoconference system during AMT-7/ROSSA98. Note the bad data in the lower image are due to the camera and framegrabber sync period. The RADAR antennae is seen in the lower right of the image.

2.6 Ship of Opportunity Sea Surface Temperature Radiometer (SOSSTR)

The SOSSTR radiometer system is a self-calibrating low cost radiometer designed and built buy the author. It is windowed at 8-12μm that uses two precision calibration radiance sources attached to the end of a continuously rotating armature. One of the calibration sources is maintained at a temperature above ambient actively heated by a NiCr resistance heater. Two TASCO THI-500L radiometer units sense the radiant temperature of the sea surface and that of the atmosphere respectively. An on going calibration of these radiometers is maintained by the periodic viewing of the radiance sources (blackbodies). The blackbody PRT units have been calibrated at Ball Aerospace, Boulder, CO to better than 0.05 K. The instrument is housed in a large stainless steel box providing protection from adverse weather.

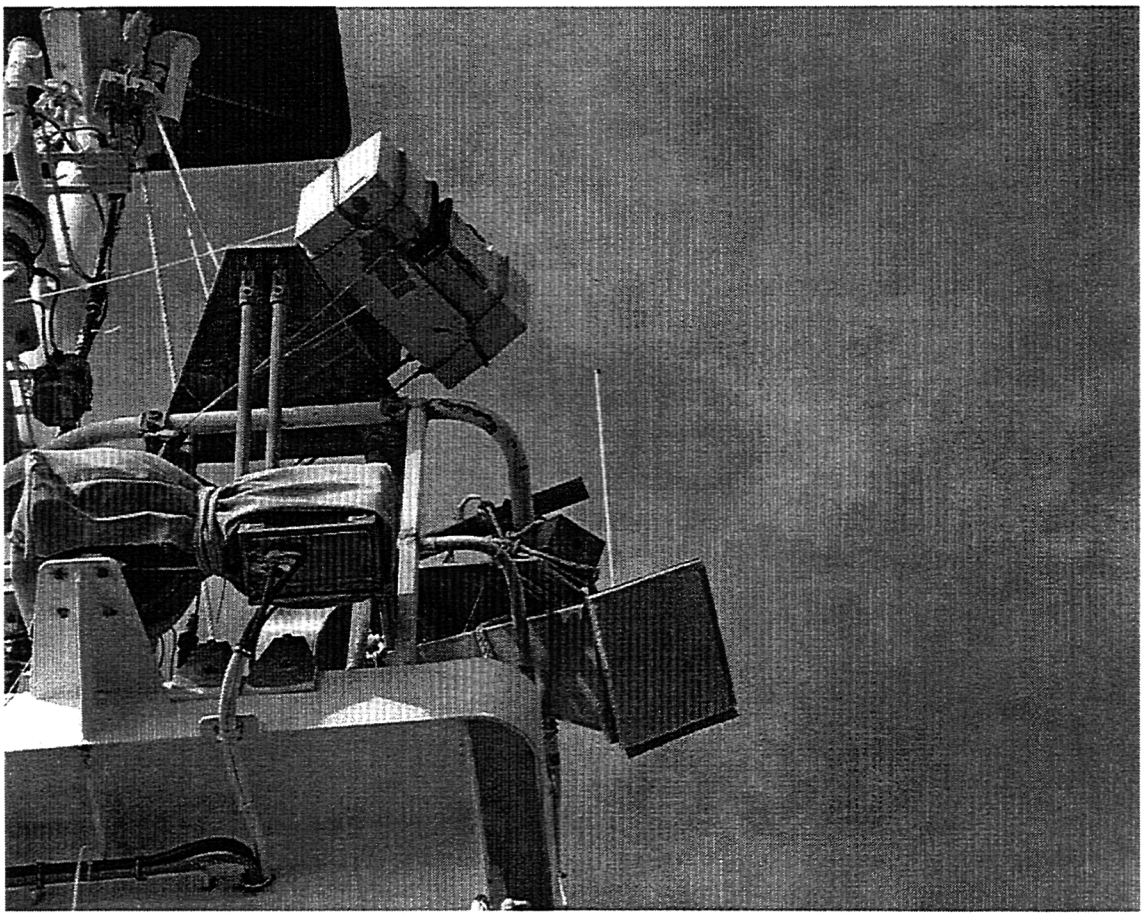

Figure 5 SISTeR radiometer (white with blue rope), RADAR system (with blue end cap in place) and CCTV camera (just above the RADAR) as deployed during AMT-7/ROSSA 1998.

The CCAR SOSSTR radiometer required extensive service after a recent transatlantic cruise. In particular, the system AM-416 multiplexer unit had failed with no suitable replacement available and the TASCO THI-500L radiometer head lenses were also severely corroded, It was decided to completely re-wire the entire instrument in Grimsby. The AM-416 multiplexer unit and corresponding PRT sensors were removed from the system and new wiring looms were installed to the unit carrying power and signal independently. The CR10X data logger was in perfect working order. One of the TASCO radiometer heads purchased as replacements was found to be faulty showing no dynamic range when operational. This unit was replaced with a recently serviced unit provided by the Southampton Oceanography Centre. The faulty

unit will be returned to the TASCO factory for replacement once back at CCAR. With considerable help from the deck engineer (D. Trevitt) a dedicated mount bracket was constructed so that the SOSSTR would view the sea surface from just forward of the bridge. A new Cambell Scientific CR10x logging programme was written which is included in Appendix A2 of this report.

Once the ship sailed from Grimsby it was immediately apparent that the radiometer was viewing the ships bow wash and that an alternative location was required. The look angle would be in excess of 50° from nadir if re-pointing of the radiometer heads was undertaken to clear the wash. This would introduce significant complexity when post processing the data. Consideration was given to the hand rail above the forward ships crane viewing off to the Starboard side, the bow of the ship and the bulwark on the foc'sl head. After discussion it was agreed that the best location would be the ships bow utilizing the old CCAR OPHIR radiometer mount bracket still in place from the ROSSA 1996 experiment. Once installed here, easy access to the instrument for maintenance was assured. Because of the considerably exposed situation (and unrealistic in terms of an autonomous deployment), in poor sea conditions it was decided to offer additional protection to the unit in the form of a large plastic bag. The look angle used by the SOSSTR in this configuration was 34° from nadir. This prevented any of the sea spray thrown up from the bow from entering the system.

A pre cruise calibration was not possible before the ship sailed and weather and time allowing, a full calibration using a CASOTS blackbody will be undertaken in Montevideo or Stanley. However, the SOSSTR radiometer was calibrated against a NIST standard blackbody unit in May 1998 and, as there is no evidence of blackbody contamination, this calibration should still hold true. Operations continued with little problem until 14 days into the cruise when the blackbody drive motor showed signs of failure. The unit was degreased using Trichloethelyne several times and eventually after multiple stalls, the unit was removed from the system for a full service. On inspection, one of the commutator graphite/carbon brushes had completely worn away. The other brush was nearly perfect. A replacement unit was installed to the system and after initial 'bedding in' the unit has functioned without problems.

On several occasions catastrophic noise on the blackbody PRT units was apparent. Although extensive enquiries have been conducted with the ship staff, there seems no obvious cause for this problem. On most occasions, the interference was limited to the SOSSTR blackbody PRT sensors alone, but on other occasions the sky radiometer also suffered the same signal problems. The character of the noise is local and mostly short lived (several seconds – 1 or 2 minutes) but on other occasions periods of up to 30 minutes data corruption have been observed. The noise also occurred during the recent GASEX experiment and was apparent in the AMT-5/ROSSA 1997 data set although no satisfactory explanation could be determined for the cause of this. The system has run near continuously for the duration of the cruise aided by excellent weather conditions for the majority of the trip.

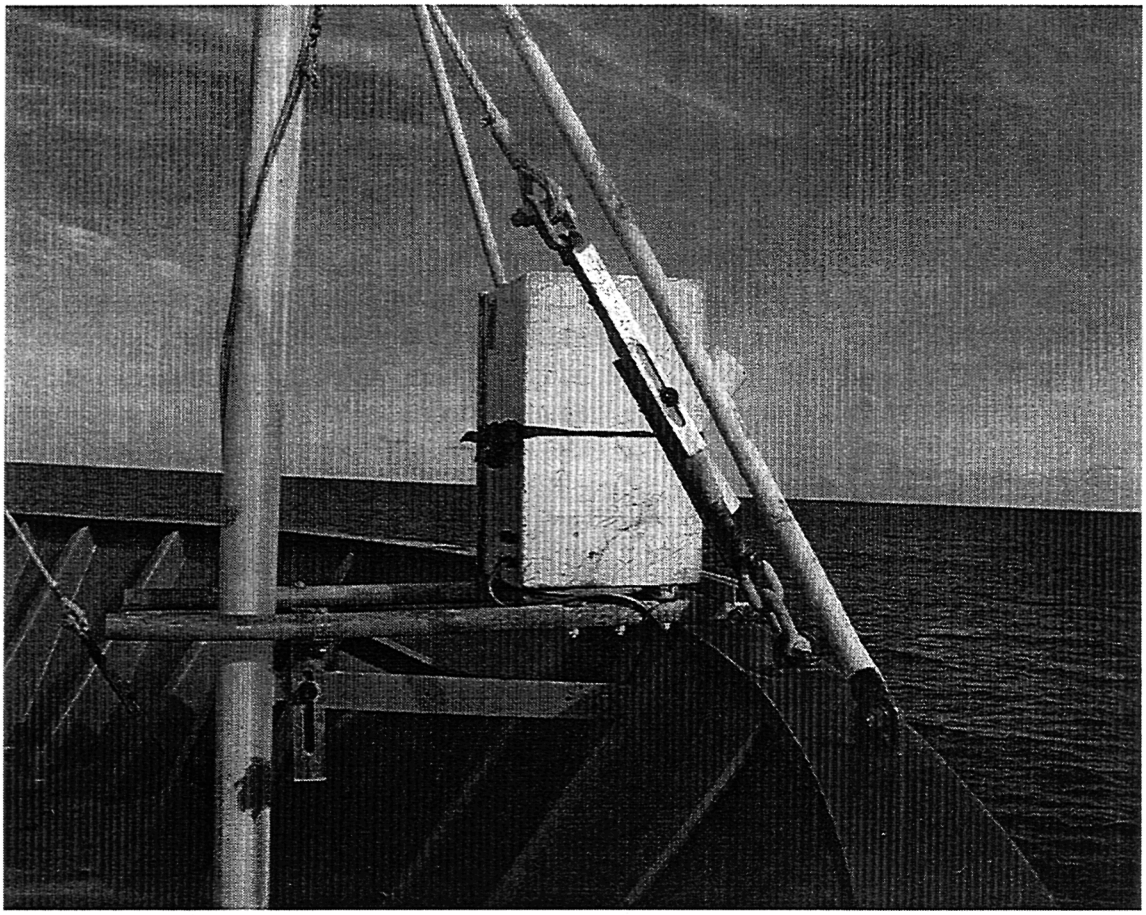

Figure 6 SOSSTR radiometer as deployed on James Clark Ross Bow during AMT-7/ROSSA 1998

2.7 Scanning Infrared Sea surface Temperature Radiometer

The Scanning Infrared Sea surface Temperature Radiometer (SISTeR) is a compact and flexible chopped, self-calibrating infrared filter radiometer, containing a filter centered at 10.8μm. A scan mirror selects between instrument views to the exterior and to two internal black bodies. One is operated at ambient temperature and the other at a programmable increment (typically 10 K) above this. Each black body contains an embedded rhodium iron thermometer and is calibrated complete against a standard thermometer, traceable to the UK National Physical Laboratory (NPL) realization of the ITS-90 temperature scale.

The SISTeR radiometer was calibrated against a CASOTS blackbody unit [Donlon et al., 1998] prior to installation to the JCR forward mast radiometer mount platform. Communication was over RS485 via the ships internal scientific wiring ("air sampler cable") patched into the fore mast island junction box terminating in the JCR main laboratory repeater cabinet. From here an independent cable was led to the main scientific junction box and routed to the JCR UIC laboratory. A separate cable was then led to the logging PC. All wiring is detailed in the BAS scientific wiring master document held in the UIC electronics lab.

Unfortunately, once installed to the mast the SISTeR scan mirror failed to operate correctly. The fault was traced to a loose grub screw holding the shaft encoder to the main scan drive. This problem was corrected and the SISTeR was again installed to

the fore mast. A second problem soon became evident in that the chopper motor drive was faulty and would not start. As the ship was due to sail shortly, it was decided to remove the suspect electronics cards for repair back at the RAL laboratory. This was undertaken and the new cards installed during the Lisbon port call. The SISTeR was calibrated once again using a CASOTS blackbody unit and re-installed to the fore mast as a functioning instrument. The SISTeR was then programmed to scan across the ship foredeck to determine the best view angle to use that would clear the ship bulwarks. An angle of 40.1° from nadir was determines as the optimum angle.

The SISTeR instrument was programmed for operational measurements using a scan sequence comprising of calibration views, a sea surface view and 3 sky views and the sequence repeated *ad infinitum*. The code used for this is given in Appendix A3. Other programmes were written, notably a fast scan routine to measure at 200ms intervals, although it was not possible to use this because of high-speed communication difficulties with the logging PC. It is suggested that this be upgraded to include a fast port that can adequately cater for the fast data frames associated with the SISTeR in these configurations. Another programme was run several times towards the end of the cruise. This programme made calibration views, sea views then a number of sky views at 10° intervals above a nominal horizon of 100° to a maximum of 170°. The skyscan.c sister code is given in appendix A4 and a summary of the SISTeR data sets held in the AMT7/ROSSA1998 archive are given in Table 2.

2.8 Radiosonde ascents

In conjunction with the UK Meteorological office (UKMO) and BAS, a radiosonde receiving station comprising of a Beukers receiver unit and a Vaisala PP-11 processor unit logging to a PC was installed on the JCR by BAS Ice and Climate personnel. Vaisala RS-80 radiosonde units were supplied by the UKMO together with balloons and helium gas was supplied by RAL. The radiosondes were used to obtain a profile of the atmosphere for temperature pressure and humidity each day. The helium gas was located on the top deck of the JCR behind the ship funnel. This provides a location from which either the top deck or the bridge deck may be used to launch the radiosondes from, depending on the wind strength and direction. Daily upper air profiles of temperature, pressure and humidity were made at approximately 09:00 GMT. All data were reported to the UKMO in near real time via the GTS.

Several problems were encountered with the radiosonde operations throughout the cruise. When purging the SISTeR radiometer with He gas in Grimsby, it was noticed that 2 of the delivered He gas cylinders were in fact empty. Fortunately there was sufficient time to have 2 replacement cylinders delivered to the JCR before she sailed.

Problems were encountered when receiving the radiosonde data. The antenna was initially located on the monkey island deck next to the He cylinders. Significant shielding by the ships main mast resulted in significant data loss. The antennae was then moved to the top of the foc'sl – bridge deck outer stairway handrail which improved reception. However, if the radiosonde flew forward of the ship it was extremely difficult to maintain reception. It is suggested that the antennae cable be extended to a higher vantagepoint on the ships main mast for future deployments.

Several flights were terminated early due to loss of signal even when the balloon flew aft of the ship. It was suggested that the balloons be filled with more gas in order to accelerate the ascent. However, signals were still lost early into the flight. Connections to the antennae pre-amplifier were thoroughly checked through with no sign of any problem. The RS-80 radiosondes were the last of this particular type of unit available from the UKMO who have since changed over to use the new Rawinsonde (wind profiling GPS) system. It is possible that he batteries were old and unreliable which would explain the premature signal losses.

2.9 PCO_2 measurements

Continuous measurements of atmospheric and surface water CO_2 were using an autonomous analytical instrument designed at Plymouth Marine Laboratories (PML). The computer controlled system consists of a series of solenoids which direct gas samples from a percolating packed bed equilibrator, a pumped air supply from the ships bridge ad two WMO traceable standards, to an infra-red transmissometer (LiCOR). The system is also equipped with a GPS system so that measurements are logged relative to time and position. Initial problems were experienced due the lack of maintenance and attention given to the system following its use on previous cruises. Some software problems were experienced during the cruise but these had minor impact on data collection.

Radiometric SSST data will be used in a collaborative study to investigate the effect of SSST calibration corrections to pCO_2.

2.10 Ship underway data

The following data streams were logged by the ships RVS ABC system at 5 s intervals for the entire cruse.

- **Wind speed and direction**. These were determined from measurements made by a sonic anemometer located on the JCR foremast at a height of 22.5 m. Post processing will be required to account for the effects of the ships movement in these data.
- **BSST at 7 m.** A hull mounted UKMO thermistor was used to determine BSST at 7 m. These data are required to account for the warming effect of the ship pumps when used to pull water up to the thermosalinograph.
- **BSST and Salinity at 7 m.** The JCR used a 'Sea Bird' thermosalinograph unit having an extendible intake pipe located at a depth of 7 m and operated continuously for the entire cruise. Salinity samples were taken at regular intervals throughout the cruise for calibration purposes.
- **Fluorescance**. A Turner-10 flourometer was operated continuously using the ships clean water scientific supply. Calibration samples are taken at 2hr intervals throughout the cruise.
- **Air pressure**. Continuous air pressure was monitored using a Vaisala PA-12 digital barometer logged to the oceanlogger system.
- **Air temperature**. This was measured via a PRT located on the handrail of the JCR foremast. The IOS psychrometer data will be used to provide a calibration for this sensor.

- **Solar radiation**. Although the JCR has a Kipp and Zonen pyranometer maintained and operated by BAS located on the handrail of the foremast island, this sensor is not used as significant shadowing from the fore mast itself introducing significant errors. It is highly recommended that this sensor be re located to the bird table in order to circumvent this problem.
- **Photosynthetically Active Radiation (PAR).** As with the BAS Solarimeter, the BAS PAR sensor is in need of a complete overhaul and re-deployment on the Bird table so that it will be free of any significant shadowing from the JCR foremast

2.11 Visual observations

For the duration of the experiment, a detailed log of all events has been kept which is presented as Appendix B.1. Additionally, the ships Officers have, when possible, kept an hourly log of sea state and cloud cover based on the Beaufort scale and standard UK Met. Office observations. These data are presented in Appendix B.2.

3.0 AMT-7/ROSSA1998 Grimsby-Montevideo data inventory

The following tables describe the AMT7/ROSSA1998 data inventory (***excluding*** the BAS-JCR data streams that are recorded for the entire cruise) for the AMT-7/ROSSA1998 experiment. Raw data are held on DLT and Exabyte tapes at the Joint Research Centre Marine Environment Unit, Italy (Contact Dr. Craig Donlon) and the Rutherford Appleton Laboratory Space Science Department, UK (Contact Dr. Timothy Nightingale)

98092002.arc	264	11:40:00	3.871479e+01	-9.110869e+00	264	12:01:00	3.871479e+01	-9.110869e+00	In Lisbon
98092003.arc	264	14:39:00	3.871479e+01	-9.110869e+00	265	16:06:00	3.866577e+01	-9.312345e+00	Loose door seat waving in front of scan drum SISTeR GS computer crashed at the end bad scan sequence
	265	16:28:00	3.861694e+01	-9.378929e+00	265	20:18:00	3.793073e+01	-1.520301e+01	slicks all about bad scan sequence
98092202.arc	265	21:30:00	3.778037e+01	-1.543620e+01	266	07:38:00	3.655566e+01	-1.738838e+01	Bad scan sequence
98092301.arc	266	09:06:00	3.631195e+01	-1.749164e+01	266	15:57:00	3.563873e+01	-1.746540e+01	Bad scan sequence
98230902.arc	266	15:57:00	3.563873e+01	-1.746540e+01	267	20:04:00	3.248986e+01	-1.692527e+01	Changes to ROSSA98.EXE to include longer time delays on scan mirror
98092401.arc	267	20:20:00	3.246856e+01	-1.695054e+01	268	14:54:00	3.263177e+01	-1.691252e+01	OK
98092501.arc	268	14:56:00	3.263234e+01	-1.691246e+01	272	05:10:00	1.864474e+01	-2.001004e+01	At 269 00:37:00 Ground station comms FAILED. Saharan dust contamination rain at end
2720633.arc	272	06:33:00	1.836755e+01	-2.000338e+01	273	08:02:00	1.460811e+01	-1.737171e+01	Dakar port call
2730850.arc	273	08:50:00	1.458588e+01	-1.744289e+01	275	17:00:00	1.124299e+01	-2.136867e+01	Glassy seas slicks
2752013.arc	275	20:13:00	1.068296e+01	-2.148221e+01	275	21:35:00	1.041985e+01	-2.153924e+01	Rain warning
2760120.arc	276	01:20:00	9.713992e+00	-2.169302e+01	276	15:10:00	7.535793e+00	-2.241175e+01	glassy seas no wind local shower at end
2761722.arc	276	17:22:00	7.168929e+00	-2.255557e+01	278	00:00:00	2.244652e+00	-2.458259e+01	Warning of rain door closed
2780104.arc	278	01:04:00	2.048390e+00	-2.465895e+01	279	13:13:00	-4.260082e+00	-2.719790e+01	Local shower door closed
2791807.arc	279	18:07:00	-4.880229e+00	-2.746039e+01	279	19:12:00	-5.081055e+00	-2.753435e+01	Door closed rain ahead
2792113.arc	279	21:13:00	-5.449961e+00	-2.768367e+01	279	22:47:00	-5.738968e+00	-2.779631e+01	Rain ahead door closed
2792325.arc	279	23:25:00	-5.854515e+00	-2.784027e+01	279	23:36:00	-5.887720e+00	-2.785403e+01	Short file
2792337.arc	279	23:37:00	-5.890723e+00	-2.785528e+01	280	10:11:00	-7.815168e+00	-2.866836e+01	Rain ahead door closed
2801140.arc	280	11:40:00	-8.042610e+00	-2.875455e+01	280	13:28:00	-8.242591e+00	-2.882752e+01	Rain ahead dorr closed
2801355.arc	280	13:55:00	-8.305926e+00	-2.884902e+01	280	14:02:00	-8.305898e+00	-2.884823e+01	Tried to load up fast200.exe resulting in chaos. Instrument requiring re set, comms catastrophically crashed !
2801410.arc	280	14:10:00	-8.306501e+00	-2.884681e+01	280	14:20:00	-8.307099e+00	-2.884625e+01	Comms crashed
2801421.arc	280	14:21:00	-8.307170e+00	-2.884613e+01	280	15:15:00	-8.348945e+00	-2.882357e+01	Rain ahead door closed
2801645.arc	280	16:45:00	-8.589904e+00	-2.893948e+01	283	18:03:00	-2.032652e+01	-3.532896e+01	Rolling seas off the Port side Warning of rain at the end door closed.
2832115.arc	283	21:15:00	-2.089990e+01	-3.556571e+01	285	04:10:00	-2.542425e+01	-3.886826e+01	Rain reported door closeda
2851512.arc	285	15:26:00	-2.673687e+01	-4.018408e+01	286	03:57:00	-2.846785e+01	-4.203160e+01	Rain ahead door closed
2860925.arc	286	09:25:00	-2.926354e+01	-4.287940e+01	286	13:33:00	-2.966956e+01	-4.332262e+01	Stopped to upload skyscan.exe
2861346.arc	286	13:46:00	-2.970159e+01	-4.335564e+01	286	13:55:00	-2.972375e+01	-4.337899e+01	skyscan.exe stopped to change skyscan code
2861401.arc	286	14:01:00	-2.973398e+01	-4.339169e+01	286	14:05:00	-2.973437e+01	-4.339338e+01	Stopped as skyscan angles are still wrong
2861412.arc	286	14:12:00	-2.973415e+01	-4.339493e+01	286	15:02:00	-2.979858e+01	-4.346518e+01	Door closed due to suspected shower ahead
2861543.arc	286	15:43:00	-2.985125e+01	-4.352169e+01	286	21:40:00	-3.066575e+01	-4.440553e+01	
2862148.arc	286	21:48:00	-3.068434e+01	-4.442692e+01	287	11:15:00	-3.264648e+01	-4.655797e+01	Logging with ROSSA98.EXE
2871115.arc	287	11:15:00	-3.264648e+01	-4.655797e+01	287	16:26:00	-3.294675e+01	-4.691411e+01	logging with skyscan.exe
2871630.arc	287	16:30:00	-3.295603e+01	-4.692476e+01	290	11:00:00	-3.500721e+01	-5.606997e+01	logging with rossa98.exe stops in Monte berth END LEG 1
2932239.arc	293	22:39:00	-3.522380e+01	-5.541700e+01	295	18:00:00	-4.004891e+01	-5.015263e+01	Good weather rain at end. Soap.out @ 294 14:30
2981050.arc	298	10:50:00	-4.993873e+01	-5.643621e+01	298	20:00:00	-5.169186e+01	-5.782208e+01	Tied up in Stanley and end of ROSSA 1998

Table 2 AMT-7/ROSSA1998 SISTeR radiometer data sets.

