Scripps Institution of Oceanography
- **Marine Instrument Calibration "You Know it Makes Sense"** - Mr. Paul Ridout, Ocean Scientific International Ltd.
- **Insitu Pressure Calibration** - Mr. Sven Ober, Netherlands Institute For Sea Research

14:30 INMARTECH '98 - WRAP-UP SESSION

Adjourn Shuttle Buses return to Hotels

18:30 Mexican Dinner at SIO Campus *

❖INMARTECH '98 ABSTRACTS❖

Tuesday 20 October 1998
Wednesday 21 October 1998
Thursday 22 October 1998

Tuesday 20, October, 1998

Tuesday
10:00 Technical Workshop

UNDERWAY SAMPLING SYSTEMS

Sumner Auditorium

Mr. Anthony F. Amos (University of Texas), Chair

❖ ***An Interactive Shipboard Scientific Log For Research Vessels*** - Mr. Anthony F. Amos, The University of Texas Marine Science Institute

Daily logs have been kept on sea-going vessels of all types for centuries. In the relatively short history of the purely research vessel, the idea that data of a more scientific nature be logged started in the notebooks of the "naturalists" and now continue in the data banks of shipboard computers. The author has devised a scientific log that incorporates some of the needs of a ship's log with that required by the onboard scientists. A few decades ago, all members of the scientific and technical crew were required to stand a daily watch to oversee the equipment such as precision depth recorders, magnetometers, etc. This practice has largely disappeared on research vessels that are often engaged in multidisciplinary programs where different expertise is required in each discipline's specialized equipment. Underway environmental data is recorded along with positional data at a rapid rate on modern vessels, making the production of a log from these data impractical. This software system runs continuously, acquiring and displaying underway data, as usual, but allowing the input of information on cruise events such as station numbers, equipment calibrations, special observations, and comments that are appended to the data line. It also automatically calculates sunrise, sunset, and Local Apparent Noon and records those at the instant of their calculated occurrence. It also displays information on time and distance to the next station. At the end of each day, a summary log of the day's events, mean and extreme environmental conditions, and station positions is produced as well as a graphical representation of conditions and a daily cruise track. The log can be provided to the scientific party in hard-copy form or electronically. The system is semi-automatic, but still requires a watch-stander and the cooperation of parties on board in entering the data pertinent to their operations. On our cruises, the CTD watch usually oversees the underway system.

❖***IMET - Improved METeorology - Instrumentation*** - Mr. David Hosom, Upper Ocean Processes Group, Woods Hole Oceanographic Institution

The ocean is critical to inter-decadal climate variability because of its ability to store and transport heat and fresh water and release them to the atmosphere through sensible and latent heat fluxes. Knowledge of various properties at the sea surface is essential to monitoring, understanding, and developing the ability to predict climate change. Vertical exchange across the air-sea interface of horizontal momentum and of buoyancy couples the ocean and atmosphere. The sea surface is the interface through which heat, fresh water, momentum, gases, and other quantities are exchanged. It is the bottom boundary of the atmosphere over approximately 70% of the earth's surface and the top surface of the very large oceanic reservoirs of heat and other properties. Observing this coupling is a fundamental need if we are to both understand ocean variability and its interrelation to climate. This requires the observation of surface wind velocity, humidity, air temperature, sea temperature, barometric pressure, incoming shortwave radiation, incoming longwave radiation and precipitation.

In planning for WOCE (World Ocean Circulation Experiment) it was recognized that moored buoys and ships would provide especially attractive platforms from which to make accurate in-situ measurements of the basic surface meteorological observable parameters required to investigate the air-sea fluxes of momentum, heat, and mass. Accuracy's of 10 Watts per meter squared were sought in estimates of the mean values (averaged over monthly and longer time scales) of each of the four components of the total heat flux (sensible, latent, shortwave, and longwave). Accuracy's of approximately 1 mm per day were sought in evaporation and precipitation.

Woods Hole Oceanographic Institution (WHOI) was funded to evaluate and choose sensors capable of meeting the WOCE goals and to develop the IMET system as a flexible data collection system. Each sensor was incorporated into a module with built-in intelligence that responds to polled commands from the central computer and data recording unit. Each module interfaces to an ADDB (addressable digital data bus) consisting of +12vdc power and RS485 serial ports. A key component of IMET accuracy is that the calibration constants are stored in the module so that the serial digital output is in calibrated units. The calibration constants from each unit are polled and stored on the data file with the data from a specific time period. Modules having non-linear algorithms will output both calibrated and raw data to permit later corrections.

IMET systems are now in use on eight UNOLS ships, six WHOI buoys, one USF (University of Southern Florida) buoy, one NOAA ship and the Rutgers University Field Station. These systems have proven themselves over the last eight years and now provide the baseline for climate quality data. This paper will discuss IMET, data accuracy and Volunteer Observing Ships (VOS) climate data acquisition.

