2017 CLIVAR P18 LADCP Cruise Report

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Introduction

LADCP data were collected during the full-depth CTD cast at all stations. Preliminary processing and QC was performed onboard by Jay Hooper during leg 1 and Sarah Purkey during leg2. Casts were sent to Thurnherr for shore-based processing as internet access allowed. A full QC will be carried out after the cruise by Thurnherr.

LADCP System Configuration

An AOML custom 48V lead acid rechargeable battery pack was used for all deployments. Instruments and battery pack were interfaced using a standard RDI star cable. Custom AOML deck leads were used for communications and charging between casts. The battery pack was periodically vented manually to prevent pressure build up. Battery power was periodically checked to ensure proper charge level of 52V was being maintained before deployments. Both the battery pack and the ADCP's were affixed to the CTD package using custom tabbed brackets aligned on horizontal cross-members of the package. The upward ADCP was positioned between niskin bottles 1 and 24 towards the outer ring, while the downward ADCP was affixed in the middle of the package about 4 inches from the bottom ring. The configuration is shown in photo 01.

During the shakedown profiles an external magnetometer/accelerometer package (independent measurement package – IMP) was installed on the rosette to collect better pitch, roll and heading data. The instrument was removed from the rosette after station 3 after cable problems to simplify LADCP operations.

The power supply and data transfer were handled independently from any CTD connections. While on deck, a communications and power cable was connected to a cable in the staging bay that ran into the wet lab. This cable connected to a battery charger located in the wet lab for power and to an acquisitions computer via USB connection for data download. The LADCP acquisitions computer clock was synced to the master clock in the computer lab via network.

Table 01: Instruments used on cruise. DL = downlooker UL = uplooker.

Model	Serial Number	Stations used
Teledyne RDI WHM150	19394	1- 204 (DL)
Teledyne RDI WHM150	24544	205 - 211(DL)
Teledyne RDI WHM300	12734	1-211 (UL)

Three different ADCP instruments were used during this cruise (table 01). Initial configuration consisted of the WHM15O #19394 as downlooker and the WHM300 #12734 as uplooker. (WHM150 #19394 had not performed well during P16, but was repaired by TRDI immediately prior to the cruise.) On or after station 201, one of the beams of the DL failed, and the spare WHM150 #24544, a brand new unit, was installed on the rosette as a replacement. The UL performed well throughout the entire cruise. All ADCPs were set up to record velocity data with 8m pulses/bins and zero blanking. Staggered pinging was used to avoid previous ping interference, which is particularly important for 150kHz instruments.

Problems/Setup Changes:

Station 1, cast1: MASTER.cmd changed from LN25 (used for the shakedown cast) to LN40

Station 1, cast 3: Errors during download at the end of cast. Generated 3 files in DL. Unplugged IMP and charged battery before trying to download again.

Station 3, cast 1: Problem with T-cable. Removed IMP and set up with single star cable.

Station 18, cast 1: On recovery, winch failed and CTD free fell ~10 m.

Station 20, cast 1: Switched to aft winch.

Station 139, cast 1: Cast aborted because of CTD cable issues. Re-done as 139, cast 2

Station 141, cast1: Cast aborted due to CTD temperature sensor.

Station 159, cast 1: Deployment issues. CTD dropped in water. Did not hit boat and no visual issues. Re-deployed as cast 2. LADCP was not restarted but ran the whole time.

Station 168: cast 1: Data was not downloaded between casts. Data lost.

Station 187, cast 1: Cast stayed 100m off the bottom because of possible altimeter communication issues.

Station 190, cast 1: LADCP not turned on. No LADCP data for station 190.

Station 202-204: Beam 1 of the DL sn # 19394 was bad

Station 205. Replaced DL WHM150 downlooker SN #19394 with WHM150 downlooker SN # 24544.

LADCP Operation

ADCP programming and data acquisition were carried out using the LDEO Acquire software running on a Mac computer. Communications between the acquisitions computer and the ADCPs took place across two parallel R5232 connections via a Keyspan USA-49WG 4-port USB-to-R5232 adapter. After station 3 no further significant communications issues were encountered. After sending the corresponding command files to the instruments prior to each cast, communication between the computer and the instrument was terminated, the deck cables were disconnected, and all connections were sealed with dummy plugs and secured. After

the CTD was brought back on deck following a cast, the data and the power supply cable were reconnected to the computer and battery charger via the deck cables. Data acquisition was terminated and the data were downloaded using the Acquire software. The battery charger remained on from the time of data download until the time the instrument was prepared for the next cast. Log files were kept for each cast to ensure that all the steps were completed.