Filename	ID	yy	ddd	hh:mm:ss	yy	ddd	hh:mm:ss	Start lat	Start lon	Stop lat	Stop lon
AMT7-255110157-255213832.sosstr_a98	38150	98	255	11:01:57	98	255	21:38:32	53.4912	0.433248	51.8778	11.8778
AMT7-255213833-256075928.sosstr_a98	37240	98	255	21:38:33	98	256	07:59:28	51.8778	1.80219	50.5943	-0.429913
AMT7-256075952-256112844.sosstr_a98	12500	98	256	07:59:52	98	256	11:28:53	50.5943	-0.429913	50.8072	807230.
AMT7-257150717-257233013.sosstr_a98	30138	98	257	15:07:17	98	257	23:30:13	50.8067	-1.10497	49.9601	-2.91542
AMT7-257233014-258072154.sosstr_a98	282280	98	257	23:30:14	98	258	07:21:55	49.9607	-2.91306	49.4235	-5.10762
AMT7-258072329-258203904.sosstr_a98	47550	98	258	07:23:29	98	258	20:39:04	49.4218	-5.11430	48.1358	-7.96602
AMT7-258204003-259084500.sosstr_a98	43460	98	258	20:40:03	98	259	08:45:00	48.1325	-7.97123	46.6378	-10.7534
AMT7-259084614-259200954.sosstr_a98	41000	98	259	08:46:14	98	259	20:09:54	46.6359	-10.7571	44.8160	-10.7783
AMT7-259201054-260085051.sosstr_a98	45595	98	259	20:10:54	98	260	08:50:51	44.8126	-10.7783	42.2706	-10.8340
AMT7-260085205-260205022.sosstr_a98	43097	98	260	08:52:05	98	260	20:50:22	42.2638	-10.8341	40.3720	-10.8064
AMT7-260205022-261083031.sosstr_a98	42020	98	260	20:50:22	98	261	08:30:43	42.2621	-10.8341	38.7643	-99.0837
AMT7-261083044-261123632.sosstr_a98	14686	98	261	08:30:44	98	261	12:36:32	38.7655	-9.90823	38.6548	-9.32625
AMT7-264144120-265072313.sosstr_a98	60022	98	264	14:41:20	98	265	07:23:13	38.7568	-9.09091	38.7414	-13.0718
AMT7-265072315-266152534.sosstr_a98	115339	98	265	07:23:15	98	266	15:25:34	38.7414	-13.0718	35.7189	-17.4708
AMT7-266152707-268145718.sosstr_a98	171102	98	266	15:27:07	98	268	14:57:18	35.7173	-17.4708	32.5141	-16.9546
AMT7-268145719-272051748.sosstr_a98	310825	98	268	14:57:19	98	272	05:17:48	32.6327	-16.9125	18.6196	-20.0100
AMT7-272051750-276061916.sosstr_a98	349280	98	272	05:17:50	98	276	06:19:16	18.6213	-20.0100	8.77063	-21.9883
AMT7-276061918-276181803.sosstr_a98	43134	98	276	06:19:18	98	276	18:18:12	7.00005	-22.6264	7.00005	-22.6264
AMT7-276181813-277192404.sosstr_a98	90351	98	276	18:18:13	98	277	19:24:04	7.00005	-22.6264	3.08742	-24.2411
AMT7-277192405-280165840.sosstr_a98	250475	98	277	19:24:05	98	280	16:58:40	3.08897	-24.2404	-8.62601	-28.9546
AMT7-280165841-284005513.sosstr_a98	287792	98	280	16:48:51	98	284	00:55:13	-8.62878	-28.9557	-21.5270	-35.8725
AMT7-284073012-284082210.sosstr_a98	3119	98	284	07:30:12	98	284	08:22:10	-22.6961	-36.4333	-22.8538	50.0000
AMT7-LISBON-CALL.sosstr_a98	266600	98	261	12:37:45	98	264	14:41:19	38.7568	-9.09091	38.7568	-9.09091

Table 3 AMT-7/ROSSA1998 SOSSTR radiometer data sets.

AMT7-255135043-256113703.eppley_a98
AMT7-257150111-258102604.eppely_a98
AMT7-258102705-258160804.eppley_a98
AMT7-258200725-258204910.eppley_a98
AMT7-259095130-260014109_eppley_a98
AMT7-260055201-260072622.eppley_a98
AMT7-260111341-260124800.eppley_a98
AMT7-260123803-261082809.eppley_a98
AMT7-261082938-261123609.eppley_a98
AMT7-264143815-265072416.eppley_a98

AMT7-265072417-265213835.eppley_a98
AMT7-265213836-265152608.eppley_a98
AMT7-265213836-266152608.eppley_a98
AMT7-266152618-268145648.eppley_a98
AMT7-268145649-268154021.eppley_a98
AMT7-268145649-272051818.eppley_a98
AMT7-272051828-276065234.eppley_a98
AMT7-276065235-279083100.eppely_a98
AMT7-279081012-279181157.eppley_a98
AMT7-279181159-282214845.eppley_a98
AMT7-282214846-285140638.eppley_a98
AMT7-LISBON-CALL.eppley_a98

Table 4 AMT-7/ROSSA1998 Eppley SW and LW radiometer data sets.

File	Time (GMT)	Lat	Lon	SSTC	AirT C	Press (mb)	Hum %	Ws (kt)	Wd (T)	Q	MMM	N	Cl	h	CmC h	Comments
09161.fli	10:45	46.5N	-010.8W	18.5	17.0	1020.7	62	2	050 (05)	7	145	7	6	4	SC	Failed at 10:10 abruptly at 689mb
09171.fli	10:00	42.0N	-010.5W	18.3	17.4	1016.1	64	20	010 (01)	7	145	7	6	3	SC	Failed early into flight
09181.fli	10:00	38.3N	-008.0W	18.4	17.8	1014.6	78	18	005 (01)	7	110	6	6	4	SC	No Sondes off Lisbon or Madera
22091.fli	10:00	38.5N	-013.4W	21.5	20.3	1017.9	61	9	339 (34)	7	110	7	4	4	AS	Message out OK
23091.fli	09:17	36.2N	-017.3W	23.4	21.9	1020.7	60	18	346 (35)	7	110	7	3	4	AC	
26091.fli	09:19	30.1N	-019.5W	23.8	22.5	1017.7	63	2.3	000 (36)	7	110	1	2	6	CC	All OK
27091.fli	09:05	26.2N	-020.0W	24.1	23.1	1018.4	71	20	067 (07)	7	74	1	3	6	AC	OK
28091.fli	09:25	22:1N	-020.0W	24.1	23.1	1018.0	81	13	040 (04)	7	81	1	2	8	CS	
29091.fli	09:18	17.5N	-020.0W	26.9	27.5	1013.4	85	14	000 (01)	7	38	5	3	6	AC	
30091.fli	09:30	14.4N	-017.3W	28.6	29.9	1013.3	85	15	176 (18)	7	38	6	3	6	AC	
02101.fli	09:30	12.2N	-021.5W	28.3	27.2	1013.7	81	5	352 ((25)	7	39	6	4	4	AS	
03101.fli	09:30	08.2N	-022.1W	28.1	26.3	1014.2	81	2	298 (30)	7	3	3	8	2	CU	
04101.fli	09:20	04:5N	-023.5W	28.0	26.5	1013.8	84	10	148 (15)	7	3	3	8	2	CU	Sonde wire failed to unwind on launch
05101.fli	09.20	00.3N	-025.2W	26.6	25.2	1012.4	66	13	145 (15)	7	3	6	3	3	AC	
06101.fli	09:30	03.4S	-026.5W	26.4	25.1	1013.2	67	15	133 (14)	5	302	4	3	6	AC	
07101.fli	09:20	07.4S	-028.4W	26.2	25.1	1013.5	71	24	116 (12)	5	302	5	3	5	AC	
08101.fli	09:15	11.4S	-030.1W	25.9	24.8	1015.5	63	24	095 (10)	5	339	4	8	2	CU	
09101.fli	09:05	15.3S	-031.5W	25.7	24.0	1016.8	62	17	095 (10)	5	339	4	8	2	CU	
10101.fli	16:14	19.5S	-035.1W	25.0	24.4	1014.4	68	19	010 (01)	5	339	7	3	3	AC	Short flight only to 400 mb
11101.fli	09:10	22.5S	-036.3W	23.9	21.1	1014.2	51	1	250 (25)	5	375	1	8	3	CU	
12101.fli	09:35	26.1S	-039.3W	22.1	18.8	1010.3	86	12	085 (09)	5	375	8	8	1	CU	Light drizzle rain
13101.fli	09:10	29.1S	-042.5W	18.7	17.7	1016.4	72	9	163(16)	5	375	7	6	3	SC	

14101.fli	09:10	31.2S	-046.2W	18.6	16.5	1020.4	64	12	160 (16)	5	412	7	6	4	SC	
14092.fli	12:35	32.4S	-046.4W	18.5	16.4	1022.8	62	5	160 (14)	5	412	1	0	7	CI	
15091.fli	09:15	35.1S	-049.0W	16.6	15.6	1017.7	61	14	326 (33)	5	412	1	0	8	CI	
16091.fli	16:15	37.4S	-052.3W	17.0	16.0	10108	58	21	189 (19)	5	413	3	8	5	31	Cu AC CC

Table 5 AMT-7/ROSSA 1998 Radiosonde data sets.

4.0 Discussion

The main purpose of this report is to document the basic data sets collected during the AMT-7/ROSSA 1998 expereiment and to provide a reference document containing the scientific logs made during the experiment. The AMT-7/ROSSA1998 experiment has generated an accurate state of the art data set suitable for the detailed investigation of the sea surface skin temperature difference and the investigation of the transport of heat, gas and moisture at the air sea interface. Using these data detailed investigations of the exchange of temperature soluble gasses across the air sea interface will be possible. The extent of data coverage for much of the experiment is continuous across the Atlantic Ocean with breaks only due to local rain, calibration runs or instrument service. The data set includes many cloud free days where validation of satellite radiometer data is potentially possible. A varied set of atmospheric and oceanic conditions have been encountered with wind speeds ranging from 0 – 15 ms^{-1}. Significant numbers of sea surface slick features have been traversed showing definite subsurface thermal and Salinity features as well as strong signals in the radiometer data. During such low wind speed conditions, significant diurnal warming of the upper 1m of the water column was apparent on many occasions. These data will be used in conjunction with GOES-8 IR satellite images to investigate the regional nature of such features.

Of particular interest have been the freshwater lenses encountered in the Tropical regions which warrant further investigation. In these cases, a measure of the rainfall rate would have been useful and it is suggested that this is included in the instrument package for the follow on AMT/ROSSA experiments.

Interesting atmospheric conditions associated with Saharan dust were encountered, which had a significant effect on the SISTeR radiometer data sets in 1996. New data collected in similar conditions this year will be used to corroborate our findings in 1996. Characteristics of these data were anomalously warm SSST at wind speeds in excess of 8ms^{-1}.

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6.0 Appendix A Data logging programmes

A1. Eppley CR10x data logging programme

```
;{CR10X}
;# CR10 X programme to operate the CCAR eppley
;# radiomstsers. Logged to CR10X directly
;# C J Donlon AMT-7 September 1996


;# Execution interval of 1 secs allows for all data
;# collection, telemetry and PC screen updates - fiddle with
;# this at your own peril !
*Table 1 Program
 01: 1   Execution Interval (seconds)


1: Volt (Diff) (P2)
 1: 1  Reps
 2: 33  25 mV 50 Hz Rejection Range
 3: 1  DIFF Channel
 4: 3  Loc [ ep_lw  ]
 5: 1.0  Mult
 6: 0.0  Offset


2: Volt (Diff) (P2)
```

```
 1: 1  Reps
 2: 33  25 mV 50 Hz Rejection Range
 3: 2  DIFF Channel
 4: 4  Loc [ ep_sw  ]
 5: 1.0  Mult
 6: 0.0  Offset


3: Z=X*F (P37)
 1: 3  X Loc [ ep_lw  ]
 2: 100  F
 3: 5  Z Loc [ eplw100 ]

4: Z=X*F (P37)
 1: 4  X Loc [ ep_sw  ]
 2: 1000  F
 3: 6  Z Loc [ epsw1000 ]


;# Check CR10x battery voltage....
5: Batt Voltage (P10)
 1: 1  Loc [ CR10_volt ]

;# Sample the CR10x internal temperature
6: Internal Temperature (P17)
 1: 2  Loc [ CR10_temp ]

;# Initiate telecommunications with PC in lab...
7: Do (P86)
 1: 10  Set Output Flag High (Flag 0)

;# Get the DATALOGGER time and data...
8: Real Time (P77)
 1: 1111  Year,Day,Hour/Minute,Seconds (midnight = 0000)

;# Sample 6 locations....
9: Sample (P70)
 1: 6  Reps
 2: 1  Loc [ CR10_volt ]

;# Set data to high resolution...
10: Resolution (P78)
 1: 1  High Resolution

;# Spit the data down the line....
11: Serial Out (P96)
 1: 71  SM192/SM716/CSM1

;# Tables 2 and 3 are UNUSED
```

```
*Table 2 Program
 01: 0.0000 Execution Interval (seconds)

*Table 3 Subroutines

End Program

-Input Locations-
1 CR10_volt 5 1 1
2 CR10_temp 9 1 1
3 ep_lw  9 2 1
4 ep_sw  17 2 1
5 eplw100 1 0 1
6 epsw1000 1 0 1

-Program Security-
0000
0000
0000
-Mode 4-
-Final Storage Area 2-
0
-CR10X ID-
0
-CR10X Power Up-
3
```

A2. SOSSTR radiometer CR10x data logging programme

```
;{CR10X}
;# CR10 X programme to operate the SOSSTR radiometer
;# C J Donlon CCAR April 1998.MT-7 September 1998


;# Execution interval of .5 secs allows for all data
;# collection, telemetry and PC screen updates - fiddle with
;# this at your own peril !
*Table 1 Program
 01: 0.5  Execution Interval (seconds)

;# Now get the Rs/Ro value for the BB1 PRT
1: Full Bridge w/mv Excit (P9)
 1: 1  Reps
 2: 33  25 mV 50 Hz Rejection Ex Range
 3: 33  25 mV 50 Hz Rejection Br Range
 4: 1  DIFF Channel
 5: 1  Excite all reps w/Exchan 1
 6: 2050  mV Excitation
 7: 1  Loc [ Rs_Ro_BB1 ]
 8: 1  Mult
```

```
 9: 0.0000 Offset

;# Using the data obtained in 4 above
;# Compute the BB1 PRT temperature (NOTE:
;# additional end-to-end calibrations are required
;# in post processing)
2: Temperature RTD (P16)
 1: 1  Reps
 2: 1  R/R0 Loc [ Rs_Ro_BB1 ]
 3: 2  Loc [ BB1_temp ]
 4: 1  Mult
 5: 0.0000 Offset

;# Now do BB2 as for BB1 above....
3: Full Bridge w/mv Excit (P9)
 1: 1  Reps
 2: 23  25 mV 60 Hz Rejection Ex Range
 3: 23  25 mV 60 Hz Rejection Br Range
 4: 3  DIFF Channel
 5: 2  Excite all reps w/Exchan 2
 6: 2050  mV Excitation
 7: 3  Loc [ Rs_Ro_BB2 ]
 8: 1  Mult
 9: 0.0000 Offset

;# BB2 temperature...
4: Temperature RTD (P16)
 1: 1  Reps
 2: 3  R/R0 Loc [ Rs_Ro_BB2 ]
 3: 4  Loc [ BB2_temp ]
 4: 1  Mult
 5: 0.0000 Offset

;# Sample TASCO A 5 times....
5: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 5  DIFF Channel
 4: 7  Loc [ TASCO_A1 ]
 5: 1.0  Mult
 6: 0.0  Offset
6: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 5  DIFF Channel
 4: 8  Loc [ TASCO_A2 ]
 5: 1.0  Mult
 6: 0.0  Offset
7: Volt (Diff) (P2)
```

```
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 5  DIFF Channel
 4: 9  Loc [ TASCO_A3 ]
 5: 1.0  Mult
 6: 0.0  Offset
8: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 5  DIFF Channel
 4: 10  Loc [ TASCO_A4 ]
 5: 1.0  Mult
 6: 0.0  Offset
9: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 5  DIFF Channel
 4: 11  Loc [ TASCO_A5 ]
 5: 1.0  Mult
 6: 0.0  Offset

;# Average the TASCO A data...
10: Spatial Average (P51)
 1: 5  Swath
 2: 7  First Loc [ TASCO_A1 ]
 3: 12  Avg Loc [ TASCO_A_x ]

;# Sample the TASCO B as for TASCO A above...
11: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 6  DIFF Channel
 4: 13  Loc [ TASCO_B1 ]
 5: 1.0  Mult
 6: 0.0  Offset
12: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 6  DIFF Channel
 4: 14  Loc [ TASCO_B2 ]
 5: 1.0  Mult
 6: 0.0  Offset
13: Volt (Diff) (P2)
 1: 1  Reps
 2: 24  250 mV 60 Hz Rejection Range
 3: 6  DIFF Channel
 4: 15  Loc [ TASCO_B3 ]
 5: 1.0  Mult
 6: 0.0  Offset
```

14: Volt (Diff) (P2)
 1: 1 Reps
 2: 24 250 mV 60 Hz Rejection Range
 3: 6 DIFF Channel
 4: 16 Loc [TASCO_B4]
 5: 1.0 Mult
 6: 0.0 Offset
15: Volt (Diff) (P2)
 1: 1 Reps
 2: 24 250 mV 60 Hz Rejection Range
 3: 6 DIFF Channel
 4: 17 Loc [TASCO_B5]
 5: 1.0 Mult
 6: 0.0 Offset

16: Spatial Average (P51)
 1: 5 Swath
 2: 13 First Loc [TASCO_B1]
 3: 18 Avg Loc [TASCO_B_x]

;# Check CR10x battery voltage....
17: Batt Voltage (P10)
 1: 5 Loc [CR10_volt]

;# Sample the CR10x internal temperature
18: Internal Temperature (P17)
 1: 6 Loc [CR10_temp]

;# Initiate telecommunications with PC in lab...
19: Do (P86)
 1: 10 Set Output Flag High (Flag 0)

;# Get the DATALOGGER time and data...
20: Real Time (P77)
 1: 1111 Year,Day,Hour/Minute,Seconds (midnight = 0000)

;# Sample 40 locations....
21: Sample (P70)
 1: 18 Reps
 2: 1 Loc [Rs_Ro_BB1]

;# Set data to high resolution...
22: Resolution (P78)
 1: 1 High Resolution

;# Spit the data down the line....
23: Serial Out (P96)

```
 1: 71  SM192/SM716/CSM1

;# Tables 2 and 3 are UNUSED
*Table 2 Program
 01: 0.0000 Execution Interval (seconds)

*Table 3 Subroutines


End Program

-Input Locations-
1 Rs_Ro_BB1 5 2 1
2 BB1_temp 9 1 1
3 Rs_Ro_BB2 9 2 1
4 BB2_temp 9 1 1
5 CR10_volt 9 1 1
6 CR10_temp 9 1 1
7 TASCO_A1 9 2 1
8 TASCO_A2 9 2 1
9 TASCO_A3 9 2 1
10 TASCO_A4 9 2 1
11 TASCO_A5 9 2 1
12 TASCO_A_x 9 1 1
13 TASCO_B1 9 2 1
14 TASCO_B2 9 2 1
15 TASCO_B3 9 2 1
16 TASCO_B4 9 2 1
17 TASCO_B5 9 2 1
18 TASCO_B_x 17 1 1

-Program Security-
0000
0000
0000
-Mode 4-
-Final Storage Area 2-
0
-CR10X ID-
0
-CR10X Power Up-
3
```

A3. SISTeR rossa98.c data logging programme

```
#include "sister.h"

void move (word position, word stabilise, word sample)
{
```

```
 Byte[1] = FALSE;
 scan_d = position;
 wait (stabilise);
 Byte[1] = TRUE;
 // scan_d = scan_c;
 wait (sample);
}

int main (void)
{
 start ();
 htren_d = 2;
 BB2_d = 220;

/*
/* Byte[0] :
/* 1) BB1
/* 2) BB2
/* 40) Sea (40 degrees)
/* 120) Sky (120 degrees)
/* 140) Sky (140 degrees)
/* 180) Sky (180 degrees)
*/

 while (TRUE) {
 Byte[0] = 2; move (BB2, 6, 8);
 Byte[0] = 1; move (BB1, 6, 8);
 Byte[0] = 40; move (NADIR + degrees (40), 8,68);
 Byte[0] = 120; move (NADIR + degrees (120), 6, 4);
 Byte[0] = 140; move (NADIR + degrees (140), 4, 4);
 Byte[0] = 180; move (NADIR + degrees (180), 4, 4);
 }
}
```

A4. SISTeR skyscan.c data logging programme

```
#include "sister.h"

void move (word position, word stabilise, word sample)
{
 Byte[1] = FALSE;
 scan_d = position;
 wait (stabilise);
 Byte[1] = TRUE;
 //scan_d = scan_c;
 wait (sample);
}
```

```
int main (void)
{
 start ();
 htren_d = 2;
 BB2_d = 220;

/*
/* Byte[0] :
/* 1) BB1
/* 2) BB2
/* 40) Sea (40 degrees)
/* 100) Sky (100 degrees)
/* 110) Sky (110 degrees)
/* 120) Sky (120 degrees)
/* 130) Sky (130 degrees)
/* 140) Sky (140 degrees)
/* 150) Sky (150 degrees)
/* 160) Sky (160 degrees)
/* 170) Sky (170 degrees)
/* 180) Sky (180 degrees)
*/

 while (TRUE) {
 Byte[0] = 2 ; move (BB2, 6, 8);
 Byte[0] = 1 ; move (BB1, 6, 8);
 Byte[0] = 40 ; move (NADIR + degrees (40), 6, 32);
 Byte[0] = 100; move (NADIR + degrees (100), 6, 4);
 Byte[0] = 110; move (NADIR + degrees (110), 6, 4);
 Byte[0] = 120; move (NADIR + degrees (120), 6, 4);
 Byte[0] = 130; move (NADIR + degrees (130), 6, 4);
 Byte[0] = 140; move (NADIR + degrees (140), 6, 4);
 Byte[0] = 150; move (NADIR + degrees (150), 6, 4);
 Byte[0] = 160; move (NADIR + degrees (160), 6, 4);
 Byte[0] = 170; move (NADIR + degrees (170), 6, 4);
 Byte[0] = 180; move (NADIR + degrees (180), 8, 4);
 }
}
```

7.0 Appendix B

B.1. Cruise program for the Atlantic Meridional Transect 7 cruise.

Plymouth Marine Laboratory

ATLANTIC MERIDIONAL TRANSECT: AMT 7

CRUISE PROGRAMME

VESSEL	RRS *JAMES CLARK ROSS*
CRUISE PERIOD	10 September to 31 October 1998, Grimsby to Stanley
CRUISE CODE	JR34

PERSONNEL:

Plymouth Marine Laboratory:	JIM AIKEN, Principal Scientist
	NIGEL REES, Physics, UOR, FRRF
	DAVE SUGGETT, FRRF, part to Lisbon
	NATALIE LEFEVRE, pCO_2, CO_2, Nutrients
	GREG JAMESON, pCO_2, part to Portsmouth
	CHRIS GALLIENNE, Zooplankton, OPC
	HERMAN MEDINA, Zooplankton, C,N.
	MALCOLM WOODWARD, Nutrients, part to Portsmouth
Southampton Oceanographic Centre:	ALEX POULTON, Filtration, Pigments, Fluorescence
	LEONIE DRANSFIELD, HPLC
University of Vigo, Spain:	EMILIO FERNANDEZ, Productivity
	STUDENT
NASA, Goddard Space Flight Centre, USA:	STAN HOOKER, Optics
	ANTHONY CREAMER, Optics
	CYRIL DEMPSEY, Optics part
University of Miami, USA:	JIM BROWN, Optics
NMFS, NOAA, Beaufort Lab, USA:	PATRICIA TESTER, NOAA GEF, Zooplankton
JRC,EU, Ispra, Italy:	CRAIG DONLON, SST Radiometry
Max-Plack-Institut fηr Chemie,Germany:	JAMIE KETTLE, COS
Max-Plack-Institut fηr Chemie,Germany: (*Nationality South Korean*)	TAE SIEK REE, COS
Government of Senegal:	LT-CDR SENE, Observer

PART:

MALCOLM WOODWARD	Grimsby to Portsmouth
GREG JAMESON	Grimsby to Portsmouth (Lisbon)
DAVE SUGGETT	Grimsby to Lisbon
CYRIL DEMPSEY	Grimsby to Lisbon

ITINERARY

AMT-7, will depart Grimsby on 13 September 1998 arr. Stanley 30 October 1998

Outline Planning itinerary.

10 to 12 September	Load equipment at PML, personnel travel to Grimsby, mobilise equipment on RRS *James Clark Ross.*
13 September	Depart Grimsby
14 September	Arrive Portsmouth; load AVCAT
	Depart Portsmouth

18 September	Arrive Lisbon
21 September	Depart Lisbon
29 September	Boat transfer Dakar
16 October	Dock Montevideo
19 October	Depart Montevideo Leg 3
30 October	Arrive Montevideo, demobolize
31 October	Return to UK

Notes:
Some of the scientific party will join at Lisbon.
Some will make the voyage to Lisbon.
A Senegalese observer will be embarked/disembarked at Dakar. (Arrangements incomplete).
The main scientific party will disembark at Montevideo.
A skeleton operation may be conducted from Montevideo to Stanley (Arrangements incomplete).

OBJECTIVES

The primary objective of the AMT research programme is to investigate biological processes in the open Atlantic Ocean over broad spatial scales (for this cruise, 50°N to 52°S). The AMT-7 cruise is the seventh in a series of transects of the Atlantic Ocean, which will measure physical, chemical, biological and optical variables in the upper 200m of the column. AMT-7 will depart from Grimsby on 13 September 1998. AMT-7 will focus on the West Africa upwelling zone with permission from Senegal and Cape Verde Islands granted.

The cruise will acquire data for: calibration of remotely sensed observations; validation of remotely sensed products (e.g. chlorophyll concentration etc.); the development of whole-water column algorithms and the interpretation of remote sensing observations; determine phytoplankton characteristics and photosynthetic parameters; relate the partial pressure of CO_2 in surface waters to biological production; allow nutrient regimes to be identified and determine the characterisation of plankton productivity and community structure; determine accurate carbon values in accordance with JGOFS protocols. In the longer term the AMT project aims to enhance our ability to model global primary production (at basin scales) and help develop ecosystems dynamics models which are needed to forecast climate change and the responses of marine ecosystems.

SCIENTIFIC METHODOLOGY AND APPROACH

The research strategy for the cruise brings together 'state of the art' marine technology with well-established methodologies for investigating oceanographic processes at the basin scale. This combination over the spatial scales of the transect, will provide data and interpretation to improve our understanding of biological oceanography and interpretation of remotely sensed bio-optical properties.

The cruise will have three sampling strategies: continuous underway sampling of surface water (7m depth) while the ship steams at 11.5 knots; semi-continuous sampling of the physical and biological properties of the euphotic zone (0 to 80m) with the Undulating Oceanographic Recorder (UOR) carrying the Fast Repetition Rate Fluorometer (FRRF),

generally through the day from dawn to dusk; one or two stations per day which will last up to 1 hour each. On station, a range of parameters will be measured by vertical profiles with a CTD and optical instruments, nets (to about 200m depth, including LHPR); discrete samples will be taken for chemical and biological analyses using the CTD rosette sampler.

