



**National
Oceanography Centre**
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Oceanography Centre

Cruise Report No. 54

RV *Walton Smith* Cruise WS18066

4 – 16 MARCH 2018

MerMEED microstructure cruise report

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2018

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| <i>ABSTRACT</i> <p>The MerMEED (Mechanisms responsible for Mesoscale Eddy Energy Dissipation) project is a NERC funded project (NE/N001745/1) to investigate the levels of dissipation associated with eddies at a western boundary, in order to identify the mechanisms responsible. Mesoscale eddies are ubiquitous in the worlds oceans, and can be found in the subtropical Atlantic travelling slowly westward (at 4–5 cm/s), with a radius of about 100 km. These eddies are formed through baroclinic instability or wind forcing across the Atlantic, but when they reach the western boundary (east coast of the USA), they disappear from the satellite altimetry record. This disappearance of eddies occurs throughout the worlds oceans at western boundaries, but from altimetry alone, it is not known whether they disappear because energy is transferred to other wave modes or the mean flow, or whether it is locally dissipated through eddy-topography interactions.</p> <p>This is the third cruise of the MerMEED project. The purpose of this cruise was to (1) make microstructure temperature and shear measurements in order to measure dissipation at the intersection of an anticyclonic eddy and the steep topography to the east of Abaco, Bahamas, and (2) deploy standard Seagliders. Of these, the standard Seagliders were intended to remain in the area for 4 months. During the 9 day cruise, 46 profiles of microstructure data were collected using a tethered microstructure profiler, and a shipboard 75 kHz ADCP collected concurrent measurements of ocean currents. This cruise is the third cruise for the MerMEED project, and the data collected are intended to complement additional field operations, including moored instruments added to the RAPID array (thermistors and ADCPs on the WB1 mooring).</p> | |
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1 Scientific and Ship's Personnel

| <i>Name</i> | <i>Institute</i> |
|--------------------------|--|
| D. Gwyn Evans (PSO) | University of Southampton (UoS) |
| Eleanor Frajka-Williams | UoS |
| Alex Forryan | UoS |
| Kurt Polzin | WHOI |
| Alberto Naveira Garabato | UoS |
| Paul Provost | National Marine Facilities Division (NMFD) |
| Steve Woodward | Marine Autonomous and Robotic Systems |
| Candice Cameron | NMFD |
| Thomas Ballinger | NMFD |

Table 1: Details of science personnel.

| <i>Name</i> | <i>Position</i> |
|---------------|-----------------|
| Shawn Lake | Master |
| Stewart Bell | 1st mate |
| Ian Greenback | 2nd mate |
| Michael Shoup | Chief engineer |
| Carol Mandel | Engineer |
| Denis Ilias | Marine tech |
| Randal Hughes | Chef |

Table 2: Details of ship's crew.

Scientific watches kept

| | 0–6 | 6–12 | 12–18 | 18–24 |
|----------|---------|---------|---------|---------|
| Science | Alex | Eleanor | Alberto | Kurt |
| | Eleanor | Alberto | Kurt | Alex |
| Deck ops | Paul | Paul | Candice | Candice |
| | Tom | Tom | Steve | Steve |

Table 3: A list of scientific watches.

2 *RV Walton Smith*

The *RV Walton Smith* is a UNOLS vessel managed by the University of Miami. It is a catamaran, with 3 main levels (lower level with engines and some cabins, main level with dry lab, wet lab, science cabins, galley and working deck, and 01 deck with bridge and captain's quarters). Due to the catamaran shape, the available working space was spacious for a vessel of its length. The back deck has an A-frame, strongpoints on an imperial grid, and both a moonpool and a notch in the stern (the latter two were not used during this cruise). The 01 deck has the winch cabin for the A-frame and two cranes. Power supply included both UPS



Figure 1: The *RV Walton Smith* alongside at RSMAS

(more stable) and non-UPS sockets with 110 V and American plugs. Internet was provided with a reasonable speed, but availability depended on the direction the vessel was facing. As a rule-of-thumb, when the vessel was heading east, internet was available.

Power supply to the VMP winches required a few modifications for compatibility. The ship supplied power at 415 V, 3 phase and 60 Hz. The UK power packs had been set up for 208 V, 3 phase and 50 Hz. We used the WHOI power pack, which was set up to be run at 60 Hz. The ship provided hydraulic power but at variable pressure, which was not suitable for the winches.

Operating characteristics were summarised from the www.rsmas.miami.edu website, see Table 4.

| | |
|----------------|--------------------------------------|
| Length | 96 feet |
| Beam | 40 feet |
| Draft | 7 feet |
| Laboratories | 680 sq. feet |
| Cruising speed | 10 knots* |
| Fuel capacity | 10,000 gallons |
| Gross Tonnage | 97 GRT |
| Complement | 20 berths (7 crew and 12 scientists) |

Table 4: Operating characteristics of the *RV Walton Smith*. *The cruising speed was noted as 10 knots, but we were advised to use 8.5 knots for planning purposes.

Computing

The Lenovo Thinkpad Pstar01 computer was used to collect and process VMP and XCP data. It dual boots to windows (for XCP) and linux (for VMP) and has a Matlab license for processing. A USB dongle was used to transfer raw data from the collection PC (initially provided by NMFD, but then replaced with a second Thinkpad after computer problems) to the processing PC. Daily backups were made to an external harddrive. A flatbed scanner was brought on the cruise for scanning of hand-written logsheets. The ship was equipped with a colour laser printer that could be used by the science party. Underway ship data including the vessel mounted ADCP were provided at the end of cruise on a DVD by the Marine Tech.

3 Itinerary

Depart University of Miami dock (4600 Rickenbacker Causeway), 8th of March 2018, arrive University of Miami, 16th March 2018.

4 Introduction

The MerMEED (Mechanisms responsible for Mesoscale Eddy Energy Dissipation) project is a NERC funded project (NE/N001745/1) to investigate the levels of dissipation associated with eddies at a western boundary in order to identify the mechanisms responsible. The purpose of this cruise was to make microstructure temperature and shear measurements in order to measure dissipation at the intersection of an cyclonic eddy and the steep topography to the east of Abaco, Bahamas.

This cruise is part of the MerMEED, and the data collected are intended to complement additional field operations, including moored instruments added to the RAPID array (thermistors and ADCPs on the WB1 mooring).

4.1 Scientific background

Mesoscale eddies are ubiquitous in the worlds' oceans, and can be found in the subtropical Atlantic travelling slowly westward (at 4–5 cm/s), with a radius of about 100 km. These eddies are form across the Atlantic, but when they reach the western boundary (east coast of the USA), they disappear from the satellite altimetry record. This disappearance of eddies occurs throughout the worlds' oceans at western boundaries, but from altimetry alone, it is not known whether they disappear because energy is transferred to other wave modes or the mean flow, or whether it is locally dissipated through eddy-topography interactions.

The thesis of Louis Clement investigated the behaviour of mesoscale eddies using the RAPID mooring array at 26.5°N in the Atlantic, including their influence on the meridional overturning circulation [Clément et al., 2014] and observations of finescale shear variance over topography associated with anticyclones [Clément et al., 2016]. They found that shear variance was elevated in anticyclones (clockwise rotating eddies) compared to cyclones (anti-clockwise), suggesting that dissipation is stronger during anticyclones than cyclones. They additionally found that in the anticyclones observed during the 18-month study period that bottom velocities were larger than during cyclones, and that there was a slight predominance of upward propagating internal waves over downward propagating lee waves. These strands of evidence could be explained by two phenomena—lee waves generated by flow over rough topography, or the arrest of southward propagating boundary waves by the northward flowing waters in an anticyclone [Hogg et al., 2011]. The MerMEED project seeks to determine whether observed dissipation at western boundary topography is a leading order term in the energy balance of mesoscale eddies, and also by what mechanisms the dissipation is occurring.

4.2 Fieldwork plans

The process cruises represent one of three approaches used by MerMEED to make observations of eddies, internal waves and mixing east of Abaco. A total of 4 cruises are planned, to capture the observed levels of dissipation during and near the tail end of both an anticyclone and a cyclone. In addition, underwater gliders will be used for a total of 6 months to map the mesoscale eddy and the evolution of its energy (potential energy, from density profiles, and kinetic energy, from geostrophic velocities derived from density profiles). Finally, additional instruments have been added to the WB1 mooring in the RAPID array in 1400 m of water including two 75 kHz profiling ADCPs (to insonify the full water column at a 1 hour time interval and 16 m vertical bins) and RBR thermistors to increase the vertical resolution of temperature data to 50 m

(from the 4 MicroCATS included as part of the RAPID array). These observations will enable a finescale parameterization-based estimate of turbulent dissipation at this location, which can be compared to the shear-based estimates at the WBADCP mooring as used in Clément et al. [2016].

We had additionally planned to use Lockheed Martin Sippican XCPs. On inspection during the previous cruise, it was discovered that the agar gel in the probes had dried. We initially attempted to order an Agar replenishment kit from Lockheed Martin - Sippican. These were not delivered in time for the cruise, so we sourced some agar from National Oceanography Centre, Southampton and replenished the agar in the probes during mobilisation.

5 Diary of Events

Gwyn Evans.

Times are reported in local. The cruise track is plotted in Fig. 2, with waypoints given in Table 5. See also the Event Log (§B)

| Waypoint | Lat [N] | Lon [W] |
|----------|-------------|------------|
| 1 | 25°54.000' | 76°58.870' |
| 2 | 26°09.000' | 76°30.000' |
| 3 | 26°04.550' | 76°58.870' |
| sg534 | 26 °05.767' | 76°57.342' |
| 4 | 26°21.000' | 76°30.000' |
| 5 | 26°32.800' | 76°53.000' |
| 6 | 26°32.800' | 76°40.000' |
| 7 | 26°31.400' | 76°40.000' |
| 8 | 26°31.400' | 76°55.000' |
| 9 | 26°30.000' | 76°55.000' |
| 10 | 26°30.000' | 76°40.000' |
| 11 | 26°28.600' | 76°40.000' |
| 12 | 26°28.600' | 76°57.000' |
| 13 | 26°35.600' | 76°55.000' |
| 14 | 26°34.990' | 76°51.160' |
| 15 | 26°21.000' | 76°57.000' |
| 16 | 26°21.000' | 76°40.000' |
| 2 | 26°09.000' | 76°30.000' |
| 20 | 26°07.500' | 76°58.870' |
| 19 | 26°07.500' | 77°08.000' |
| 21 | 26°07.500' | 76°55.800' |
| 22 | 26°16.800' | 77°00.000' |
| 21 | 26°07.500' | 76°55.800' |
| 23 | 25°48.000' | 77°06.500' |

Table 5: Waypoints from WS18066

Sunday, March 4 - Travel Eleanor, Alberto, Alex and Gwyn flew to Miami, arriving 1700 local time. Paul, Candice, Steve and Tom had arrived in Miami during the previous day. On arrival in Miami, we were

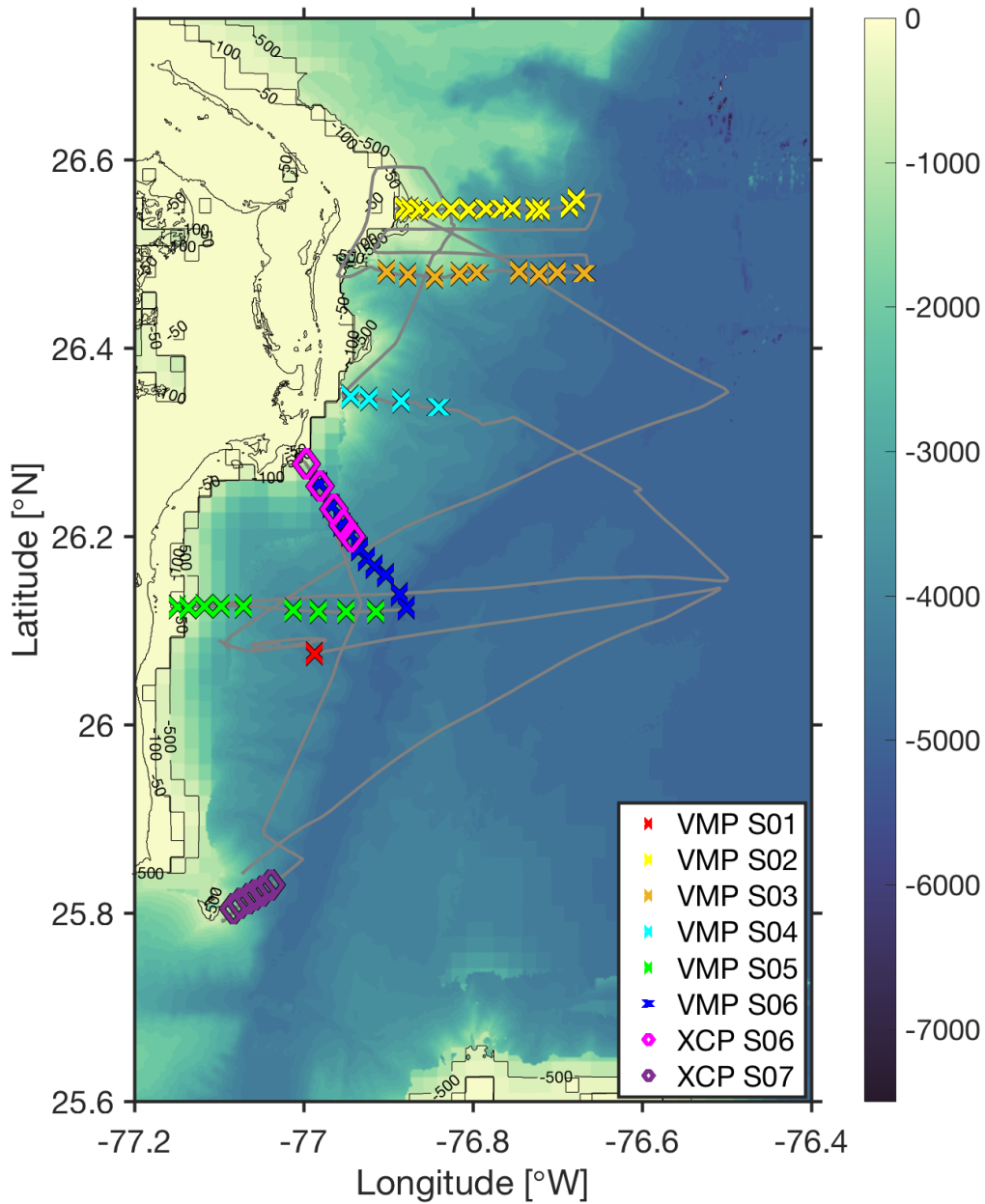


Figure 2: Cruise track from the 75 kHz ADCP data feed. Symbols show VMP and XCP profile locations

informed that the ship's departure from shipyard was delayed and that it would not arrive alongside at RSMAS until midday on March 5th.

