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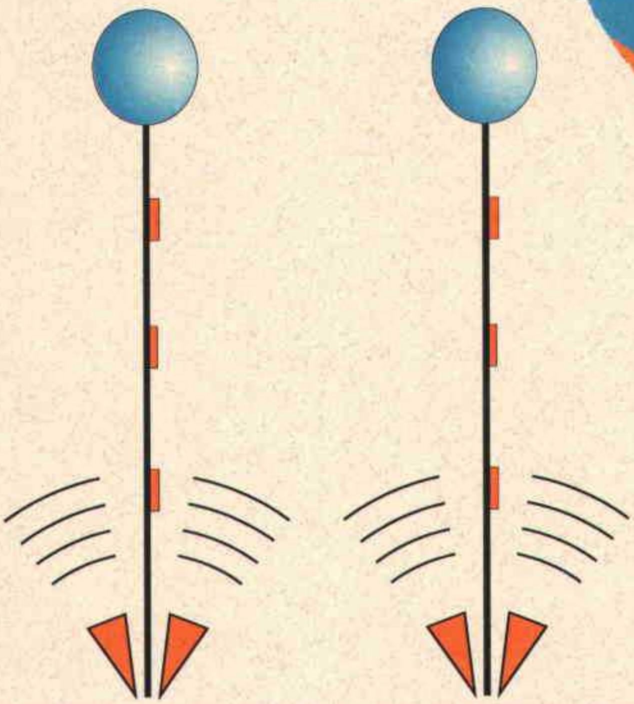

Mooring Observations from the Hawaiian Ridge

August 2002 - June 2003

A component of the
Hawaii Ocean Mixing Experiment
(HOME) Nearfield Program

by
Timothy Boyd
Murray D. Levine
Steve R. Gard
Walt Waldorf

OREGON STATE UNIVERSITY

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TABLE OF CONTENTS

INTRODUCTION 1

SECTION I 1

DEPLOYMENT and RECOVERY 1

CTD DATA 3

CTD Calibration

R/V *Wecoma* CTD

R/V *Roger Revelle* CTD

CTD Data Processing

MOORINGS and INSTRUMENTATION 5

Design Strategy

Moorings A1 and B1

Mooring A2

Mooring Construction

Instrument Calibration

Temperature and Salinity

At-Sea Conductivity Calibration

ADCP Compass

Long Ranger Pressure

ADCP Energy

ADCP DATA QUALITY 8

Mean Signal Quality

Diurnal Variability in Signal Quality

Other ADCP Data Quality Issues

DATA REPORT CD 13

Notes on Additional Figures in the Data Report CD

REFERENCES 13

TABLES 14

Table 1. Instrumentation on Moorings: A1, B1, & A2

Table 2. Sampling parameters for Acoustic Doppler Current Profilers: A1, B1, &A2

Table 3. CTD Log: Deployment, Turn-around, and Recovery Cruises

Table 4. Mooring Construction Detail: A1, B1, & A2

Table 5. Day of year 2002-2003

Table 6. Data location diagram: A1/B1, A2

Table 7. Mooring Diagram (Engineering Components): A1, B1

Table 8. Mooring Design & Dynamics Output

ADDENDA..41
1. Deployment Cruise Event Log
2. Turn-around Cruise Event Log
3. Final Recovery Cruise Event Log

FIGURES..46
Figure 1. Kauai Ridge bathymetry and mooring & CTD locations
Figure 2. Detailed bathymetry around mooring & CTD locations
Figure 3. Instrument sampling depths: A1, B1, A2
Figure 4. CTD casts
Figure 5. θ/S curves with raw & corrected C: A1, B1, & A2
Figure 6. Deployment-average ADCP correlation and amplitude: A1, B1, & A2
Figure 7. Mean and std U & V for several "% good ping" classes: A1, B1, & A2
Figure 8. ADCP diagnostics as a function of time of day: A1, B1, & A2
Figure 9. ADCP diagnostics for selected times of day: A1, B1, & A2
Figure 10. Fraction of ensembles that fall within "% good ping per ensemble" classes

SECTION II 75

A. VELOCITY Depth/Time Plots (40-hr low-pass filtered)..77

B. VELOCITY Depth/Time Plots (unfiltered)..87

C. TEMPERATURE Time Series: Line Plots (40-hr low-pass filtered)....................147

D. TEMPERATURE Time Series: Offset Line Plots (unfiltered)..............................151

E. SALINITY Time Series: Line Plots (40-hr low-pass filtered).............................227

F. PRESSURE Time Series: Line Plots (unfiltered and 40-hr low-pass filtered)..........231

INTRODUCTION

This report documents the observations of velocity, temperature and conductivity made from moorings deployed in the Kauai Channel on the ridge extending NW from Oahu, Hawaii. Two moorings (A1, B1) were deployed in August 2002 for three months and one mooring (A2) was redeployed in November 2002 for seven months as part of the Hawaii Ocean Mixing Experiment (HOME) Near-field Program. Mooring A2 was a joint effort with Douglas Luther and Mark Merrifield at the University of Hawaii.

HOME is a program to study mixing processes near the Hawaiian Ridge, motivated by the desire to understand how topographic mixing affects the advective-diffusive balance in the ocean interior. The focus of HOME is on the tide as the energy source for mixing (Pinkel et al., 2000). There are five components in HOME: Historical Data Analysis, Modeling, Survey, Nearfield Experiment, and Farfield Experiment.

The overall goals of the Nearfield are to:

- Observe mixing process in sufficient detail to determine the dynamics, and
- Provide data that can be used in models to extend results to the entire ridge and the global ocean.

The specific objectives of this mooring component are to:

- Provide a temporal context for observations made from mobile profiling instruments,
- Record high vertical resolution time series of density and velocity to learn about the physical mechanism leading to overturning and enhanced mixing,
- Extend the observations beyond the few-month period of the intensive Nearfield experiment, and
- Provide data for use in modeling efforts.

This report is divided into two sections. The first section contains descriptions of the moorings, including design and construction, and instrumentation deployed, as well as ancillary CTD data and a discussion of data quality. The second section contains plots of the observations. Time is given as day of the year 2002 in all the time series plots, with the convention that noon on January 1 is day 1.5. Time in 2003 is still referenced to 2002, hence, noon on January 1, 2003 is day 366.5. Conversion to calendar date is provided in Table 5.

A companion CD contains a pdf version of the data report as presented here, as well as additional figures of the measured variables at higher temporal resolution, with dynamic links between figures for different variables.

SECTION I

DEPLOYMENT and RECOVERY

The mooring program was carried out on three separate cruises: Deployment Cruise, Turnaround Cruise, and final Recovery cruise. The initial deployment of four moorings (A1, B1, C1, D1) took place in August 2002 during the Deployment Cruise. During the Turnaround Cruise in November 2002 all the moorings were first recovered and then two reconfigured moorings (A2, C2) were deployed for 7 months until final recovery in June 2003.

Moorings A1 and B1 were deployed on the south and north slope of the ridge, respectively (Figures 1 and 2). The moorings were deployed from the R/V *Wecoma* during an 8 day cruise (W0208B) leaving from the University of Hawaii Marine Center (1 Sand Island Road, Honolulu) on 11 August 2002. Most of the mooring gear was shipped to Hawaii aboard the *R/V Wecoma.*

In a gesture of goodwill we first deployed a profiler mooring for Matthew Alford (University of Washington / APL) in Mamala Bay.

The deployment of B1 began in the morning on 12 August. Since this was the same site as Bigboy deployed in 2000, no preliminary survey was needed. The mooring was deployed anchor first. Hence the wire was under high tension Due to intermittent surging of the wire that was wrapped on the trawl winch, the clamps holding the instruments slipped on the wire and sometimes the tie wraps broke. One SBE 39 fell off its bracket and was lost. Time was taken to rethink the clamping. Finally, black tape was added to the clamping groove to increase friction, and nylon line (thanks Daryl Swensen) was used to secure the instruments to the clamps. The small MTRs were taped directly to the wire using vulcanizing tape (thanks Doug Luther). After about a 5 hour delay the mooring was successfully deployed at 21 deg 48.00' N; 158 deg 27.80 W in water of depth 1456 m. The mooring was first lowered to within 50 m of the bottom before being let go by an acoustic release.

Mooring A1 was deployed in a similar manner to B1. The position was 21 deg 44.99' N; 158 deg 45.50' W in water of depth 1337 m.

A description of the instruments attached to each mooring along with the depth and sampling rate is given in Table 1. The sampling parameters of the acoustic Doppler current meters are presented in Table 2. The locations of the various oceanographic variables sampled are illustrated in Figure 3 and Table 6.

The mooring recoveries were also conducted from the R/V *Wecoma* on a 10-day cruise (W0211A) departing from the University of Hawaii Marine Center on 9 November. Moorings B1 and A1 were released on 9 and 11 November respectively. Recovery operations proceeded without incident. Moorings C1, D1 and the Mamala Bay mooring were recovered without any serious problems.

Redeployments of two moorings, called A2 and C2, were made re-using the wire and many of the instruments. Data from instruments were downloaded and batteries and O-rings replaced. These moorings were the responsibility of the University of Hawaii, however we contributed greatly to the instrumentation of A2. Hence data from our instruments on A2 are reported here. The moorings were deployed float first using the Lebus winch; the anchor released using a tip plate. The location of A2 was 21 deg 45.14'N; 158 deg 45.42'N in water of depth 1332 m.

The final recovery cruise was on the *R/V Roger Revelle* (CNTL-10) departed University of Hawaii Marine Center on 10 June 2003. Mooring A2 was recovered on 11 June and C2 was on deck on 12 June.

CTD DATA

A variety of CTD casts were made during each cruise: some single casts and some time series. A few "calibration" casts during the Turnaround and Final Recovery cruises had instruments from the moorings attached to the CTD rosette. These were used to check instrument calibrations and determine corrections to measured conductivity.

A summary of the location of each CTD cast is given in Table 3.

CTD Calibration

R/V *Wecoma* CTD. A single calibration of the conductivity cells was done using data from both R/V *Wecoma* cruises (W0208B and W0211A), since they used the same sensors. Jane Fleischbein of OSU did the analysis; she has done calibrations of this CTD system for many years. One or two 5-liter Niskin bottles were taken over a well-mixed region during each cast. Duplicate water samples were drawn and the salinity measured with a Guildline 8400B Autosal (OSU #6) in Corvallis in January 2003.

Two temperature and conductivity sensor pairs were used on the CTD. The primary sensors were T0 (#1369) and C0 (#1021); the secondary pair were T1 (#1371) and C1 (#1030). Using 20 salinity samples (4 points were discarded as outliers), the following differences between bottle and sensor values were found:

Sensors	Mean ΔC	Std dev C	Mean ΔS	Std dev S
Primary	0.003	0.005	0.002	0.004
Secondary	0.003	0.006	0.003	0.004

Where ΔC = "bottle" conductivity – CTD sensor conductivity ("bottle" conductivity is calculated from formula using bottle salinity and $T_{in\ situ}$ from CTD sensor), and where ΔS = "bottle" salinity – CTD sensor salinity from formula. Conductivity units are mmhos/cm^2.

The recommendation is to correct conductivity from the measured sensor as follows:

Primary: $C_{cor} = C * 1.00007713$
Secondary: $C_{cor} = C * 1.00009036$

Fleischbein recommends using the primary sensor pair (T0, C0), however plots of the temperature over some of deeper low-gradient sections reveal that the primary temperature sensor is noisier. We thus recommend using the secondary sensor pair (T1, C1). The CTD profiles presented here (Figure 4) from the turnaround cruise employ the secondary sensor pair with the small conductivity correction shown above, which results in a salinity increase of about 0.0035.

<u>R/V *Roger Revelle* CTD.</u> Bottle samples were collected during the final recovery cruise aboard the R/V *Roger Revelle*. The salinity corrections calculated from these samples were provided by Kevin Bartlett of University of Hawaii:

Primary salinity correction = -0.0011 psu
Secondary salinity correction = -0.0033 psu

These corrections were added to the salinities calculated as discussed above. The primary sensor pair is used due to slightly lower salinity variance in the deeper part of the casts.

CTD Data Processing

Temperature and salinity data were collected using SBE 911*plus* CTDs on both the deployment and recovery cruises.

The *Wecoma* deployment and turnaround cruise CTD data were processed by Jane Fleischbein using the algorithms and parameter values recommended for standard processing of SBE 911 data, as given in the SBE Data Processing v5.32a manual. Namely: secondary conductivity was lagged 0.073 seconds relative to pressure (primary conductivity is lagged the same amount in the deck unit) in module ALIGNCTD; conductivity cell thermal mass errors were corrected using parameters alpha = 0.03 and 1/beta = 7.0 in Seasoft module CELLTM; pressure was low pass filtered with a time constant of 0.15 seconds and conductivity signals were low pass filtered with a time constant of 0.03 seconds in FILTER; data from periods when the CTD was moving at less than 0.1 m/s were removed with LOOPEDIT; the downcast data were averaged into 1db bins with BINAVG.

The *Revelle* recovery cruise CTD data were also processed using the SBE Data Processing modules. Three types of casts were obtained during the *Revelle* cruise: single casts that were taken as part of a time series; yoyo casts in which the CTD was lowered to depth and repeatedly profiled over a subset of the water column; and calibration casts in which the CTD was lowered to a single depth and held fixed for several minutes. Having no prior experience with the *Revelle* CTD, we empirically determined the correct time lag between conductivity and temperature for each pair of sensors using the ALIGNCTD module (in conjunction with CELLTM with the standard SBE 911 time constants), focusing on the resulting salinity spiking at temperature steps observed in cast 1. Salinity spiking was minimized and symmetric about depths of temperature steps for lags of 0.052 s for the primary and 0.006 s for the secondary conductivity sensors relative to pressure. For the standard CTD casts (1-18), the remainder of the SBE Data Processing was as described for the *Wecoma* deployment and turnaround cruises. The yoyo casts (19-22) and calibration casts (23-24) were processed identically, except for excluding the use of LOOPEDIT and BINAVG modules, in order to retain time series of variable temperature, salinity, and pressure at depth.

Difference in uncorrected salinity derived from the *Revelle* primary (S1) and secondary (S2) sensor pairs was a function of depth, with $\delta S = S2\text{-}S1 \approx 0.001$ at the surface and cast bottom (typically 2500m), and $\delta S \approx -0.003$ at the depth of the salinity maximum, around 500m. Application of the UH-provided salinity offsets changed these values to $\delta S \approx -0.001$ at the surface/bottom and $\delta S \approx -0.005$ at the depth of the salinity maximum. Implementation of the UH salinity offsets results in closer overlap of the deepest portion of θ/S curves derived from the primary sensor pair in the *Revelle* recovery cruise CTD casts 11-18 and the Wecoma deployment cruise casts 24-27, which were nearly co-located. We have used

MOORINGS and INSTRUMENTATION

Design Strategy

Moorings A1 and B1. Moorings A1 and B1 measured velocity profiles above the bottom along with point measurements of temperature (T) and conductivity (C). T sensors were clustered in three groups of 5 instruments in which sensors were separated by 16 m, coinciding with the depths of ADCP velocity bins. C was measured at one or two locations in each of the groups. Our objective, since there were fewer C than T instruments, was to have enough measurements of C to define a temperature-salinity relationship that could be used to infer salinity at depths where only T was measured. Some additional T instruments were placed between the groups to fill in and define the larger vertical scales.

Mooring A2. Mooring A2 was designed by Doug Luther. It included instrumentation belonging to both the OSU and UH groups. The objective was to measure the vertical water column as completely as possible. The OSU contribution consisted of two Long Ranger ADCPs, to measure velocity from the bottom to 150 m depth, as well as 26 T and 8 C sensors distributed within 700 m of the bottom. The remainder of the instrumentation was provided by the UH group.

Mooring Construction

The moorings were constructed of ¼" jacketed wire rope and the primary flotation was provided by glass balls. (The uppermost UH 300kHz ADCP on A2 was nested within a syntactic float.) Anchors were constructed at OSU by stacking and welding railroad wheels. Each mooring had dual acoustic releases sitting about 10 m above the anchor. Mooring details are shown in Tables 4 and 7. Mooring tension and behavior in response to a steady current were determined using "Mooring Design and Dynamics", by Richard Dewey (Univ.Victoria, B.C., Canada). All wire segments for the nearfield moorings A1, B1, and C1 were laid out and marked for sensor locations at OSU. Wire recovered at the end of the first deployment period was re-used on the A2 mooring.

Instrument Calibration

Temperature and Salinity. All SBE 39 Temperature Recorders, SBE 16 Seacats (T,C recorders), and SBE 37 MicroCats (T,C recorders) were calibrated at Sea-Bird Electronics. All these instruments were calibrated between May and July 2002, except Microcat #42 which was calibrated in May 2000 (and not used before HOME). SBE 37 and SBE 39 instruments store the calibrations constants internally and output data in engineering units. SBE 16 calibrations coefficients are not stored internally. The SBE 16 data are downloaded in hex and converted later using the calibration coefficients.

The MTRs (Miniature Temperature Recorders) were calibrated at OSU. A calibration from 1996 was used for three of the MTRs (3073, 3090, 3098). The other MTRs were calibrated in Dec 2002. The bath reference temperature was measured by an SBE-38 Digital Immersion Thermometer (s/n 0088), which was calibrated by SBE in Nov 2002. MTRs sampled at 2 minute intervals and the SBE-38 sampled at 10 second intervals for the calibrations. Calibration data were collected at 10 steps over the temperature range 1.5-16°C. Temperature was held fixed at each step for 150 minutes and the calibration used the average MTR and standard temperatures over the last (i.e., most stable) 16 minutes of each step. Calibration coefficients are obtained by least squares fit of the polynomial $T = (a + b*R + c*R^2 + d*R^3)^{-1} - 273.15$, where R=ln(rs/f0), f0=1000.0, and rs=4.0x10^8/(MTR counts).

<u>At-Sea Conductivity Calibration</u>. Because the response of the moored Seacat and microcat conductivity sensors is subject to drift over time, calibration casts were performed following recovery of the instruments, as part of both the mooring turnaround (R/V *Wecoma* W0211A) and recovery (R/V *Revelle*) cruises. The calibrations were performed by attaching the mooring sensors to the CTD rosette and lowering it to several depths at which the mooring sensors sampled simultaneously with the CTD for a period of time. Data were obtained from both the turnaround and recovery cruise casts. The most useful data resulted from a turnaround cruise depth-step lasting 15 minutes, during which the standard deviation of values from the CTD were the minimum of any step: T (0.0013°C) and C (0.00015 Siemens/m). Hence, this step was used to determine an offset that has been applied to all conductivity data from moorings A1, B1 and A2. The offsets were determined by taking the difference between the CTD and mooring sensor (ms) conductivity ($\Delta C = \langle C_{CTD} \rangle - C_{ms}$), where $\langle\ \rangle$ is the average value over the 15 minute step, and where $\langle C_{CTD} \rangle = 3.3196$ S/m. The resulting offsets ($\langle \Delta C \rangle$) that have been added to the mooring sensor conductivities are:

Sensor	Serial No.	$\langle \Delta C \rangle$ (x 10^4 S/m)	Standard deviation of C_{ms} (x 10^4 S/m)
SBE 37	41	3.7	5.3
SBE 37	43	3.9	5.5
SBE 37	1413	-1.9	4.8
SBE 37	1816	3.1	4.5
SBE 37	1818	3.2	4.6
SBE 37	2372	6.3	4.3
SBE 37	2374	5.6	3.1
SBE 16	40	10.9	6.0
SBE 16	41	9.7	6.3
SBE 16	43	5.0	0.6

SBE 16	50	12.0	2.6
SBE 16	51	3.2	4.3

The standard deviation is also over the 15 minute sampling interval of the depth step. Note that most of the offsets (<ΔC>) are of the same sign. This calibration has been shown to reduce the relative error among the sensors (Figure 5), however, further small adjustments in C based on the TS relationship may still be warranted.

We note also that the step-averaged temperature difference (<ΔT>) between the CTD and mooring sensor, where $\Delta T = \langle T_{CTD} \rangle - T_{ms}$, was less than 0.003 °C for every sensor.

ADCP Compass. Compass calibrations were performed for the two 300kHz Workhorse and two 75 kHz Long Ranger ADCPs at OSU in July 2002 prior to shipment to Hawaii. These calibrations were conducted per the RDI calibration specifications using the actual deployment configurations: with the deployment battery packs installed and mounted in the stainless steel inline frames (Mooring Systems Inc.). Rotation of the units was performed by suspending the units by rope from a sturdy tree branch at a distance from all metallic objects.

The Long Rangers were calibrated again in November 2002, during the Honolulu port call following their recovery on the A1 and B1 moorings, and prior to their deployment on mooring A2. This compass calibration was performed in a park on Sand Island, Honolulu using scaffolding constructed by D. Luther (UH).

Long Ranger Pressure. Calibration of the Long Ranger pressure sensors was performed at COAS in October 2003, using a custom jig based on drawings provided by RDI. In the calibration, pressure was increased incrementally to bring the pressure to the value of the HOME deployment at approximately 1400m. Pressure was removed over fewer increments to check for hysteresis in the pressure cell. A Paroscientific pressure cell was used as the standard. The calibrations were performed in the COAS Core Lab walk-in refrigerator at temperature = 6.2-6.3 °C. For comparison, a second calibration of LR s/n 1429 was conducted at room temperature = 21.8 °C.

The pressure signal that is output from the Long Ranger is a cubic polynomial of raw pressure counts using pressure coefficients that are stored in memory, i.e., y=a*x.^3 + b*x.^2 + c*x +d with y = computed pressure, x = raw pressure counts, and a, b, c, and d are pressure coefficients. Raw pressure count data are obtained from the LR by replacing the values for pressure coefficients [a b c d] with [0 0 1 0]. Rather than solving for new pressure coefficients, data from the pressure standard was simply compared to the LR data using the pressure coefficient values that were used in the HOME Nearfield deployment: [a b c d] = [0 -1.513068e-07 -5.305897e-01 -2.410703e01] for s/n 1429, and [a b c d] = [0 0 0.502395 -18.583452] for s/n 1426. Over the range of pressures tested (0-2200 psi), the pressure error ($P_{LR} - P_{parosci}$) was on average about -18 psi for LR s/n 1429 and -10 psi for LR s/n 1426, with errors of about -19 (s/n1429) and -4 (s/n 1426) psi at the highest range of the pressures tested. With the exception of one outlier in 12 pressure steps, the behavior of the pressure error in LR s/n 1429 was very similar at 6.3 °C and 21.8 °C.

ADCP Energy. Energy consumed by the Long Rangers during these deployments has been estimated using the RDI "Plan" software. The estimates shown in Table 2 are for the entire sampling period, which is slightly longer than the final data set. Note that the estimated energy consumed by Long Ranger s/n 1429 while deployed deep on the A2 mooring (1161 Wh) is much less than the nominal energy available (1600 Wh), as well as less than the estimated energy consumed by Long Rangers at similar depth on moorings A1 and B1 (~1450 Wh). Thus, the early termination of sampling by instrument A2d remains a mystery. Unlike the previous deployment of Long Rangers in the HOME Survey experiment, no further testing of the battery capacity was conducted following return to OSU.

ADCP DATA QUALITY

The HOME Nearfield program consisted of two deployments. The OSU contingent deployed two moorings (A1 and B1) during the first deployment period (August - November 2002) and contributed numerous instruments and mooring elements to a single mooring (A2) deployed collaboratively with the UH contingent during the second deployment period (November 2002 - June 2003). One near-bottom, upward-looking RDI 75kHz "Long Ranger" ADCP and one mid-water, upward-looking RDI 300 kHz "Workhorse" ADCP were mounted on each of moorings A1 and B1. The two Long Rangers were redeployed on mooring A2: one near-bottom looking upward and one mid-depth looking upward. The locations of the ADCPs on the moorings and their sampling parameters for both deployment periods are displayed in Tables 1-2. The purpose of this section is to describe evidence of temporal and spatial variability in quality of the ADCP data, and to identify segments of these data that are of poor quality.

Data from these RDI 75kHz Long Ranger (LR) ADCPs deployed during the HOME Survey experiment show evidence of acoustic side-lobe reflection from hard targets on the mooring located within the sampling range of the ADCPs. For the Long Rangers, the acoustic energy in side-lobes directed vertically, i.e. 20-degrees off the main axis of each beam, is ~50db down from the main lobe (on axis) energy (J. Gast, RDI, personal communication). Ordinarily, the *in situ* scattering strength within the main lobe, that is, within a cone defined by +/- 5° about the main axis of the transducer, is sufficient to dominate the signal reflected back to the transducer. In waters off Hawai'i, the *in situ* scattering strength is sufficiently low at depths greater than 1000 m that side-lobe scattering was found to dominate the signal returned from the depths of even some relatively small targets (e.g. MTRs: 5 cm diameter,14 cm high titanium cylinders with brackets) on the Home Survey experiment BigBoy mooring, at the site of the Nearfield B1 mooring. Evidence of signal contamination by side-lobe reflection off mooring elements includes: anomalously high returned signal strength at the depth of the element, variation of signal correlation around the element depth, smaller velocity mean and variance at the element depth (velocity signal is biased to zero due to the contribution by a non-moving mooring element). Examples of these effects can be found in Boyd et al., 2002a. Comparison of data from the HOME Survey BigBoy LR ADCP (deployed at 1450 m depth over the north slope of Kaena Ridge) and the Shorty LR ADCP (deployed at 1050m depth over the top of Kaena Ridge) reveals the side-lobe contamination was more significant below 1050 m. Suprisingly, side-lobe contamination effects were also found in data from the 300 kHz Workhorse (WH) ADCPs deployed on the Oregon shelf during the NSF-CoOP COAST experiment (Boyd et al, 2002b).

In order to reduce the impact of side-lobe contamination of the velocity signal, we designed and constructed acoustic baffles to knock down side-lobe reflections. These were deployed on the mooring wire above each of the ADCPs, as shown in Tables 4,7, and 8. Design of the acoustic baffles used in the HOME Nearfield deployments was influenced by discussions with Darryl Simonds and Joel Gast of RDI and was preceded by testing of a prototype using materials supplied by RDI with a LR ADCP suspended from the R/V *Wecoma* off Oregon in September 2001. The design philosophy is to keep the baffle outside of the main lobes of all beams, while knocking down the signal returned vertically along the mooring line using a stack of materials with a variety of acoustic impedances and absorptions. The resulting baffles were radially symmetric in-line mooring elements (built around 1" 316 stainless steel rod) that were sufficiently robust to handle the entire mooring tension. From top to bottom, the baffle consisted of ½" layers of lead (4 sheets at 1/8"), blended neoprene/cork gasketing (2 sheets at ¼"), and silicone rubber (2 sheets at ¼"), each of which were separated by 1/4" thick sheets of high density polyethylene, all of which were sandwiched between a ¼" stainless steel bottom plate (welded to the ss rod with braces below) and a ½" plywood lid. The 75 kHz Long Ranger baffles are 24 inches in diameter and were mounted 7.7 meters (center of baffle) above the ADCP frames. The 300 kHz Workhorse baffles are 12 inches in diameter and were mounted 3.9 meters above the ADCP frames. In order to avoid a 15° cone above the transducers, the minimum separations between the baffles and the 75 kHz LR and 300 kHz WH ADCPs are 2.5m and 1 m, respectively.

Mean Signal Quality

Data from all of the Long Rangers deployed deep during HOME Nearfield, that is, LR s/n 1426 deployed at 1328 m on mooring A1 (aka A1d), LR s/n 1429 deployed at 1442 m on mooring B1 (aka B1d), and LR s/n 1429 deployed at 1314 m on mooring A2 (aka A2d), show fewer of the effects of side-lobe reflections than did data from LR s/n 1426 deployed without a baffle at 1445 m on the HOME Survey BigBoy mooring. Probable side-lobe interactions are apparent in the beam correlations from these instruments, Figure 6, where slight modulation of the correlation (record average of the ensemble average over 4 beams) is observed in bins 2-4 for A1d, bins 3-4 for B1d, and bins 2-3 for A2d. Well-defined local minima are found in variance of both horizontal velocity components around the depths of the correlation signature for the B1d record (Figure 7c, centered on bin 3), but not the A1d or A2d records, although the mean of A2d north component velocity has a well defined local minimum at bin 2. In addition, a local minimum in vertical velocity is observed at all times of day in bin 2 for LR A1d (Figure 8a). Collectively, these results suggest side-lobe and other contamination of the A1d LR record in the first 2 bins (i.e. bin 3 is first good bin), contamination of the B1d LR record in the first 3 bins (i.e. bin 5 is the first good bin), and contamination of the A2d LR record in the first 3 bins (i.e. bin 4 is the first good bin).

As in many previous velocity records from near-bottom ADCPs, the A1d and B1d records show lower variance in the closest bins than in bins at greater distance from the bottom. While we expect velocity variance to decrease towards the bottom in the boundary layer, previous experience and as well as the correlation records here suggests that data from the first two bins are not reliable. In the mid-depth 300 kHz WH ADCP records, where there is no *a priori* expectation of lower water velocities at the depths of the nearest bins, the WH velocity records show lower horizontal velocity variance in the nearest two bins (A1s Figure 7b; B1s Figure 7d). In addition, temporal variability of vertical velocity in the closest two bins for each instrument differs from variability in higher bins, which is otherwise vertically coherent (A1s Figure 8b; B1s Figure 8d). Collectively, these results suggest contamination in bins 1-2 in the A1s WH record (i.e. bin 3 is the first good bin), and contamination of bins 1-2 in the B1s WH record (i.e. bin 3 is the first good bin). The shallow A2s LR record also has a dramatic decrease in velocity component means and std in the nearest 3 bins (Figure 7f), and rapid decrease in the signal amplitude and correlation over the first two bins, as is typical for all of these ADCPs (Figure 6b, bin 3 is the first good bin). We note that there is also a small decrease in A1s velocity component variances at the depths of bins 8-9 (depths 744 – 748 m, Figure 7b). It is not likely that this is due to reflection off elements of the mooring since there are no instruments on mooring A1 around the depths of these bins. The figures shown in Section II use data from bins beginning with the first good bins identified above (see also Table 2).

For almost all ADCP records, there is a significant depth range over which the velocity signal is "good" by some measures. In these cases, with the exception of the anomalous bins, usually – as described above – at close range or associated with side-lobe reflection from hard targets, the percentage of good pings per ensemble is high over a significant hunk of water. This is clear in Figure 7, where the velocity component means and std are computed over ensembles within several "% good pings per ensemble" categories (90-100%, 35-100%, and 0-100% = all good ensembles). Over the depth range where most ensembles have 90-100% good pings, the curves for the different % good classes overlap. As the number of ensembles with fewer % good pings increases, the curves diverge. For most ADCP records, there is a substantial region in which the curves overlap. The record from the B1s WH ADCP is notably different. The velocity component mean and std profiles for the three different % good categories diverge immediately beyond the range of the second good bin (bin #4). This suggests a high degree of unreliability in all of the B1s data with the exception of bins 3-4. Figure 10 also summarizes this difference with contours of the percentage of good pings per ensemble as a function of depth and the percentage of ensembles: for almost all of the instruments (with the exception of B1s) there is a broad region of depth (greater for the Long Rangers than for the Workhorses) in which nearly 100% of the ensembles have greater than 90% good pings.

Diurnal Variability in Signal Quality

The overall pattern of diurnal variability in the depth range over which acceptable acoustic signals are returned is: maximum range at 1800-0300 GMT (0800-1700 local time) and minimum range at 0400-1700 GMT (1800-0700 local time) for the deep instruments A1d, B1d, and A2d, but minimum range at 1800-0300 GMT and maximum range at 0400-1700

GMT for the shallow instrument A2s. For the deep instruments, the period of the reduction in range of good signal return (and therefore good velocities) is preceded by a period of large upward vertical velocity, and followed by a less intense period of downward velocity. For the shallow instrument, the period of increase in the range of good signal return is preceded by a period of large upward vertical velocity and followed by a period of large downward velocity. This suggests that the vertical region over which acceptable acoustic signals are returned is reduced following upward vertical migration of biological scatterers. The vertical motion is most intense during 1600-1800 local (0200-0400 GMT), i.e. just preceding sunset.

75 kHz Long Rangers (A1d, B1d, A2s, A2d). Plots of average ADCP diagnostics as a function of time of day (Figure 8) illustrate in greater detail the diurnal variability in the effective range of good quality velocity data shown in the depth/time plots of Section II. The four panels shown in Figure 8 are: (1) the percentage of pings per ensemble in which no velocity is available because the ADCP returned signal has been rejected due to low signal correlation in more than one beam (i.e., Percentage of Pings with No Solution – PPNS), (2) beam 1 correlation (BC), (3) return signal amplitude (i.e., RSSI in RDI nomenclature), and (4) vertical velocity (W), all as a function of depth and GMT hour of day. Hawai'i local time is GMT – 10 hours.

Consider first the diagnostics for the A1 75kHz Long Ranger ADCP (A1d, Figure 8a). At first order, below 1150 m the average PPNS is low at all times, and both BC and RSSI are high at all times; above 750 m PPNS is high at all times and both BC and RSSI are low at all times; between 750 m and 1150 m, these diagnostics vary diurnally with maximum (minimum) values in PPNS (BC and RSSI) between 0400 and 1600 GMT. In many cases, the value of these diagnostics change monotonically but rapidly with depth; in the A1d record there is a well-defined diurnal signal in the range at which this happens. In particular, record average BC and RSSI values decrease rapidly with increasing range, and as a consequence the record average of PPNS increases rapidly with increasing range. From 1900-0300 GMT (0900-1700 local time), PPNS is less than 5% at ranges closer than bin 73 (depths greater than 730 m). Starting at 0400 GMT (1800 local), there is a rapid decrease in the maximum range at which PPNS is less than 5% to bin 37 (depth of 1020 m). Defining PPNS=5% as the threshold for acceptable data, the maximum range of acceptable data then remains low until 1700 GMT (0700 local), at which point there is a rapid increase in the range to which the data is acceptable. Temporal variability in the range of significant correlation and amplitude correlates with variability in maximum range of acceptable data (Figure 8), thus defined. In addition, large upward vertical velocities are observed over most of the range of acceptable data in the two hours (0200-0400 GMT) preceding the rapid decrease in that maximum range. Extremes in the maximum range of acceptable data can be obtained from profiles through the depth/time-of-day diagnostics shown in Figure 8. Slices through these figures during the periods of worst (0800-1200 GMT) and best (2400 GMT) signal quality provide estimates of the range over which ADCP data can be regarded as reliable in worst and best cases (Figure 9). This first-order description is complicated by a local minimum (maximum) in the PPNS (BC) at the greater ranges of acceptable data (around 800 m) during the second half (1000-1600 GMT) of the low signal quality period.

Qualitatively similar diurnal patterns are observed in the deeper ADCPs on moorings B1 and A2 (B1d and A2d). In both the A1d and A2d records, PPNS rises to a maximum of about 20% during the 0400-1700 GMT low signal quality period, whereas the PPNS rises to much larger values in the B1d record. Using the criterion of PPNS = 5% as a threshold (Figure 9), the depths of maximum range for reliable deep 75kHz Long Ranger data at 0800-1200 GMT (2400 GMT) are approximately: 1020 m (730 m) for A1d, 1230 m (930 m) for B1d, 1050 m (730 m) for A2d. During the low signal quality period 0800-1200 GMT the A2d data has the added complexity of an additional region of high quality data in the depth range 730-870 m. Using a PPNS threshold of 10% would increase the ranges of the acceptable A1d and B1d data by less than 50m, but would almost entirely eliminate diurnal variability in the range of good A2d data (i.e. good data all the way to 730m for all times). Raising the threshold to 20% would similarly eliminate diurnal variability in the range of good A1d data, but would only increase the range of good B1d data by a few 10s of meters. The range bins corresponding to the far limit of acceptable data under the 5% PPNS thresholds at 0800-1200 GMT (2400 GMT) are: 37 (73) for A1d, 25 (63) for B1d, and 32 (72) for A2d. Under the best conditions, range from A1d deployed at 1328 m (73 bins) was 80m greater than from B1d deployed at 1442 m (63 bins). Estimates of the maximum range of acceptable data from the ADCPs can also be obtained from figure 10, which shows the percentage of ensembles at each range falling within several % good pings per ensemble classes. For example, a worst-case maximum range can be obtained using the PPNS = 10% threshold (i.e., in Figure 9, the class with 90-100% acceptable pings per ensemble), and requiring almost 100% of the ensembles to satisfy this criterion. In this case the depths (bin numbers) at maximum ranges are: 1100 m for A1d (bin 25), 1250 m B1d (bin 23), and 1130 m for A2d (bin 22). These patterns of diurnal variability are also apparent in slices through the beam correlation and beam amplitude (Figure 9).

The diurnal pattern of variability in the range of acceptable data for the shallow 75 kHz Long Range on mooring A2 (A2s) is roughly out of phase with the variations observed at A1d, B1d, and A2d. Specifically, the range of acceptable data, using the 10% PPNS threshold (to avoid an intermediate maximum, as above for A1d) is minimum at 2400 GMT and maximum at 0800-1200 GMT. Maximum range at 2400 GMT is out to bin 74 (depth 150 m) and at 0800-1200 GMT is to bin 48 (depth 360 m).

300 kHz Workhorses (A1s, B1s). The 300kHz Workhorse ADCPs mounted at the upper end of moorings A1 (A1s) and B1 (B1s) exhibited less pronounced diurnal variability in diagnostics than the deeper 75kHz Long Ranger ADCPs. The range of acceptable data for A1s was slightly greater (by approximately 10 m) at 2400 GMT than in the period 0800-1200 GMT, whereas B1s (which had a very short aperture of good data) showed almost no diurnal variability

Other ADCP Data Quality Issues

The A2s shallow 75 kHz Long Ranger ADCP sees the surface bounce of the A2d 75 kHz ADCP. This is due to the fact that the two instruments were set to ping at the same time. The problem arises early in the deployment when the clocks of each ADCP are still aligned. As the data record proceeds, the clocks come out of alignment and the reflected signal progresses downward, i.e. becomes apparent in lower bins, closer to A2s. The problem seems to have disappeared by day 344 of year 2002.

DATA REPORT CD

Notes on Additional Figures in the Data Report CD

This report was released with a companion CD that includes a pdf version of the printed report as well as additional figures that were not included in the printed report due to size constraints.

Additional figures in the data report CD present the velocity, temperature, and salinity data at larger temporal scales and in different formats. The CD also includes time series of ADCP diagnostics, and velocity plots for different cutoff values of data quality parameters. Dynamic links allow toggling between cotemporaneous plots of different variables on a mooring, plots of a single variable at different scales, and cotemporaneous plots of a single variable on different moorings (A1 and B1). A description of these plots and a guide to navigating through them is provided in a README file on the data CD.

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Table 1. Instrumentation on Moorings

A. A1 Mooring - 21° 44.99' N, 158° 45.50' W -- water depth 1337 m

Sensor	Serial #	Depth, m	Δt, min	Calibrations	Comments *
Microcat w/ p	1413	665	1	15-Jul-02	-33s
MTR	3095	681	4	Dec-02	173s
MTR	3113	697	4	Dec-02	120s
MTR	3094	713	4	Dec-02	119s
Seacat	51	729	4	22-May-02	97s
ADCP 300 kHz	1944	767	0.2	N/A	Drift Unknown
MTR	3084	811	4	Dec-02	146s
MTR	3099	891	4	Dec-02	130s
SBE39	269	971	1	21-May-02	18s
SBE39	878	987	1	24-Jun-02	14s
Seacat	43	1003	4	22-May-02	100s
SBE39	270	1019	1	21-May-02	16s
SBE39	875	1035	1	24-Jun-02	12s
MTR	3085	1067	4	Dec-02	Battery disconnected and data very gappy
Microcat	1816	1099	1	20-May-02	-12s
SBE39	876	1115	1	24-Jun-02	11s
SBE39	666	1131	1	22-May-02	13s
SBE39	664	1147	1	22-May-02	17s
Microcat	2374	1163	1	4-Jun-02	-63s
~~MTR~~	~~3086~~	~~1195~~	4	~~Dec-02~~	~~Dead on arrival~~
Microcat	43	1227	2	20-May-02	23s
SBE39	231	1243	1	21-May-02	22s
SBE39	665	1259	1	23-May-02	11s
SBE39	869	1275	1	24-Jun-02	15s
Microcat	2372	1291	1	3-Jun-02	-37s
ADCP Long Ranger	1426	1323	0.4	N/A	Drift Unknown
MTR	3079	1328	4	Dec-02	141s On Release

*Note: times shown are clock drift (reference – instrument) measured on instrument recovery

Table 1. Instrumentation on Moorings

B. B1 Mooring - 21° 48.00' N, 158° 27.80' W -- water depth 1456 m

Sensor	Serial #	Depth, m	Δt, min	Calibrations	Comments *
Seacat	41	784	4	22-May-02	105s
MTR	3098	800	4	Apr-96	129s
SBE39	88	816	1	22-May-02	7s
MTR	3073	832	4	Apr-96	124s
Seacat	40	848	4	22-May-02	101s
ADCP 300kHz	1969	886	0.2	N/A	Drift Unknown
MTR	3090	930	4	Apr-96	71s
MTR	3078	1010	4	Dec-02	Stopped in August
SBE39	168	1090	1	23-May-02	9s
SBE39	87	1106	1	23-May-02	-17s
Seacat	50	1122	4	22-May-02	112s
SBE39	263	1138	1	21-May-02	16s
SBE39	175	1154	1	22-May-02	11s
MTR	3010	1186	4	Dec-02	136s
Microcat	39	1218	2	20-May-02	
SBE39 w/ p	668	1234	1	24-May-02/ p 1-Mar-01	7s
SBE39	268	1250	1	21-May-02	25s
SBE39	235	1266	1	21-May-02	20s
Microcat	41	1282	2	20-May-02	-30s
MTR	3082	1314	4	Dec-02	65s
Microcat	42	1346	2	16-Mar-00	
SBE39	264	1362	1	21-May-02	22s
SBE39	265	1378	1	30-May-02	14s
SBE39	267	1394	1	21-May-02	23s
Microcat	1818	1410	1	20-May-02	-45s
ADCP Long Ranger	1429	1442	0.4	N/A	Drift Unknown
MTR	3088	1447	4	Dec-02	52s On Release

*Note: times shown are clock drift (reference – instrument) measured on instrument recovery

Table 1. Instrumentation on Moorings

C. A2 Mooring - 21° 45.14' N, 158° 45.42' W -- water depth 1333 m

Sensor	Serial #	Depth, m	Δt, min	Calibrations	Comments *
Seacat	40	667	8	22-May-02	210s
SBE39	268	675	2	21-May-02	61s
Seacat	1099	683	10		UH instrument
SBE39	878	691	2	24-Jun-02	32s
~~Microcat~~	~~404~~	~~699~~	~~10~~		~~UH instrument~~
SBE39	235	707	2	21-May-02	54s
Seacat	51	715	8	22-May-02	Drift not noted
ADCP Long Ranger	1426	749	16	N/A	36s
MTR	3090	803	8	Apr-96	288s
SBE39	263	883	2	21-May-02	34s
Seacat	43	963	8	22-May-02	230s
SBE39	264	979	2	21-May-02	47s
SBE39	231	995	2	21-May-02	49s
SBE39	269	1011	2	21-May-02	40s
SBE39	1076	1019	5		UH instrument
Seacat	50	1027	8	22-May-02	245s
SBE39	876	1059	2	24-Jun-02	30s
Microcat	1413	1091	4	15-Jul-02	-74s With Pressure
SBE39	270	1107	2	21-May-02	37s
SBE39	265	1123	2	30-May-02	29s
SBE39	267	1139	2	21-May-02	51s
SBE39	1077	1147	5		UH instrument
Seacat	41	1155	8	22-May-02	259s
SBE39	168	1187	2	23-May-02	34s
Microcat	2374	1219	4	4-Jun-02	-104s
SBE39	875	1235	2	24-Jun-02	31s
SBE39	869	1251	2	24-Jun-02	90s
SBE39	175	1267	2	22-May-02	36s
SBE39	1078	1275	5		UH instrument
Microcat	2372	1283	4	3-Jun-02	-81s
ADCP Long Ranger	1429	1317	16	N/A	24s
MTR	3073	1318	8	Apr-96	309s On Baffle
MTR	3098	1323	8	Apr-96	332s On Release

*Note: times shown are clock drift (reference – instrument) over duration of the experiment

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

A. A1 Mooring - 21° 44.99' N, 158° 45.50' W -- water depth 1337 m

Long Ranger ADCP (A1d)

Parameter	Value	Comment
Manufacturer	RDI, Inc.	Long Ranger; Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1426 / 16.05	
Frequency / Configuration	76.8 kHz / 4 beam, Janus	
Beam Angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt 1, Tilt 2,	Temperature, Pressure
Pressure Sensor Coefficients	0.00,-0.00,0.50,-18.58	=(c3,c2,c1,offset)
Temp Sensor Offset	-0.20 C	
Power	High	Command – CQ 255
Mode	Wide	Command – WB 0
Number of Bins	80	Command – WN 080
Bin Size (cm)	800	Command – WS 0800
Number of pings / ensemble	20	Command – WP 00020
Time between pings	24 sec	Command – TP 00:24.00 (Set by PLAN)
Ensemble interval	8 min	Command – TE 00:08:00.00
Time of first ping (first ensemble)	02/08/11, 20:56:00	Command – TF 02/08/11,20:56:00
Salinity (PSU)	35	Command – ES 35
Depth (m)	1336	Command – ED 13360
Data out	Vel Cor Amp PG	Command – WD 111100000
Blank transmit (cm)	704	Command – WF 0704
Ambiguity velocity (cm/s radial)	170	Command – WV 170 (Mode 1 Ambiguity)
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,S,T	Command – EZ 1111111
Flow Control	EnsCyc PngCyc Binry Rec	Command – CF 11101
Raw Data: Last Ensemble	02/11/11, 20:32:00	16558 ensembles, 91 days 23:44:00
Final Data: Good Bins	First: 4	
Final Data: Good Ensembles	First: 02/08/13, 22:40:00	Last: 02/11/11, 17:52:00 (16165 ensembles)
Energy Used	RDI Plan est.: 1472 Whr	duration: 91.99 days; temperature: 3 °C

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

A. A1 Mooring - 21° 44.99' N, 158° 45.50' W -- water depth 1337 m (continued)

300 kHz Workhorse ADCP (A1s)

Parameter	**Value**	**Comment**
Manufacturer	RDI, Inc.	Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1944 / 16.12	
Frequency / Configuration	307.2 kHz / 4 beam, Janus	
Beam angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt1, Tilt2,	Temperature
Temp Sensor Offset	-0.24 C	
Mode	Narrow	Command – WB 1
Number of Bins	50	Command – WN 050
Bin Size (cm)	400	Command – WS 0400
Number of pings / ensemble	40	Command – WP 00040
Time between ping	12 sec	Command – TP 00:12.00 (Set by PLAN)
Ensemble interval	8 min	Command – TE 00:08:00.00
Time of first ping (first ensemble)	02/08/11, 12:56:00	Command – TF 02/08/11,12:56:00
Salinity (PSU)	35	Command – ES 35
Depth (m)	780	Command – ED 07800
Data out	Vel Cor Amp PG	Command – WD 111100000
Blank transmit (cm)	176	Command – WF 0176
Ambiguity velocity (cm/s radial)	170	Command – WV 170 (Mode 1 Ambiguity)
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,S,T	Command – EZ 1111111
Raw Data: Last Ensemble	02/11/11, 22:24:00	16632 ensembles, 92 days 09:36:00
Final Data: Good Bins	First: 3	
Final Data: Good Ensembles	First: 02/08/13, 22:40:00	Last: 02/11/11, 17:52:00 (16165 ensembles)
Energy Used	RDI Plan est.: 370 Whr	duration: 92.40 days; temperature: 5 °C

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

B. B1 Mooring - 21° 48.00' N, 158° 27.80' W -- water depth 1456 m

Long Ranger ADCP (B1d)

Parameter	Value	Comment
Manufacturer	RDI, Inc.	Long Ranger; Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1429 / 16.05	
Frequency / Configuration	76.8 kHz / 4 beam, Janus	
Beam Angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt 1, Tilt 2,	Temperature, Pressure
Pressure Sensor Coefficients	0.00,-0.00,0.53,-24.11	=(c3,c2,c1,offset)
Temp Sensor Offset	-0.24 C	
Power	High	Command – CQ 255
Mode	Wide	Command – WB 0
Number of Bins	80	Command – WN 080
Bin Size (cm)	800	Command – WS 0800
Number of pings / ensemble	20	Command – WP 00020
Time between pings	24 sec	Command – TP 00:24.00 (Set by PLAN)
Ensemble interval	8 min	Command – TE 00:08:00.00
Time of first ping (first ensemble)	02/08/11, 20:56:00	Command – TF 02/08/11,20:56:00
Salinity (PSU)	35	Command – ES 35
Depth (m)	1436	Command – ED 14360
Data out	Vel Cor Amp PG	Command – WD 111100000
Blank transmit (cm)	704	Command – WF 0704
Ambiguity velocity (cm/s radial)	170	Command – WV 170 (Mode 1 Ambiguity)
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,S,T	Command – EZ 1111111
Raw Data: Last Ensemble	02/11/10, 05:12:00	16263 ensembles, 90 days 08:24:00
Final Data: Good Bins	First: 5	
Final Data: Good Ensembles	First: 02/08/13, 05:28:00	Last: 02/11/10, 00:56:00 (15987 ensembles)
Energy Used	RDI Plan est.: 1444 Whr	duration: 90.35 days; temperature: 3 °C

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

B. B1 Mooring - 21° 48.00' N, 158° 27.80' W -- water depth 1456 m (continued)

Workhorse ADCP (B1s)

Parameter	Value	Comment
Manufacturer	RDI, Inc.	Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1969 / 16.12	
Frequency / Configuration	307.2 kHz / 4 beam, Janus	
Beam Angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt1, Tilt2,	Temperature
Temp Sensor Offset	-0.22 degrees C	
Mode	Narrow	Command – WB 1
Number of Bins	50	Command – WN 050
Bin Size (cm)	400	Command – WS 0400
Number of pings / ensemble	40	Command – WP 00040
Time between ping	12 sec	Command – TP 00:12.00 (Set by PLAN)
Ensemble interval	8 min	Command – TE 00:08:00.00
Time of first ping	02/08/11, 12:56:00	Command – TF 02/08/11,12:56:00
Salinity (PSU)	35	Command – ES 35
Depth (m)	880	Command – ED 08800
Data out	Vel Cor Amp PG	Command – WD 111100000
Blank transmit (cm)	176	Command – WF 0176
Ambiguity velocity (cm/s radial)	170	Command – WV 170 (Mode 1 Ambiguity)
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,S,T	Command – EZ 1111111
Raw Data: Last Ensemble	02/11/10, 16:40:00	16409 ensembles, 91 days 03:52:00
Final Data: Good Bins	First: 3	Last: 4
Final Data: Good Ensembles	First: 02/08/13, 05:28:00.2	Last: 02/11/10, 00:56:00.1 (15987 ensembles)
Energy Used	RDI Plan est.: 365 Whr	Duration: 91.16 days; temperture 5 °C

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

C. A2 Mooring - 21° 45.14' N, 158° 45.42' W -- water depth 1333 m

LongRanger ADCP (A2d)

Parameter	Value	Comment
Manufacturer	RDI, Inc.	Long Ranger; Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1429 / 16.05	
Frequency / Configuration	76.8 kHz / 4 beam, Janus	
Beam Angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt 1, Tilt 2,	Temperature, Pressure
Pressure Sensor Coefficients	0.00,-0.00,0.53,-24.11	=(c3,c2,c1,offset)
Temp Sensor Offset	-0.24 C	
Power	High	Command – CQ 255
Mode	Wide	Command – WB 0
Number of Bins	75	Command – WN 075
Bin Size (cm)	800	Command – WS 0800
Number of pings / ensemble	16	Command – WP 00016
Time between ping	1 min	Command – TP 01:00.00 (Set by PLAN)
Ensemble interval	16 min	Command – TE 00:16:00.00
Time of first ping	02/11/14, 21:52:00	Command – TF 02/11/14,21:52:00
Salinity (PSU)	35	Command – ES 35
Depth (m)	1400	Command – ED 14000
Data out	Vel, Cor, Amp, PG	Command – WD 111 100 000
Blank transmit (cm)	704	Command – WF 0704
Ambiguity velocity (cm/s radial)	170	Command – WV 170 ; Mode 1 Ambiguity
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,T	Command – EZ 1111111
Raw Data: Last Ensemble	03/05/16, 14:24:00	16443 ensembles, 182 days 16:48:00
Final Data: Good Bins	First: 4	
Final Data: Good Ensembles	First: 02/11/16, 02:39:59.9	Last: 03/05/16, 14:24:00.0 (16335 ensembles)
Energy Used	RDI Plan est.: 1161 Whr	duration: 182.70 days; temperature: 3 °C