At two stations, approximately at 36°N and 33°N, there will be deeper casts (1000 to 3000m) if time allows, to supplement the CANIGO ocean-circulation study.

Physical measurements

Continuous underway surface logging of temperature and salinity will relate the daily station measurements to the wider physical structure of the Atlantic Ocean. Expendable Bathy-Thermographs (XBT's) from the UK Hydrographic Office will be deployed along the transect to record temperature profiles to depths of 750m. The ADCP will be used to provide data on current velocities and direction. The Undulating Oceanographic Recorder (UOR) will be towed, as convenient, in order to improve spatial resolution of physical and optical parameters between stations.

Optical and bio-optical measurements

Measurements will be taken to determine the optical attenuation coefficients of the water and its reflectance both above and below surface. In addition to providing physical measurements, the UOR will carry a set of precision light sensors to measure the vertical structure of optical properties at SeaWiFS wavelengths. On station, optical properties will be measured from vertical casts using the NASA multi-spectral profiling rigs (at SeaWiFS wavelengths). The instruments will be calibrated daily with the new NASA SeaWiFS Quality Monitor System (SQM). This instrument will allow higher quality bio-optical measurements than previously possible. A tethered, free-fall optical profiling rig will be deployed for comparison with the multi-spectral profiling rig. The absorption and attenuation of the water will be measured by the AC/9 instrument profiled vertically on station.

Chemical and biological measurements

Samples for chemical and biological analyses (nutrients, autonomous pCO_2, chlorophyll, pigments, size fractionated production, phytoplankton, microzooplankton and zooplankton carbon, community size structure and taxonomy) will be taken at each station. Nutrients (nitrate, nitrite, phosphate and silicate) will be analysed using a 4-channel Technicon segmented-flow auto-analyser and novel technique n-molar analysis of Nitrate and Nitrite using chemilumnisence, and amonia by fluorometry. Chlorophyll samples will be extracted using acetone and analysed by fluorometry on-board. Samples for pigment analysis (HPLC) will be taken and analysed on board; some samples will be frozen in liquid nitrogen for subsequent analysis in the laboratory. Size fractionated primary production experiments will be conducted at each station and ^{14}C analyses will be performed on-board. Samples of zooplankton within the size range <1μm to over 1000μm will be size-fractionated for total C & N in accordance with JGOFS protocols. These samples will be processed on-board in preparation for analysis back in the laboratory. Samples for phytoplankton, microzooplankton and zooplankton distribution and composition will be taken and preserved on the cruise for analysis by microscope back in the laboratory. Zooplankton will be examined for ingestion rates and gut contents. The ships ADCP will be run to log zooplankton distribution and abundance from back-scatter. Automated

analysis will be carried out for particle size structure and concentration (Coulter Multisizer), and zooplankton community size structure (Optical Plankton Counter and high speed video camera).

EQUIPMENT SUPPLIED BY PML, UoP, SOC, NASA & JRC

pCO_2 analyser
2 x UOR plus PC system and support equipment, including towing wires
2 x FRR fluorometers
Optical equipment for profiling (Satlantic) and deck use (PML spectrometer)
NASA Optical Systems
SQM Optical Calibration System & supporting computers
Surface Viewing Spectrometer
Profiling CTD and Fluorometer for the Optics rig
Micro-nutrient analysers
Optical Plankton Counter, PC and supporting equipment
Filtration equipment
Liquid nitrogen* containers
On-deck production incubators
Microscope
Plankton nets
LHPR System
Nitrogen gas cylinder (X2)
SeaBird 911 plus CTD and 12 x 30l water bottle rossette

EQUIPMENT MADE AVAILABLE ON BOARD BY BAS:

CTD and rosette water bottle system
Underway logging (ABC)
Thermo-salinograph
ADCP
Liquid scintillation counter
Drying oven
Guildline precision salinometer
Elga clean water system

PREPARED BY: Jim Aiken
AMT-7 Principal Scientist

DATE: 29July 1998

CIRCULATION:

Internal

J McGlade, Director CCMS
R F C Mantoura, Director PML
P Williamson, NERC HQ
C Rapley, Director, BAS
F Curry, A Clarke, J Priddle, J Hall, BAS
G B Shimmield, Director DML
J Huthnance, Director POL
P H Burkill, P N Claridge, R P Harris, D B Robins, S B Groom, PML
J Burgan & C Elliott, Masters, RRS James Clark Ross c/o BAS
Cruise scientific personnel

External

J Shepherd, Director, SOC
G Jackson, DERA, Winfrith
C McClain, NASA, Goddard, USA
J Campbell, NASA, HQ, Washington, DC
M Rast, ESA/ESTEC, Noordwijk, Netherlands
N Hoepffner, IRSA, JRC of the EC, Ispra, Italy
R. Anadon, Oviedo, Spain

ANNEX 1 Provisional station position by latitude only

Date	Station	Latitude
Leg 1 Portsmouth to Lisbon		
September		
14pm	Dep Portsmouth	(50N)
15	1	49N
16	2	45N
17	3	41N
18pm	4a Arrive Lisbon	(38N)
Leg 2 Lisbon to Montevideo		
21pm	4b Dep Lisbon	38N
22	5	42N
23	6	38N
24	7	34N
25	8	30N
26	9	26N
27	10	22N
28	11	18N
29	12 Boat transfer Dakar	14.5N
30	13	13.5N
October		
1	14	10N
2	15	6.6N
3	16	3.3N
4	17	0
5	18	-3.3S
6	19	-6.6S
7	20	-10S
8	21	-13.3S
9	22	-16.6S
10	23	-20S
11	24	-23.3S
12	25	-26.6S
13	26	-30S
14	27	-33.3S
15	28	-36.6S
16	Arrive Montevideo	
Leg 3 Montevideo to Stanley (FI)		
19	Depart Montevideo	
20	29	
21	30	
22	31	
23	32	
24	33	
25	34	
26	35	
27	36	
28	37	
29	Arrive Stanley	

B.2. AMT-7 Combined CTD and Optics cast stations.

Appendix A7-2. AMT-7 Combined CTD and Optics casts station lists.

Sta.	TimeGMT	Date(SDY)		Lat(N,S),Lon(E,W)	CTD	SOPS	SFAL	LoNS	MiNS	HPL,Cfl
A700	08.23-09.30	13/9	256	50 35.0'N, 00 32.0'W	TEST	N	N	N	N	- -
A701	08.57-09.57	15/9	258	49 19.5'N, 05 29.8'W	A7-01	01	N	N	N	2.45 , 3.31
A702	09.00-10.00	16/9	259	46 36.8'N, 10 48.2'W	A7-02	02	1	N	N	0.27 , 0.39
A703	14.00-14.47	16/9	259	43 52.1'N, 10 47.1'W	NIL	N	2	1-4	N	- , 0.54
A704	12.10-13.11	17/9	260	41 37.8'N, 10 48.0'W	A7-03	03-04	3-6	N	N	0.26 , 0.36
A705	13.35-14.04	17/9	260	41 34.7'N, 10 47.8'W	NIL	N	7-9	5-7	N	0.28 , 0.38
LISBON										
A706	09.30-11.00	22/9	265	38 46.6'N, 13 36.1'W	A7-04	05-06	11-12	N	N	0.087, 0.14
A707	13.00-13.41	22/9	265	38 35.0'N, 14 02.4'W	NIL	N	13-14	N	1-2	0.085, 0.112
A708	14.00-14.38	22/9	265	38 34.5'N, 14 04.8'W	NIL	N	15-17	N	3-4	0.034, 0.092
A709	09.00-10.55	23/9	266	36 18.7'N, 17 29.5'W	A7-05	07-08	18-21	N	N	0.058, 0.083
A710	12.13-13.14	23/9	266	36 05.7'N, 17 29.8'W	NIL	09	22-27	8-9	N	0.037, 0.078
MADEIRA										
A711	15.40-16.30	25/9	268	32 32.7'N, 16 56.8'W	A7-06	N	N	N	N	0.043, 0.118
A712	10.00-12.06	26/9	269	30 03.7'N, 19 56.6'W	A7-07	10	28-30	N	5-6	0.086, 0.094
A713	13.05-15.14	26/9	269	29 49.9'N, 19 58.0'W	NIL	11-12	31-38	N	7-13	0.05 , 0.062
A714	09.54-10.48	27/9	270	26 10.0'N, 20 00.0'W	ABT	13	39-40	N	N	0.116, 0.139
A715	12.33-13.48	27/9	270	25 49.1'N, 19 58.9'W	A7-08	14	41-46	N	N	0.086, 0.126
A716*	22.00-23.00	27/9	270	24 13.3'N, 20 00.0'W	NIL	N	N	N	N	- , 0.119
A717	10.00-11.12	28/9	271	22 00.9'N, 19 59.6'W	A7-09	15-16	47	N	14-18	0.26 , 0.35
A718	14.07-14.47	28/9	271	21 33.6'N, 19 59.5'W	NIL	17	N	10-12	19-21	0.15 , 0.25
A719	10.00-11.45	29/9	272	17 41.4'N, 20 00.0'W	A7-10	18	48-52	N	22-26	1.13 , 3.17
A720	12.56-13.30	29/9	272	17 28.5'N, 19 49.8'W	NIL	19	53-56	13-16	N	2.18 , 3.57
DAKAR										
A721	10.16-11.00	30/9	273	14 35.4'N, 17 45.4'W	A7-11	20	N	N	N	0.47 , 0.46
A722	14.25-16.10	30/9	273	14 59.2'N, 17 34.8'W	NIL	21	57-61	17-21	N	0.49 , 0.73
A722	16.10-16.42	30/9	273	15 02.9'N, 17 34.5'W	NIL	22	62-63	N	27-28	0.27 , 0.36
A723*	19.00-20.16	30/9	273	14 48.4'N, 17 54.3'W	NIL	N	N	N	N	
A724	12.00-12.41	1/10	274	14 23.4'N, 17 43.5'W	A7-12	23	64-66	N	29-31	0.22 , 0.273
A725	15.00-15.39	1/10	274	14 09.9'N, 18 06.0'W	NIL	24	67-69	N	32-34	0.22 , 0.271
A726	10.30-11.20	2/10	275	12 10.5'N, 21 18.9'W	A7-13	25	70-73	22-25	N	1.18 , 1.66
A727	14.45-15.20	2/10	275	11 30.4'N, 21 19.8'W	NIL	N	74-75	26-27	N	0.59 , 0.73
A728	10.00-11.00	3/10	276	08 04.8'N, 22 12.3'W	A7-14	26	76-77	N	35-37	0.28 , 0.38
A729	13.20-14.15	3/10	276	07 38.9'N, 22 21.9'W	NIL	27	78-83	N	38-43	0.17 , 0.23
A730	21.56-22.33	3/10	276	06 20.0'N, 22 53.3'W	NETS	ONLY				
A731	10.00-10.45	4/10	277	04 16.9'N, 23 45.1'W	A7-15	28	84-85	28-31	N	0.16 , 0.20
A732	14.00-14.45	4/10	277	03 49.2'N, 23 56.0'W	NIL	29	N	32-35	44-47	0.16 , 0.23
A733	10.00-10.48	5/10	278	00 24.8'N, 25 19.1'W	A7-16	30	86	36	N	0.18 , 0.23
A734	14.20-15.06	5/10	278	00 13.9'S, 25 37.7'W	NIL	31	87-89	37-39	N	0.15 , 0.27
A735	11.00-11.48	6/10	279	03 59.3'S, 27 05.6'W	A7-17	N	90-93	N	48-51	0.10 , 0.16
A736	12.38-13.29	6/10	279	04 20.6'S, 27 14.0'W	NIL	32	94-97	N	52-55	0.09 , 0.15
A737	11.25-12.25	7/10	280	08 02.6'S, 28 45.3'W	A7-18	N	98-100	N	56-59	0.09 , 0.14
A738	13.47-14.47	7/10	280	08 18.3'S, 28 51.0'W	NIL	33	-103	N	60-62	? , 0.11
A739	11.00-11.45	8/10	281	11 55.2'S, 30 19.5'W	A7-19	N	-106	N	63-65	0.05 , 0.08
A740	12.59-13.44	8/10	281	12 09.6'S, 30 25.9'W	NIL	34	-108	40-41	N	? , 0.08
A741	14.52-15.52	8/10	281	12 22.5'S, 30 31.2'W	NIL	35	-112	42-45	N	? , 0.08
A742	11.10-12.12	9/10	282	15 56.5'S, 32 00.8'W	A7-20	N	-118	N	N	0.05 , 0.08
A743	13.38 14.41	9/10	282	16 14.1'S, 32 08.4'W	NIL	36	N	46-48	66-70	0.04 , 0.06

A744	12.00-13.03	10/10	283	19 35.9'S, 34 56.3'W	A7-21	37	-123	49-53	N	0.06 , 0.09
A745	14.29-15.26	10/10	283	19 49.6'S, 35 08.2'W	NIL	38	N	54-57	71-74	- , 0.06
A746	12.30-13.45	11/10	284	23 29.5'S, 36 53.7'W	A7-22	39-40	-132	58-65	N	0.13 , 0.07
A747	15.44-16.13	11/10	284	23 44.0'S, 37 08.4'W	NIL	41	N	66-68	75-77	- , 0.11
A748	12.00-13.22	12/10	285	26 28.8'S, 39 53.9'W	A7-23	N	N	N	N	0.14 , 0.20
A749	17.25-17.53	12/10	285	27 00.7'S, 40 29.4'W	NIL	N	-134	69-70	N	
A750	11.56-13.00	13/10	286	29 35.9'S, 43 14.1'W	A7-24	42-43	-139	71-76	N	
A751	13.56-14.36	13/10	286	29 44.4'S, 43 23.6'W	NIL	44	N	77-78	78-79	
A752	15.23-16.06	13/10	286	29 50.9'S, 43 31.2'W	NIL	45	N	79-80	80-81	
A753	12.03-13.42	14/10	287	34 44.6'S, 46 39.6'W	A7-25	46	-147	81-90	N	
A754	14.15-15.26	14/10	287	32 49.5'S, 46 45.7'W	NIL	47-48	N	91-97	82-88	
A755	11.30	15/10	288	36 40 51						

Notes:

LHPR - LA701 deployed at station A709 from 10.24 to 10.55.
LHPR - LA702 deployed at station A712 from 11.14 to 12.06.
LHPR - LA703 deployed solo at station A716* from 22.00 to 23.00.
LHPR - LA704 deployed at station A719 from 10.52 to 11.45.
LHPR - LA705 deployed at station A722 from 15.10 to 16.07.
Station A722 has 2 positions for SeaOPS 22, before LHPR, LA705 and SeaOPS 23 after.
LHPR - LA706 deployed solo at station A723 from 19.00 to 20.16.
OPT-01 launched at the end of Sta A725.
OPT-02 launched at 00 00.8'S, 25 29.7'W 13.07 GMT pre Sta 734.
CTD A7-13 at station A726 was to 500 m.
CTD A7-18 at station A737 was to 500 m.
CTD A7-20 at station A742 was to 500 m.
CTD A7-23 at station A748 was to 1500 m.

B.3. Main scientific log for the AMT-7/ROSSA1998 experiment

```
# Filename:AMT7-mainlog.txt
"
# Title: AMT-7 RRS James Clark Ross Sept 14th - Oct 16th
1998
"
# Instrument:main scientific log
"
# Contact: Dr. Craig Donlon (craig.donlon@jrc.it ||
cjdn@colorado.edu) file containing start and end points
for each data file
# Accuracy: -999
# Precision: -999
# Calibration: Raw data
# Number of records:34
# Data start time:98 264 11:40:00
# Data stop time:98 287 16:30:00
# Data start position:00 00
# Data stop position:00 00
# Record Format:jday,starttime,logentry (variable width
string)

98 255 10:00:00 Departed Grimsby @ 09:30:00 bound for
Portsmouth -> Lisbon -> Madera -> Montevideo.  Julian day
255 == 12/09/98
98 255 11:00:00  SOSSTR set up on Port bridge wing to
view sea surface @ 40 deg.  Clearly not a good place, as
the sensors are seeing the bow wash.  Main problems on
set up include a failed TASCO probe (brand new !) which
has been replaced with a SOC probe.  Planning to move the
SOSSTR to the bow using the old OPHIR radiometer mounts.
98 255 11:01:00 RhoPoints all messed up as the PSU was
disconnected by PML on set up.  On re-connection, the
psychrometer signals and soap[ signals are rubbish.
98 255 13:25:00 New programme to log the eppley LW and SW
radiometers installed to the forward mast bird table.
Logging raw output and LW*100 and SW*1000 to increase the
resolution at low radiances.  Logging intreval set to 1s.
Note that the signal is reversed so that we are getting
negative values.  This needs to be corrected in post-
processing.
98 255 13:59:00  Raining steadily, calmish seas with
light winds rom astern.
98 255 15:00:00  Still raining
98 255 18:00:00  Stopped raining.  Traced all of the
RhoPopint system cables through and it seems that the
SOPA has blown.  Psychrometer is OK, but no ,soap.  On
reconnecting the soap, the psychrometer signals return to
the rubbish as before.  Will try and get a soap
electronics box from SOC at portsmouth.
98 255 18:10:00  Talked with the Old Man and Doug:  plan
to relocate the SOSSTR to the bow area.  Got the go-ahead
for this which should be completed in Portsmoputh.  Puts
the testing of the RADAR and the camera back a little.
However, all seems to be coming together again
```

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98 255 18:10:00 Talked with the Old Man and Doug: plan to relocate the SOSSTR to the bow area. Got the go-ahead for this which should be completed in Portsmoputh. Puts the testing of the RADAR and the camera back a little. However, all seems to be coming together again.
98 255 19:00:00 Configuring Linux printers and general setups for the cruise. All seems OK.
98 255 19:05:00 SOSSTR sky temperature is currently -43C which is what I would have imagined for the sky here. Need tpo keep an eye on this as the cruise progresses for both water vapour but also for lens degradation. SOSSTR seems extremely well behaved at the moment.
98 255 20:10:00 Clear skies still with broken patches of cloud.
98 255 19:54:00 Note that there is a small bias on the SW eppley in total darkness - possibly ship reflections or stars or the moon.
98 255 20:20:00 Called Robin Pascall and Gary Fisher @ the SOC to try and arrange a new SOAP for Portsmouth tomorrow. SOSSTR OK and Logging (in the wake though), psy 1&2 logging and the Oceanlogger is On
98 256 07:20:00 Overcast skies in the E Channel. Seas bigger and on the nose. Wind speed ~ 4.0 ms-1. CTD station planned at 08:00:00. SOSSTR looks V. Well behaved
98 256 07:36:00 Sky is brightening up. Looking at the eppleys, there seems to be a solar dependence on the LW sensor.
98 256 08:00:00 50.59519 -0.438144 CTD station. Moving SOSSTR backup file onto network.
98 256 08:55:00 Tried to call Gary Fisher @ SOC: still get answer machine so he may not be available today. Robin Pascall's answer machine is turned off at the moment so he has picked up his messages. 4/8 Cu cloud, still on station
98 256 09:00:00 SOSSTR sea signal trace shown a marked decrease in noise while the ship is on station confirming that the data are corrupted by the ships wash.
98 256 09:15:00 Underway. SOAP board is frazzed: reversed polarity/over voltage has taken out the board completely. Try to call ISR at home to sort out a replacement from Robin.
98 256 10:06:00 SOAP resistance is ~1.6K @ ~20C and ~1.4K @ ~30C. Need a 1.5K precision resistor fopr the cambell although I think we may be able to get away with a 10K resistor.
98 256 10:07:00 SOSSTR OK although signal is again noisy as a consequence of the wash. V stable BB signals. Eppley still logging OK.
98 256 11:25:00 Off Portsmouth Pilot on Board heading for the Berth. Closing SOSSTR operations down in preparation

for moving the instrument to the bow. Eppley logging also stopped.
98 256 17:58:00 Psychrometer fan not going: checked PSU and AGAIN, the PML lot have disconnected and re-wired the PSU !!!! This time putting the +12V supply across ground.
98 256 18:00:00 SOSSTR now proudly sitting on the bow and all looks OK. Comms established and the HBB is warming up. Power from the Mail room was out due to a blown fuse and I guess the UPS was on for a reasonable time draining the batteries. Going to try and limit the aperture of SOSSTR using tape based on TASCO readings.
98 256 18:20:00 SOSSTR sorted out and logging. Problems with the _OTHER_ BSI 'lunchbox' which will not boot at all. Beeps on boot up then hangs before even probing the video card - a well known phrase: " I only regret my economies" - and this is what happened at CCAR becuase these machines are cheapo versions of the one that Jim Maslanik had. Still at the berth in Portsmouth harbour no level A at all at the moment.
98 257 12:25:00 New electronics arrived for the soap. Currently, the soap is in calibration with the EOS PRT system in the CASOTS BB. Starting @ 9.0C with the heater on.
98 257 15:00:00 Oceanlogger data stream crapped out half way thru calibration. Restarted using ice. Now at 30C and rising. Will wait for 35C then quit.
98 257 15:00:01 Sosstr data stream started to file 2731500.dat
98 257 15:07:00 Eppley logging and soap calibrating. leaving berth
98 257 15:26:00 2/8 ScCu with large banks on the horizon.
98 257 16:32:00 7/8 Sc with wind off the stbd bows. SOSSTR logging, eppley logging, SOAP logging, Psychrometer logging. SOAP calibration needs to be sorted out from todays data. SOSSTR CR10X clock re set to ships GMT.
98 257 17:00:00 SOSSTR calibrations suggest that the sea and sky TASCOs have wet for-optics as the calibration is poor - especially the 17:15:00 cal.
98 257 17:15:00 SOSSTR has a bag inside the baffle tubes to stop it getting drenched. Sea is hard on the nose F5-6 and is set to get heavier as we move further out into the channel.
98 257 20:42:00 SOSSTR sky radiometer can't see the HBB properly at all reports a half temperature (HBB = 28C sky TASCO = 18C). Must be V wet. Will make a canvas bag for it tomorrow.
98 257 20:45:00 Still sea on the nose with lots of water everywhere.
98 258 07:20:00 8/8 Sc with lots of sea last night. SOSSTR still working with sky rad having a greatly reduced HBB cal. Sea Rad is not so bad. Epoley still logging and SOAP OK. SOAP stay line is broken the stay line.
98 258 08:12:00 Still pitching too much for SOSSTR in it's current position. SOSSTR still bagged up. Sea state is generally falling at the moment.

98 258 08:22:00 Preparing for first real station at 09:00:00. Will use this time to (a) check out the SOSSTR, (b) to check mast instruments.
98 258 09:16:00 Checked SOSSTR: Plastic bag did not seal off the top aperture completely. There was a little water in the SOSSTR case as a consequence of spray getting into the instrument but nothing substantial. Both BB cavities are completely dry and clean. Sky raidiometer and sea radiometer cleaned and dried using distilled water and kimwipe. This will be seen in the data at ~09:05:00 marked by a rapid HBB temperature fall to ~28C from ~31.8C. After a roughish night, the SOSSTR seems OK. Re tied the SOAP stay cable and set this up for moving off. 8/8Sc all around. Hop[efully we can get some data later today. Note that this is an extremely exposed position on the JCR and not a fair test of the 'autonomy' of SOSSTR. It is therfore prudent to protect the system. Need to do a CASOTS BB calibration in Lisbon.
98 258 09:32:00 SOSSTR cals are coming up great again after a clean. Need to prepare a proper plug for the SOSSTR and to mask out the aperture for the TASCO's. Still on station.
98 258 10:00 Underway again. Will check on sea state once we have been moving for some time.6-7/8 Sc clouds gradually breaking up.
98 258 11:45:00 Se has come round onto the Stabd bow and is getting smaller. I'll wait another hour and think about putting the SOSSTR online. Su is starting to break through now.
98 258 12:53:00 Beggining to roll more now so we may get some data today. I'll still leave it for a while as there are still a few nose dives on the Bow. Air temperature and pressure are now rising so things are looking up.
98 258 14:17:00 Moderate seas on the stbd bow still crashing over the SOSSTR. Ship seems to be moving with the weather so perhaps it may be another 12 hrs or so before we get S enough to start SOSSTRing.
98 258 20:15:00 Seas building again. Noticable noise on the Eppley signals Tried re-starting the logger programme at this end. Looking at the numeric display things appear OK with occational -9999 being recorded. changed the logging interval to 2 mins and screen update to 2s in the hope that comms may be implicated in this. Note that scheduled data recovery has failed from 16:00 onwards. Should be enough room in the CR10x to hold the days data though. Recovering this now. Psychrometer is OK as is the SOAP. SOSSTR still bagged and getting a battering on the bows og the JCR. Errors are all on the LW sensor and are periodic. Suggests a cable problem either requiring a re-termination or replacement. These cables were checked before installation and looked fine though with no obvious signs of corrosion. No rain reported although the spray from the bow has been considerable at times. SOSSTR is maintaining calibration quite well indicating no water ingress today.