Monday, March 5 - MOB day 1 Due to the delay in the return of the vessel from shipyard the science party arrived at RSMAS at noon and met the NMF technicians. While waiting for the vessel to arrive at RSMAS we moved our equipment to the dock ready to be loaded and began testing the two MARS Seagliders and the two UW Deepgliders. All gliders failed to connect to the iridium satellite

in a similar manner to the previous MerMEED cruise. The boat arrived alongside at RSMAS at approximately 1800 local. We loaded some equipment aboard the vessel.

Tuesday, March 6 - MOB day 2 In the morning, the lead NMF technician was too unwell to leave the hotel, we were therefore unable to build the VMP-2000, but we were able to set up winches, line-pullers and power supplies in the correct locations on deck. The gliders were transferred to the vessel, and once again they failed to connect via iridium. During the day it became apparent that there were several outstanding issues with the vessel following its time in shipyard. The major issue being a clutch problem in the starboard engine. Further, weather forecasts suggested strong seas and high winds for March 7th through to the morning of March 8th. Departure for Bimini remained as planned (1000, March 7th) pending the forecast and clutch problems.

Wednesday, March 7 - MOB day 3 Following a conversation with the captain and marine-ops, departure was delayed until at least 1200 due to the outstanding issue with the clutch and poor weather conditions. During this time, the NMF completed assembly of the VMP. The science team replaced the Agar in the expendable current profilers. During the morning an electrical engineer was able to fix the issue with the clutch, however the weather forecast had not improved during the day. The decision was therefore taken to delay departure until 1000 March 8th.

Thursday, March 8 - Cruise day 1 With improved weather our departure went ahead as planned, although conditions were still expected to be rough as we crossed the Gulf Stream. We attended a safety briefing at 0900, and departed RSMAS at 1010. During transit out of Miami we completed a safety drill. We then made steady progress from Miami across the Florida Straits. This slow progress meant that we would arrive late at Bimini where in the past we had cleared in/out of immigration/customs for the Bahamas. We therefore sailed for Chub Cay.

Friday, March 9 - Cruise day 2 We arrived at the Chub Cay anchorage at 0730. The captain went ashore with the 2nd mate to clear in and out of Bahamian immigration and customs. They arrived back at the ship at 0950 local. At this point the engineers were still trying to resolve some issues with the starboard engine. We decided to move the two Deepgliders down to the main deck as the conditions were relatively calm. We departed the anchorage at 1120 local and made for WP1 where we began an ADCP transect to WP2. We planned to deploy all the gliders the following morning, and recover sg534. We continued to experience problems with the starboard engine which slowed our progress slightly, reducing vessel speed to 8 kt.

Saturday, March 10 - Cruise day 3 We arrived at station on WP3 at 0600 local. We performed a test dip of the VMP once we arrived on station. The lay of the wire was not great, it had previously been hand wound, so we deployed the VMP to full wire out taking slightly longer than originally planned. At 0730 local we began the deployment of the MARS Seagliders. We deployed the gliders over the starboard side using the crane which went very smoothly. The MARS glider deployments were completed by 0915. We began the process of deploying the first of the Deepgliders (dg039) at 0930. We first performed a buoyancy test with the glider tethered to the ship. The glider was lying flat in the water, but after calling Seattle to confirm this was OK we brought the glider aboard removed the tether and deployed the glider at 1005. The Deepglider remained flat in the water, and we remained within visual range until the pilots in Seattle were happy for us to leave the glider at 1150. We then steamed toward the latest position received from sg534 to begin recovery. We made visual contact with sg534 at 1245 local, and after two passes, during which the glider passed underneath the starboard hull at the stern of the ship, we recovered the glider at 1300 local. The glider's CT cell was damaged and there were grey paint marks on the glider, which likely occurred during the recovery. Following a call from Seattle, we decided to recover the Deepglider. We arrived at the most recent location at 1345,

and were in the process of recovering the glider when the problems with the starboard engine resumed followed by an issue with the port engine. We finally recovered the Deepglider at 1535 and steamed for WP4. We reached WP4 at 2100 local, and began an ADCP section running NW toward WP5. We started the section at 5 kt, but slowed to 3.5 kt as the ADCP returns were dropping out. These ADCP sections showed southward flow offshore associated with the cyclone. However, close to the slope, this flow reversed, forming an intense northward flow very close to the boundary.

Sunday, March 11 - Cruise day 4 The clocks moved forward an hour for US daylight savings, however we remained on ship time, 5 hours behind GMT. We reached WP5 at 0230 local, and began VMP section 2 heading east toward WP 6 at a speed of 1kt. We completed the section at 1550 local and transited to WP 7 to begin two ADCP sections from WP7 to WP8 and WP9 to WP10, which we completed at 1136 local. Surprisingly the flow structure was very similar to the previous cruises, despite the differing eddy conditions.

Monday, March 12 - Cruise day 5 We began VMP section 3 from WP11 to WP12 at midnight. During this section the primary shear sensor was replaced. During the VMP section several squalls passed through, and wind speed gradually increased. After much deliberation we decided to complete one more ADCP section to the north of our current ADCP and VMP sections to determine if the same jet structure existed after the topographically bound northward flow separated from the topography. Following completion of the VMP section we steamed north, however during this transit and the initial portion of the ADCP section running west to east, the weather and sea state deteriorated. Wind-speed averaged between 30-35 kt gusting to 45 kt for several hours. With the swell on our starboard beam, significant ship roll resulted in no usable ADCP data. We therefore abandoned the ADCP line and steam gradually south. After a few hours we set course for WP15 where we hoped to begin a VMP section. By the time we reached WP15 the weather improved sufficiently to begin a VMP section. We also adapted our plan for the remainder of the cruise in which we set out to determine the origin of the northward flow along the boundary, that has persisted despite the presence of a cyclone. We further planned to assess the impact of southward flow passed the southern tip of Abaco.

Tuesday, March 13 - Cruise day 6 During the early morning, after struggling to hold course at 1 kt with increasing winds and sea state, VMP section 4 was cut short and the ship turned southeast with the south-westerly wind and swell. We initially aimed for WP18 with the intention of turning west to run an ADCP section toward the shore. This was quickly abandoned as the sea state was not conducive to good quality ADCP data. We instead turned toward WP2, which gave us some usable ADCP data. Upon reaching WP2 the sea state had improved slightly and we made a run towards WP19. During this transit conditions improved further as we moved within the lee of Grand Abaco, so we reduced speed so that we could collect useful ADCP data. The flow along this section was southward, with larger magnitude to the east, closer to the eddy centre. There was almost no suggestion of northward flow along this portion of the section, except at the surface of the western end of the section. This was surprising considering the northward flow close to the slope, in the northern portion of our study region. At the western end of the section flow was generally weak. We completed a VMP section (section 5) from west to east (WP19 to WP21), to observe the transition from weak flow along the boundary to the strong southward flow at the eastern end of the section. Following this we ran a further VMP section from southeast (WP21) to northwest (WP22), followed by an ADCP section from WP21 to WP23, to capture the flow to the south of VMP section 5. A final VMP section was planned from WP23 to WP24 (west to east) across the southern tip of Grand Abaco.

Wednesday, March 14 - Cruise day 7 VMP section 5 finished in the early hours of the morning having extended past the original waypoint into the southward flow of the cyclone. Section 6 running north

continued until 1200 local. We observed a lot of high mixing below the vertical extent of the ADCP. We therefore decided to deploy XCPs in between VMP profilers. We deployed the XCPs when the VMP was at the surface behind the vessel, and we maintained a vessel speed of 1 kt during the XCP profile, which worked well. We managed a total of 5 casts, which all worked very well, except for the second cast, which had some noise between 500 and 700 m. We were careful not to use the VHF radio while the WinMK software was in deployment mode, as this tended to trigger a profile. These revealed clockwise rotating velocity vectors below 1000 m coincident with the regions of high mixing. Following section 6 we steamed back toward WP21, the start of section 6 and began an ADCP section toward the southern tip of Abaco. Before beginning the completing the ADCP section to the southern tip of Abaco we planned to deploy one of University of Washington Deepgliders (dg037). However, during the ADCP section the crew started to have issues with the oil pressure in the gearbox of the starboard engine. Initially, at 1530 local it was declared that the starboard engine was no longer useable and that we should return to Miami. However, the engineers decided they may be able to fix the issue using a spare pump. While they were conducting this repair we performed profiles with the remaining XCPs, in a short section running 6 km offshore from WP23. We spaced the profiles at 1 km intervals, and planned to steam at full speed between to each drop site, and ease off the engines when we dropped the probe so that the momentum of the vessel would carry us past the required 100 m. This system worked well and we obtained 6 usable profiles despite WinMK software crashing on the first drop. Once we completed the XCP section the crew tested their repair of the gearbox, however the oil pressure continued to drop, and we therefore had to return to Miami at 1845 local.

Thursday, March 15 - Cruise day 8 Transit to Miami.

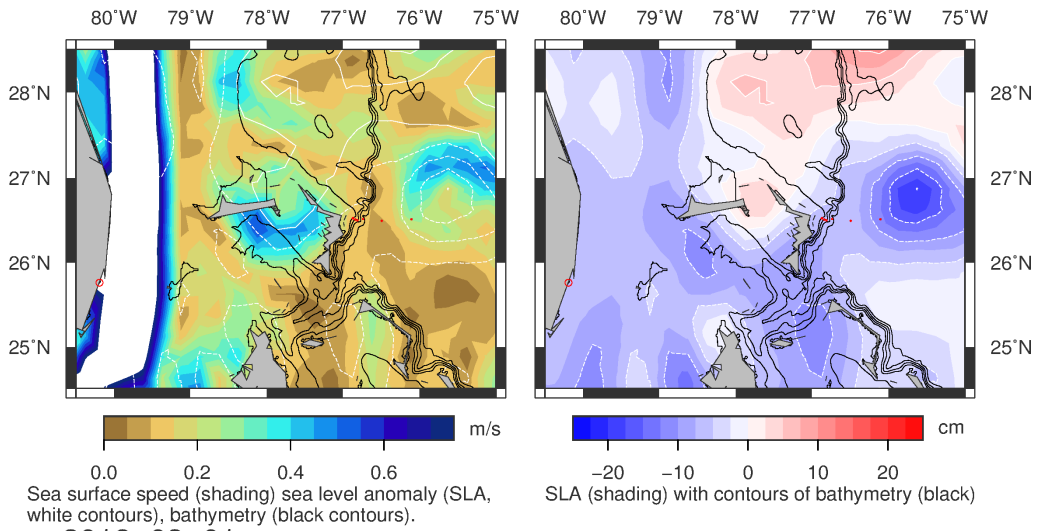
Friday, November 10 We arrived alongside at RSMAS at 0900. Upon arrival we completed unloading our equipment. Once completed the non-Americans cleared immigration at the office in the cruise terminal.

6 Sea level anomaly and satellite geostrophic velocities

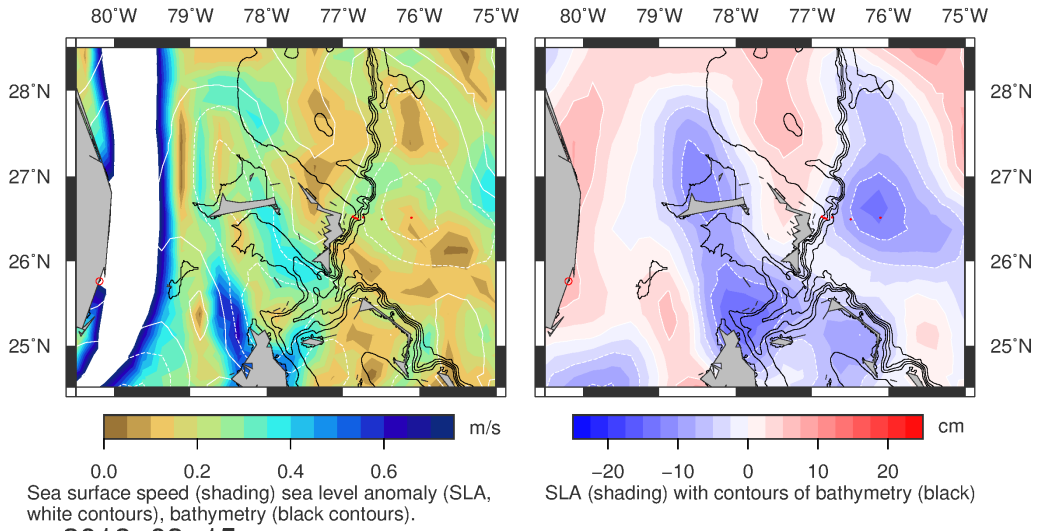
Dafydd Gwyn Evans.