Table 2. Sampling Parameters for Acoustic Doppler Current Profilers

C. A2 Mooring - 21° 45.14' N, 158° 45.42' W -- water depth 1333 m (continued)

LongRanger ADCP (A2s)

Parameter	Value	Comment
Manufacturer	RDI, Inc.	Long Ranger; Purchased by Levine / Boyd
Model / Serial no. / CPU firmware	Workhorse / 1426 / 16.05	
Frequency / Configuration	76.8 kHz / 4 beam, Janus	
Beam Angle, Pattern / Orientation	20 degrees, Convex / Up	
Sensors	Heading, Tilt 1, Tilt 2,	Temperature, Pressure
Pressure Sensor Coefficients	0.00,-0.00,0.50,-18.58	=(c3,c2,c1,offset)
Temp Sensor Offset	-0.20 C	
Power	High	Command – CQ 255
Mode	Wide	Command – WB 0
Number of Bins	75	Command – WN 075
Bin Size (cm)	800	Command – WS 0800
Number of pings / ensemble	16	Command – WP 00016
Time between ping	1 min	Command – TP 01:00.00 (Set by PLAN)
Ensemble interval	16 min	Command – TE 00:16:00.00
Time of first ping	02/11/14, 21:52:00	Command – TF 02/11/14,21:52:00
Salinity (PSU)	35	Command – ES 35
Transducer Depth (m)	750	Command – ED 07500
Data out	Vel, Cor, Amp, PG	Command – WD 111 100 000
Blank transmit (cm)	704	Command – WF 0704
Ambiguity velocity (cm/s radial)	170	Command – WV 170 (Mode 1 Ambiguity)
Heading Align (1/100 deg)	+00000	Command – EA 00000
Heading Bias (1/100 deg)	+00000	Command – EB 00000
Coordinate Transform	Earth,Tilt,3Bm,BinMap	Command – EX 11111
Sensor Source	C,D,H,P,R,S,T	Command – EZ 1111111
Raw Data: Last Ensemble	03/06/13, 07:28:00	18937 ensembles, 210 days 09:52:00
Final Data: Good Bins	First: 3	
Final Data: Good Ensembles	First: 02/11/16, 02:39:59.9	Last: 03/06/11, 22:07:59.8 (18704 ensembles)
Energy Used	RDI Plan est.: 1338 Whr	duration: 210.41 days; temperature: 5 °C

Table 3. CTD Log

A. Nearfield Deployment on RV *Wecoma* (W0208B)

Cast #	Time, UTC	Date, UTC	Latitude, N	Longitude,W	Station
1	0438	12 Aug 2002	21° 20.98'	158° 20.99'	DW
2	0724	14 Aug 2002	21° 34.98'	158° 39.98'	D1
3	0900	"	21° 34.98'	158° 39.98'	D1
4	1028	"	21° 34.99'	158° 40.00'	D1
5	1159	"	21° 34.98'	158° 40.00'	D1
6	1328	"	21° 34.98'	158° 39.99'	D1
7	1504	"	21° 34.98'	158° 39.99'	D1
8	1641	"	21° 34.99'	158° 39.99'	D1
9	1818	"	21° 34.98'	158° 39.99'	D1
10	0729	15 Aug 2002	21° 33.38'	158° 42.29'	CD
11	0914	"	21° 33.39'	158° 42.29'	CD
12	1033	'	21° 33.37'	158° 42.29'	CD
13	1144	"	21° 33.39'	158° 42.29'	CD
14	1250	"	21° 33.38'	158° 42.30'	CD
15	1350	"	21° 33.38'	158° 42.30'	CD
16	1452	"	21° 33.38'	158° 42.29'	CD
17	1905	16 Aug 2002	21° 23.99'	158° 50.00'	CC
18	2204	"	21° 23.99'	158° 50.00'	CC
19	0058	17 Aug 2002	21° 23.99'	158° 50.00'	CC
20	0656	"	21° 23.97'	158° 50.00'	CC
21	0951	"	21° 24.00'	158° 50.00'	CC
22	1248	"	21° 24.02'	158° 49.97'	CC
23	1552	"	21° 23.99'	158° 49.99'	CC
24	0344	18 Aug 2002	21° 51.00'	158° 25.99'	BS
25	0510	"	21° 51.00'	158° 26.01'	BS
26	0636	"	21° 50.99'	158° 26.01'	BS
27	0807	"	21° 50.99'	158° 26.00'	BS

B. Nearfield Turn-Around on RV *Wecoma* (W0211A)

Cast #	Time, UTC	Date, UTC	Latitude, N	Longitude,W	Station
1	0155	11 Nov 2002	21° 23.45'	158° 50.93'	C1
2	0136	12 Nov 2002	21° 45.00'	158° 45.53'	A1
3	0429	"	21° 48.03'	158° 27.75'	B1
4	0127	13 Nov 2002	21° 07.12'	158° 09.76'	Calib / OSU
5	0804	"	21° 07.12'	158° 09.76'	Calib / UH
6	0124	15 Nov 2002	21° 52.02'	158° 24.40'	D2
7	0417	"	21° 55.97'	158° 20.00'	D2b

Table 3. CTD Log

C. Nearfield Recovery on RV *Revelle*

Cast #	Time, UTC	Date, UTC	Latitude, N	Longitude,W	Station
1	1037	11 June 2003	21° 44.44’	158° 45.43’	A2
2	1209	“	21° 44.45’	158° 45.42’	A2
3	1315	“	21° 44.44’	158° 45.42’	A2
4	1419	“	21° 44.47’	158° 45.43’	A2
5	1527	“	21° 44.46’	158° 45.43’	A2
6	1538	“	21° 44.48’	158° 45.43’	A2
7	1744	“	21° 44.44’	158° 45.42’	A2
8	1848	“	21° 44.44’	158° 45.42’	A2
9	1956	“	21° 44.44’	158° 45.42’	A2
10	2102	“	21° 44.44’	158° 45.42’	A2
11	0802	13 June 2003	21° 52.08’	158° 24.72’	D2
12	0948	“	21° 52.08’	158° 24.72’	D2
13	1033	“	21° 52.08’	158° 24.72’	D2
14	1212	“	21° 52.08’	158° 24.72’	D2
15	1347	“	21° 52.08’	158° 24.72’	D2
16	1528	“	21° 52.08’	158° 24.72’	D2
17	1700	“	21° 52.08’	158° 24.72’	D2
18	2238	“	21° 52.00’	158° 25.00’	D2
19	0301	14 June 2003	21° 34.97’	158° 40.00’	C2/yoyo
20	0954	“	21° 34.96’	158° 40.00’	C2
~~21~~	~~1347~~	~~“~~	~~21° 34.96’~~	~~158° 40.00’~~	C2/No data
22	1558	“	21° 34.96’	158° 40.00’	C2
23	2134	“	21° 34.97’	158° 39.99’	C2/Calib
24	0044	15 June 2003	21° 34.97’	158° 40.00’	C2/Calib

Updated depths using ADCP pressure calibrated and neglect #1413 p as bad										
A1	28-Jun-04		Water =	1337						
Dist over bottom	Instrument	Bin	**Dist over transducer**	**Depth**	**V**	T,C	T	**Dist over wire rope**		**Sensor #**
0	Anchor bottom - 2 wheel		-14	1337						
	Chain (3/8") (2m)		-9.5							
	Nylon (5m)									
	Chain (3/8") (1m)									
9	Release point, T - MTR		-5	1328			1		**MTR**	3079
11.8	Glass (2) w/chain		-2.5							
14	ADCP transducer		0	1323						1426
22	8m-- Chain, baffle- top		8					**0**		
	wire rope (540m)									
30		1	16	1307	1			8		
46	T,C - Microcat	3	32	1291	1	1		**24**	**T,C - MIcrocat**	2372
62	T - SBE39	5	48	1275	1		1	**40**	**T - SBE39**	869
78	T - SBE39	7	64	1259	1		1	**56**	**T - SBE39**	665
94	T - SBE39	9	80	1243	1		1	**72**	**T - SBE39**	231
110	T,C - Microcat	11	96	1227	1	1		**88**	**T,C - Microcat**	43
126		13	112	1211	1			104		
142	T - MTR	15	128	1195	1		1	**120**	**T - MTR**	3086
158		17	144	1179	1			136		
174	T,C - Microcat	19	160	1163	1	1		**152**	**T,C - MIcrocat**	2374
190	T - SBE39	21	176	1147	1		1	**168**	**T - SBE39**	664
206	T - SBE39	23	192	1131	1		1	**184**	**T - SBE39**	666
222	T - SBE39	25	208	1115	1		1	**200**	**T - SBE39**	876
238	T,C - Microcat	27	224	1099	1	1		**216**	**T,C - MIcrocat**	1816
254		29	240	1083	1			232		
270	T - MTR	31	256	1067	1		1	**248**	**T - MTR**	3085
286		33	272	1051	1			264		
302	T - SBE39	35	288	1035	1		1	**280**	**T - SBE39**	875
318	T - SBE39	37	304	1019	1		1	**296**	**T - SBE39**	270
334	T,C - Seacat	39	320	1003	1	1		**312**	**T,C - Seacat**	43
350	T - SBE39	41	336	987	1		1	**328**	**T - SBE39**	878
366	T - SBE39	43	352	971	1		1	**344**	**T - SBE39**	269
382		45	368	955	1			360		
398		47	384	939	1			376		
414		49	400	923	1			392		
430		51	416	907	1			408		
446	T - MTR	53	432	891	1		1	**424**	**T - MTR**	3099
462		55	448	875	1			440		
478		57	464	859	1			456		
494		59	480	843	1			472		
510		61	496	827	1			488		
526	T - MTR	63	512	811	1		1	**504**	**T - MTR**	3084
542		65	528	795	1			520		
562	End of Wire			775						

	Glass (2) w/chain									
	Glass (2) w/chain		**Dist over**					**Dist over**		
	Glass (2) w/chain		**transducer**					**wire rope**		**Sensor #**
568	End of Glass			769						
570	300 kHz ADCP transducer		0	767						
574	Baffle, chain -- top							**0**		
	wire rope (152m)									
576	First bin at 6m	1	6	761	1			2		
608	T,C - Seacat	9	38	729	1	1		**34**	**T,C - Seacat**	51
624	T - MTR	13	54	713	1		1	**50**	**T - MTR**	3094
640	T - MTR	17	70	697	1		1	**66**	**T - MTR**	3113
656	T - MTR	21	86	681	1		1	**82**	**T - MTR**	3095
672	T,C - Microcat w/p	25	102	665	1	1		**98**	**T,C - Microcat w**	1413
726	End of Wire		156	611	1					
729	S+M+S			608						
	Glass (2) w/chain									
731	S+M+S			606		Tot	Tot			
	Glass (2) w/chain					T,C	T only			
733	S+M+S			604		7	18			
	Glass (2) w/chain									
735	S+M+S			602						
	Glass (2) w/chain									
737	S+M+S			600						
	Glass (2) w/chain									
739	S+M+S			598						
	Glass (2) w/chain									
741	S+M+S			596						
	Glass (2) w/chain									
743	S+M+S			594						
	Glass (2) w/chain									
745	S+M+S			592						
	Glass (2) w/chain									
total balls	26									

Updated water depth										
B1	28-Jun-04		Water =	1456						
Dist ove	Instrument	Bin	**Dist over**	**Depth**	**V**	T,C	T	**Dist over**		
bottom			**transducer**					**wire rope**		**Sensor #**
0	Anchor bottom - 2 wheel		-14	1456						
	Chain (3/8") (2m)		-9.5							
	Nylon (5m)									
	Chain (3/8") (1m)									
9	Release point, T - MTR		-5	1447			1		**MTR**	3088
11.8	Glass (2) w/chain		-2.5							
14	ADCP transducer		0	1442						1429
22	8m-- Chain, baffle- top		8					**0**		
	wire rope (540m)									
30		1	16	1426	1			8		
46	T,C - Microcat	3	32	1410	1	1		**24**	**T,C - Microcat**	1818
62	T - SBE39	5	48	1394	1		1	**40**	**T - SBE39**	267
78	T - SBE39	7	64	1378	1		1	**56**	**T - SBE39**	265
94	T - SBE39	9	80	1362	1		1	**72**	**T - SBE39**	264
110	T,C - Microcat	11	96	1346	1	1		**88**	**T,C - Microcat**	42
126		13	112	1330	1			104		
142	T - MTR	15	128	1314	1		1	**120**	**T - MTR**	3082
158		17	144	1298	1			136		
174	T,C - Microcat	19	160	1282	1	1		**152**	**T,C - Microcat**	41
190	T - SBE39	21	176	1266	1		1	**168**	**T - SBE39**	235
206	T - SBE39	23	192	1250	1		1	**184**	**T - SBE39**	268
222	T - SBE39	25	208	1234	1		1	**200**	**T - SBE39**	668
238	T,C - Microcat	27	224	1218	1	1		**216**	**T,C - Microcat**	39
254		29	240	1202	1			232		
270	T - MTR	31	256	1186	1		1	**248**	**T - MTR**	3010
286		33	272	1170	1			264		
302	T - SBE39	35	288	1154	1		1	**280**	**T - SBE39**	175
318	T - SBE39	37	304	1138	1		1	**296**	**T - SBE39**	263
334	T,C - Seacat	39	320	1122	1	1		**312**	**T,C - Seacat**	50
350	T - SBE39	41	336	1106	1		1	**328**	**T - SBE39**	87
366	T - SBE39	43	352	1090	1		1	**344**	**T - SBE39**	168
382		45	368	1074	1			360		
398		47	384	1058	1			376		
414		49	400	1042	1			392		
430		51	416	1026	1			408		
446	T - MTR	53	432	1010	1		1	**424**	**T - MTR**	3078
462		55	448	994	1			440		
478		57	464	978	1			456		
494		59	480	962	1			472		
510		61	496	946	1			488		
526	T - MTR	63	512	930	1		1	**504**	**T - MTR**	3090
542		65	528	914	1			520		
562	End of Wire			894						

	Glass (2) w/chain									
	Glass (2) w/chain		**Dist over**					**Dist over**		
	Glass (2) w/chain		**transducer**					**wire rope**		**Sensor #**
568	End of Glass			888						
570	300 kHz ADCP transducer		0	886						
574	Baffle, chain -- top							**0**		
	wire rope (152m)									
576	First bin at 6m	1	6	880	1			**2**		
608	T,C - Seacat	9	38	848	1	1		**34**	**T,C - Seacat**	40
624	T - MTR	13	54	832	1		1	**50**	**T - MTR**	3073
640	T - SBE39	17	70	816	1		1	**66**	**T - SBE39**	88
656	T - MTR	21	86	800	1		1	**82**	**T - MTR**	3098
672	T,C - Seacat	25	102	784	1	1		**98**	**T,C - Seacat**	41
726	End of Wire		156	730	1					
729	S+M+S			727						
	Glass (2) w/chain									
731	S+M+S			725		Tot	Tot			
	Glass (2) w/chain					T,C	T only			
733	S+M+S			723		7	18			
	Glass (2) w/chain									
735	S+M+S			721						
	Glass (2) w/chain									
737	S+M+S			719						
	Glass (2) w/chain									
739	S+M+S			717						
	Glass (2) w/chain									
741	S+M+S			715						
	Glass (2) w/chain									
743	S+M+S			713						
	Glass (2) w/chain									
745	S+M+S			711						
	Glass (2) w/chain									
total bal	26									

A2 Mooring as determined by D. Luther

```
Table output by designmooring.m.
Mooring design last modified 2004-05-24 11:45:57

Water Depth 1332.8 metres

################### Inventory of Element Types in this Mooring #################

2 - "Benthos866A"                          <wt, dims from 865A manual>
1 - "2 RR wheel stack"                     <2 railroad wheels+331b seahook>
2 - "75kHz ADCP-neb"                       <RDI Longranger in cage, no external battery
case>
1 - "300kHz ADCP"                          <300 kHz ADCP in cage--weight approx>
22 - "17" glass ball"                      <17" diameter includes hardhat>
1 - "49" float"                            <buoyancy approx.>
6 - "SBE16 T/C Al"                         <Aluminum-case SBE-16>
3 - "SBE16 T/C Ti"                         <Titanium-case SBE-16>
7 - "SBE37 T/C/P1000"                      <SBE-37, max depth 1000 m--Colosi's>
4 - "SBE37 T/C"
18 - "SBE39 T"
2 - "acoustic baffle"                      <weight approx.>
1 - "CML"                                  <Seimac Mooring Locator>
3 - "MTR"                                  <wt, dims, approx.>
27 - "5/8" Master Link"
4 - "1/2" swivel"
59 - "1/2" anchor shac"                    <1/2" safety anchor shackle (SAS)>
8 - "5/8" anchor shac"                     <5/8" anchor shackle >
1 - "5.5x7/8 ring"                      <5-1/2" dia. x 7/8" weldless ring (Crosby S643)>
1 - "5/8S+5/8ML+5/8S"
1 - 1.0 m shot of "1/2" LL chain"
3 - 2.0 m shot of "1/2" LL chain"
1 - 8.0 m shot of "1/2" LL chain"
12 - 2.0 m shot of "3/8" SL chain"
1 - 8.0 m shot of "1/2" SL chain"
1 - 0.1 m shot of "doubled1/2chain"        <1/2" LL chain doubled>
1 - 1.0 m shot of "doubled3/8chain"        <3/8" SL chain doubled>
6 - 104.0 m shot of "1/4" JWR"             <1/4" jacketed wire rope--5/16" OD>
1 - 540.0 m shot of "1/4" JWR"             <1/4" jacketed wire rope--5/16" OD>
1 - 5.0 m shot of "3/4" Nylon"


################# Compound Element Types and their Constituents #################

(N.B., constituent elements included in inventory above)

1 - "2Benthos866A"  <wt, dims, from 865A manual>
             1) Benthos866A
             2) Benthos866A
1 - "double5/8shack"        <Two 5/8" anchor shackles in parallel>
             1) 5/8" anchor shac
             2) 5/8" anchor shac
2 - "double1/2shack"        <Two 1/2" anchor shackles in parallel>
             1) 1/2" anchor shac
             2) 1/2" anchor shac
23 - "1/2S+5/8ML+1/2S"
             1) 1/2" anchor shac
             2) 5/8" Master Link
             3) 1/2" anchor shac


############################## Summary of Mooring ##############################

Depth in metres;
SN is serial number;

Depth      Name                                   SN                Comments
```

99.5 m - 49" float		
99.9 m - 300kHz ADCP	2903	
99.9 m - CML	?	<OSU's>
100.2 m - 1/2S+5/8ML+1/2S		<Orig, just a 5/8" SAS>
100.4 m - begin 2.00 m of 1/2" LL chain		
102.4 m - 1/2" anchor shac		
102.5 m - begin 104.00 m of 1/4" JWR	spool B2-2	<unmarked>
206.5 m - 1/2S+5/8ML+1/2S		
206.7 m - begin 104.00 m of 1/4" JWR	spool B2-1	<8m markings>
214.7 m - SBE37 T/C/P1000	1771	<1st mark--Colosi>
222.7 m - SBE37 T/C	2428	<2nd mark--UH>
310.7 m - 1/2S+5/8ML+1/2S		
311.0 m - begin 2.00 m of 3/8" SL chain		
311.7 m - 17" glass ball		
312.3 m - 17" glass ball		
313.0 m - 1/2S+5/8ML+1/2S		
313.2 m - begin 2.00 m of 3/8" SL chain		
313.9 m - 17" glass ball		
314.6 m - 17" glass ball		
315.2 m - 1/2S+5/8ML+1/2S		
315.5 m - begin 2.00 m of 3/8" SL chain		
316.2 m - 17" glass ball		
316.8 m - 17" glass ball		
317.5 m - 1/2S+5/8ML+1/2S		
317.7 m - begin 2.00 m of 3/8" SL chain		
318.4 m - 17" glass ball		
319.1 m - 17" glass ball		
319.7 m - 1/2S+5/8ML+1/2S		
320.0 m - begin 2.00 m of 3/8" SL chain		
320.6 m - 17" glass ball		
321.3 m - 17" glass ball		
322.0 m - 1/2S+5/8ML+1/2S		<Orig, ML&2nd SAS below swivel>
322.2 m - 1/2" swivel		
322.4 m - 1/2" anchor shac		
322.4 m - begin 104.00 m of 1/4" JWR	spool B2-1	<8m markings>
354.4 m - SBE37 T/C/P1000	0401	<4th mark--Colosi>
362.4 m - SBE16 T/C Al	0800	<5th mark--Lukas>
370.4 m - SBE37 T/C/P1000	0400	<6th mark--Colosi>
426.4 m - 1/2S+5/8ML+1/2S		
426.7 m - begin 104.00 m of 1/4" JWR	spool D-1	<8m markings>
458.7 m - SBE37 T/C/P1000	0397	<4th mark--Colosi>
466.7 m - SBE16 T/C Ti	1087	<5th mark--Lukas>
474.7 m - SBE37 T/C	2429	<6th mark--UH>
482.7 m - SBE37 T/C/P1000	0406	<7th mark--Colosi>
490.7 m - SBE16 T/C Ti	1090	<8th mark--Lukas>
530.7 m - 1/2S+5/8ML+1/2S		
530.9 m - begin 104.00 m of 1/4" JWR	spool B2-2	<unmarked>
634.9 m - 1/2S+5/8ML+1/2S		
635.2 m - begin 104.00 m of 1/4" JWR	spool D-1	<8m markings>
667.2 m - SBE16 T/C Al	0040	<4th mark--OSU>
675.2 m - SBE39 T	0268	<5th mark--OSU>
683.2 m - SBE16 T/C Ti	1099	<6th mark--Lukas>
691.2 m - SBE39 T	0878	<7th mark--OSU>
699.2 m - SBE37 T/C/P1000	0404	<8th mark--Colosi>
707.2 m - SBE39 T	0235	<9th mark--OSU>
715.2 m - SBE16 T/C Al	0051	<10th mark--OSU>
739.2 m - 1/2" anchor shac		
739.3 m - 5/8" Master Link		
739.4 m - 5/8" anchor shac		
739.5 m - acoustic baffle		
740.2 m - 1/2S+5/8ML+1/2S		
740.4 m - begin 8.00 m of 1/2" LL chain		
748.4 m - 1/2" anchor shac		
748.5 m - 5/8" Master Link		
748.6 m - 5/8" anchor shac		
748.7 m - 75kHz ADCP-neb	1426	<OSU; T&P sensors>

750.8 m - 5/8" anchor shac
750.9 m - 5/8" Master Link
751.0 m - 1/2" anchor shac
751.1 m - 1/2" swivel
751.3 m - 1/2" anchor shac
751.3 m - begin 2.00 m of 1/2" LL chain
753.3 m - 1/2S+5/8ML+1/2S
753.6 m - begin 2.00 m of 3/8" SL chain
754.3 m - 17" glass ball
754.9 m - 17" glass ball
755.6 m - 1/2S+5/8ML+1/2S
755.8 m - begin 2.00 m of 3/8" SL chain
756.5 m - 17" glass ball
757.2 m - 17" glass ball
757.8 m - 1/2S+5/8ML+1/2S
758.1 m - begin 2.00 m of 3/8" SL chain
758.7 m - 17" glass ball
759.4 m - 17" glass ball
760.1 m - 1/2S+5/8ML+1/2S
760.3 m - begin 2.00 m of 3/8" SL chain
761.0 m - 17" glass ball
761.7 m - 17" glass ball
762.3 m - 1/2S+5/8ML+1/2S
762.6 m - begin 2.00 m of 3/8" SL chain
763.2 m - 17" glass ball
763.9 m - 17" glass ball
764.6 m - 1/2S+5/8ML+1/2S
764.8 m - begin 2.00 m of 3/8" SL chain
765.5 m - 17" glass ball
766.2 m - 17" glass ball
766.8 m - 1/2S+5/8ML+1/2S
767.1 m - 1/2" swivel
767.2 m - 1/2" anchor shac <Orig, ML&2nd SAS here.>
767.3 m - begin 540.00 m of 1/4" JWR <Mooring A1's shot>
803.3 m - MTR 3090 <OSU>
883.3 m - SBE39 T 0263 <OSU>
963.3 m - SBE16 T/C Al 0043 <OSU>
979.3 m - SBE39 T 0264 <OSU>
995.3 m - SBE39 T 0231 <OSU>
1011.3 m - SBE39 T 0269 <OSU>
1019.3 m - SBE39 T 1076 <UH>
1027.3 m - SBE16 T/C Al 0050 <OSU>
1059.3 m - SBE39 T 0876 <OSU>
1091.3 m - SBE37 T/C/P1000 1413 <OSU>
1107.3 m - SBE39 T 0270 <OSU>
1123.3 m - SBE39 T 0265 <OSU>
1139.3 m - SBE39 T 0267 <OSU>
1147.3 m - SBE39 T 1077 <UH>
1155.3 m - SBE16 T/C Al 0041 <OSU>
1187.3 m - SBE39 T 0168 <OSU>
1219.3 m - SBE37 T/C 2374 <OSU>
1235.3 m - SBE39 T 0875 <OSU>
1251.3 m - SBE39 T 0869 <OSU>
1267.3 m - SBE39 T 0175 <OSU>
1275.3 m - SBE39 T 1078 <UH>
1283.3 m - SBE37 T/C 2372 <OSU>
1307.3 m - 1/2S+5/8ML+1/2S
1307.5 m - acoustic baffle
1308.2 m - 1/2S+5/8ML+1/2S
1308.5 m - begin 8.00 m of 1/2" SL chain
1316.5 m - 1/2S+5/8ML+1/2S <Orig, 5/8" attached to ADCP>
1316.7 m - 75kHz ADCP-neb 1429
1317.8 m - MTR 3073
1318.8 m - 1/2S+5/8ML+1/2S <Orig, 5/8" attached to ADCP>
1319.1 m - 1/2" swivel
1319.2 m - 1/2" anchor shac
1319.3 m - begin 2.00 m of 3/8" SL chain

```
1321.3 m - 1/2" anchor shac
1321.4 m - 5/8" Master Link
1321.5 m - double1/2shack
1321.6 m - begin   1.00 m of doubled3/8chain
1322.6 m - double1/2shack
1322.7 m - 2Benthos866A                              154/156
   1323.2 m - MTR                                    3098
1323.7 m - double5/8shack
1323.7 m - begin   0.15 m of doubled1/2chain
1323.9 m - 5.5x7/8 ring
1324.0 m - 5/8" anchor shac
1324.1 m - begin   1.00 m of 1/2" LL chain
1325.1 m - 5/8" anchor shac
1325.1 m - begin   5.00 m of 3/4" Nylon
1330.1 m - 5/8S+5/8ML+5/8S                                     <Orig, just 5/8" SAS here>
1330.4 m - begin   2.00 m of 1/2" LL chain
1332.4 m - 5/8" anchor shac
1332.5 m - 2 RR wheel stack
1332.8 m - Bottom
```

Day of Year starting 2002

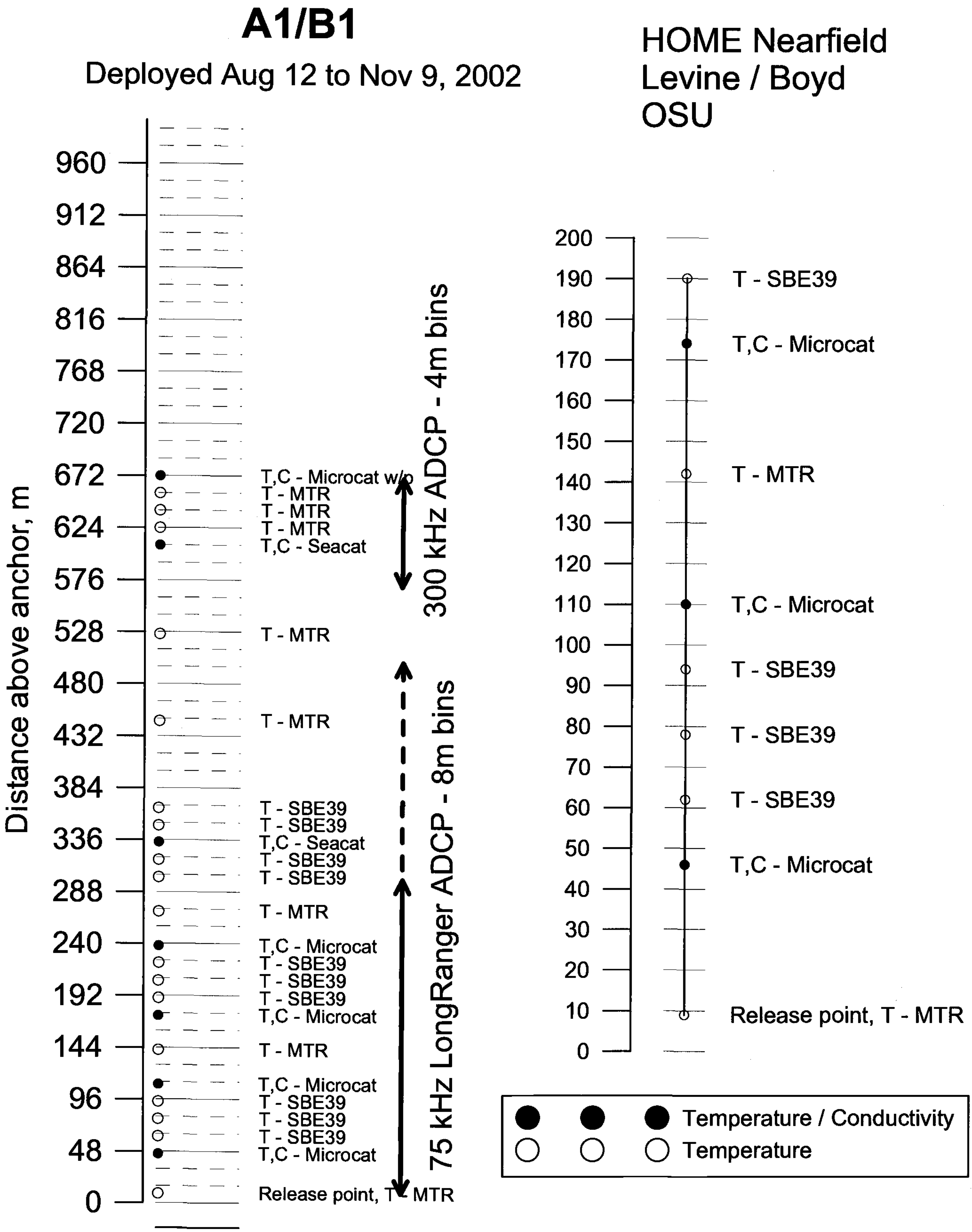
2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Day # 1	1	32	60	91	121	152	182	213	244	274	305	335	Day # 1
Day # 2	2	33	61	92	122	153	183	214	245	275	306	336	Day # 2
Day # 3	3	34	62	93	123	154	184	215	246	276	307	337	Day # 3
Day # 4	4	35	63	94	124	155	185	216	247	277	308	338	Day # 4
Day # 5	5	36	64	95	125	156	186	217	248	278	309	339	Day # 5
Day # 6	6	37	65	96	126	157	187	218	249	279	310	340	Day # 6
Day # 7	7	38	66	97	127	158	188	219	250	280	311	341	Day # 7
Day # 8	8	39	67	98	128	159	189	220	251	281	312	342	Day # 8
Day # 9	9	40	68	99	129	160	190	221	252	282	313	343	Day # 9
Day #10	10	41	69	100	130	161	191	222	253	283	314	344	Day #10
Day #11	11	42	70	101	131	162	192	223	254	284	315	345	Day #11
Day #12	12	43	71	102	132	163	193	224	255	285	316	346	Day #12
Day #13	13	44	72	103	133	164	194	225	256	286	317	347	Day #13
Day #14	14	45	73	104	134	165	195	226	257	287	318	348	Day #14
Day #15	15	46	74	105	135	166	196	227	258	288	319	349	Day #15
Day #16	16	47	75	106	136	167	197	228	259	289	320	350	Day #16
Day #17	17	48	76	107	137	168	198	229	260	290	321	351	Day #17
Day #18	18	49	77	108	138	169	199	230	261	291	322	352	Day #18
Day #19	19	50	78	109	139	170	200	231	262	292	323	353	Day #19
Day #20	20	51	79	110	140	171	201	232	263	293	324	354	Day #20
Day #21	21	52	80	111	141	172	202	233	264	294	325	355	Day #21
Day #22	22	53	81	112	142	173	203	234	265	295	326	356	Day #22
Day #23	23	54	82	113	143	174	204	235	266	296	327	357	Day #23
Day #24	24	55	83	114	144	175	205	236	267	297	328	358	Day #24
Day #25	25	56	84	115	145	176	206	237	268	298	329	359	Day #25
Day #26	26	57	85	116	146	177	207	238	269	299	330	360	Day #26
Day #27	27	58	86	117	147	178	208	239	270	300	331	361	Day #27
Day #28	28	59	87	118	148	179	209	240	271	301	332	362	Day #28
Day #29	29		88	119	149	180	210	241	272	302	333	363	Day #29
Day #30	30		89	120	150	181	211	242	273	303	334	364	Day #30
Day #31	31		90		151		212	243		304		365	Day #31

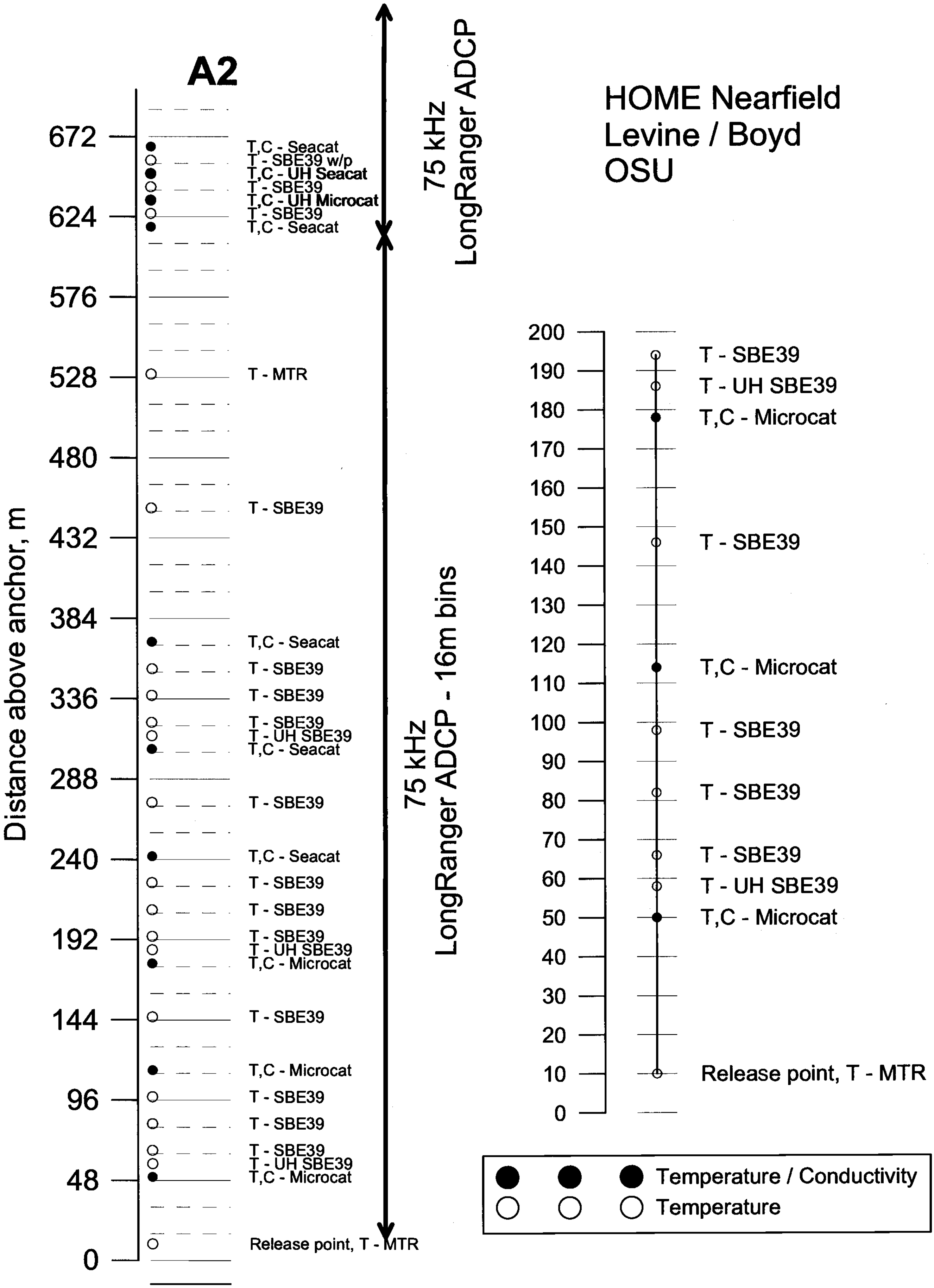
2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Day # 1	366	397	425	456	486	517	547	578	609	639	670	700	Day # 1
Day # 2	367	398	426	457	487	518	548	579	610	640	671	701	Day # 2
Day # 3	368	399	427	458	488	519	549	580	611	641	672	702	Day # 3
Day # 4	369	400	428	459	489	520	550	581	612	642	673	703	Day # 4
Day # 5	370	401	429	460	490	521	551	582	613	643	674	704	Day # 5
Day # 6	371	402	430	461	491	522	552	583	614	644	675	705	Day # 6
Day # 7	372	403	431	462	492	523	553	584	615	645	676	706	Day # 7
Day # 8	373	404	432	463	493	524	554	585	616	646	677	707	Day # 8
Day # 9	374	405	433	464	494	525	555	586	617	647	678	708	Day # 9
Day #10	375	406	434	465	495	526	556	587	618	648	679	709	Day #10
Day #11	376	407	435	466	496	527	557	588	619	649	680	710	Day #11
Day #12	377	408	436	467	497	528	558	589	620	650	681	711	Day #12
Day #13	378	409	437	468	498	529	559	590	621	651	682	712	Day #13
Day #14	379	410	438	469	499	530	560	591	622	652	683	713	Day #14
Day #15	380	411	439	470	500	531	561	592	623	653	684	714	Day #15
Day #16	381	412	440	471	501	532	562	593	624	654	685	715	Day #16
Day #17	382	413	441	472	502	533	563	594	625	655	686	716	Day #17
Day #18	383	414	442	473	503	534	564	595	626	656	687	717	Day #18
Day #19	384	415	443	474	504	535	565	596	627	657	688	718	Day #19
Day #20	385	416	444	475	505	536	566	597	628	658	689	719	Day #20
Day #21	386	417	445	476	506	537	567	598	629	659	690	720	Day #21
Day #22	387	418	446	477	507	538	568	599	630	660	691	721	Day #22
Day #23	388	419	447	478	508	539	569	600	631	661	692	722	Day #23
Day #24	389	420	448	479	509	540	570	601	632	662	693	723	Day #24
Day #25	390	421	449	480	510	541	571	602	633	663	694	724	Day #25
Day #26	391	422	450	481	511	542	572	603	634	664	695	725	Day #26
Day #27	392	423	451	482	512	543	573	604	635	665	696	726	Day #27
Day #28	393	424	452	483	513	544	574	605	636	666	697	727	Day #28
Day #29	394		453	484	514	545	575	606	637	667	698	728	Day #29
Day #30	395		454	485	515	546	576	607	638	668	699	729	Day #30
Day #31	396		455		516		577	608		669		730	Day #31

Day of Year starting 2003

2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Day # 1	-364	-333	-305	-274	-244	-213	-183	-152	-121	-91	-60	-30	Day # 1
Day # 2	-363	-332	-304	-273	-243	-212	-182	-151	-120	-90	-59	-29	Day # 2
Day # 3	-362	-331	-303	-272	-242	-211	-181	-150	-119	-89	-58	-28	Day # 3
Day # 4	-361	-330	-302	-271	-241	-210	-180	-149	-118	-88	-57	-27	Day # 4
Day # 5	-360	-329	-301	-270	-240	-209	-179	-148	-117	-87	-56	-26	Day # 5
Day # 6	-359	-328	-300	-269	-239	-208	-178	-147	-116	-86	-55	-25	Day # 6
Day # 7	-358	-327	-299	-268	-238	-207	-177	-146	-115	-85	-54	-24	Day # 7
Day # 8	-357	-326	-298	-267	-237	-206	-176	-145	-114	-84	-53	-23	Day # 8
Day # 9	-356	-325	-297	-266	-236	-205	-175	-144	-113	-83	-52	-22	Day # 9
Day #10	-355	-324	-296	-265	-235	-204	-174	-143	-112	-82	-51	-21	Day #10
Day #11	-354	-323	-295	-264	-234	-203	-173	-142	-111	-81	-50	-20	Day #11
Day #12	-353	-322	-294	-263	-233	-202	-172	-141	-110	-80	-49	-19	Day #12
Day #13	-352	-321	-293	-262	-232	-201	-171	-140	-109	-79	-48	-18	Day #13
Day #14	-351	-320	-292	-261	-231	-200	-170	-139	-108	-78	-47	-17	Day #14
Day #15	-350	-319	-291	-260	-230	-199	-169	-138	-107	-77	-46	-16	Day #15
Day #16	-349	-318	-290	-259	-229	-198	-168	-137	-106	-76	-45	-15	Day #16
Day #17	-348	-317	-289	-258	-228	-197	-167	-136	-105	-75	-44	-14	Day #17
Day #18	-347	-316	-288	-257	-227	-196	-166	-135	-104	-74	-43	-13	Day #18
Day #19	-346	-315	-287	-256	-226	-195	-165	-134	-103	-73	-42	-12	Day #19
Day #20	-345	-314	-286	-255	-225	-194	-164	-133	-102	-72	-41	-11	Day #20
Day #21	-344	-313	-285	-254	-224	-193	-163	-132	-101	-71	-40	-10	Day #21
Day #22	-343	-312	-284	-253	-223	-192	-162	-131	-100	-70	-39	-9	Day #22
Day #23	-342	-311	-283	-252	-222	-191	-161	-130	-99	-69	-38	-8	Day #23
Day #24	-341	-310	-282	-251	-221	-190	-160	-129	-98	-68	-37	-7	Day #24
Day #25	-340	-309	-281	-250	-220	-189	-159	-128	-97	-67	-36	-6	Day #25
Day #26	-339	-308	-280	-249	-219	-188	-158	-127	-96	-66	-35	-5	Day #26
Day #27	-338	-307	-279	-248	-218	-187	-157	-126	-95	-65	-34	-4	Day #27
Day #28	-337	-306	-278	-247	-217	-186	-156	-125	-94	-64	-33	-3	Day #28
Day #29	-336		-277	-246	-216	-185	-155	-124	-93	-63	-32	-2	Day #29
Day #30	-335		-276	-245	-215	-184	-154	-123	-92	-62	-31	-1	Day #30
Day #31	-334		-275		-214		-153	-122		-61		0	Day #31

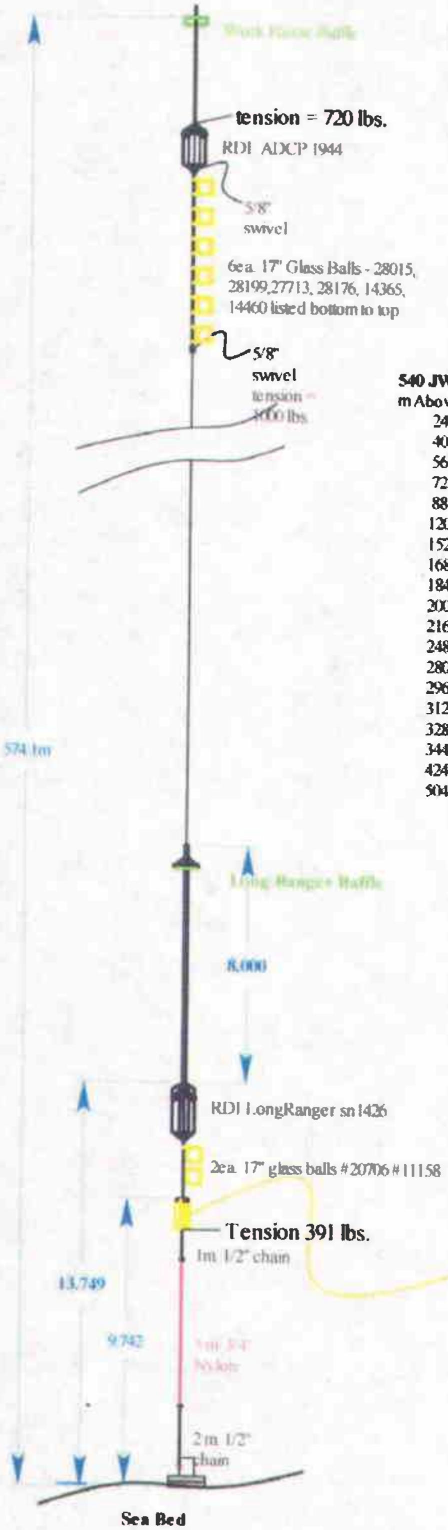
2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Day # 1	1	32	60	91	121	152	182	213	244	274	305	335	Day # 1
Day # 2	2	33	61	92	122	153	183	214	245	275	306	336	Day # 2
Day # 3	3	34	62	93	123	154	184	215	246	276	307	337	Day # 3
Day # 4	4	35	63	94	124	155	185	216	247	277	308	338	Day # 4
Day # 5	5	36	64	95	125	156	186	217	248	278	309	339	Day # 5
Day # 6	6	37	65	96	126	157	187	218	249	279	310	340	Day # 6
Day # 7	7	38	66	97	127	158	188	219	250	280	311	341	Day # 7
Day # 8	8	39	67	98	128	159	189	220	251	281	312	342	Day # 8
Day # 9	9	40	68	99	129	160	190	221	252	282	313	343	Day # 9
Day #10	10	41	69	100	130	161	191	222	253	283	314	344	Day #10
Day #11	11	42	70	101	131	162	192	223	254	284	315	345	Day #11
Day #12	12	43	71	102	132	163	193	224	255	285	316	346	Day #12
Day #13	13	44	72	103	133	164	194	225	256	286	317	347	Day #13
Day #14	14	45	73	104	134	165	195	226	257	287	318	348	Day #14
Day #15	15	46	74	105	135	166	196	227	258	288	319	349	Day #15
Day #16	16	47	75	106	136	167	197	228	259	289	320	350	Day #16
Day #17	17	48	76	107	137	168	198	229	260	290	321	351	Day #17
Day #18	18	49	77	108	138	169	199	230	261	291	322	352	Day #18
Day #19	19	50	78	109	139	170	200	231	262	292	323	353	Day #19
Day #20	20	51	79	110	140	171	201	232	263	293	324	354	Day #20
Day #21	21	52	80	111	141	172	202	233	264	294	325	355	Day #21
Day #22	22	53	81	112	142	173	203	234	265	295	326	356	Day #22
Day #23	23	54	82	113	143	174	204	235	266	296	327	357	Day #23
Day #24	24	55	83	114	144	175	205	236	267	297	328	358	Day #24
Day #25	25	56	84	115	145	176	206	237	268	298	329	359	Day #25
Day #26	26	57	85	116	146	177	207	238	269	299	330	360	Day #26
Day #27	27	58	86	117	147	178	208	239	270	300	331	361	Day #27
Day #28	28	59	87	118	148	179	209	240	271	301	332	362	Day #28
Day #29	29		88	119	149	180	210	241	272	302	333	363	Day #29
Day #30	30		89	120	150	181	211	242	273	303	334	364	Day #30
Day #31	31		90		151		212	243		304		365	Day #31


A1/B1
Deployed Aug 12 to Nov 9, 2002
HOME Nearfield
Levine / Boyd
OSU
Distance above anchor, m
960
912
864
816
768
720
672
624
576
528
480
432
384
336
288
240
192
144
96
48
0
T,C - Microcat w/o
T - MTR
T - MTR
T - MTR
T,C - Seacat
T - MTR
T - MTR
T - SBE39
T - SBE39
T,C - Seacat
T - SBE39
T - SBE39
T - MTR
T,C - Microcat
T - SBE39
T - SBE39
T - SBE39
T,C - Microcat
T - MTR
T,C - Microcat
T - SBE39
T - SBE39
T - SBE39
T,C - Microcat
Release point, T - MTR
300 kHz ADCP - 4m bins
75 kHz LongRanger ADCP - 8m bins
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
T - SBE39
T,C - Microcat
T - MTR
T,C - Microcat
T - SBE39
T - SBE39
T - SBE39
T,C - Microcat
Release point, T - MTR
Temperature / Conductivity
Temperature


A2
Distance above anchor, m
672
624
576
528
480
432
384
336
288
240
192
144
96
48
0
T,C - Seacat
T - SBE39 w/p
T,C - UH Seacat
T - SBE39
T,C - UH Microcat
T - SBE39
T,C - Seacat
T - MTR
T - SBE39
T,C - Seacat
T - SBE39
T - SBE39
T - SBE39
T - UH SBE39
T,C - Seacat
T - SBE39
T,C - Seacat
T - SBE39
T - SBE39
T - SBE39
T - UH SBE39
T,C - Microcat
T - SBE39
T,C - Microcat
T - SBE39
T - SBE39
T - SBE39
T - UH SBE39
T,C - Microcat
Release point, T - MTR
75 kHz
LongRanger ADCP
75 kHz
LongRanger ADCP - 16m bins
HOME Nearfield
Levine / Boyd
OSU
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
T - SBE39
T - UH SBE39
T,C - Microcat
T - SBE39
T,C - Microcat
T - SBE39
T - SBE39
T - SBE39
T - UH SBE39
T,C - Microcat
Release point, T - MTR
Temperature / Conductivity
Temperature

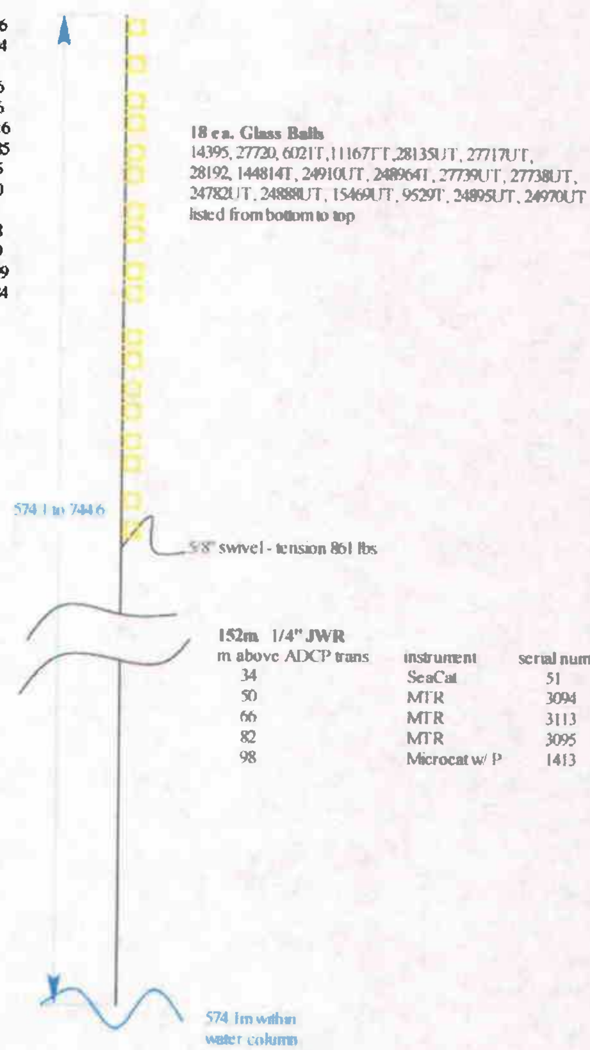
HOME Nearfield Component
Mooring A1

Deployed 13 August 2002 R/V Wecoma
Depth = 1342m
21 44.994N Lat. 158 45.446W Long.



540 JWR

m Above Transducer	Instrument	Serial Number
24	Microcat	2372
40	SBE39	869
56	SBE39	665
72	SBE39	231
88	Microcat	43
120	MTR	3086
152	Microcat	2374
168	SBE39	664
184	SBE39	666
200	SBE39	876
216	Microcat	1816
248	MTR	3085
280	SBE39	875
296	SBE39	270
312	SeaCat	43
328	SBE39	878
344	SBE39	269
424	MTR	3099
504	MTR	3084



152m 1/4" JWR

m above ADCP trans	instrument	serial number
34	SeaCat	51
50	MTR	3094
66	MTR	3113
82	MTR	3095
98	Microcat w/ P	1413

MTR on release = 3079
Dual Acoustic Release
s/n14507 8242
Release=445331
Disable=470435
Enable=470450 no reply on enable, normal

s/n25438 8242XS
Release=324342
Disable A&B=305156
Enable A=305110
inter @11KHz
reply@12KHz
Enable B=305133
inter@9KHz
reply@11Khz

HOME Nearfield Component
Mooring B1

Deployed 12 August 2002 R/V Wecoma
Depth = 1456m
21 47.998N Lat.   158 27.800W Long.