98 258 20:27:00 Re boot of SOSSTR PC by accident. Also seem to be getting lots of comms errors in the log: low battery shutdown error and failed to open disk file or disk full errors. disk is not full, but Linux may be using the com port for something periodically. Will check out the low battery status tomorrow while on station. It is possible that a) the switch is OFF in the Foc'sl supplying power to the CR10X or that the transformer in the CR10X box is not set up properly - it was sot of playing up in the lab, but we thought it was fixed. Also, the fuse was blown to the power serving the UPS system on 255 (along with a whole host of other things across the ship). Could have also taken the power to the Mast out.:w
98 259 06:44:00 Seas have calmed down significantly and we can begin sosstring. SOAP and PSY OK Going to unbag the SOSSTR and plan a radiosonde ascent later this am. Still getting errors on the LW pyrgeometer.at least 1/2 - 2/3 data are corrupt. Solarimeter looks fine though.
98 259 07:00:00 SOSSTR unbagged and logging SSST at last. SOAP OK and all inact Lead line a little frayed by chaffing on the steel cable but otherwise everything solid with no apparent damage to the SOAP cable.2/8ScCu clouds with lots of blue sky. Wind just off the stbd bow with a gentle roll on the ship.
98 259 07:28:00 Noise on Solarimeter as the sun comes up - still noise on the LW sensor although the signal is generally discernable within the data stream. Can probably patch this up. Have a bridge log sheet worked up for hourly met observations getting at cloud cover and swell.
98 259 08:09:00 SOSSTR sea BT's are cooler than the BSST by ~1K. At the moemnt the air temp is less than the sea and is steadily rising: if I see a flip in the diffference as the day warms up (assumimng the wind speed is > say 5m/s) then I can assume that the radiometers are viewing part of the baffle. I'll checkwhen we are on station at 9:00. Also, I will try and mask out the aperture to suit the TASCOs using tape. Seems set at 17.15C with the HBB rising throght this.
98 259 08:30:00 Backing up last nights SOSSTR data and starting a new log file. Eppley has quietened down now and is all logging. Radiosonde system checked out and appears to be working OK. At least I can receive a data file. Note that the SOC laptop I'm using for the radiosondes needs the time setting each time you switch it on.
98 259 09:03:00 On station. SOSSTR to be checked out now. SOSSTR sea view set up to clear the baffle 101%: it was slightly high and was possibly viewing the baffle. It looks somewhat better now in the data trace. Checked out the EPPLEY LW: unplugged the unit and checked the cables which look OK. Re plugged it in and the data looks a little cleaner.
98 259 09:59:00 Underway off the station. Re set the soap forward stay attached to the chain holding the shackle this time. Rope was off again. BSST=18.7,SOSSTR sea BT=18.00 air temp=16.9. Preparing for a radiosonde

release at 10:30:00Z. Oh yes, checked out the psychrometer fan which is definately sucking rather than blowing which is the correct way around !
98 259 11:00:00 Radiosonde 1 off with no bother and logging to disk. SOSSTR OK and logging fine with good cals and sensible SSST's. Eppley LW is now clean after the cable was re set into the instrument. SW sensor also OK. Looks like we have some data here at last.
98 259 11:19:00 Radiosonde abruptly failed at 680mb - simply stopped. Eppley logger crashed out last night: it keeps getting hung up about comms which don't really apperat to be a problem. At least I can't see why it's not downloading the data on time - aha ! date is 2 days in advance for some strange reason ! Re set the logging interval to work with todays date ! 7/8 low Sc cloud, light oily seas with light winds.
98 259 11:39:00 found the sonde again and logging to a new file 15092.fli. Weak signal from the sonde getting a few data packets at 300mb or so (4 !)
98 259 12:18:00 Going to check out camera system in mail room with the notion of placing this on the foremast.
98 259 14:47:00 Camera system working: going to put this up on the foremanst. 2/8 Ci Cu clouds with a V. calm blue sea. Just swell waves. All logging OK. Setting PC clock on Video camera to GMT
98 259 15:50:50 Video camera system looks OK and is working fine. Up on the mast looking UPSIDE DOWN with the RADAR anntennae in the corner. Should be OK for most days I think. Eppley LW seems to be suffereing from SW leakage as the data are now really different from before. Mind you it could just be clear skies I guess.
98 259 16:00:00 Video system logging. Will need to change the CDROM each day. Loads of slicks around at the moment with lots of T/S structure in the Oceanlogger data. Not well resolved in the SSST from SOSSTR mind you.
98 259 16:26:00 Just realised that the radar and the video clocks are 1HOUR exactly fast - these were set by a wristwatch set to local time. Need to change this now. Otherwise, RADAR is logging with radar-2.exe as RADAR-4.exe produces no screen output. All logging 1/8 horizon Cu cloud and a really nice day. Slicks about all day.
98 259 17:50:00 Checked the camera and the RADAR: RADAR is still operational as is the camera. Problem is that the camera images don't look that good on the screen. Need to turn off the camera at night as the data will be hopeless. Light winds (2ms-1) with 7/8 cloud all low on the horizon: Could be a good night for an overpass. the day has been really calm with oily seas and slicks all day.
98 259 18:22:00 Still lits and lots of structure in the upper water column as shown on the BSST and salinity data over the last few hours or so. BB's now cooling in SOSSTR as sun goes down. Psy1&2 together with the SOAP are all functional.still 7/8 CiCu with crystal clear overhead.
98 259 19:52:00 All running bar SISTeR. Calm night plenty of stars about and excellent for an overpass of

whatever.0/8 cloud and a small swell with gentle breeze ripples across the swell.
98 259 20:06:00 Structure in SST has now vanished: could have been due to preferential warming associated with bioligical structures or slick materials. However, these have decended to at least 5m which is where the underway intake is situated at (more like 7m). Decided to leave the camera to log overnight and test the cdwrite software (we have enough disks due to the lost few days of poor weather at the cruise start.)
98 259 20:10:00 started a new SOSSTR data file for the evening to facillitate the exchange of data between computers.
98 259 22:38:00 Checked thru the instruments all OK: video still on to check cdwrite and radar logging. Quiet BSST signal at the moment.
98 260 07:26:00 Sound morning still rolling slightly with a bit more swell and wind. Otherwise, 5/8 Sc clouds SOSSTR still going, eppley data logging crashed (downloading data now). SOAP and psychrometer all OK. Gave windows a re-start and wabi comes back great guns.
98 260 08:14:27 Wind and sea now on the port Quarter: Checked the RADAR which is still running and checked the video which is also still running. May have to manually backup the video images if all fails. RADAR system was not scaling sensibly and crapped out a couple of times as I moved the keyboard. All running again now. Large Sc banks with a reasonable sea on the qtr. Epplies are fine and logging - sinusoidal form in the LW sensor related to clouds (and/or a SW leak).
98 260 08:49:00 Still as before all logging OK. Eppley tripping up still - I think that its a Wabi problem with the com ports. SST is falling probably moving into the upwellin regions off Iberia.
98 260 09:34:00 Preparing for a radiosonde release at 10:00 Light winds, light seas with 8/8 Sc clouds. Ship is rolling a little:
98 260 10:00:00 Radiosonde off OK and receiving fine. Sonde went forward with the wind so it may be tricky to hold the signal. Dropouts with the ship roll are already occuring. We will see how this one goes and think about moving the Antennae furthe aft if we loose the sonde too early. Very noisy data.
98 260 10:06:00 8/8 Sc cloud seas on the stbd qtr wspds upto 10 ms-1.
98 260 12:00:00 On station for CTD casts etc. 7/8 Sc clouds with sea from starboard bow (while on station). Note the drastic cooling of the SOSSTR as JCR heads to wind. All logging OK.
98 260 12:01:00 Radiosonde was again a little disaster as we lost the sonde quite early. The software to produce a met message fails (I think because there is basically insufficient data in the data stream) with an overflow error. I'm going to move the antennae to further aft in an attempt to get better data.
98 260 12:43:00 New eppley data file started. Old file has data chuncks missing due to bad comms. Data from 258 16:00-20:00 not there and data 258 20:49 259 09:51 not

there. also data 260 in the early morning is gone. Ah: this must be a cheapo version without the extra 2M of RAM that we have on the CCAR CR10X hence data loss. Will now back up regularly.
98 260 13:10:00 Brightening up mnd underway. 4/8 Sc/Cu clouds. Note the cange in SSST associated with the ship moving off: SSST falls by ~0.75K and the solar rad increased at this time.
98 260 14:05:00 Underway after an afternoon 'rocket' station for optical profilers. Moved the Radiosonde antennae to the aft position that we have used on the last 2 trips in the hope of increasing the data rate from the baloons. Checked the RADAR system which was still going: Top trace tends to show deviations from a straight line whereas the bottom trace looks 'proper' with a steady signal. Both traces do not fill the entire range of the plot space. Camera is still going and logging @ 60s intervals. No recent crashes on the CR10X eppley system. BSST=18.5 BT_sea=17.8.
98 260 17:07:00 7/8 Sc all day with wind and sea on the stern. Epplyys still logging as is the SOSSTR. Air temperature warming up now at 18.4C with a conswquencial rise in SOSSTR BB temperatures. wins speed still at ~10 kt 350-355 T. Still no word from Tim as yet re the Lisbon visit and the deployment of SISTeR.
98 260 19:00:00 All OK
98 260 20:00:00 All OK Swell from astern 8/8 cloud
98 260 22:00:00 All OK No changes ! Mini station at some point this evening
98 261 00:00:00 Same as above BSST upto 20.2C
98 261 02:00:00 As above
98 261 08:26:00 7/8Sc cloud moving slowly now towards Lisbon. SOSSTR OK with a BSST of 18.6 - upwelling water mixed into the Warmer SST ? Need to check out the RADAR and camera data. Starting a new data file for the Eppley and for the SOSSTR. Note that by closing down all of the windows on Smaug, Wabi has behaved itself beutifully and I have no more data loss on the Eppley system.a
98 261 09:12:00 Ship has slowed down to get into Lisbon on time: Stern wind is helping out. When we turn into the Tejo, it may be a problem for the SOAP and SOSSTR as the sea will be on the Port Bow. checked the RADAR (still going) and the camera. Camera script is working OK although it looks like the cd-write failed. However, there is enough disk space for todays data and I can do a backup in Lisbon.
98 261 10:00:00 Radiosonde off OK and out to the Stbd side aft. should be a good signal now that the antennae has moved. Surface data OK. We have now turned (~09:45:00) onto a Port side beam sea as we head into Lisbon. SOSSTR data downloaded to smaug OK for yesterday.
98 261 10:30:00 Clear skies for an overpass.6/8 Sc Ci. Sorted out the SOSSTR and Eppley files and backed up to JRUE98 261 11:41:00 Approaching Lisbon in 'green water now'. Pilot on voard @~13:00:00 so the soap will come in @ 12:30:00. Radiosonde has reached 89mb and is still going - record for me I think is ~33mb. Haze about as a

consequence of the cooler SST associated with the upwellings.a
98 261 11:45:00 Looks like the underway pumps went off at ~11:30ish. Will continue to log data from SOSSTR and the SOAP as lomg as possible. Once the SOAP is in then I'll start a new file for Lisbon. I'll leave the SOSSTr running and the Psychrometer to keep the motors going.
98 261 12:20:00 SOAP in and stowed. New SOSSTR file opered and new eppley file opened "lisbsos and lisbep.dat'
98 261 13:57:00 Coming alongside at Expo '98. RADAR and video will be stopped soon.
98 261 15:00:00 RADAR and video camera stopped. SOSSTR still running.
98 262 12:00:00 All day at Expo 98 - some rain in the late afternoon and evening
98 263 12:00:00 All day at Expo 98 - More rain in the afternoon
98 264 11:40:00 SISTeR up and running on the foremast. Set the view to 40 degrees. # progs: rossa98.exe is the basic logging programme, skyscan makes 10deg increments above the horizon after a sea view and then fast200 makes measures in 200ms intervals. Backing up the RADAR and the camera data from the last part of the trip.
98 264 11:45:00 New code segment to be patched into the RADAR programme sent by Lyzenga. Will patch this after the backup is complete.
98 264 12:00:01 SISTeR door is shut and the archive is turned OFF. Rossa98.exe is running. SOSSTR is still running as are the eppleys. Will start new data files for all instruments when we are away.
98 264 14:39:00 SISTeR archive started: logging to 98092003.arc. Camera started. Sosstr data files started eppley data files started. Bright sunny day all OK.
98 264 15:37:00 All logging and OK. Hazy mist over the sea with ~5/8 Sc Cu and high Ci. Moving out of the Tejo river under the Bridge. Going to rig the SOAP ready for deployment later. Some structure as we move out.
98 264 15:58:00 All OK, soap rigged and to be deployed after dinner. RADAR system code getting re-compiled with the new versions of plot4.c then turned on after dinner. 3/8 high Cs Ci.
98 264 16:18:00 Noise on the SOSSTR data BB signals - non regular and sporadic in nature. TASCO's seem fine. SISTeR is stil;l OK and logging. Out of the river and picking up on the swell. Sea is low with swell onm the Stbd bows.
98 264 17:05 Going to deploy the SOAP.
98 264 17:35:00 SOAP out and OK. SISTeR checked: at some point in the last few hours, the seal has come away from the SISTeR and was waving in front of the aperture (!@). Fixed now and secured more firmly with Gaffer tape to the ends. Should be fine. Pumped supply was turned on in the last few minutes or so. More noise on the SOSSTRE signal at 17:20ish.
98 264 17:55:00 OK, more fiddling with the SISTeR door cushons which are now firmly taped down to the body. Dolphins on the bow. SOSSTR BB signals are really

crapping out: 10 min period of mayhem then quiet signal again. Possibly radar or comms traffic intefering with the signal ? Possible earthing problem through the main drive loop as the earth is via the gear connection to the motor. Will try and clean this up some tomorrow sing WD40. Signals certainly quiet for the time being.(18:07:00). Overcast sky at the moment with lots of haze all about. Going to sort out the RADAR floppy drive which is not seen by the RADAR PC. Probably a loose connection.
98 264 19:12:00 OK, lots of loose cables in the RADAR machine. eventually got all working correctly. However, the bits of code fixings that Lyzenga sent are not that wonderful and the 4 channel RADAR programme stiull provides nothing on the screen. Currently logging using RADAR-2.exe. SOSSTR now well behaved and SISTeR running. All well. V hazy outside. SSST movinmg around a little as is the Salinity and the flourescence. Camera system off and burning data to CD-ROM
98 264 19:25:00 Small frontal feature crossed: edy or filament - warm water feature.
98 264 19:36:00 More SOSSTR BB interference.
98 264 19:42:00 Still crap signals. MAy have to go up to the instrument and poke about a bit. Tried re-sending the logging programme to the logger with little change. Nor\te that the TASCO signals are steady and are unaffected by the noise. Just the two BBU's.
989 264 19:54:00 Noise stopped. Checked with the bridge, Cheif Eng. and mate for possibilities, with the conclusion that there is a busted flourecant lamp that is not starting up properly. This is in the Foksl allyway and may be the problem. Will sort it out tomorrow. for the time being, all is quiet on the SOSSTR ront again. 19.8 SST, 18.9 tair all logging.
98 264 10:15:00 Odd salinity and temperature signals: Possibly from blobs of esturine freshwater out of the Tejo river ? Strong signals at 19:40:00.
98 264 21:07:00 Wind 330T@10ms-1. 7/8 clouds at the moment with clear patches and stars occationally poking through. V. calm seas with a light swell. Informed bridge to be woken up at any sign of rain. Forecast is bad further south with the remains of a tropical depression off sennegal. SOSSTR logging and OK, Eppley logging and OK, soap out, psy on, SISTeR DOOR OPEN and logging. Will exchange the ethernet cards in the SOSSTR PC so that I can use a standard BNC cable.
98 264 21:20:00 Should be a good data set to compare SISTeR and SOSSTR data: brokenm clouds, small scale structure, high humidity.
98 264 21:28:00 Just had a thought: I don't think that I compiled the plot4 and replt4 subroutines up on the RADAR system so that the link would be to the old object files- no change in the radar-4 programme. I will go and see if this changes the situation now. No difference just loads of errors on compilatioon (mostly about lack of ; - will check out the code tomorrow.
98 264 22:18:00 8/8 cloud mwith a warming base temperature (getting lower ?) Watch keepers informed to

call me up if there is any rain. SOSSTR signals clean all OK
98 265 01:53:00 All OK and logging.
98 265 06:44:00 SOSSTR OK, Eppley OK, SISTeR OK, 7/8 As little swell, easy weather.
98 265 07:15:00 Checked all of the systems and started the Camera system again. Very calm seas with 6/8 As clouds.98 265 08:43:00 7/8 As cloud as before no rain. Calm seas all logging. Camera grab time set to 20s instead of 60s.
98 265 09:39:00 On station and all logging. SOSSTR crapping out badly at the moment. very severe interference. Going to check out the system and clean it up inside. Then prepare for a radiosonde. 6/8 As.
98 265 09:53:00 SOSSTR cleaned up (Noit the TASCOS) and WD-40 sprayed onto the drive gears and contacts. Hopefully this will prervent the noise that we see periodically on the BB PRT's.
98 265 09:54:00 Preparing a radiosonde ascent.
98 265 10:13:00 Balloon off OK all fine and logging. 7/8 As/Ac sky. Small SOSSTR crap out at ~10:05ish. Note that SOSSTR is getting hot as we sit on station. Need to thermally Isolate the ISAR because of this.
98 265 11:15:00 BAloon still OK at 390 mb. 7/8 AsAc sky. SOSSTR signal really clean.
98 265 11:32:00 Moving into better weather: 5/8 As Cu cloud and all logging. Changing out the ethernet card on the PC logging SOSSTR so that an ftp capability will be possible.
98 265 12:10:00 OK, 3/8 Sc As Ci clouds sun is shining. Swapped out the network cards which now allows an ftp link to the SOSSTR machine. Downloaded all of the data sets. and am sorting out the data backlogged since the changes.
98 265 13:04:00 On station for an afternoon measurement suite. 3/8 Ac clouds. V Calm.
98 265 13:50:00 Underway and weather improoving all of the time !!! All logging and met message away !!!
98 265 14:00:00 On station again. 3/8 Sc As on the horizon.
98 265 14:30:00 Still on station.
98 265 14:50:00 Underway 5/8 Sc getting heavier.
98 265 15:06:00 Backed up the eppley radiosonde and SOSSTR data to JRUE.
98 265 15:23:00 4/8 Mixed sky with As, Sc, Ci and Cu !!! Very nice. Little chance of rain so I'm off to sleep.
98 265 16:06:00 SISTer computer crashed. Have a zip drive to back up the data files.
98 265 16:28:00 OK, sorted out now and new archive started: 98092201.arc.
98 265 17:09:00 Absolutely like a millpond. amazing.
98 265 17:26:00 Large slick field all about. Loads of photographs all about the ship showing the slicks. V light winds all about. Slicks tending to arrange in Langmuir style formations with bifurcations. Impressive sight. Loads of structure in the Radiomstsr data and in the BSST. Caught between two high pressure systems at the moment hence calm weather. 5/8 Sc/As Cu

98 265 17:51:00 Still slick central. All logging with 5/8 cloud. lots of structure in the T/S data.
98 265 18:12:00 Checked over all gear and looks great. RADAR and camera still logging OK.
98 265 20:18:00 Wind picked up and sea is now building on the Stbd bow. Looks like rain directly ahead and therefore the SISTeR dorr has been closed. Archive stopped and backup began. Mixed sky at the moment with some clear patches but definate signs of rain on the horizon. Programme and system left running rossa98.exe.
98 265 20:42:00 10ms wind @ 320T. SOSSTR still going. Going to turn Camera off and do a backup of the system.
98 265 20:54:00 Overpass time approaches and there is clear sky ahead. Will check again in 10 mins and try and open up SISTeR for 1/2 hr.
98 265 21:30:00 Overpass looks good with loads of stars ouot and clear overhead. SOSSTR BB PRT's completely crapped out in the last 15 minutes ???? SISTeR logging and all fine.
98 265 21:47:00 Still clear overhead, SOSSTR calibration is clean again and the Eppley system has been restarted to log to a new file. Basically, the eppley system will crap out if Wabi looses the font server (don't ask me why on this !) Re start the system without the network running at a1,1 and boot WABI straight away.
98 265 22:00:00 SOSSTR cals look good either side of the dodgy PRT period so I think a calibration can be done. Lost ~10 mins of Eppley data at 19:45 - 19:57 due to Wabi crapping out. Fixed and logging to a new file.
98 265 22:01:00 Note that earlier on there was a large step in the T/S oceanlogger system after backflushing: need to use the SOAP as an absolute check on the T/S from the Oceanlogger system.
98 266 00:57:00 @/8 Ac with the sea on the Stbd side. All logging and OK. SOSSTR data clean with loads of stars up in the sky.
98 266 01:11:00 Flow rate increased across the T/S system which seems to be providing a more stable signal mow. Potentially suspect T/S data for last 8hrs. Wind is 330T (60R) At 10ms
98 266 01:53:00 All logging OK: Sea at F4-5
98 266 02:22:00 All logging OK ~2-3/8 Ac Cu loads of stars sea on Stbd bow. SISTeR was viewing 11.1 deg under rossa98.exe ?? next cycle back to 40.1 deg (921counts)
98 266 02:54:00 All logging OK: 2-3/8 AsCu clouds
98 266 03 54:00 All logging and OK. 2-3/8 clear overhead. Rolling more now, but sea still on Stabd side
98 266 04:55:00 All logging as above
98 266 07:18:00 6/8 Cu with showers about. Going to close down SISTeR door to get some sleep.
98 266 07:38:00 SISTeR closed down and the camera started up. Archive stopped (SISTeR actually closed ~10 mins ago). %/8 Cu with imminent rain ahead. SISTeR OK, and left running rossa98.exe. SOSSTR fine SOAP OK, RADAR running
98 266 09:06 SISTeR archive started and going to open door. Preparing radiosonde. $/8 ScCu clouds all about.

98 266 09:30:00 Balloon off OK. Low Sc on the horizon with Cu all about total 4-5/8. Still on station.a
98 266 09:46:00 SISTeR target view at 36.1 deg instead of 40 deg ????? Loads of different sea views 11-67 deg anywhere in between. Note that the sky scans and the BB scans seem to add up scan_c==scan_d and away we go. Why is the sea view such a hit and miss thing ? Sea at F4-5
98 266 10:05:00 Tried to re compile the RADAR routines but I get loads of errors. Also, the output screen on RADAR-2.EXE doesn't look all that clever. I'll mail Lyzenga again
98 266 10:13:00 Underway for a UoR tow: sea on the Stbd beam/bow as we move 4/8 Cu cloud all about not much sign of rain.
98 266 10:06:00 Tried radar-4.exe with a scale factor of 5 which results in a plot in the top window and nothing in the bottom window. Photograph under the Lifeboat of the sea. Lots of breaking
98 266 10:34:00 SOSSTR BB signals crapped out.
98 266 10:47:00 SOSSTR BB's still crapped out and the Plankton Recorder comiung in. Making ~3.5kt into the sea (no splashing on SOSSTR).
98 266 10:48:57 Hardy nets coming back on board. 2/8 Cu.
98 266 10:55:00 Underway again SOSSTR BB's still crapped out ?
98 266 11:11:00 Still crapped out.
98 266 12:01:00 SISTeR scan mirror at 50.1 deg target. Still can't get bloody met message out for todays radiosonde. Processes yesterdays data Fine.....
98 266 12:09:00 SOSSTR data seems fine after wiggling the cables on the deck somewhat. Perhaps they are crushed ?
98 266 12:41:00 Keep getting subscript out of range errors on the radiosonde software. Will work through it in detail and try to work out what to do. Onstation for afterniin casts .
98 266 13:05:00 Still on station preparing for UoR tow. 3/8 Sc Cu cloud
98 266 13:19:00 Preparing for UoR tow and underwaya
98 266 13:19:00 Sunglint in skyview TASCO on SOSSTR.
98 266 13:57:00 UoR tow with sea on the stern. all logging with 4/8 Cu all about.
98 266 14:00:00 Fired off an e-mail to John Shanklin to remind me of the pre processing steps required on a raw sonde file so that it will work with his code.
98 266 15:17:00 All running OK. SOSSTR running hot @ ~50C for HBB - no cooling by wind which is basically on the arse at the moment. 48 Cu about.
98 266 15:24:00 Preparing to retrieve the UoR then on to Madera to arrive 7.00 am tomorrow.
98 266 15:51:00 Cleaned up todays baloon data to be spotless in terms of its content. Run this through flight.bas and it still screws up with division by zero. Put in a fix for the division by zero error.
98 266 15:57:00 Going to restart SISTeR in ther hope thaT this will cure some of the scan positioning problems. Restarted the system and loaded rossa98.exe.

Started the programme and all looks good. LoOgging to file 98230902.arc.
98 266 15:51:00 Cleaned up todays baloon data to be spotless in terms of its content. Run this through flight.bas and it still screws up with division by zero. Put in a fix for the division by zero error.
98 266 15:57:00 Going to restart SISTeR in ther hope thaT this will cure some of the scan positioning problems. Restarted the system and loaded rossa98.exe. Started the programme and all looks good. LoOgging to file 98230902.arc. Gettin g high counts on BB2 and low counts on 180 deg sky.
98 266 16:20:00 Mail off to Tim explaining the situation as it stands re the SISTeR scan drum positioning.
98 266 16:48:00 Backed up SOSSTR and Eppley data to jrue after adding header data.
98 266 17:37:00 Clear overhead with wind from behind. All logging OK 2/8 Ci overhead in the Azores High. Should be fine for data all evening.
98 266 19:47:00 SISSTeR still setting rather strange demands which are often met ? Look angle of 71.3 deg ??????
SOSSTR logging OK and cooling to rational levels. 1/8 Sc on the hoirizon otherwise clear.
98 266 20:02:00 All logging and OK Going to turn off the camera system.
98 266 20:10:00 Cameraz backup begun and in progress. Will sort out the camera system tomorrow once complete. All logging OK
98 266 20:58:00 SISTER seems to be OK, but it is not really made easy to see this. SOSSSTR looging all OK. 1/8 Ci
98 266 21:11:00 All logging clear skies overhead and on track
98 267 00:15:00 All Ok and logging
98 267 00:29:00 all ok and loggging
98 267 06:45:00 Off Madera SOAP inboard. SOSSTR and SISTeR logging still. DP trials all day. Clear overhead and all Logging. Basically, lolling about with some small movements here and there. 1/8 Cu cloud clear overhead with clouds over Madera. Camera off.
98 267 20:03:00 DP trials all day with clear skies and light winds. All logging with SOAP INBOARD.
98 267 20:04:00 SISTeR archive stopped and mods made to the ROSSA98.exe programme to allow more settling time for the scan mirror. Re built the exe file and downloaded to the instrument. Need to power down the SISTeR and power back up again. RTe started the SISTeR groundstation after a GP error. Hopefully this should cure the problems with spurious sea views. Will have to be careful to process the data correctly though
98 267 20:20:00 Downloading the new rossa98.exe programme: Needed a reset onj the comms line to get the prog sent OK. BB will have cooled slightly whilke there is no programme running on the SISTeR but it shouldn't take too long to get them back up to temperature. Archive file 98092401.arc.