Gridded maps of sea level anomaly and geostrophic velocity were used target eddies approaching the MerMEED study region. Near-real time maps for mean sea-level anomaly (MSLA) and geostrophic velocity anomalies (UV) were accessed via CMEMS - Copernicus Marine Environment Monitoring Service using data from `Core/SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046/dataset-duacs-nrt-global-merged-allsat-phy-l4-v3/nrt_global_allsat_phy_14_20171105_20171105.nc.gz` on a regular basis in the months leading up to WS18066. This analysis identified an cyclonic mesoscale eddy (negative MSLA; Figure 3) just east of the study region. According to the lifespan of previous eddies, should propagate further west and remain for 2–3 months [Clément et al., 2016]. What we observed was that from altimetry, the eddy deformed, and possibly merged with a region of negative MSLA to the south east of the study region. The SLA at the start of WS18066 shows the cyclonic anomaly east of the Bahamas (Figure 3). This is the first cyclone we attempted to observe during the MerMEED project. Despite the expected negative southward flow, we observed northward flow along the slope, with southward flow offshore.

2018-02-15



2018-03-01



2018-03-15

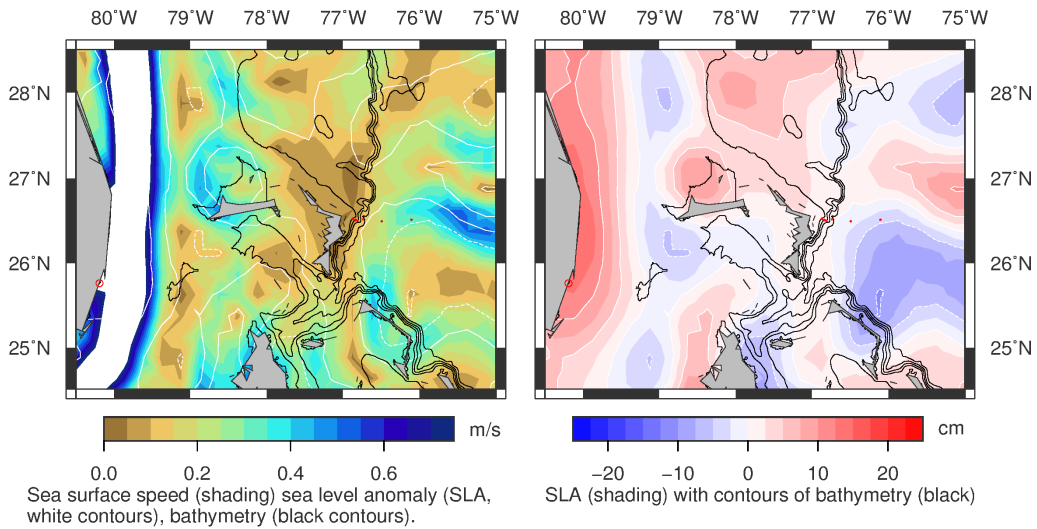


Figure 3: MSLA and UV from satellite altimetry.

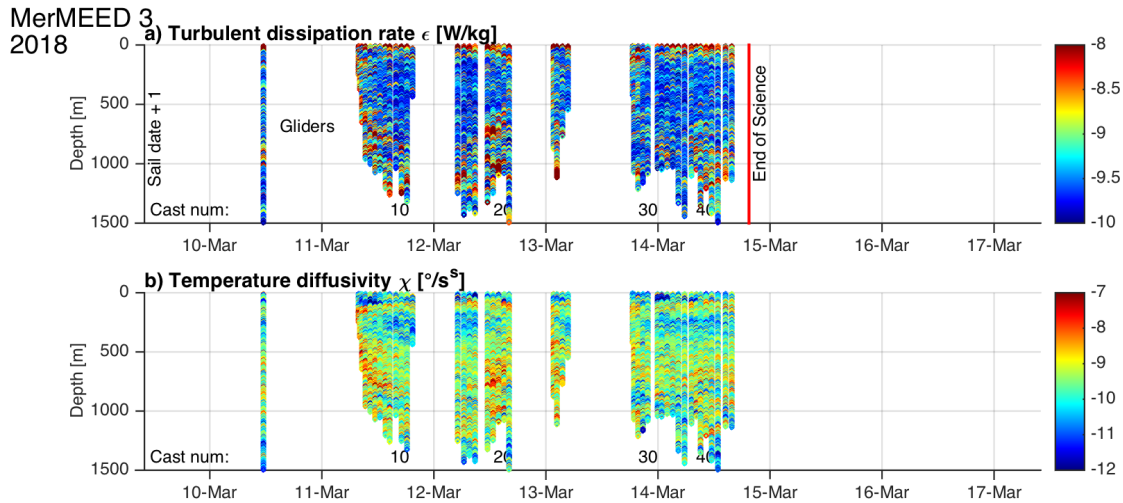


Figure 4: Profiles of turbulent dissipation (ϵ , top panel) and temperature variance (χ , bottom panel) and collected during cruise WS18066.

7 VMP-2000 (Vertical Microstructure Profiler)

D. Gwyn Evans.

7.1 Overview

The tethered VMP-2000 vertical microstructure profiler manufactured by Rockland Scientific International (RSI) serial number SN023 was used as the primary instrument on the WS18066 cruise, in combination with the power pack loaned from Kurt Polzin (WHOI) that operates at the frequency of the F.G. Walton Smith ship power (60 Hz). This instrument measures profiles of temperature and velocity microstructure on length scales of typically a few millimetres to tens of centimetres. From these profiles the rates of dissipation of turbulent kinetic energy (ϵ) and temperature variance (χ) are estimated using a methodology based on Oakey [1982]; and finescale temperature, salinity and pressure with a pumped Seabird CTD mounted on the side of the instrument. The central goal of the cruise was to investigate the levels and processes involved in dissipating the anticyclone present during the cruise. A total of 46 microstructure profiles were collected during the WS18066 cruise between 8th - 14th March 2018 (Fig. 4).

7.2 VMP-2000 deployment, recovery and winch operation

The VMPs were stored on deck on stands, and strapped down with a ratchet strap. The slack wire was wound on the winch to remove the hazard of loose wire on the deck. For deployment, the VMP was attached to the winch on the A-frame to lift it over the back deck. Two people steadied the VMP while it was being raised to protect the delicate sensors. Once it was over the back, the wire was taken in on the VMP winch and the strop attaching the VMP to the A-frame was removed. The profiler was then lowered into the water and held at the surface until given the go-ahead by the person operating the recording computer. Once that message was received, the operator veered the winch and adjusted the speed of the winch and line puller to pay out wire at a sufficient rate so that the VMP was free falling (about 0.80 dbar/s for SN023). At a predetermined depth, judged based on previous casts and the surface currents/ship speed, the winch was halted and the VMP left to profile until the maximum pressure was achieved. In particularly strong currents,

this was almost immediate. The time and position and maximum pressure were recorded, and then the winch hauled the profiler back to the surface. For the continuous sections (profiled in a to-yo manner), the profiler remained at the surface until the next cast was started. When recovering the profiler, the VMP winch was used to haul the profiler out of water where it could then be attached to the A-frame winch. The VMP winch then paid out, and the A-frame winch hauled in to transfer the weight to the A-frame. Two people steadied the VMP as it came back on board, and was again lowered into the stands and strapped down until the next station.

7.3 Data acquisition and processing

Data acquisition and processing took place on two separate laptops. A Windows based laptop was used to run the ODAS-RT acquisition software supplied by RSI. With the VMP powered up, when opened ODAS-RT loads an existing configuration (.cfg) file, which unless the sensor configuration has changed, can be copied and renamed from the previous section/station. Once loaded, the configuration file should be edited within ODAS-RT to update the section/station number. The calibration routine should then be run, which is in the ‘Calibrate’ tab. Once successfully completed, the instrument can be connected from within the ‘Real Time’ tab ready for recording. Aboard the F.G. Walton Smith, particular care had to be taken to avoid tripping the circuit breakers in the wall mounted power sockets while using the handheld UK VHF radios. Serial numbers for sensors used during the cruise are given in table 6.

| Date | shear 1 | shear 2 | temp 1 | temp 2 | SBE 3 | SBE 4 | Comments |
|----------|---------|---------|--------|--------|-------|-------|--|
| 10/03/18 | M1792 | M1408 | T1168 | T1167 | 3389 | 4869 | Using calibrations dated 13-10-2016 for SBE3 due to units issues with more recent cal. |
| 12/03/18 | M1792 | M1410 | T1168 | T1167 | 3389 | 4869 | Shear 1 replaced. |

Table 6: Serial numbers for the VMPs and sensors

All processing scripts used on this cruise were adaptations of those used in previous VMP cruises by the UoS group. All processing steps and calculations remain the same as those described in previous cruise reports [Garabato, 2009, Meredith and Cunningham, 2011, Watson, 2011, Sallee, 2013], with the most recent cruise being the March 2017 DynOPO cruise. A summary of the processing steps is given in table 7.

| <i>Function</i> | <i>Description</i> |
|----------------------|--|
| vmp_firstlook4 | Reads in the VMP datafile and produces two matlab files, one containing the raw un-calibrated VMP data, and the other containing the extracted downcast data with all calibrations supplied in the <code>setup.cfg</code> file applied (<code>_cdc.mat</code>). Also produces a series of diagnostic plots for the raw un-calibrated VMP data. |
| vmp_process_seabird4 | Processes the VMP seabird data and applies various corrections. Output is saved as a separate matlab file (<code>_dCTD.mat</code> and <code>_uCTD.mat</code> for the down- and upcasts, respectively). |
| vmp_process_micro4 | Processes the VMP microstructure shear and temperature. Microstructure temperature are calibrated by regressing against the processed VMP seabird temperature. Output is saved as a separate matlab file (<code>_micro.mat</code>). |

Table 7: Processing steps used for the VMP-2000 on cruise WS18066.

7.4 Station/section description

See the scanned logsheets (appendix XXX) for detailed notes on each cast.

| Sec. | Date | Start Pos. | End Pos. | Casts | Comments |
|------|------------------|------------------------|------------------------|-------|--|
| 1 | 10/03/2018 | 26° 4.59N 76° 58.9W | 26° 5.11N 76° 59.7W | 1 | Test station |
| 2 | 11/03/2018 07:48 | 26° 32.9N 76° 52.9W | 26° 33.4N 76° 40.2W | 13 | Cast 13 only partial downcast recorded. |
| 3 | 12/03/2018 05:01 | 26° 28.7N 76° 39.9W | 26° 28.8N 76° 54.1W | 10 | Cast 1 bad buffers. |
| 4 | 13/03/2018 01:35 | 26° 22.0N 76° 56.8W | 26° 28.8N 76° 54.1W | 4 | Finished short due to bad weather. Cast 3 mis-recorded. Final cast split between two files (005 and 006) concatenated for processing. Bad buffers on final cast recovery. |
| 5 | 13/03/2018 16:27 | 26° 7.47N 76° 9.00W | 26° 7.21N 76° 54.7W | 9 | All casts renamed for processing to: WS18066_S05_XXX.p. Cast 6 mis-recorded and not recoverable due to editing and reloading config file in attempt to change cast file names. |
| 6 | 14/03/2018 04:23 | 26° 7.47N 76° 52.7W | 26° 15.3N 76° 58.7W | 10 | Bad buffers cast 7 |

Table 8: VMP Deployment Summary

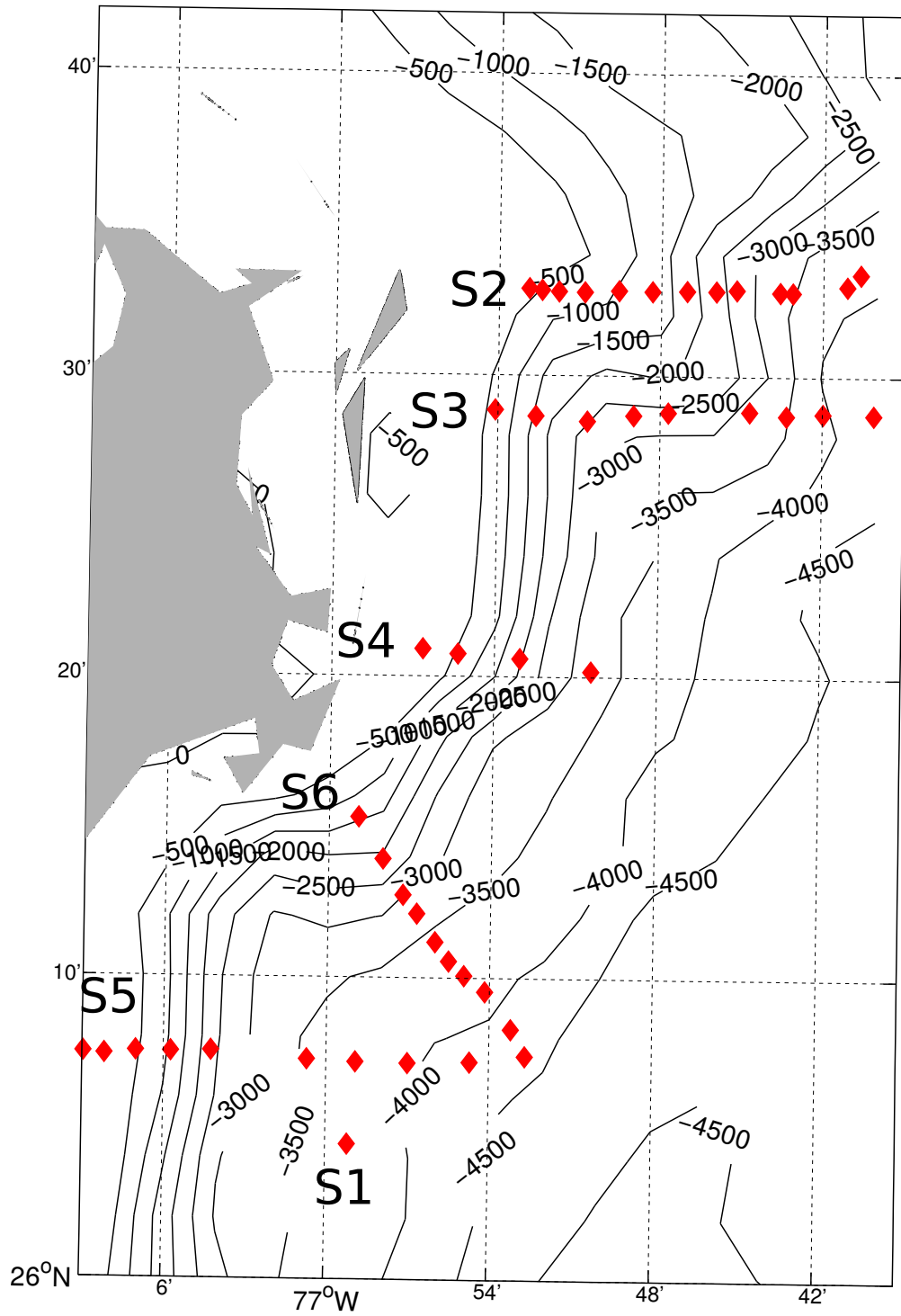


Figure 5: VMP cast position, with section numbers indicated, during cruise WS18066.