Data Processing and Quality Control

The LADCP data were processed by Hooper/Purkey at least once per day using the Matlab-based LDEO IX_10 processing software(1), as well as by Thurnherr in his lab during times of good internet connection (essentially the first leg). Processing warnings and diagnostic figures created during processing were reviewed for signs of anomalies, which included checking the realism of final profile values, checking for any biased shear, examining the agreement between aligned CTD/LADCP time series, and monitoring beam strength and range. Thurnherr was either sent data or consulted when questionable profiles were observed.

The cruise-processed profiles of LADCP-derived horizontal velocity are shown in Figure 03. Comparison of the LADCP velocities in the upper ocean with the corresponding on-station SADCP velocities (not shown) indicates that the quality of these data is high. Data quality will be assessed more quantitatively during additional post-cruise QC and re-processing by Thurnherr at LDEO.

(1) available for download at http ://www.ldeo.columbia.edu/LADCP

Photo 01: Instruments and battery pack on rosette. UVP is not mounted in this photo.

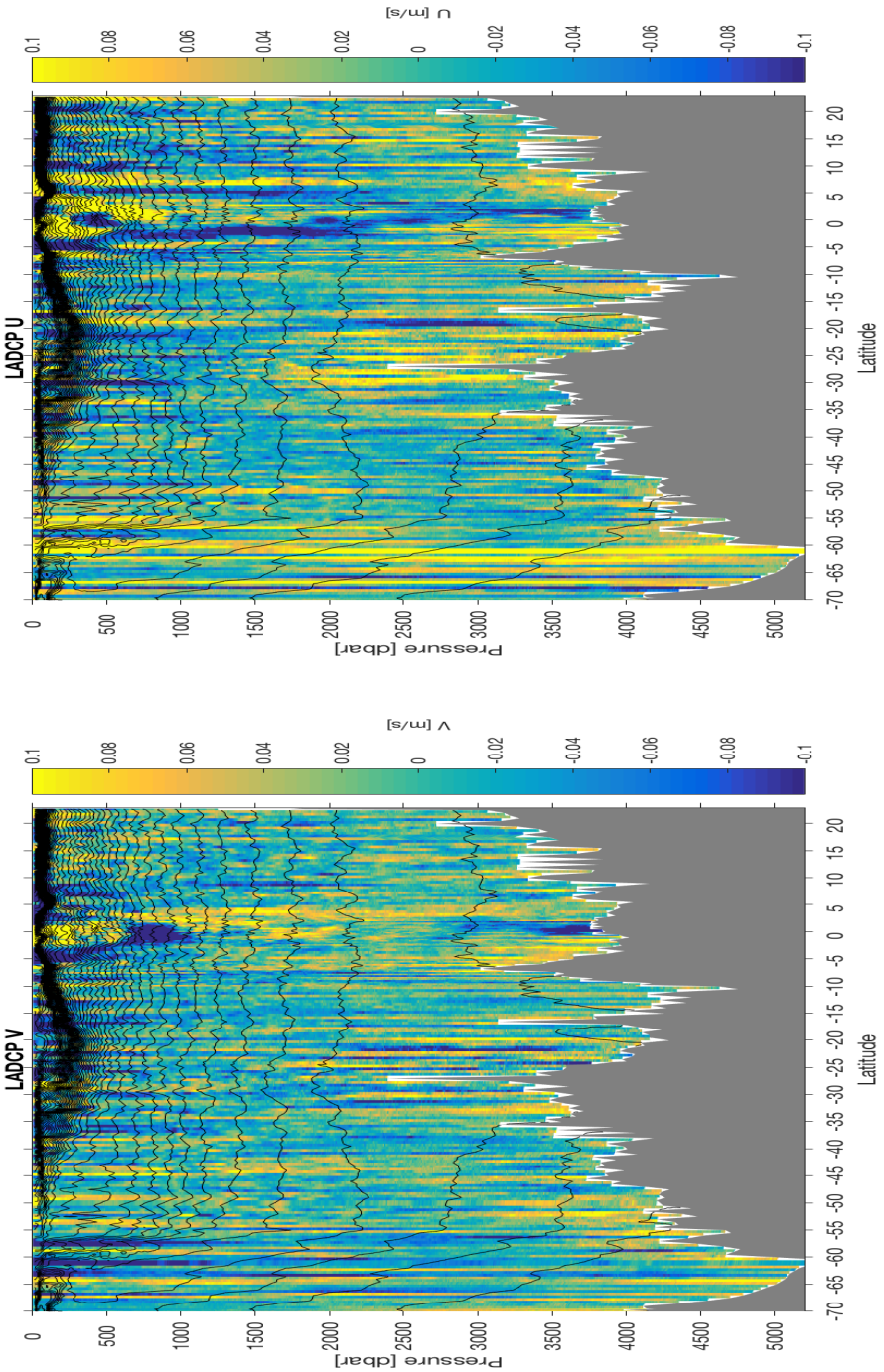

Figure 01: LADCP-derived velocities observed during P18 from preliminary processing. Upper panel: Zonal velocity component. Lower panel: Meridional velocity component.