540 JWR

m Above Transducer	Instrument	Serial Number
24	Microcat	1818
40	SBE39	267
56	SBE39	265
72	SBE39	264
88	Microcat	42
120	MTR	3082
152	Microcat	41
168	SBE39	235
184	SBE39	268
200	SBE39 w/	668
216	Microcat	39
248	MTR	3010
280	SBE39	175
296	SBE39	263
312	SeaCat	50
328	SBE39	87
344	SBE39	168
424	MTR	3078
504	MTR	3090

18 ea. Glass Balls
14348T, 24745UT, 28123, 14420T, 24722UT, 11984T, 27752UT, 28022, 28191, 27671UT, 27791UT, 11965T, 24739UT, 27729UT, 27783, 27786UT, 28140, 27719UT listed from bottom to top

5/8" swivel tension 861 lbs.

152m 1/4" JWR

m above ADCP trans.	instrument	serial number
34	SeaCat	40
50	MTR	3073
66	SBE39	88
82	MTR	3098
98	SeaCat	41

574.1m within water column

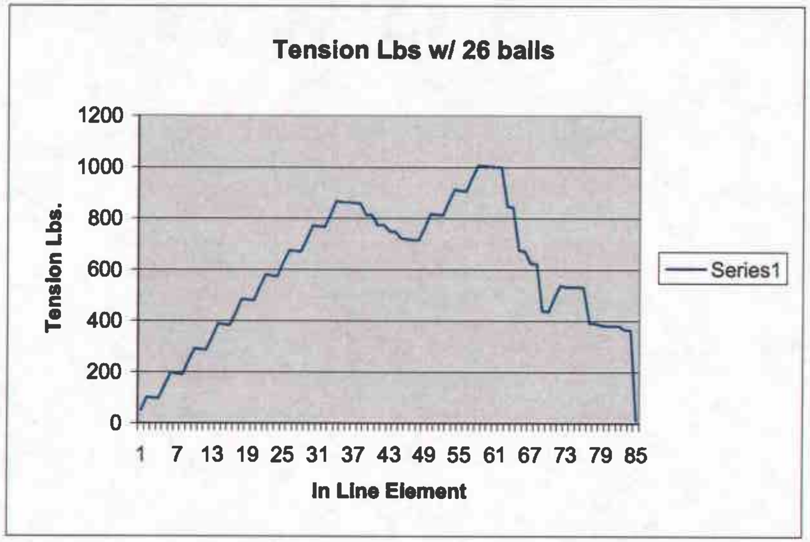
MTR on release = 3088
Dual Acoustic Release
s/n14743 8242
Release=446744
Disable=474707
Enable=474724 no reply on enable, normal

s/n25429 8242XS
Release=324233
Disable A&B=304455
Enable A=304413
inter @11KHz
reply@12KHz
Enable B=304430
inter@9KHz
reply@11Khz

A1 / B1 Mooring - with current - From program by Richard Dewey

Height[m]	U [m/s]	V [m/s]	W [m/s]	Density [kg/m^3]
1350.00	0.55	0.00	0.00	1024.00
1250.00	0.45	0.00	0.00	1025.00
1200.00	0.42	0.00	0.00	1026.00
1000.00	0.23	0.00	0.00	1026.00
550.00	0.20	0.00	0.00	1026.00
0.00	0.00	0.00	0.00	1026.00

First, find neutral (no current) mooring component positions.
...
This is (starting off as) a sub-surface mooring
Searching for a converged solution.
...
This is a sub-surface solution.
Total Tension on Anchor [kg] = 165.9
Vertical load [kg] = 164.2 Horizontal load [kg] = 23.5
Safe wet anchor mass = 305.0 [kg] = 671.0 [lb]
Safe dry steel anchor mass = 350.6 [kg] = 771.3 [lb]
Safe dry concrete anchor mass = 469.2 [kg] = 1032.3 [lb]
Weight under anchor = -591.1 [kg] (negative is down)



#	In-Line Mooring Element	Length[m]	Buoy[kg]	Height[m] (middle)	dZ[m]	dX[m]	dY[m]	Tens Top	ion[kg] Bottom	Ang Top	le[deg] Bottom	Tension Lbs.	Tension after release
1	17 in glass	0.57	23	743.28	1	37.4	0	0	23	1.4	1.4	50.6	-340.56
2	17 in glass	0.57	23	742.71	1	37.4	0	23	46	1.4	1.4	101.2	-289.96
3	3/8 chain SL	0.61	-2.33					46	44.6	1.4	1.5	98.12	-293.04
4	1/2 5/8 1/2SMLS	0.25	-1.1	741.69	1	37.4	0	44.6	43.5	1.5	1.6	95.7	-295.46
5	17 in glass	0.57	23	741.28	1	37.3	0	43.5	66.5	1.6	1.6	146.3	-244.86
6	17 in glass	0.57	23	740.71	1	37.3	0	66.5	89.5	1.6	1.5	196.9	-194.26
7	3/8 chain SL	0.61	-2.33					89.5	88.1	1.5	1.6	193.82	-197.34
8	1/2 5/8 1/2SMLS	0.25	-1.1	739.69	1	37.3	0	88.1	87	1.6	1.6	191.4	-199.76
9	17 in glass	0.57	23	739.28	1	37.3	0	87	110	1.6	1.6	242	-149.16
10	17 in glass	0.57	23	738.71	1	37.3	0	110	133	1.6	1.6	292.6	-98.56
11	3/8 chain SL	0.61	-2.33					133	131.6	1.6	1.6	289.52	-101.64
12	1/2 5/8 1/2SMLS	0.25	-1.1	737.7	1	37.2	0	131.6	130.5	1.6	1.6	287.1	-104.06
13	17 in glass	0.57	23	737.29	1	37.2	0	130.5	153.5	1.6	1.6	337.7	-53.46
14	17 in glass	0.57	23	736.72	1	37.2	0	153.5	176.5	1.6	1.6	388.3	-2.86
15	3/8 chain SL	0.61	-2.33					176.5	175.1	1.6	1.6	385.22	-5.94
16	1/2 5/8 1/2SMLS	0.25	-1.1	735.7	1	37.2	0	175.1	174	1.6	1.6	382.8	-8.36
17	17 in glass	0.57	23	735.29	1	37.2	0	174	197	1.6	1.6	433.4	42.24
18	17 in glass	0.57	23	734.72	1	37.2	0	197	220	1.6	1.6	484	92.84
19	3/8 chain SL	0.61	-2.33					220	218.6	1.6	1.6	480.92	89.76
20	1/2 5/8 1/2SMLS	0.25	-1.1	733.7	1	37.1	0	218.6	217.5	1.6	1.6	478.5	87.34
21	17 in glass	0.57	23	733.29	1	37.1	0	217.5	240.5	1.6	1.6	529.1	137.94
22	17 in glass	0.57	23	732.72	1	37.1	0	240.5	263.5	1.6	1.6	579.7	188.54
23	3/8 chain SL	0.61	-2.33					263.5	262.1	1.6	1.6	576.62	185.46
24	1/2 5/8 1/2SMLS	0.25	-1.1	731.7	1	37.1	0	262.1	261	1.6	1.6	574.2	183.04
25	17 in glass	0.57	23	731.29	1	37.1	0	261	284	1.6	1.6	624.8	233.64
26	17 in glass	0.57	23	730.72	1	37	0	284	307	1.6	1.6	675.4	284.24
27	3/8 chain SL	0.61	-2.33					307	305.6	1.6	1.6	672.32	281.16
28	1/2 5/8 1/2SMLS	0.25	-1.1	729.7	1	37	0	305.6	304.5	1.6	1.6	669.9	278.74
29	17 in glass	0.57	23	729.29	1	37	0	304.5	327.5	1.6	1.6	720.5	329.34
30	17 in glass	0.57	23	728.72	1	37	0	327.5	350.5	1.6	1.6	771.1	379.94
31	3/8 chain SL	0.61	-2.33					350.5	349.1	1.6	1.6	768.02	376.86
32	1/2 5/8 1/2SMLS	0.25	-1.1	727.7	1	37	0	349.1	348	1.6	1.6	765.6	374.44
33	17 in glass	0.57	23	727.29	1	37	0	348	371	1.6	1.6	816.2	425.04
34	17 in glass	0.57	23	726.72	1	36.9	0	371	394	1.6	1.6	866.8	475.64
35	3/8 chain SL	0.61	-2.33					394	392.6	1.6	1.6	863.72	472.56
36	1/2 shackle	0.08	-0.3	725.78	1	36.9	0	392.6	392.3	1.6	1.6	863.06	471.9
37	5/8 swivel	0.16	-0.9	725.66	1	36.9	0	392.3	391.4	1.6	1.6	861.08	469.92
38	1/2 5/8 1/2SMLS	0.25	-1.1	725.46	1	36.9	0	391.4	390.3	1.6	1.6	858.66	467.5
39	**1/4 wire/jack**	**152**	**-0.13**					**390.3**	**370.6**	**1.6**	**2.3**	**815.32**	424.16
40	1/2 5/8 1/2SMLS	0.25	-1.1	573.3	0.9	31.8	0	370.6	369.5	2.3	2.3	812.9	421.74
41	WHBaffle	0.24	-18.18	573.05	0.9	31.7	0	369.5	351.4	2.3	2.4	773.08	381.92
42	1/2 shackle	0.08	-0.3	572.89	0.9	31.7	0	351.4	351.1	2.4	2.4	772.42	381.26
43	1/2 chain LL	3.43	-3.1					351.1	340.4	2.4	2.5	748.88	357.72
44	1/2 5/8 1/2SMLS	0.25	-1.1	569.3	0.9	31.6	0	340.4	339.3	2.5	2.5	746.46	355.3
45	**RD ADCP**	**1.41**	**-12**	**568.47**	**0.9**	**31.5**	**0**	**339.3**	**327.4**	**2.5**	**2.8**	**720.28**	329.12
46	1/2 5/8 1/2SMLS	0.25	-1.1	567.64	0.9	31.5	0	327.4	326.3	2.8	2.8	717.86	326.7

47 5/8 swivel	0.16	-0.9	567.44	0.9	31.5	0	326.3	325.4	2.8	2.8	715.88	324.72
48 1/2 shackle	0.08	-0.3	567.32	0.9	31.5	0	325.4	325.1	2.8	2.8	715.22	324.06
49 17 in glass	0.57	23	566.99	0.9	31.5	0	325.1	348.1	2.8	2.7	765.82	374.66
50 17 in glass	0.57	23	566.42	0.9	31.5	0	348.1	371.1	2.7	2.6	816.42	425.26
51 3/8 chain SL	0.61	-2.33					371.1	369.7	2.6	2.6	813.34	422.18
52 1/2 5/8 1/2SMLS	0.25	-1.1	565.41	0.9	31.4	0	369.7	368.6	2.6	2.7	810.92	419.76
53 17 in glass	0.57	23	565	0.9	31.4	0	368.6	391.6	2.7	2.6	861.52	470.36
54 17 in glass	0.57	23	564.43	0.9	31.4	0	391.6	414.6	2.6	2.5	912.12	520.96
55 3/8 chain SL	0.61	-2.33					414.6	413.1	2.5	2.5	908.82	517.66
56 1/2 5/8 1/2SMLS	0.25	-1.1	563.41	0.9	31.3	0	413.1	412.1	2.5	2.5	906.62	515.46
57 17 in glass	0.57	23	563	0.9	31.3	0	412.1	435.1	2.5	2.5	957.22	566.06
58 17 in glass	0.57	23	562.43	0.9	31.3	0	435.1	458.1	2.5	2.4	1007.82	616.66
59 3/8 chain SL	0.61	-2.33					458.1	456.6	2.4	2.4	1004.52	613.36
60 1/2 5/8 1/2SMLS	0.25	-1.1	561.41	0.9	31.2	0	456.6	455.5	2.4	2.4	1002.1	610.94
61 5/8 swivel	0.16	-0.9	561.2	0.9	31.2	0	455.5	454.6	2.4	2.4	1000.12	608.96
62 1/2 shackle	0.08	-0.3	561.08	0.9	31.2	0	454.6	454.3	2.4	2.4	999.46	608.3
63 1/4 wire/jack	**540**	**-0.13**					**454.3**	**384.4**	**2.4**	**3.5**	**845.68**	454.52
64 1/2 5/8 1/2SMLS	0.25	-1.1	21.7	0.1	2.3	0	384.4	383.3	3.5	3.5	843.26	452.1
65 LR Baffle	**0.6**	**-77.27**	**21.28**	**0.1**	**2.2**	**0**	**383.3**	**306.2**	**3.5**	**4.4**	**673.64**	282.48
66 1/2 shackle	0.08	-0.3	20.94	0.1	2.2	0	306.2	305.9	4.4	4.4	672.98	281.82
67 1/2 chain LL	7.07	-3.1					305.9	284.1	4.4	4.8	625.02	233.86
68 1/2 5/8 1/2SMLS	0.25	-1.1	13.73	0.1	1.6	0	284.1	283	4.8	4.8	622.6	231.44
69 LongRanger	**1.9**	**-84.1**	**12.66**	**0.1**	**1.5**	**0**	**283**	**199.3**	**4.8**	**6.8**	**438.46**	47.3
70 1/2 5/8 1/2SMLS	0.25	-1.1	11.59	0.1	1.4	0	199.3	198.2	6.8	6.8	436.04	44.88
71 17 in glass	0.57	23	11.18	0.1	1.4	0	198.2	221.1	6.8	6.1	486.42	95.26
72 17 in glass	0.57	23	10.61	0.1	1.3	0	221.1	244	6.1	5.5	536.8	145.64
73 3/8 chain SL	0.61	-2.33					244	242.5	5.5	5.6	533.5	142.34
74 1/2 shackle	0.08	-0.3	9.68	0.1	1.2	0	242.5	242.2	5.6	5.6	532.84	141.68
75 1/2 galv link	0.1	-0.2	9.59	0.1	1.2	0	242.2	242	5.6	5.6	532.4	141.24
76 5/8 shackle	0.07	-0.65	9.51	0.1	1.2	0	242	241.4	5.6	5.6	531.08	139.92
77 double AR/EG&G	**0.95**	**-64**	**9.01**	**0.1**	**1.2**	**0**	**241.4**	**177.8**	**5.6**	**7.6**	**391.16**	
78 5/8 shackle	0.07	-0.65	8.5	0.1	1.1	0	177.8	177.2	7.6	7.6	389.84	
79 1/2 chain LL	1	-3.1					177.2	174.1	7.6	7.8	383.02	
80 5/8 shackle	0.07	-0.65	7.45	0.1	1	0	174.1	173.5	7.8	7.8	381.7	
81 3/4 Nylon	5	-0.03					173.5	173.3	7.8	7.8	381.26	
82 5/8 shackle	0.07	-0.65	2.43	0	0.3	0	173.3	172.7	7.8	7.8	379.94	
83 1/2 chain LL	2	-3.1					172.7	166.5	7.8	8.1	366.3	
84 5/8 shackle	0.07	-0.65	0.38	0	0	0	166.5	165.9	8.1	8.1	364.98	
85 2 Wheels OSU	0.35	-757	0.17	0	0	0	16	5.9	8.1		12.98	

Tally of all In-Line mooring/tow components by type.

#	Element Name	Total Number/Length
1	17 in glass	26
2	3/8 chain SL	7.93 m
3	1/2 5/8 1/2SMLS	18
4	1/2 shackle	6
5	5/8 swivel	3
6	1/4 wire/jack	692 m
7	WHBaffle	1
8	1/2 chain LL	13.5 m
9	RD ADCP	1
10	LR Baffle	1
11	LongRanger	1
12	1/2 galv link	1
13	5/8 shackle	5
14	double AR/EG&G	1
15	3/4 Nylon	5 m
16	2 Wheels OSU	1

ADENDA

1. Event Log of HOME mooring deployment cruise on Wecoma (W0208B)
recorded by M. Levine

All times in HST (+10 UTC)

11 Aug 2002

1000 Depart. Travel to MB site. Do short E-W transect to assess bathymetry—no surprises. Replaced software card

1230 After lunch deploy Alford's MB profiler. Profiler mooring going when ready to deploy. Called Scott W and talked through how to reprogram. Unclear what the problem was.

1330 Anchor away
Acoustic survey using release to transpond and get range from 3 locations.
MB Position GPS: 21 deg 13.95' N; 158 deg 0.57' W; water depth = 395m
Set up deck for B1 and spool wire

1830 Luther's instrument comparison among all TC instruments using CTD with wires to clamp instruments. Station DW (deep water) 21deg 21'N; 158deg 21'W. Cast01

2030 Begin Bathymetric survey through C1, D1 and B1 sites. Let echosounder unattended at night, data not very good.

12 Aug 2002

0800 On station B1. Prepare deck for deployment. Anchor first deployment.

0723 Anchor in water
Serious problem in the clamping of instruments to wire! Lost one SBE39. Spent much time trying to decide how to proceed. Seems to be 2 problems that may be related. The clamp to the wire rope was not always as strong as expected. Less surface area for clamps to grab. Should machine other halves of brackets to get more surface contact area using ¼" wire. Second problem was with the tie wraps breaking. The wire on the trawl winch was not laid down under much tension and there was significan surges. This apparently put enough acceleration on the wire to slip the clamps and break the tie wraps. Decided to fix problem 1 by adding 4 layers of black tape in the groove on the clamp. Problem 2 was solved by tying the instruments onto the brackets using Daryl's nylon line. The MTRs were too small, so we borrowed the vulcanizing tape from Luther to tape directly to the wire. Deployment delayed 5+ hours.

1713 Released mooring. Check our release – behaved normally. Range was consistent with being next to mooring (1431m + 10m to transducer on ship + 9 m since release is above anchor = 1450m). Did not do triangle survey.
B1 GPS position – 21 deg 48.00'N; 158 deg 27.80'W; water depth = 1456m

1850 Get deck ready for A1. Use Lebus spooler to load trawl winch.

2130 ADCP survey at same spot; leave for A1 to be on station by 0700

13 Aug 2002

0700 Gave Rick updated A1 position; moved to new position

0900 Start deployment of A1; anchor over first. Borrowed enough tape to use on MTRs and SBE39s. Tied Microcats and Seacats with line as done on B1. Deployment went without incident.

1213 Mooring released.. Water depth from echosounder: 1342 m.
A1 GPS position: 21deg 44.99'N; 158deg 45.50'W; water depth = 1342m
Checked release—normal. Transponder range:
No acoustic triangle survey.

1300 Go to D1 for LongRanger tests. Put Luther LongRanger with release and baffle and 8 m chain.
Added 2 glass balls at 2 locations onto the trawl wire. Lower to 750 m and stop for some time; t then lower to 1250 and stop again. Bring up on deck and remove baffle and redeploy as before.

2100 Start 12 h time series of CTD casts at D1. Full depth 0 to 2500m.

14 Aug 2002

0930 end of CTD time series. Casts 02 thru 09. Total of 8 casts in 12 hours
On watch: Kimball/Jerome, Kevin/Adrien, Murray/Julie, Tim/Nathali
Prepare deck for D1 mooring; spool wire. Some discussion about moving site, but after seeing CTDs decide to leave at same location.
1245 Start D1 deployment anchor first; 250m long mooring
1630 **D1 Released anchor at: 21 deg 34.99'N; 158 deg 40.00'W; depth 2430m (2417m corrected)**
Triangle survey. Wecoma dumping.
Set up deck for C1
Go to site CD (between C1 and D1) (21deg 33.4N; 158deg 42.3W)

15 Aug 2002

Do CTD time series from 2100 to 0600 HST from 2000 to 3500 m. Casts: 10 to 16. Total of 7 casts in 10 hours.
On watch: Mark/Thomas, Nathalie/Adrien, Murray/Julie

0630 go 12 nm beyond C1 turn around; pass C1 by .4nm to north before releasing anchor.
Set up deck
Top float in water

2130 Anchor away; depth = 4750 (4762 corrected)
C1 released anchor at: 21 deg 23.83'N; 158 deg 51.00'W
C1 Triangle survey: 21 deg 23.48'N, 158 50.97'W; water depth=4762 (corrected)

16 Aug 2002
0800 Calculate CC position for time series
0900 Begin 24 h CTD survey at CC = 21 deg 24'N; 158 deg 50'W
from surface to 4750 m

Watches:	0900 – 1300	Adrien / Julie
	1300 – 1700	Murray/Nathalie
	1700 – 2100	Tim/Walt
	2100 – 0100	Thomas / Doug

17 Aug 2002

	0100 – 0500	Mark / Jerome
	0500 – 0900	Kimbal / Kevin

Total 6 casts, cast 17 to 22.
CTD run into ground resulting in 2 hour interruption for retermination.
Transit to WB for mooring deployment

1300 start deployment of Jerome mooirng
1430 Anchor dropped
WB at 21deg 39.88'N; 158deg6.06'W

Swim Call
Proceed to BS: 21deg 51'N; 158deg26'W

1743 Start casts 0 to 2300 m time series
4 casts till midnight—last cast is "deep cast with fruit"

Watches:	start-2100	Murray/Nathalie
	2100-2400	Julie/Adrien

Head for HOME port.

18 Aug 20002
0800 at the dock

2. Event Log of HOME mooring recovery / turnaround cruise on Wecoma (W0211A)
as recorded by M. Levine

All times in HST (+10 UTC)

9 Nov 2002

1000 Depart UH pier.
1510 Arrive at B1. Release with #25429.
1545 Start recovery
1730 Releases on deck.
Set up deck for Lebus and C1; unspool wire
Night ops: ADCP survey between ADCP 1 (21deg 37.62'N; 158deg 37.64'W) and ADCP 2 (21deg 21.6'N; 158deg 52.6'W).

10 Nov 2002

700 At C1 for recovery.
800 Release C1 – buoy on surface very soon after.
1515 C1 on deck
1605 CTD Cast01.dat at C1, 21deg 23.46'N; 158deg 50.97'W) 4760 m deep
Night ops: ADCP survey

11 Nov 2002

0830 Top of mooring A1 on deck
0945 Releases on deck
Prep deck for D1 recovery
D1 recovered.
1500 Leave for A1 CTD
1548 CTD Cast02.dat at A1, 21deg 45.0'N; 158deg 45.53'W, 1337 m water depth
1842 CTD Cast03.dat at B1, 21 deg 48.04'N; 158deg 27.74'W, 1453 m water depth
Night ops: ADCP survey

12 Nov 2002

0700 at MB site
Recover MB mooring – broken spring from corrosion.
1515 CTD calibration cast for OSU instruments at ADCP5 – 21deg 7.12'N; 158deg 9.76'W to 1400m
Cast04.dat "Deep cast with fruit"
At 1400 m for 15 min 0151 –
At 750 m for 15 min 0221 –
At 20 m for 15 min 0253 –

2200 CTD calibration cast for UH Cast05.dat
Night ops: ADCP survey on way to dock.

13 Nov 2002

0700 at Pier 31
calibration of ADCPs; prepare other instruments for re-deployment

2000 Left dock -- ADCP survey toward site for D2

14 Nov 2002

0930 Begin D2 deployment, anchor first
D2 - 21 deg 52.01'N; 158deg 25.00'W; at 2407 m depth

1230 begin triangulation survey
1519 CTD at D2 Cast06.dat at 21deg 52.04'N; 158deg 24.4'W; at 2470 m water depth
1815 CTD at D2B Cast07.dat at 21deg56'N; 158deg20'W; at 3319 m water depth

15 Nov 2002

0700 At site for A2
1009 Start deployment – float in water
1619 **A2 - Anchor drop (day 320 0219:40) – 21deg 45.140'N; 158deg 45.42'W; water depth 1311 m corrected**

16 Nov 2002

0630 Deck set up for C2
0800 Start to deploy C2
2200 Drop anchor (day 321 0800:53) –
Triangulation survey – **C2 -- 21deg 38.06'N; 158deg 51.60'W**

17 Nov 2002

0800 At dock

3. Event Log of final mooring recorvery on R/V Revelle (CNTL10)
as recorded by D. Luther

0154z 06/11/03 21 18.96N. 157 53.17W. Depart Honolulu DK
0722z 06/11/03 21 45.69N. 158 45.97W. Transducer A2 (NW) deployed DK
0800z 06/11/03 21 45.66N. 158 45.97W. Transducer on deck DK
0815z 06/11/03 21 45.69N. 158 44.89W. Transducer A2 (NE) deployed DK
0830z 06/11/03 21 45.68N. 158 44.89W. Transducer on deck DK
0857z 06/11/03 21 44.45N. 158 45.43W. Transducer A2 (S) deployed DK
0912z 06/11/03 21 44.45N. 158 45.43W. Transducer on deck DK
0922z 06/11/03 21 44.45N. 158 45.43W. CTD #1 deployed MT
1035z 06/11/03 21 44.45N. 158 45.43W. CTD #1 @ 1398m DK
1102z 06/11/03 21 44.45N. 158 45.43W. CTD #1 @ surface DK
1138z 06/11/03 21 44.45N. 158 45.43W. CTD #2 @ 1396m DK
1207z 06/11/03 21 44.45N. 158 45.43W. CTD #2 @ surface DK
1244z 06/11/03 21 44.45N. 158 45.43W. CTD #3 @ 1394m DK
1313z 06/11/03 21 44.45N. 158 45.43W. CTD #3 @ surface DK
1350z 06/11/03 21 44.46N. 158 45.43W. CTD #4 @ 1388m DK
1422z 06/11/03 21 44.46N. 158 45.43W. CTD #4 @ surface TD
1500z 06/11/03 21 44.49N. 158 45.44W. CTD #5 @ 1380m TD
1532z 06/11/03 21 44.48N. 158 45.44W. CTD #5 @ surface TD
1609z 06/11/03 21 44.44N. 158 45.43W. CTD #6 @ 1390m TD
1641z 06/11/03 21 44.44N. 158 45.43W. CTD #6 @ surface TD
1715z 06/11/03 21 44.45N. 158 45.43W. CTD #7 @ 1386m TD
1746z 06/11/03 21 44.45N. 158 45.43W. CTD #7 at surface MT
1815z 06/11/03 21 44.45N. 158 45.43W. CTD #8 @ 1380m MT

1856z 06/11/03 21 44.45N. 158 45.43W. CTD #8 at surface MT
1926z 06/11/03 21 44.45N. 158 45.43W. CTD #9 at 1389m MT
1954z 06/11/03 21 44.45N. 158 45.43W. CTD #9 at surface MT
2038z 06/11/03 21 44.45N. 158 45.43W. CTD #10 at 1394m MT
2122z 06/11/03 21 44.45N. 158 45.43W. CTD #10 on deck MT
2241z 06/11/03 21 45.09N. 158 45.54W. A2 float alongside DK
0430z 06/12/03 21 46.24N. 158 42.75W. A2 mooring on deck EW
1630z 06/12/03 21 37.99N. 158 51.79W. Mooring C2 alongside TD
0317z 06/13/03 21 43.56N. 158 43.79W. C2 on deck EW
0654z 06/13/03 21 52.08N. 158 24.73W. CTD (D2) #1 deployed MT
0750z 06/13/03 21 52.08N. 158 24.73W. CTD #1 @ 2429M MT
0843z 06/13/03 21 52.08N. 158 24.73W. CTD # 1 at surface MT
0937z 06/13/03 21 52.08N. 158 24.73W. CTD #2 at 2430 MT
1033z 06/13/03 21 52.08N. 158 24.73W. CTD #2 @ surface DK
1120z 06/13/03 21 52.08N. 158 24.73W. CTD #3 @ 2431m DK
1210z 06/13/03 21 52.08N. 158 24.73W. CTD #3 @ surface DK
1258z 06/13/03 21 52.08N. 158 24.73W. CTD #4 @ 2430m DK
1345z 06/13/03 21 52.08N. 158 24.73W. CTD #4 @ surface DK
1437z 06/13/03 21 52.08N. 158 24.73W. CTD #5 @ 2424m TD
1524z 06/13/03 21 52.08N. 158 24.73W. CTD #5 @ surface TD
1612z 06/13/03 21 52.08N. 158 24.73W. CTD #7 @ 2426m TD
1700z 06/13/03 21 52.08N. 158 24.73W. CTD #7 @ surface TD
1746z 06/13/03 21 52.08N. 158 24.73W. CTD #8 at 2423M MT
1847z 06/13/03 21 52.07N. 158 24.73W. CTD #8 on deck MT
2024z 06/13/03 21 51.95N. 158 24.92W. Mooring D2 alongside MT
2145z 06/13/03 21 52.87N. 158 23.60W. Mooring D2 on deck MT
2233z 06/13/03 21 52.01N. 158 25.01W. CTD #1 (D2) deployed DK
2326z 06/13/03 21 52.01N. 158 25.00W. CTD #1 @ 2425m DK
0012z 06/14/03 21 52.01N. 158 25.00W. CTD #1 @ surface DK
0021z 06/14/03 21 52.01N. 158 25.00W. CTD on deck DK
0320z 06/14/03 21 34.97N. 158 40.00W. CTD deployed MT
1935z 06/14/03 21 34.97N. 158 40.00W. CTD on deck MT
2126z 06/14/03 21 34.97N. 158 40.00W. CTD deployed MT
2336z 06/14/03 21 34.97N. 158 40.00W. CTD on deck DK
0045z 06/15/03 21 34.97N. 158 40.00W. CTD deployed DK
0119z 06/15/03 21 34.97N. 158 40.00W. CTD @ 1345m DK
0234z 06/15/03 21 34.97N. 158 39.99W. CTD on deck DK
0425z 06/15/03 21 30.44N. 158 17.70W. Commence radar calibration run DK
1355z 06/15/03 21 31.00N. 158 17.32W. End Radar Srvey TD

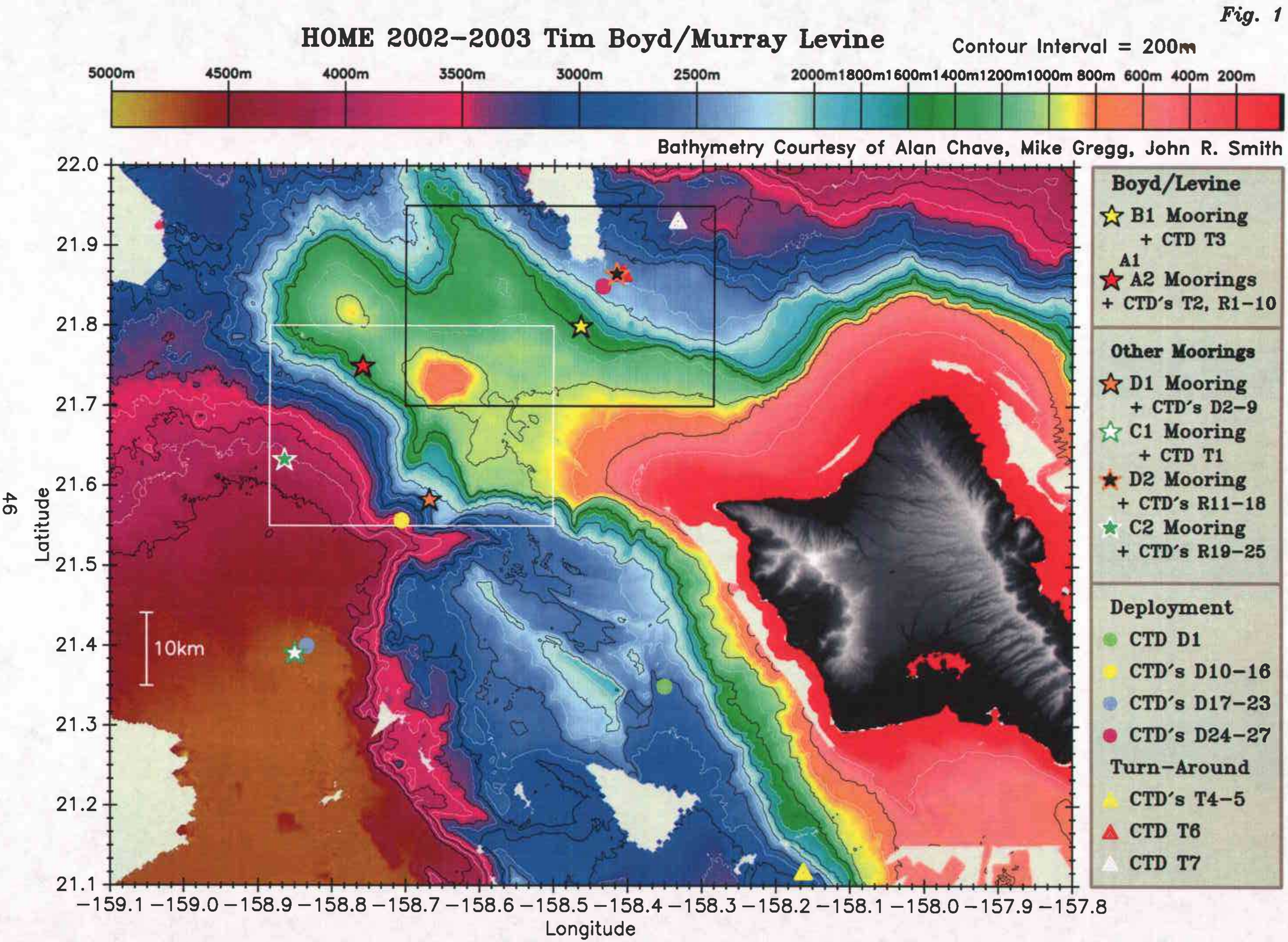
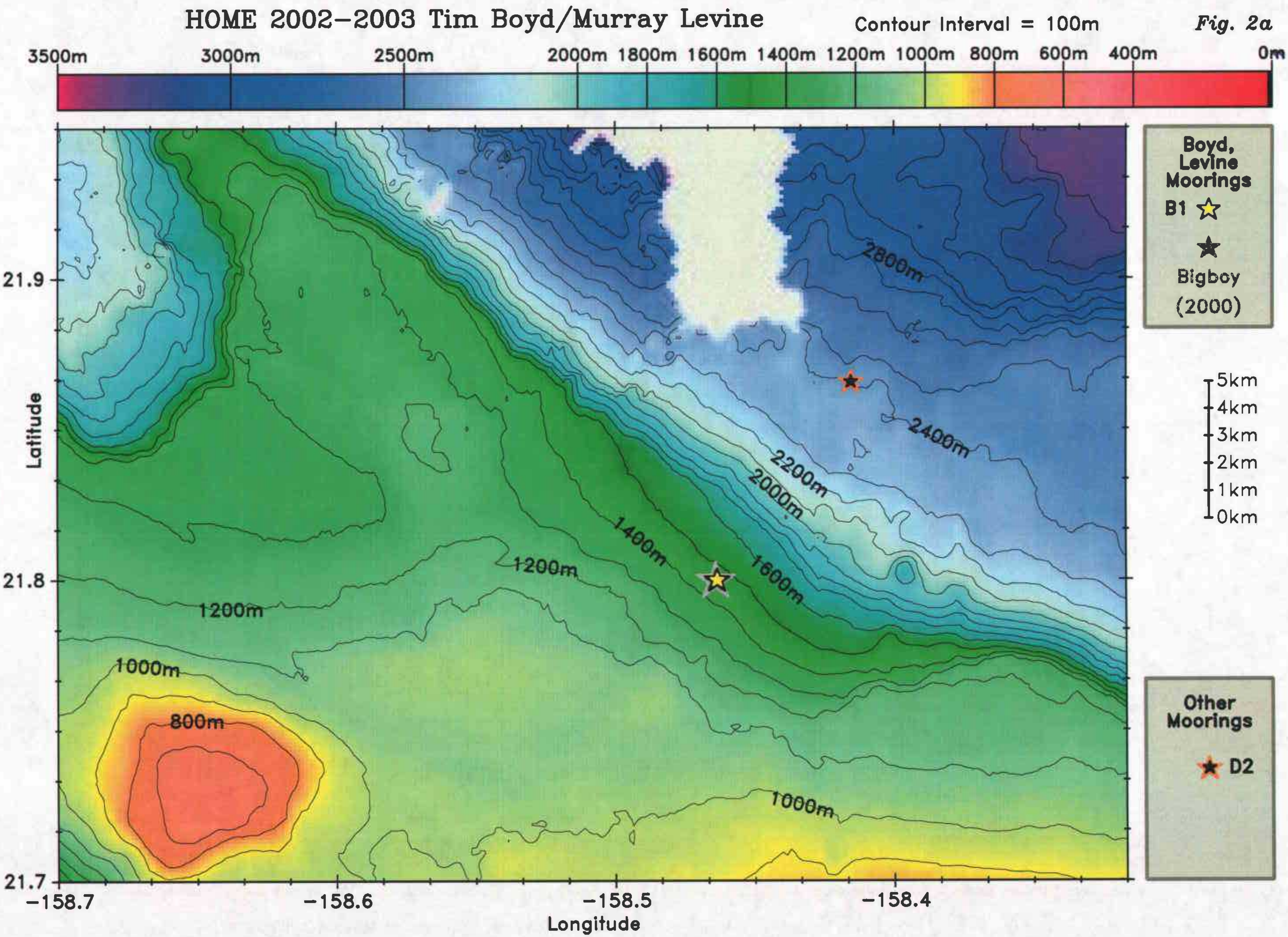
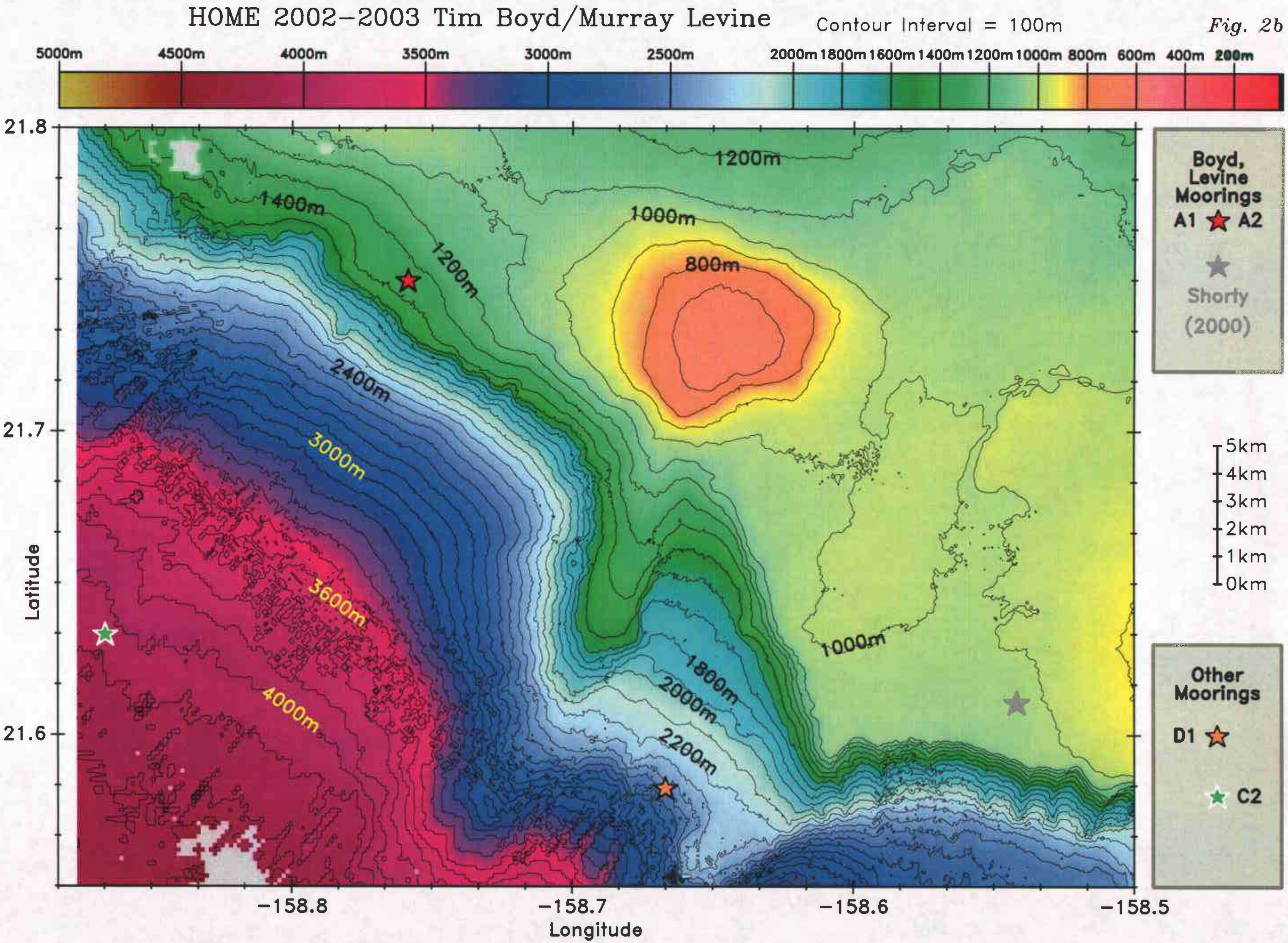


Fig. 1
HOME 2002-2003 Tim Boyd/Murray Levine
Contour Interval = 200m
5000m 4500m 4000m 3500m 3000m 2500m 2000m 1800m 1600m 1400m 1200m 1000m 800m 600m 400m 200m
Bathymetry Courtesy of Alan Chave, Mike Gregg, John R. Smith
Boyd/Levine
B1 Mooring + CTD T3
A1 A2 Moorings + CTD's T2, R1-10
Other Moorings
D1 Mooring + CTD's D2-9
C1 Mooring + CTD T1
D2 Mooring + CTD's R11-18
C2 Mooring + CTD's R19-25
Deployment
CTD D1
CTD's D10-16
CTD's D17-23
CTD's D24-27
Turn-Around
CTD's T4-5
CTD T6
CTD T7
10km
Latitude
Longitude



HOME 2002–2003 Tim Boyd/Murray Levine
Contour Interval = 100m
Fig. 2a
3500m
3000m
2500m
2000m
1800m
1600m
1400m
1200m
1000m
800m
600m
400m
0m
Boyd, Levine Moorings
B1
Bigboy (2000)
Other Moorings
D2
5km
4km
3km
2km
1km
0km
2800m
2400m
2200m
2000m
1400m
1600m
1200m
1200m
1000m
800m
1000m
21.9
21.8
21.7
Latitude
−158.7
−158.6
−158.5
−158.4
Longitude

Fig. 2b


HOME 2002-2003 Tim Boyd/Murray Levine
Contour Interval = 100m
5000m 4500m 4000m 3500m 3000m 2500m 2000m 1800m 1600m 1400m 1200m 1000m 800m 600m 400m 200m
1200m
1400m
1000m
1200m
800m
2400m
3000m
3600m
4000m
1000m
1800m
2000m
2200m
21.8
21.7
21.6
−158.8
−158.7
−158.6
−158.5
Latitude
Longitude
5km
4km
3km
2km
1km
0km
Boyd, Levine Moorings
A1 A2
Shorty (2000)
Other Moorings
D1
C2

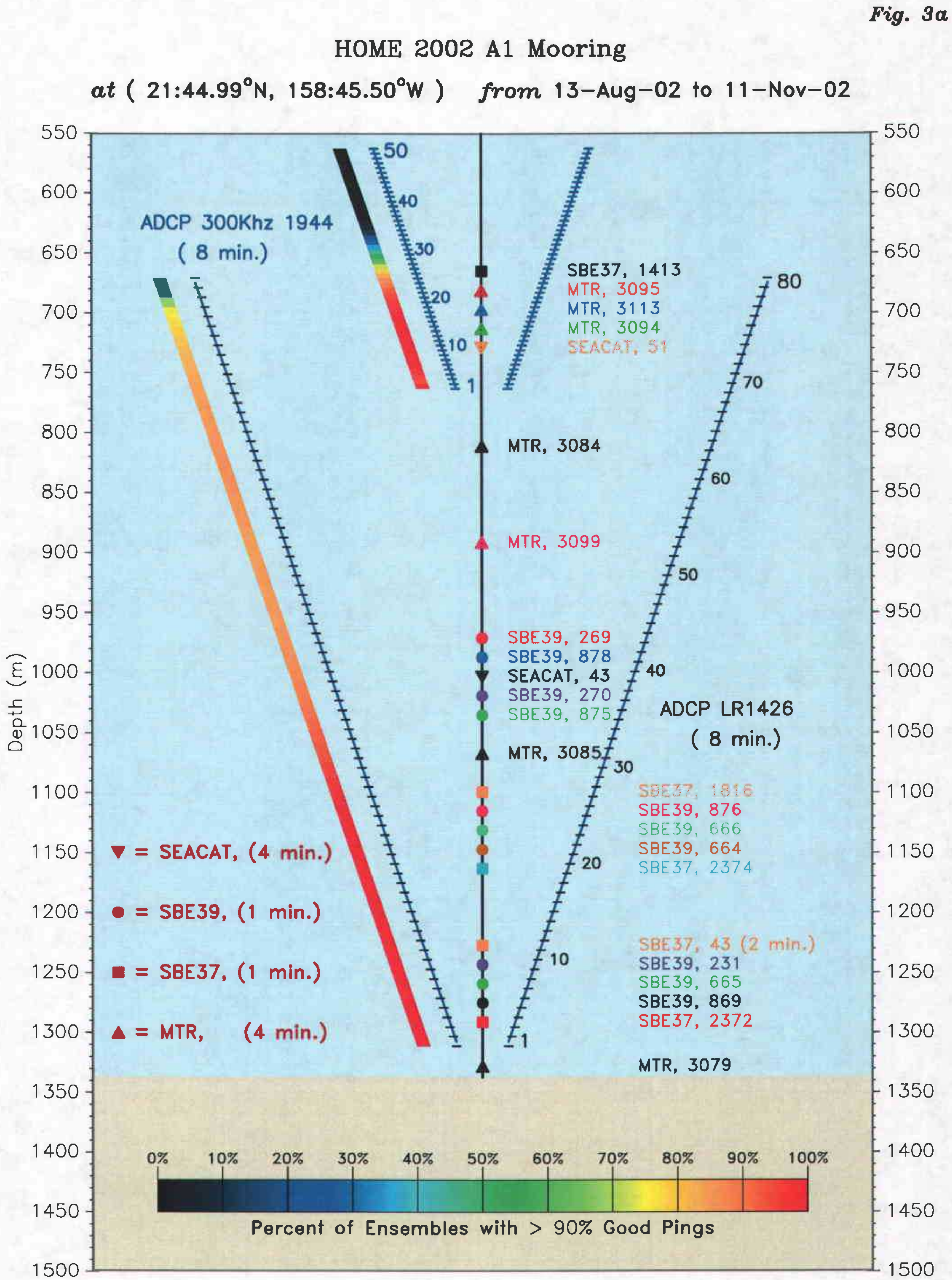


Fig. 3a
HOME 2002 A1 Mooring
at (21:44.99°N, 158:45.50°W) from 13–Aug–02 to 11–Nov–02
ADCP 300Khz 1944
(8 min.)
SBE37, 1413
MTR, 3095
MTR, 3113
MTR, 3094
SEACAT, 51
MTR, 3084
MTR, 3099
SBE39, 269
SBE39, 878
SEACAT, 43
SBE39, 270
SBE39, 875
ADCP LR1426
(8 min.)
MTR, 3085
SBE37, 1816
SBE39, 876
SBE39, 666
SBE39, 664
SBE37, 2374
SBE37, 43 (2 min.)
SBE39, 231
SBE39, 665
SBE39, 869
SBE37, 2372
MTR, 3079
▼ = SEACAT, (4 min.)
● = SBE39, (1 min.)
■ = SBE37, (1 min.)
▲ = MTR, (4 min.)
Depth (m)
Percent of Ensembles with > 90% Good Pings
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Fig. 3b

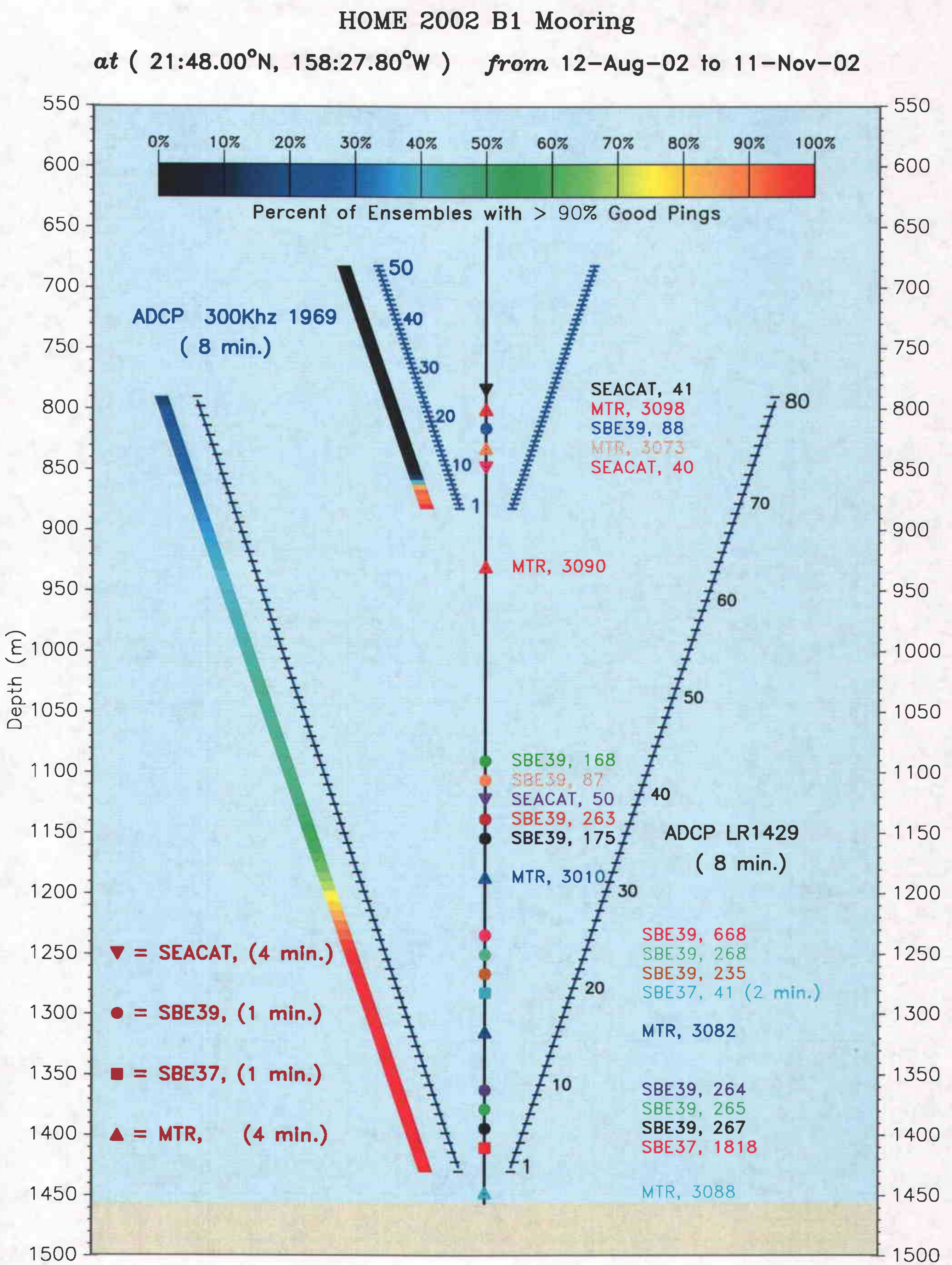
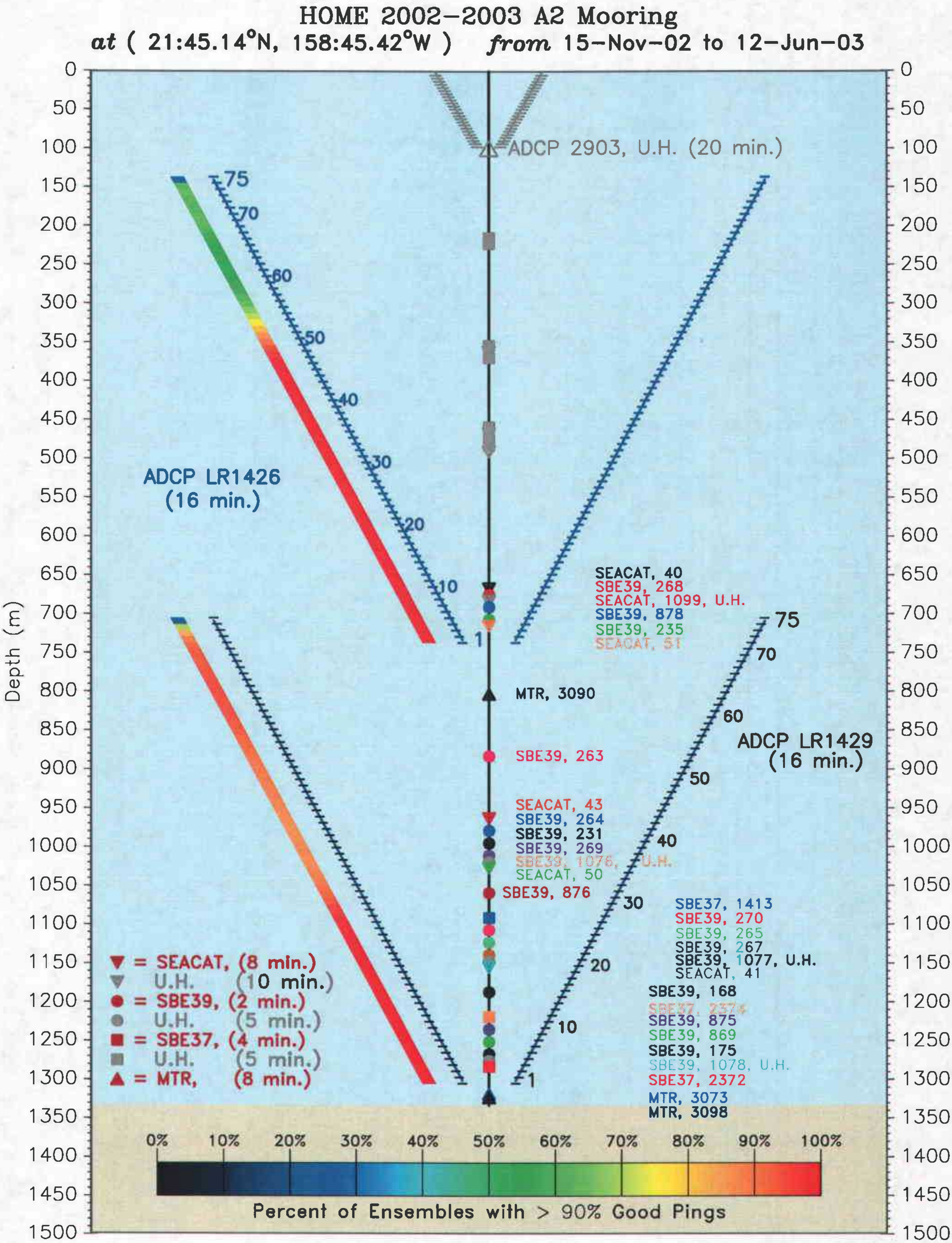