8 Seagliders

Stephen Woodward (MARS Gliders, NMF-SS, NOC Southampton)

8.1 Objectives

Planned glider operations on MERMEED-3 consisted of turnaround of MARS Seagliders and deployment of University of Washington Deepgliders. All glider deployments and recoveries were carried out from the starboard deck crane, using rigid rope rigs. Gliders were recovered using a telescopic carbon fire hoop, lassoing the rudder for recovery. Deepglider deployments were to include a buoyancy check, using a 12” lifting strop to allow the glider to float free from the deployment rig. Calibration CTD casts were not available for this cruise

8.2 Deployments/Recoveries

Seaglider Deployments

Seaglider SN605 (‘Bowmore’). Deployed 10/03/2018 (26°04.771 N, 77°00.862 W).

Seaglider SN638 (‘Ziggy’). Deployed 10/03/2018 (26°04.931 N, 77°01.763 W).

Seaglider Recovery

Seaglider SN534 (‘Denebola’). Recovered 10/03/2018 (26°05.065 N, 77°05.332 W).

Deepglider Deployment

Deepglider SN039. Deployed 10/03/2018 (26°05.170 N, 77°02.460 W).

Deepglider Recovery

Deepglider SN039. Recovered 10/03/2018 (26°05.21 N, 77°05.620 W).

8.3 MARS glider sensor Packages

Seaglider SN605:

Seabird CT sensor S/N 0127

Aanderaa Oxygen optode S/N 230

WetLabs Fluorometer S/N 1338

Seaglider SN638:

Seabird CT sensor S/N 0303

Contros Hydroflash Oxygen sensor S/N 288

WetLabs SeaOwl Fluorometer S/N 014

Seaglider SN534:

Seabird CT sensor S/N 0217

Aanderaa Oxygen optode S/N 197

WetLabs Fluorometer S/N 1166



Figure 6: The damaged CT sensor on SG534.

8.4 Problems encountered

On recovery, Seaglider 534's CT sensor was found to be badly damaged (see Figure 6). On the first attempt at recovery the glider passed under the starboard hull - it is assumed that this was the cause. The conductivity tube was held in place by its potting, but was cracked. The tube guard was sheared off.

Deepglider 039 was lying flat in the water during buoyancy check 7. Following confirmation from the pilot, the glider was launched. Comms were sufficient for the glider to call in and start the first dive. The glider was reacquired after the first dive, at which point the surface position was no different.

Again following confirmation from the pilot, the glider was left in the water and the ship moved off to commence other duties. Communication problems led to the pilot calling the field team, and the glider was recovered. Basic post recovery inspection of the glider (specifically the compressesee containers) could not identify the cause.



Figure 7: Surface position of DG039.

9 Vessel Mounted ADCP

Dafydd Gwyn Evans.

The *RV Walton Smith* has two Acoustic Doppler Current Profilers (ADCP) installed; an RDI 600 kHz Workhorse (WH600) and an RDI 75 kHz Ocean Surveyor (OS75). The BB600 has a typical range of 10–20m in the best of conditions and was logged but not used. The OS75 can reach to 750 m in good weather in its deep-profiling (“narrowband”) mode. The configuration of each instrument is given below.

ADCP was configured and run through the University of Hawaii Data Acquisition System (UHDAS), a suite of programs for ADCP data acquisition and automated processing. ADCP data was available to download in 5 minute averages in netcdf format during the cruise from from a remote network drive created by Denis. The data were reprocessed in 1 minute averages by Alex Forryan following the cruise.

As for the previous cruises (WS16336 in Dec 2016, WS17305 in Nov 2017), the default configuration (switching between narrowband and broadband) for the 75 kHz ADCP was switched to be narrowband (deeper reaching) only. During the WS18066 cruise, we made several ADCP transects east of Abaco. As in previous cruises we found that a maximum of 5 kts resulted in reasonable data quality (no gaps) in the 5-minute averages. During more intensive transects, we reduced vessel speed to 3.5 kts (6.5 kph) resulting in an along-track resolution of about 540 m for the 5-minute averages. During VMP sections the speed was 1–2 kts (1.85–3.7 kph) resulting in an along-track resolution of 150–310 m.

| | |
|------------|------------------------------|
| trajectory | |
| uship | Ship meridional velocity |
| u | Meridional water velocity |
| vship | Ship zonal velocity |
| v | Zonal water velocity |
| tr_temp | ADCP transducer temperature. |
| pg | percentage good pings |
| pflag | Editing flags |
| lon | Longitude (degrees E) |
| lat | Latitude (degrees N) |
| heading | Ship heading |
| depth | Depth (m) |
| amp | Received signal strength |

Table 9: Fields in the processed ADCP netcdf file.

ADCP transects are shown in Fig. 8.

Instrument Configuration

OS150 The instrument was configured to run in narrowband mode with 60 x 16 m bins and no bottom track. See Table 10 for command settings.

WH600 The instrument was configured to run in broadband mode with 40 x 2 m bins and no bottom track. See Table 10 for command settings.

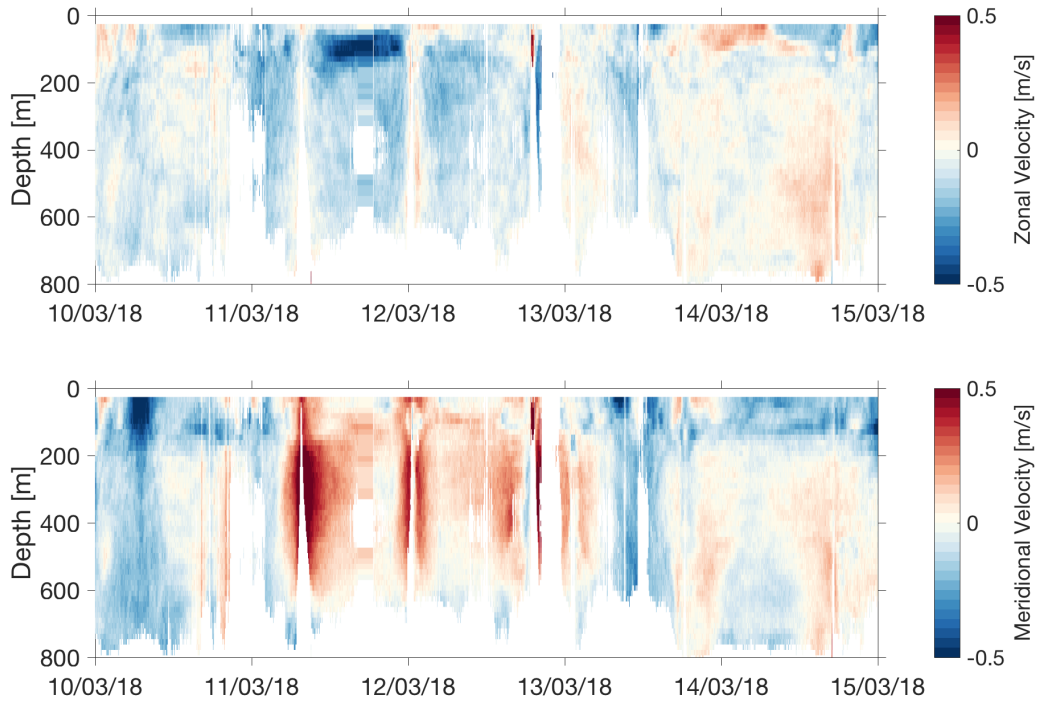


Figure 8: ADCP data (top) zonal velocities and (bottom) meridional velocities.

| <i>OS75 RDI</i> | <i>WH600 RDI</i> |
|-----------------|------------------|
| NP1 | WP1 |
| NN60 | WN40 |
| NS1600 | WS200 |
| NF800 | WF300 |
| WP0 | BP0 |
| WN80 | BX2000 |
| WS800 | WB0 |
| WF800 | WV550 |
| BP0 | TP00:00.80 |
| BX1000 | |
| TP00:01.80 | |
| CX0,0 | |

Table 10: (left) OS75 RDI command settings used on cruise WS17305. (right) WH600 RDI command settings used on cruise WS17305.

10 Expendable Current Profilers (XCP)

Eleanor Frajka-Williams, Dafydd Gwyn Evans.

10.1 Overview

11 Lockheed Martin Sippican expendable current profilers (XCPs) were deployed during WS18066. Each XCP measures profiles of zonal and meridional velocity as well as temperature at a vertical resolution of 2 meters (as output by the software `xcpdsp` from John Dunlap, Applied Physics Lab, University of Washington) to a maximum depth of 1700 m. During WS18066 the XCPs were used on 2 occasions – during VMP section 6 and during a final section near the southern tip of Abaco, as the vessel was preparing to depart the region on one engine.

The XCP probes are deployed within a float that transmits data across various radio frequency (RF) channels. The XCPs used on this cruise use channel 14. The signal is received aboard the vessel using an AOR AR5001D digital processing (RF) communications receiver tuned to the appropriate frequency (172 MHz for channel 14). The audio signal output by the RF receiver is fed directly into both the MK21 ethernet deck unit supplied by Lockheed Martin Sippican and an audio recorder (Marantz model PMD620MKII, based on a recommendation by Roger Anderson, Applied Physics Lab, University of Washington). The deck unit communicates with a Windows laptop via an ethernet cable and network switch, and displays real-time profiles using the Windows-based WinMK21 data acquisition software. The audio recording of the probe deployment is also processed using separate Matlab based software (`xcpdsp.m`) provided by John Dunlap and accessible at <https://ohm.apl.uw.edu/~dunlap/xcpdsp/>. Setup and equipment are described further within the manuals provided with MK21 deck unit and the WinMK21 software.

10.2 Equipment setup

Required equipment:

- **VHF radio receiver:** AOR AR5001D digital processing
- **Antenna:** Laird Technologies 4-Element Economy Yagis.
- **RF cable:** Low loss RG-8 size coax. Dunlap recommends Belden 8214. Cable should be just long enough to reach from the antenna to the deck box.
- **Audio recorder:** Marantz PMD620MKII high quality digital audio recorder with high speed, high capacity flash card
- **Other:** headphone-to-headphone cable and headphones.

Optional equipment

- **Deck unit:** Sippican MK21 deck unit. Works with software (below).
- **Software:** WinMK21 software on a Windows computer. This is provided by Sippican and allows for real-time data viewing.
- **Other:** Ethernet cable to connect deck unit to Windows computer and, if required, a network switch.

For our use, we used all of the required and optional equipment (above). Equipment were setup prior to departure, with the main working area in the R/V Walton Smith wetlab, port side. The deck unit, VHF receiver and network switch are all contained in a 19" rack box. Power is provided via a protected power supply on the forward wall of the wetlab, away from the operator area. On a previous cruise (WS16336 and WS17305) we found that the protected power supplies nearer the equipment setup area (aft wall) could be tripped when using handheld radios to communicate. Ideally, equipment should be positioned in view of a GMT clock and GPS position information so that the operator can record the time and position of the drop, but in our case, the GPS and clock were around the corner, requiring the operator to set the computer to capture the data and the audio recorder to record, then to quickly go and record the time and position onto the logsheets.

The RF cable from the VHF receiver was run through a port in the exterior wall, up to the 01 deck where the antenna was mounted. Note instructions from Dunlap regarding handling of the coax cable: "Handle the RF coax cable extremely gently. The coax has a foam core which is easily deformed and damaged causing poor reception. Don't bend it sharply. Don't step on it. Don't squeeze it by tugging hard on cable ties." The antenna was mounted on a vertical post near the aft winch cabin, in this case using the post aft and to the port side. The 4 elements of the antenna were aligned vertically, with the smaller element at the aft end, and the larger element forward. The antenna was pointed towards the center of the A-frame, anticipating that the probes would be deployed from between the two VMP line-pullers between the A-frame. The connection between the RF cable and antenna was protected as per instructions from John Dunlap using Scotch-23 self-amalgamating/self-vulcanizing tape, covered with Scotch-88 to waterproof the connections.

In the Wetlab, the sound output from the VHF receiver is split into both the MK21 deck unit and Marantz audio recorder. The Marantz recorder should be set to record in 16-bit Mono .wav format. The audio recorder serves as a failsafe, recording raw signals that can later be reprocessed using Matlab software. The deck unit should be connected to the computer running the WinMK21 software using an ethernet cable. For our purposes, a network switch was required between the deck unit and computer due to incompatibility between the deck unit and network card on the cruise laptop. Note that while the deck unit (£20k) provides a real-time view of the data as it is coming in, which is handy when trying to interpret the sounds coming into the headphones, it should not be used without the audio recorder. All processing can be done using the Matlab software on the raw *.wav files from the audio recorder, meaning that the deck unit itself is optional.