98 267 22:15:00 SOSSTR motor has stopped completely. Going to try and free it up with some WD 40. OK this seems to have done the trick. Will service the motor tomorrow as best I can. SOSSTR logging, SISTeR looks OK, SOAP inboard, O/8 cloud all looks fine.
98 268 07:40:00 MM, still here off Madera with calm seas and clear skies:2/8 Cu clouds all logging but SOAPO is inboard. SISTer OK and SOSSTR OK.
98 268 08:23:00 Going to clean up the SOSSTR motor. Clouds moving in as Sc. Going to try for a radiosonde thjis AM and see If I can get any sense ouot of it. this time.
98 268 08:53:00 OK, as suggested by JDS, I have manually edited the radiosonde data for the 23rd to the best of my ability correcting each dodgy pressure record. Still doesn't work properly soI'm going to send the data set + progs to JDSH.
98 268 09:07:00 No Radiosonde again as we are near to an airport.
98 268 10:21:00 Wind is picking up now to 9.5ms T. 7/8 Ac Cu and building.
98 268 11:07:00 F4 breakers now and all logging. No soap or camera. 5/8 Cu Ac Sc cloude but still plenty of clean sky 5/8 Cu Ac Sc cloude but still plenty of clean sky
98 268 High Ci and some Sc otherwise clearing. JCR to sail South in ~ 1 hr. Preparing all systems and starting new log files.
98 268 14:56:00 New SISTeR archive started 98092501.arc, new SOSSTR data file started and new Eppley data file startED. SOSSTR=2691458.dat and eppley=2691459.dat Camera to be turned on and soap deployed once we are underway agaian
98 268 15:26:00 Underway with SOAPO out and camera logging. RADAR OK, Sea is on the stbd Bow @ ~ F4. Heading South then for a CTD in a few mins.
98 268 15:52:00 Moving out to CTD station. 6/8 CiAs clouds all over the sky. some high Ac also present
98 268 16:07:00 CTD station to 200m. Sea should be on the Qtr once we move off. All logging and OK
98 268 16:48:00 UoR out and sea on the Stbd beam. Out for 10-20 mins then back in nad on thius course 'till tomorrow AM. 6/8 Ci Ac As Sea on the Stbd side @ ~ F4
98 268 17:00:00 Slowing down to recover the UoR then offski
98 268 20:55:00 Sea has been just fwd of the stbd beam. Ship is rolling but otherwise OK. all logging but going to turn off the video camera. 0/8 Cloud with a 9ms wind. all OK
98 268 23:04:00 0/8 cloud and a calming sea. all logging. SISTeR OK, SOSSTR OK, psy & soap OK.
98 269 00:37:07 SISTeR ground station communications screwed up and stalled. Did a re-set which brought the data stream back on line. Still 0/8 cloud with loads and loads of stars.
98 269 02:14:00 SOSSTR motor crashed out again. Going up to see if I can re-start it. OK, SOSSTR re started

OK. 0/8 cloud and a really beutiful night out there. Sea is calming down more and more.
98 269 07:15:00 All OK and logging. 1/8 Cu cloud calm sea and light wind. Camera system playing up a little bit.
98 269 07:51:00 Going to try and service the SOSSTR BB drive motor. 2/8 Cu cloud all OK
98 269 08:15:00 Last 20 mins SOSSTR data is corrupted with motor cleanup. I gave the motor a thorough drenching with trichloethelyne which seemed to free it all up. However, whern the armature gets into a particular position it locks up. That got less and less as the trichlo got to work. Hopefully that should be it now. 3/8 Cu cloud and all logging OK.
98 269 09:00:00 Prep[aring radiosonde for launch. 2/8 Ci cloud calm sea. All OK and logging. Station at 10:00:00
98 269 10:00:00 On station. 2/8 Cc clouds calm seas light seas radiosonde at 200mb and rising
98 269 10:44:00 CTD inboard 4/8 Cc clouds All logging
98 269 11:42:00 Towing the Hardy Plankton Net. 1/8 Ci cloud excellent day
98 269 12:10:00 Underway again
98 269 12:51:00 All logging 1/8 low Cu (non active). All logging and OK. Note that the SOSSTR ambient BB is now ~10K above the SSST and the HBB is up at 47 C !!!! SISTeR shows a HBB @ 20C above the
SSST and an ambient 10C above SSST.
98 269 14:19:00 Afternoon station in progress with Zodiacs out carrying Stans gear etc. CTD cast. 0/8 cloud
98 269 15:57:00 2/8 Cu clouds - very calm sea (falling all of the time). Slicks are starting to apperar (over the last houir or so). Standard slick structure in the T/S plots. SISTeR OK, SOSSTR OK. Wspd=3ms-1 @ 29T
98 269 17:25:00 All OK and Logging: 3/8 Cu Ci cloud. Smooth seas stable ship.
98 269 19:27:00 Camera off and the backup CD mastered OK. RADAR disk will not make it through the night so I have stopped this for a backup to Exabyte. Then to download this to JRUE
98 296 19:21:00 3/8 non volitile Cu on the horizon. Late day convection will soon abate now that the sun has gone down and overturn sets in. SOSSTR OK, SISTeR OK and the eppley's OK. SOAP still out and logging as is the Psychrometyer. Sea is calm with a gentle swell on the Stbd bow.
98 269 23:36:00 1/8 cloud all logging. SISTeR OK, SOSSTR OK, eppley fine. Calm seas with a light wind.
98 270 00:14:00 1/8 cloud all logging ok SOSSTR fine, sister fine, eppley fine, psy and soap OK
98 270 06:53:00 Going to start the RADAR and camera system.
98 270 09:00:00 Radiosonde off. Sea picking up now on the PORT beam/qtr. ~F4 4/8 Cu cloud with crickets chirping on the back deck ???
98 270 09:15:00 Definate loss of SSST structure with the increase in wind speed.

98 270 09:55:00 Spent the last few hours trying to get a backup off the RADAR computer. The tape drive crapps out everytime which is a pain in the arse. Only solution is to hoof the PC out of the main lab, plug it into the network and ftp everything over to jrue. Radar and camera are now both running again. RADAR is logging with RADAR-4.exe
98 270 10:00:00 On station for the morning CTD. SISTeR OK, SOSSTR ok, eppley OK, SOAP OK, psy OK, RADAR logging, camera logging. 0/8 cloud. SOSSTR starting to warm up
98 270 10:32:00 CTD jumped off the wire and needs a re-termination. Sonde @ 98mb Sea on the nose and all logging
98 270 13:36:00 On station already for some time for a CTD. 5/8 Cu cloud and building today. Processed radiosonde OK all logging
98 270 16:55:00 6/8 Cu cloud with the sea on the Port beam. All logging and OK. F4-5 at the moment
98 270 21:29:00 Seas on the port beam as before. going to turn off the camera. All OK and logging. SOAP OK as is the psychrometer. 4/8 Cu Ac clouds
98 271 00:09:00 0/8 Clouds loads of stars and all logging. Sea is on the Port side @ F4-5 with a wind speed of 6.3 ms @ 064T. Note the noise on the SOSSTR/SISTeR signals could be breaking waves as there is a large swell with lots of smallish rollers. Ship is rolling but not with any degree of severity (<5 deg).
98 271 06:10:00 seas much calmer now, light cloud (1/8) Cu, all logging. light winds.
98 271 07:35:00 Going to start the camera system up. 3/8 Ac , seas calmer with v light winds. All logging OK, with 1/8 Ac cloud.
98 271 09:28:00 Radiosonde away, 1/8 Cs. Flying fish all about v humid conditions 'sticky' atmosphere
98 271 10:00:00 On Station. All logging and OK, 0/8 Ci cloud v calm low wind speeds with a gentle swell. Radiosonde @ 170mb. Underway again
98 271 12:40:00 0/8 cloud but very humid atmosphere - looks like there os a blanket of fog up there ! Sending met message and all logging
98 271 15:45:00 0/8 cloud with a gentle swell. Sea is just behind the port beam
98 271 17:00:00 0/8 Cloud as above all logging
98 271 19:00:00 0/8 cloud with a very hazy sunset 9.7ms wspd @ 015T Totally bizzarre sunset. There seems to be so much water vapour/dust/?? in the atmosphere that the sunset ~0-10 degrees above the horizon was almost all diffuse light. the sun was a golden ball which didn't even hurt your eyes to look at. Thats visible light - what about the IR ? No chance !!
98 271 22:00:00 All OK 0/8 cloud all logging.
98 271 23:54:00 All OK 8/8 cloud all logging. Sea still on port quarter.
98 272 01:13:00 All OK difficult to tell what the clouds are doing as there is so much humidity. I can see lots of stars but none of them clearly so to speak. Have informed the bridge to contact me if rain looks imminent.

98 272 05:10 call from bridge to say that it is becoming increasingly difficult to dodge around rain showers seen on the RADAR system. Up onto the foredeck and closed SISTeR dorr. No sign of rain contamination on any of the ropes or in the SOSSTR data trace. Backing up SISTeR data, SOSSTR data and Eppley data.
98 272 06:11:00 SISTeR off otherwise all going. Note that the ROSSA98 programme is still running on the SISTeR to maintain BB temperatures.
98 272 06:33:00 Bridge called to give the all clear signal for rain. Large clouds behind us now with lots of lightning. Clear ahead. SISTeR door opened and logging to archive 2720633.arc.
98 272 09:18:00 Radiosonde release. Sea from astern at the moment !! @ ~F4-5. Very hazy with lots of mist and broken cloud. Sc 5/8 but difficult to tell because of the haze. SISTeR running, SOSSTR running. Will start up video system again. Very hot and humid.
98 272 10:00:00 On station for CTD and morning activities. Checked up on the mast. Psychrometer has 1/2 bottle of h20 everything else secure. SUSTeR door cables ok. Saharan dust on the SOSSTR radiomstsr case but not on the SISTeR case: mostly due to spray hitting SOSSTR. Camera started and logging, RADAR logging. 4/8 Ac clouds.
98 272 10:39:00 Underway for Dakar. Arrival at 8.00am tomorrow morning. Hardy plankton nets out for 3/4 hour. Seas calmer and all logging. Sonde up to 28mb
98 272 11:36:00 HPK coming in. 7/8 As clouds
98 272 12:30:00 Turning towards Dakar. Sea now on the Port beam.4/8 clouds all logging. Ship rolling ~3-6 deg.
98 272 14:00:00 Steady seas on the port beam all logging OK
98 272 16:04:00 Steady seas 6/8 cloud (Sc, but difficult to see)
98 272 19:25:00 2.2ms-1 from astern and all logging OK. Expected Dakar @ 08:00 tomorrow. all logging and OK. Going to turn off camera system
98 272 21:37:00 All logging wind at 346T 5ms-1. RADAR checked ok and the camera system stopped. Video backed up to cd-rom.
98 272 23:32:00 All OK and logging. Sea and wind from astern
98 273 01:51:00 All OK and logging.
98 273 07:30:00 SOAP in in preparation for Dakar
98 273 08:02:00 SOSSTR Stopped sometime last night with a dodgy motor. Will investigate this morning. At Dakar. SISTeR OK and Logging. Going to stop archive and do a backup
98 273 09:37:00 Underway sprayed up the SOSSTR motor with WD40 but this doesn't seem to have done the trick. Need to get the motor out and refurbish. Wait until the turn as the sea and wind are on the port bow. SOAP had a peice of tape wrapped around the end stopping water flow. Sensor was still exposed with 1 opening. Will re tape the soap now before deployment. Motor I guess just gets bunged up with gunk as we move onwards. Noticable saharan dust within the SOSSTR box as a light coating

98 273 08:50:00 Restarted SISTeR and SOSSTR is still running OK although the sea view radiometer is reading low compared to normal. Will clean out the lenses
98 273 09:13:00 Soap deployed and streaming Ok. SOSSTR sorted out again. Motor is now much freer and seems to not stick anymore. Cleaned TASCO lenses with kimwipe and distilled water.
98 273 09:31:00 Sonde away OK. SISTeR OK, SOSSTR OK, all logging.6/8 AC cloud
98 273 11:22:00 Sonde still going all logging OK. 1/8 Ci Ac
98 273 12:30:00 Looking for frontal features corresponding to upwelling regions. 1/8 high Ci clouod
98 273 12:33:00 Frontal; features present in the SSST and BSST data streams V calm seas with lots of slicks forming
98 273 15:03:00 On station sampling the great African Upwelling. 4/8 Ci cloud very calm all logging
98 273 16:47:00 Stations for Optics etc. No real upwelling water at the moment. 2/8 high Ci clouds.
98 273 19:56:00 All logging and OK- station work throuoghout the early evening. Ca;m seas and light winds
98 273 21:33:00 As above - rather boring !!! But there is loads of structure in the T/S plots associated with mixing waters
98 274 00:36:00 Ill informed of SOSSTR instrument failure. Serviced the instrumentand all OK. Glassy sea no wind or sea and all logging OK. 5/8 Ci cloud moon out.
98 274 02:09:00 All logging and OK
98 274 08:29:00 All logging and pole still outboard. SISTeR OK, SOSSTR ok 4/8 high Ci Cs cloud with a v. calm sea and wind
98 274 10:04:00 Underway again and all logging @ 15kts !
98 274 10:20:00 Camera system started, RADAR logging
98 274 15:26:00 All logging and OK steady sea with little swell.
98 274 16:16:00 All logging 1/8 high Ci clouds steady sea and light wind Wind at 265T at 4ms-1
98 274 19:12:00 As before all logging Camera to go off shortly
98 274 22:00:00 All logging as before ..... 2/8 Ci cloud
98 275 00:40:00 All logging as before - v quiet seas and wind
98 275 04:07:00 Lots of fine structure in the SSST and BSST, Sal, flourescance.
98 275 08:00:00 All logging and OK. 6/8 cloud mistly high Ac but some low Cu (flat based.
98 275 09:14:00 Loads of slicks about
98 275 09:27:00 Radiosonde off. changed over the gas bottle to the 3rd one from Stbd (the second one is still full and unused) All logging and OK
98 275 11:52:00 All logging and OK. Stable, light wind with calm sea and sliocks all about. High biology in this region
98 275 16:52:00 All logging possibiulity of showers is increasing

98 275 17:00:00 SISTeR Door closed and the archive terminated in a local shower. Dor closed just as the shower started !!
98 275 17:00:09 Sky tasco calibration gone indicating wet lens. severe local storm (single convection cell) passing
98 275 17:00:09 Sky tasco calibration gone indicating wet lens. severe local storm (single convection cell) p assing . Backing up SISTeR data to jrue Freshwater signal seen in SOSSTR sea view data 8/8 cloud now with a few local cells raining out. I'm on the night shift (2-6am) so it should be OK to keep opening and closing the door
98 275 17:13:00 SOSSTR has a V strange sea view signal now associated with the rain just passed with lots of structure in it. T/S data also shows the effect. Note that there is hardly and wind atall and the sea is most Calm
98 275 17:23:00 All looks clear ahead again Still 7/8-overcast cloud.
98 275 17:29:00 LEaving the SISTER door closed for the time being (oh for an automatic system !!) after assessing the regoin using the JCR long range RADAR. Lits of cells about - possibly late afternoon convection getting rid of the days maoisture as it cools etc. Will try again after tea. SOSSTR is OK and still logging omnteresting features as we pass through the region. No measure of rain rate unfortunately although the storm was local. Several photographs of the clouds and freshwater slicks associated with the signals seen in the IR data Film 2 exp 20-23. Still lts of structure in the SOSSTR seaq data and in the traces
98 275 20:06:00 SOSSTR calibration has recovered now. Going to check oiutside for SISTeR possibility Camera to stop
Stars out and some small Cu all abot but no obvious signs of convection. sister Door open and archive started. File:2752013.arc Very light seas and wind, hot and humid. Still lots of structure in the T/S data
98 275 21:35:00 Bridge called to say rain, SISTeR door closed and the archive stopped. Light shower this time - SOSSTR has no change.
98 276 01:20:00 Clear as a bell outside - SISTeR archive started 2760120.arc and door open. All logging @/8 Sc on the far horizon, loads of stars and steady sea. Swell is off the Stbd bow but gentle with it.
98 276 02:00:00 all logging and OK clear skies
98 276 05:10:00 All logging OK
98 276 06:03:00 Clear skies light swell all logging
98 276 06:04:00 SOSSTR motor has stopped going to try and free it up
98 276 06:19:00 SOSSTR checked out, motor freed up really easily and seems to have loads of power ? Must be a dodgy commutator/bearing. Stopped archive for a new file
98 276 09:30:00 Radiosonde off all logghing wiuth v. light winds ans calm sea. Entering the doldrums

98 276 11:30 All logging OK, sea is glassy and v stable. No wind at all nearly. Cu beggining to build so we can expect rain this afternoon sometime but all is OK at the moment.
98 276 11:56:00 Sea is even more glassy now
98 276 15:10:00 Small local shower SISTEr Door closed. Lots of structure in the SSST as shown by SOSSTR - especially the warm signal associated with the rain when sky tempererature is measured at ~15:05.
98 276 15:14:00 Shower stopped. SISTeR Archive stopped and I'll leave the door closed Until later after the local convection has quetened down some more.
98 276 17:23:00 SISTeR archive started 2761723.arc and door is now to be openerd
98 276 17:53:00 SOSSTR motor stopped. Re started with a new log file. SIOSTeR logging and all OK. 3/8 Cu clouds (some active) 3.3ms wind @ 270T and calm sea. Slight swell.
98 276 20:43:00 SOSSTR crashed out again. going to get it going with a shot of trichloethylene into the motor system
98 276 22:12:00 SOSSTYR OK and all is logging. RADAR backup complete and re-installing PC to mail room
98 276 22:22:00 2/8 Cu cloud all logging and OK
98 277 00:16:00 All logging OK steady ship and sea
98 277 01:28:00 Some largish Cu clouds with lots of clear skies. All logging OK
98 277 08:15:00 Camera system on and logging. Checked SOAP out and a1;1 is well. Sensor still attached with no tape problems. Cable re-secured as it was lyinmg outyside of the wall. SISTeR logging, SOSSTR logging RADAR logging.
98 277 08:26:00 Camera system cd-writer is not recording poroperly., Will back up via ftp tonight.
98 277 08:39:00 Serviced the psychrometer. all looks OK and the water bottle is now full.
98 277 09:15:00 Radiosonde launched semi-successfully. Sonde cable failed to unwind on launch: ~3m of cable were streamed. 3/8 Cu clouds wuth a 150T 5 ms-1 wind. All logging
98 277 17:00:00 SOSSTR motor stopped. Going to sort it out....
98 277 19:22:00 OK, so I got the SOSSTR BB drive motor out and 1 of the commutator brushes was completely shot away. Looks like it was a soft brush which has worn preferentially. Tho other is as good as new. Swapped out the motor units using a spare and re wired. All looks set now. Started a new data file. Sea is building on the Port side and the clouds are small. 3/8 Cu. New file is 2771924.dat Last section of data is useless as the HBB heater was disconnected.
98 277 23:48:00 Finally got the network card on the camera PC working and a successful backyup to jrue. Will now have to back up like this each day. Sea is picking up on the port bow at present and JCR is starting to move about - actually feels like a ship at the moment for a change ! SOSSTR seems to be much smoother now with more

regular calibrations temperature is falling althoiugh the sky is clear
98 278 00:00:00 Bridge warning of rain ahead and the SISTeR door is closed. archive stopped and data backed up to jrue
98 278 00:43:00 SISTeR still stopped and camera data fully backed up off the PC
98 278 00:59:00 SISTeR door opened and a new data file begun 2780104.arc 3/8 Cu inactive and the bridge will call again if it looks dodgy
98 278 08:00:00 Camera started up. $/8 cloud: 1/8 low Cu (fair weather) and 3/8 Cc (high). Noise on the SOSSTR prt units which is local and irregular. Otherwise all OK.
98 278 09:27:00 Radiosonde off OK and logging. 6/8 Ac some low Cu
98 278 08:26:00 All logging and OK.
98 278 10:00:00 On station
98 278 10:15:00 All logging OK and on station. SOSSTR PRT signals are still noisy. Will check the motor out later to see if it needs to be in better contact with the main gear and also the earth to the PRTs off of the motot gearbox chassis. 6-7/8 Ci As
98 278 14:00:00 Re set the SOSSTR motor drive which has given a much better signal now. SOSSTR logging, SISTeR logging, all OK 1/8 Cu clouds sea on the port bow. Some spray on the SOSSTR front case, but dry inside
98 278 17:44:00 2/8 Cu cloud sea on port bow all logging. Still noise on the SOSSTR PRT's
98 278 20:06:00 All logging 3/8 Cu cloud all OK
98 278 23:09:00 SOSSTR still giving PRT errors. All OK and logging Still lots of noise on the SOSSTR signal
98 279 09:37:00 All logging still noiuse on the SOSSTR PRTS: gong to try and cable tie the motor-bb armature mounts together in the hope that this minimisaes the problem. Radiosonde off OK. Sea is quite large on the port side. with 4/Ac Sc Wabi has crashed out
98 279 09:47:00 Looks like the eppley data is gone for all of last night (from about 15:20ish yesterday.) Got data from 279 08:11:33 onwards.
98 279 10:21:00 Camera system started and SOSSTR serviced. Cable tied the motor as above with no change ?
98 279 13:13:00 Shower and the SISTeR door closed. 7/8 Cu some active. SISTeR archive stippped. SOSSTR noise has now dissapeared so perhaps the cable tie did the trick ! Sea is on the Port side @ ~F4-5 with some reasonable swell. Plenty of whitecaps about and all logging., Ship is rolling a little
98 279 13:23:00 Clear skies again - local shower openin g SISTeR up again and logging to a new file: 2971325.arc. Sea is picking up all of the time now and the foprward face of the SOSSTR box is wet
98 279 15:21:00 SISter door closed in anticipation of heavy rain imminently. 5/8 Cu cloud with heavy signs of rain ahead. Sea on port beam/bow
98 279 18:06:44 Eppley logger crapped out again and SOSSTR noise back. Seems like this is the case once we

are nderway and the ship begins to move About a little.
3/8 Cu cloud SISTeR archive started 2791008.arc
98 279 18:13:00 SISTeR door open and logging to disk.
2/8 Cu clouds all about with some really bad stuff now behind us. Eppley data archived off and a new file started 2791814.dat. Note that it looks like the broken data sets have been written to the last 276 data file as well. No data loss for today as the last set of data was appended to the last 276file.
98 279 19:12:00 SISTeR door closed due to rain shower ahead. Will re-assess after dinner. Archive stoppped.
7/8 Cu clouds
98 279 20:08:00 Lots of large Cu clouds raining out all over - only 5/8 covberage but sizable systems nevertheless. SISTeR door to remain closed until next check
98 279 21:13:00 SISTeR archive started and door open
98 279 21:58:00 SOSSTR noise is back again ????
98 279 22:47:00 Bridge warning of rain: slight spitting by the time I got to close the SISTeR door with a V. lrge bank of ominous looking cloud ahead..... Archive stopped.
98 279 23:36:00 Clear ahead from the bridge and the SISTeR door is opened with a new archive file: 2792337.arc. SOAP is bouncing about a little now although the stay rope is still holding. Hopefully this will hold through the night
98 280 00:32:00 1/8 inactive low Cu lots of stars and a nice moon. All logging
98 280 02:14:00 All logging and OK
98 280 08:45:00 All logginmg with plenty of rolling about. @/8 Cu lcloud. Going to start Camera after breakfast and get a sonde up
98 280 09:29:00 Sonde off in strong winds: nearly ditched in the sea but at the last minute, all was well. SOSSTR drive motor showing signs of labouring. Calibration interval is extending somewhat. Going to try a squirt of WD40 to help out ???? Seems to have done the trick 4/8 Cu/Ac clouds with sea just fwd of the Port beam. F5
98 280 10:11:00 SISTeR door closed and arcjive stopped. Rain ,ahead off the Port side. Looks like a local storm which should pass through in the next 10-20 mins.
98 280 11:00:00 On station.
98 280 11:39:00 Clouds and rain have cleared and SISTeR door is opened. Staring a new data file: 2801140.arc. SOSSTR cals are still struggling: motor problems again ? If so we could be in a real mess here as ther is not another spare motor ....
98 280 11:50:00 SOAP checked out. All is well. the bulb of rope on the shackle retaining chain has stopped the forestay from parting. Cleaned up the gaffer tape and redeployd. Sonde up to 60mb at the moment. Will stop at 12:00
98 280 13:28:00 Bridge warning of shower ahead. SISTeR door closed and archive STOPPED 5/8 Active Cu all about sea upto a good F5 on the port beam. Rolling a lot

98 280 13:55:00 On Station and weather looking good. SISTeR door opeded and new archive file started: 28013:55.arc
98 280 14:02:00 Tried to load up fast200.exe to SISTeR which has failed miserably. Going to do a power re-set on the instrument. Re-set OK and loading fast200.exe and also rossa98.exe up to the SISTeR. Re-set OK and loading fast200.exe and also rossa98.exe up to the SISTeR If Fast200.exe works out OK, then I'll rtun fast200.exe
98 280 14:10:00 Started FAST200.exe logging from SISTeR. Going to up the scan rate for the camera to 1s intervals....all gone to ratshit as the GS is falling over miserably and it looks like the scan mirror is stuck as nothing is happening.....Killed off and started again with rossa98.exe
98 280 14:28:00 Started a new SISTeR archive file: 2801421.arc using ROSSA98.exe. SOSSTR drive motor has slowed down considerably.
98 280 15:15:00 Shower ahead and SISTeR door closed and the archive stopped
98 280 16:45:00 SISTeR door open and a new archive started:2801645.arc logging rossa98.exe. $/8 Cu all about but otherwise OK. SOSSTR calibrations are getting slower and slower. Going to try and free up the motor again
98 280 17:00:00 27771924.dat (*SOSSTR) has loads of problems with the BB motor crapping out still. Started a new file 2801700.dat after a thorough cleaning of the motor unit (again !). Note that the cals were ~0.5hrs apart towards the end of the last file. Shows the stability of the BBU even in these conditions are good.
98 280 20:38:00 Rolling more heavily now with a growing sea on the port side Camera data stopped and backung up to JRUE
98 280 23:55:00 SISTeR OK, SOSSTR OK, eppley OK soap and psy OK
98 281 00:35:00 All OK and logging variable cloud with lumpy sea on the Port fwd qtr.
98 281 08:30:00 All OK and logging. Camera system started and RADAR disk space checked out. 300+ Mb availablke on the HDD, so I'll bnack this up this evening.
98 281 09:20:00 Radiosonde release OK. Slightly larger balloon so as to get the sonde up and away from the ship as yesterday, it was caughth in the local low pressure region behind the ship which pulled the sonde down to within a m or so of the sea surface.a
98 281 11:04:00 Sky tasco producing same style noise a\s the prt's ?? This is the first time that either of the TASCO radiometers have shown this type of error.
98 281 11:40:00 TASCO has quietened down now on station.
98 281 11:41:00 Underway again with 6/8 cloud. All logging OK
98 281 12:28:00 Still having problems with the bloody radiosonde processing software. Seems like its so fussy about its input its unbelievable. Keep getting subscript out of range errors Spent 2 hrs on it again with no luck ....