❖***Data - Sensor Calibrations and Data Quality Analysis*** - Mr. R. Williams, Scripps Institution of Oceanography

❖ ***Underway Data Collection System on Board RV PELAGIA; Considerations and Design of a New System*** - Mr. J. Derksen, Netherlands Institute For Sea Research

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Tuesday
13:00 Technical Workshops

GEOPHYSICAL TECHNOLOGIES

Hubbs Hall

Mr. Paul Henkart (Scripps Institution of Oceanography), Chair

❖***Seismic Sources in the UNOLS Fleet*** - Dr. John Diebold, Lamont-Doherty Earth Observatory of Columbia University

Ever since seismic refraction and reflection profiles were first acquired (in the 1930s and 50s, respectively) active seismic techniques have played an important role in marine geophysical data acquisition by the US fleet. Since their invention in the 1960s, airguns have supplanted the original explosive sources, first in reflection work, and more recently, in refraction profiling. Airguns require a significant initial investment ($30 - $40K ea) and expensive compressors are needed as well. However, they are cost-effective in the long run, are more efficient, and much safer. For example, a single shot by EWING's full 8,500 cu. in. 20-gun array provides as much energy in the seismic band as a single 2,000 LB TNT charge. Considering that explosives typically cost between $1 and $2 per pound, and that the airguns can be fired every 20-seconds for an entire 40-day leg, it is difficult to justify using explosives at all, except in cases where very large or deep shots are required.

Taken as a class of tools, airguns are very flexible, in that they can be applied to a broad range of seismic problems. Of the three types of airgun generally available, however, each is somewhat more limited in its range of applications. The 20 Bolt airguns in the EWING's array, for example can be configured to produce a good source for large-scale refraction work (with offsets well in excess of 100 km), deep penetration multichannel reflection profiles, and medium resolution reflection profiles, but they are not appropriate for high resolution work. Two other types of airgun; the sleeve gun (Western Geophysical/Haliburton) and the "GI" gun (Seismic Systems, Inc.) are better suited for the shallow towing necessary to obtain the bandwidth needed for high temporal resolution. The GI gun, in particular, is well suited for use on small and medium-sized vessels, and those with limited compressor capacity, since a single GI gun, with its ability to cancel bubble reverberation, creates a "tuned" signature, which requires an array of sleeve guns. We discuss these, and other tradeoffs that ship operators should be aware of when planning or proposing seismic work for the academic community.

❖ ***Sound Receivers*** - Dr. Graham Kent, Scripps Institution of Oceanography

❖ ***Chirp Sonar Design for In-Hull Applications*** - Dr. Lester R. LeBlanc (Presenter), Professor of Ocean Engineering & Dr. Steven G. Schock, Associate Professor of Ocean Engineering, Florida Atlantic University, Department of Ocean Engineering

The Chirp Sonar is a linear FM sonar that was developed to support the objectives of remote acoustic classification of seafloor sediments. It is a calibrated wideband digital frequency modulated sonar that provides quantitative high-resolution low noise images. It can be operated, either using a tow-vehicle, or using an in-hull mount. Since the Chirp Sonar system can precisely transmit a specified waveform with wide bandwidth, and its digital receiver is calibrated, the data can be processed to estimate the acoustic impulse response of the seafloor sediment, and sediment attenuation. The processed chirp pulse is designed to provide low temporal sidelobes and nearly constant resolution with depth. Because the system is wideband, the resulting beampattern has nearly no sidelobes. All of these factors combine to make the Chirp Sonar an outstanding tool for sea floor exploration.

❖ ***An Overview of Swath Bathymetry*** - Dr. Dale Chayes, Lamont-Doherty Earth Observatory

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Tuesday
13:00

ROV AND TOWED VEHICLES

Sumner Auditorium
Mr. Marc Willis (Oregon State University), Chair

❖***A Typical Cruise with the ROV Jason*** - Mr. Robert Elder, Woods Hole Oceanographic Institution

A description of the unmanned vehicles operated as part of the U.S. Deep Submergence Facility will be given. A typical deployment of the ROV Jason will be presented with particular attention to support vessel requirements. A launch and recovery sequence along with operating methods will be discussed. The presentation will also include a look at some of the data products that can be generated with an ROV such as Jason.

❖***Recent MPL Deep Tow Group Seagoing Work*** - Dr. Fred Spiess/Dr. John Hildebrand/Dr. Christian de Moustier, Scripps Institution of Oceanography

The MPL Deep Tow Group operates several vehicles, two of which have been used in major NSF-funded operations in 1998. The first operation of the year (January and February) was the Ocean Seismic Network Pilot Experiment (OSNPE - Ralph Stephen of WHOI, Chief Scientist) in which the JOI/MPL wireline reentry Control Vehicle (CV) was the primary work platform. This load-carrying ROV was used to make four entries, including seismometer downhole installation, in ODP hole 843 in 4.4 km of water about 100 miles south of Oahu. The CV was also used in the placement and installation documentation for seismometers placed on or in the sea floor in the same experiment. The site was revisited in June and the CV used to retrieve all three seismometers and their data recording packages.