HOME 2002 B1 Mooring
at (21:48.00°N, 158:27.80°W) from 12-Aug-02 to 11-Nov-02
Percent of Ensembles with > 90% Good Pings
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
ADCP 300Khz 1969
(8 min.)
ADCP LR1429
(8 min.)
SEACAT, 41
MTR, 3098
SBE39, 88
MTR, 3073
SEACAT, 40
MTR, 3090
SBE39, 168
SBE39, 87
SEACAT, 50
SBE39, 263
SBE39, 175
MTR, 3010
SBE39, 668
SBE39, 268
SBE39, 235
SBE37, 41 (2 min.)
MTR, 3082
SBE39, 264
SBE39, 265
SBE39, 267
SBE37, 1818
MTR, 3088
▼ = SEACAT, (4 min.)
● = SBE39, (1 min.)
■ = SBE37, (1 min.)
▲ = MTR, (4 min.)
Depth (m)
550 600 650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500

Fig. 3c



HOME 2002–2003 A2 Mooring
at (21:45.14°N, 158:45.42°W) from 15–Nov–02 to 12–Jun–03
Depth (m)
ADCP 2903, U.H. (20 min.)
ADCP LR1426 (16 min.)
ADCP LR1429 (16 min.)
SEACAT, 40
SBE39, 268
SEACAT, 1099, U.H.
SBE39, 878
SBE39, 235
SEACAT, 51
MTR, 3090
SBE39, 263
SEACAT, 43
SBE39, 264
SBE39, 231
SBE39, 269
SBE39, 1076, U.H.
SEACAT, 50
SBE39, 876
SBE37, 1413
SBE39, 270
SBE39, 265
SBE39, 267
SBE39, 1077, U.H.
SEACAT, 41
SBE39, 168
SBE37, 2374
SBE39, 875
SBE39, 869
SBE39, 175
SBE39, 1078, U.H.
SBE37, 2372
MTR, 3073
MTR, 3098
▼ = SEACAT, (8 min.)
▼ U.H. (10 min.)
● = SBE39, (2 min.)
● U.H. (5 min.)
■ = SBE37, (4 min.)
■ U.H. (5 min.)
▲ = MTR, (8 min.)
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Percent of Ensembles with > 90% Good Pings

Fig. 4

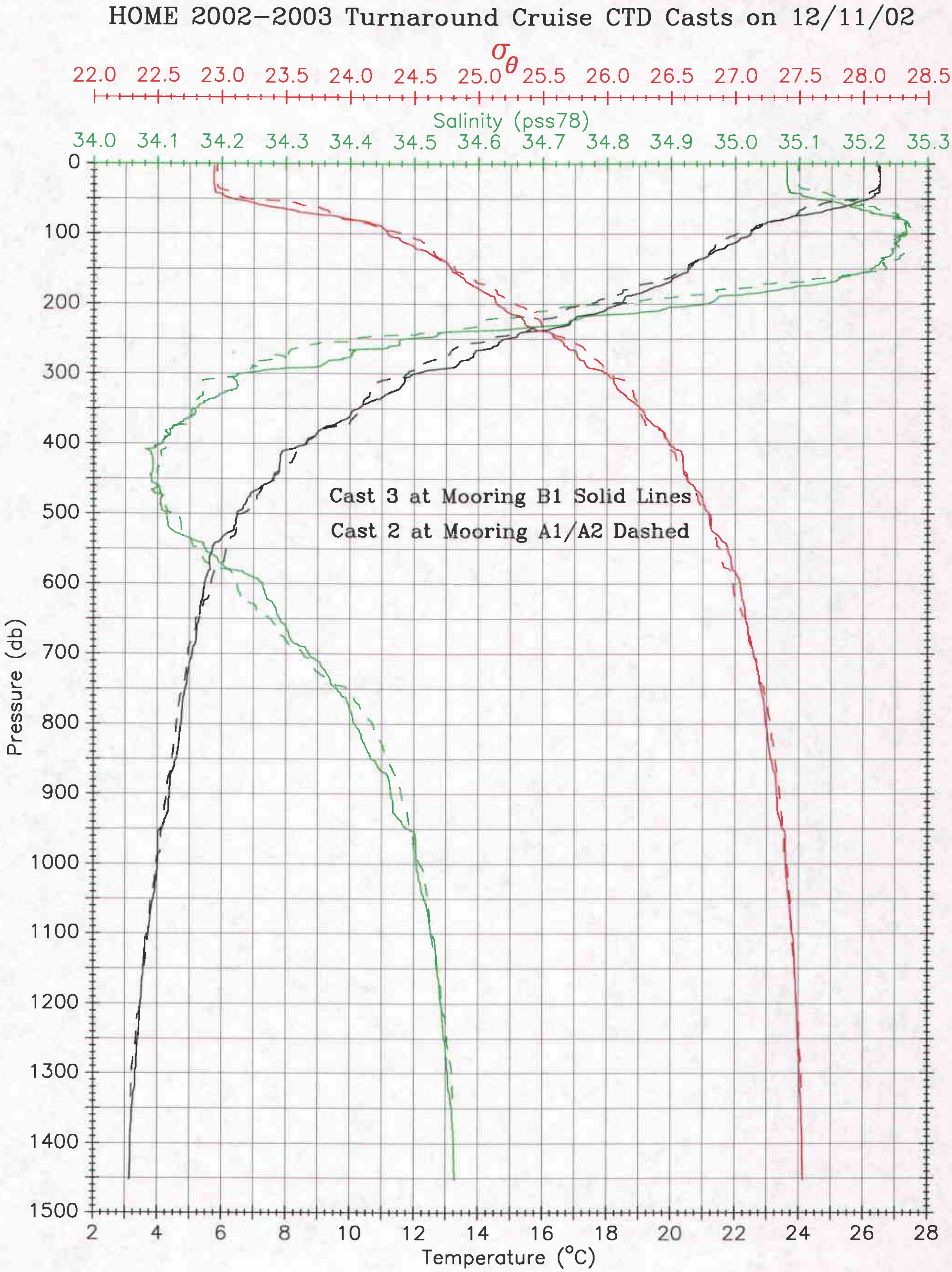
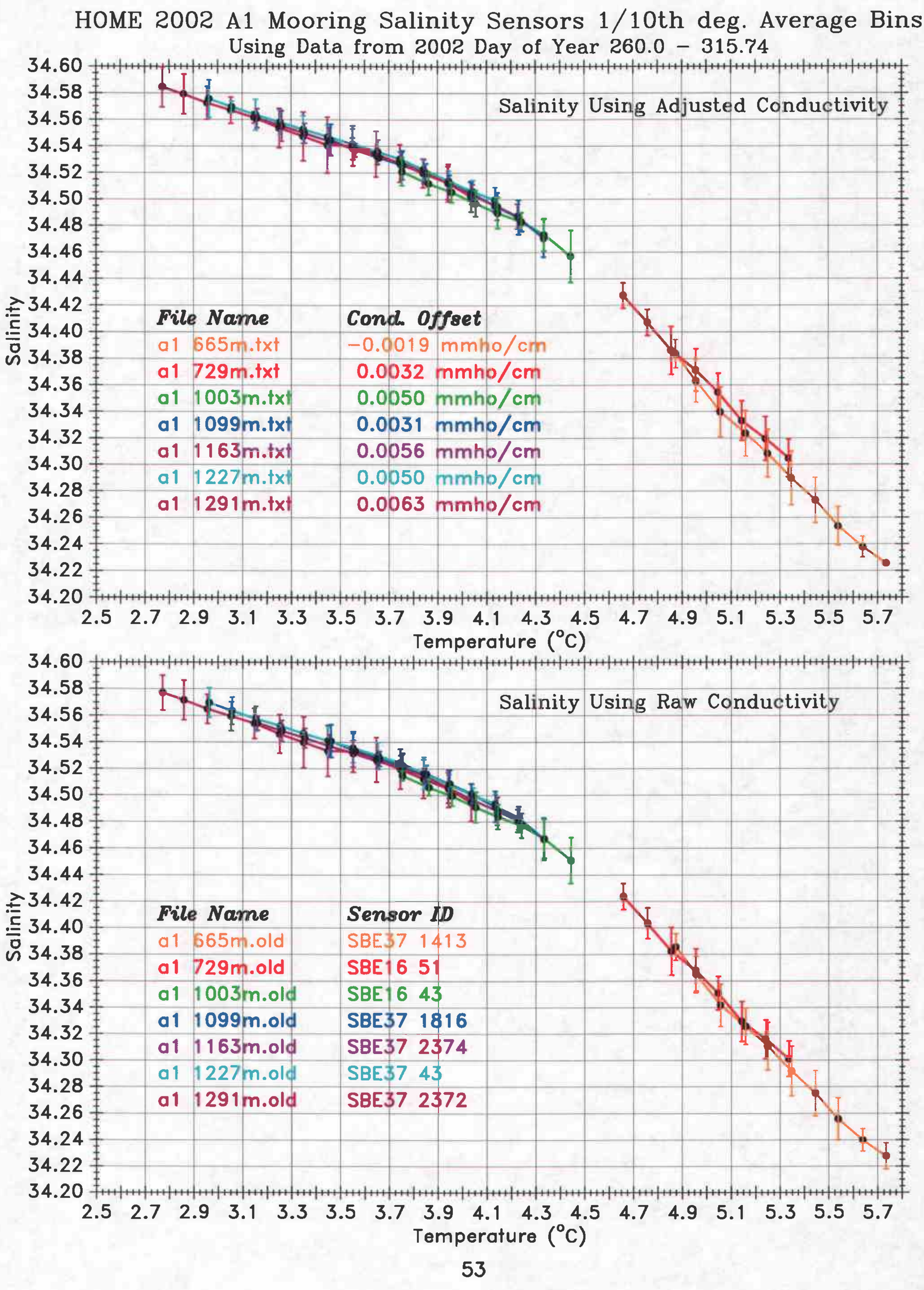
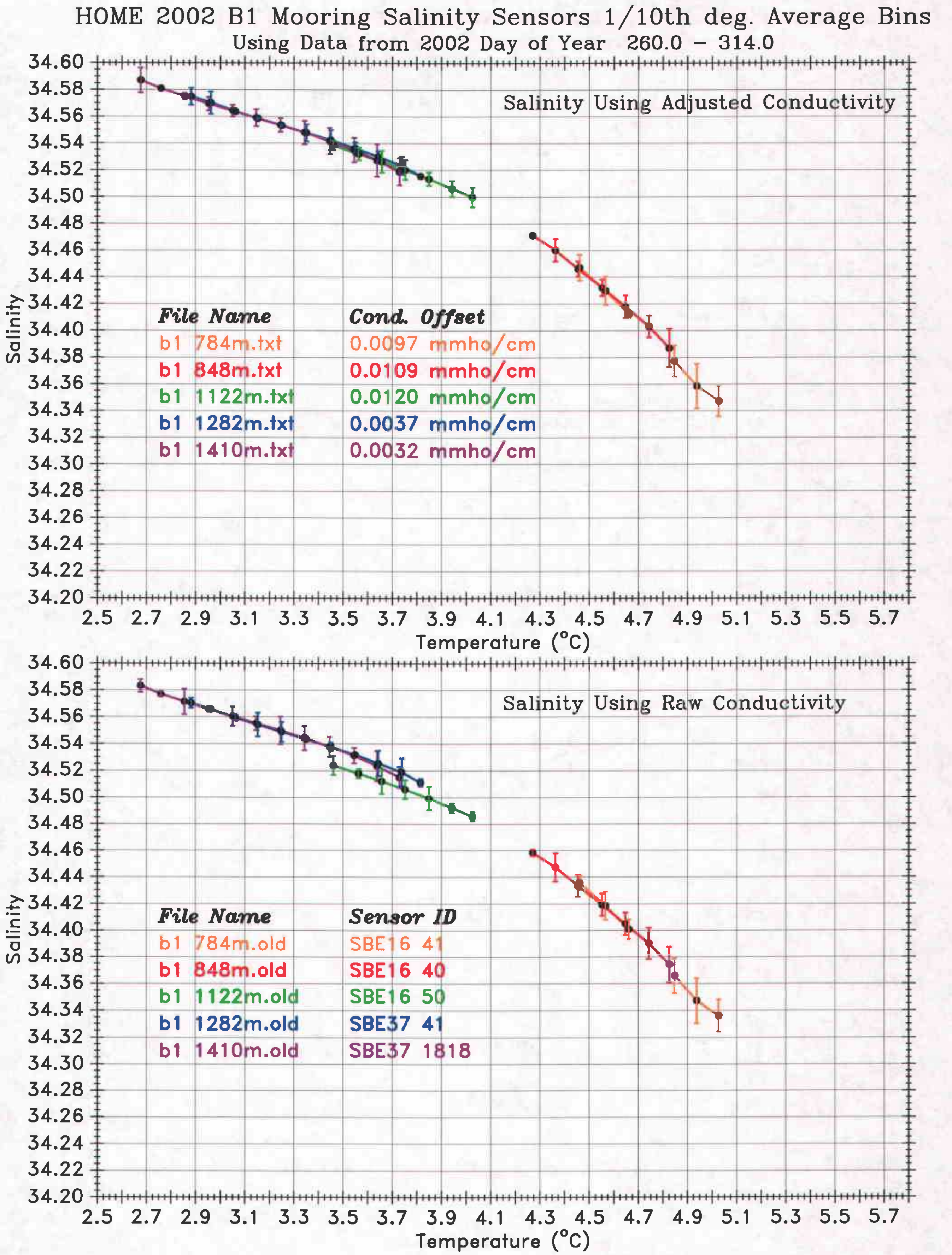

HOME 2002–2003 Turnaround Cruise CTD Casts on 12/11/02
σ_θ
22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5
Salinity (pss78)
34.0 34.1 34.2 34.3 34.4 34.5 34.6 34.7 34.8 34.9 35.0 35.1 35.2 35.3
Cast 3 at Mooring B1 Solid Lines
Cast 2 at Mooring A1/A2 Dashed
Pressure (db)
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
2 4 6 8 10 12 14 16 18 20 22 24 26 28
Temperature (°C)

Fig. 5a



HOME 2002 A1 Mooring Salinity Sensors 1/10th deg. Average Bins
Using Data from 2002 Day of Year 260.0 - 315.74
Salinity Using Adjusted Conductivity
File Name
Cond. Offset
a1 665m.txt -0.0019 mmho/cm
a1 729m.txt 0.0032 mmho/cm
a1 1003m.txt 0.0050 mmho/cm
a1 1099m.txt 0.0031 mmho/cm
a1 1163m.txt 0.0056 mmho/cm
a1 1227m.txt 0.0050 mmho/cm
a1 1291m.txt 0.0063 mmho/cm
Salinity
34.60
34.58
34.56
34.54
34.52
34.50
34.48
34.46
34.44
34.42
34.40
34.38
34.36
34.34
34.32
34.30
34.28
34.26
34.24
34.22
34.20
2.5 2.7 2.9 3.1 3.3 3.5 3.7 3.9 4.1 4.3 4.5 4.7 4.9 5.1 5.3 5.5 5.7
Temperature (°C)
Salinity Using Raw Conductivity
File Name
Sensor ID
a1 665m.old SBE37 1413
a1 729m.old SBE16 51
a1 1003m.old SBE16 43
a1 1099m.old SBE37 1816
a1 1163m.old SBE37 2374
a1 1227m.old SBE37 43
a1 1291m.old SBE37 2372
Salinity
Temperature (°C)

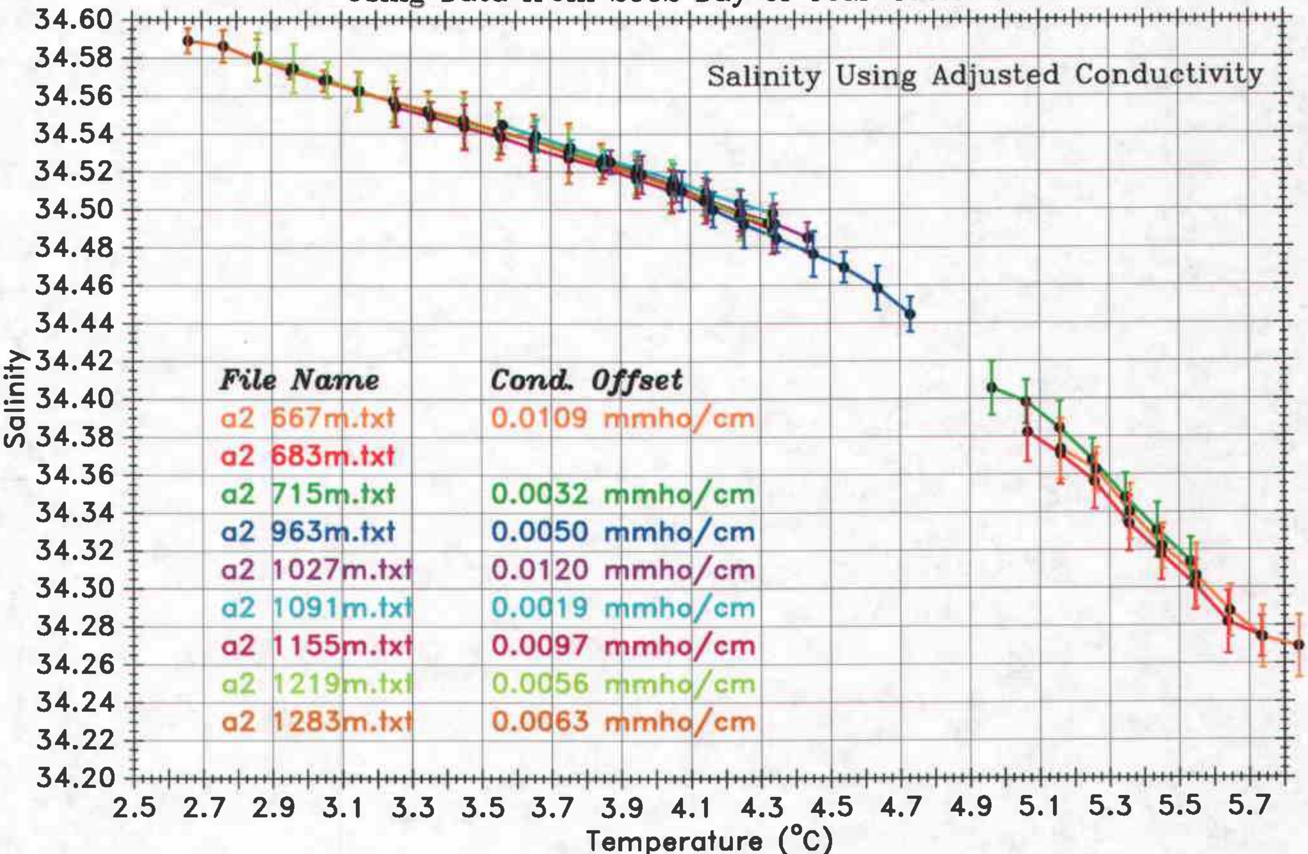
Fig. 5b



HOME 2002 B1 Mooring Salinity Sensors 1/10th deg. Average Bins
Using Data from 2002 Day of Year 260.0 - 314.0
Salinity Using Adjusted Conductivity
File Name
Cond. Offset
b1 784m.txt
0.0097 mmho/cm
b1 848m.txt
0.0109 mmho/cm
b1 1122m.txt
0.0120 mmho/cm
b1 1282m.txt
0.0037 mmho/cm
b1 1410m.txt
0.0032 mmho/cm
Salinity
Temperature (°C)
Salinity Using Raw Conductivity
File Name
Sensor ID
b1 784m.old
SBE16 41
b1 848m.old
SBE16 40
b1 1122m.old
SBE16 50
b1 1282m.old
SBE37 41
b1 1410m.old
SBE37 1818
Salinity
Temperature (°C)

Fig. 5c

HOME 2002/3 A2 Mooring Salinity Sensors 1/10th deg. Average Bins
Using Data from 2002 Day of Year 460.0–527.9



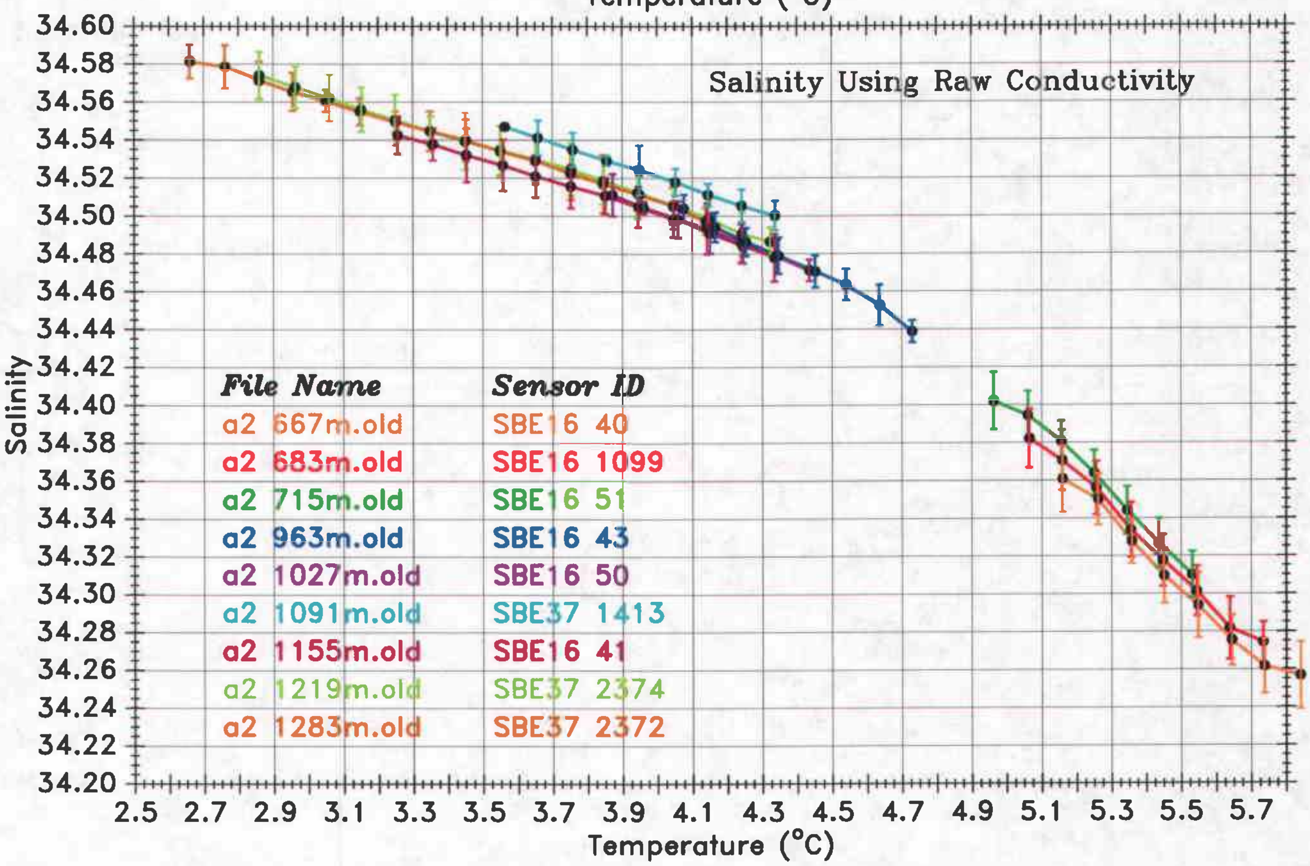


Fig. 5d

HOME 2002/3 A2 Mooring Salinity Sensors 1/10th deg. Average Bins

Using Data from 2002 Day of Year 320.0–365.0

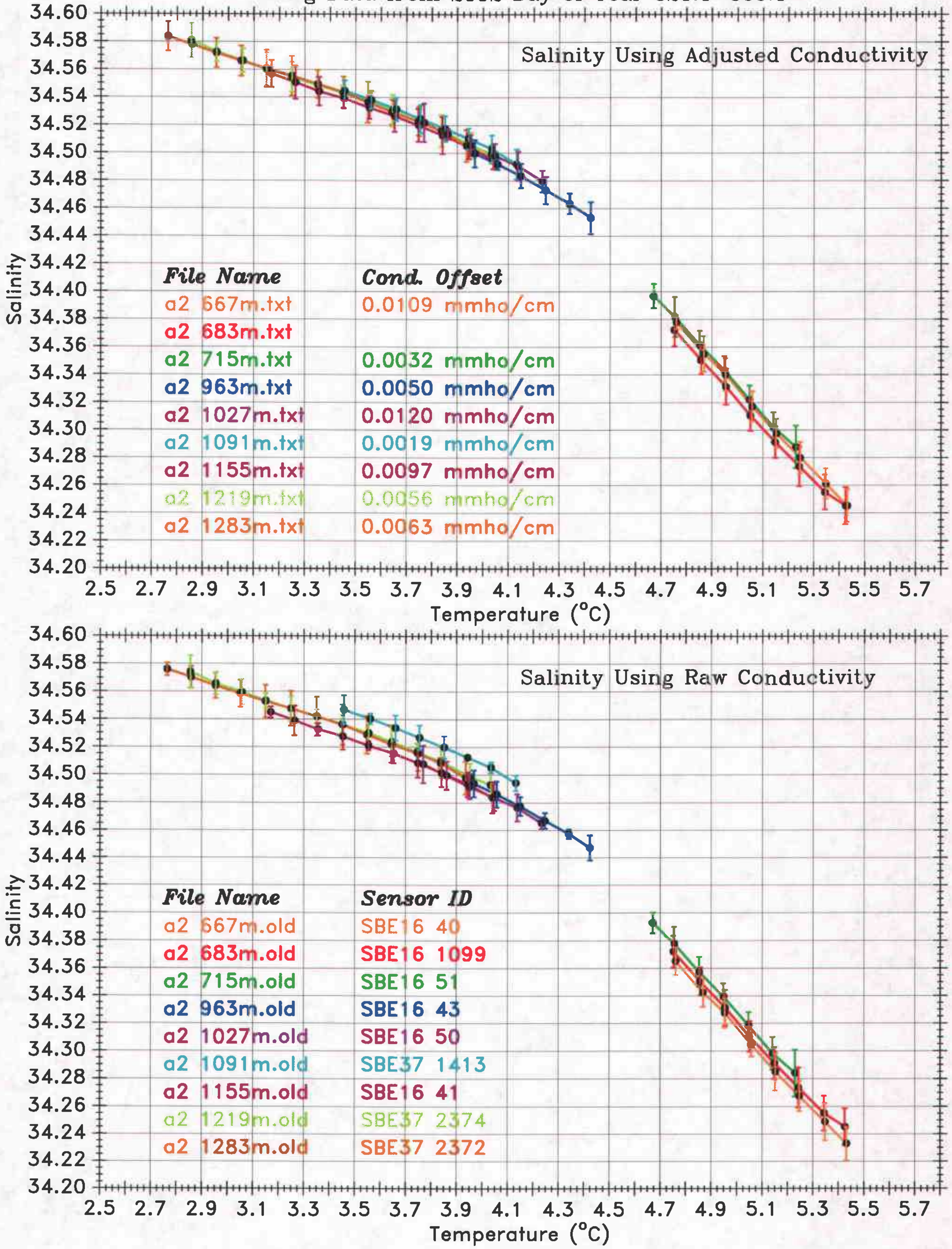
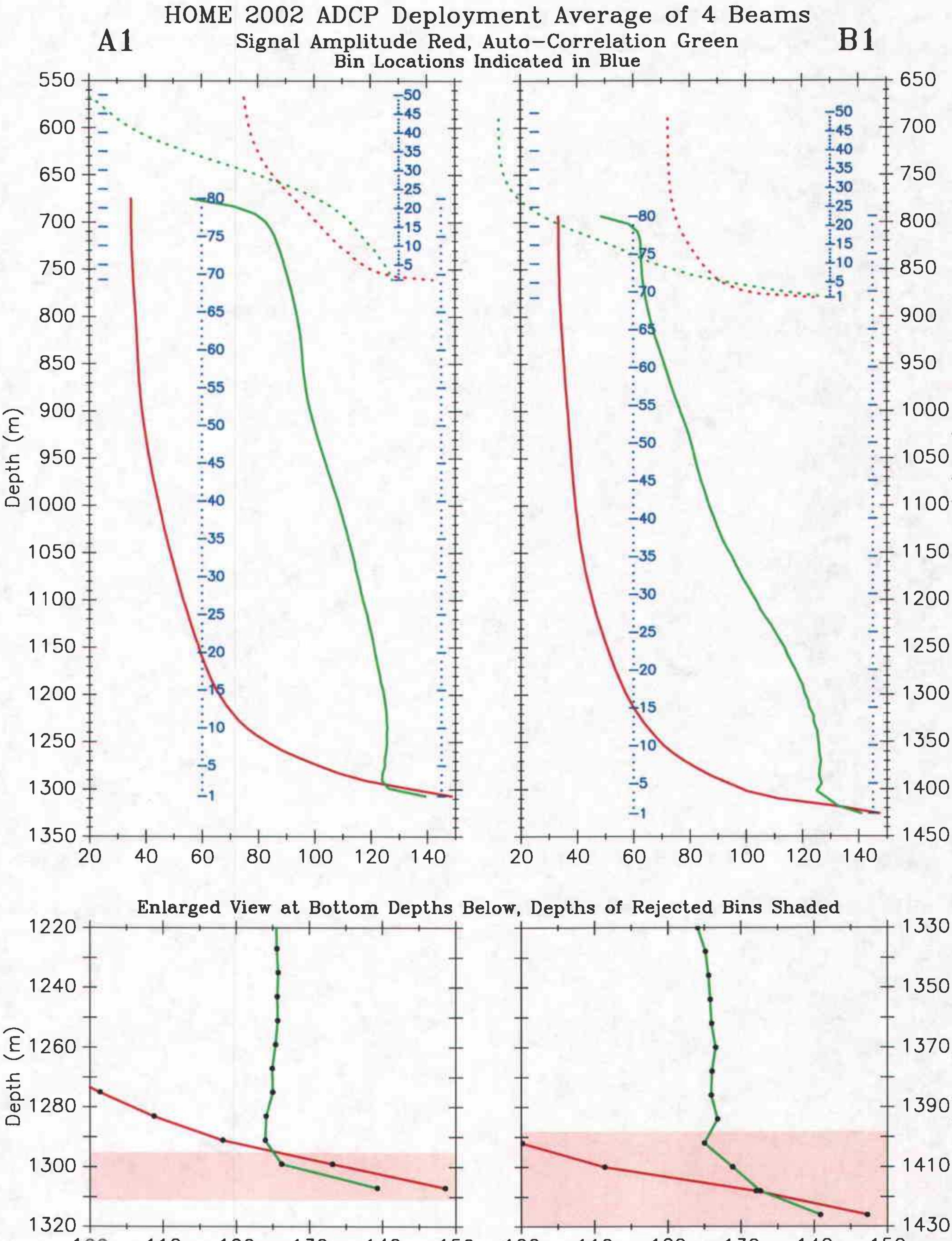


Fig. 6a



HOME 2002 ADCP Deployment Average of 4 Beams
Signal Amplitude Red, Auto-Correlation Green
Bin Locations Indicated in Blue
A1
B1
Depth (m)
Enlarged View at Bottom Depths Below, Depths of Rejected Bins Shaded
Depth (m)

Fig. 6b

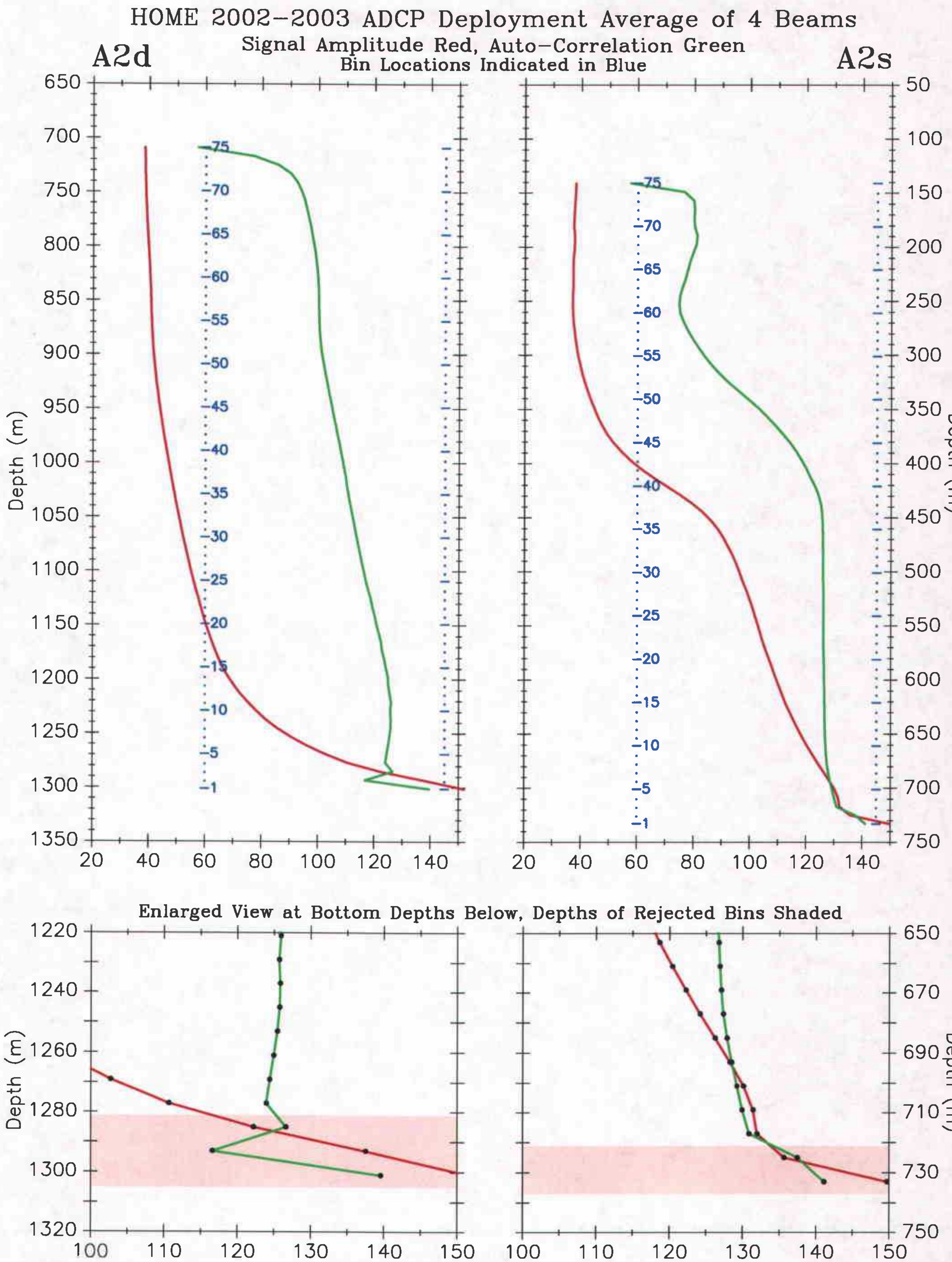

HOME 2002–2003 ADCP Deployment Average of 4 Beams
Signal Amplitude Red, Auto–Correlation Green
Bin Locations Indicated in Blue
A2d
A2s
Depth (m)
Depth (m)
Enlarged View at Bottom Depths Below, Depths of Rejected Bins Shaded

Fig. 7a

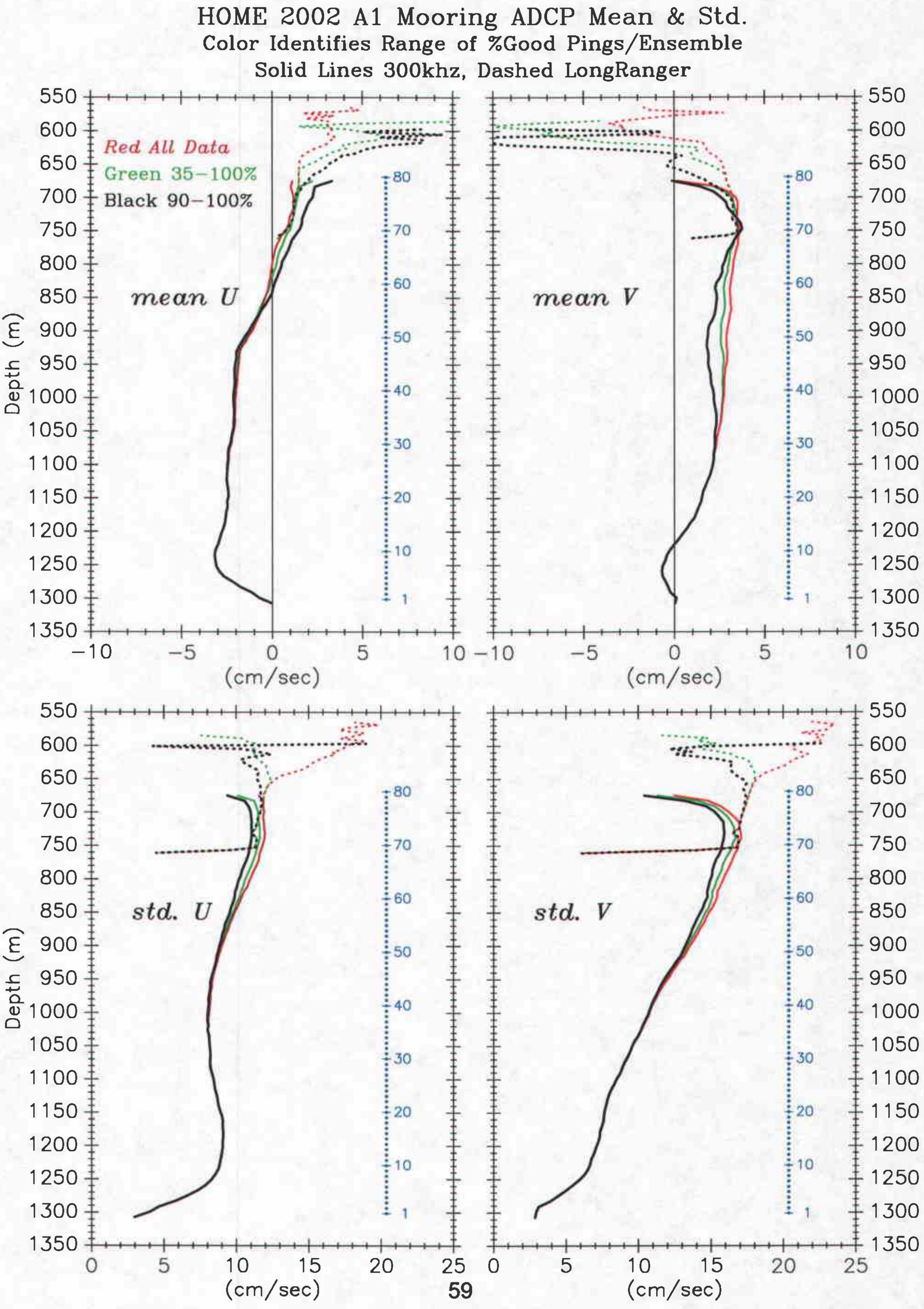
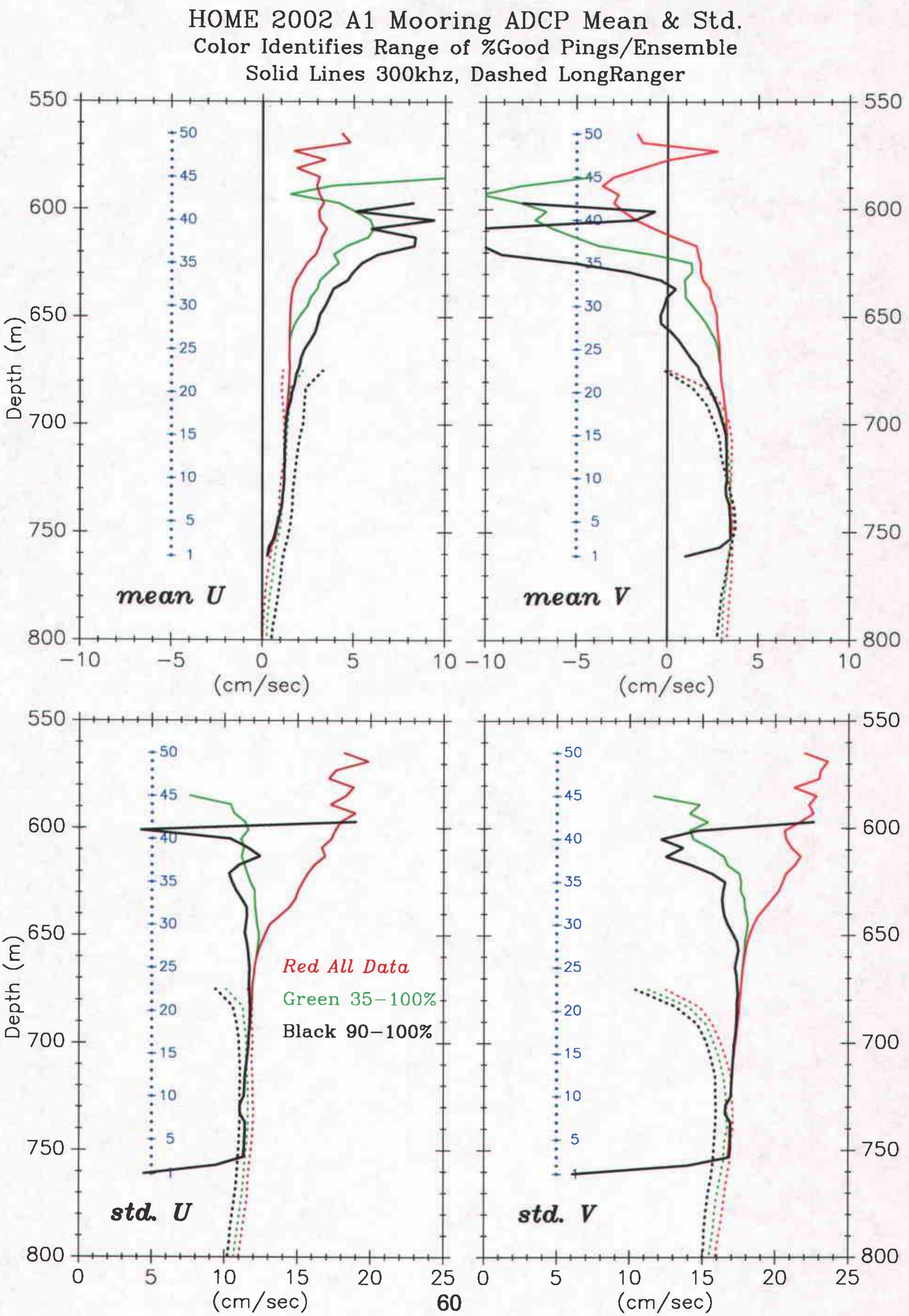
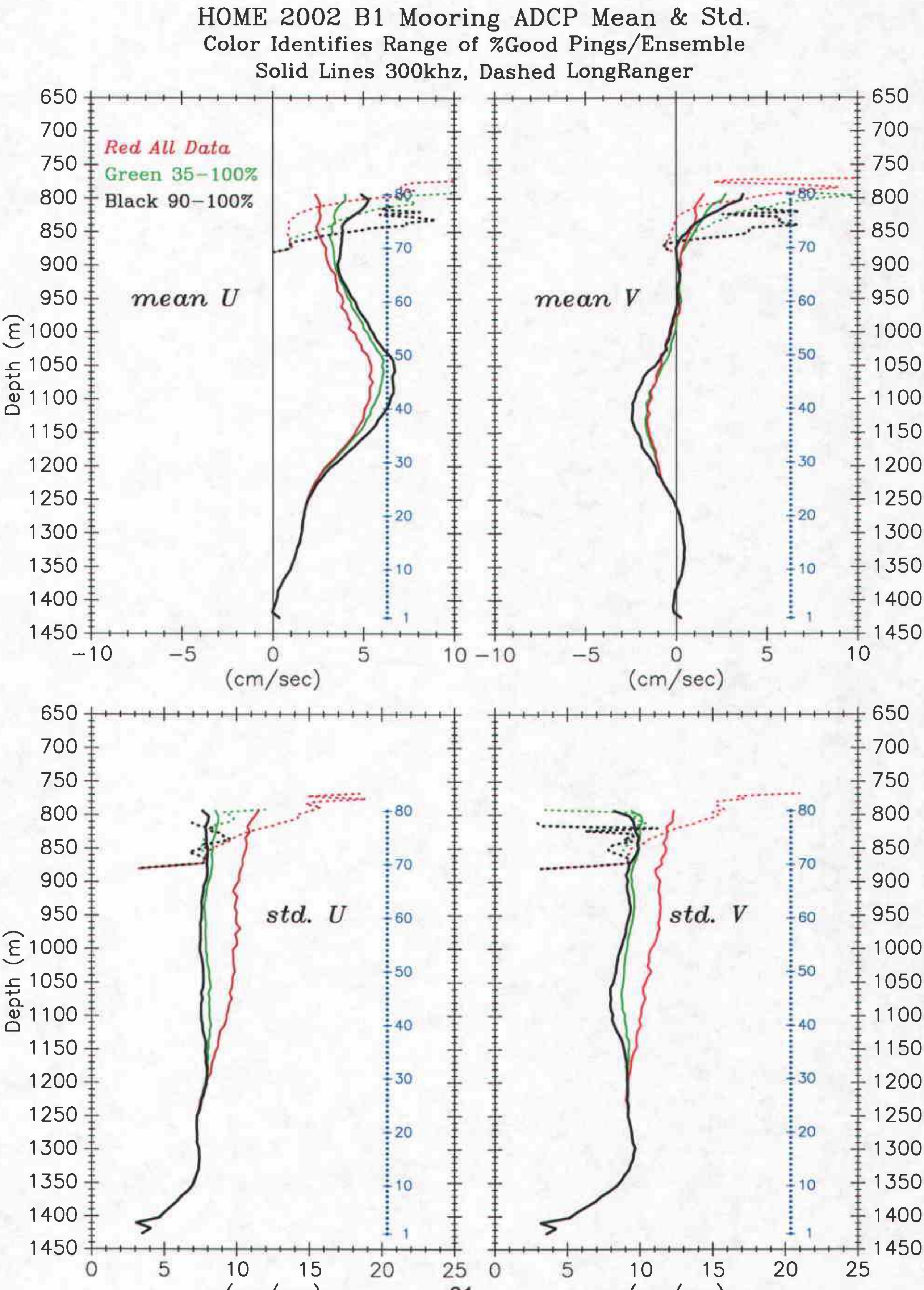

HOME 2002 A1 Mooring ADCP Mean & Std.
Color Identifies Range of %Good Pings/Ensemble
Solid Lines 300khz, Dashed LongRanger
Red All Data
Green 35-100%
Black 90-100%
mean U
mean V
std. U
std. V
Depth (m)
(cm/sec)
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
-10
-5
0
5
10
15
20
25
80
70
60
50
40
30
20
10
1

Fig. 7b


HOME 2002 A1 Mooring ADCP Mean & Std.
Color Identifies Range of %Good Pings/Ensemble
Solid Lines 300khz, Dashed LongRanger
mean U
mean V
std. U
std. V
Depth (m)
(cm/sec)
Red All Data
Green 35−100%
Black 90−100%


HOME 2002 B1 Mooring ADCP Mean & Std.
Color Identifies Range of %Good Pings/Ensemble
Solid Lines 300khz, Dashed LongRanger
Red All Data
Green 35-100%
Black 90-100%
mean U
mean V
std. U
std. V
Depth (m)
(cm/sec)

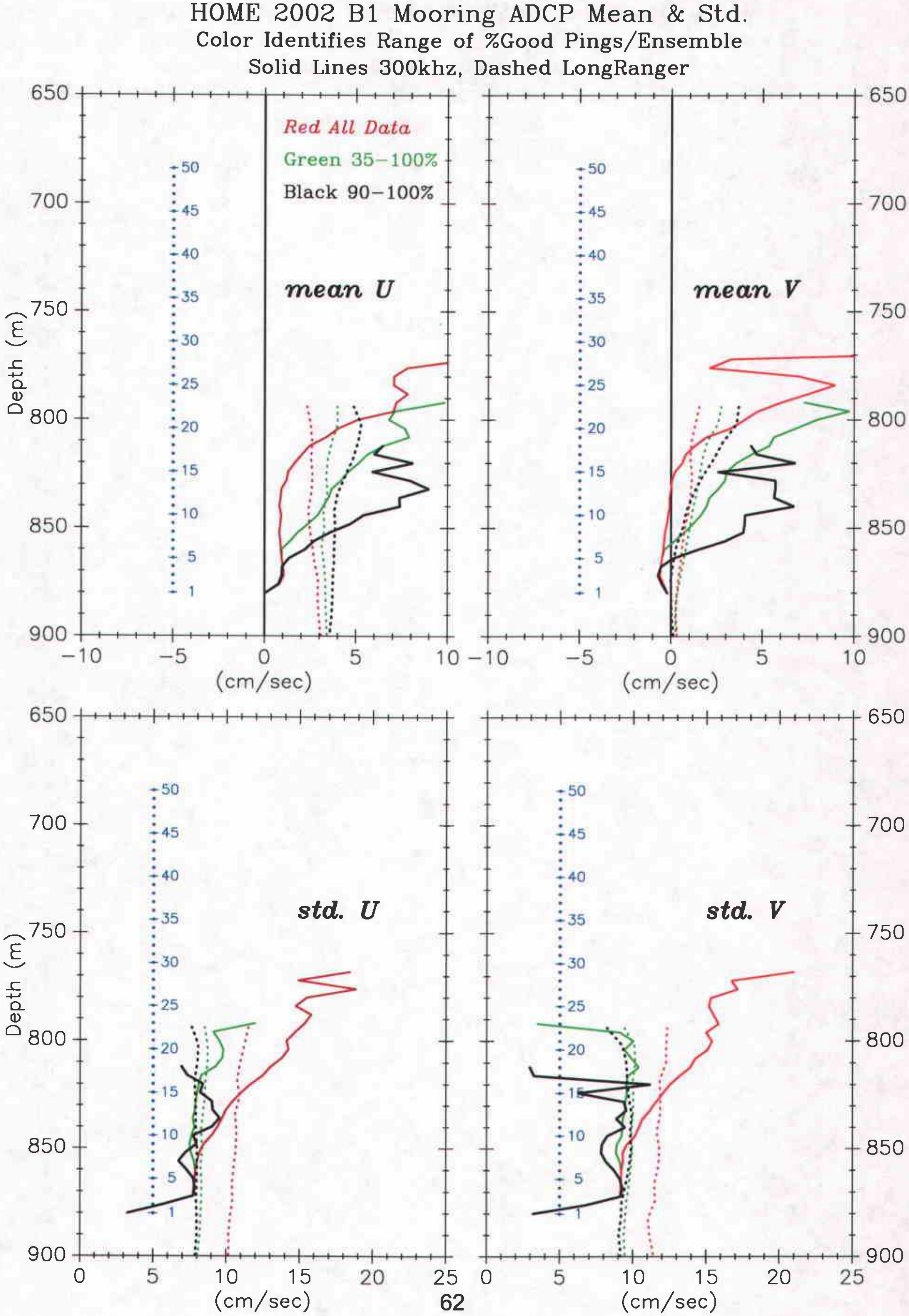
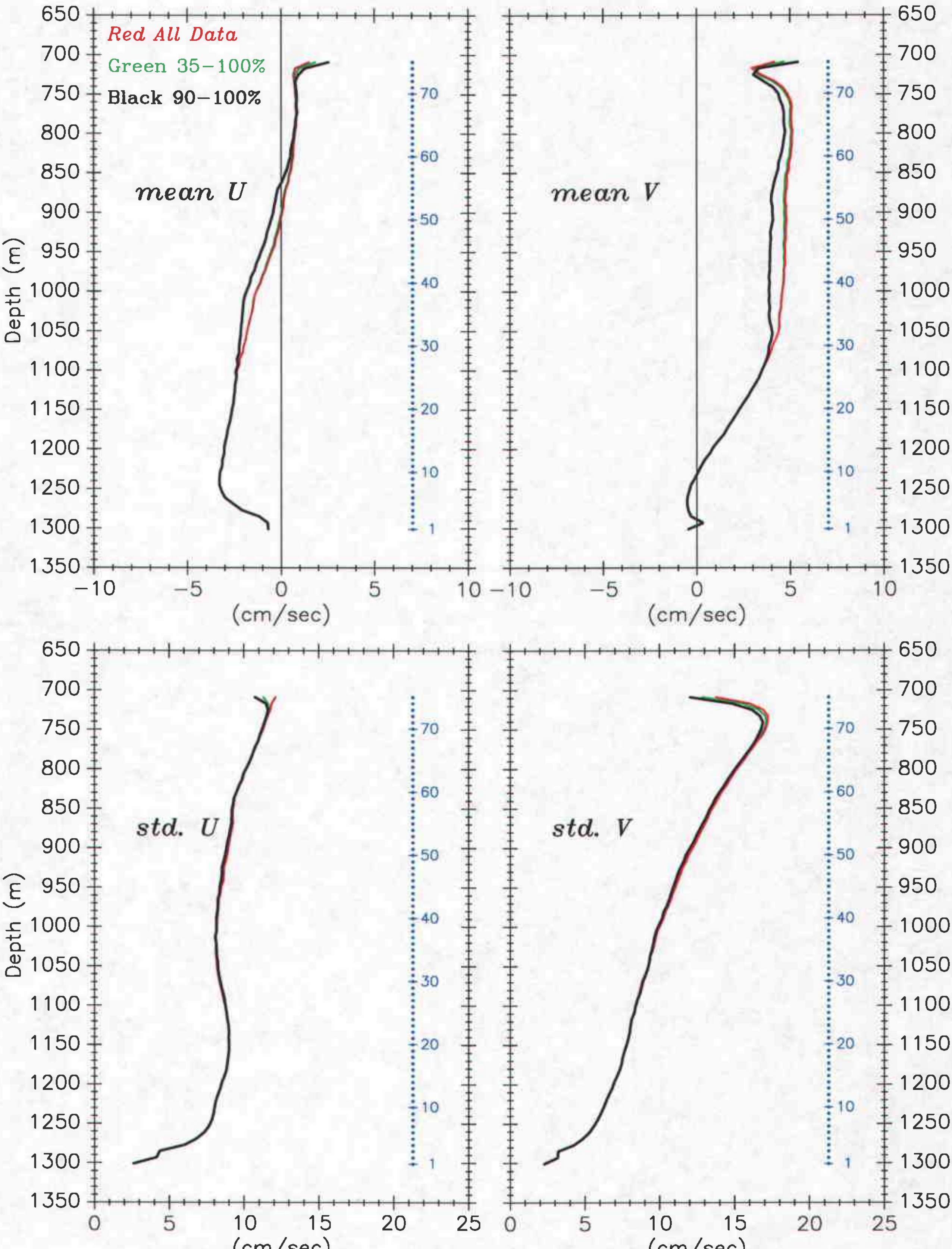

HOME 2002 B1 Mooring ADCP Mean & Std.
Color Identifies Range of %Good Pings/Ensemble
Solid Lines 300khz, Dashed LongRanger
Red All Data
Green 35–100%
Black 90–100%
mean U
mean V
std. U
std. V
Depth (m)
(cm/sec)
650
700
750
800
850
900
−10
−5
0
5
10
15
20
25
50
45
40
35
30
1

Fig. 7e

HOME 2002–2003 $A2_d$ Mooring ADCP Mean & Std.