98 281 12:36:00 All logging Ok with 2/8 clouds
98 281 15:45:00 SOSSTR drive still slowing down so I'm going to degrease it again. All done. Main gear train also de-greased in the hopee that this is the cause of the noise ?? $/8 Sc Cu
98 281 16:00 Underway after station ans all logging. Sea seems to be abating a little at the moment. Pressure remains high and the clouds are in our favour !
98 281 21:50:00 All logging and OK. SOSSTR motor is faltering a little with uneven calibrations varying between 15 mins and ~6mins
98 281 22:46:00 All OK and logging doing a backup of the camera system. RADAR system has 160Mb to go which should last 'till tomorrow AM. then a backup. 2/8 cloud with lots of stars and all OK
98 282 00:43:00 All logging and OK. Sea is quietining down. Still clear skies. Sea is quietining down. Still clear skies
98 282 08:36:00 0/8 cloud (thius is amazing: so much good weather even in reasonable winds !) and all logging. SOSSTR signal is quiet and stable, SISTeR is fine, soap is fine. Going to start camera up and backup the RADAR system to jrue
98 282 09:05:00 Radiosonde off OK. clouds starting to build. Probably going to rain at some point today. Bridge will call if rain is imminent. 5/8 Ac/Sc Sea has calmed down a little now but is still off the Port beam
98 282 09:55:00 RADAR still backing up. CAMERA data deleted from jrue so a restore is needed. RADAR data to go ouit to DAT tapes. Sky is changable at the moment with only 3/8 Cu clouod at present
98 282 10:01:00 RADAR clock checked and OK to GMT
98 282 11:00:00 on station for CTD
98 282 11:34:00 Radiosonde complete, SOSSTR sky signal is really noisy, sea signal OK but the motor is labouring somewhat as the cals are getting longer and longer. Will sort out the radiosonde and then the SOSSTR. SISTeR OK and logging
98 282 21:48:00 Eppley data logger crapped out. Data recovered in 3 stages after repeated attempts to re-start wabi. Each time the system hung (wabi) and a re start was required. All data downloaded into 27691814.dat Started a new file to log to: 2822150.dat
98 283 00:18:00 All logging no rain mixed sky. Slight rolling and abating wind. All OK. Starting second dump of the JRUE partition
98 283 06:03:00 SOSSTR calibratios slower,: 3/8 low Cu cloud, all logging
98 283 12:00:00 On station all lopgging 2/8 Cu cloud going to start camera system
98 283 16:00:00 Quiet day with 2 stations. All logging OK with a 5/8 Cu sky. Sea is quietish and stable. Night shift tonight, preparing radiosone for the 18:00 sched. Sea has come aroound to the Port aft 1/4
98 283 16:14:00 Radiosonde relaease OK - moving fwd of the ship

98 283 16:15:00 Just realised that the eppley logger crashed at 08:08 this morning. Data being collected now and the logger re-started
98 283 16:15:00 Just realised that the eppley logger crashed at 08:08 this morning. Data being collected now and the logger re-starteta lost from 08:08 - 14:01.
98 283 16:46:00 All logging and OK 8/8 Sc cloud noW
98 283 18:03:00 Bridge warning of extensive rain ahead. SISTeR closed down and the archive stopped. Backing up to JRUE
98 283 18:09:00 Drizzle starting now.
98 283 18:18:00 Increasing rain rate now
98 283 21:04:00 SISTeR off SOSSTR still logging eppley and soap all OK Going to stop camera system
98 283 21:15:00 SISTeR archive started and all logging. 4/8 CU cloud and bridge informed of my imminent sleep. Wind has come 180 degrees and is now on the nose. If water starts to get shipped then I'll put a placcy bag over the SOSSTR.
98 283 23:26:00 Eppley system crashed out again. Recovered OK. Ship beginning to pitch a little now, all logging OK Plenty of stars all about
98 284 00:55:57 Bridge warns of spray on the foredeck. SOSSTR bagged up in case things worsten quickly. While the bag is on I'm logging to 284baged.dat. Clear skies all about and SISTeR is logging OK. Instructed bridge to contact me if spray starts reaching the foremast proper. Still loads of stars all about
98 284 03:52:00 As above, all logging
98 284 04:54:00 All logging and OK. SOSSTR still bagged
98 284 07:17:00 All OK and logging. Still pitching with some spray on the bow.
98 284 07:31:00 SOSSSTR archive started and system unbagged. Logging to 2840730.dat 1/8 low Cu clouod with an amazing sunrise. Swell off the Stbd bow but no water making it onto the bow itself Soap checked and OK. Backing up all of ther SOSSTR data to jrue.
98 284 08:49:00 All logging and OK. Camera system started up and radiosonde in preparation
98 284 11:12:00 Sonde crapped out at 400mb: I have retuned the reciever but there is so much noise that its having trouble getting its head together. At ~70mb now. 0/8 cloud and calming seas all the time SISTeR OK, SOSSTR OK eppley OK
98 284 14:12:00 1/8 high Ci cloud all logging. Swell still with us but light winds
98 284 16:23:00 Large swell 0/8 cloud and all logging
98 284 18:44:00 Swell still with us and clouds building up as if there is something ahead ! All logging OK
98 284 20:03:00 8/8 Overcast cloud getting heavier al;1 the time. Swell still with us but no rain. All logging and OK
98 284 20:57:00 Going to stop camera system and do the backup All logging OK
98 285 01:37:00 All logging. Overcast sky
98 285 04:10:00 Rain reported. Actually a very light drizzle has started, SISTeR door closed and the archive

stopped. I suspect the rain is set to get heavier in the next hour or so
98 285 09:35:00 radiosonde off raining with a v light drizzle 8/8 cloud SISTeR off and camera off. SOSSTR running but with a much reduced temperature range . Note that both of the TASCO's are showing signs of contamination, but this should calibrate out
98 285 10:16:00 8/8 Cu light drizzle SISTeR door closed camera off.
98 285 11:51:00 8/8 Sc cloud light drizzle, SISTeR off and Camera off.
98 285 13:54:00 8/8 cloud with some small break ups starting to form Still raining and SISTeR closed with the sea coming onto the nose a litttle more. WABI crashed and re started with no data loss
98 285 14:09:00 started a new eppley data file 2851909.dat Eppley clock is 5s fast at this point
98 285 15:00:00 Wabi crashed out again. Re started with no data loss
98 285 15:12:00 Sunshine ! clouds are clearing and things look good. Starting a new SISTeR archive 2851512.arc and opening the door ! 6/8 Sc
98 285 15:26:00 Checked all on th mast all OK psy water bottle 2/3 full
98 285 18:39:00 3/8 Cu Sc cloud and weather improoving all of the time. All logging.
98 285 19:00:00 Opened up SOSSTR to take a picture of the guts. 3/8 Cu all about, all logging and weather looking good
98 285 21:53:00 Downloading the camera data to JRUE. Short data set due to rain all morning. 2/8 Cu cloud now with an excellent sunset. all OK and Logging
98 286 03:57:00 Light drizzke rain starting. SISTeR door closed and archive stopped.
98 286 08:10:00 Eppley logger crashed and re-started with no data loss
98 286 09:15:00 Radiosonde off. This time with 2 times the diameter (as best as I could estimate) as suggested by John shanklin
98 286 09:25:00 SISTeR door opened and logging to a new file 2860925.arc and camera started 7/8 Sc + Cu clouda
98 286 09:30:00 Checked the SOSSTR and SOAP out: both OK and the soap is streaming fine
98 286 09:52:00 Radiosonde @ 339mb..... LOTS of gas in this one !!!! All logging with a small swell and 7/8 Sc all about
98 286 11:41:00 All logging and OKa
98 286 13:04:00 All logging and OK 6/8 Cu/Sc clouds
98 286 13:22:00 Bridge warning of rain: going to investigate.
98 286 13:31:00 Rain passed to Stbd side
98 286 13:33:00 SISTer archive stoppped and trying to load up skyscan.exe. Failed miserably requireing a power down of the instrument. Mixed sky at the moment but it looks like there could be some 0/8 ahead Plan to run skyscan untill we go through the cloud free areas
98 286 13:46:00 Started skyscan logging to file 2861346.arc

98 286 13:55:00 Stopped archive to rebuild the skyscan exe file using longer move delays as the angles look suspect. Powered down the SIStEr and back up again to restart. Weather improoving all the time now 4/8 Sc Cu clouds
98 286 14:01:00 starten new archive 2861401.arc
98 286 14:05:00 Stopped again as the angles are still shite ! Trying to up the delay....power reset required....OK here we go again.....
98 286 14:12:00 Started the skyscan programme and logging to 2861412.arc.going to make notes on the cloud conditions. Don't get the 180 degree view still. Mixed sky at the moment
98 286 15:02:00 8/8 Sc and light drizzle reported from bridge. SISTeR door closed and archive stopped. Rain looks like its possibly set in for a while
98 286 15:42:00 False alarm and SISTeR restarted logging to file 2861543.arc using skyscan.exe
98 286 16:32:00 Clouds on the horizon but clear overhead on the SISTeR side. all logging
98 286 16:56:00 8/8 Cu in SISTeR sky FoV for several minutes now and into the future !!
98 268 17:28:00 Added headers to the eppley data and moved up the files to JRUE. 3/8 Cu cloud all about blue sky under SISTeR at the moemnt
98 286 18:25:00 3/8 Cu all about all logging
98 286 18:59:00 3/8 Cu all about calm sea all logging
98 286 21:24:00 WABI crashed. Going to stop the camera system and re-start rossa98.exe on the SISTeR radiometer. downloaded data to 286crash.dat
98 286 21:40:00 SISTeR archive stopped ready to load up ROSSA98.exe again. Goig to re set whiule getting the camera system down
98 286 21:46:00 Power cycled SISTeR and loading up rossa98.exe: 3/8 Cu clouds at the moement with the sea picking up off the port bow SISTeR logging to 2862148.arc
98 286 21:54:00 All OK and logging again
98 286 23:39:00 All OK and logging (SISTeR on rossa98.exe)
98 287 01:06:00 All OK and logging - clear skies 1/8 cloud
98 287 02:01:00 All OK and logging - some clouds building
98 287 02:35:00 All OK and logging
98 287 09:04:00 Preparing radiosonde. %/8 Sc Ac cloud, all logging and OK.
98 287 09:20:00 Sonde off OK 7/8 Sc clouds all logging OK. quiet sea on ther port bow, wspd 6ms@160T
98 287 10:13:00 Camera system started. Sea is building slowly 3/8 Cu clouds. May try and use the skyscan prog on SISTeR again later today
98 287 11:08:00 0/8 cloud ! going to run skyscan.exe on SISTeR. SISTer archive stopped. Attempt to load up skyscan.exe and re-start on the fly....Nope, popwer re-set required
98 287 11:15:00 SISTeR archive started using SKYSCAN.EXE: 2871115.arc. 0/8 cloud out on the SISTeR

side with only 1-2/8 on the opposite side: getting better all of the time. Now we have skyscan data from yesterday in overcast, mixed sky and today, clear sky conditions which is what we wanted from the skyscan programme.
98 287 11:@1:00 Some small (0.2/8) Cu clouds on the SISTeR horizon
98 287 12:35:00 0/8 cloud radiosone off for attempt 2. Looks good if there is an overpass with us !
98 287 13:08:00 < 1/8 Cu clouds still on station All logging
98 287 15:56:00 Possible internal waves on the edge of the eddy systems of the Falklands- Brazil confluence 3/8 Cu clouds calm seas all afternoon still logging with skyscan.exe. Will change this over to rossa98.exe on sister soon as thewre is now enough skyscan data to answer our questions.
98 287 16:26:00 SISTeR stopped fro a repower and load up rossa98.exe for the remainder of the trip
98 287 16:30:00 SISTeR came back up without a repower and rossa98 is logging fiune: new file 2871630.arc
98 287 16:42:00 Clouds thickening up slowly and pressure still high
98 287 18:01:00 3/8 Cu clouds all about Press ure holding up and all logging
98 287 18:50:00 3/8 Cu cloud all logging and OK. Sea is on the port bow still
98 287 19:18:00 3/8 Cu cloud all logging and OK
98 287 22:00:00 Sea beggining to pick up again. Backing up the RADAR and camera systems. All logging and OK
98 287 23:12:00 Clear skies overhead all logging set for a good ATSR overpass (?) maybe
98 287 23:24:00 Still can't get a backup off the RADAR machine got half now the Eth0 keeps playing up big time. OK, gave up and put the radar back with some of the backup left on the system.
98 287 23:50:00 RADAR started up again and logging. some of the 287data is still to be backed up in Monte. Ther is ~850Mb free on the HDD which wiil be enough to get to Monte. Plan a re-install of Linux to get the system correct there. 0/8 Clouds all logging OK
98 288 01:14:00 All logging and OK 1/8 cloud loads of stars
98 288 02:00 Lots of structure in the SOSSTR and in the Salinity signals
98 288 02:10 0/8 cloud absolutely amazing clear skies with loads of stars
98 288 02:12 0/8 cloud: SOSSTR radiometer trace shows distinct 'noisy signal'. Swell is quite large and the bridge reports some nose diggging in. Cals remain quiet in the sense and the noise is very very much reduced.
98 288 03:00:00 0/8 cloud all logging SOSSTR still showing a noisy signal. a
98 288 09:04:00 Preparing radiosonde axcwent. SOSSTR signal now quieter compared to last nighth. 1/8 high Ci clouds all logging and OK
98 288 09:19:00 Sea on the Stbs rear qtr 3/8 Ci Cs

98 288 09:40:00 $/8 Ci/Cs. Camera system started all loggingand OK. Note a 'short' choppy sea to the stern at the moment Some PRT noise in the SOSSTR signals
98 288 11:13:00 All OK and logging Radiosonde still crapoped out
98 288 12:17:00 All OK and logging. On station for the CTD etc. Sea on the nose
98 288 17:00:00 All OK and logging fine. Still 1/8 Cs cloud all about with a gentle pitching motion. Entering cooler air as the HBB is cooling rather rapidly .. unless ther is a problem. Lots of T/S and flourometer structure all about in the oceanlogger streams In green water for several days
98 288 18:47:00 All logging and OK 7/8 high Ci cloud. Sea is off the Stbd bow
98 288 19:09:00 All loggging and OKa
98 289 01:30:00 All logging and OK Clear skies overhead
98 289 03:33:00 All logging OK. Sea on the stbd bow
98 289 11:47:00 All loggiong and OK6/8 CiCs clouds easy seas. Going to start the camera
98 289 13:23:00 All logging and OK Some noise on the SOSSTR prt's
98 289 13:39:00 Wabi crashed ? Data recovered OK clear overhead.
98 289 14:20:00 Sea just off the Stbd bow. all logging, lots of T/S/F structure sea on the Port Beam
98 289 16:15:00 Radiosonde off all logging. Sea on the Poert rear qtr at the moment with quite strong winds (10ms.) Making 15Kt into Monte Rolling slightly with clear skies overhead. SISTeR still logging, SOSSTR still logging, SOAPS OK and checked, psychrometer OK. All OK
98 289 16:46:00 Checked all the systems and all OK. SOAP pole could perhaps do with a stay to the end as its flexing a little when the shackle bounces out of the water
98 289 18:50:00 All OK and logging. Pumps expected off @ ~ midnight. 1/8 Ci with some low St on the horizon.
98 289 20:07:00 Lumpy sea as we approach the shelf. Large sea on the Port qtr. 0/8 cloud at the moment and all logging OK
98 289 22:21:00 Approching the shelf and all logging. Camera data backing up now. Still clear skies overhead at the moment and will stop logging at when the pumps go off later tonight
98 289 22:47:00 SOSSTR prt's are v. noisy again. Temperature is dropping rapidly
98 289 23:45:00 Pumps off and Oceanlogger T,S and F are finished. Will leave the SOAP out and all the other stuff untill after the 10:30 ATSR overpass then turn it off Still clear skies and all logging OK
98 290 01:31:00 NO Underway water, SOAP still out and all logging OK Clear skies all about. Excellent data.
98 290 01:53:00 Amazing night. 0/8 cloud loads of stars. Clear skies city
98 290 05:05:00 SOAP out of the water, disconnected and re plugged in. SOSSTR logging, SISTeR logging, Eppley logging, RADAR logging. Monte lights on the horizon

98 290 11:00:00 All OFF and End of Leg
!!!!!!!!!!!!!!!!!!!!!!!!!

98 292 18:20:00 Started calibration of SISTeR vs CASOTS, file names 98101901.arc, 98101901.dat. ASL bridged synchronised to main clock before start of run, SISTeR not (forgot). Just heard that the bastard Germans are NOT going to retrieve the 2nd buoy therefore only >>6<< days sailing time maximum. AGH.
98 293 18:30:00 Cleared Montevideo harbour breakwaters. SISTeR warm and closed. Not logging
98 293 18:43:00 Started Eppley file 2931843.dat (after comms failure).
98 293 18:51:00 Started SOSSTR file 2931851.dat
98 293 19:00:00 Started to drizzle (turning to light rain). Bagged SOSSTR.
98 293 19:10:00 Started camera and radar.
98 293 22:39:00 Drizzle stopped. Covers off SISTeR ands SOSSTR. SISTeR logging to 2932239.arc . No SOAP until out of territorial waters (fiat from Nigel). Clouds ~8/8 (6/8 at horizon). Sunset so difficult to tell.
98 294 00:11:36 Clear skies? plenty of stars. Foul weather predicted (three converging low pressure fronts) in a day or two.
98 294 09:30:00 Clear skies. Light swell. Decks, SOSSTR damp (dew).
98 294 10:10:00 Camera now set up and running after a couple of false starts. Difficult to set contrast. Strong sunglint in centre of camera image.
98 294 14:30:00 SOAP pole lashed on and SOAP deployed. Weather still very fine. No cloud, light swell. NB no second SOAP calibration yet. Either at sea or inaccessible due to welding work on tender.
98 294 16:56:00 Weather georgous. Clear skies, no wind, light swell. JCR manoeuvered then stopped in preparation for station.
98 294 17:55:00 (Approximately) Under way again. Problems with the CTD. Will repeat cast in a couple of hours. Weather still perfect.
98 294 18:33:00 Some hazy high cloud well to the North (astern) approximately 5-10 degrees above horizon. Longwave Eppley graph shows substantial change in signal (~40K cooling, with ~10min time constant) coincident with CTD stop. Is this an artifact caused by solar heating of the instrument? No noticeable change in sky state over CTD period.
98 294 19:45:00 On station. High cloud to ~30 degrees above horizon towards west. Clear OH. Wind increased slightly.
98 294 20:26:00 Underway again.
98 294 21:06:00 4/8 Cirrus, mainly astern, faintly OH.
98 295 09:52:00 Tried (and failed) since 08:30 to establish network connection to dump camera data. Also last night. Now running with previous data sets tarred. 8/8 Cirrus (though not thick). Small amounts of lower cloud. Infrequent white caps on waves.
98 295 10:30:00 Entries for the next few hours are somewhat curtailled. smaug crashed (with the help of

wabi). Much running around to get it fixed and the Eppleys logging again. CR10X dumps in 295crash.dat, 295crsh2.dat and 295crsh3.dat
98 295 10:50:00 On station.
98 295 11:05:05 End of station. Short manoeuvre then start of search for buoy. Repeated stops interspaced with quartering from here on.
98 295 15:23:00 Balloon launch somehow in the middle of the mayhem. No sign of the required proc_radiosonde.pro file (only proc_radiosonde). Edited sonde data by hand. Worked first time, but poor maximum altitude (250mb) before out of range. Now overcast. Sc & Ac I think. Might try shortening the hose so we don't fill the balloon up with air first.
98 295 18:00 Rain. SISTeR closed up, SOSSTR bagged.
98 295 18:15 Missed transmission for 18:00, but have smaug back again (thanks Jim). Edited sonde data in 22101.fli. New Eppley file is 2951818.dat.
98 295 18:45 Search for buoy called off. Underway again.
98 295 20:30 Seas getting heavier. Ban on scientists from going onto the forward deck. Dispensation to check SISTeR door and SOSSTR bag, but that's all. SOSSTR, SOAP, Camera, RADAR will have to look after themselves.

98 296 09:15 Heavier seas. Sky clearing (1-2/8). Captain B. decided to up the speed at 5 this morning (8GMT) so the going's gone from bearable to difficult. SOSSTER and the SOAP are having a rough ride. Will get them in at the first oportunity. Swell and stiff wind (40+ knots relative) so skipped balloon for the time being.
98 296 11:45 Clouding in again (6/8+ Cumulus). Station at about 10 (13GMT).
98 296 13:00 On station. Took down SOSSTER. Amazingly dry considering what got thrown at it. No water inside at all. SOAP coiled and lashed to deck. Still working fine. Brought camera and RADAR PCs back to lab to try and back up before the next station. Camera is out of disk space (no surprise).
98 296 10:00 CTD not deployed (kink in wire), underway again. NOONE allowed out on deck anywhere at all. Balloons, XBTs etc are off (see above). Cloud 7/8 Cumulus. BIG swell. Wind 40kts true. Clear air and quite bright.
98 296 16:20 Permission for a balloon launch. Got one off but it went for a swim before climbing. Great fun in a Force 8 though! Cut hose down to minimum lengh - balloon appeared much more buoyant than before.
98 296 17:40 Wabi crashed. Dumped Eppleys to 296crash.dat. new file is 2961736.dat.
98 296 18:00 Station cancelled (CTD rewiring problems) so no forward access.
Current status:SISTeR shut, SOSSTR derigged, camera and RADAR PCs in the UIC,
balloon sonde damp. Eppleys doing just fine. Force 8 and quite heavy swell (regular drenching of companionway, officer's bar windows; waves at eye level from winch control windows). No prospect of change this evening.