The second operation was a 45 day expedition (May - June) utilizing Deep Tow Fish 6 to carry out an extensive near bottom magnetometer and sidelooking sonar survey oriented to the east Pacific Rise in the tropical Pacific with Dr. Jeff Gee of SIO as Chief Scientist. We will show data from the Gee operation as well as TV clips of operational aspects of the OSNPE, and comment on operations using other vehicles during the year.

❖***Tiburon: MBARI's ROV for Science Research*** - Dr. William J. Kirkwood, Monterey Bay Aquarium Research Institute

Tiburon is MBARI's Remotely Operated Vehicle (ROV) which has recently begun operations for science and exploration of the Eastern Pacific. The vehicle was specified and built by MBARI's technical staff to address missions defined by the science staff. Reviewers from various institutions (Scripps, MIT, ISE, IFREMER and others) modified the specification and system concepts for Tiburon. The ROV is completely integrated with MBARI's SWATH vessel, R/V WESTERN FLYER. The integrated system has been performing science missions concurrently with engineering tests.

The 1997-1998 year of operation has brought a variety of experiences and issues. Some aspects of the system's performance have yielded better than anticipated results. Other aspects have shown potential but require fine-tuning. The overall architecture has proven to be robust, but has also shown vulnerability when efforts are not coordinated. Experience with the integrated system has added knowledge that needs to be applied towards improving and maximizing the system's utility.

The R/V WESTERN FLYER has functioned for more than a year as the platform for supporting Tiburon operations. The control room was designed explicitly to assist in the efficient operation of science missions. Concepts about Pilot to Chief Scientist communications and coordination with the ship crew have been tested and validated. Support systems for the ROV and coordinated control have been accomplished at the rated depth of 4000 meters. Transects over several kilometers in excess of 3000 meters depth have been successful using the R/V WESTERN FLYER's dynamic positioning system in conjunction with Tiburon's controls.

This presentation discusses the original specification, decisions about architecture and system trades, and how Tiburon (along with the R/V WESTERN FLYER) have performed against that specification.

❖***A comparison of Single Body and Two Body Shallow Towed Vehicles-*** Mr. Mark Rognastad, University of Hawaii

In 1995 the National Defense Center of Excellence for Research in Ocean Science (CEROS) began funding Raytheon Corp. (then Alliant Techsystems, later Hughes Naval and Maritime Systems) and the Hawaii Mapping Research Group (HMRG) of the University of Hawaii to conduct a series of experiments in synthetic aperture sonar. The first experiment, a proof of concept test, utilized the HAWAII MR1 sonar system together with a hydrophone array provided by Raytheon. These results were promising, and a purpose-built tow vehicle was then funded, and has been tested in several configurations.

The HAWAII MR1 is a two body system, with a tow vehicle weighing 3500 lbs. in air, but ballasted to be between 50 and 100 lbs. positively buoyant in water, connected with a neutrally buoyant tether to a depressor with 2000 lbs. of negative buoyancy. In typical use, this depressor is towed at a depth of 100 meters, attached to the towing vessel by a steel armored electromechanical cable, at speeds of 7 to 10 kts. A drogue line and buoy are fastened to the after end of the tow vehicle, both to improve vehicle stability and to aid recovery in the event of loss. Launch and recovery of the vehicle and depressor is accomplished using a mechanical system designed by Sound Ocean Systems and subsequently modified by HMRG.

The synthetic aperture testing required speeds of 2 to 5 kts. and depths of 15 to 25 meters; several modifications were made to the MR1 system to improve its performance at slow speed. The buoyancy of the vehicle was reduced, and the drogue line shortened to 30 meters. Small (10 cm diam.) drogue chutes were added to the drogue line to increase drag. With these modifications, the MR1 system performed well.

The initial design for the purpose-built tow vehicle was based on an existing design created at Raytheon, the result of a significant effort on hydrodynamic simulation and model tank testing. The Raytheon vehicle had been used for similar synthetic aperture experiments in Lake Washington and Puget Sound with good results. It is a single body design, towed from the upper midpoint of the vehicle, and weighs roughly 2300 lbs. in water.

❖ ***SeaSoar Metamorphosis*** - Dr. Lindsay Pender and Mr. Ian Helmond, CSIRO Marine Research, Hobart, Tasmania, Australia

Over the past 13 years, we have progressively changed the characteristics of our SeaSoar to improve its performance. In this presentation, we will discuss the current configuration, its performance, and the rational behind the changes we have made. We will discuss the replacement of the standard hydraulic wing control unit with a low maintenance, low torque electric drive. In order to implement the low torque drive, new wings were developed and an aileron roll stabilization scheme implemented. These changes resulted in an increased depth range and improved roll stability.

We will also discuss ships wake avoidance, communication, and our system control software, which includes real time bottom avoidance. The developments outlined can be readily applied to other actively controlled towed vehicles.

Wednesday, October 21, 1998

Wednesday
08:30

BOTTOM SAMPLING TECHNIQUES

Hubbs Hall

❖***A Large Diameter Piston Corer for Use on UNOLS Research Vessels*** - Dr. Peter Kalk, Oregon State University

This presentation covers a brief history of marine sediment sampling leading to Kullenberg's invention of the piston corer and subsequent modifications to the original. A large diameter piston corer as used today is examined. UNOLS vessel equipment needed for long piston corers and problems encountered with today's corers are reviewed.