Color Identifies Range of %Good Pings/Ensemble



HOME 2002–2003 $A2_s$ Mooring ADCP Mean & Std.
Color Identifies Range of %Good Pings/Ensemble

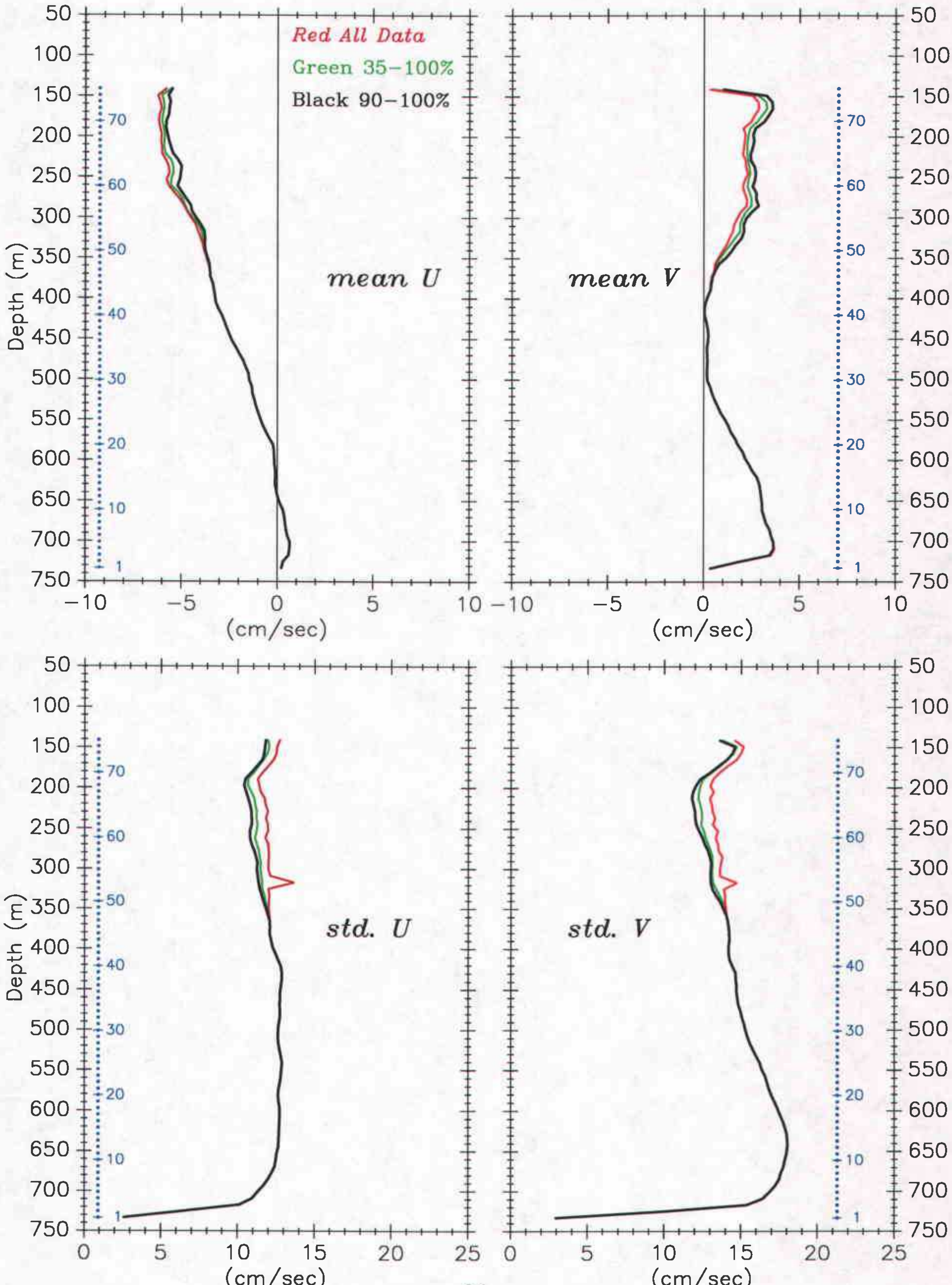


Fig. 8a

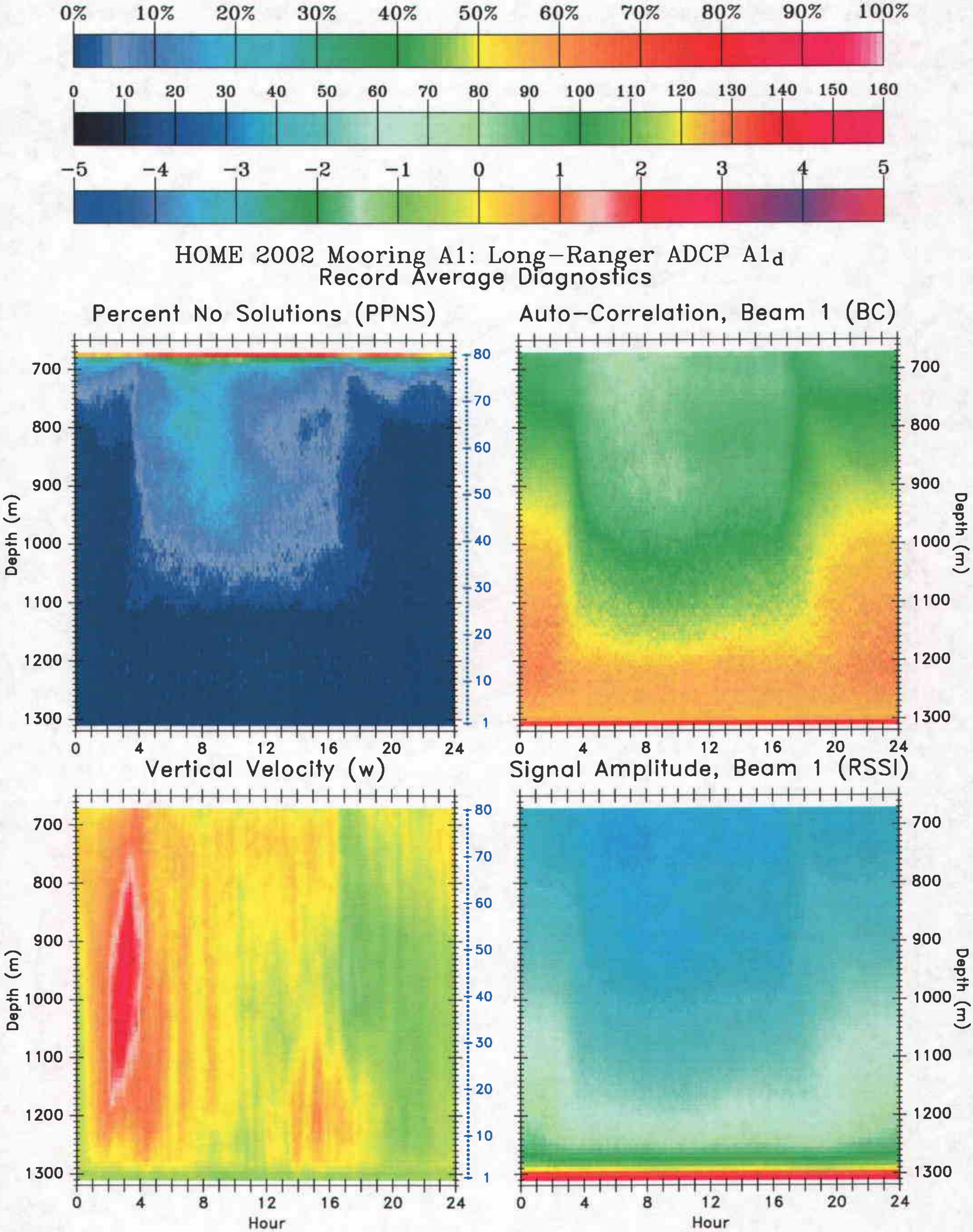
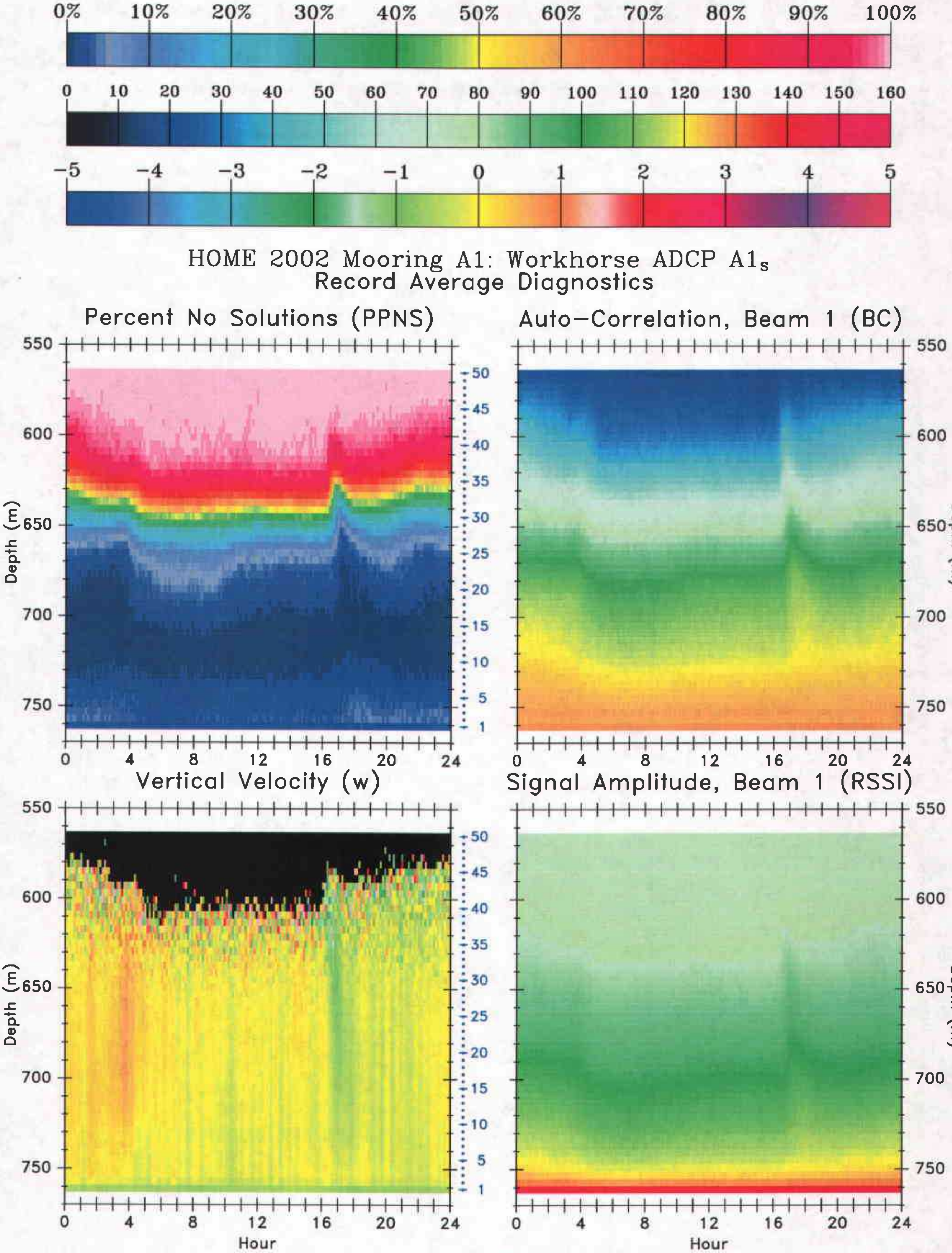

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
-5 -4 -3 -2 -1 0 1 2 3 4 5
HOME 2002 Mooring A1: Long-Ranger ADCP A1d
Record Average Diagnostics
Percent No Solutions (PPNS)
Auto-Correlation, Beam 1 (BC)
Vertical Velocity (w)
Signal Amplitude, Beam 1 (RSSI)
Depth (m)
Hour

Fig. 8b


0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
-5 -4 -3 -2 -1 0 1 2 3 4 5
HOME 2002 Mooring A1: Workhorse ADCP A1s
Record Average Diagnostics
Percent No Solutions (PPNS)
Auto-Correlation, Beam 1 (BC)
Vertical Velocity (w)
Signal Amplitude, Beam 1 (RSSI)
Depth (m)
Hour

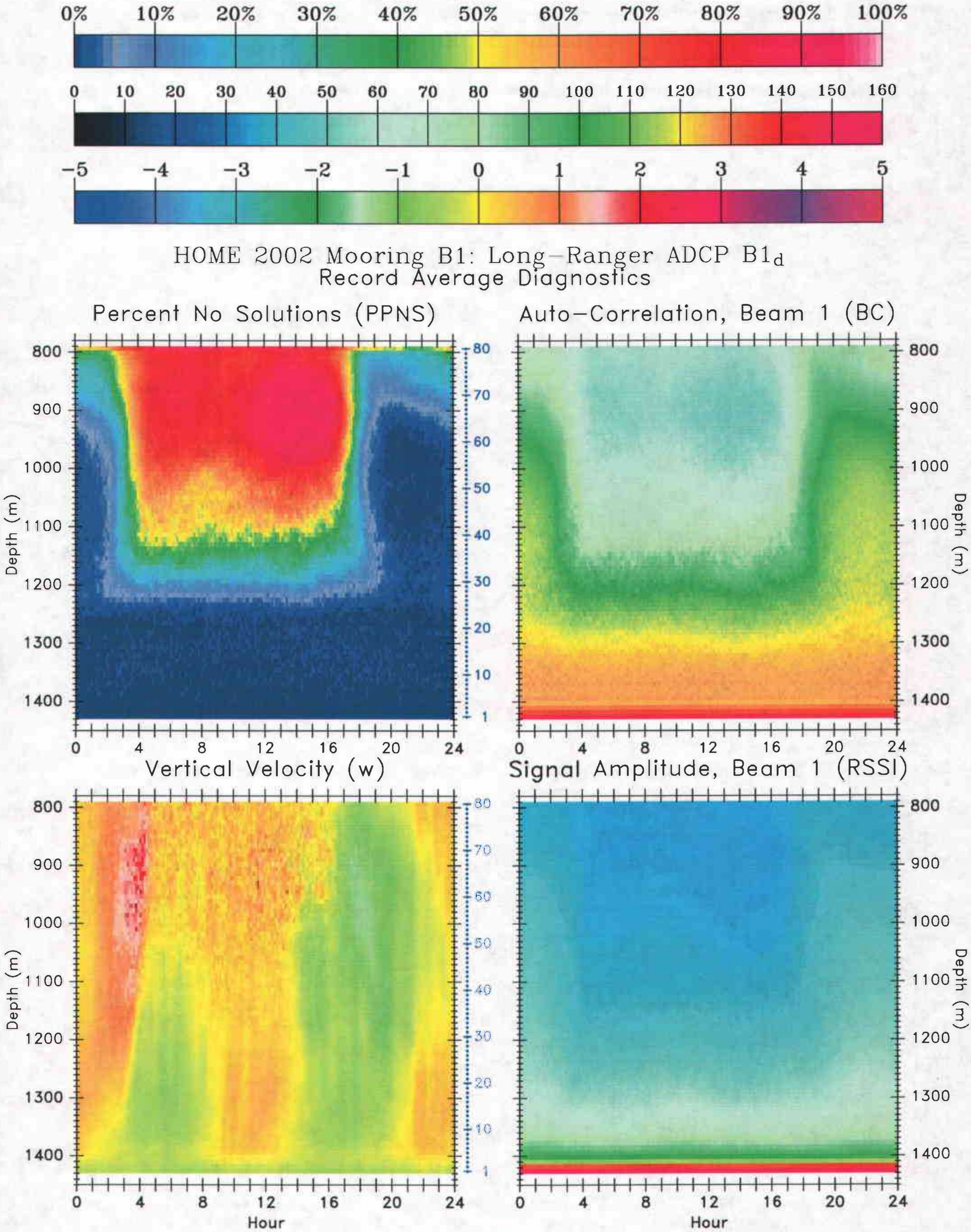

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
−5 −4 −3 −2 −1 0 1 2 3 4 5
HOME 2002 Mooring B1: Long−Ranger ADCP B1d
Record Average Diagnostics
Percent No Solutions (PPNS)
Auto−Correlation, Beam 1 (BC)
Vertical Velocity (w)
Signal Amplitude, Beam 1 (RSSI)
Depth (m)
Hour

Fig. 8d

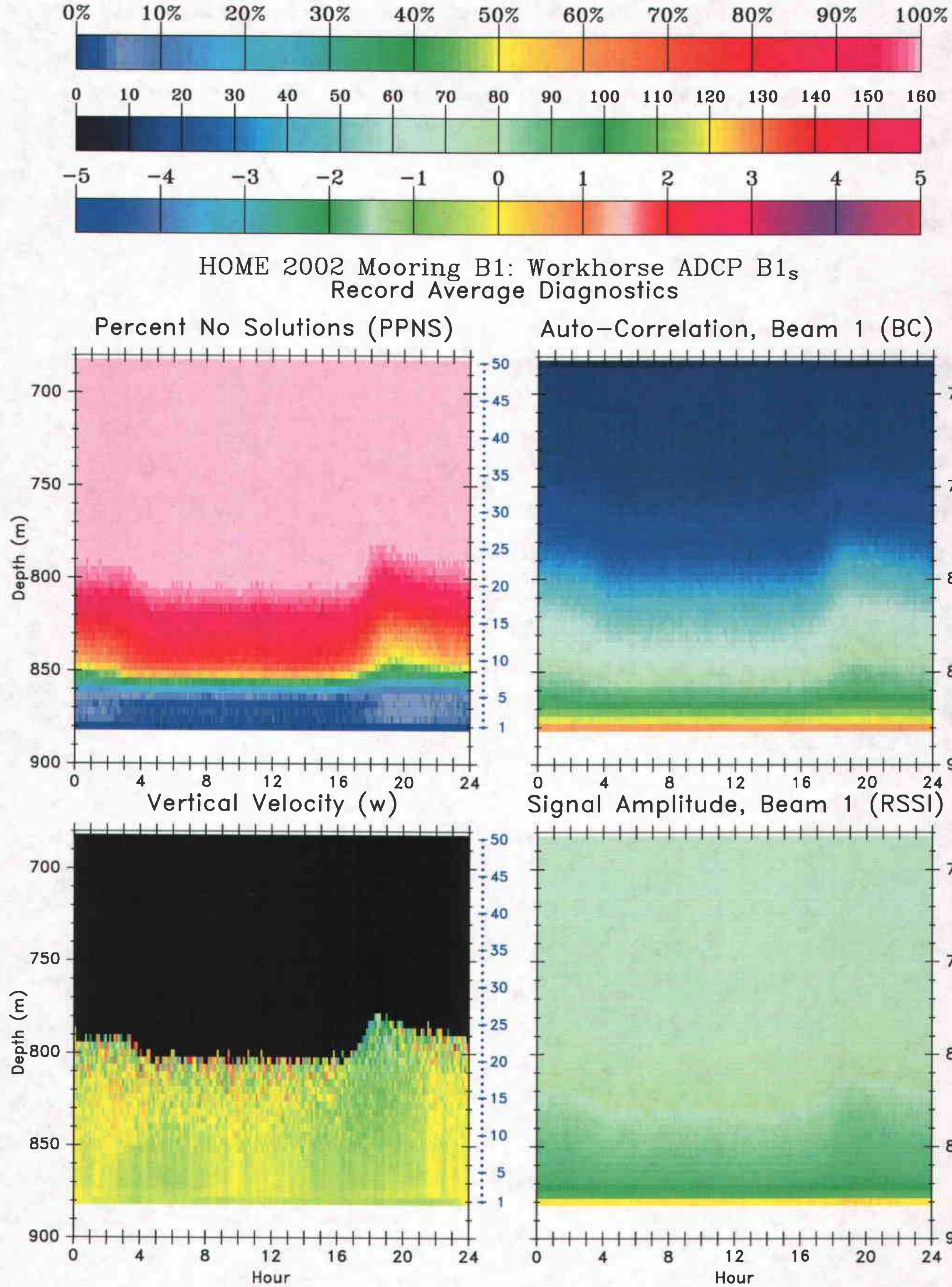
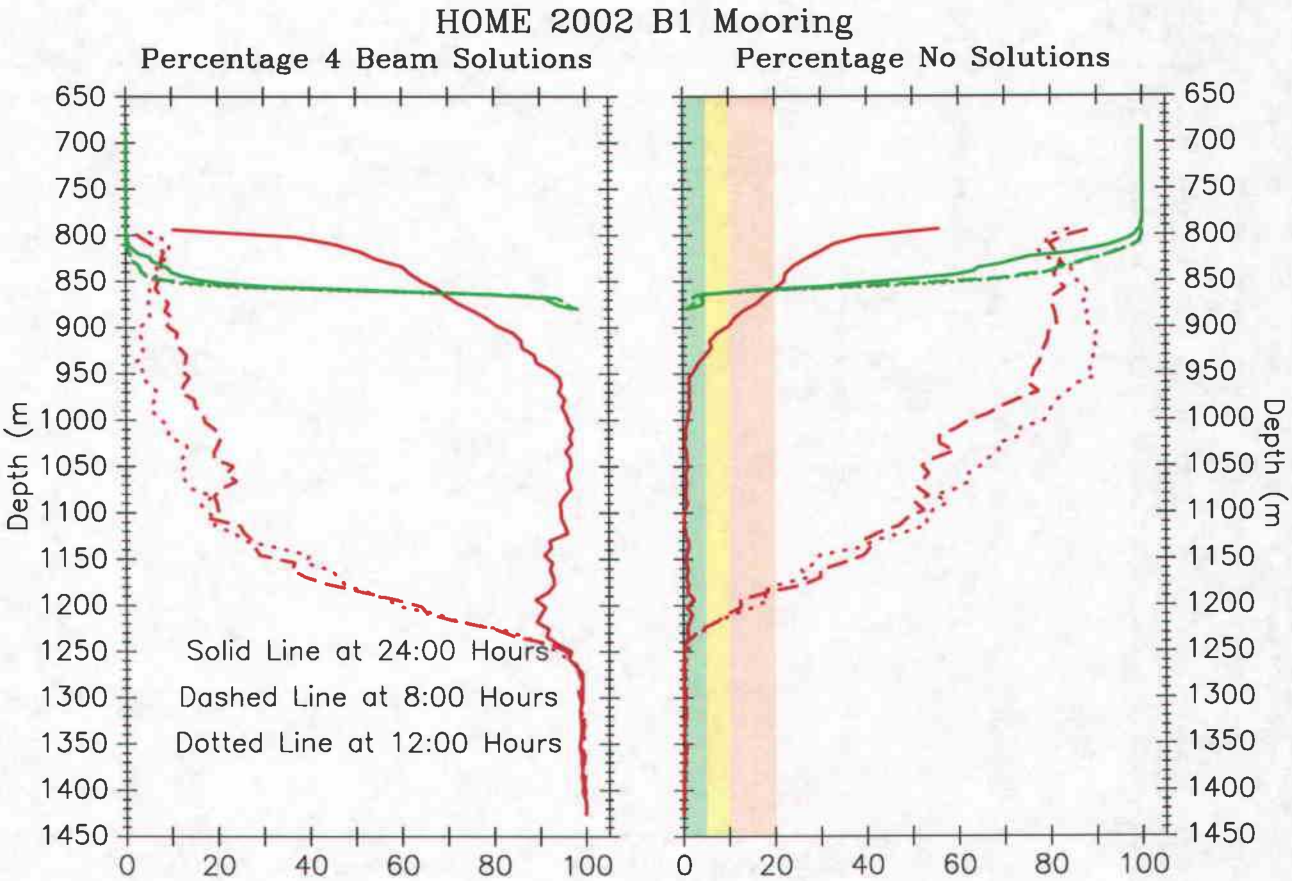

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
−5 −4 −3 −2 −1 0 1 2 3 4 5
HOME 2002 Mooring B1: Workhorse ADCP $B1_s$
Record Average Diagnostics
Percent No Solutions (PPNS)
Auto−Correlation, Beam 1 (BC)
Vertical Velocity (w)
Signal Amplitude, Beam 1 (RSSI)
Depth (m)
700
750
800
850
900
50 45 40 35 30 25 20 15 10 5 1
0 4 8 12 16 20 24
Hour

Fig. 9a


HOME 2002 B1 Mooring
Percentage 4 Beam Solutions
Percentage No Solutions
Depth (m)
Solid Line at 24:00 Hours
Dashed Line at 8:00 Hours
Dotted Line at 12:00 Hours
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
0
20
40
60
80
100

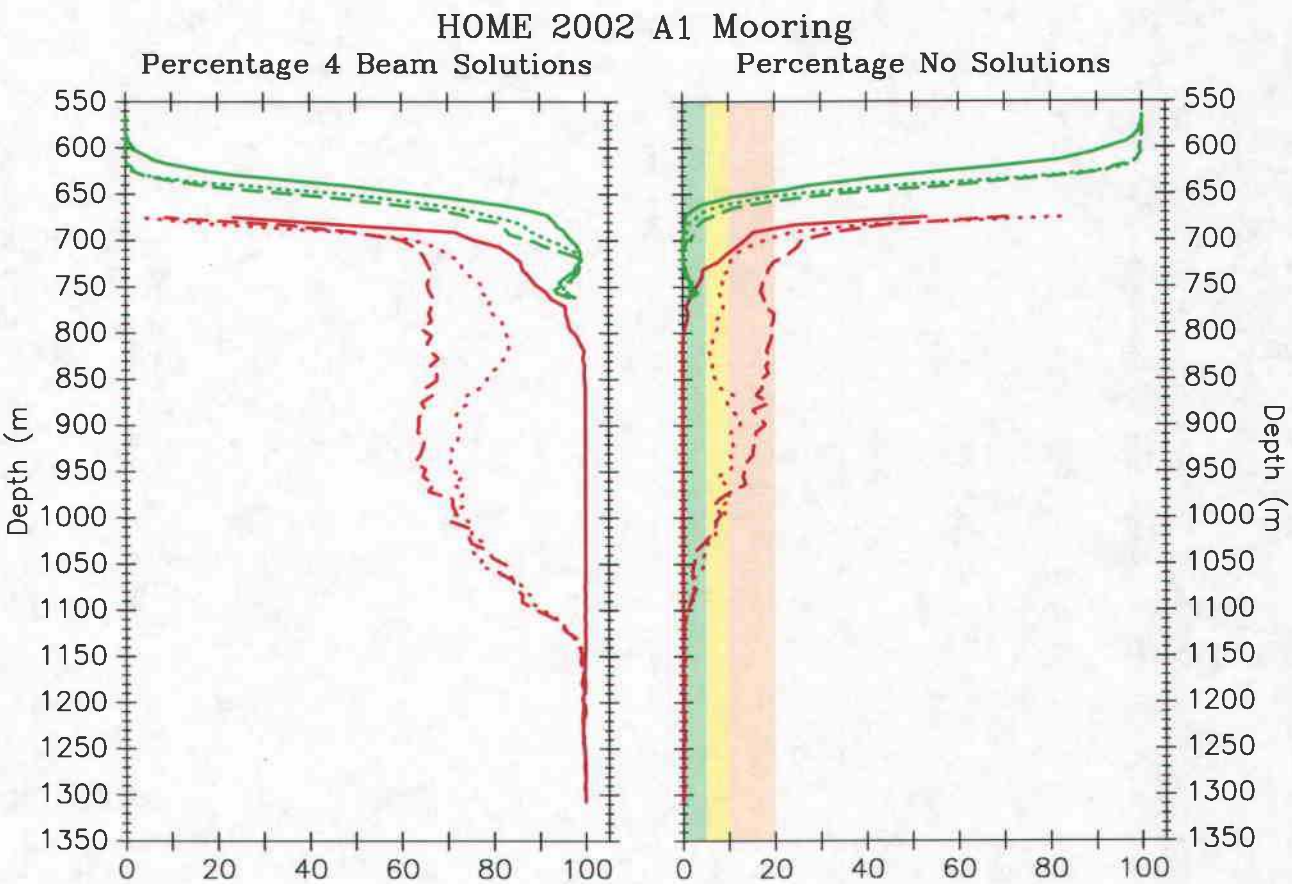

HOME 2002 A1 Mooring
Percentage 4 Beam Solutions
Percentage No Solutions
Depth (m)
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
0
20
40
60
80
100

Fig. 9b

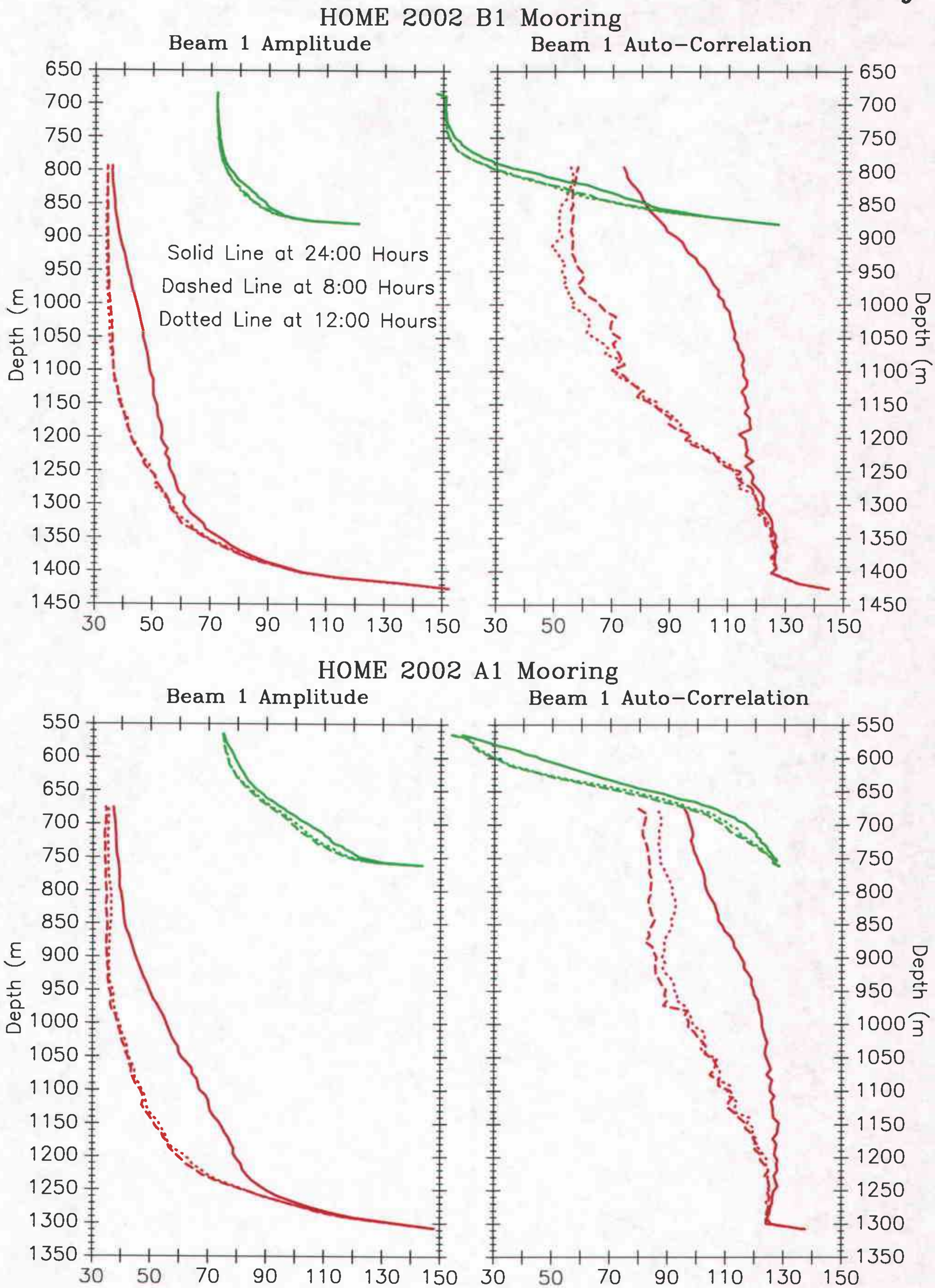
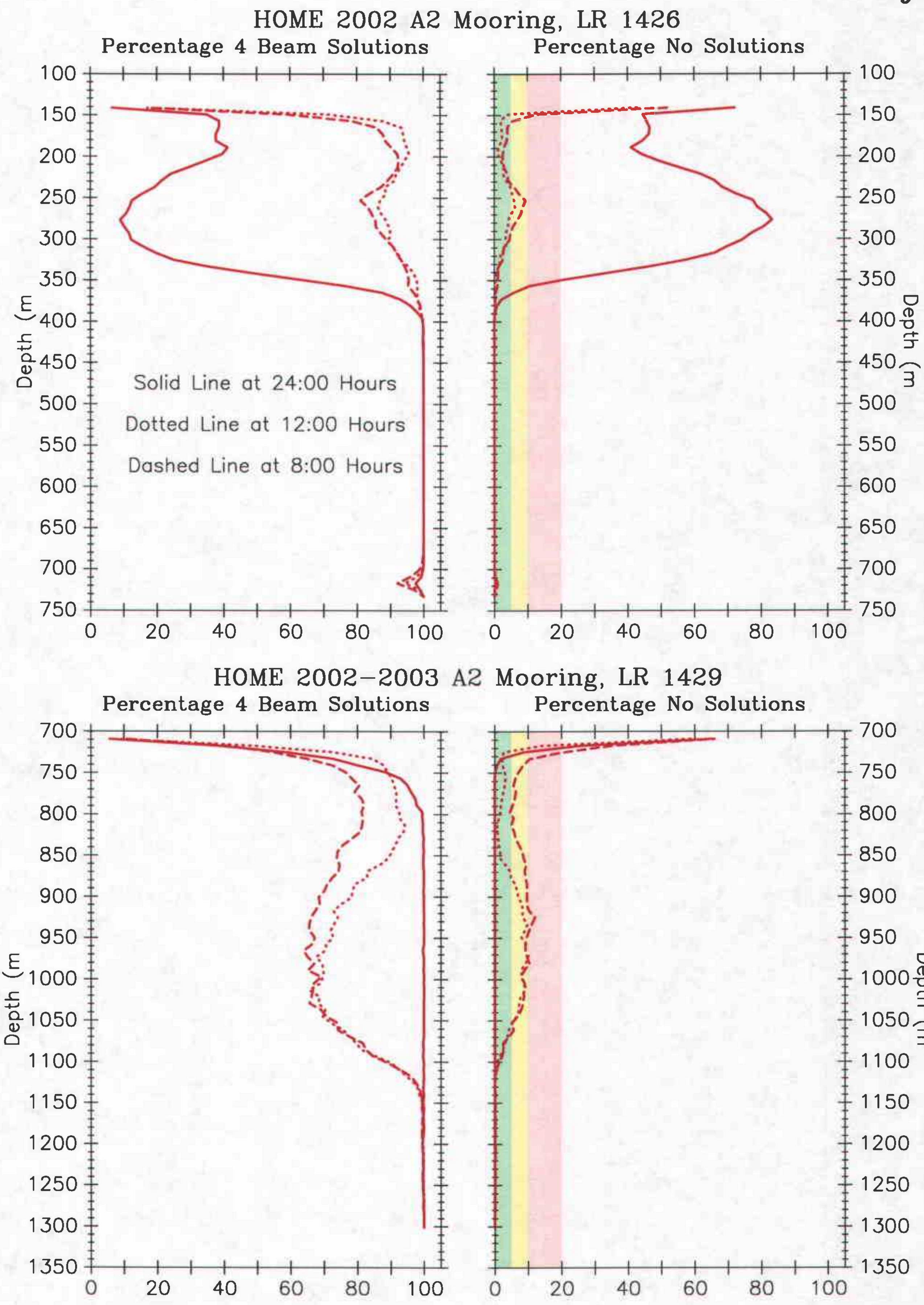
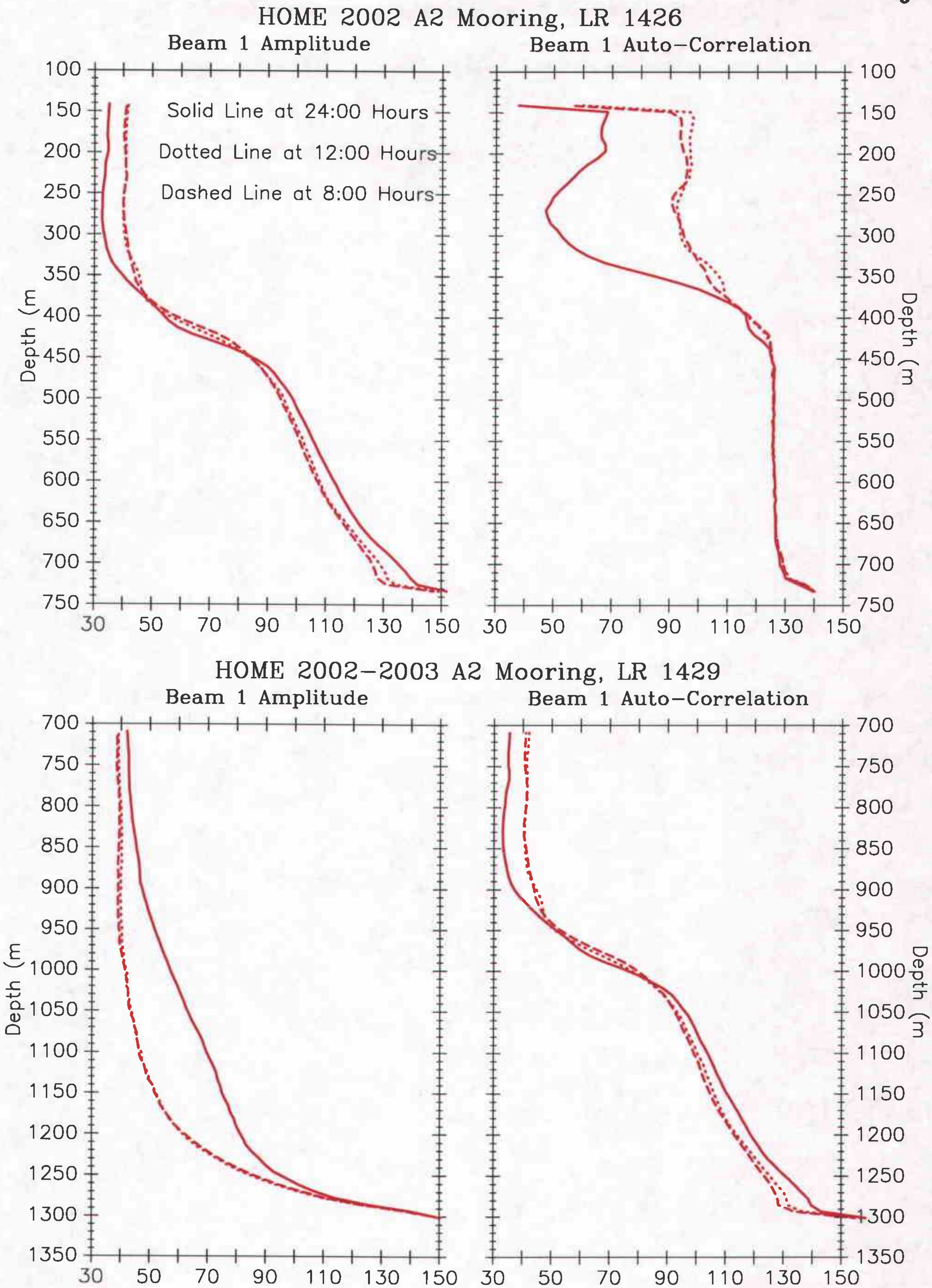

HOME 2002 B1 Mooring
Beam 1 Amplitude
Beam 1 Auto-Correlation
Solid Line at 24:00 Hours
Dashed Line at 8:00 Hours
Dotted Line at 12:00 Hours
Depth (m
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
1400
1450
30
50
70
90
110
130
150
HOME 2002 A1 Mooring
Beam 1 Amplitude
Beam 1 Auto-Correlation
Depth (m
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350
30
50
70
90
110
130
150

Fig. 9c



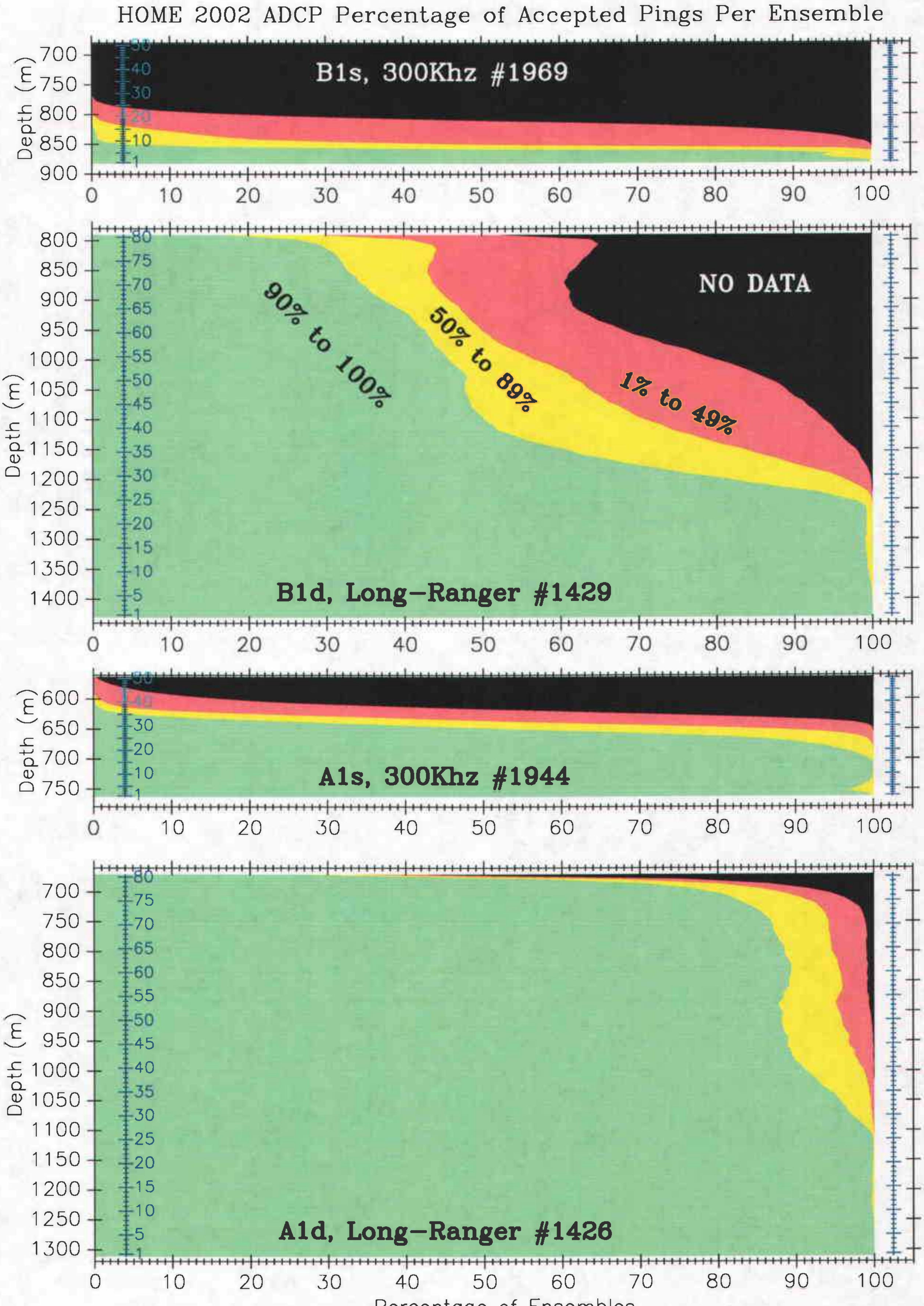
HOME 2002 A2 Mooring, LR 1426
Percentage 4 Beam Solutions
Percentage No Solutions
Depth (m
Solid Line at 24:00 Hours
Dotted Line at 12:00 Hours
Dashed Line at 8:00 Hours
HOME 2002–2003 A2 Mooring, LR 1429
Percentage 4 Beam Solutions
Percentage No Solutions
Depth (m

Fig. 9d

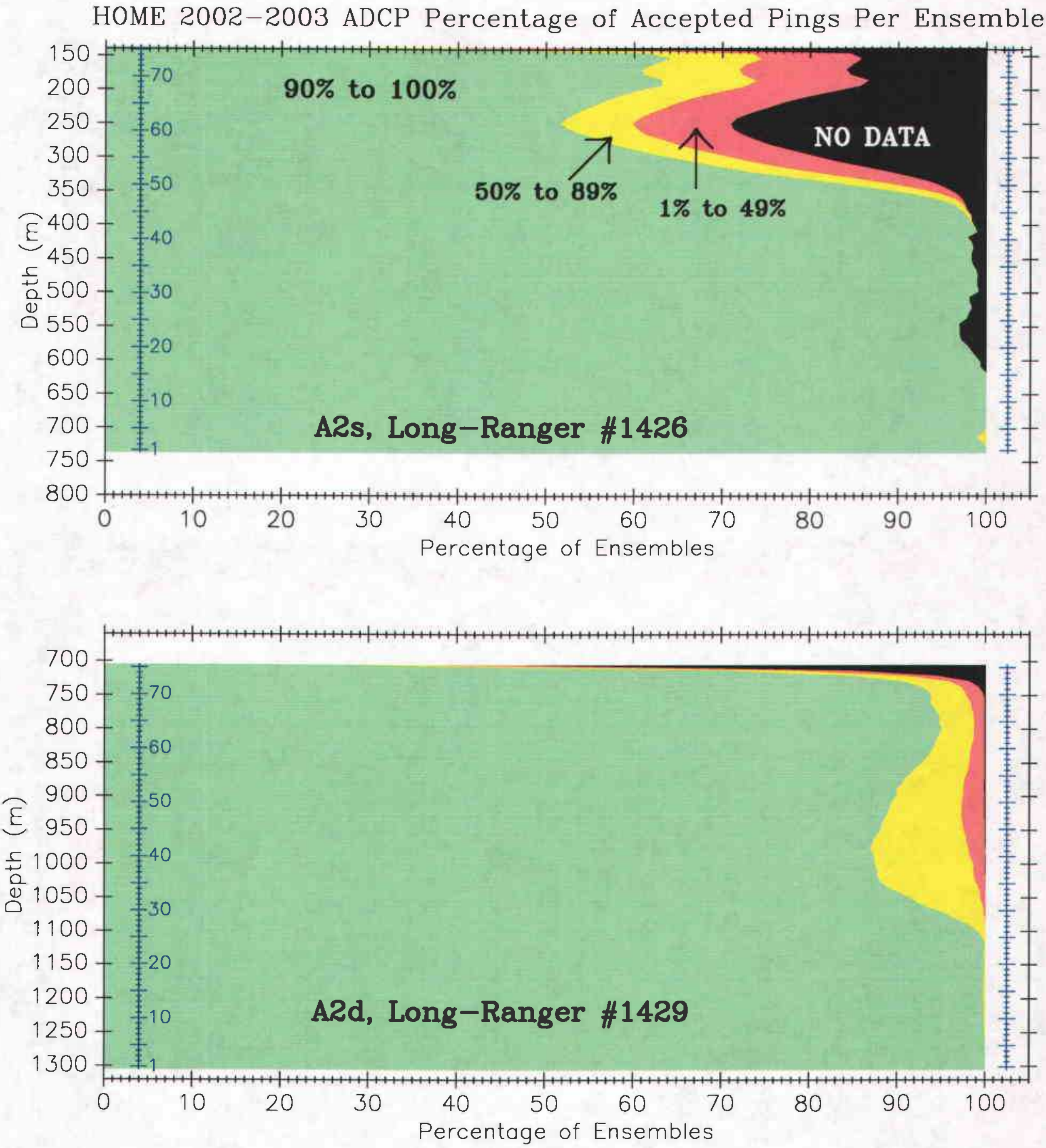


HOME 2002 A2 Mooring, LR 1426
Beam 1 Amplitude
Beam 1 Auto-Correlation
Solid Line at 24:00 Hours
Dotted Line at 12:00 Hours
Dashed Line at 8:00 Hours
Depth (m
100
150
200
250
300
350
400
450
500
550
600
650
700
750
30
50
70
90
110
130
150
HOME 2002-2003 A2 Mooring, LR 1429
Beam 1 Amplitude
Beam 1 Auto-Correlation
700
750
800
850
900
950
1000
1050
1100
1150
1200
1250
1300
1350

Fig. 10a



HOME 2002 ADCP Percentage of Accepted Pings Per Ensemble
B1s, 300Khz #1969
NO DATA
90% to 100%
50% to 89%
1% to 49%
B1d, Long-Ranger #1429
A1s, 300Khz #1944
A1d, Long-Ranger #1426
Depth (m)
Percentage of Ensembles


HOME 2002-2003 ADCP Percentage of Accepted Pings Per Ensemble
90% to 100%
NO DATA
50% to 89%
1% to 49%
A2s, Long-Ranger #1426
Depth (m)
Percentage of Ensembles
A2d, Long-Ranger #1429
Depth (m)
Percentage of Ensembles

SECTION II

A. VELOCITY Depth/Time Plots (40-hr low-pass filtered)

B. VELOCITY Depth/Time Plots (unfiltered)

C. TEMPERATURE Time Series: line plots (40-hr low-pass filtered)

D. TEMPERATURE Time Series: offset line plots (unfiltered)

E. SALINITY Time Series: line plots (40-hr low-pass filtered)

F. PRESSURE Time Series: line plots (unfiltered and 40-hr low-pass filtered)

A. VELOCITY Depth/Time Plots 40-hour Low-Pass Filtered A1, B1, and A2 Moorings

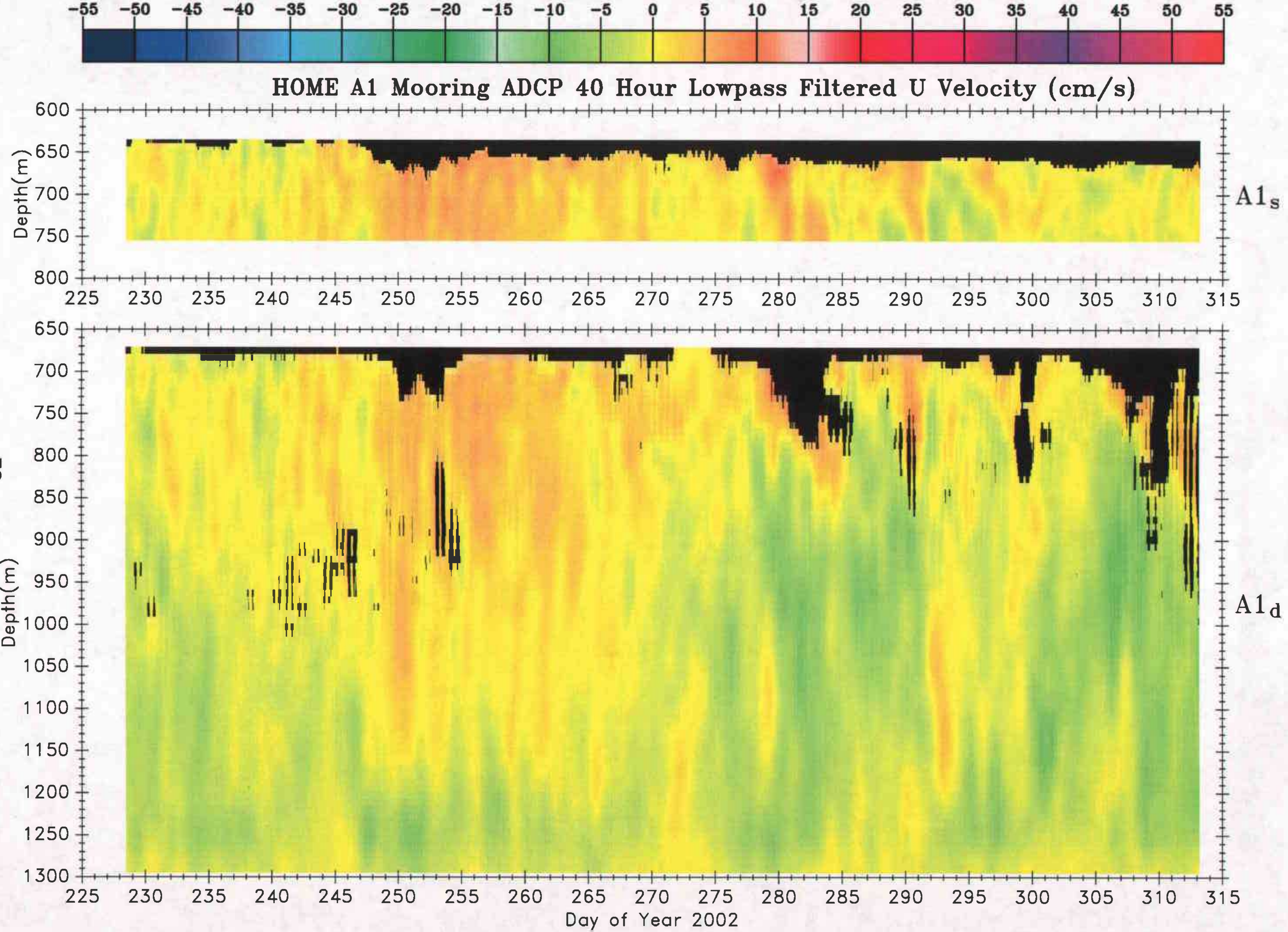
40-hour low-pass filtered velocities are scaled by color and shown in depth and time for the ADCPs deployed on the A1, B1, and A2 moorings. Data from the deep ADCPs of the first deployment (75 kHz Long Rangers A1d and B1d) are plotted in the lower panels. Data from the shallow ADCPs of the first deployment period (300kHz Workhorses A1s and B1s) are plotted in the upper panels. This format shows the region of data overlap of the shallow and deep instruments. Data from the deep (A2d) and shallow (A2s) Long Rangers of the second deployment period are shown in a single panel, together with data from the shallowest ADCP of that deployment, the UH 300 kHz Workhorse ADCP. Data from both the A1 and A2 mooring deployments are plotted together in a single figure.