98 297 12:00 Wind dropped just a little (force 7-8). Eppleys still logging, but sw has a good number of data spikes (spray od domes?). Finally sat Jim (recovering from bad sea-sickness) down in front of camera PC only to find the DOS/Windows partition appears to have been damaged overnight, possibly by the way the boat has been slamming around. No straightforward way of building Linux ethernet or reinstalling Windows 95. So that's probably the end of the ride for the camera. Only instruments logging data currently are the Eppleys.
98 297 13:00 On station.
98 297 13:15 Radar now running again.
98 297 14:00 Underway.
98 297 16:03 Launched ballon (couldn't get an extra pair of hands any earlier)
98 297 18:00 Missed Met O. schedule. V. poor sonde reception led to lots of *.fli editing. Reached 150mb before gave up. Cloud 8/8 As, Cs.
98 297 19:34 More of the same. Seas slightly bigger. Speed pushed up a bit, so a good deal of pitching and rolling. Overcast.
98 297 23:00 On station.
98 297 23:55 Underway. Overcast. Eppley v. noisy. Nothing to do with spray. Happened all through station. Met logger to be turned off before Stanley so, with no forward access while underway, the on-board SOAP calibration is stuffed. Off to bed. 4am shift tomorrow.
98 298 07:45 A good deal calmer (18kts) hazy. Eppley trace looks ok again.
98 298 10:20 Got ban rescinded. Opened up SISTeR and redeployed SOAP. SISTeR logging to 2981050.arc.
98 298 11:59 Cast met bucket with thermometer Zeal Met 21532 Mk3 24 7 2 3/89 from bridge wing immediately above SOAP: one point at least. Reading 6.8C
98 298 12:02:30 6.7C
98 298 12:04:30 6.7C Ship slowed to 2kts during these samples. SOAP will have
sunk a bit. Repeat sequence when underway again...
98 298 12:16:30 6.8C
98 298 12:21:00 6.7C
98 298 12:24:00 6.7C
98 298 15:30 (Approximate - more interested in getting calibration started) Pulled SOAP in, cut it loose and fed data lead through gooseneck. Started calibration of SOAP in mail room vs Leicester PRT1/CASOTS.
at ~10C.
98 298 16:15 Clear that the SOAP won't cover a worthwhile range in the time remaining (oceanlogger off at 4pm (7pm GMT)). Raise water bath temperature in stepsof ~2C each 5-10mins with hot water.
98 298 17:30 Finish calibration at ~33C. Cleared up ~30mins later.
98 298 18:00 Beautiful afternoon. Clear sky (cloud to 5deg above northern horizon). Stiffish wind (30kts) but no swell.
98 298 19:00 Enter sound.
98 298 19:55 Tied up at Stanley. SISTeR, RADAR powered down.

```
98 298 20:00  Eppley logger stopped.

<<<<<<<<<<<<<<<<<<<<<<<<<<<<< THE END
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
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B.4. Bridge log for the AMT-7/ROSSA1998 experiment.

Visual observations made by the RRS *James Clark Ross* Officers from the ship Bridge.

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 16/09/98

SHEET No: 01

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0800	1/8	Cu, Sc	1.5	270	1 1/2	
0900	6/8	Sc, Cu	2.0	270	LT AIRS	
1000	7/8	Sc, Cu	1.0	270	LT AIRS	
1100	7/8	Sc, Cu	1.0	~~330~~ 270	LT AIRS	
1200	7/8	Sc. Cu	1.5	310	S 1	
1300	7/8	Sc	1.5	310	LT AIRS	
14						
15						
16						
17						
18						
19						
20	0/8	—	1.0	310	LT AIRS	
21	0/8	—	1.0	310	LT AIRS	
22	3/8	Sc	1.0	310	LT AIRS	
23	7/8	Sc Cu	1.0	310	ENE 3	
2359	3/8	Sc	2.0	340	ENE 3	
17 — 0100	1/8	?	2.0	340	NE 3	
0200	3/8	Sc ?	2.0	340	NE 3	
0300	3/8	Sc	2.0	340	ENE 3	
0400	1/8	?	2.0	340	NE 3	
0500	6/8	Sc, Cu	2.0	340	NE 4	
0600	6/8	Sc	2.0	350	NE 4	
0700	7/8	Sc, Ci	2.0	350	NE 5	
- 0800	6/8	Sc Cu	2.0	020	NNE 5	
0900	7/8	Sc, Ci	2.0	020	NNE 6	
1 1000	8/8	Sc Ci	2.0	020	NNE 5	
1100	7/8	Sc	2.0	020	NNE 5	
		Sc Ci				
1200	7/8	Sc	2.0	000	N 3	
1400	3/8	Sc/Ci	2.5	350	NNE 3/4	Cleared to 1/8 then clouded
1500	7/8	Sc	2.5	350	N 3/4	
1800	6/8	C, Sc, Ci	2.5	010	N 5	
1900	7/8	Sc	2.5	010	N 5	
2000	6/8	Sc	2.5	010	N 5	
2100	7/8	Sc	2.5	010	N 5	
2200	5/8	Sc	2.5	010	N 5	
2300	5/8	Sc	2.5	010	N 5	
2400	4/8	Sc	2.5	010	N 6	
18 TH 0100	8/8	Sc	2.0	360	N 4	

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AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE:

SHEET No: 2

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0200	6/8	Sc	2.0	350	N 4	SET LACE
0300	8/8	Sc	2.0	350	N 4	SWELL HAZE. VIS 4-6'
0400	8/8	Sc	2.0	350	NNE 4	HAZE/MIST
0500	8/8	Sc	2.0	350	N 4-5	—"—
0600	8/8	Sc	2.0	350	N 4-5	—"—
0700	8/8	S	2.0	340	N 4	—"—
0800	8/8	S	2.0	340	N 4	—"—
0900	8/8	S	2.0	360	N 4	HAZEY
1000	8/8	S	2.0	360	N 3	HAZE 1-2
1100	8/8	S	2.0	360	N 3	HAZE
21/09/98						
1900	8/8	Ac As	2.0	350	NNW 3	HAZY VIS ≈ 3'
2000	8/8	Ac As	2.0	350	N 3	—"—
2100	8/8	As	2.0	350	N 3	
2200	7/8	As	2.0	350	N 2	HAZE
2300	8/8	Ac	2.0	350	N 2/3	HAZE
2200	8/8	Ac	2.0	350	N 2	HAZE
2200	8/8	As	1.5	350	N 2	"" THICK
0100	8/8	Sc	1.5	350	NW 2	"" ~
0200	8/8	Sc	1.5	350	W 2	VIS BACKING AS FAST
0300	8/8	Sc	1.5	350	W 2	HAZE
0400	8/8	Sc	1.5	350	W 2	HAZE
0500	8/8	Sc	1.5	350	WNW 3	HAZE
0600	8/8	Sc	1.5	350	WNW 3	
0700	8/8	Sc	2.0	340	NW 3	
0800	7/8	Sc. Ac	2.0	320	NW 2.	
0900	7/8	Sc. Ac	2.0	320	N-W 3	
1100	6/8	AS/AC	2.0	270	NW 3	CONFUSED SEA 2nd Swell.
1200	"	" "	"	290	NW 2	
1300	4/8	" "	"	310	NW 1-2	
1400	4/8	" "	2.0	310	NW 2	
1500	4/8	" "	2.0	CONF/260	NW 2	
1600	3/8	Ci Ac Ac	2.0	280	NW 1-2	
1700	4/8	C Sc Ac	1.5	280	LT VAR	
1800	3/8	C Sc Ac	1.5	280	LT VAR	
1900	3/8	C Ac	1.5	280	VAR 2	
2000	6/8	C Ac	1.5	280	W 3	
2100	5/8	Sc	1.5	280	NNW 5	
2200	5/8	Sc	1.5	280	NNW 5	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 22/09/98

SHEET No: 3

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
2300	5/8	Sc	1.5	280	NNW 5	
23 2000	3/8	Cu/Sc	2-0	310 ish	NNW 4	
2100	6/8	Sc	2.5	" "	NNW 4	
[illegible]						
0000	2/8	Cu Sc	2.5	300	NxW 4-	
0400	2/8	Cu Sc	2.5	310	NxW 4-5	
0500	2/8	Cu Sc	2.5	310	NxW 4-5	
0600	5/8	Cu	2.5	310	NxW 5	
0700	5/8	Cu	2.5	320	NNW 5	
0800	5/8	Cu	2.5	320	NNW 5	
1300	2/8	Cu	3.0	340	NxW 4/5	
[illegible]	3/8	Cu	3.0	340	NW 4	
1500	"	"	"	"	"	
1600	2/8	Cu Sc	3.0	340	NNW 5	
1700	2/8	Cu Sc	3.0	340	NxW 5	
1800	2/8	Cu Sc Ac	3.0	340	NxW 4-5	
1900	2/8	Sc Ac	3.0	340	NxW 5	
2000	2/8	Sc Cu	3.0	340	NxW 4	
2100	2/8	Sc Ac	3.0	340	NxW 4	
2200	3/8	Sc Ac	3.0	340	NxW 3	
2300	3/8	Sc	3.0	340	NW 3	
0200	1/8	Sc	2.5	350	N 3	FIXED ULS TRANSMIT AT 54
0300	1/8	"	"	"	"	"
25TH 2100	1/8	Cu	2.0	300	NW 4	
2200	2/8	Cu	2.0	300	NW 4	
2300	2/8	—	2.0	300	NW 4	
26TH 0400	1/8	Cu	2.0	310	NW 3-4	
0500	1/8	Cu	2.0	310	NW 3	
0600	1/8	Cu	2.0	310	NWxN 3	
0700	2/8	Cu	2.0	310	NWxN 2-3	
0800	2/8	Cu	2.0	340	NxW 2	
0900	2/8	Cu	2.0	340	NxW 2	
1200	2/8	Cu	2.5	350	NxE 2	DAWN BRIGHT
↓	"	"	"	"	"	
1600	2/8	Cu	2.5	350	NW 2	
1700	2/8	Cu	2.5	340	NNE 2	
1800	2/8	Cu	2.5	340	NE 2	
1900	2/8	Cu	2.5	340	NE 2	

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AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE:

SHEET No: 04

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
SEPT. 26TH						
1000	2/8	Cu	2.5	340	NE 2	
1100	2/8	Cu	2.5	340	NE 2	
2200	2/8	Cu	2.5	340	NE 2	
2300	2/8	Cu	2.5	340	NE 3	
2400	4/8	Cu	2.5	340	NE 4	
27TH 0100	3/8	"	2.0	350	NE 3	
0200	3/8	"	2.0	"		
0300	2/8	"	2.0	"	"	
0400	"	"	"	"	"	
0500	1/8	Cu	2.0	350	NE 3-4	
0600	1/8	Cu	2.0	350	NNE 4	
0700	2/8	Cu	2.0	360	NNE 4	
0800	4/8	Cu Ac	2.0	360	ENE 4	
0900	4/8	Cu Ac	2.0	060	ENE 4	
1100	4/8	Cu Ac	2.0	070	ENE 4	
1200	3/8	Cu	2.0	070	ENE 4	
1300	3/8	Cu	3.0	070	NNE 4	
1400	4/8	Sc Cu	3.0	"		
1500	4/8	Sc Cu	3.0	"		
1600	4/8	" "	"	"	ENE 4	
1700	5/8	Sc + Cu	3.0	050	ENE 4	
1800	7/8	Sc	3.0	050	ENE 4-5	
1900	7/8	Sc	2.5	060	ENE 5	
2100	7/8	Sc Cu	2.5	060	ENE 5	
2200	3/8	Sc	2.5	060	ENE 5	
2300	3/8	Cu	2.5	060	ENE 4	
2400	2/8	Cu	2.5	060	ENE 4	
0100	2/8	"	"	"	"	
0200	1/8	"	"	"	"	LT. HAZE
0300	NIL	—	"	"	"	" "
0400	NIL	—	"	"	"	" "
0500	1/8	?	2.0	060	ENE 3	HAZE
0600	1/8	—	2.0	060	ENE 3	HAZE + HUMID
0700	6/8	Sc Ac	2.0	040	ENE 3	
0900	3/8	Ac Sc	2.0	040	ENE 3	
1100	N.L	Ac Sc	2.0	035	ENE 3	HAZE
1200	N.L	—	2.0	030	ENE 3	HAZE
1300	1/8	Ac	2.0	030	"	
1500	1/8	"	2.0	"	"	
1600	"	"	"	"	NE 3	
1800	1/8	As	1.5	020	N 4	
1900	0	0	1.5	020	NNE 4	
2000	0	0	1.5	020	NNE 4	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 28-09-98

SHEET No: 05

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beaufort force	Comments
2100	Nil	—	2.0	020	NNE 3	
2200	3/8	Sc	2.0	020	NNE 3	
2300	Nil	–	2.0	020	NNE 3	
2400	3/8	Sc	2.0	020	NNE 3	
29th 0100	7/8	"	3.0	"	NNE 4	THIN CLOUD
0200	6/8	"	"	"	NExN 4	
0300	7/8	"	"	"	"	
0400	7/8	"	"	"	"	DISTANT LIGHTNING
0500	8/8	Cb	2.5	020°	NExN 8	HEAVY BLACK CLOUD + LIGHTNING OVER SHIP
0600	7/8	Cb	2.5	020°	NxE 4	LIGHTNING + THUNDER CLOSE BUT NOT OVER SHIP
0700	7/8	Sc Cu	2.5	020°	NxE 4	LIGHTNING RECEDING TO N.W.
0800	7/8	Sc Cu	2.5	020°	NNE 5	
0900	5/8	Sc Cu	2.5	020	NNE 5	
1600	8/8	As	2.5	010°	NE 2	HAZY
1700	8/8	As	2.0	010°	Lt. VAR.	VERY HAZY
1800	8/8	As	2.0	010°	—"—	
1900	8/8	As	2.0	010°	VAR 2	LIGHTLY OVERCAST + HAZY
2000	8/8	As	2.0	010°	VAR 2	——"——
2100	8/8	AS	2.0	010	VAR 2	HAZY
2200	8/8	AS	2.0	010	VAR 2	HAZY
2300	8/8	AS	2.0	010	VAR 2.	HAZY
2400	8/8	AS	2.0	010	VAR 2	
30th 0100	7/8	AS (rain)	2.0	" "	NE 2	0130 wind goes from F2 to 8 in 30 sec! from SE.
0200	2/8	Cu	2.0	CONF.	SE 8	
0300	7/8	Sc	2.0	CONF	ENE 4	
0500	8/8	Ac, Sc	2.0	020°	SSW 3	
1800	7/8	Sc, Ac	Confused	Swells	CALM	
2000	7/8	Sc, Ac	1.5	160	Lt. Var.	
2100	7/8	Sc, Ac	1.5	160	LT. VAR	
2200	7/8	Sc, Ac	1.5	160	LT. VAR	
2300	7/8	Sc, Ac	1.5	160	LT. VAR.	
2400	7/8	Sc, Ac	1.5	160	LT. VAR.	
0100	4/8	AS	1.5	CONF	LT AIRS	
0200	"	"	"	"	"	
0300	"	"	"	"	"	
0400	"	"	"	"	NE 2	
0500	6/8	As	1.5	170°	NNW 3	
0600	6/8	As, Sc	2.0	170°	NNW 3	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 01-10-98

SHEET No: 06

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
1/10/98 1600	8/8	Cu, As	2.0	000°	W 3	
1700	8/8	Cu, As	2.0	010°	W 3	
1800	8/8	Cs	2.0	010°	W 3	
1900	8/8	Cu, Sc, Cs	2.0	010°	W 3	
2000	2/8	Cu, Sc	2.0	010	W 2-3	
2100	1/8	Cu, Sc	2.0	010	W 2	
2200	3/8	Cu Sc	2.0	010	W 2	
2300	1/8	Cu	2.0	010	LT VAR	
2400	0/8	—	2.0	0/0	LT VAR	
2/10/98 0100	0/	—	2.0	210/010	NW 2	2 MAIN SWELL
0200	6/8	As/Cs	2.0	010/210	WNW 2	OPPOSED SWELL.
0300	"	"	"	"	"	
0400	2/8	As	"	"	"	
0500	2/8	Cu	2.0	010°	NW 1-2	
0600	3/8	Cu, Sc	2.0	010°	WNW 1-2	
0700	4/8	Cu, Sc,	2.0	010°/220°	LT AIR	
0800	6/8	Cu, Sc, Ac	2.0	010°/220°	LT AIR	
0900	6/8	Cu Sc.	2.0	010/220	LT, DIS	
1000	5/8	Cu, Sc	2.0	010/220	LT DIS	
1200	4/8	Cu, Sc.	2.0	190	LT VAR	
1300	6/8	Cu	2.0	CONF	LT VAR	
1400	7/8	Cu Ac	"	190	VAR 2	
1500	6/8	Cb Ac As	"	190	VAR 2	
1600	"	" "	"	"	"	
1700	7/8	Cb, Cu Sc	2.0	Confused	VAR 2	SHOWERS.
1800	5/8	Cu, As, Cs	2.0	— " —	VAR 2	SHOWERS
1900	4/8	Cu As Cs	2.0	— " —	LT. VAR	SHOWERS IN SIGHT.
2000	4/8	Cu As Cs	2.0	160°	VAR 2	
2100	3/8	Cu As Cs	2.0	160	VAR	
2200	5/8	Cu As Cs	2.0	160	VAR 2	
2300	3/8	As, Cs	20	160	VAR 2	
2400	3/8	Cu, As, Cs	2.0	160	VAR 2	
3/10 0100	2/	Ac	"	190	NW 2	
0200	3/8	Ac				
0300	4/8	Ac, As	"	"	"	
0400	2/8	Ac	"	"	"	
0500	2/8	Cu Ac	2.0	180°	VAR 2	
0600	1/8	Cu Ac	2.0	180°	VAR 2	
0700	3/8	Cu Sc Ac	2.0	180°	LT. AIR	
0800	3/8	Cu Sc Ac Cu	2.0	200	WNW 2	
0900	3/8	Cu Sc Ac	2.0	200	VAR 2	
1200	3/8	Cu Sc.	2.0	190	LT VAR	
1300	4/8	Cu Sc	"	CONF	" "	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 3-10-98

SHEET No: 7

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
1400	4/8	Cu	2.0	CENT	GT ALTS	SHOWERS
1500	4/8	Cu	"	"	"	
1600	5/8	Cu	"	190	"	" " IN DIST
1700	4/8	Cu Ac Ci	2.0	190	SSW 2	
1800	3/8	Cu Ac Ci	2.0	190	" "	
1900	3/8	Cu Ac Ci	2.0	190	S 2	
2000	4/8	Cu Sc Ci	2.0	180	S 2	
2100	4/8	cu Sc ci	2.0	180	S 2.	
2200	4/8	cu Sc ci	2.0	180	S 2.	
2300	2/8	cu Sc	2.0	180	S 2	
2400	3/8	Cu	2.0	180	S 2.	
4TH 0100	3/8	"	"	190	SxE 2	DISTANT SHOWERS
0200	4/8	"	"	"	"	"
0300	2/8	"	"	"	"	"
0400	1/8	"	"	"	SxE 3	
0500	1/8	Cu	2.0	180	S 3	
0600	2/8	Cu Ac	2.0	180	S 3	
0700	3/8	Cu Sc Ac	2.0	180	S 3	
0800	4/8	Cu Sc	2.0	180	SxE 3	
0900	4/8	Cu, Sc	2.0	140	SxE 3	
1000	4/8	Cu Sc	2.0	180	SxE 3	
1100	4/8	Cu Sc	2.0	180	SxE 3	
1200	4/8	Cu. Sc	2.0	180	SxE 3	
1300	4/8	Cu	"	160	SSE 2/3	
1400	3/8	"	"	"	SxE 2/3	
1500	2/8	"	"	"	SSE 2/3	
1600		"	"	"	SSE 2/3	
1700	2/8	Cu	2.0	160	SSE 3	
1800	2/8	Cu	2.0	160	SxE 3	
1900	2/8	Cu	2.0	160	SxE 3	
2000	3/8	Cu	2.0	160	SxE 3	
2100	3/8	Cu	2.0	160	SxE 3	
2200	4/8	Cu, Sc	2.0	160	SxE 3	
2300	5/8	Cu. Sc	2.0	160	SE 3	
2400	7/8	Cu.	2.0	160	SE 4	
0100	6/8	Cu	2.0	180	S 4	DISTANT RAIN
0200	7/8	Cu	2.5	180	S 4	
0300	6/8	Cu Sc	"	"	SxE 4	THW Sc
0400	7/8	Cu Sc	"	"	SxE 4	" "
0500	6/8	Cu Ac	2.0	160	SSE 4	
0600	6/8	Cu Ac	2.0	160	SSE 4	
0700	6/8	Cu Ac	2.0	160	SSE 3-4	
0800	5/8	Cu Ac Sc	2.0	160	SSE 3-4	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 05 - 10 - 98

SHEET No: 8

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0900	5/8	Cu, Sc, Sc.	2.0	160	SSE 3/4	
1100	4/8	Cu, Sc.	2.0	160	SSE 3/4	
1200	3/8	Cu Sc	2.0	160	SSE 4	
1700	4/8	Cu Sc	2.5	160	SE 4	
1800	4/8	Cu Sc Cs	2.5	160	SE 4	
1900	4/8	Cu Sc Cs	2.5	160	SE 4	
2000	4/8	Cu Sc	2.5	160	SE 4	
2100	6/8	Cu Sc	2.5	160	SE 4	
2200	7/8	Cu, Sc	2.5	160	SE 4	
2300	5/8	Cu, Sc	2.5	160	SE 4	
2400	6/8	Cu, Sc, As	2.5	160	SE 4	
6-10 0001	8/8	Cu, As	3.0	170	SE 4	LIGHT RAIN -L
0100	4	" Ac	"	170	"	
0200	4	" "	"	"	"	
0300	4	" "	"	"	"	
0400	7/8	As/Ac	"	"	"	
0500	4/8	Cu Ac	3.0	170	SE 4	
0600	4/8	Cu Sc	3.0	170	SE 4	
0700	5/8	Cu Sc Ac	3.0	170	SE 4	
0800	5/8	Cu Sc Ac	3.0	170	SE 4	
0900	5/8	Cu, Sc Ac	3.0	170	SE 4/5	
1100	4/8	Cu, Sc	3.0	170	SE 4/5	
1200	4/8	Cu, Sc	3.0	170	SE 5	
1300	4/8	" "	"	160	SE 4	
1400	5/8	" "	"	160	SE 4	SHOWERS
1500	5/8	" "	"	160	SE 4	" "
1600	5/8	" "	"	"	"	" " IN DIST.
1700	5/8	Cu Sc Cs	3.0	160	SE 4-5	SHOWERS IN SIGHT
1800	5/8	Cu Sc Cs	3.0	160	SE 4	—" —
1900	6/8	Cu Sc	3.0	160	SE 4	SHOWERS
2000	4/8	Cu Sc	3.0	160	SE 4	SHOWERS IN SIGHT.
(2100)	4/8	Cu, Sc	3.0	160	SE 5/6	
2200	7/8	Cu Sc	3.0	160	ESE 5	PRECIPITATION
2400	8/8	Cu, Sc	3.0	160	ESE 5	
7TH 0100	3/8	Cu, Sc	3.0	160	ESE 5	
0200	4/8	Cu Sc	"	"	" 4/5	
0300	6/8	Sc	"	"	SE 4/5	
0400	4/8	Cu	"	"	"	
0500	4/8	Cu	"	"	SE 4	
0600	1/8	Cu	3.0	160	SExE 5	
0700	5/8	Cu Sc	3.0	160	SExE 5	
0800	4/8	Cu	3.0	160	SExE 5	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 07-10-98

SHEET No: 9

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0900	3/8	Cu Sc	3.0	160	SE×E 5	
1000	3/8	Cu, Sc	3.0	140	ESE 5	
1100	3/8	Cu, Sc	3.0	170	ESE 5	
1200	3/8	Cu, Sc.	3.0	130	ESE 6	
1300	3/8	Cu Sc	3.5	170	ESE 6	
1400	4/8	Cu Sc	3-0	"	ESE 5	Showers
1500	4/8	Ns, Cu	"	120	"	" "
1600.	5/8	Ns, Cu	"	120	"	
1700	4/8	Cu, Sc	"	"	"	
1800	7/8	Cu Sc	3.0	120	ESE 5	Showers in sight.
1900	4/8	Cu Sc	3.0	120	ESE 5	
2000	6/8	Cu Sc	3.0	120	ESE 5	
2100	4/8	Cu Sc	3.0	120	ESE 5	
2200	4/8	Cu Sc	3.0	120	ESE 5	
2300	4/8	Cu, Sc	3.0	120	ESE 5	
2400	3/8	Cu, Sc	3.0	120	ESE 5	
0100	3/8	Cu. Sc	3.0	120	ESE 4/5	
0200	7/8	Sc	"	"	ESE 5	
0300	5/8	Sc Cu	"	"	"	
0400	4/8	Sc Cu	"	"	"	
0500	4/8	Cu	"	"	"	
0600	3/8	Cu Sc	3.0	120	ESE 5	
0700	4/8	Sc Cu	3.0	120	ESE 5	
0800	3/8	Sc Cu	3.0	110	ESE 5	
0900	5/8	Cu, Sc	3.0	110	E 5	
1200	4/8	Cu, Sc	3.0	110	E 5	
1300	3/8	Cu Sc As	3.0	110	E 5	
1400	4/8	Sc Cu	"	080/110	ESE 4	
1500	4/8	" "	"	" "	" "	
1600	4/8	" "	"	" "	" "	
1700	4/8	Cu Sc As	"	" "	E 4	
1800	3/8	Cu Sc As	2.5	110	ESE 5	
1900	3/8	Cu Sc As	2.5	110	ESE 5	
2000	4/8	Cu Sc As	2.5	110	E 5	
2100	3/8	Cu Sc As	2.5	110	E 4	
2200	5/8	Cu Sc As	2.5	110	E 4	
2300	3/8	Cu, Sc,	2.5	110	E 3	
2400	3/8	Cu Sc.	2.5	110	E 3	
0200	3/8	Cu	"	080	E 4	
0300	2/8	Cu	"	080	"	
0400	2/8	Cu	"	070	"	Showers in Dist
0500	2/8	Cu	"	070	E 4	
0600	3/8	Cu	2.5	090	E 4	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 09-10-98

SHEET No: 10

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
10-98 0700	3/8	Cu	2.5m	100	E 4	
0800	3/8	Cu	2.5m	090	E 4	
0900	3/8	Cu	2.5m	090	E 4	
1000	3/8	Cu	2.5	090	E 5	
1100	3/8	Cu	2.5	090	E 4	