❖ ***MultiCoring*** - Mr. Richard Muller, Moss Landing Marine Laboratory

❖***Glass Coring and Rock Dredging*** - Mr. Ronald Comer, Scripps Institution of Oceanography

A history of dredging and glass coring using SIO systems. A discussion of the pros and cons of each system and when to utitlize each system as compared to geologic setting, time constraints, effectiveness, costs, and sampling goals.

Wednesday
08:30

ACOUSTIC, DOPPLER, CURRENT PROFILER

Sumner Auditorium
Dr. Eric Firing (University of Hawaii), Chair

❖***Fundamental Components of Shipboard and Lowered ADCP Systems*** - Dr. Eric Firing, University of Hawaii

Shipboard and lowered ADCP systems include the following subsystems: the platform or frame; the profiler itself; a GPS receiver; attitude sensors; the data acquisition system; and data processing software. Among these, the least troublesome is the GPS receiver. Each of the other components can limit the accuracy of the profiles of water velocity relative to the earth. Choices and problems associated with two of the subsystems will be emphasized here: the profiler and the attitude sensors. Profiler issues include coded versus uncoded pulses and phased array transducers versus a single element per beam. Attitude sensor issues include the status of GPS attitude sensing and the possible advantage of using pitch and roll sensors in shipboard systems; and the vulnerability of lowered systems to poor compass performance.

❖ ***Routine Shipboard ADCP Operation: Benefits, Problems, Methods*** - Dr. Eric Firing, University of Hawaii

The costs of operating a shipboard ADCP are mainly fixed--they are the same whether the unit is on or off. Benefits of a policy of routine ADCP operation are of two sorts. First, the observations can be highly valuable even if they are not central to the science of a particular cruise. Second, routine operation makes it much more likely that the system will work correctly on those cruises for which it is crucial. Problems of routine operation--or of maximizing the benefit of routine operation--range from the diplomatic (clearance issues) through the organizational (procedures for instrument operation, checking, and data transfer) and technical (shortcomings of the instrument systems themselves) to the financial (funding for processing and analyzing the data).

❖***Lowered Acoustic Doppler Current Profiler: From an Experimental Instrument to a Standard***

Hydrographic Tool - Dr. Martin Visbeck, Lamont-Doherty Earth Observatory Columbia University, NY

During the last decade lowered acoustic Doppler current profiler (LADCPs) have matured from an experimental instrument to an almost off-the-shelf standard tool for deep hydrographic programs such as WOCE (Firing, 1998). The first LADCP profile was taken in 1989 at a site near Hawaii by Firing and Gordon (1990). The way the LADCP system works is that it relies on the fact that short current profiles can be 'pieced together' to obtain a full ocean depth velocity profile (Fig. 1). The initial results were not too encouraging since systematic errors of the order of 10 cm/s were expected, much too large to be used for quantitative purposes such as top to bottom transport calculations. However, proof of concept was given and some first steps towards a useful processing algorithms were realized. A year later in 1990, Fischer and Visbeck (1993) used a similar system during a cruise in the equatorial Atlantic. They had the advantage of simultaneous LADCP and Pegasus velocity profiles. The Pegasus is an acoustically tracked free-falling float that can be used to accurately measure top to bottom ocean transports; however, it requires bottom mounted and navigated acoustic beacons. Consequently each station takes several hours of extra ship time plus the expense of a pair of acoustic beacons to obtain one Pegasus velocity profile. In comparison the LADCP is much more attractive: no extra ship time is required and the running costs per station are minimal. However, when care was taken during the data processing of the LADCP system both velocity estimates agreed. In particular the close comparison allowed us to develope a method to compute the barotropic mean flow given accurate GPS ship navigation.

During those first years self-contained ADCPs, typically used for moored applications, were mounted on the CTD/rosette frame. Most of the early designs replaced two bottles in favor of the large ADCPS. In particular the narrow band 150 kHz full ocean depth system was very difficult to mount and handle due to its weight of app. 140 pounds.

The next generation of broad band technology ADCPs promised much increased single ping accuracy, however, the range of useful data was reduced despite an effort to boost the power level of the transducers. The instruments themselves were more compact and easier to handle, however, the power requirements increased by almost an order of magnitude. Consequently a rechargeable battery pack hat to be added to the system in order to run an intense hydrographic program without unmounting and opening the ADCP every few days. Better rosette designs emerged that were able to accommodate the new ADCPs in the center of the package. Such configurations were used throughout the WOCE and provided a wealth of useful top to bottom velocity profiles.