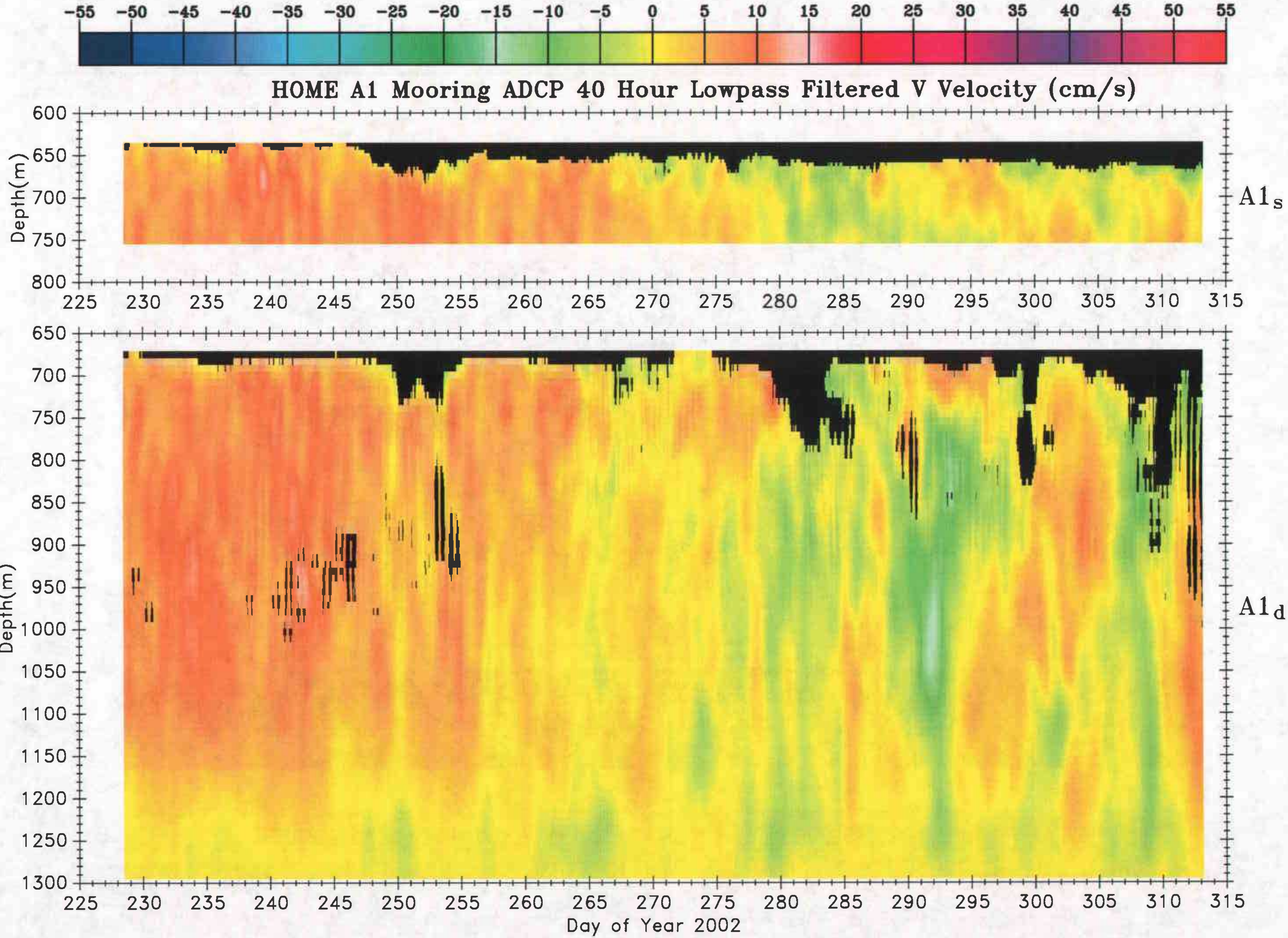
The A1s 300 kHz ADCP provides usable data out to a range of about 120 m, overlapping but barely extending the range of the A1d deep Long Ranger. The B1s 300kHz ADCP provides useable data in only six of the closer bins. Although the A1s and B1s 300 kHz data do not extend the range of the A1d and B1d Long Ranger data, respectively, they provide a nearly continuous time series of velocity at the depths of the farthest bins of the deep Long Rangers, whereas the Long Rangers provide useable data at those depths only a portion of each day. The combination of two Long Rangers worked very well during the A2 deployment, except when pinging simultaneously.

A blue band across the single panel in the A2 plots shows the boundary between the displayed portions of the A2d and A2s data, with the upper data shown to its useful upper limit.

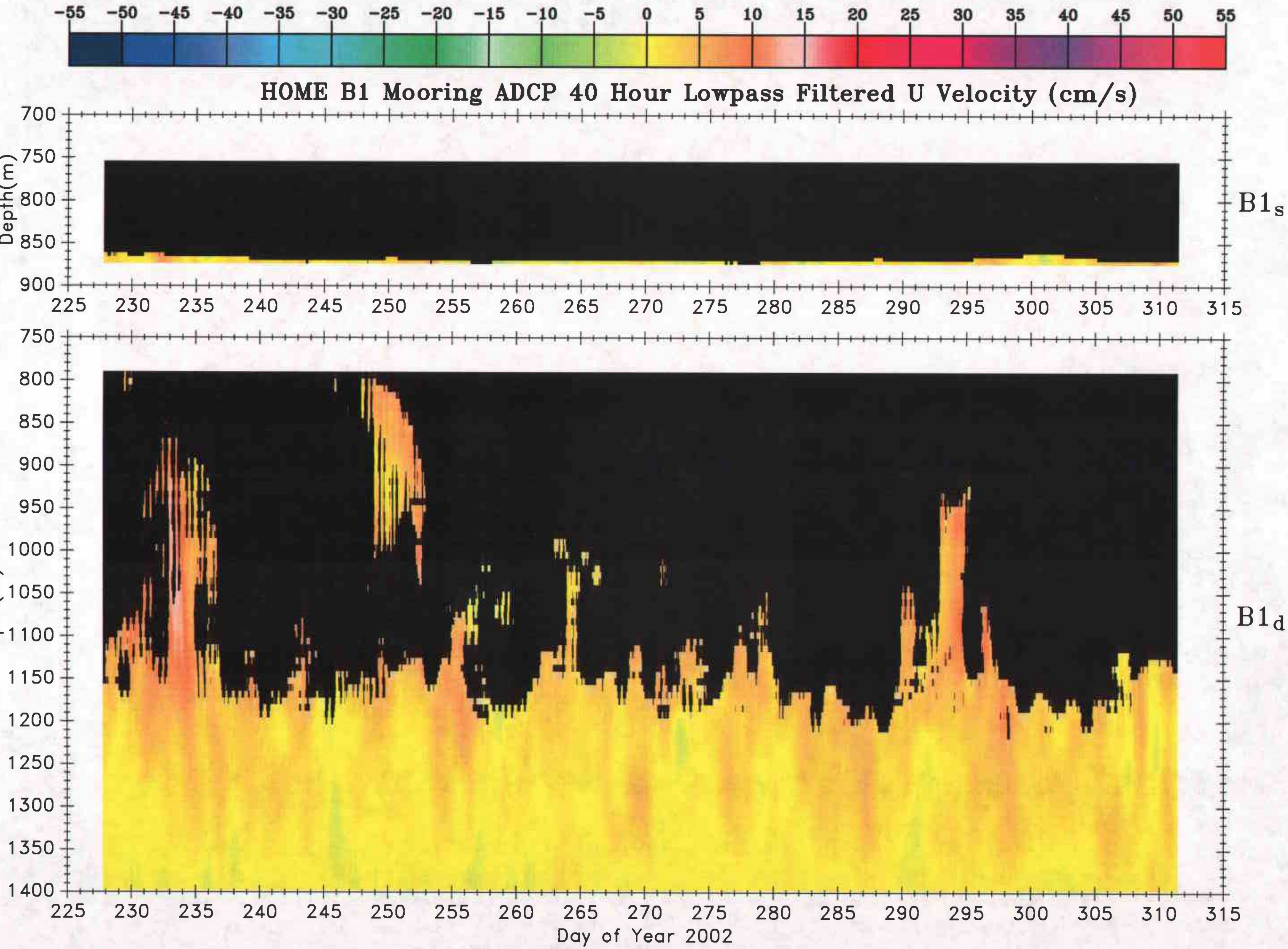
As in most moored ADCP deployments the closest two of bins of velocity data are anomalously low. On A1 and A2, the first two bins of the upper sensor (A1s 300 kHz; A2s 75 kHz) are not shown. In the case of B1, the first two bins are shown since there are very few acceptable bins from this instrument, and the B1s data are more continuous in time than the B1d data at that depth. As a conservative estimate, data from B1s 300 kHz bins 3-4 can be used for a time series.

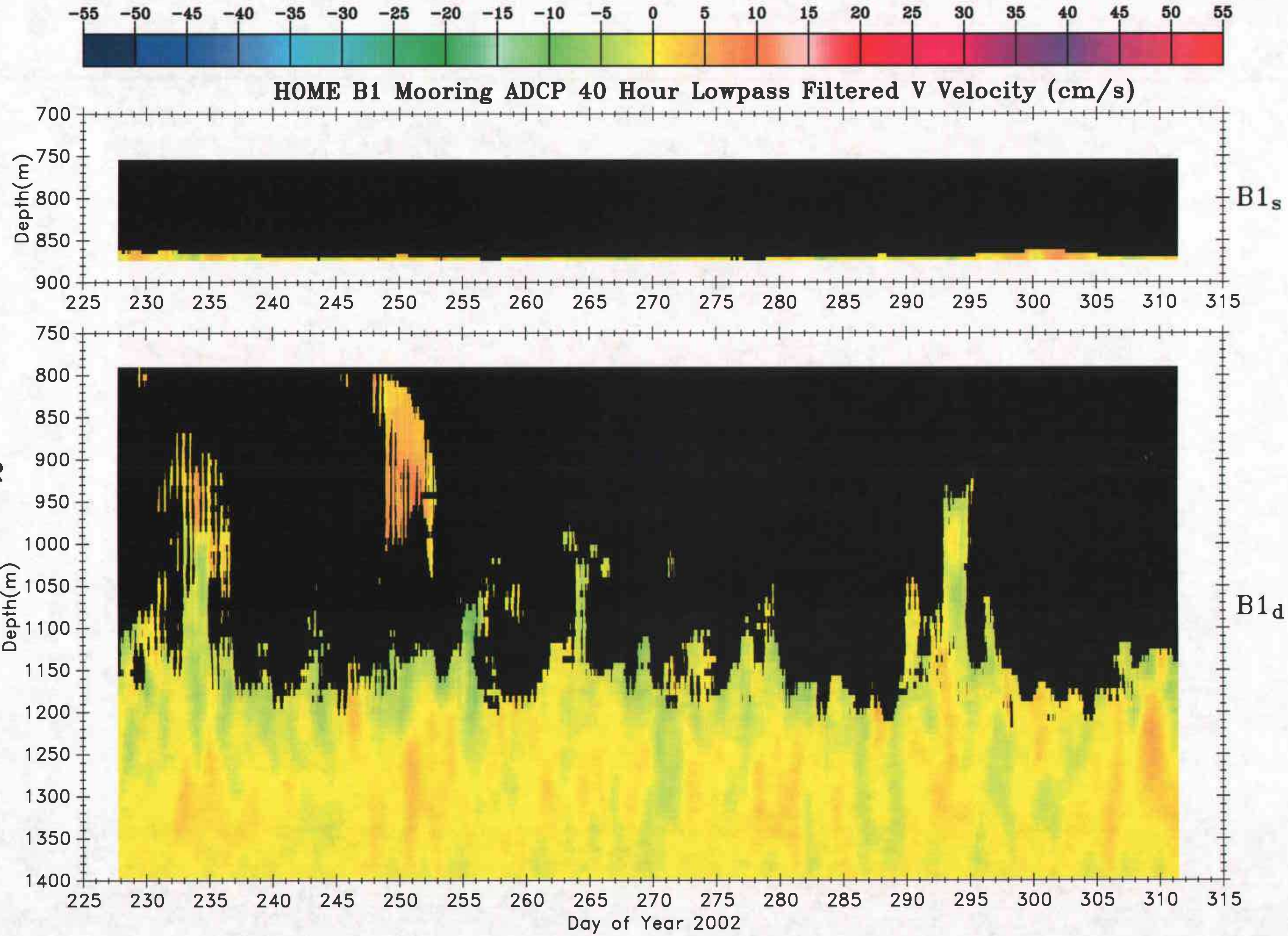
Early in the A2 deployment period, prior to significant clock drift of A2s relative to A2d, the surface reflection of the signal transmitted from A2d is picked up and interpreted by A2s as reflection off water column scatterers. The A2s range bin at which this happens decreases with time as the clocks of A2s and A2d drift relative to each other. The area contaminated by this process is shown as a white swatch at the beginning of the A2s record, increasing in depth with time, and ending at about day 345 of year 2002.


-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
HOME A1 Mooring ADCP 40 Hour Lowpass Filtered U Velocity (cm/s)
Depth(m)
600 650 700 750 800
225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315
A1s
Depth(m)
650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300
225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315
Day of Year 2002
A1d

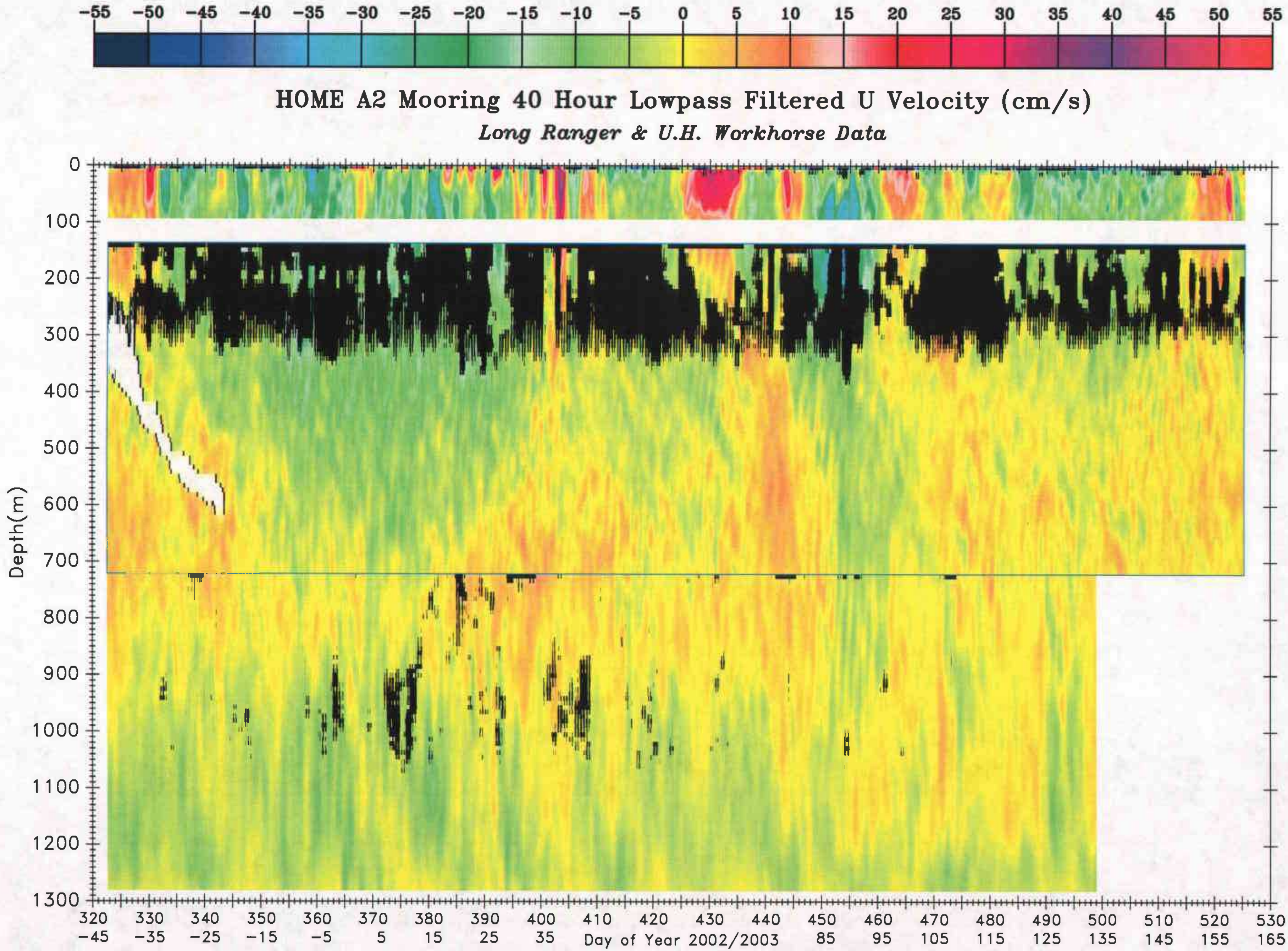


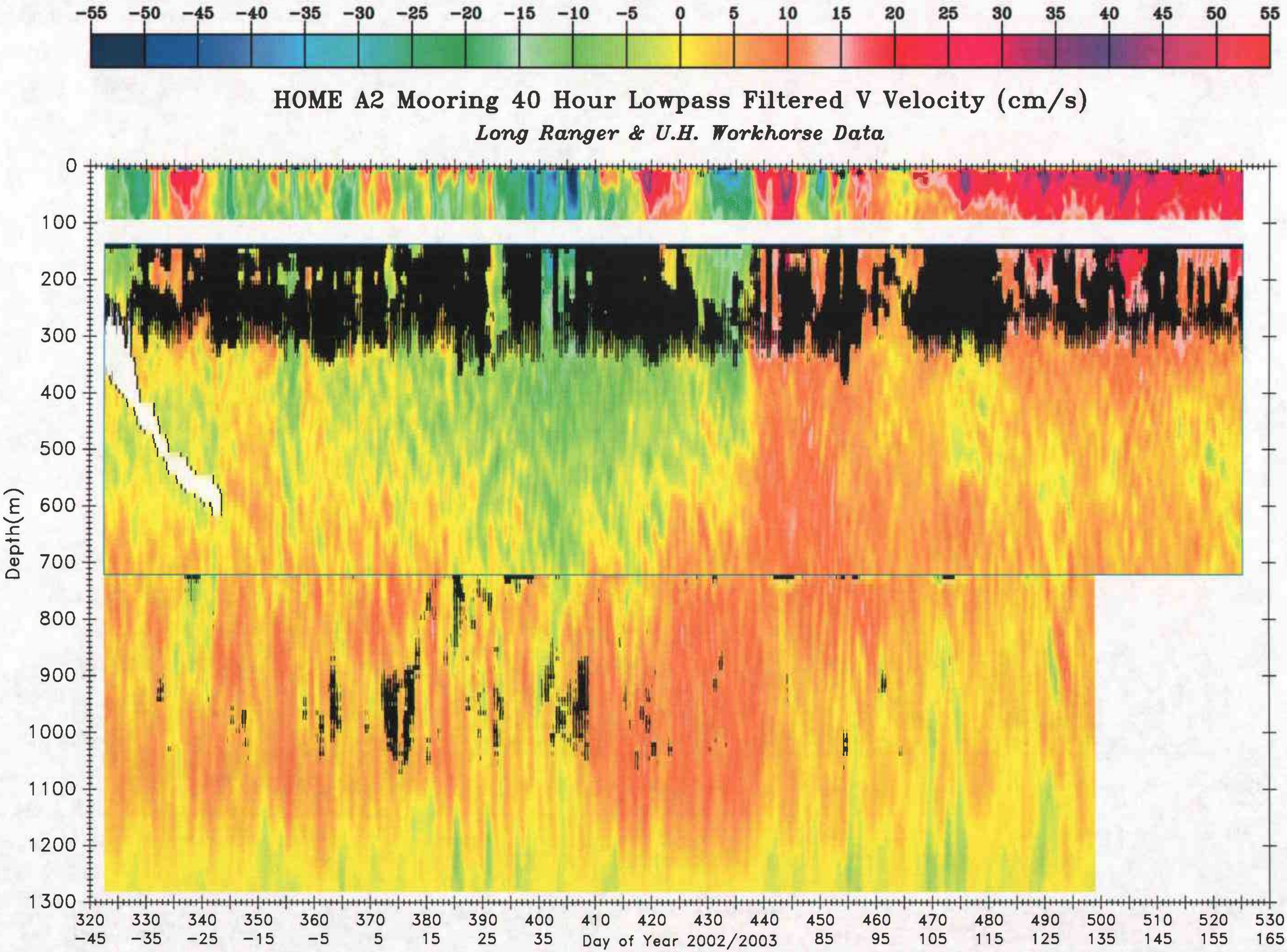
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
HOME A1 Mooring ADCP 40 Hour Lowpass Filtered V Velocity (cm/s)
Depth(m)
600 650 700 750 800
225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315
A1s
Depth(m)
650 700 750 800 850 900 950 1000 1050 1100 1150 1200 1250 1300
225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315
Day of Year 2002
A1d


-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
HOME B1 Mooring ADCP 40 Hour Lowpass Filtered U Velocity (cm/s)
Depth(m)
B1s
B1d
Day of Year 2002



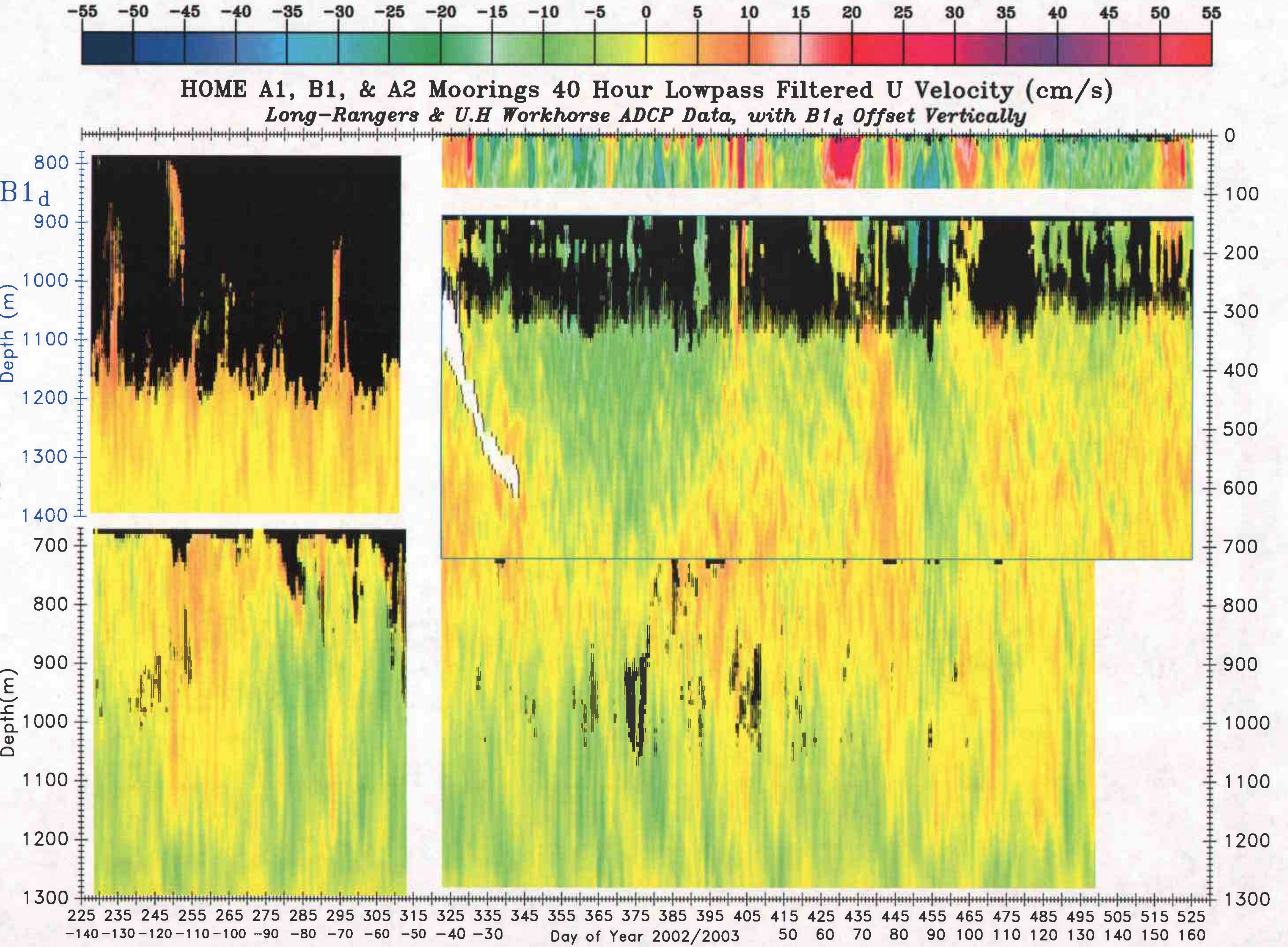
-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
HOME B1 Mooring ADCP 40 Hour Lowpass Filtered V Velocity (cm/s)
Depth(m)
$B1_s$
Depth(m)
$B1_d$
Day of Year 2002

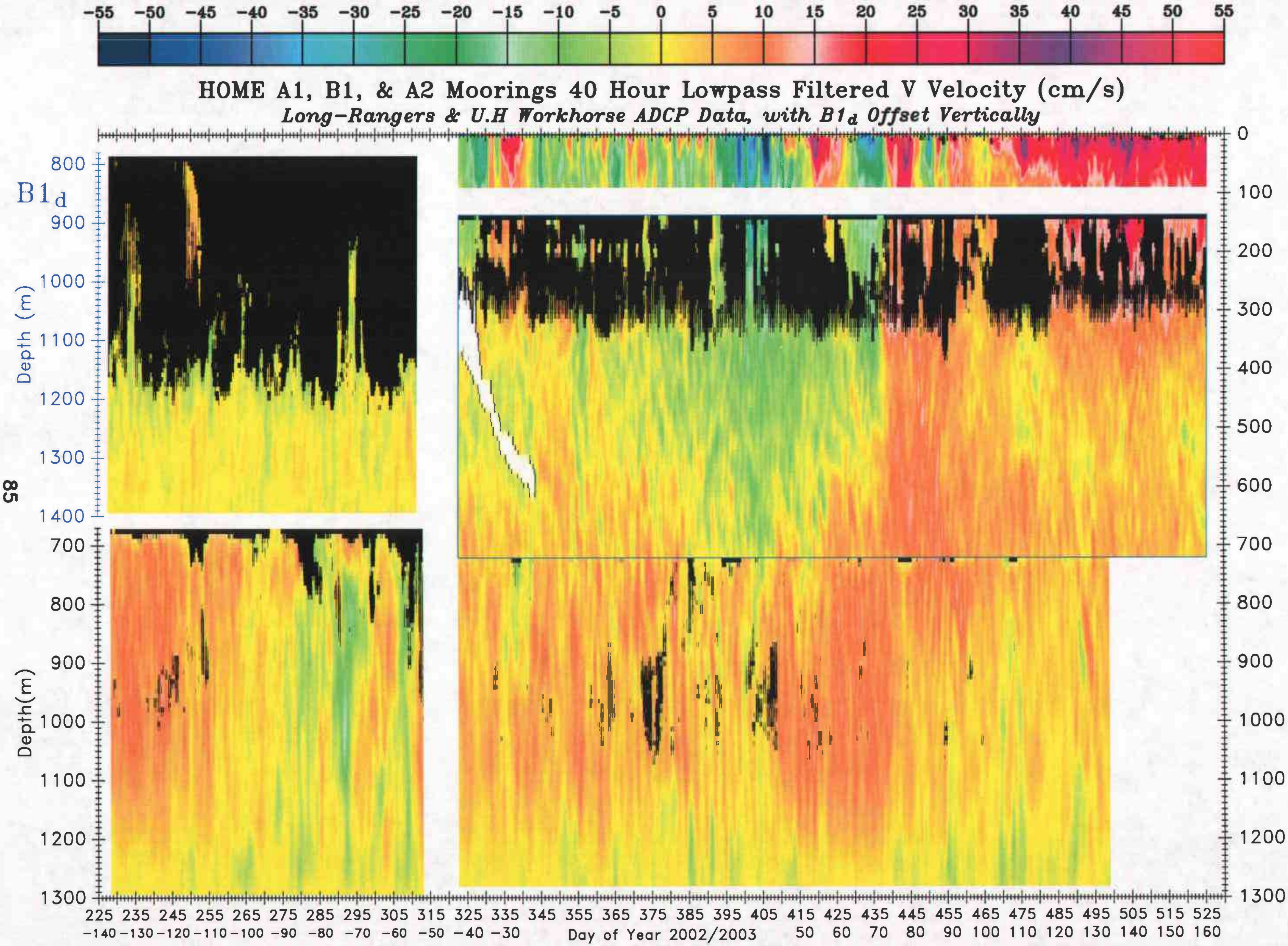

-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55
HOME A2 Mooring 40 Hour Lowpass Filtered U Velocity (cm/s)
Long Ranger & U.H. Workhorse Data
Depth(m)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500 510 520 530
-45 -35 -25 -15 -5 5 15 25 35 85 95 105 115 125 135 145 155 165
Day of Year 2002/2003



HOME A2 Mooring 40 Hour Lowpass Filtered V Velocity (cm/s)

Long Ranger & U.H. Workhorse Data


HOME A1, B1, & A2 Moorings 40 Hour Lowpass Filtered U Velocity (cm/s)
Long-Rangers & U.H Workhorse ADCP Data, with B1d Offset Vertically
−55 −50 −45 −40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30 35 40 45 50 55
B1d
Depth (m)
Depth(m)
Day of Year 2002/2003
225 235 245 255 265 275 285 295 305 315 325 335 345 355 365 375 385 395 405 415 425 435 445 455 465 475 485 495 505 515 525
−140 −130 −120 −110 −100 −90 −80 −70 −60 −50 −40 −30 50 60 70 80 90 100 110 120 130 140 150 160



−55 −50 −45 −40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30 35 40 45 50 55
HOME A1, B1, & A2 Moorings 40 Hour Lowpass Filtered V Velocity (cm/s)
Long-Rangers & U.H Workhorse ADCP Data, with B1d Offset Vertically
B1d
Depth (m)
800 900 1000 1100 1200 1300 1400
Depth(m)
700 800 900 1000 1100 1200 1300
0 100 200 300 400 500 600 700 800 900 1000 1100 1200 1300
225 235 245 255 265 275 285 295 305 315 325 335 345 355 365 375 385 395 405 415 425 435 445 455 465 475 485 495 505 515 525
−140 −130 −120 −110 −100 −90 −80 −70 −60 −50 −40 −30
Day of Year 2002/2003
50 60 70 80 90 100 110 120 130 140 150 160

B. VELOCITY Depth/Time Plots
Unfiltered, 11 days/page
A1, B1, and A2 Moorings

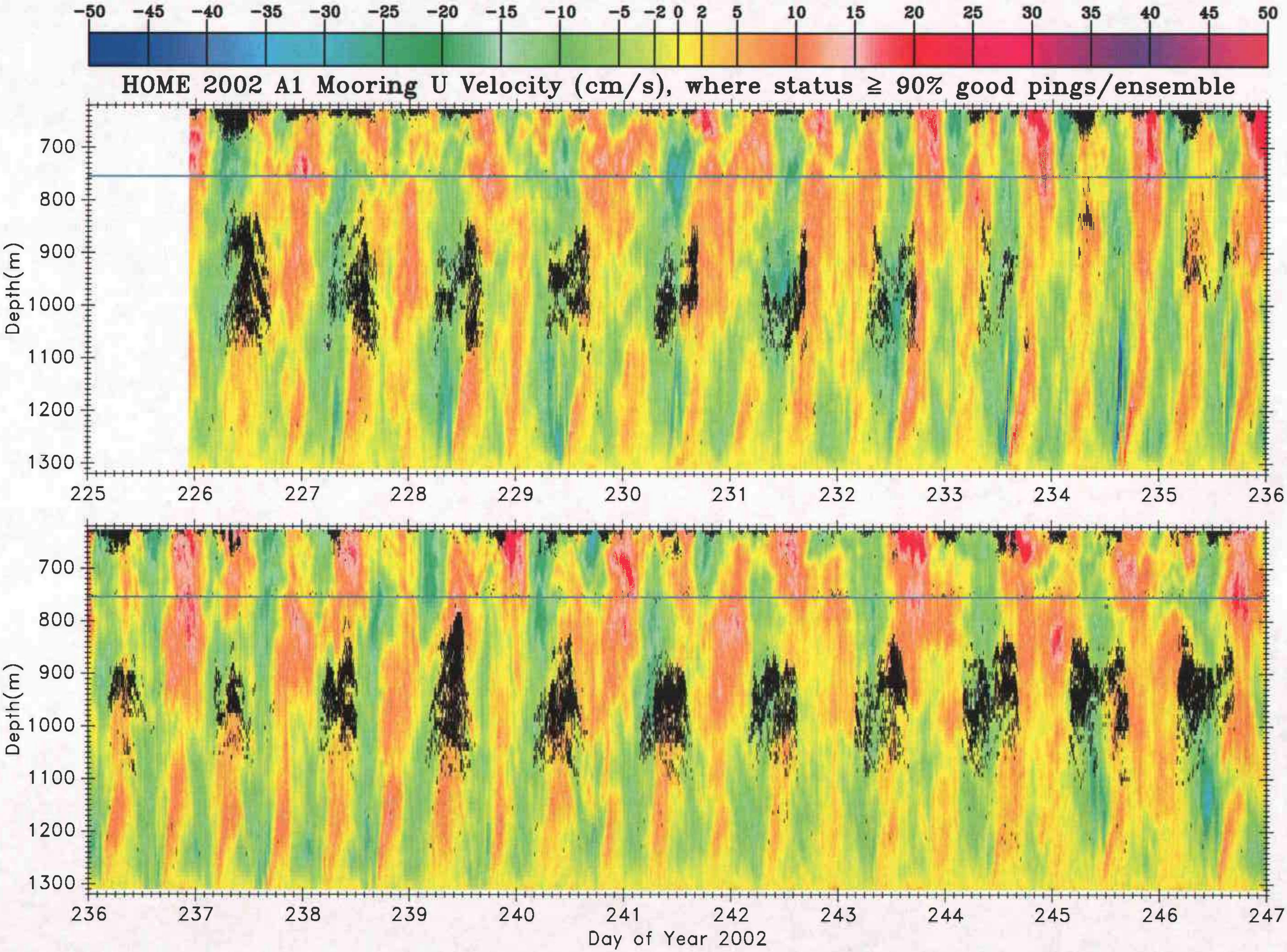
Unfiltered velocities are scaled by color and shown in depth and time for the ADCPs deployed on the A1, B1, and A2 moorings. Data from the deep and shallow instruments in each deployment are shown in a single panel. Data from the deep ADCPs (75 kHz Long Rangers A1d, B1d, and A2d) are plotted in the lower part of the panels, with data from the shallow ADCPs (300kHz Workhorses A1s and B1s, and Long Ranger A2s) overlaid in the upper portions of the panels. Velocity data from the A2 deployment of the UH 300 kHz Workhorse ADCP are plotted above the A2d and A2s velocity data. North and East components of velocity are plotted on facing pages.

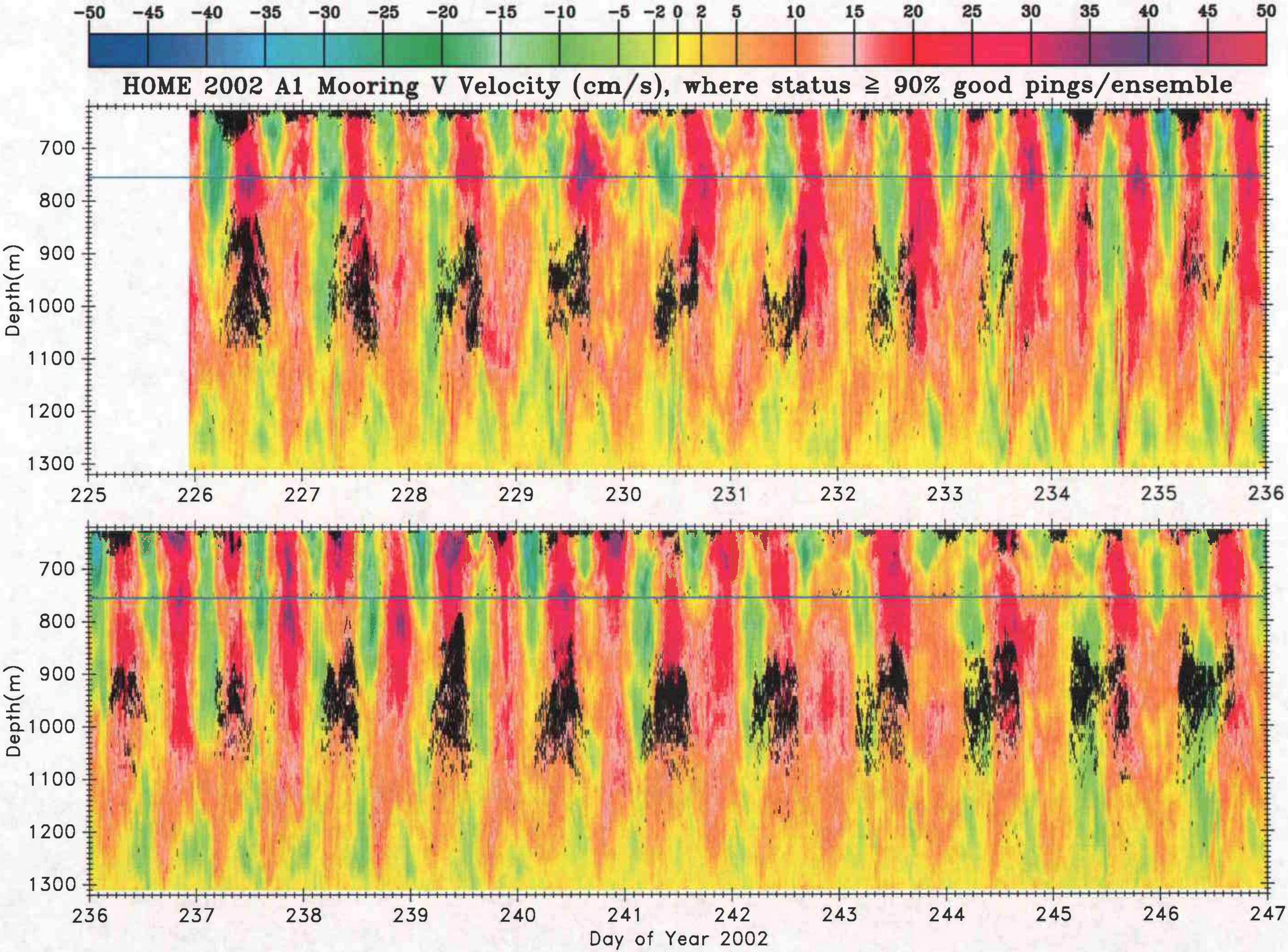
The A1s 300 kHz ADCP provides usable data out to a range of about 120 m, overlapping but barely extending the range of the A1d deep Long Ranger. The B1s 300kHz ADCP provides useable data in only six of the closer bins. Although the A1s and B1s 300 kHz data do not extend the range of the A1d and B1d Long Ranger data, respectively, they provide a nearly continuous time series of velocity at the depths of the farthest bins of the deep Long Rangers, whereas the Long Rangers provide useable data at those depths only a portion of each day. The combination of two Long Rangers worked very well during the A2 deployment, except when pinging simultaneously.

Blue bands across each panel show the boundaries between the displayed portions of data from the upper and lower sensors. In the case of the A1 and A2 moorings, data from the upper sensors (A1s and A2s) are shown to their useful upper limit. In the case of the B1 mooring, the B1s data is displayed only for a narrow, six bin (24 m) band, above which are shown B1d data from depths shallower than the useable B1s data.

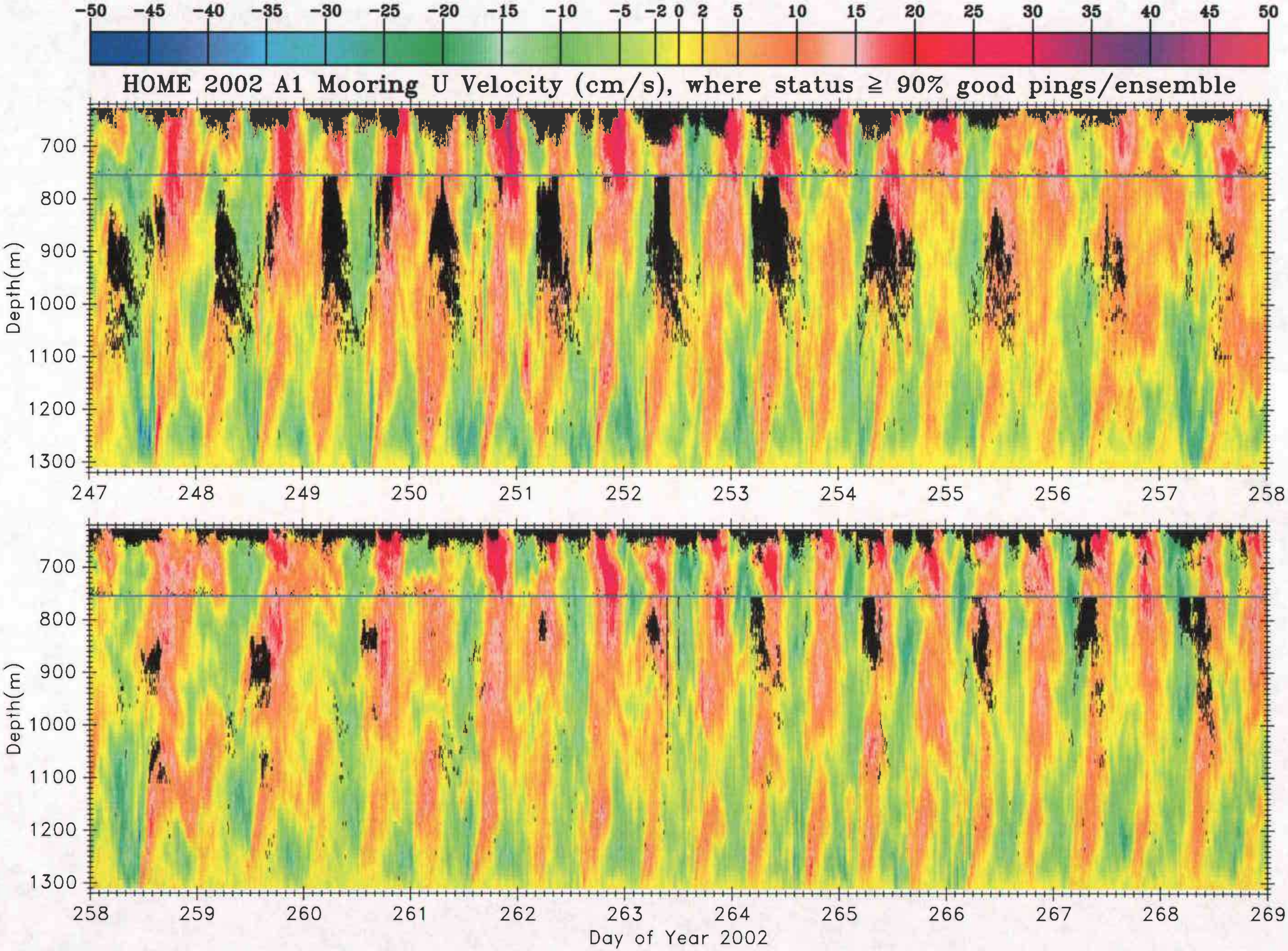
As in most moored ADCP deployments the closest two of bins of velocity data are anomalously low. On A1 and A2, the first two bins of the upper sensor (A1s 300 kHz; A2s 75 kHz) are not shown. In the case of B1, the first two bins are shown since there are very few acceptable bins from this instrument, and the B1s data are more continuous in time than the B1d data at that depth. As a conservative estimate, data from B1s 300 kHz bins 3-4 can be used for a time series.