The connections between the WinMK21 software and deck unit are verified in the software upon opening WinMK21 (see also, WinMK21 software manual).

At the beginning of the cruise or prior to departure, the full equipment setup should then be tested with a probe. The test is carried out by closing the seawater switch and listening for 'quieting' on the radio. The seawater switch is the metal plate (roughly 1" by 3" extending down from the top float of the XCP) and it can be closed by using a screwdriver or knife to bridge the gap across the pale yellow strip. This should be done carefully, following instructions in the manual, as closing the seawater switch for too long can result in premature deployment of the XCP. The probe can be tested on the back deck in the field-of-view of the antenna. For WS18066, the testing was carried out by holding the probe while standing in the middle of the A-frame.

Early in the cruise (for probes older than 1-year), the condition of the agar in all probes should be checked. If it has dried or pulled away from the side wall of the electrode hole, it should be replenished. During WS17305, we discovered that the agar had dried and opted not to use the probes. At the beginning of WS18066, the agar was replenished following the steps in §10.3.

10.3 Agar replenishment prior to departure

The agar gel is used to ensure good electrical contact between the electrodes bedded in the agar and the seawater. When the agar has dried, it no longer performs this function as well, and it is recommended that the dried outer part of the agar plug be scraped back and replenished using part number 352270 from Lockheed Martin Sippican. (If the agar has only pulled slightly away from the casing, it can be reinvigorated by adding seawater.) During the previous cruise (WS17305), it was discovered that much of the agar in the electrodes had dried, causing it to pull away from the casing. We contacted Lockheed prior to the cruise to order a replenishment kit, but received no reply. Not receiving a response, we instead contacted John Dunlap and Avery Snyder who instructed us on how to replenish the agar. On returning to Southampton following the cruise, we found that a replenishment kit had been sent by Sippican and arrived in Southampton March 6, a few days after we had left for Miami. Avery Snyder gave us the following instructions:

To start remove all the old dried agar is removed, using a pick carefully, do your best to remove any dried agar from below the electrode. The wire to the electrode can be delicate.

To make the agar, the ratio of agar to Seawater is 2% by weight (exp. 10g agar to 490g of Seawater). Make seawater to the approximate salinity of the test area, you can use actual sea water too. Using a hot plate with a magnetic stir bar heat the water up to just before boiling or sublimation and add the agarose powder. It will look opaque/cloudy.

After the agarose powder is mixed thoroughly, as quick as possible, use a syringe (with a needle or tip as wide as possible to fit past the electrode) pull some agar from the mixture and place the tip past the electrode to the bottom of the electrode well to fill from the bottom retracting the syringe tip as the well fills. I usually slightly over fill the well using the surface tension of the mixture to make a convex surface with the agar. After the agar cools it will either shrink slightly and become flush or you can shave the Agar flush with a razor.

The agar will most likely solidify in your needle and you will either have to blow it out, replace it or sometimes placing the needle back in the hot mixture will clear it out.

Keep the mixture stirring and not boiling until you are done (as soon as it cools it will become gelatinous). You can transfer the hot Agar mixture to an air tight glass container and reuse for years to come. To reuse the already made agar just cut out about half or more of what is left and re-heat/stir it on the hotplate (you will have to stir by hand until the stir bar can take over).

Two 10g vials of agarose were graciously provided by John Gittins at University of Southampton. A hotplate and magnetic stirring plate were acquired at RSMAS. The agar gel was heated and stirred, then injected into the empty electrode spaces using a plastic syringe from Walgreens pharmacy. The agar was found to dry rapidly (within a few minutes), and that overfilling the electrode holes was necessary in order for the agar, when dry, to not pull away from the walls. In the end, it was determined that the agar still pulled away from the edges in several cases, and that replenishment might have been better accomplished simply by adding seawater to the original agar, so that the moisture could be absorbed and the agar fill the gaps in the holes. In one case (s/n 15071008), the replenished agar when dried was more deteriorated than prior to replenishment. On this probe, the data became noisy between the depth ranges 300 m – 400 m, but subsequently recovered at greater depths.

10.4 Launching an XCP probe

The deployment pattern we used involved three handheld radios and 3 personnel in addition to the ship operator. One person is responsible for the software setup and logsheet recording (one radio). Two people handle the XCP and deployment on the back deck – one of them handles the radio, the other the probe. The

third radio was provided to the bridge. Software checks and probe checks should be carried out prior to launching a probe. Steps were recorded in the XCP deployment logsheet (Fig. 9).

Prior to arriving at the drop location, the software operator carries out the following steps:

- The RF receiver should be turned on and tuned to the appropriate channel/frequency (channel 14 is 172 MHz). The receiver should be outputting radio static.
- The audio signal from the probe can be listened to in realtime using headphones connected to the recorder.
- The WinMK21 software should be opened, if it is not already, and the connection between the software and deck unit verified. The software can be left idle until the XCP is ready to be deployed, and between XCP deployments.
- Set up the XCP drop. Rather than using the calibration information provided for each probe, we used the default APL corrections on advice from John Dunlap that the calibration corrections introduced more noise to the signal. In the WinMK21 setup, this means selecting 'UW APL defaults' for the configuration.
- Magnetic adjustments should be added using values for the latitude, longitude and date.
- Once the configuration information is entered, wait until the deployment location is reached before starting recording. If the recording is started early, it should be stopped and restarted since otherwise radio noise can trigger an artificial drop and contaminate the data file.

Prior to commencing approach, the probe operator carries out the following steps:

- Remove the XCP probe from the box carefully. Bumps and excessive jostling can cause the spring/catch holding the bottom door to open/fail, rendering the probe useless.
- 3 specified pieces of tape (and only these three) were removed: (1) holding down the antenna, (2) over both electrodes, and (3) around the door at the narrow end of the canister. Remaining tape should not be removed, as it provides additional stability to the probe and particularly the lower door. Excessive removal of tape may have been the cause of an early probe failure on WS16336.
- Visually inspecting the agar gel and communicating its condition to the software operator, to record on the logsheet.
- Communicating the probe serial number to the software operator to record on the logsheet and in the WinMK21 software.

Communication with the bridge must be very clear. No radio transmissions should be made during the probe drop. The bridge was told that we would like to drop a probe at a given lat/lon location, after which point the ship would continue steaming forward at several knots (about 30 s), then stop and hold position with the aft of the vessel still pointed towards the XCP float on the surface. The aim was to get about 100 m away from the float within 40 seconds, at which point the probe would deploy and start transmitting. In practice, we did not always achieve this distance away, and it did not appear to negatively affect the data quality.

Steps to deploying the probe were handled as:

1. Bridge provides a countdown (100 m) and mark (at location) to the drop location via the radio.

2. At mark, software operator sets the WinMK21 software to record and the Marantz recorder to record, then communicates to the probe operator to drop when ready.
3. Two operators on the backdeck listen for the command from the software operator to drop, then drop the probe. We used two operators as one handled the radio communications and the other the probe (in case of excessive wind/noise and to avoid dropping the radio over the side).
4. Software operator watches for the probe to be dropped, then records the GMT position and time of drop onto the logsheet.
5. Software operator returns to listen on the headphones for radio quieting (about 40 seconds after the drop), recording this time on the logsheet as well. At this point, the data will begin coming in on the WinMK21 software, and the quieting is replaced by a low warble indicating data transmission. About 10 minutes after the float started transmitting, it will stop, and a new probe can be deployed.
6. Once the transmission is complete (as noted by the WinMK21 software), the recording can be stopped and the WinMK21 software exited.
7. Software operator instructs the bridge to carry on to the next activity/drop.

The probe is dropped or tossed narrow side down/float side up, into the space between the A-frame. We found that deploying the probe in the prop wash resulted in the probe getting trapped in the eddying currents against the side of the vessel. Since we could not use the radios to communicate to the bridge once the probe was in the water, any ship adjustments (e.g., telling the ship to keep going forward) had to be handled by running up to the bridge to verbally ask for the ship to carry forward.

10.5 Individual deployments

The location of each deployment is shown in Table 11. Below details of each deployment and the resultant data are discussed.

| Section | Cast | Date | Time (GMT) | Lat [N] | Lon [W] |
|---------|------|------------|------------|------------|------------|
| 6 | 1 | 14/03/2018 | 1123 | 26°11.956' | 76°56.605' |
| | 2 | | 1240 | 26°12.68' | 76°57.205' |
| | 3 | | 1422 | 26°13.73' | 76°57.88' |
| | 4 | | 1539 | 26°15.17' | 76°58.83' |
| | 5 | | 1703 | 26°16.59' | 76°59.84' |
| 7 | 1 | 14/03/2018 | 2225 | 25°49.755' | 77°2.323' |
| | 2 | | 2239 | 25°49.381' | 77°2.91' |
| | 3 | | 2254 | 25°49.14' | 77°3.45' |
| | 4 | | 2306 | 25°48.882' | 77°3.918' |
| | 5 | | 2319 | 25°48.585' | 77°4.4713' |
| | 6 | | 2332 | 25°48.283' | 77°5.002' |

Table 11: Deployment locations for XCP profiles during WS18066.

10.5.1 Section 6

Data from XCP section 6 are displayed in Figure 10. This section was run simultaneously with VMP section 6 to provide high resolution full depth velocity profiles up the slope. These data show southeastward flow

XCP Deployment Log Sheet

| | | | |
|---------------------------------------|--------------------------|-----------------|--|
| Cruise | | XCP serial # | |
| Ship name | | Latitude | |
| Date (YYYYMMDD) | | Longitude | |
| Time GMT (HHMM) | | Operator | |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input type="checkbox"/> | | |
| Remove electrode tape | <input type="checkbox"/> | | |
| Inspect agar jelly | <input type="checkbox"/> | | |
| Remove probe retainer tape | <input type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input type="checkbox"/> | | |
| <UW APL defaults> | <input type="checkbox"/> | | |
| Turn on recorder | <input type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | | | |
| Latitude in water | | | |
| Longitude in water | | | |
| Begin recording | <input type="checkbox"/> | | |
| Confirm RF quieting | <input type="checkbox"/> | | |
| Confirm probe release | <input type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input type="checkbox"/> | | |
| End time | | | |
| End latitude | | | |
| End longitude | | | |
| Select <Exit Probe Drop> | <input type="checkbox"/> | | |
| Comments: | | | |
| | | | |

Figure 9: XCP deployment check list from WS18066

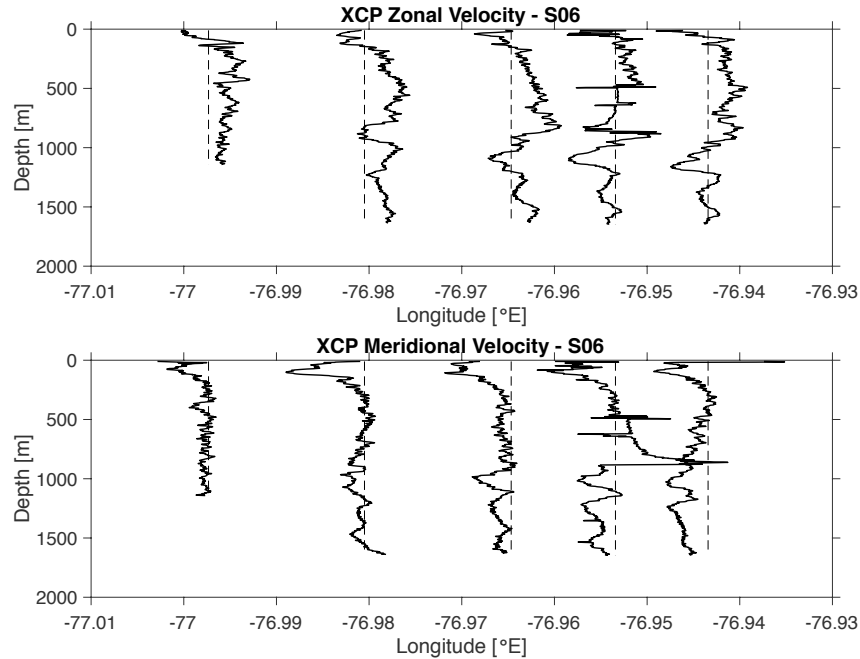


Figure 10: XCP deployment - section 6

between 1000 m and 1500 m, eastward flow between 250 m and 500 m and southwestward flow at shallower than 250 m.

10.5.2 Section 7

XCP section 7 ran east to west to the southern tip of Grand Abaco. These data are displayed in Figure 11. This shows weak southward flow below 1000 m, northward flow between 250 m and 1000 m, and southwestward flow shallower than 250 m.

10.6 Data processing

The sound files acquired using the recorder were processed using `xcpdsp.m`. This is designed to process data in realtime and to reprocess existing sound files. For WS18066, `xcpdsp.m` was used in the latter mode, using the options for no pilot tone and to process at the highest quality level. Data are output as `.mat` files, with supporting figures saved as `.png` files. As an input, the software requires a file listing the name of the sound file, the name of the output `.mat` file and the horizontal and vertical magnetic field components. These can be computed using matlab functions downloadable from IGRF.