The latest generation of ADCPs are much smaller instruments with a frequency of either 300 kHz. The new instruments have no internal batteries and hence are extremely compact with a dimension of only 9x8 inches and a weight of 30 pounds. Moreover, the price dropped dramatically and one can now purchase two transducer heads for the price of one of the traditional 150 kHz BB systems. In order to make up for the reduced range of the higher frequency systems we have recently started to mount two heads on one CTD frame, one looking upward and one looking downward. This LADCP2 system has several other advantages (Visbeck, 1998): no complete loss of data when the CTD is close to the bottom, view of sea surface for an improved initial depth estimate and some built in redundancy. While mounting an upward looking system is not always easy to do, the small size and much reduced power requirements make the new LADCP system very adaptable to small CTD frames and towed vessels. Today there are two commercial vendors who both have promised to sell complete LADCP2 systems in the near future. Over the years the community has learned how to process the data, and we are beginning to understand how instrumental and system errors affect the final velocity profiles. We have discovered regions in the worlds ocean with dramatically reduced instrument range due to low abundance of acoustic scatters. One of the surprises on the way was, that what initially seemed to be the hardest problem, i.e. to obtain the vertical mean velocity, turned out to be a very robust estimate for reasonably deep (long) CTD stations. We have learned how to use the 'water' bins for acceptable bottom tracking (Visbeck, 1998). We still have not fully understood why sometimes the up and down cast velocity profiles differ dramatically, which ADCP beam angles are most versatile and what the tradeoff between accuracy and range is.

We envision that in the very near future the LADCP system will be available on most hydrographic vessels. In conjunction with an easy to use processing software this will allow even the inexperienced user to obtain full ocean depth velocity profiles at every CTD station.

PRODUCTS from the LADCP system:
- full ocean depth relative velocity profile
- with GPS full ocean depth absolute velocity profile
- accurate absolute velocity profiles within 300m of the ocean floor
- profiles of acoustic back scatter
- pitch, roll and heading of CTD/rosette
- absolute position in X, Y and Z of CTD/rosette
- measure distance of CTD/rosette of the bottom

References:

Firing, E. and R. Gordon, 1990: Deep ocean acoustic Doppler current profiling. Proc. IEEE Fourth Working Conf. on Current Measurements. 192-201

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Fischer, J. and M. Visbeck, 1993: Deep velocity profiling with self-contained ADCP'S. J. Atmos. And Oceanic Technol., 10, 764-773.

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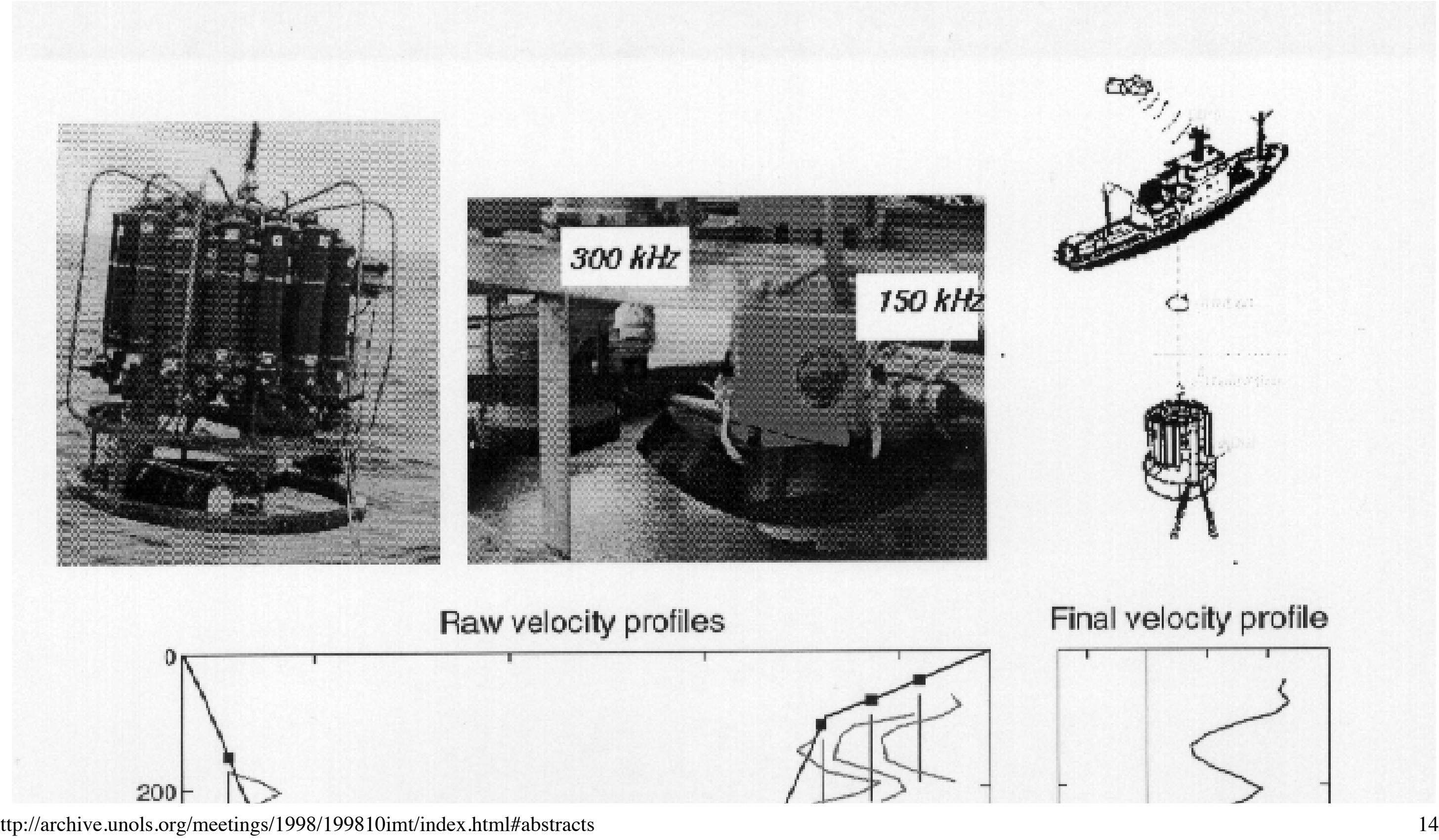