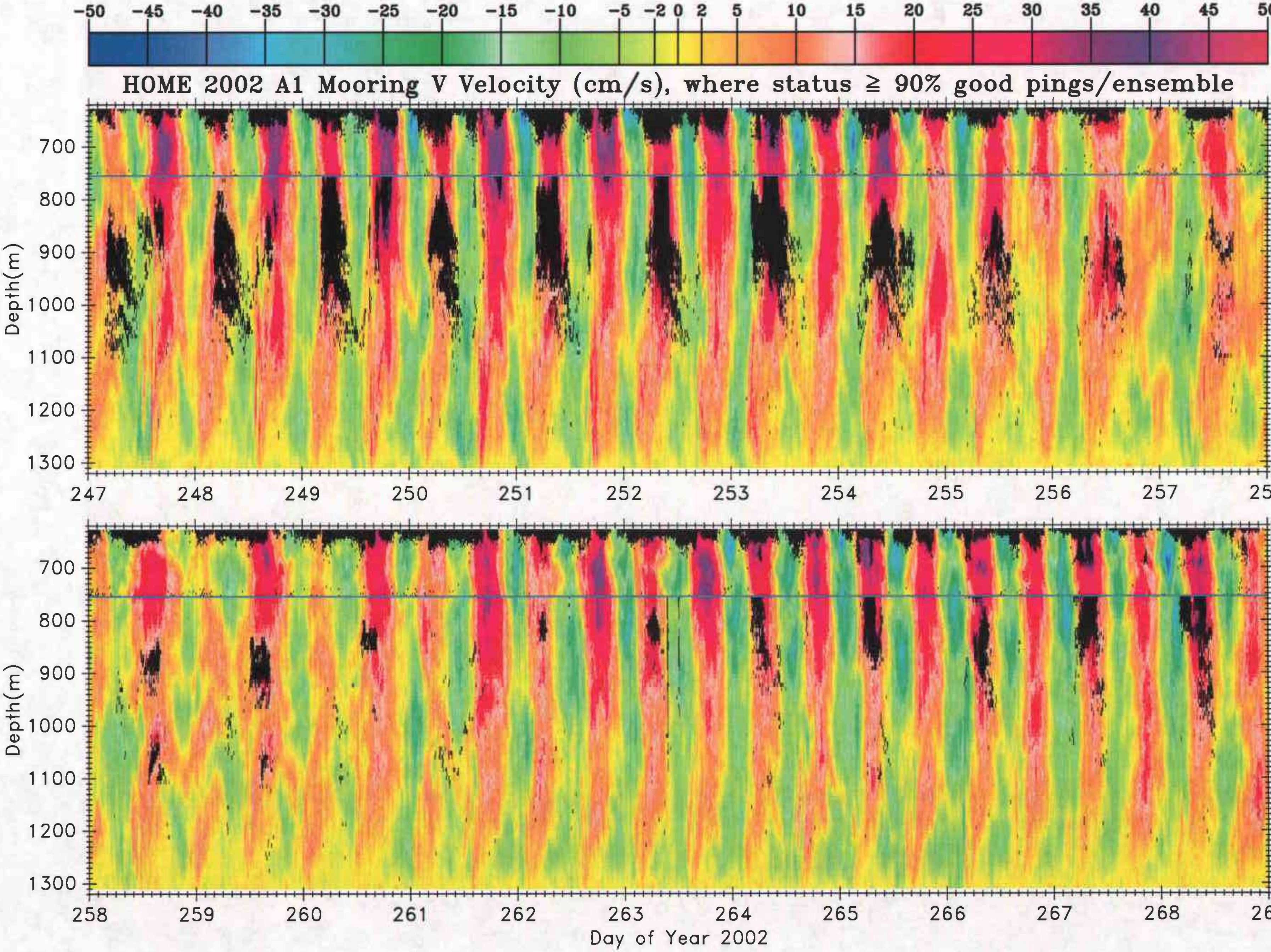
Early in the A2 deployment period, prior to significant clock drift of A2s relative to A2d, the surface reflection of the signal transmitted from A2d is picked up and interpreted by A2s as reflection off water column scatterers. The A2s range bin at which this happens decreases with time as the clocks of A2s and A2d drift relative to each other. The area contaminated by this process is shown as a white swatch at the beginning of the A2s record, increasing in depth with time, and ending on day 343 of year 2002.

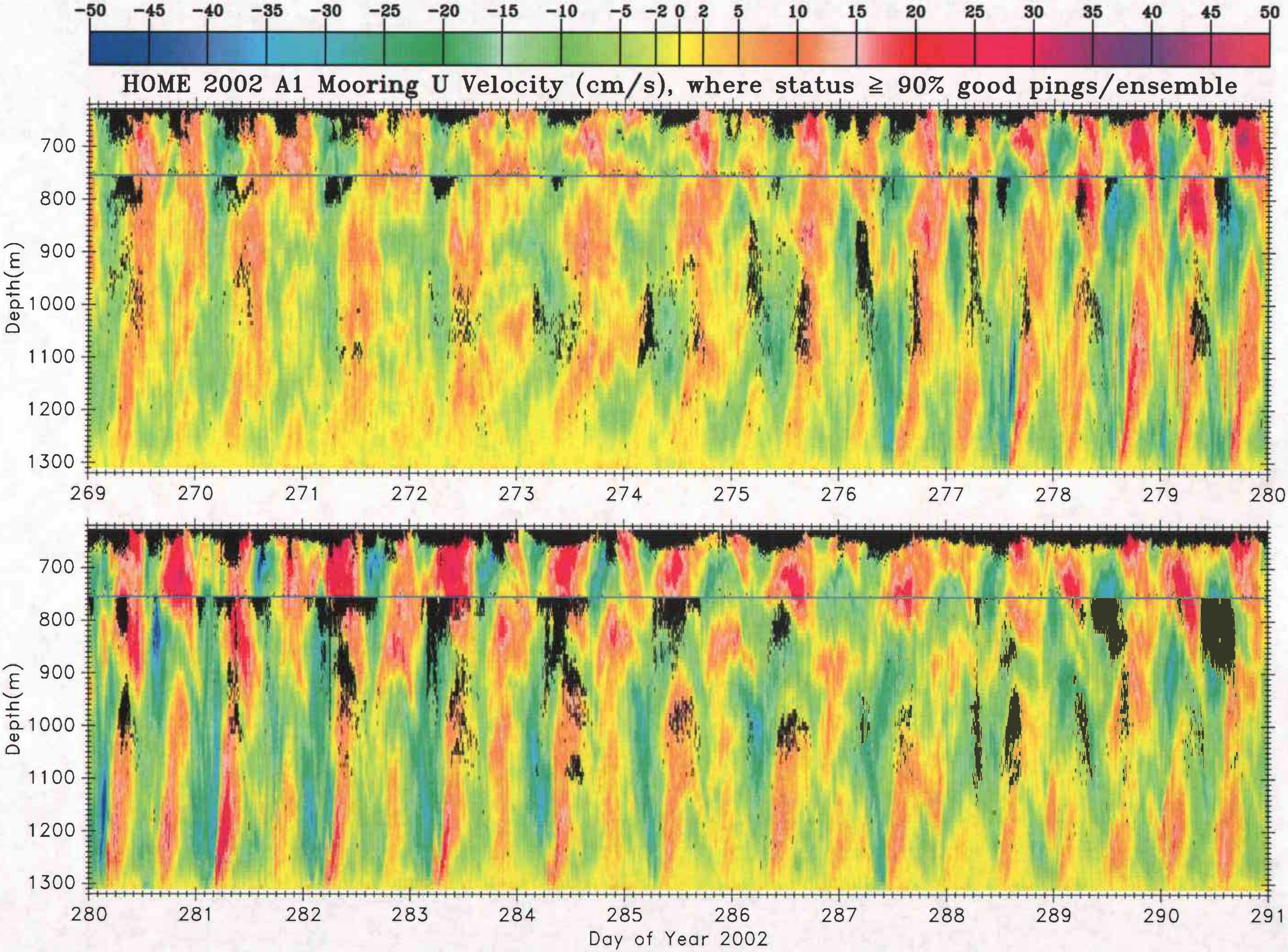

-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring U Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700 800 900 1000 1100 1200 1300
225 226 227 228 229 230 231 232 233 234 235 236
236 237 238 239 240 241 242 243 244 245 246 247
Day of Year 2002



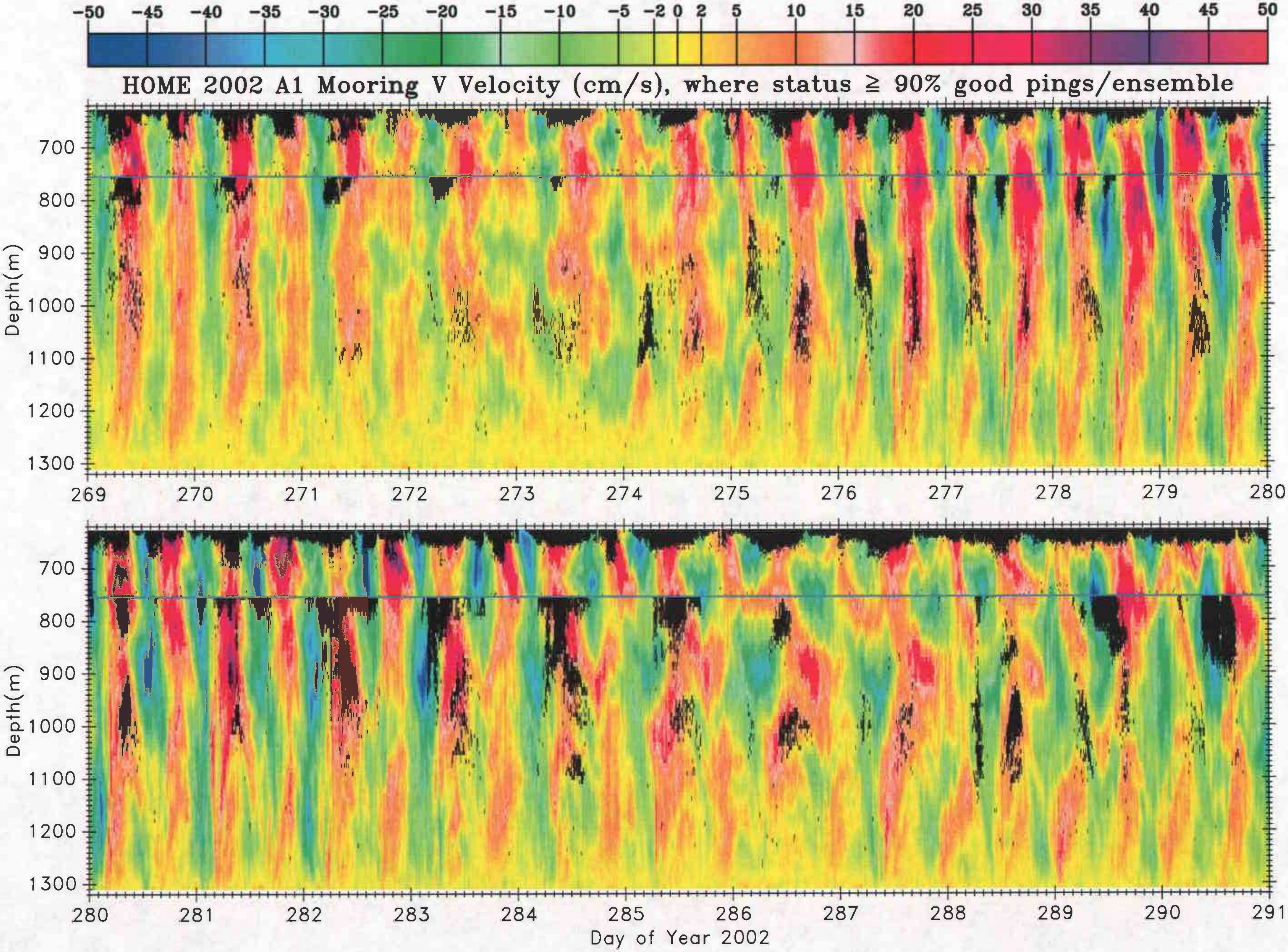
−50 −45 −40 −35 −30 −25 −20 −15 −10 −5 −2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring V Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700 800 900 1000 1100 1200 1300
225 226 227 228 229 230 231 232 233 234 235 236
Depth(m)
700 800 900 1000 1100 1200 1300
236 237 238 239 240 241 242 243 244 245 246 247
Day of Year 2002

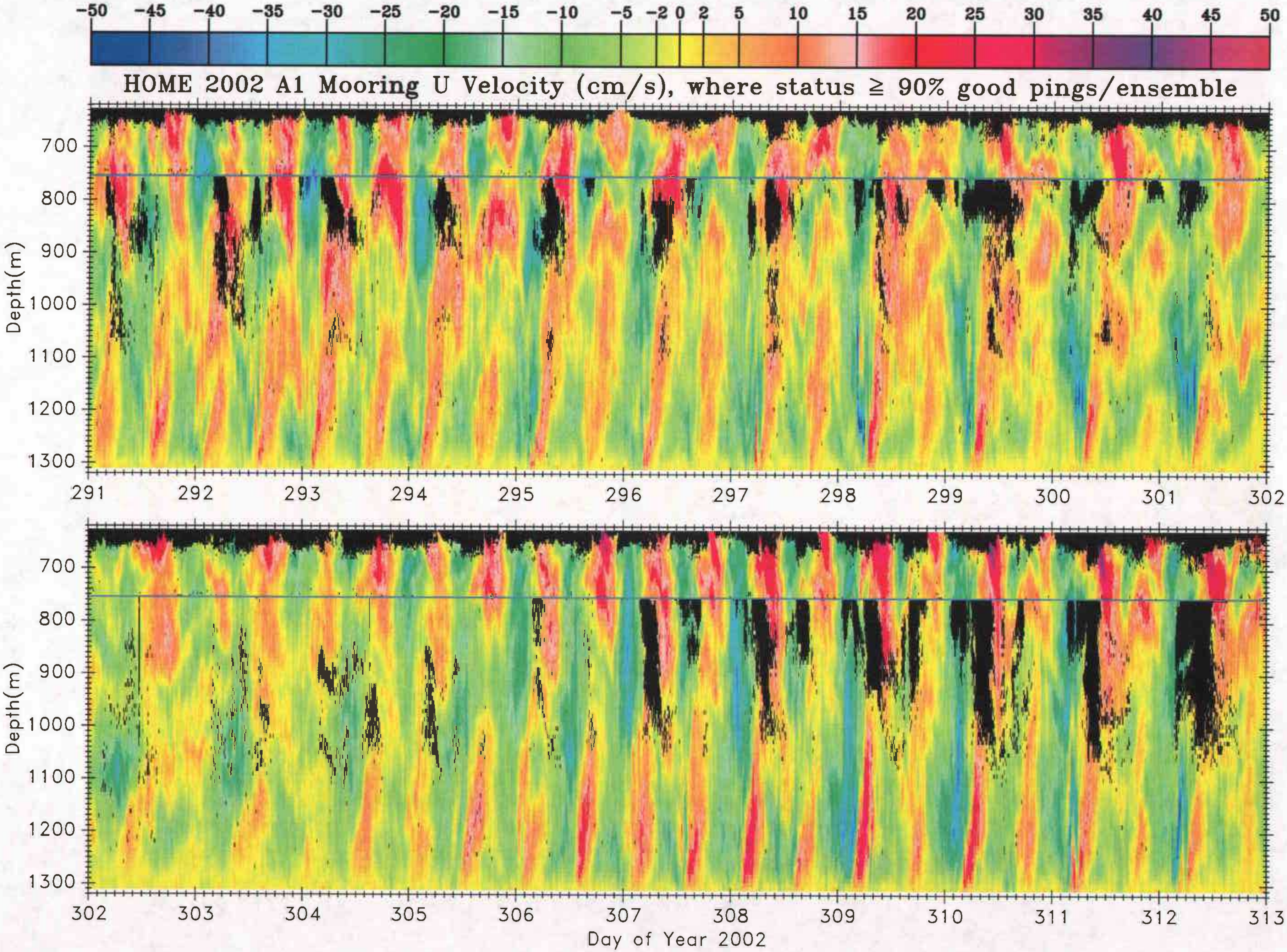

−50 −45 −40 −35 −30 −25 −20 −15 −10 −5 −2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring U Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700 800 900 1000 1100 1200 1300
247 248 249 250 251 252 253 254 255 256 257 258
Depth(m)
700 800 900 1000 1100 1200 1300
258 259 260 261 262 263 264 265 266 267 268 269
Day of Year 2002

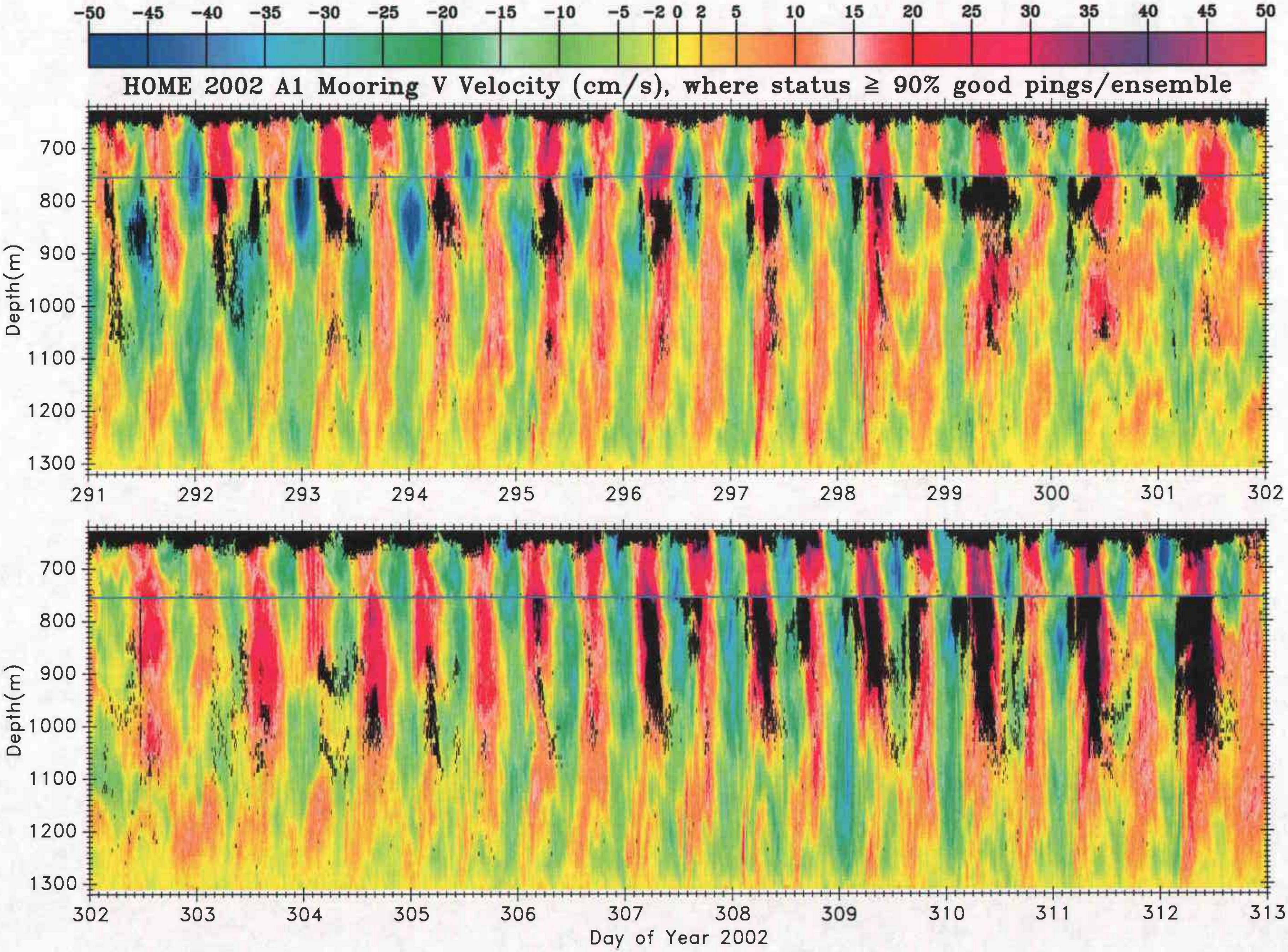

-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring V Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700
800
900
1000
1100
1200
1300
247 248 249 250 251 252 253 254 255 256 257 258
Depth(m)
700
800
900
1000
1100
1200
1300
258 259 260 261 262 263 264 265 266 267 268 269
Day of Year 2002



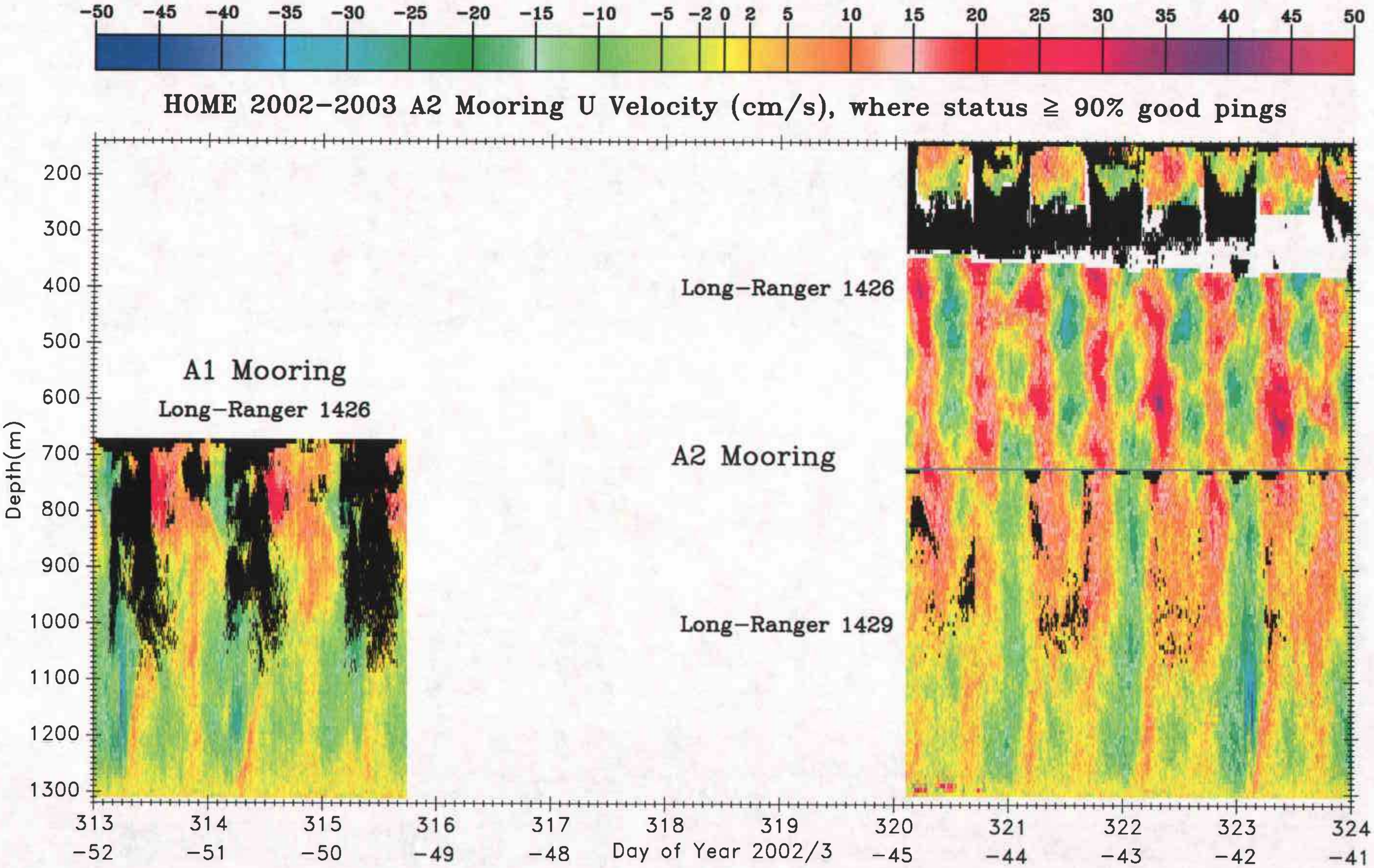
-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring U Velocity (cm/s), where status ≧ 90% good pings/ensemble
Depth(m)
700
800
900
1000
1100
1200
1300
269 270 271 272 273 274 275 276 277 278 279 280
280 281 282 283 284 285 286 287 288 289 290 291
Day of Year 2002

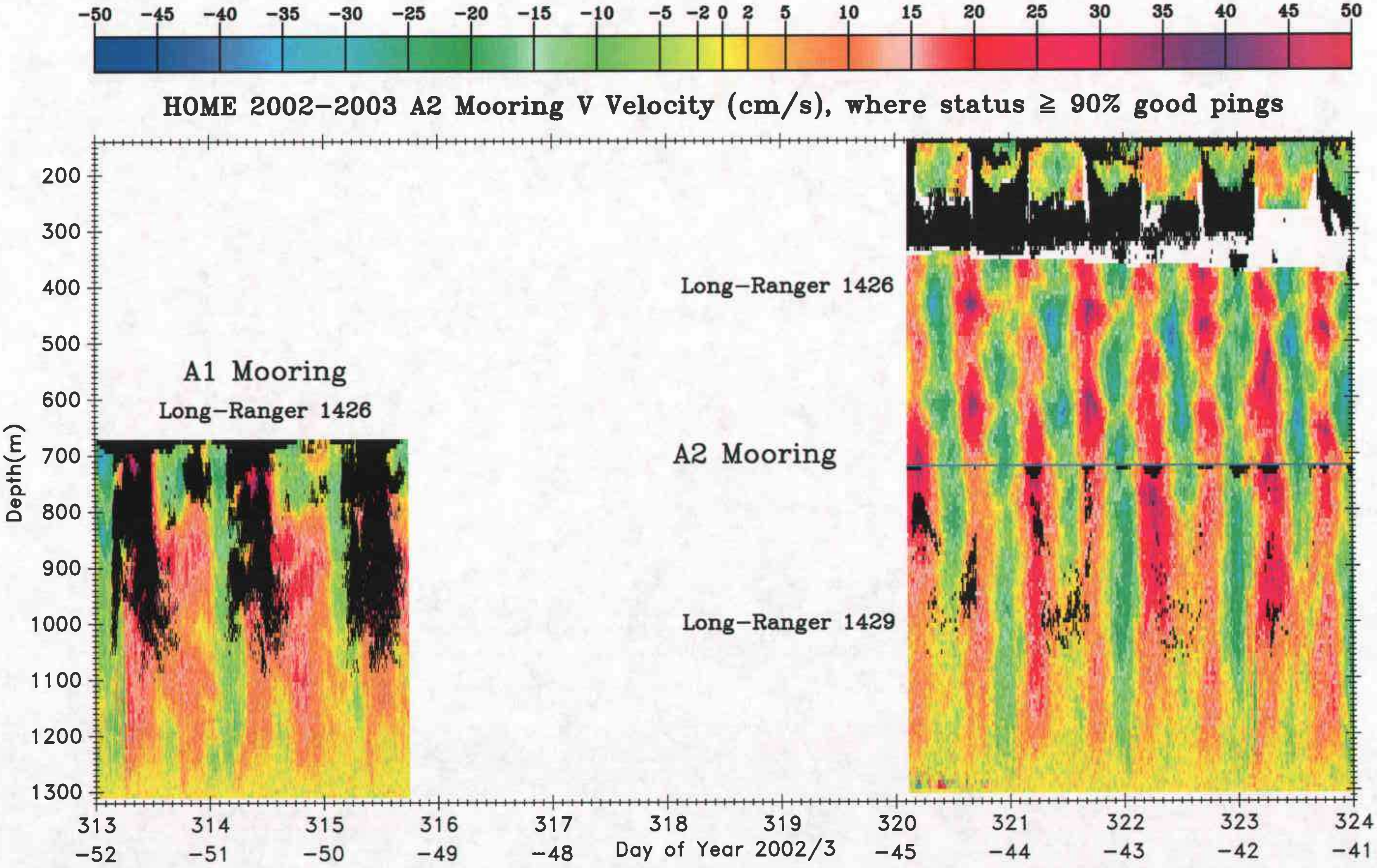

-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring V Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700
800
900
1000
1100
1200
1300
269 270 271 272 273 274 275 276 277 278 279 280
Depth(m)
700
800
900
1000
1100
1200
1300
280 281 282 283 284 285 286 287 288 289 290 291
Day of Year 2002


-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring U Velocity (cm/s), where status ≧ 90% good pings/ensemble
Depth(m)
700
800
900
1000
1100
1200
1300
291 292 293 294 295 296 297 298 299 300 301 302
302 303 304 305 306 307 308 309 310 311 312 313
Day of Year 2002



-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002 A1 Mooring V Velocity (cm/s), where status ≥ 90% good pings/ensemble
Depth(m)
700 800 900 1000 1100 1200 1300
291 292 293 294 295 296 297 298 299 300 301 302
302 303 304 305 306 307 308 309 310 311 312 313
Day of Year 2002


-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings
A1 Mooring
Long-Ranger 1426
Long-Ranger 1426
A2 Mooring
Long-Ranger 1429
Depth(m)
200
300
400
500
600
700
800
900
1000
1100
1200
1300
313 314 315 316 317 318 319 320 321 322 323 324
-52 -51 -50 -49 -48 -45 -44 -43 -42 -41
Day of Year 2002/3



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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
A1 Mooring
Long-Ranger 1426
A2 Mooring
Long-Ranger 1426
Long-Ranger 1429
Depth(m)
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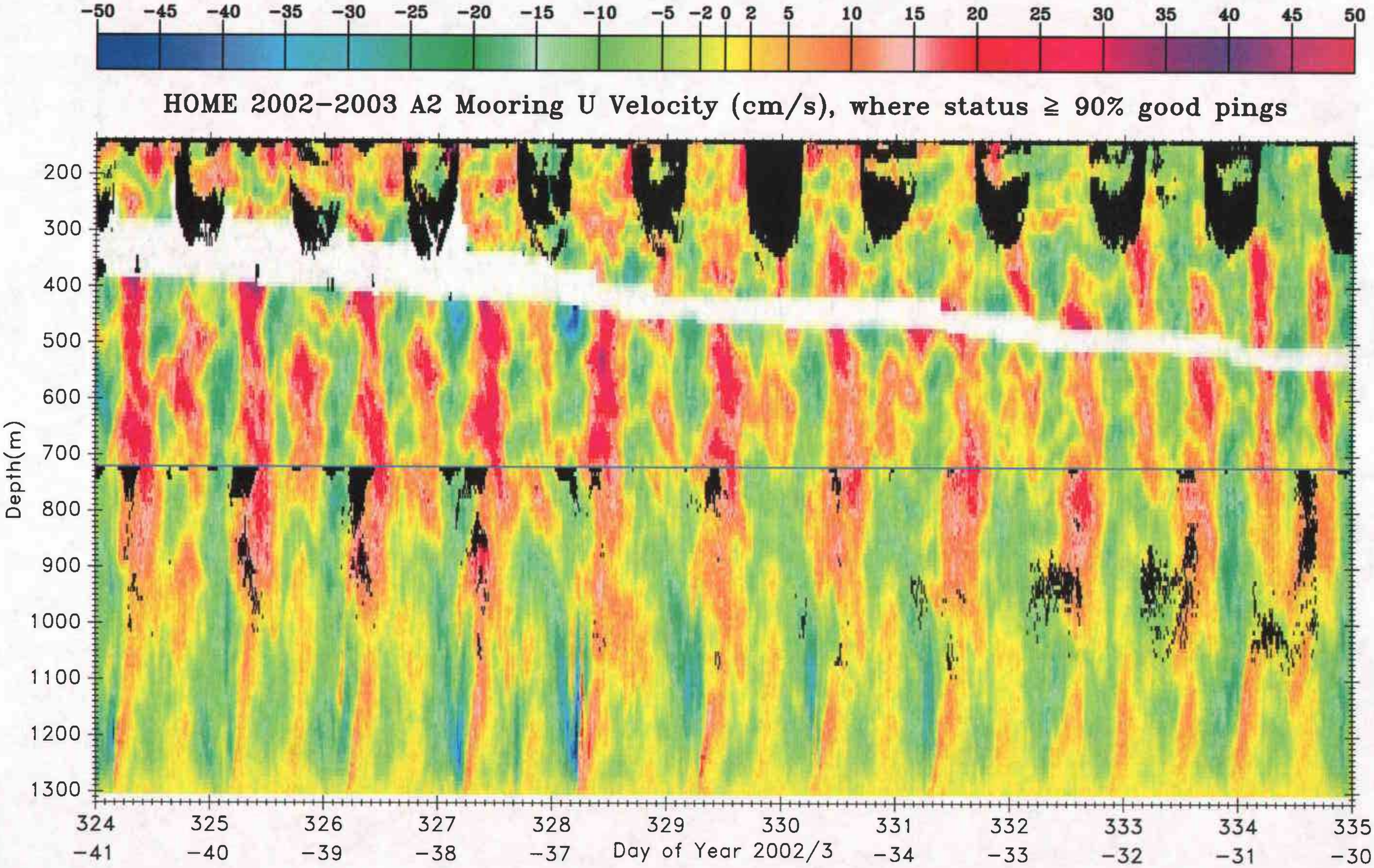
313 314 315 316 317 318 319 320 321 322 323 324
-52 -51 -50 -49 -48 -45 -44 -43 -42 -41
Day of Year 2002/3



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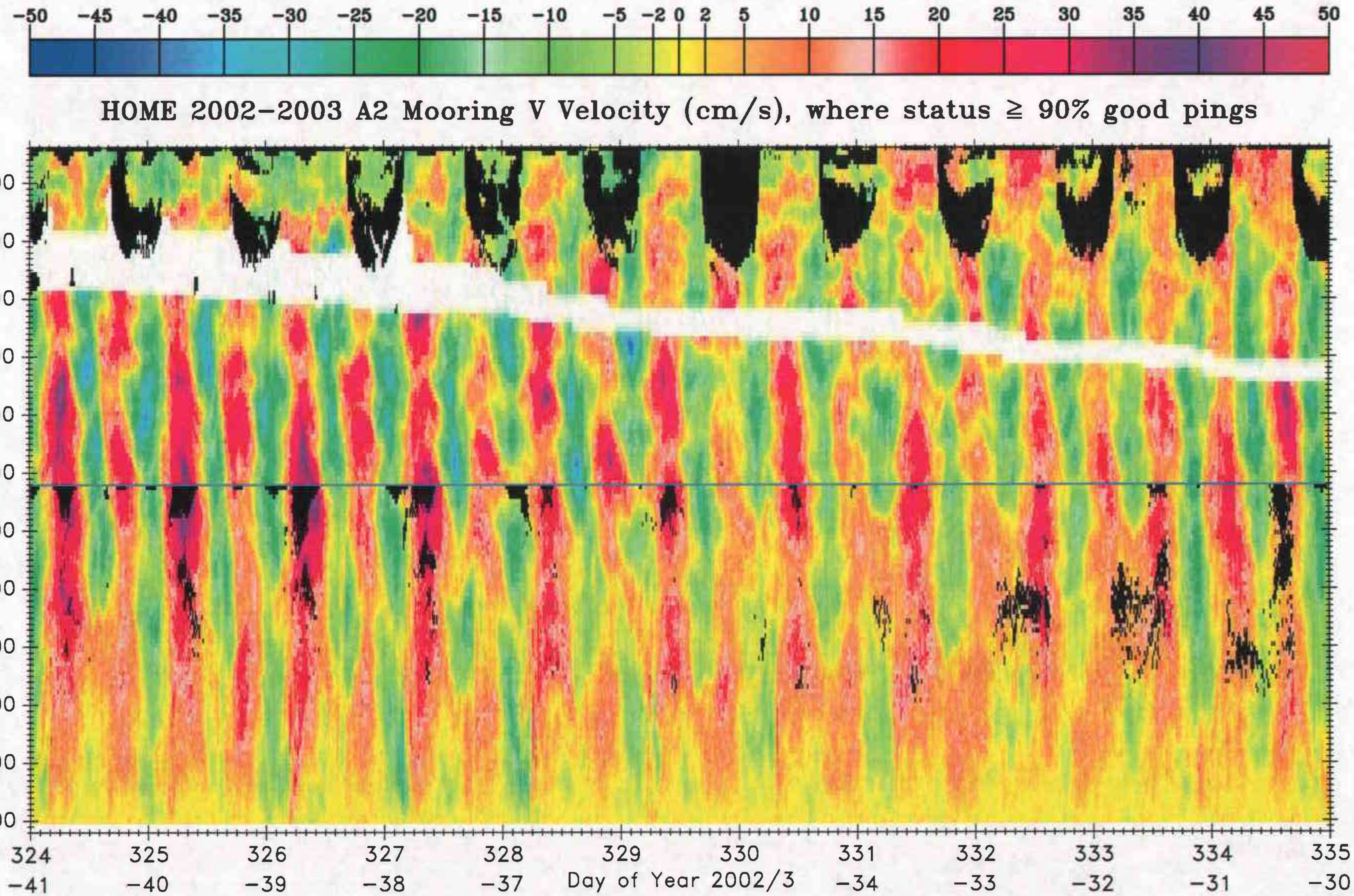
HOME 2002–2003 A2 Mooring U Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
324 325 326 327 328 329 330 331 332 333 334 335
-41 -40 -39 -38 -37 -34 -33 -32 -31 -30
Day of Year 2002/3



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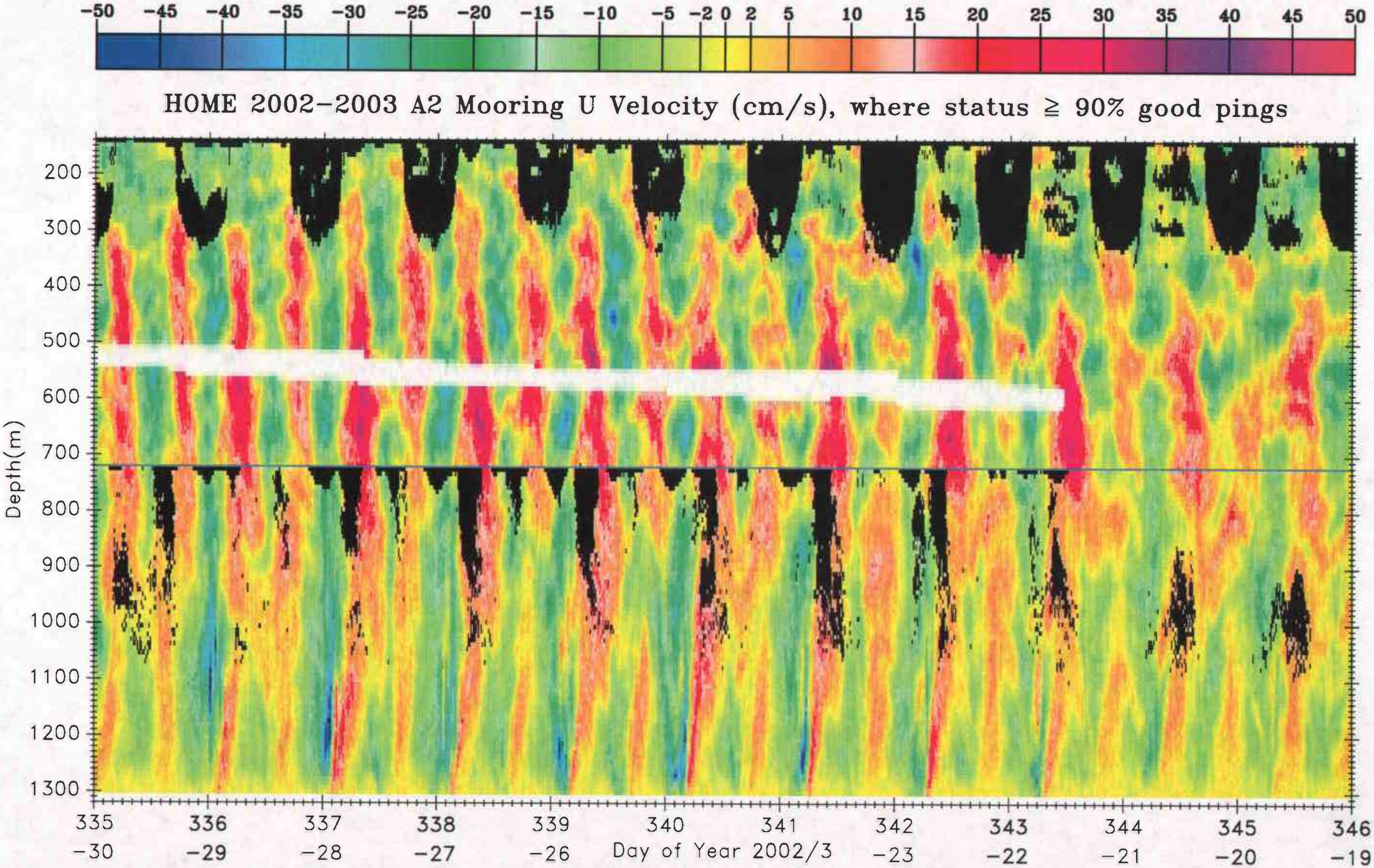
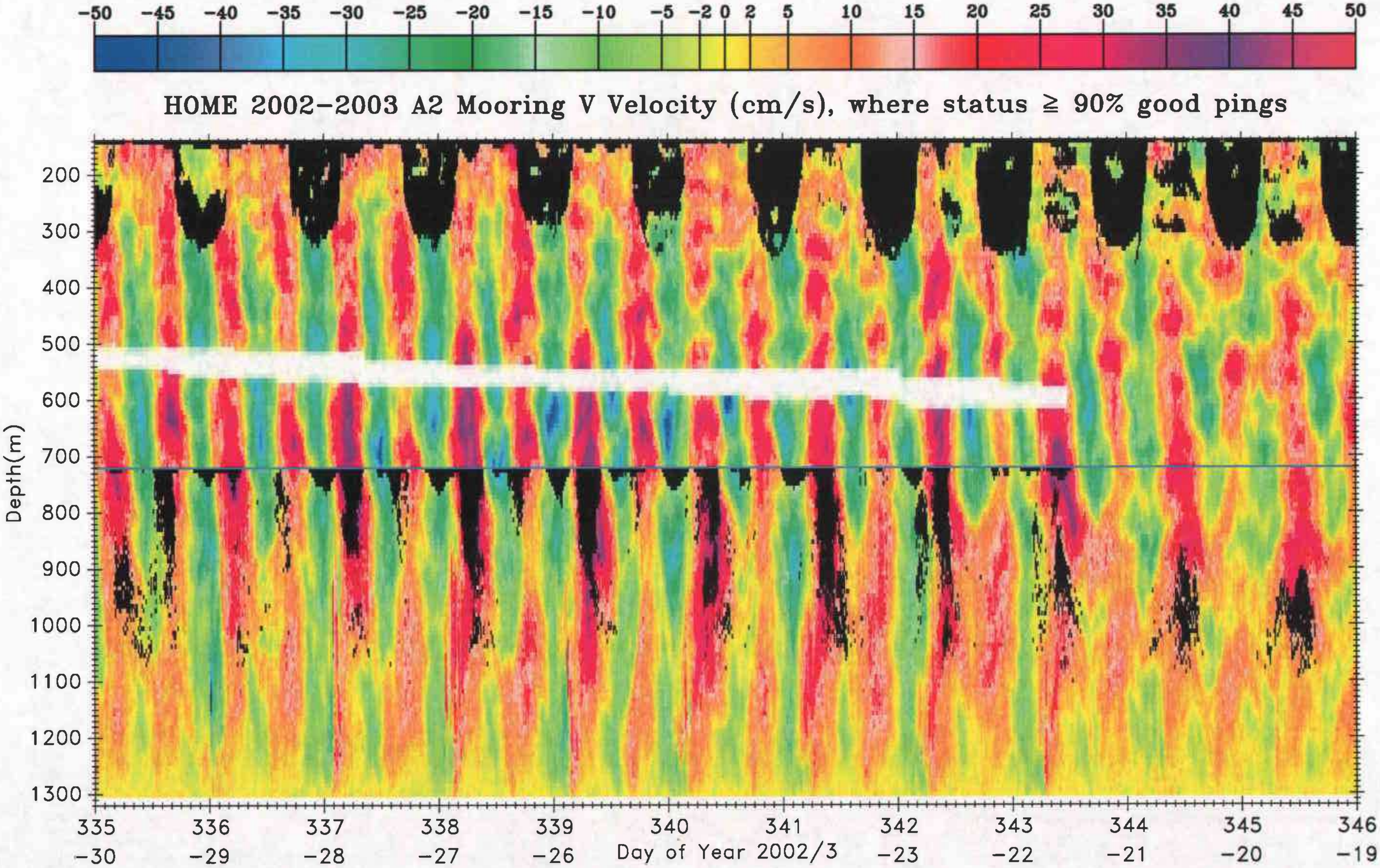
HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
324 325 326 327 328 329 330 331 332 333 334 335
-41 -40 -39 -38 -37 -34 -33 -32 -31 -30
Day of Year 2002/3



HOME 2002–2003 A2 Mooring U Velocity (cm/s), where status ≥ 90% good pings
-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
335 336 337 338 339 340 341 342 343 344 345 346
-30 -29 -28 -27 -26 -23 -22 -21 -20 -19
Day of Year 2002/3



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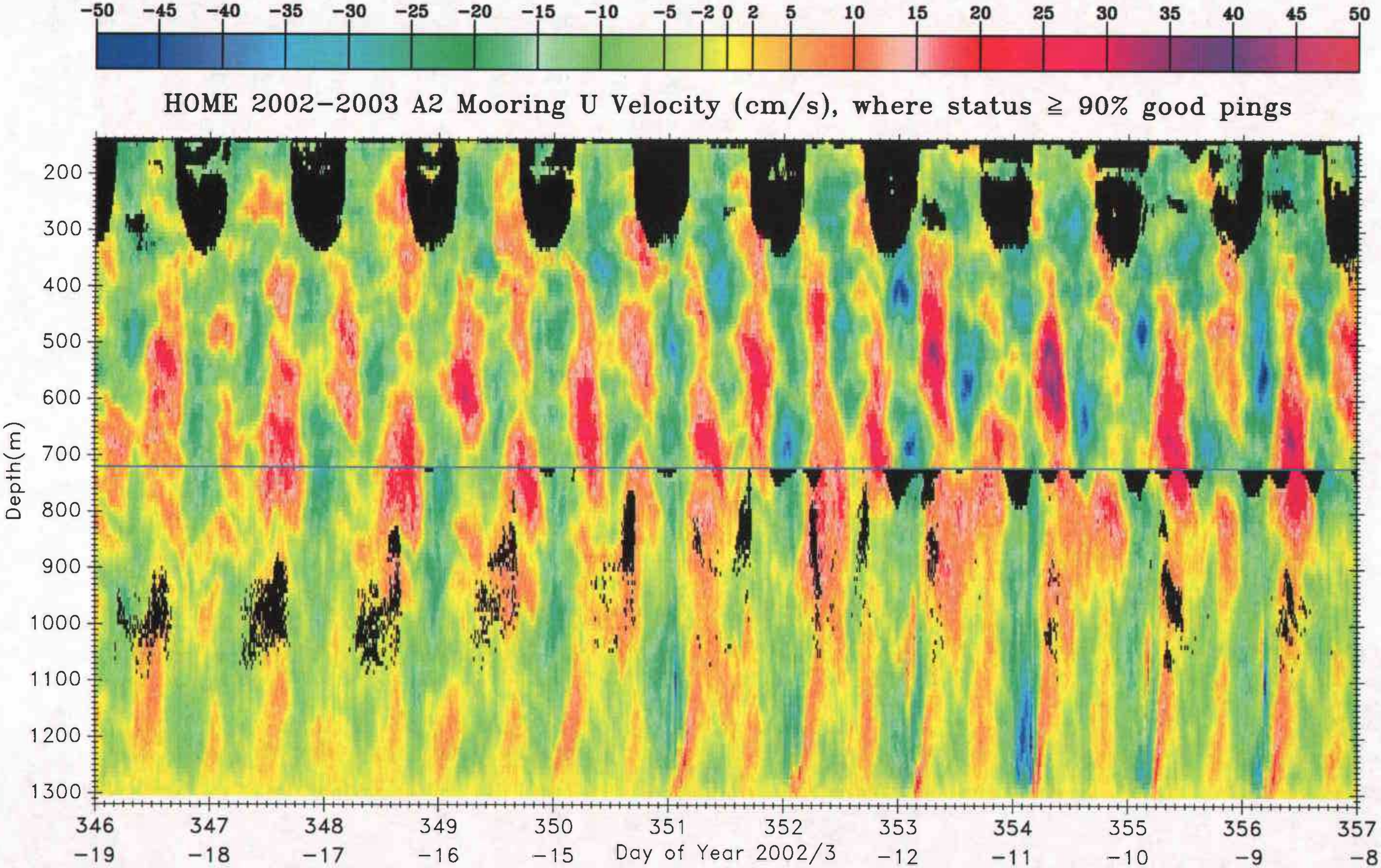
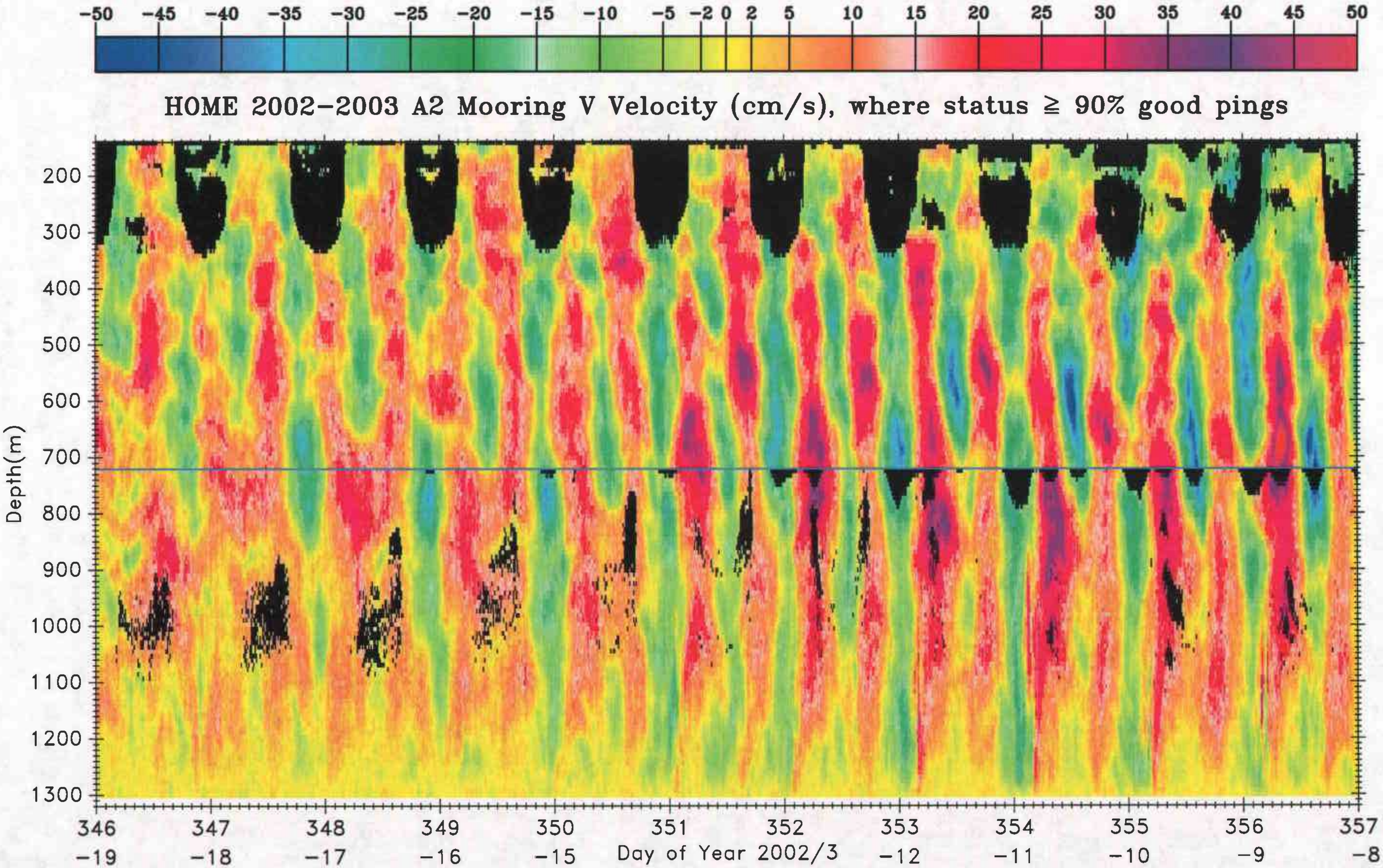
HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
335 336 337 338 339 340 341 342 343 344 345 346
-30 -29 -28 -27 -26 -23 -22 -21 -20 -19
Day of Year 2002/3



HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
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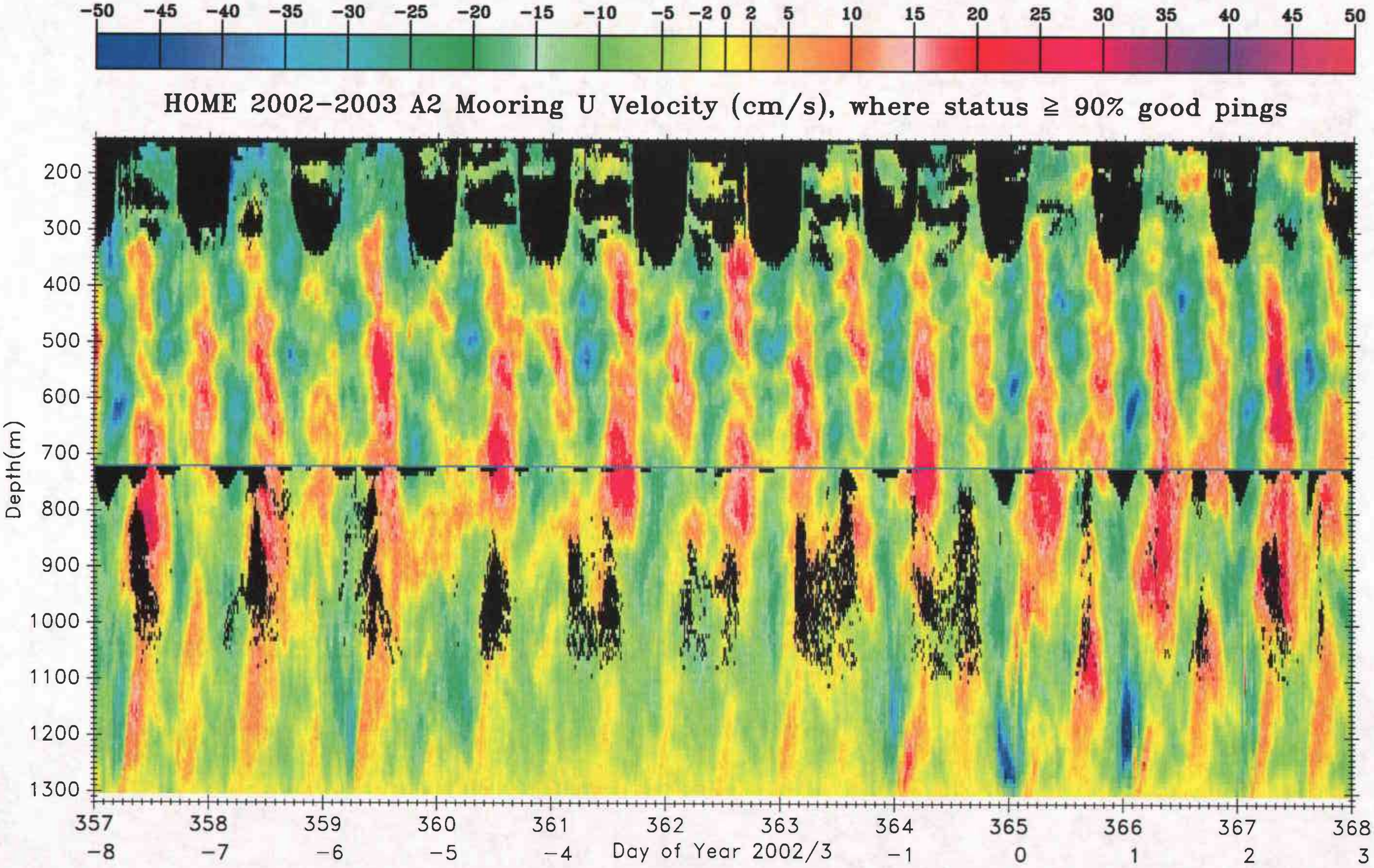
346 347 348 349 350 351 352 353 354 355 356 357
-19 -18 -17 -16 -15 -12 -11 -10 -9 -8
Day of Year 2002/3



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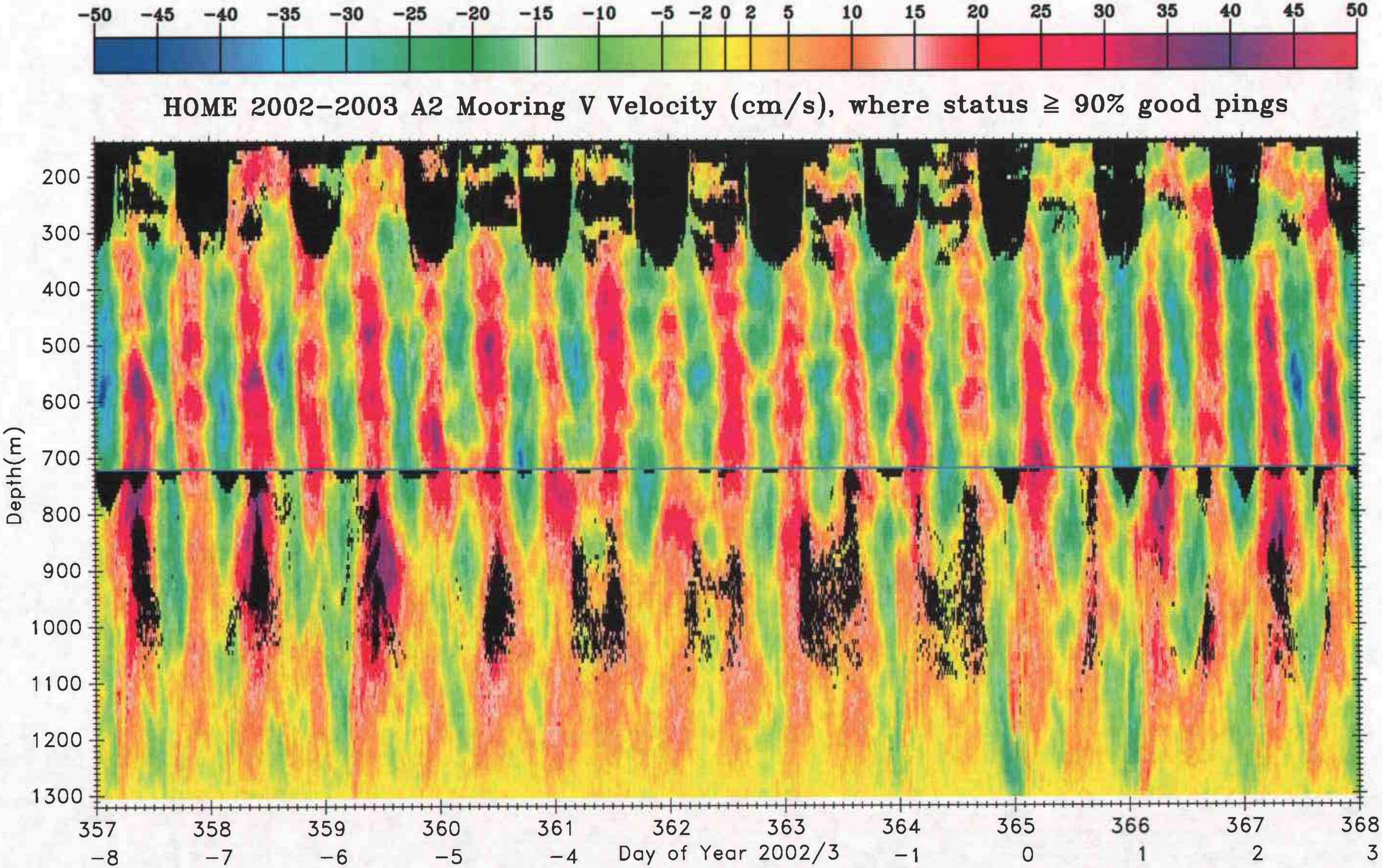
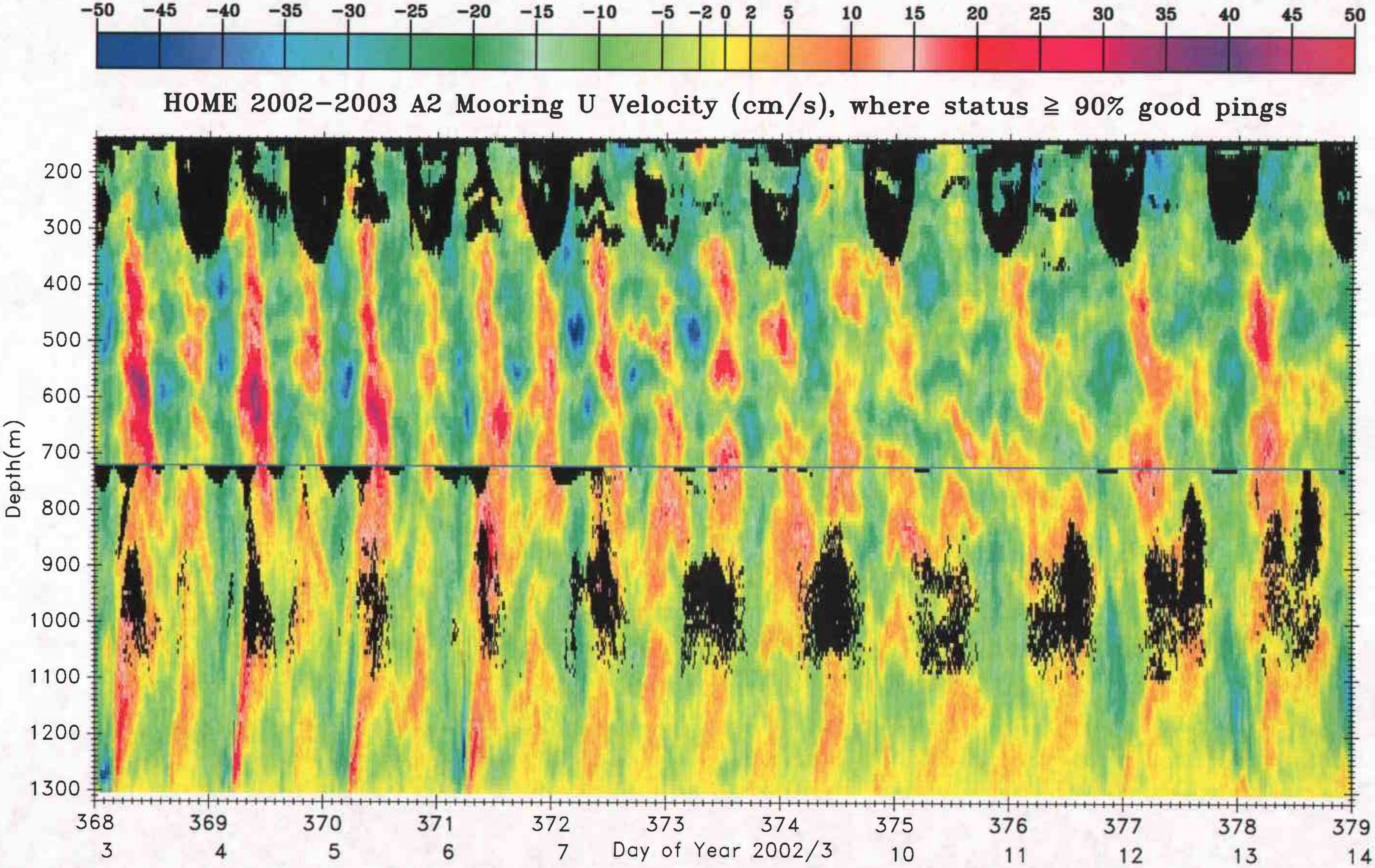
HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
357 358 359 360 361 362 363 364 365 366 367 368
-8 -7 -6 -5 -4 -1 0 1 2 3
Day of Year 2002/3


-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
357 358 359 360 361 362 363 364 365 366 367 368
-8 -7 -6 -5 -4 -1 0 1 2 3
Day of Year 2002/3



-50 -45 -40 -35 -30 -25 -20 -15 -10 -5 -2 0 2 5 10 15 20 25 30 35 40 45 50
HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
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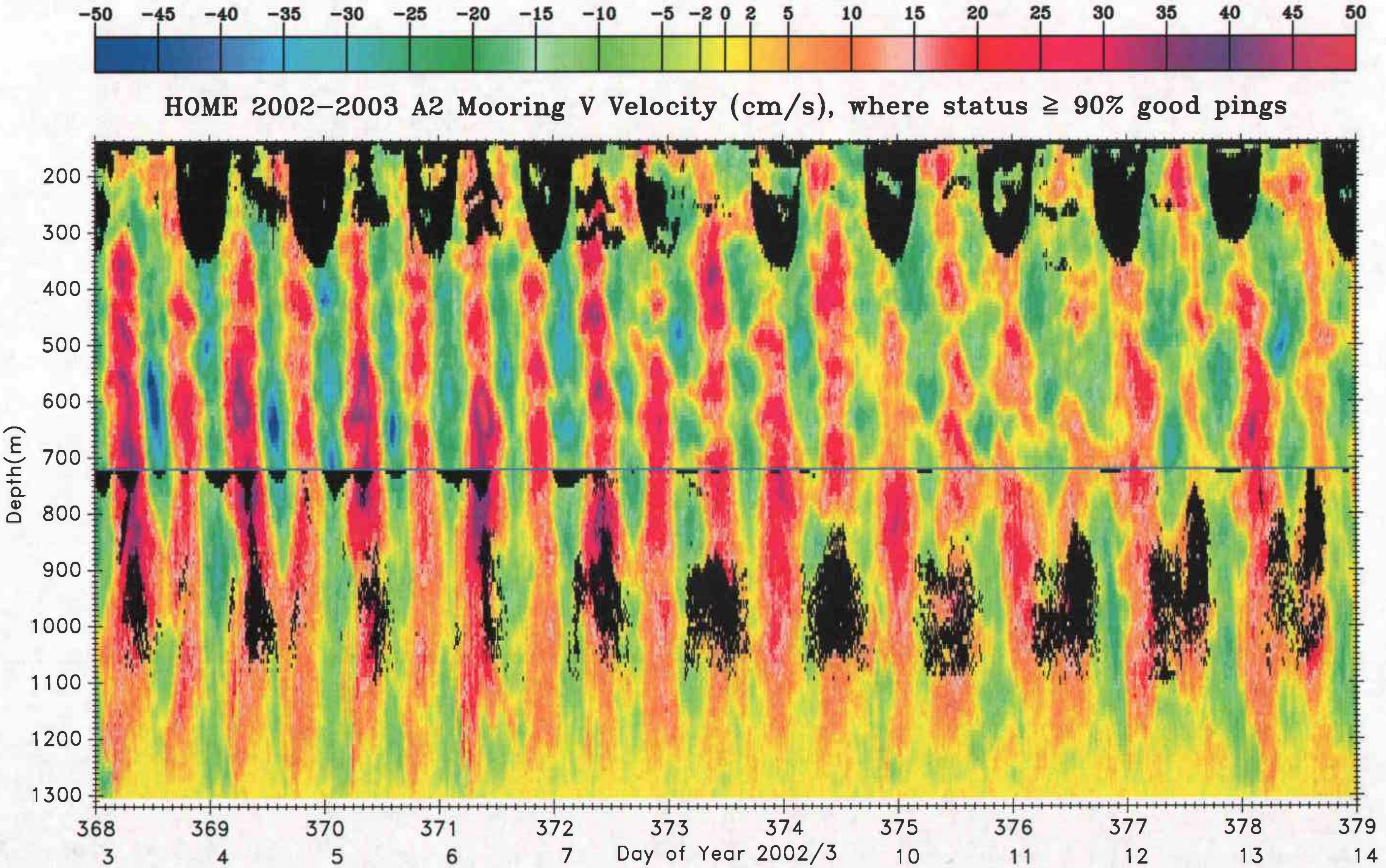
368 369 370 371 372 373 374 375 376 377 378 379
3 4 5 6 7 10 11 12 13 14
Day of Year 2002/3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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
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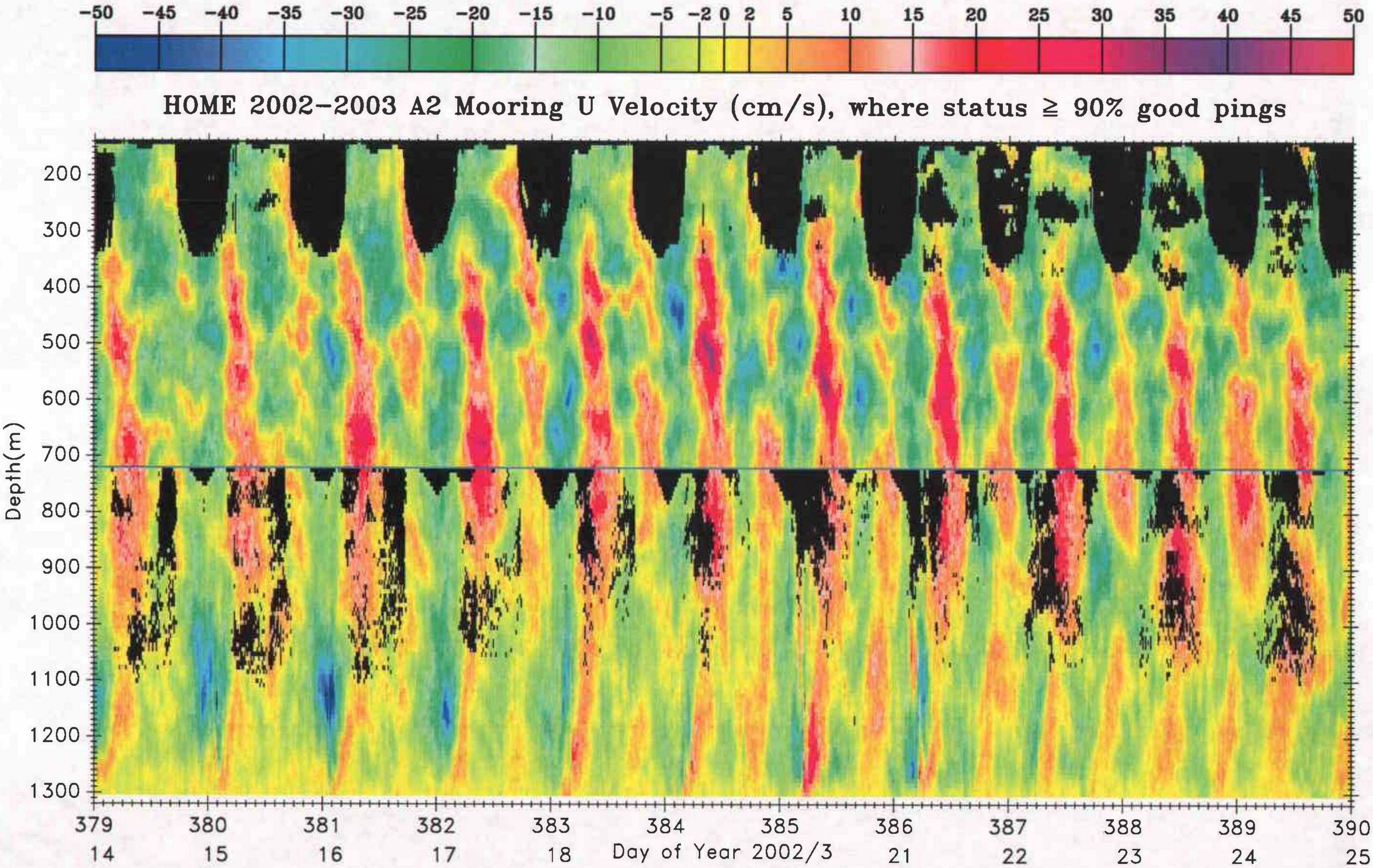
368 369 370 371 372 373 374 375 376 377 378 379
3 4 5 6 7 10 11 12 13 14
Day of Year 2002/3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HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
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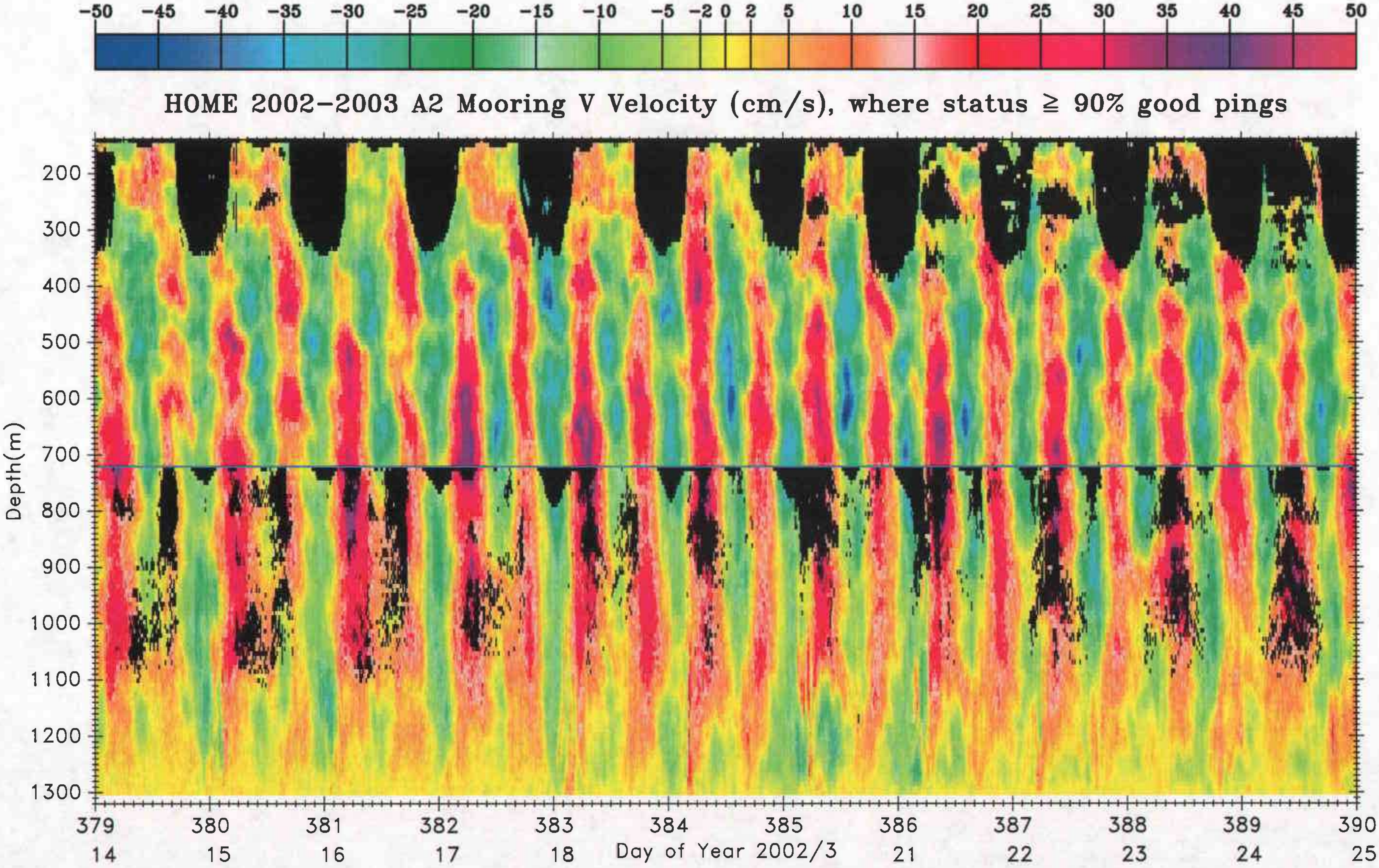
Day of Year 2002/3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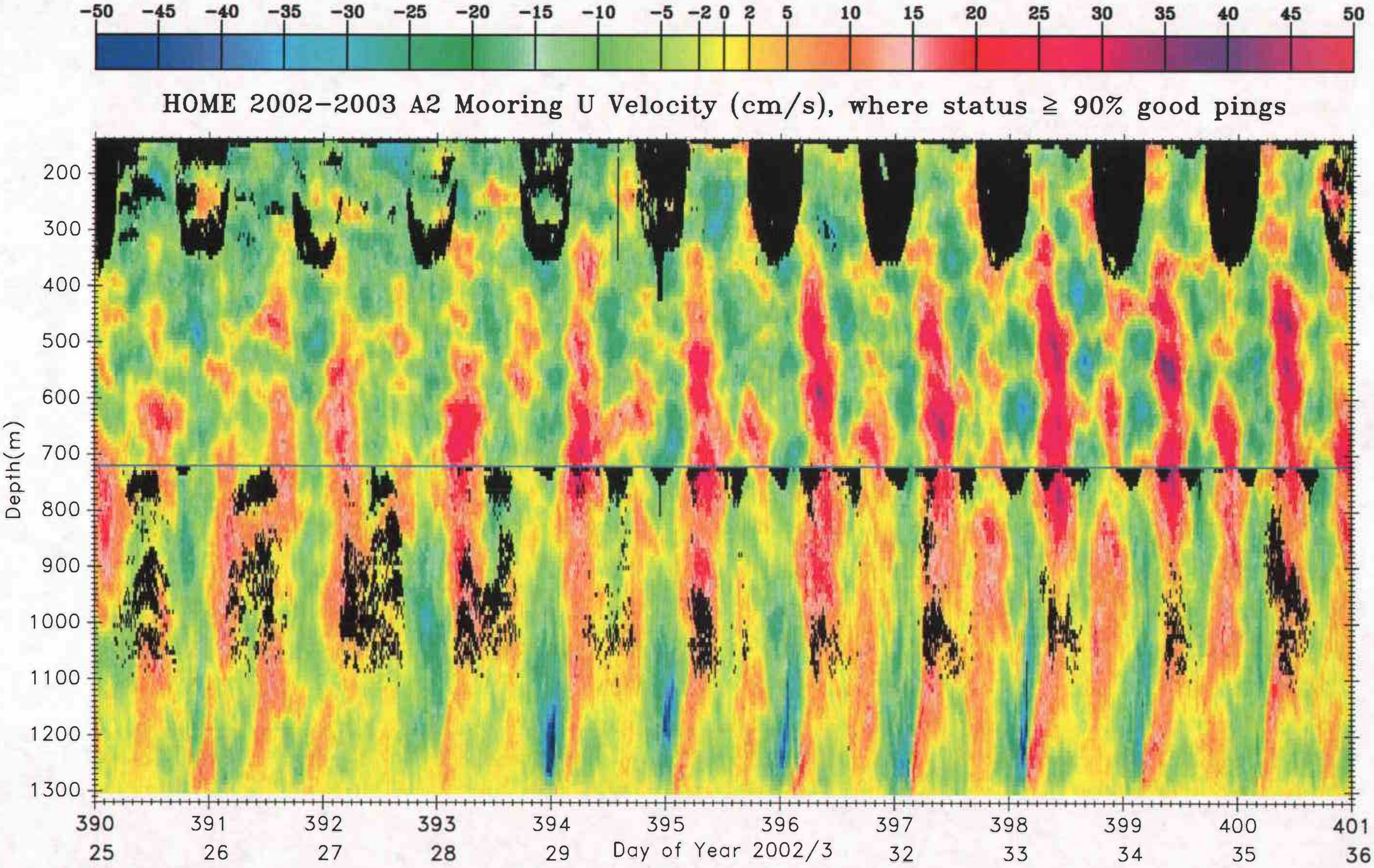
HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
379 380 381 382 383 384 385 386 387 388 389 390
14 15 16 17 18 21 22 23 24 25
Day of Year 2002/3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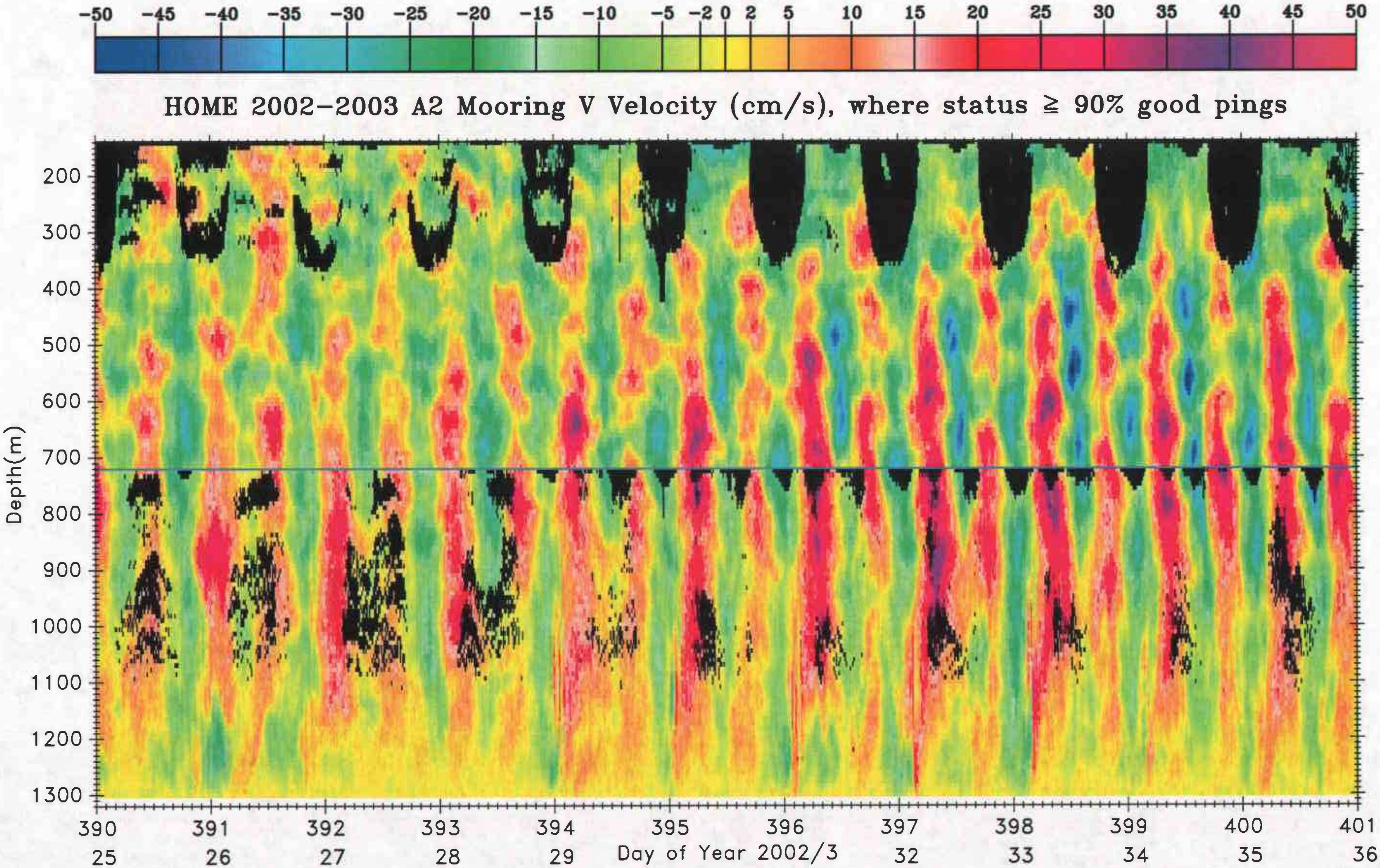
HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
390 391 392 393 394 395 396 397 398 399 400 401
25 26 27 28 29 32 33 34 35 36
Day of Year 2002/3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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
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390 391 392 393 394 395 396 397 398 399 400 401
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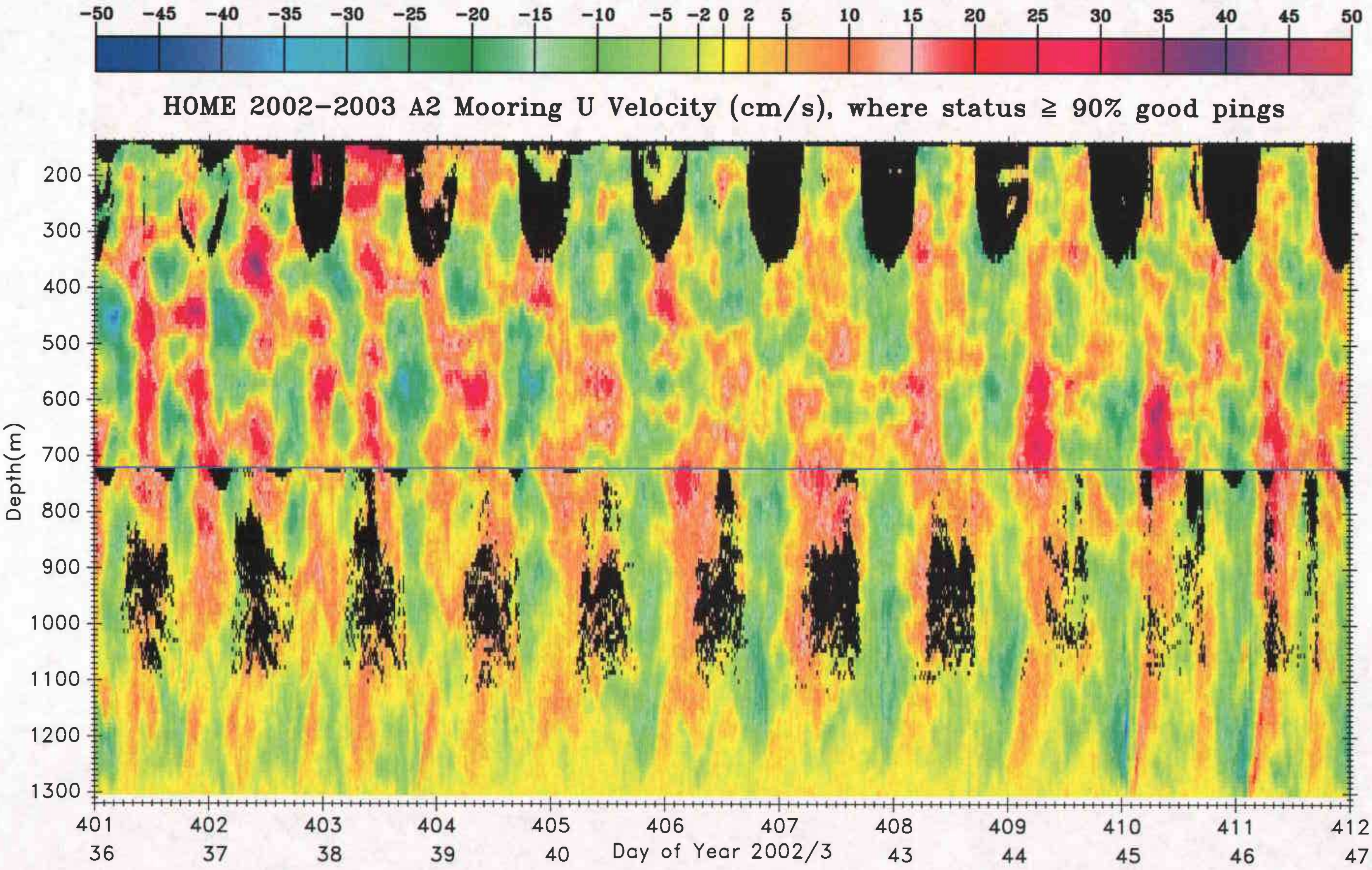
Day of Year 2002/3



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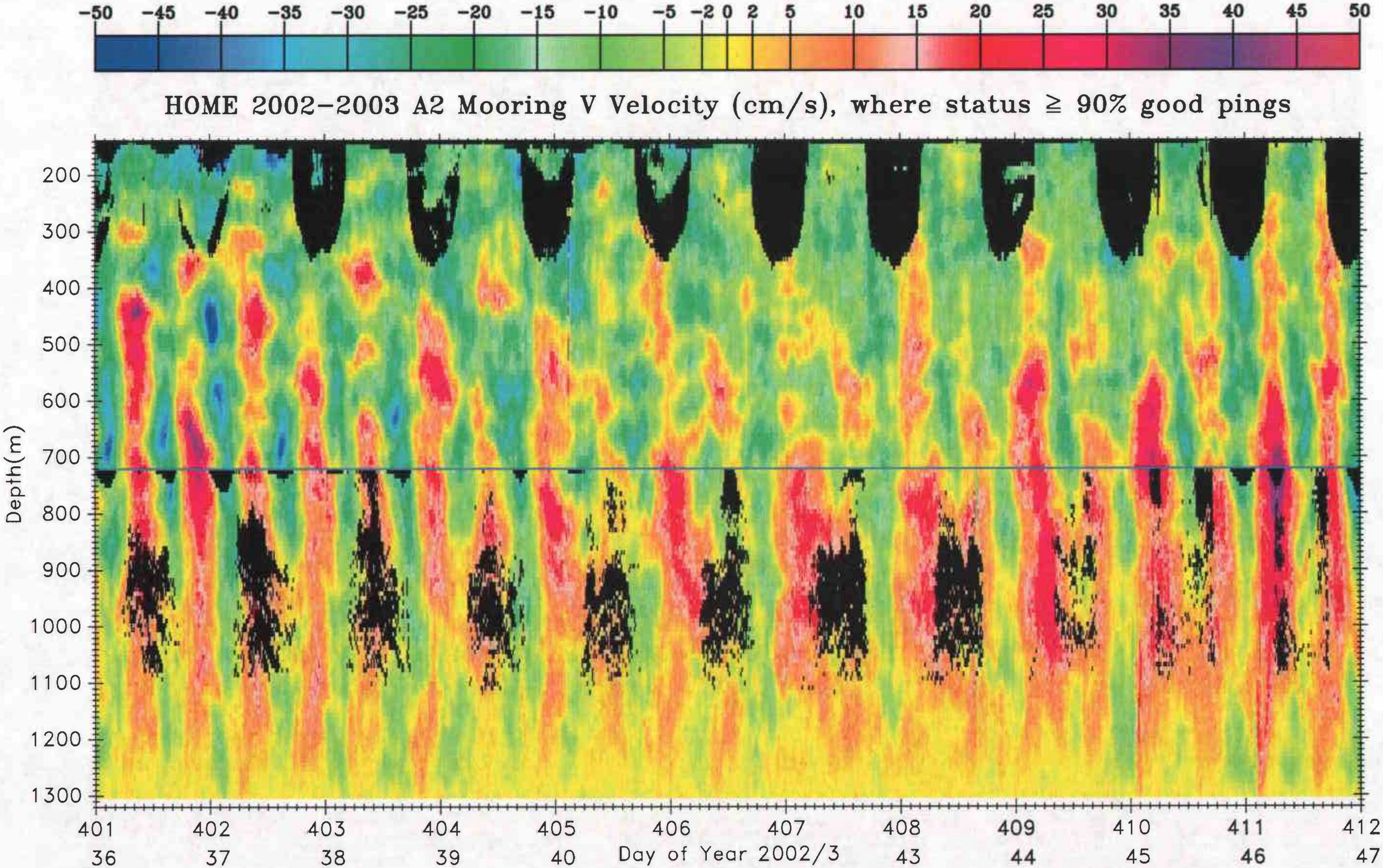
HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
401 402 403 404 405 406 407 408 409 410 411 412
36 37 38 39 40 43 44 45 46 47
Day of Year 2002/3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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
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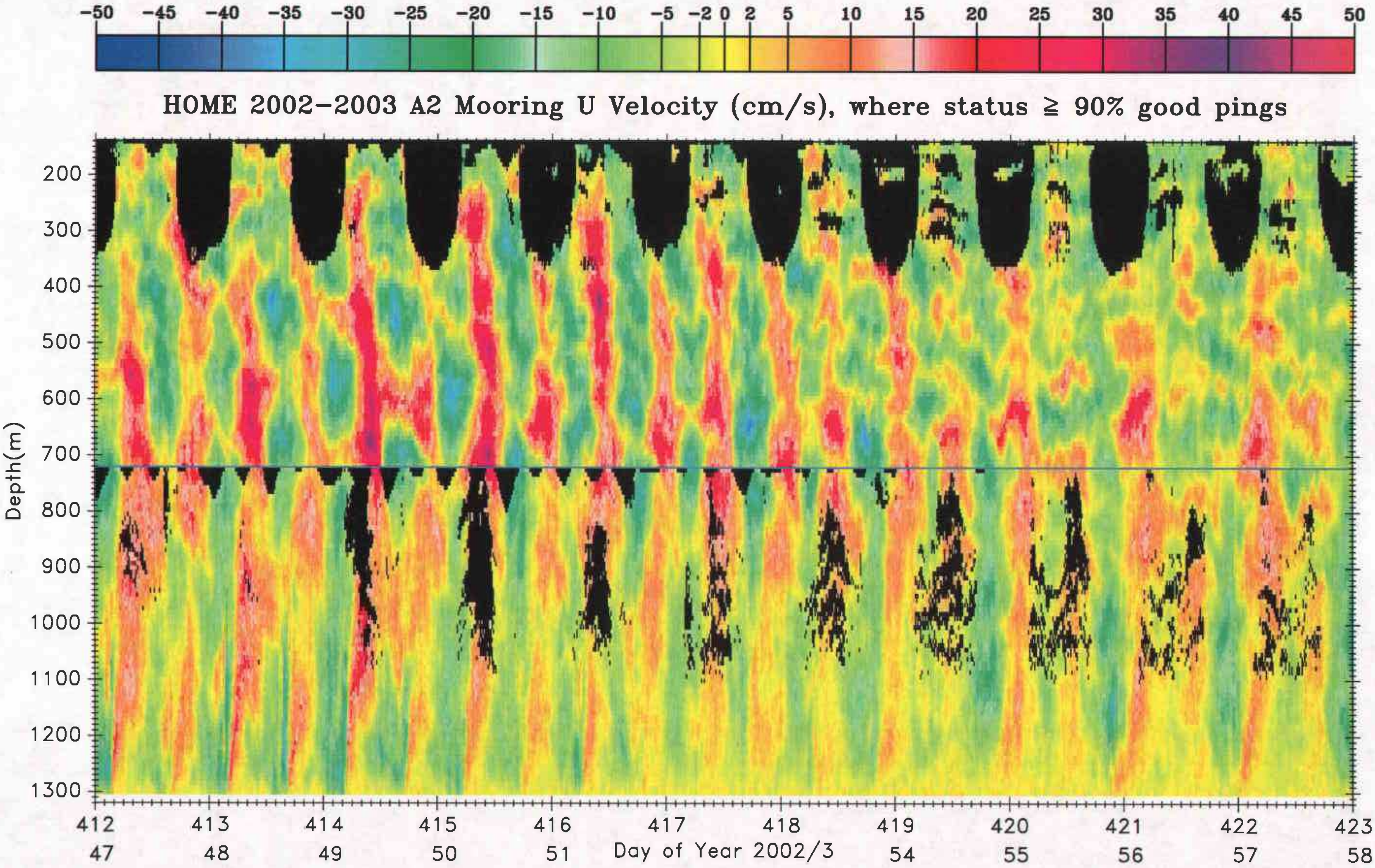
Day of Year 2002/3



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HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≧ 90% good pings
Depth(m)
200
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412 413 414 415 416 417 418 419 420 421 422 423
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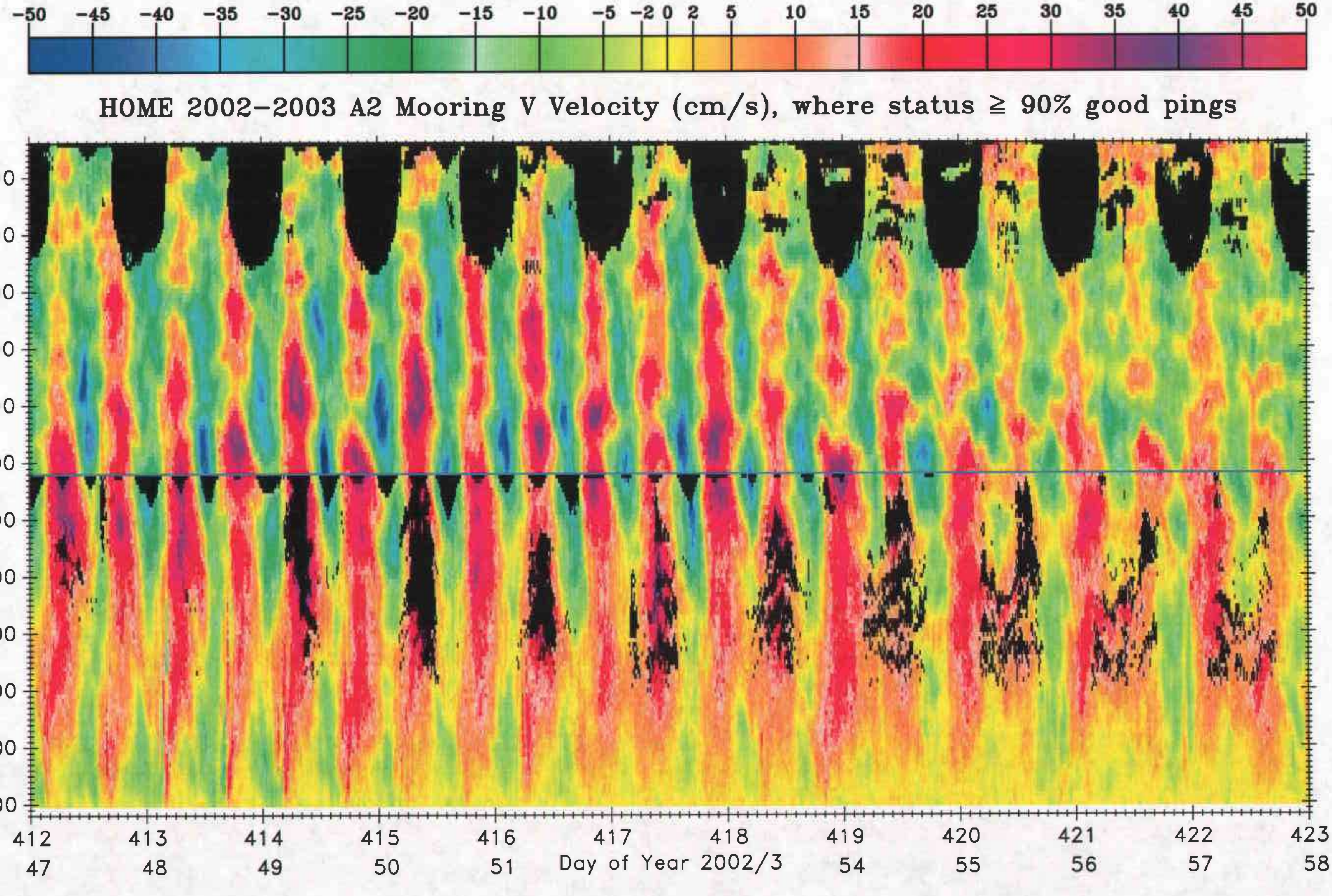
Day of Year 2002/3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HOME 2002-2003 A2 Mooring V Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
200 300 400 500 600 700 800 900 1000 1100 1200 1300
412 413 414 415 416 417 418 419 420 421 422 423
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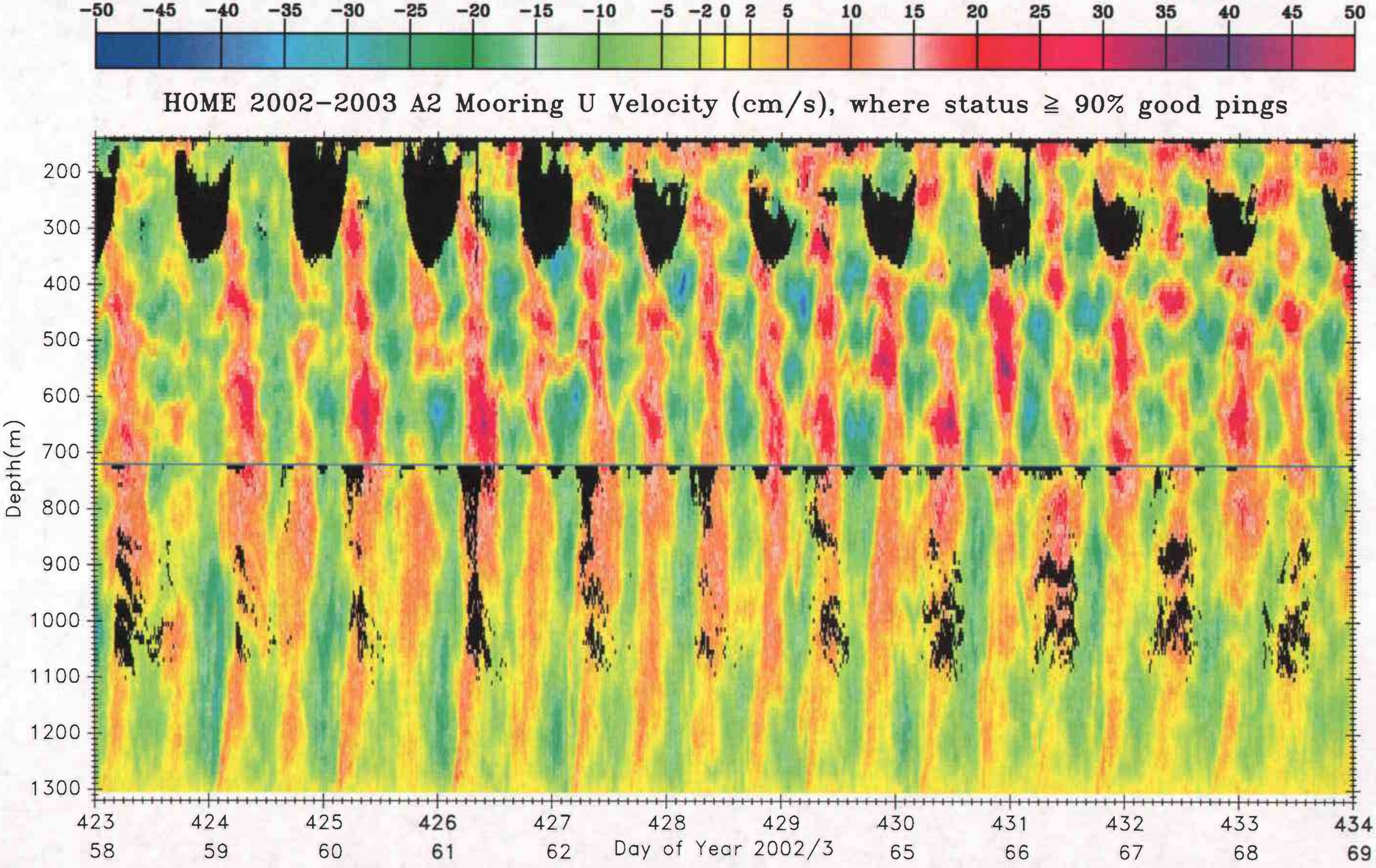
Day of Year 2002/3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HOME 2002-2003 A2 Mooring U Velocity (cm/s), where status ≥ 90% good pings
Depth(m)
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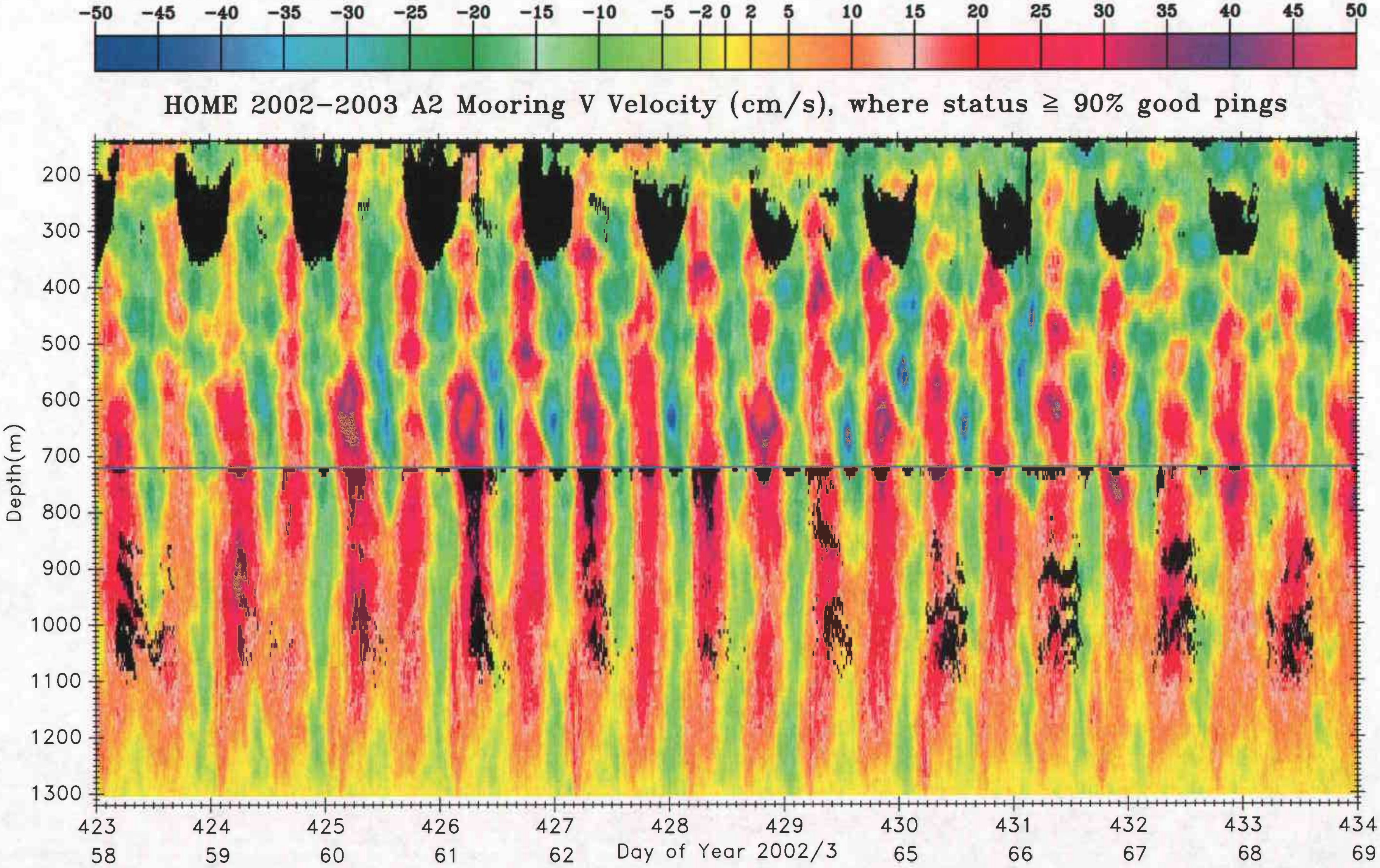
Day of Year 2002/3



HOME 2002–2003 A2 Mooring V Velocity (cm/s), where status ≥ 90% good pings