1200	3/8	Cu	2.5	090	E 4	
1300	3/8	Cu	2.5	090	E 4	
1400	4/8	Cu, Sc	2.5	070	E×N 3/4	
1500	5/8	" "	"	"	"	
1600	4/8	" "	"	"	"	
1700	"	" "	"	"	"	
1800	4/8	Cu Sc Ac	2.5	070°	E×N 4	
1900	4/8	Cu Sc	2.0	070°	E 4	
2000	4/8	Cu Sc	2.0	070	E 4	
2100	4/8	Cu Sc	2.0	070°	E 4	
2200	4/8	Cu Sc	2.0	090	E 4	
2300	4/8	Cu Sc	2.0	070	E 4	
2400	4/8	—	2.0	070	E 4	
10/10 0300	4/8	Cu	"	"	NE 3	2nd Conf. swell, v low
0400	5/8	"	"	"	"	"
0500	4/8	"	"	"	"	"
0600	4/8	"	"	"	"	"
0700	2/8	Cu	2.0	080	NE 3/4	
0800	3/8	Cu	2.0	070	NE 4	
0900	3/8	Cu Ac	2.0	070	NE 4	
1000	3/8	Cu	2.0	080	NE 4	
1100	3/8	Cu	2.0	040	NE 4	
1200	2/8	Cu	2.0	040	NE 4	
1300	4/8	Cu	2.0	040	NE 4	
1400	3/8	Cu	2.0	040	NE 4	
1500	5/8	Cu Ac As	2.5	040/340	N×E 4	2 swells
1600	7/8	"			"	"
1700	7/8				"	"
1800	8/8	Ns, Sc	"	" "		Showers
1900	8/8	Cb	2.0	040/340	S×E 5	—" —
2000	7/8	Sc	2.0	040/340	S×E 4	
2100	7/8	Cu Sc	2.0	040/340	S×E 4	
2200	7/8	Cu Sc	2.0	040/340	S×E 4	
2300	4/8	Cu, Ac	2.0	040/340	S×E 4	
2400	3/8	Cu, Sc	2.0	040/340	S×E 4	
0100	2/8	Cu, Sc	2.0	040/340	S×E 4	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 14/10/98

SHEET No: 11

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0200	1/8	Cu	4.0	240	SSW 4	
0400	1/8	Cu	"	"	"	
0600	2/8	Cu	3.5	"	"	
0800	1/8	"	"	"	SWxS 4	
0700	1/8	Cu	4.0	230	WNW 2	
0800	1/8	Cu	4.0	230	WNW 2	
0900	1/8	Cu	3.5	230	WNW 2	
1000	1/8	Sc Cu	3.5	230	WNW 2	
1100	1/8	Cu, Sc	3.5	230	WNW 2	
1200	3/8	Ac Cu	3.5	230	NW 3	
1300	1/8	AC, Cu	3.5	230	WNW 3	
1400	1/8	AC, Cu	3.5	230	WNW 3	
1500	"	Ac	4.0	200	WNW 3	CONF 2nd Swell.
1600	"	"	"	190	NNW 3	" "
1700	"	"	"	190	"	" "
1800	"	"	"	"	"	" "
1900	3/8	Sc Ac	3.5	190	NNW 3	
2000	3/8	Sc Ac As	3.5	190	NNW 3	
2100	4/8	Sc As Ds	3.5	190	NNW 3	
2200	6/8	AC, Sc	3.5	190	NW 3	
0100	4/8	AC, Sc	3.5	190	NW 3	
0200	4/8	AC, Sc.	3.5	190	NW 3	
0300	8/8	Sc	3.0	"		
0400	7/8	"	"	"		
0500	"	"	2.5	"	NNE 3	LT DRIZZLE
0600	"	"	2.0	"	NE 3	" "
0700	8/8	Sc	2.5	180	NNE 2	LT. DRIZZLE
0800	8/8	Sc	2.5	180	VAR 2	LT. DRIZZLE
0900	8/8	Sc	2.5	180	VAR 2	DRIZZLE
1000	8/8	Sc	2.5	180	SE 2	DRIZZLE
1100	8/8	Sc	2.5	180	SE 2	PRECIP.
1200	8/8	Cu	2.5	180	S 3	
1400	8/8	Cu	2.5	180	S 3	
1500	4/8	As Ac Ci	2.0	"	S 3	
1600	3/8	" "	"	"	"	
1700	"	" "	"	170	"	
1800	4/8	Cu, Ac	2.0	"	SSE 3	
1900	6/8	Cu Ac	2.0	180	SSW 3	
2000	5/8	Cu Sc	2.0	180	SSW 3	
2100	4/8	Cu	2.0	180	SSW 3	
2200	4/8	Cu	2.0	180	SW 3	
2300	2/8	Cu	2.0	180	SSW 3	
0100	2/8	Cu	2.0	180	SSW 3	

12TH

15TH

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 13/10/98

SHEET No: 12

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0200	2/8	Cu	~~1.0~~ 2.0	180	SSW 3	
0300	7/8	Sc	"	200	"	Showers / drizzle
0400	7/8	Sc	"	"	SSW 4	" "
0500	5/8	Sc Cu	"	"	" 3	" "
0600	4/8	Sc. Cu	"	"	" "	———
0700	8/8	Sc	2-0	190	SSE 3	
0800	8/8	Sc	2-0	190	SE 3	
0900	8/8	Sc	2.0	190	SSW 2	
1000	7/8	Sc	2.0	190	"	
1100	5/8	Cu	2.0	180	S 3	
1200	5/8	Cu	2.0	180	S 3	
1400	3/8	Cu	2.0	190	VSW 2	
1500	5/8	Cu Ac	1.5	200	SW 3	Drizzle Showers
1600	4/8	Cu	" "	"	SSW 3	" "
1700	2/8	Cu	1.5	"	SSW 3	
1800	4/8	Cu	"	"	"	
1900	3/8	Cu	1.5	200	S 3	
2000	3/8	Cu	1.5	200	S 3	
2100	3/8	Cu	1.5	200	SxE 3	
2200	4/8	Cu	1.5	200	SSE 3	
2300	6/8	Cu	1.5	200	SSE 3	
0000	7/8	Cu, Sc	1.5	200	SSE 3	
0100	3/8	Cu Sc	1.5	200	S 3	
0200	2/8	Cu, Sc	1.5	200	S 3	
0300	3/8	Cu, Sc	"	"	"	
0400	4/8	"	"	"	SSE 2	
0500	4/8	"	"	"	"	
0600	3/8	"	"	"	"	
0700	6/8	Cu Sc	1.5	200	SSE 2	
0800	8/8	Cu Sc	1.5	200	SSE 3	
0900	6/8	Cu Ac Cc	1.5	200	SSE 3	
1000	6/8	Cu Sc Ac Cc	1.5	200	SxE 3-4	
1500	3/8	Cu	2.5	200	SSE 2	Swell Conf. swell.
1600	5/8	"	"	"		" "
1700	6/8	"	"	"	"	
1800	4/8	"	"	"	"	
1900	1/8	Cu	2.0	200	SxE 3	
2000	2/8	Cu	2-0	210	SxE 3	
2100	2/8	Cu	2.0	210	SxE 2	
2200	1/8	Cu	2-0	200	S 2	
2300	1/8	Cu	2.0	200	S 2	
2400	1/8	Cu	2.0	200	S	

14:14

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 15/10/98

SHEET No: 13

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0100	1/8	Cu, Sc	2.0	200	E 2	
0200	1/8	Cu, Sc	2.0	200	E 2	
0300	Nil	—	"	"	NE&E 2	
0400	"	—	"	"	NNE 2	
0500	"	—	"	"	NNE 2	
0600	"	—	"	"	" 3	
0700	1/8	Cu	2.0	200	NNW 3	
0800	2/8	Cu Sc	2.5	200	NNW 3	
1000	2/8	Cu, Sc	2.5	200	NNW 3	
1100	2/8	Cu Sc	2.5	200	NNW 4	
1200	2/8	Cu, Sc	2.5	200	NNW 4	
1300	4/8	Cu, Sc	2.5	200	NNW 4	
1400	4/8	Cu, Sc	2.5	200	NNW 4	
[illegible]	5/8	As	2.0	290	NW 3	2nd Cont [illegible]
[illegible]	"	"	"	"	WNW 3	" " "
1700	8/8	"	"	"	"	" " "
1800	7/8	"	"	"	"	" " "
1900	7/8	As	2.0	290	WNW 3	
2000	7/8	As	2.0	290	WNW 3-4	
2100	7/8	As	"	"	WNW 3	
2200	3/8	As	2.0	290	WNW 3	
2400	2/8	As	2.0	290	NNW 3	
16/10/98 — 0100	2/8	As	2.0	290	NNW 3	
0200	2/8	As	2.0	290	NNW 3	
[illegible]	7/8	[illegible]	"	[illegible]	[illegible]	
[illegible]	[illegible]	"	"	"	"	
[illegible]	[illegible]	"	"	"	"	
[illegible]	[illegible]	"	"	"	NW 6	
[illegible]	"	"	"	"	"	
0800	7/8	Sc	2.0	310	WNW 5	
0900	7/8	Sc	2.0	310	WSW 4	
1000	8/8	Sc	2.0	310	WSW 4	
1500	6/8	Sc	2.0	310	SSW 5	
1600	3/8	Ac As		160	S 5	
1700	3/8	" "	2.0	160	S 5	
2000	1/8	Sc As	2.5	180	SxE 6	
2100	1/8	Sc As	2.5	180	S 6	
2200	1/8	Sc Fr	2.5	180	SxE 6	
2300	1/8	Sc As	2.5	170	SSE 5-4	
2400	1/8	Sc As	2.5	170	SSE 3	
0100	1/8	Sc As	2.5	170	SSE 3	
0200	1/8	Sc As	2.5	170	SSE 3	
0300	1/8	Sc As	2.5	170	SSE 3	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE:

SHEET No:

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
0600	NIL	—	1·5	170	SxE 4	
0700	"	—	"	"	"	
0800	"	—	"	"	SE 3	
0900	"	—	"	"	SE 3	
0200	NIL	—	1·0	140	SE 3	
0900	1/8	Sc	1·0	140	SExE 3	
1000	2/8	Sc Ac	1·0	140	ESE 3	
1100						

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 20-10-98

SHEET No: 1

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
2100	7/8	Sc Ac Ci	0.5	W	Wly 3	
2200	6/8	Sc Ac Ci	0.5	W	W 3	
2300	6/8	Sc	0.5	W	SSW 2-3	
2400	4/8	Sc.	0.5	W	SSW 2	
0100	4/8	Sc	0.5	W	SSW 2	
0200	4/8	Sc	0.5	270	SSW 2	
0300	2/8	Sc	0.5	270	SSW 2	
0400	Nil	—	CALM	TEL:	W 2	LT HAZE
0500	Nil	—	"	"	W 2	" "
0600	Nil	—	2.0	160	WxN 2	" "
0700	"	"	"	"	"	" "
0800	Nil	—	2-0	120/020	WNW 2-3	
0900	1/8	Sc	2-0	020/100	WNW 2-3	
1000	1/8	Sc	2.0	020/120	WNW 2	
1100	1/8	Sc	2-0	020/120	WNW 2	
1200	1/8	Sc	2.0	020/120	WNW 2	
1300	1/8	Sc	2.0	020/120	WNW 2	
1400	1/8	Ac	2.0	020/120	WNW 2	
1500	Nil	—	2.0	CONF	LT AIRS	HAZE
1600	"	"	"	"	"	"
1800	"	"	"	"	"	"
1900	"	"	"	"	ENE 2	"
2000	6/8	Ac Cs	2.0	140°/—	NNE 2-3	
2100	7/8	Ac Cs	2.0	140°/—	NNE 2-3	
2200	6/8	Sc Ac Cs	2.0	Confused	NNE 3	
2300	5/8	Sc Cs	2.0	—"—	NNE 3	
2400	3/8	Sc Cs	2.0	Confused	NNE 3	
0100	3/8	Sc As	2.0	"	N 3	
0200	3/8	Sc Cs	2.0	"	N 3	
0300	4/8	Sc Cu	2.0	Confused	N 3	
0400	1/8	As	1.5	020	N 3	HAZE
0500	Nil	—	1.5	020	NxE 3	"
0600	"	—	1.5	020	"	"
0700	1/8	As or Sc	"	"	"	"
0800	8/8	As Sc	2.0	020	NxE 3-4	Hazy.
0900	8/8	As Sc	2.0	020	NxE 4	
1000	8/8	As Sc	2-0	020	N 5-6	
1900	8/8	Sc	2.5	000	NNE 6	Mist / Drizzle
2000	8/8	St	2.5	340	NxW 6	—"—
2100	8/8	St	2.5	340	NxW 6	—"—
2200	8/8	St	3.0	340	NxW 6	—"—

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 22-10-98

SHEET No: 2

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
2300	8/8	Ns	3.0	340	NNW 6/7	DRIZZLE
2400	8/8	Ns	3.0	340	NNW 7	
23/10 0100	8/8	Ns, Cu	3.0	340	NNW 7	
0200	8/8	Ns, Cu	3.0	340	NNW 7	RAIN.
0300	8/8	Ns Cu	3.0	340	NW 7	RAIN. LIGHTNING
0400	8/8	Sc, Sc	"	"	SW 7	SHOWERS
0500	"	" "	"	"	" "	
0600	4/8	Sc	"	cont	" "	
0700	1/8	Cu	"	cont/200	" "	
0800	7/8	Sc	3.0	200°	SW 7	
1200	4/8	Cu, Sc.	3.0	220	W 8	
1300	4/8	Cu, Sc	3.0	220	W 7/8	
1500	4/8	Cu, Sc	3.0	220	WSW 8	
1500	4/8	Cu, Sc	3.0	220	WSW 8	
1600	5/8	Ns, Sc, As	4.0	230	"	
1700	8/8	" " "	"	"	"	
2000	7/8	Sc As	5.0	240	WSW 8	RAIN
2100	7/8	Sc As Ns	5.0	190/240	SWxS 8	RAIN
2400	4/8	Cu, Ns, Sc	5.0	210	SWxS 7	
24/10 0100	5/8	Cu, Sc.	5.0	210	SW 7	
0200	5/8	Cu, Sc	5.0	210	SW 7	
0300						
0400	5/8	Cu Sc	8.0	240	WSW 8	
0500	4/8	" "	"	240	"	
0600	5/8	" "	"	"	"	
0700	4/8	" "	"	"	"	
0800	7/8	Sc	6.0	240	W 7-8	
0900	7/8	Cu Sc	6.0	240°	WNW 7-8	
2 1200	7/8	Cu, Sc	6.0	240	WNW 7	
1300	7/8	Cu Sc	6.0	240	WNW 7	
1400	7/8	Cu, Sc	6.0	250	WNW 7	
1500	4/8	Cu, Sc	6.0	260	WNW 7	
1600	8/8	As, Sc,	6.0	340/240	WNW 7	
1700	"	"	"	" "	" "	
1800	"	"	"	" "	" "	
1900	"	As	"	" "	" "	CLT - MIST
2000	8/8	St As	6.0	340/240	NW 7	HAZE OR HORIZON MIST.
2100	8/8	St As	6.5	340/240	NW 7	—
2200	8/8	As	6.5	340/240	NNW 7	
2300	8/8	Ns St	6.5	340/240	NW 7	
2400	7/8	Ns St	6.5	340/240	NW 7	

AMT-7/ROSSA 1998 Hourly Bridge Met. log

DATE: 25/10/98

SHEET No: 3

Time (GMT)	Cloud cover (8ths)	Cloud type	Swell height (m)	Swell direction (degT)	Beufort force	Comments
25TH 0100	7/8	As, Sc	5.0/3.0 ↔	6.5	WNW 7	
0200	7/8	As Sc	5.0	340/345	WNW 7	
0300						
0400	3/8	Cu Sc	5.0	340	NW 5	
0500	"	" "	"	"	NWxN 5	
0600	3/8	" "	"	"	" "	
0700	"	Cu	"	"	NNW 4/5	
0800	6/8	Ac Cc Sc	4.5	340	NxW 5-6	
0900	7/8	Sc As Ci	4.5	340	NNW 5	
1000	8/8	Sc As Ci	4.0	340	NNW 5	
1100	8/8	As Ci	3.5	340	NNW 5	
1200	6/8	Ci St As	3.5	340	NNW 5	
1300	6/8	Ci St As	3.5	340	NNW 5	
1400	6/8	Ci As	3.5	340	NNW 5	
1500	5/8	Ci Sc As	3.5	340	NNW 5	

8.0 Appendix C

Calibration certificates and data relevant to ROSSA sensors on AMT-7. Data are shown for the IOS Psychrometer and SOAP. Re calibration of the SOAP sensor is show as a plot.

Southampton Oceanography Centre

Ocean Technology Division

Gwyn Griffiths
Head of Division

University of Southampton
Empress Dock
Southampton
SO14 3ZH
United Kingdom

Telephone +44 (0)1703 59
Fax +44 (0)1703 596149

Calibration Certificate
Psychrometer io2002

Date Produced : 09-04-1998

Cal tw28297A

C 0 -10.30403
C 1 3.902904E-02
C 2 1.227016E-06
C 3 2.747183E-10

Cal tw17598A

C 0 -9.953542
C 1 3.777681E-02
C 2 2.677249E-06
C 3 -2.718097E-10

Freq	Temp A	Temp B	Diff
50	-8.3495	-8.0580	-0.2914
150	-4.4211	-4.2277	-0.1934
250	-0.4658	-0.3463	-0.1195
350	3.5182	3.5846	-0.0664
450	7.5325	7.5634	-0.0309
550	11.5788	11.5883	-0.0095
650	15.6587	15.6579	0.0008
750	19.7738	19.7703	0.0035
850	23.9259	23.9241	0.0018
950	28.1165	28.1176	-0.0011

Mean = -7.062795E-02

Professor John Shepherd
Director, SOC

Natural Environment Research Council

University of Southampton

Southampton Oceanography Centre

Ocean Technology Division

Gwyn Griffiths
Head of Division

University of Southampton
Empress Dock
Southampton
SO14 3ZH
United Kingdom

Telephone +44 (0)1703 59
Fax +44 (0)1703 596149

Calibration Certificate
Psychrometer io2002

Date Produced : 09-04-1998

Cal td28297A

C	0	-10.46192
C	1	3.868983E-02
C	2	1.52812E-06
C	3	1.898753E-10

Cal td17598A

C	0	-10.1651
C	1	3.765883E-02
C	2	2.719187E-06
C	3	-2.794081E-10

Freq	Temp A	Temp B	Diff
50	-8.5236	-8.2754	-0.2482
150	-4.6234	-4.4560	-0.1674
250	-0.6910	-0.5848	-0.1062
350	3.2749	3.3366	-0.0618
450	7.2752	7.3065	-0.0313
550	11.3113	11.3233	-0.0120
650	15.3842	15.3853	-0.0010
750	19.4951	19.4907	0.0044
850	23.6451	23.6379	0.0072
950	27.8353	27.8253	0.0100

Mean = -6.061561E-02

Professor John Shepherd
Director, SOC

Natural Environment Research Council

University of Southampton

Southampton Oceanography Centre

Ocean Technology Division

Gwyn Griffiths
Head of Division

University of Southampton
Empress Dock
Southampton
SO14 3ZH
United Kingdom

Telephone +44 (0)1703 59
Fax +44 (0)1703 596149

Calibration Certificate
SST pd0009

Date Produced : 09-04-1998

Cal sp22397A

C 0 64.68826
C 1 -.1046675
C 2 1.20051E-04
C 3 -9.036646E-08

Cal sp17598A

C 0 64.47183
C 1 -.1037935
C 2 1.188501E-04
C 3 -8.97902E-08

Freq	Temp A	Temp B	Diff
50	59.7437	59.5681	0.1757
150	51.3843	51.2739	0.1104
250	44.6126	44.5486	0.0640
350	38.8864	38.8535	0.0330
450	33.6636	33.6498	0.0138
550	28.4019	28.3987	0.0031
650	22.5591	22.5616	-0.0025
750	15.5930	15.5997	-0.0067
850	6.9615	6.9742	-0.0127
950	-3.8777	-3.8536	-0.0241

Mean = 3.540402E-02

Professor John Shepherd
Director, SOC

Natural Environment Research Council

University of Southampton

Southampton Oceanography Centre

Ocean Technology Division

Gwyn Griffiths
Head of Division

University of Southampton
Empress Dock
Southampton
SO14 3ZH
United Kingdom

Telephone +44 (0)1703 59
Fax +44 (0)1703 596149

Calibration Certificate
SST pd0010

Date Produced : 09-04-1998

Cal sp22497A

C 0 63.71049
C 1 -.1012721
C 2 1.144473E-04
C 3 -8.759114E-08

Cal sp17698A

C 0 63.9836
C 1 -.1026365
C 2 1.164703E-04
C 3 -8.864582E-08

Freq	Temp A	Temp B	Diff
50	58.9221	59.1319	-0.2098
150	50.7991	50.9095	-0.1104
250	44.1768	44.2188	-0.0420
350	38.5296	38.5277	0.0018
450	33.3319	33.3046	0.0273
550	28.0582	28.0173	0.0408
650	22.1829	22.1342	0.0487
750	15.1805	15.1233	0.0572
850	6.5255	6.4527	0.0727
950	-4.3078	-4.4094	0.1016

Mean = -1.196098E-03

Professor John Shepherd
Director, SOC

Natural Environment Research Council

University of Southampton

Calibration Certificate
SST pd0009

Date Produced : 06-25-1998

Cal sp22397A

C 0 64.68826
C 1 -.1046675
C 2 1.20051E-04
C 3 -9.036646E-08

Cal sp17598A

C 0 64.47183
C 1 -.1037985
C 2 1.188501E-04
C 3 -8.97902E-08

Freq	Temp A	Temp B	Diff
350	38.8864	38.8535	0.0330
400	36.2460	36.2239	0.0221
450	33.6636	33.6498	0.0138
500	31.0715	31.0638	0.0076
550	28.4019	28.3987	0.0031
600	25.5870	25.5871	-0.0001
650	22.5591	22.5616	-0.0025
700	19.2503	19.2549	-0.0046
750	15.5930	15.5997	-0.0067
800	11.5193	11.5285	-0.0092

Mean = 5.662156E-03

Calibration Certificate
SST pd0010

Date Produced : 06-26-1998

Cal sp22497A

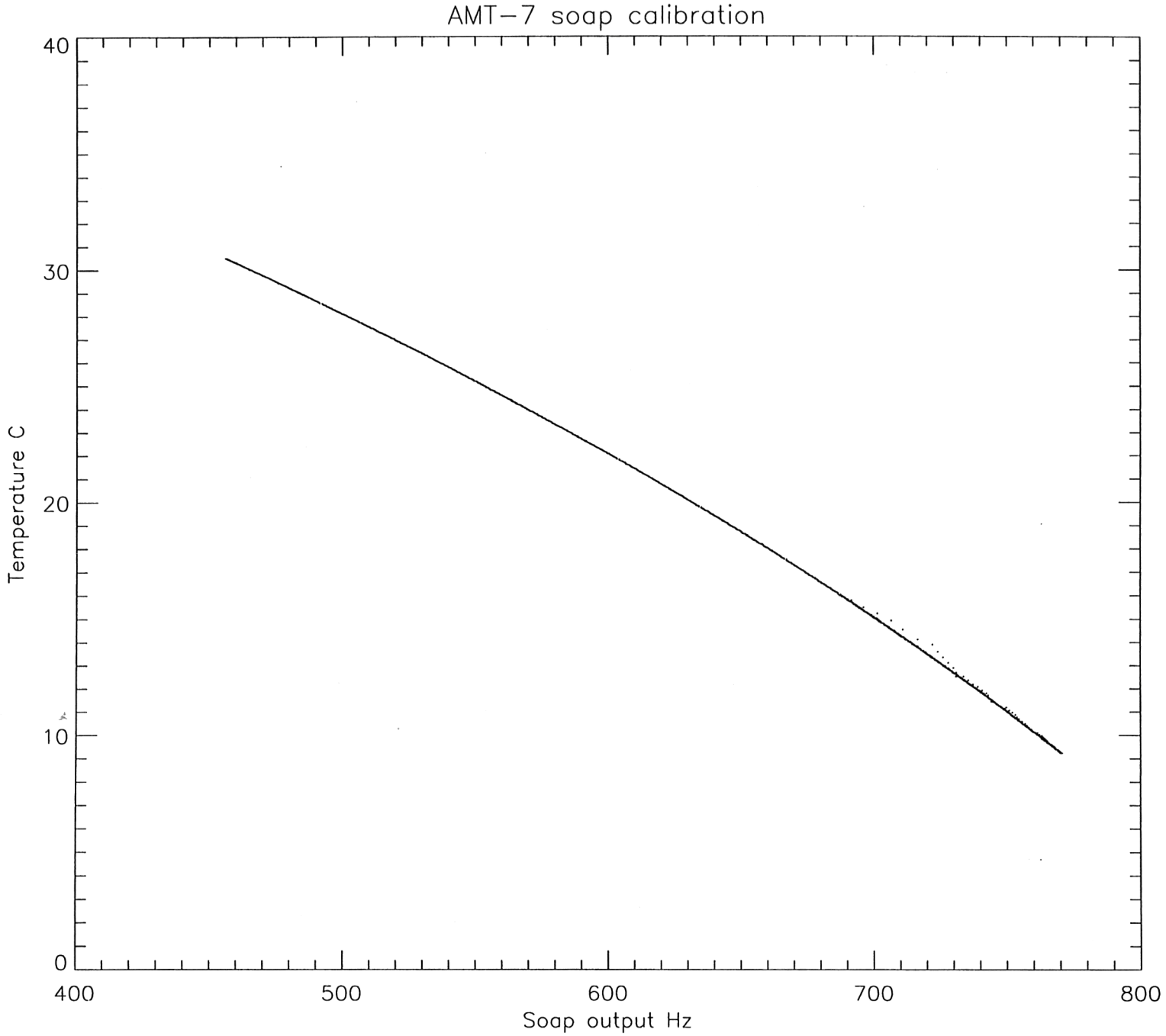
C 0 63.71049
C 1 -.1012721
C 2 1.144473E-04
C 3 -8.759114E-08

Cal sp17698A

C 0 63.9836
C 1 -.1026365
C 2 1.164703E-04
C 3 -8.864582E-08

Freq	Temp A	Temp B	Diff
450	33.3319	33.3046	0.0273
500	30.7374	30.7022	0.0352
550	28.0582	28.0173	0.0408
600	25.2286	25.1835	0.0451
650	22.1829	22.1342	0.0487
700	18.8554	18.8030	0.0525
750	15.1805	15.1233	0.0572
800	11.0924	11.0287	0.0637
850	6.5255	6.4527	0.0727
900	1.4140	1.3288	0.0851

Mean = .0528328


AMT−7 soap calibration
40
30
20
10
0
Temperature C
400
500
600
700
800
Soap output Hz

9.0 ROSSA Personel

C. J. Donlon, (ROSSA PI, leg 1)
Space Applications Institute,
Marine Environment Unit,
Joint Research Centre,
Ispra,
Italy.
e-mail: craig.donlon@jrc.it

T. Nightingale (ROSSA PI, leg 2)
Rutherford Appleton Laboratory,
Oxford,
England.
e-mail: t.j.nightingale@rl.ac.uk

I. S. Robinson,
Southampton Oceanography Centre,
University of Southampton,
Southampton,
England.
e-mail:isr@soc.soton.ac.uk

W. J. Emery,
Colorado Center for Astrodynamics Research
University of Colorado
Boulder,
CO, 80309,
USA
e-mail:emery@frodo.colorado.edu

W. Eifler,
Space Applications Institute,
Marine Environment Unit,
Joint Research Centre,
Ispra,
Italy.
e-mail: walter.eifler@jrc.it

List of Figures

European Cmmision
EUR 19008 EN **- Atlantic Meridional Transect (AMT) 7/ Radiometric Observations of the Sea Surface and Atmosphere (ROSSA) September – October 1998 Cruise report and data inventory.**

Craig Donlon

1999 – 108 pp – 21.0 x 29.7

A series of atmospheric and oceanic measurements along a transect from the UK to the Falkland Islands has been made using the UK Royal Research Ship *James Clark Ross* (JCR) on her southerly passage from the UK to the Falkland islands made during the period 13th September - 16th October 1998.

This report is describes the instrumentation used, the data that was collected and the scientific running logs that were taken during the Joint Atlantic Meridional Transect and Radiometric Observations of the Sea Surface and Atmosphere (AMT-7/ROSSA1998) during September – October 1998. The experiment was undertaken as a collaboratative effort involving contributions from the Colorado Center for Astrodynamics Research (CCAR, USA), the Rutherford Appleton Laboratory (RAL, UK), Southampton Oceanography Center (SOC, UK) and the European Joint Research Centre (JRC, Italy).