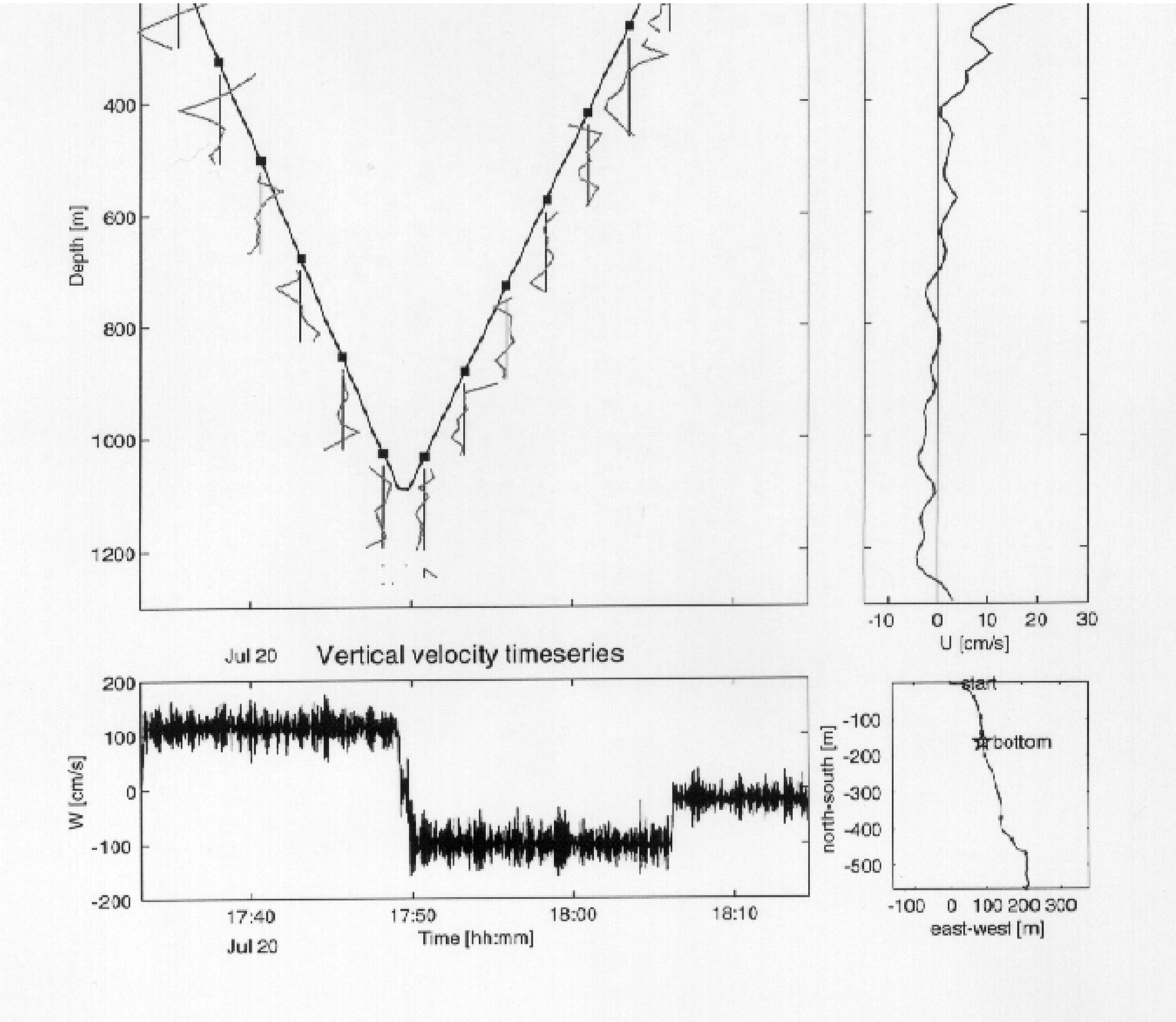

❖***Acquisition of Vessel-Mounted Narrowband and Broadband ADCP Data using a Sun Logging System on ORV FRANKLIN, FRV SOUTHERN SURVEYOR and RSV AURORA AUSTRALIS*** - Dr. Helen Beggs, CSIRO Marine Research, Hobart, Tasmania, Australia

In early 1998 an RDI broadband ADCP and Ashtech 3DF ADU2 GPS were installed on CSIRO's FRV SOUTHERN SURVEYOR. The existing RDI narrowband ADCP acquisition software from the ORV FRANKLIN Data Collection System (FDCS), written in C for a Sun, was modified for a broadband ADCP and installed on the FRV SOUTHERN SURVEYOR Sun computers. The RDI ADCP data acquisition code ("Transect") was installed on a PC and used for testing the ADCP.