11 Acknowledgements

We would like to thank the officers and crew of the *RV Walton Smith* for their expert and cheerful work in safely operating during VMP operations, and the Marine Operations department at University of Miami for their efficiency and enthusiasm in cruise preparations. We would also like to thank John Gittins for kindly lending us a supply of Agar to replenish our XCPs. The advice we received from John Dunlap, Avery Snyder and Tom Sanford was invaluable, and we would have been unable to successfully deploy the XCPs without

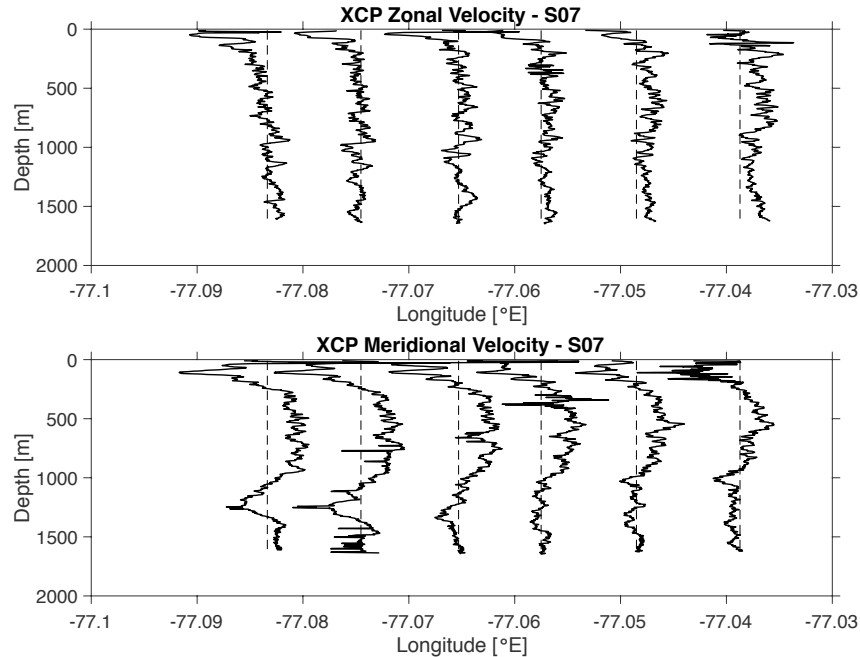


Figure 11: XCP deployment - section 7

they're advice. The NMF D technicians were efficient, energetic, and expert in their operation of the VMP probes and winches, directly leading to the successful recovery of a high quality dataset. Steve Woodward, David White and the MARS team were tireless in there efforts deploying and piloting our gliders. We would also like to thank Kurt Polzin for lending us his hydro pack that ran in the voltage used by the vessel.

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A VMP config file

A.1 Serial number 023, station 1-3

```
; Standard configuration setup.cfg file for a downward profiling VMP.
; Change the vehicle type in the [instrument_info] section to rvmp for an
; uprising profiler.
; Created by RSI, 2015-12-17
; Modified by Dave Cronkrite, 2016-09-19,new setupfile for NOC
;
; Any line that starts with a semicolon, ";", is a comment and is ignored by
; software. Likewise, everything to the right of a semicolon is ignored.
; Use this feature to leave notes and to indicate that you have made changes
; to this file. Indicate the date (YYYY-MM-DD), your name and a brief
; description of your changes.

; The first section is the [root] section. It determines the data
; acquisition parameters. It does not need to be declared explicitly.

rate          = 512                ; the sampling rate of "fast" channels
prefix        = WS18066_S01_      ; the base name of your data files. A 3-digit file num
; appended to this base name. The limit is 8 characters
; total for internally recording instruments.
disk          =                   ; the directory for the data files. It must exist. The
; should be /data for internally recording instruments. For
; real-time instruments it is best to leave this blank, so
; that it defaults to the local directory.
recsize       = 1                  ; the size of a record in seconds
man_com_rate = 4                   ; the communication rate for real-time VMPs. This value must
; match the jumper settings of the RSTRANS in your VMP.
; It is not needed for internally recording instruments.
no-fast       = 8                  ; number of fast "columns" in the address matrix (see below).
no-slow       = 2                  ; number of slow "columns" in the address matrix.

; -----
; This section presents the address [matrix] of your instrument and
; automatically ends the [root] section above. The first columns are "slow"
; channels as defined by the "no-slow" parameter in the [root] section.
; The remainder are "fast" columns ("no-fast").
[matrix]
num_rows=8
row01  = 255 0 1 2 3 5 7 8 9 12
row02  = 4 6 1 2 3 5 7 8 9 12
row03  = 10 11 1 2 3 5 7 8 9 12
row04  = 14 15 1 2 3 5 7 8 9 12
row05  = 0 0 1 2 3 5 7 8 9 12
row06  = 0 0 1 2 3 5 7 8 9 12
row07  = 16 17 1 2 3 5 7 8 9 12
```



```

row08    = 18 19 1 2 3 5 7 8 9 12
; -----
;This section identifies your instrument. Only the vehicle is important.
[instrument_info]
vehicle = vmp-2000 ; downward profiling. Use either vmp or rvmp but not both.
;vehicle= rvmp      ; upward profiling
model   = vmp-2000 ; The actual model. Used for trouble shooting.
sn      = 023      ; The serial number of the instrument. For trouble shooting

; -----
; The next section is optional and can be expanded. Do not use the parameter "id =
[cruise_info]
operator   = CC/PP
project    = MerMeed part 3
ship       = RV W/S
leg        =

; -----
; Next come the [channel] sections. These are used to convert your data
; into physical units, and to save them into a mat-file.
; They also determine the name given to various signals
; in your data file. Please, stick to the convention of
; RSI because data visualization using the RSI Matlab Library of functions
; assumes particular names. However, data will be converted into physical
; units regardless of the name of the channels. If you change the names,
; then data visualization and further processing is your responsibility.
; A list of typical channel addresses (id) and their names and functions
; is at the end of this file.

; Each channel section consists of a part that is unique to your instrument.
; It does not need to be changed. The second part is dependent on your
; sensors (shear probes, FP07 thermistors, etc.) and must be updated
; whenever you change a probe.
;
; The record average value is display for some channels with a real-time
; instrument. Display can be forced or suppressed using
; display = true, or display = false. Internally recording instruments
; have no display. The units used for display can be specified with
; units = [unit_symbols]. Keep it short for best display.

; The ground reference channel.
[channel]
; instrument dependent parameters
id      = 0    ; the channel address, 0 to 254. Listed in the [matrix] section.
name    = Gnd ; the name it will have in the mat-file.
type    = gnd ; the algorithm used to convert raw data into physical units.
;coef0  = 0    ; the coefficients required for conversion. None in this case.

```

```

; -----
; The piezo-vibration sensors
[channel]
; instrument dependent parameters
id      = 1
name    = Ax
type    = accel
coef0   = 3150
coef1   = 15653
display = true ; Pertinent only to real-time telemetering VMPS.

[channel]
; instrument dependent parameters
id      = 2
name    = Ay
type    = accel
coef0   = 4045
coef1   = 18533
display = true

[channel]
; instrument dependent parameters
id      = 3
name    = Az
type    = accel
coef0   = 2423.5
coef1   = 19154
display = false

; -----
; The thermistor channels
; without pre-emphasis
[channel]
; instrument dependent parameters
id      = 4
name    = T1
type    = therm
adc_fs  = 5.000
adc_bits = 16
a       = -35
b       = 0.99879
G       = 11
E_B     = 0.68209
; sensor dependent parameters
SN      = T1168
beta    = 3143.55
beta_2  = 2.5e5
T_0     = 289.301

```

```

cal_date      =
units         = [C]

; with pre-emphasis
[channel]
; instrument dependent parameter
id            = 5
name          = T1_dT1
type          = therm
adc_fs        = 5.000
adc_bits      = 16
a             = -35
b             = 0.99879
G             = 11
E_B           = 0.68209
beta          = 3143.55
beta_2        = 2.5e5
T_0           = 289.301
diff_gain     = 0.995
display=false

; without pre-emphasis
[channel]
; instrument dependent parameters
id            = 6
name          = T2
type          = therm
adc_fs        = 5.000
adc_bits      = 16
a             = -15
b             = 0.99885
G             = 11
E_B           = 0.68201
; sensor dependent parameters
SN            = T1167
beta          = 3143.55
beta_2        = 2.5e5
T_0           = 289.301
cal_date      =
units         = [C]

; with pre-emphasis
[channel]
; instrument dependent parameters
id            = 7
name          = T2_dT2
type          = therm
adc_fs        = 5.000

```

```

adc_bits    = 16
a           = -15
b           = 0.99885
G           = 11
E_B         = 0.68201
beta        = 3143.55
beta_2      = 2.5e5
T_0         = 289.301
diff_gain   = 0.995
display=false

; -----
; The shear probe channels
[channel]
; instrument dependent parameters
id          = 8
name        = sh1
type        = shear
adc_fs      = 5.000
adc_bits    = 16
diff_gain   = 1.01
; sensor dependent parameters
sens        = 0.0648
SN          = M1792
cal_date    = 22-11-2017

[channel]
; instrument dependent parameters
id          = 9
name        = sh2
type        = shear
adc_fs      = 5.000
adc_bits    = 16
diff_gain   = 1.02
; sensor dependent parameters
sens        = 0.0507
SN          = M1408
cal_date    = 08-09-2017

; -----
; The pressure transducer
; without pre-emphasis
[channel]
; instrument dependent parameters
id          = 10
name        = P
type        = poly
; sensor dependent parameters

```

```

coef0      = 6.52
coef1      = 0.10649
coef2      = -6.435e-9
cal_date   =
units      = [dBar]
display=true

; with pre-emphasis
[channel]
; instrument dependent parameters
id         = 11
name       = P_dP
type       = poly
diff_gain  = 20.3

[channel]
id         = 12
type       = ucond
name       = C1_blank
a          = -0.7869
b          = 196.9
diff_gain  = 0.995
adc_fs     = 5.000
adc_bits   = 16
units      = [mS / cm]
display    = false
; Sensor dependent cell-constant in units of metres.
K          = 1.03e-3
SN         =

[channel]
id         = 14
name       = Chlorophyll
type       = poly
sign       = unsigned
coef0     = -4.58552e0
coef1     = 6.564e-3
units     = [ppb]
SN        = 2
display   = false

[channel]
id         = 15
name       = Turbidity
type       = poly
sign       = unsigned
coef0     = -2.670057e0
coef1     = 3.638e-3

```

```

coef2    = 0
coef3    = 0
units    = [FTU]
SN       = 2
display  = false

; -----
; Sea-Bird SBE3 thermometer. Remove, if you are using a JAC CT, and
; remember to update the [matrix] section.
[channel]
; instrument dependent parameters
;id      = 16, 17      ; A two-channel signal. Separate channels with a "," and/or
id_even  = 16
id_odd   = 17
name     = SBT1
type     = sbt
coef5    = 24e6        ; reference clock
coef6    = 128         ; periods
; sensor dependent parameters
coef0    = 4.33172014e-3
coef1    = 6.36238494e-4
coef2    = 2.05415014e-5
coef3    = 1.66852309e-6
coef4    = 1000
SN       = 4869
cal_date = 2017-09-12 ; date of calibration
units    = [C]
display  = true

; Sea-Bird SBE4 conductivity cell. Remove, if you are using a JAC CT, and
; remember to update the [matrix] section.
[channel]
; instrument dependent parameters
;id      = 18, 19
id_even  = 18
id_odd   = 19
name     = SBC1
type     = sbc
coef5    = 24e6
coef6    = 128
; sensor dependent parameters
coef0    = -1.07837921e1
coef1    = 0
coef2    = 1.66255830
coef3    = -3.33094922e-3
coef4    = 3.66229645e-4
SN       = 3389

```

```

cal_date      = 13 October 2016 ; date of calibration
units         = [mS/cm]
display       = true

; -----
; The Sea-Bird SBE43F oxygen sensor
[channel]
;id           = 48,49
;name         = O2_43F
;type         = o2_43f
;coef0        = -8.677e-2
;coef1        = 2.7697e-4
;coef2        = 24e6           ; reference frequency
;coef3        = 128           ; number of cycles for estimate
;SN           = 0122
;cal_date     = 2007-09-28
;display      = false

; -----
; This is a list of typical channels (addresses) and their signals
; Only some of these channels will be in any particular instrument
; id   Name   - rate - Description
; -----
; 0    Gnd    - slow - Reference ground
; 1    Ax     - fast - horizontal acceleration in the direction of the pressure
; 2    Ay     - fast - horizontal acceleration orthogonal to the direction of the pressure
; 3    Az     - fast - vertical acceleration, positive up
; 4    T1     - slow - Temperature from Thermistor 1 without pre-emphasis
; 5    T1_dT1 - fast - Temperature from Thermistor 1 with pre-emphasis
; 6    T2     - slow - Temperature from Thermistor 2 without pre-emphasis
; 7    T2_dT2 - fast - Temperature from Thermistor 2 with pre-emphasis
; 8    sh1    - fast - velocity derivative from shear probe 1
; 9    sh2    - fast - velocity derivative from shear probe 2
; 10   P      - slow - pressure signal without pre-emphasis
; 11   P_dP   - slow - pressure signal with pre-emphasis
; 12   Cl_dCl - fast - micro-conductivity with pre-emphasis
; 14   Chlorophyll - fast - JAC fluorometer
; 15   Turbidity - fast - JAC backscatter sensor
; 16, 17 SBT   - slow - The even and odd addresses of the Sea-Bird SBE3 thermometer
; 18, 19 SBC   - slow - The even and odd addresses of the Sea-Bird SBE4 conductivity
; 48, 49 O2_43F - slow - The even and odd addresses of the Sea-Bird SBE43F oxygen
; 255   sp_char - slow - special Character that always returns 32752D or 7FF0H and
;                               is used to test the integrity of communication.

; End of setup configuration file.