During the presentation I will describe the Sun-based FDCS data acquisition system as it relates to logging ADCP data, and briefly compare it with RDI's Transect ADCP acquisition software. The quality of data and performance of the broadband ADCP on the FRV SOUTHERN SURVEYOR will be compared with the narrowband ADCPs on the ORV FRANKLIN and RSV AURORA AUSTRALIS.

The following table summarizes the differences between the ADCPs mounted on vessels used by CSIRO Marine Research:

	ORV FRANKLIN	RSV AURORA AUSTRALIS	FRV SOUTHERN SURVEYOR
ADCP TYPE	150 kHz RDI narrow-band	150 kHz RDI narrow-band	150 kHz RDI broad-band
PURCHASED	1985	1994	1998
MOUNTED	moon pool-flush with hull	behind acoustic window	moon pool-1.5m below hull
NAVIGATION	Ashtech differential GPS	Ashtech 3DF GPS	Ashtech 3DF GPS
ATTITUDE SENSOR	gyrocompass	Ashtech 3DF GPS	Ashtech 3DF GPS
PITCH/ROLL SENSOR	none	Ashtech 3DF GPS	Ashtech 3DF GPS
SYNCHRONISED?	no	yes	yes
INTERFERENCE	none	interferes with echo sounders	interference from fish sonar
TYPICAL LONG-TERM ERROR PER m/s OF SHIP SPEED	0.6-1.1 cm/s	1.0 cm/s	1.0 cm/s

ADCP range on all three vessels is reduced when the ship is underway, possibly due to bubbles under the hull. The FRANKLIN narrowband ADCP gives the greatest range in any sea state, suffers least from interference from other acoustic devices on the ship, and the data quality suffers least in rough weather. The AURORA AUSTRALIS narrowband ADCP has a smaller range than the FRANKLIN narrowband ADCP, both when the ship is steaming or stationary. This may be due to the acoustic window over the transducer or bubbling underneath the hull.

Data collected during a two-ship cruise of the SOUTHERN SURVEYOR and AURORA AUSTRALIS into the Southern Ocean in March 1998, indicated that in moderate to rough seas the SOUTHERN SURVEYOR broadband ADCP (set to Mode 1, medium-band) had about 90% of the range of the AURORA AUSTRALIS narrowband ADCP. In calm seas, the SOUTHERN SURVEYOR broadband ADCP (set to Mode 7) matched or exceeded the range of the AURORA AUSTRALIS narrowband ADCP.

Thursday, October 22nd

Thursday
08:30

DECK OPERATIONS AND ONBOARD SAFETY

Hubbs Hall

Mr. Woody Sutherland (Scripps Institution of Oceanography), Chair

❖***Research Vessel Operators' Committee (RVOC) Safety Video*** - A recently completed 20 minute safety video will be viewed. The film was developed by the RVOC Safety Committee and will be distributed to each of the UNOLS research vessel. It is intended for viewing at the start of a science cruise to provide important shipboard safety information to the science party. The film, with an introduction by Dr. Robert Gagosian, was shot on board R/V ENDEAVOR with special effects and graphics provided by Jamestown Marine.

❖***Oceanographic Research Vessel Deck Safety*** - Capt. Daniel S. Schwartz and Mr. George White, University of Washington, School of Oceanography

The large oceanographic research vessels are away from homeport for extended periods, often operate independently in remote areas away from shipping lanes (and assistance), and travel great distances. Science packages and instruments deployed in all types of weather from these vessels are unique and varied; often heavy and/or bulky. Science operations may require small boat operations, working all times of the day and night, and are physically and mentally fatiguing. Many researchers are on board a vessel for the first time. These parameters make safety on board research ships a critical-indeed primary-shared responsibility of the ship's crew, technicians and the researchers. The commercial fishing industry has the highest rate of on-the-job fatalities of any occupation: higher even than coal mining. The similarities, at least with respect to exposure to hazard while working on deck, between fishing vessels and research vessels far outnumber the differences. Humanity, not to mention exposure to unwanted litigation and expensive liability claims, demands we strive to achieve the lowest possible rates of injury and loss of life. In addition, safety is cost effective and contributes to mission accomplishment, while avoiding loss of expensive or irreplaceable scientific instruments and equipment. While there will be no attempt to provide an exhaustive inventory of hazards and safety procedures for research vessel deck operations, this talk will attempt to outline some of the recurring areas of concern and ways we as a community should be addressing them.

❖***Small Research Vessel Deck Operations*** - Mr. Steve Hartz, University of Alaska

❖***Fiber Optic Cable***

Thursday
08:30

Shipboard Networking and SeaNet

Sumner Auditorium

Mr. Barrie Walden (Woods Hole Oceanographic Institution), Chair

❖***Data Collection and Distribution*** - Mr. Barrie Walden, Woods Hole Oceanographic Institution

The instrumentation on oceanographic research vessels has passed beyond stand-alone equipment and now frequently requires sophisticated inter-connectivity. The problem of linking sensors to recorders remains but the “recorder” is likely to be a computer having strict time synchronization requirements, demanding additional data from various sources and, with appropriate connections, having the ability to display results in multiple formats on numerous media. To make matters more interesting, the scientific requirements keep changing and the level of technology continually increases in an attempt to keep pace.

Meeting today’s requirements is not difficult if you have a lot of money and you’re not concerned with anything past builder’s trials. However, if you live in the real world where funding is always an issue and “maintainability” is not somebody else’s problem, development of a versatile, reliable, instrumentation installation requires careful planning and considerable thought. This presentation will outline the methods employed on the ships operated by the Woods Hole Oceanographic Institution. All of the installations have been made within the past five years and the system on R/V ATLANTIS is still “under construction”. These systems are not perfect but they work well and provide insight into which areas need careful attention.

❖***SeaNet - Extending the Internet to Oceanographic Research Platforms*** - Mr. Andrew Maffei and Mr. Steve Lerner, Woods Hole Oceanographic Institution

The SeaNet Collaborative has been funded to provide hardware, software, and the network infrastructure support necessary to connect several US research vessels to the Internet. The high cost of satellite links has had a strong influence on the design of this system. A status report on the SeaNet effort, currently being undertaken by Woods Hole Oceanographic Institution, Lamont Doherty Earth Observatory, the Naval Postgraduate School, Omnet, Inc. and Joint Oceanographic Institutions, Inc as well as associated corporate partners will be given. Funding is being provided by the US NOPP program.

❖***Sensor Data Acquisition and Display via the Ship Network*** - Mr. Dennis Shields, National Oceanographic and Atmospheric Administration

The talk will provide a description and demo of the Scientific Computer System (SCS) that is presently installed on ten NOAA vessels. This system acquires data from a wide variety of ship sensors either directly or through the network. The network is also used to provide users real-time access to the data, displays and graphs via a client server architecture. SCS is based on the Microsoft Windows NT operating system and is written in C++ for pentium PC's.

❖ ***E-mail on the Woods Hole Oceanographic Institution Ships*** - Mr. James Akens, Woods Hole Oceanographic Institution

This will be a discussion of the e-mail system used by Woods Hole Oceanographic Institution Ships. This system is Linux based and uses no proprietary software. The code is written in Perl and Expect. Topics to be covered include: initial installation, administration, maintenance tools, billing tools and the overall cost of operation. Particular emphasis will be given to a discussion of the message filtering system. This allows control of recipients and message size from either the ship or shore.

❖ ***Direct Connection Network Sensor Interfaces*** - Mr. Richard Findley, University of Miami

Making high accuracy measurements from an analog sensor is difficult in a shipboard environment. There are line losses and radio frequency interference problems. Multiple systems may need immediate access to data from the same sensor simultaneously. Conversion from raw values to engineering units and the application of calibration constants must be accomplished - in real time.

To solve these problems the University of Miami Marine Technology Group is implementing the use of commercially available high accuracy sensor interfaces directly connected to the ship's computer network.

A description of available interfaces and specifications will be given along with a live demonstration using these interfaces with a graphical programming language.

Thursday
13:00 Technical Workshop

CTD PACKAGES

Sumner Auditorium

Mr. Woody Sutherland (Scripps Institution of Oceanography), Chair

❖***WOCE Operations*** - Mr. Frank Delahoyde, Scripps Institution of Oceanography

❖***SeaBird CTD Data Processing in Coastal Waters*** - Ms. Kristen Sanborn, Scripps Institution of Oceanography

The SeaBird CTD Data Processing in Coastal Waters presentation will address:
I. The importance of calibrations of the sensors.
II. Problems encountered with the SeaBird Processing Programs and programs STS/ODF have developed to augment the SeaBird Programs.
III. Proper documenting of problems that are encountered at sea to aid the final data processing.
IV. Changes STS/Oceanographic Data Facility have made to the SeaBird method of data acquisition.

❖ ***Data Evaluation and Quality Control for Routine CTD/Hydrographic Data*** - Dr. James Swift, UCSD Scripps Institution of Oceanography

Data quality assessment of routine CTD /hydrographic data is learned over years of practice. Some simple aspects of practice do, however, lead to improved reliability and documentation of data. These include:

◆for water sample data:
verification of the collection depth and unambiguous association of that depth with a unique sample identifier,
knowing the degree to which the water which issued from the sampling spigot matched the characteristics of the water from the collection level,