```

A.2 Serial number 023, station 3-6

```
; Standard configuration setup.cfg file for a downward profiling VMP.
; Change the vehicle type in the [instrument_info] section to rvmp for an
; uprising profiler.
; Created by RSI, 2015-12-17
; Modified by Dave Cronkrite, 2016-09-19,new setupfile for NOC
;
; Any line that starts with a semicolon, ";", is a comment and is ignored by
; software. Likewise, everything to the right of a semicolon is ignored.
; Use this feature to leave notes and to indicate that you have made changes
; to this file. Indicate the date (YYYY-MM-DD), your name and a brief
; description of your changes.

; The first section is the [root] section. It determines the data
; acquisition parameters. It does not need to be declared explicitly.

rate          = 512                ; the sampling rate of "fast" channels
prefix        = WS18066_S04_      ; the base name of your data files. A 3-digit file num
; appended to this base name. The limit is 8 characters
; total for internally recording instruments.
disk          =                   ; the directory for the data files. It must exist. The
; should be /data for internally recording instruments. For
; real-time instruments it is best to leave this blank, so
; that it defaults to the local directory.
recsize       = 1                  ; the size of a record in seconds
man_com_rate = 4                   ; the communication rate for real-time VMPs. This value must
; match the jumper settings of the RSTRANS in your VMP.
; It is not needed for internally recording instruments.
no-fast       = 8                  ; number of fast "columns" in the address matrix (see below).
no-slow       = 2                  ; number of slow "columns" in the address matrix.

; -----
; This section presents the address [matrix] of your instrument and
; automatically ends the [root] section above. The first columns are "slow"
; channels as defined by the "no-slow" parameter in the [root] section.
; The remainder are "fast" columns ("no-fast").
[matrix]
num_rows=8
row01  = 255 0 1 2 3 5 7 8 9 12
row02  = 4 6 1 2 3 5 7 8 9 12
row03  = 10 11 1 2 3 5 7 8 9 12
row04  = 14 15 1 2 3 5 7 8 9 12
row05  = 0 0 1 2 3 5 7 8 9 12
row06  = 0 0 1 2 3 5 7 8 9 12
row07  = 16 17 1 2 3 5 7 8 9 12
row08  = 18 19 1 2 3 5 7 8 9 12
; -----
```



```

;This section identifies your instrument. Only the vehicle is important.
[instrument_info]
vehicle = vmp-2000 ; downward profiling. Use either vmp or rvmp but not both.
;vehicle= rvmp      ; upward profiling
model   = vmp-2000 ; The actual model. Used for trouble shooting.
sn      = 023      ; The serial number of the instrument. For trouble shooting

; -----
; The next section is optional and can be expanded. Do not use the parameter "id =
[cruise_info]
operator   = CC/PP
project    = MerMeed part 3
ship       = RV W/S
leg        =

; -----
; Next come the [channel] sections. These are used to convert your data
; into physical units, and to save them into a mat-file.
; They also determine the name given to various signals
; in your data file. Please, stick to the convention of
; RSI because data visualization using the RSI Matlab Library of functions
; assumes particular names. However, data will be converted into physical
; units regardless of the name of the channels. If you change the names,
; then data visualization and further processing is your responsibility.
; A list of typical channel addresses (id) and their names and functions
; is at the end of this file.

; Each channel section consists of a part that is unique to your instrument.
; It does not need to be changed. The second part is dependent on your
; sensors (shear probes, FP07 thermistors, etc.) and must be updated
; whenever you change a probe.
;
; The record average value is display for some channels with a real-time
; instrument. Display can be forced or suppressed using
; display = true, or display = false. Internally recording instruments
; have no display. The units used for display can be specified with
; units = [unit_symbols]. Keep it short for best display.

; The ground reference channel.
[channel]
; instrument dependent parameters
id      = 0      ; the channel address, 0 to 254. Listed in the [matrix] section.
name    = Gnd   ; the name it will have in the mat-file.
type    = gnd   ; the algorithm used to convert raw data into physical units.
;coef0  = 0     ; the coefficients required for conversion. None in this case.

; -----
; The piezo-vibration sensors

```

```
[channel]
; instrument dependent parameters
id      = 1
name    = Ax
type    = accel
coef0   = 3150
coef1   = 15653
display = true ; Pertinent only to real-time telemetering VMPS.
```

```
[channel]
; instrument dependent parameters
id      = 2
name    = Ay
type    = accel
coef0   = 4045
coef1   = 18533
display = true
```

```
[channel]
; instrument dependent parameters
id      = 3
name    = Az
type    = accel
coef0   = 2423.5
coef1   = 19154
display = false
```

```
; -----
; The thermistor channels
; without pre-emphasis
[channel]
; instrument dependent parameters
id      = 4
name    = T1
type    = therm
adc_fs  = 5.000
adc_bits = 16
a       = -35
b       = 0.99879
G       = 11
E_B     = 0.68209
; sensor dependent parameters
SN      = T1168
beta    = 3143.55
beta_2  = 2.5e5
T_0     = 289.301
cal_date =
units   = [C]
```

```

; with pre-emphasis
[channel]
; instrument dependent parameter
id          = 5
name        = T1_dT1
type        = therm
adc_fs      = 5.000
adc_bits    = 16
a           = -35
b           = 0.99879
G           = 11
E_B        = 0.68209
beta       = 3143.55
beta_2     = 2.5e5
T_0        = 289.301
diff_gain   = 0.995
display=false

; without pre-emphasis
[channel]
; instrument dependent parameters
id          = 6
name        = T2
type        = therm
adc_fs      = 5.000
adc_bits    = 16
a           = -15
b           = 0.99885
G           = 11
E_B        = 0.68201
; sensor dependent parameters
SN          = T1167
beta       = 3143.55
beta_2     = 2.5e5
T_0        = 289.301
cal_date   =
units      = [C]

; with pre-emphasis
[channel]
; instrument dependent parameters
id          = 7
name        = T2_dT2
type        = therm
adc_fs      = 5.000
adc_bits    = 16
a           = -15

```

```

b          = 0.99885
G          = 11
E_B       = 0.68201
beta      = 3143.55
beta_2    = 2.5e5
T_0       = 289.301
diff_gain = 0.995
display=false

; -----
; The shear probe channels
[channel]
; instrument dependent parameters
id        = 8
name      = sh1
type      = shear
adc_fs    = 5.000
adc_bits  = 16
diff_gain = 1.01
; sensor dependent parameters
sens      = 0.0639
SN        = M1410
cal_date  = 22-01-2016

[channel]
; instrument dependent parameters
id        = 9
name      = sh2
type      = shear
adc_fs    = 5.000
adc_bits  = 16
diff_gain = 1.02
; sensor dependent parameters
sens      = 0.0507
SN        = M1408
cal_date  = 08-09-2017

; -----
; The pressure transducer
; without pre-emphasis
[channel]
; instrument dependent parameters
id        = 10
name      = P
type      = poly
; sensor dependent parameters
coef0     = 6.52
coef1     = 0.10649

```

```

coef2      = -6.435e-9
cal_date   =
units      = [dBar]
display=true

; with pre-emphasis
[channel]
; instrument dependent parameters
id         = 11
name       = P_dP
type       = poly
diff_gain  = 20.3

[channel]
id         = 12
type       = ucond
name       = C1_blank
a          = -0.7869
b          = 196.9
diff_gain  = 0.995
adc_fs     = 5.000
adc_bits   = 16
units      = [mS / cm]
display    = false
; Sensor dependent cell-constant in units of metres.
K          = 1.03e-3
SN         =

[channel]
id         = 14
name       = Chlorophyll
type       = poly
sign       = unsigned
coef0      = -4.58552e0
coef1      = 6.564e-3
units      = [ppb]
SN         = 2
display    = false

[channel]
id         = 15
name       = Turbidity
type       = poly
sign       = unsigned
coef0      = -2.670057e0
coef1      = 3.638e-3
coef2      = 0
coef3      = 0

```

```
units    = [FTU]
SN       = 2
display  = false
```

```
; -----
```

```
; Sea-Bird SBE3 thermometer. Remove, if you are using a JAC CT, and
; remember to update the [matrix] section.
```

```
[channel]
```

```
; instrument dependent parameters
```

```
;id          = 16, 17      ; A two-channel signal. Separate channels with a "," and/
```

```
id_even     = 16
```

```
id_odd      = 17
```

```
name        = SBT1
```

```
type        = sbt
```

```
coef5       = 24e6          ; reference clock
```

```
coef6       = 128           ; periods
```

```
; sensor dependent parameters
```

```
coef0       = 4.33172014e-3
```

```
coef1       = 6.36238494e-4
```

```
coef2       = 2.05415014e-5
```

```
coef3       = 1.66852309e-6
```

```
coef4       = 1000
```

```
SN          = 4869
```

```
cal_date    = 2017-09-12 ; date of calibration
```

```
units       = [C]
```

```
display     = true
```

```
; Sea-Bird SBE4 conductivity cell. Remove, if you are using a JAC CT, and
; remember to update the [matrix] section.
```

```
[channel]
```

```
; instrument dependent parameters
```

```
;id          = 18, 19
```

```
id_even     = 18
```

```
id_odd      = 19
```

```
name        = SBC1
```

```
type        = sbc
```

```
coef5       = 24e6
```

```
coef6       = 128
```

```
; sensor dependent parameters
```

```
coef0       = -1.07837921e1
```

```
coef1       = 0
```

```
coef2       = 1.66255830
```

```
coef3       = -3.33094922e-3
```

```
coef4       = 3.66229645e-4
```

```
SN          = 3389
```

```
cal_date    = 13 October 2016 ; date of calibration
```

```
units       = [mS/cm]
```

```

display      = true

; -----
; The Sea-Bird SBE43F oxygen sensor
[channel]
;id          = 48,49
;name        = O2_43F
;type        = o2_43f
;coef0       = -8.677e-2
;coef1       = 2.7697e-4
;coef2       = 24e6           ; reference frequency
;coef3       = 128           ; number of cycles for estimate
;SN          = 0122
;cal_date    = 2007-09-28
;display     = false

; -----
; This is a list of typical channels (addresses) and their signals
; Only some of these channels will be in any particular instrument
; id      Name      - rate - Description
; -----
; 0      Gnd        - slow - Reference ground
; 1      Ax         - fast - horizontal acceleration in the direction of the pressure
; 2      Ay         - fast - horizontal acceleration orthogonal to the direction of the pressure
; 3      Az         - fast - vertical acceleration, positive up
; 4      T1         - slow - Temperature from Thermistor 1 without pre-emphasis
; 5      T1_dT1     - fast - Temperature from Thermistor 1 with pre-emphasis
; 6      T2         - slow - Temperature from Thermistor 2 without pre-emphasis
; 7      T2_dT2     - fast - Temperature from Thermistor 2 with pre-emphasis
; 8      sh1        - fast - velocity derivative from shear probe 1
; 9      sh2        - fast - velocity derivative from shear probe 2
; 10     P          - slow - pressure signal without pre-emphasis
; 11     P_dP       - slow - pressure signal with pre-emphasis
; 12     C1_dC1     - fast - micro-conductivity with pre-emphasis
; 14     Chlorophyll - fast - JAC fluorometer
; 15     Turbidity  - fast - JAC backscatter sensor
; 16, 17 SBT        - slow - The even and odd addresses of the Sea-Bird SBE3 thermometer
; 18, 19 SBC        - slow - The even and odd addresses of the Sea-Bird SBE4 conductivity
; 48, 49 O2_43F     - slow - The even and odd addresses of the Sea-Bird SBE43F oxygen
; 255    sp_char    - slow - special Character that always returns 32752D or 7FF0H and
;                               is used to test the integrity of communication.

; End of setup configuration file.

```

B Event Log

WS18XXX Event Log

| # | Date/time (GMT, else L for local time) | Latitude N | Longitude W | Event (activity, data features, downtime station/section numbers) |
|----|--|------------|-------------|--|
| 1 | 2018/03/08 1530 GMT | RSMAS | RSMAS | Depart RSMAS |
| 2 | 2018/03/09 1220 GMT | 25°24.26 | 77°55.06 | Arrive @ Chub Cay: Immigration |
| 3 | 2018/03/09 1620 GMT | " | " | Depart for WP1 |
| 4 | 2018/03/10 0047 | 25°54.09 | 76°58.75 | Arrive @ WP1 Start ADCP to WP2 |
| 5 | 2018/03/10 0700 | 26°8.4 | 76°31.98 | Arrive @ WP2 Start ADCP to WP3 (5 kts → arr @ 60m depth) |
| 6 | 2018/03/10 1100 | 26°4.59 | 76°58.87 | Arrive @ WP3 VMP test dip |
| 7 | 2018/03/10 1115 | " | " | VMP over side for test dip to 1000m |
| 8 | 2018/03/10 1252 | 26°5.11 | 76°59.67 | VMP recovered |
| 9 | 2018/03/10 1330 | 26°4.85 | 76°0.62 | Seaglider Biomare sg605 in water |
| 10 | 2018/03/10 1416 | 26°4.95 | 77°1.57 | Seaglider Ziaa sg638 in water |
| 11 | 1505 | 26°5.17 | 77°2.49 | sg039 in the water |
| 12 | 2018/03/10 1800 | 26°08.90 | 76°98.20 | Recover sg534 |
| 13 | 2018/03/10 2030 | 26°5.21 | 77°5.62 | Recover sg039 |
| 14 | 2018/03/11 0200 | 26°35° | 76°50.33° | Arrive WP4, ADCP section to WP5 |
| 15 | 2018/03/11 0743 | 26°32.89 | 76°52.98 | Arrive WP5, VMP section to WP6 |
| 16 | 2018/03/11 0748 | 26°32.89 | 76°52.63 | Start VMP 2 |
| 17 | 2018/03/11 2054 | 26°33.731 | 76°38.931 | Start Finish VMP 502 → WP7 |
| 18 | 2018/03/11 2115 | 26°52.6° | 76°67.0° | Arrive WP7 start ADCP |
| 19 | 2018/03/12 0030 | 26°31.46 | 76°54.144 | Arrive WP8 → WP9 |
| 20 | 2018/03/12 0050 | 26°50.0° | 76°9.1° | Arrive WP9 → WP10 |
| 21 | 2018/03/12 0413.6 | 26°29.912 | 76°39.968 | Arrive WP10 → 11 |
| 22 | 2018/03/12 0415.2 | 26°28.704 | 76°39.804 | Arrive WP11 Start VMP |
| 23 | 2018/03/12 1835 | 26°28.87 | 76°57.47 | Arrive WP12 → WP13 |
| 24 | 2018/03/12 1929 | 26°35.439 | 76°54.613 | Arrive WP13 ADCP → WP14 |

WS18XXX Event Log

| # | Date/time (GMT, else L for | Latitude | Longitude | Event (activity, data features, downtime station/section numbers) |
|----|-------------------------------|------------|------------|--|
| 24 | 2018/03/12 2035 | 26°38.99 | 76°51.16 | Abandon ADCP section from WP13 → WP14, bad weather. |
| 25 | 2018/03/12 2200 | 26.52° | 76.82° | Steam to WP15 and wait for weather to improve for VMP |
| 26 | 2018/03/13 0135 | 26°21.998' | 76°56.805' | Arrive @ WP15 VMP to WP16 / WP4 |
| 27 | 2018/03/13 0536 | 26°19.51 | 76°47.98' | Weather challenging. VMP winch stalling. Decide to recover |
| 28 | 2018/03/13 0632 | 26°19.11 | 76°47.21' | Recover VMP. Head to WP16 ^{as ADCP} |
| 29 | 2018/03/13 0731 | 26°19.05 | 76°43.97 | Head to WP17 - southward flow |
| 30 | 2018/03/13 0904 | 26°14.86 | 76°36.26 | WP17 head to 18 |
| 31 | 2018/03/13 0911 | 26°14.86 | 76°36.51 | No data > 200m ^{heading west} → go to WP2 @ 4.5 kts |
| 32 | 2018/03/13 11.12 | 26°09.13 | 76°30.27 | WP2, head to WP19 |
| 33 | 2018/03/13 1827 | 26°07.476 | 77° 9.00' | Arrive at WP19 → VMP to 20 |
| 34 | 2018/03/14 04.24 | 26° 7.46 | 76° 52.71 | WP20 → 21 new VMP section |
| 35 | 2018/03/14 11.23 | 26°11.956 | 76°56.605 | XCP drop 15061034 |
| 36 | 2018/03/14 1232 | 26°12.625 | 76°57.163 | XCP drop 15061030 |
| 37 | 2018/03/14 1354 | 26°13.73 | 76°57.88 | XCP drop 15061040 |
| 38 | 2018/03/14 1528 | 26°14.94 | 76°58.68 | XCP drop 15061042 |
| 39 | 2018/03/14 1644 | 26°16.29 | 76°59.63 | XCP drop 15061002 |
| 40 | 2018/03/14 1715 | 26°16.17 | 76°59.55 | VMP section to WP22 complete ^{Transfer to WP21} |
| 41 | 2018/03/14 < 2007 | ? | ? | Starboard engine out - decision to go |
| 42 | 2018/03/14 2213 | 25°49.755 | 77° 2 323 | XCP drop 15071030 |
| 43 | 2018/03/14 2239 | 25°49.381 | 77° 2.91 | XCP drop 15061025 |
| 44 | 2018/03/14 2254 | 25°49.14 | 77° 3.45 | XCP drop 15071008 |
| 45 | 2018/03/14 2306 | 25°48.88 | 77° 03.919 | XCP drop 15071008 15061004 |
| 46 | 2018/03/14 2311 | 25°48.585 | 77° 4.4713 | XCP drop 15071010 |
| 47 | 2018/03/14 2332 | 25°48.283 | 77° 5.002 | XCP drop 15061023 |
| 50 | 2018/03/14 2345 | | | Test attempted repair ↳ No fix ... back to Miami |

C VMP logsheets

MERMEED VMP 2000 LOG # 1

| St. No. | Date (yday) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|--------------|-------------------|-------------|---------------------------|-----------|-------------------------|-----------------------|----------|-----------------------|---|
| 1 | 10/3 2018 | start 26° 4.497' | 76° 58.979' | 11:30 11:30 | AF EFW | 1072 4126 | 1262 | ~1500m | WS18066-501 -001.P | Test station SW023 10-8 and large E betw 750-1000m |
| | | max 26° 4.59' | 76° 59.14' | 1159/108 | | (S) | 1575 | 1900 | | |
| | | end 26° 5.09' | 76° 59.62' | 1247 | | | | | | |
| 2 | 11/3 2018 | start 26° 32.887' | 76° 52.936' | 0748 0748 | AF EFW | 325 | 254 | 500 | WS18066- 502-001.P | Added buoyancy & removed (overhandles wobbly fall rate - not freefall? sh look ok |
| | | max 26° 32.85' | 76° 52.63' | 0758 | | (S) | | | | |
| | | end 26° 32.83' | 76° 52.42' | 0808 | | | | | | |
| | 11/3 2018 | start 26° 32.83' | 76° 52.42' | 0809 | AF EFW | 520 | 520 490 | 1000 | WS18066- 502-002.P | Fall rate ~ 0.7-0.8 check Ax near full depth |
| | | max 26° 32.79' | 76° 52.16' | 0820 | | | | | | |
| | | end 26° 32.784' | 76° 51.823' | 08136 | | | | | | |
| | 11/3 2018 | start 26° 32.787' | 76° 51.785' | 08138 | AF EFW | 686 | 686 657 | 1450 | WS18066- 502-003.P | |
| | | max 26° 32.77' | 76° 51.43' | 0852 | | | | | | |
| | | end 26° 32.77' | 76° 50.89' | 0915 | | | | | | |
| | 11/3 2018 | start 26° 32.77' | 76° 50.80' | 0919 | AF EFW | 1076 | 967 | all | WS18066- 502-004.P | |
| | | max 26° 32.80' | 76° 50.26' | 0941 | | | | | | |
| | | end 26° 32.83' | 76° 49.51' | 10:17 | | | | | | |

MERMEED VMP 2000 LOG #

2

| St. No. | Date (yday) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|--------------|----------|------------|------------|----------|-------------|-----------|----------|-----------|--|
| 2 | 11/3 2018 | start | 26° 32.82 | 76° 49.53 | 10:19 | afw | 1011 | max | 502-005.p | |
| | | max | 26 32.805 | 76 44.023 | 10:42 | afw | | | | |
| | | end | 26 32.804 | 76° 48.337 | 10:17 | | | | | |
| 2 | 11/3 2018 | start | 26 32.802 | 76° 48.226 | 11:20 | afw | 1083 | max | 502-006.p | |
| | | max | 26° 32.81 | 76° 47.83 | 11:43 | afw | | | | |
| | | end | 26° 32.828 | 76° 47.099 | 12:25 | afw | | | | |
| | | start | 26° 32.826 | 76° 47.054 | 12:27 | afw | 1062 | max | 502-007.p | |
| | | max | 26° 32.789 | 76° 46.600 | 12:51 | afw | | | | |
| | | end | 26° 32.824 | 76° 45.978 | 13:32 | | | | | |
| | | start | 26° 32.819 | 76° 45.934 | 13:34 | afw | 1210 | max | 502-008.p | |
| | | max | 26° 32.79 | 76° 45.576 | 14:01 | afw | | | | |
| | | end | 26° 32.86 | 76° 45.21 | 14:32 | | | | | |
| | | start | 26° 32.86 | 76° 45.19 | 14:34 | afw | 1262 | max | 502-009.p | (said 6 dban @ surf) ship slower? slow hauling |
| | | max | 26° 32.92 | 76° 44.84 | 15:01 | | | | | |
| | | end | 26° 32.80 | 76° 43.77 | 15:48 | | | | | |

MERMEED VMP 2000 LOG # 3

| St. No. | Date (day) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|--------------|----------|------------|------------|----------|-------------|-----------|----------|-----------------------|---|
| 2 | 11/3 2018 | start | 26° 32.80 | 76° 43.64 | 1556 | epw | 1040 | full | WS18066- S02-0108 | |
| | | max | 26° 32.79 | 76° 43.10 | 1619 | | | | | |
| | | end | 26° 32.77 | 76° 42.18 | 1702 | | | | | |
| " | " | start | 26° 32.77 | 76° 42.14 | 1705 | KP | 3927 | full | WS18066- S02-011P | yea team! |
| | | max | 26° 32.81 | 76° 41.77 | 1733 | | | | | |
| | | end | 26° 32.76 | 76° 41.28 | 1811 | | | | | |
| " | " | start | 26° 32.76 | 76° 41.72 | 1815 | KP | 3945 | full | WS18066- S02-0127P | |
| | | max | 26° 33.091 | 76° 41.034 | 1844 | | | | | |
| | | end | 26° 33.48 | 76° 40.600 | 1922 | | | | | |
| " | " | start | 26° 33.428 | 76° 40.570 | 1924 | KP DGE | 4106 | full | WS18066- S02-013P | Double click of start / stop recording @ 1939 |
| | | max | 26° 33.540 | 76° 40.185 | 1957 | | | | | |
| | | end | 26 | 76 | 20 | | | | | |
| 3 | 12/3 2018 | start | 26° 28.717 | 76° 39.727 | 05:01 | APF GFW | 4695 | max | WS18060-503 -001P | straight to 90m BS 5 47m - upstart lem-hd de 93db - computer went into power save mode sh1.mermaid@200-300m / TI suspect 500-100m |
| | | max | 26° 28.797 | 76° 40.899 | 05:31 | | | | | |
| | | end | 26° 28.776 | 76° 41.772 | 06:24 | | | | | |

MERMEED VMP 2000 LOG # 4

| St. No. | Date (day) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|--------------------------|----------|-----------|------------|----------|-------------|--------------|--------------|-------------------|---|
| 3 | 12 ¹³ 2018 | start | 26°28.78 | 76°42.01 | 06:28 | ofw | 1160 1437 | max | WS18066-503-003.P | fall rate still ~0.8 m/s |
| | | max | 26°28.75 | 76°42.62 | 06:59 | | | | | |
| | | end | 26°28.70 | 76°43.34 | 07:37 | | | | | |
| 3 | 11 | start | 26°28.70 | 76°43.57 | 07:39 | nb | 4011 | max | WS18066-503-003.P | sh1 had 2 noisy patches → planning to replace after S3/cost 4 |
| | | max | 26°28.696 | 76°44.015 | 08:09 | | | | | |
| | | end | 26°28.825 | 76°44.185 | 08:46 | | | | | |
| 3 | 12 | start | 26°28.825 | 76°44.685 | 08:47 | ofw | 3783 | 1160 1426 | WS18066-503-004.P | |
| | | max | 26°28.82 | 76°45.25 | 09:16 | | | | | |
| | | end | 26°28.91 | 76°45.93 | 09:56 | | | | | |
| 3 | 13 | start | 26°28.90 | 76°46.32 | 10:20 | ofw efw | 3305 | max | WS18066-503-005.P | new sh1 1410 s/v (cast not recorded) |
| | | max | 26°28.847 | 76°46.842 | 10:50 | | | | | |
| | | end | 26°28.79 | 76°47.67 | 11:30 | | | | | |
| 3 | 11 | start | 26°28.79 | 76°47.68 | 11:30 | avg efw | 2582 | 1217 | WS18066-503-007.P | ↑ (odd - diff cast) |
| | | max | 26°28.82 | 76°48.26 | 12:08 | | | | | |
| | | end | 26°28.68 | 76°49.01 | 12:43 | | | | | |

MERMEED VMP 2000 LOG # 3

| St. No. | Date (day) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|------------|----------|------------|------------|----------|-------------|-----------|----------|-------------|-------|
| 3 | 15 | start | 26° 28.67 | 76° 49.03 | 12:41 | efw | 1255 | max | WS18066-50 | |
| | | max | 26° 28.59 | 76° 49.62 | 13:12 | any | | | -008.P | |
| | | end | 26° 28.49 | 76° 50.64 | 13:49 | | | | | |
| | | start | 26° 28.48 | 76° 50.73 | 13:52 | efw | 1104 | max | WS18066-50 | |
| | | max | 26° 28.59 | 76° 51.42 | | any | | | -009.P | |
| | | end | 26° 28.66 | 76° 52.56 | 15:00 | | | | | |
| 3 | 12/13 | start | 26° 28.65 | 76° 52.65 | 15:04 | efw | 1083 | max | WS18066 S03 | |
| | | max | 26° 28.66 | 76° 53.34 | 15:28 | | | | -010.P | |
| | | end | 26° 28.84 | 76° 54.07 | 16:04 | | | | | |
| 3 | 12/13 | start | 26° 28.84 | 76° 54.10 | 16:06 | efw | 1588 | max | WS18066- | |
| | | max | 26° 28.92 | 76° 54.54 | 16:41 | efw | | | S03-011.P | |
| | | end | 26° 29.11 | 76° 55.15 | 17:22 | | | | | |
| 4 | 20/18 | start | 26° 21.998 | 76° 56.805 | 01:35 | A | 870 | max | WS18066- | |
| | | max | 26° 20.9 | 76° 56.009 | 2:00 | | | | S04-001.P | |
| | | end | 26° 20.767 | 76° 55.379 | 2:20 | | | | | |

MERMEED VMP 2000 LOG #

6

| St. No. | Date (day) | Latitude | Longitude | Time (GMT) | Operator | Water Depth | Max Press | Wire Out | File | Notes |
|---------|--------------|-----------------|-----------|------------|----------|-------------|-----------|----------|---------------------------------|---|
| 4 | 13/3 2018 | start 26 20.770 | 76 55.262 | 2:24 | | 2387 | 1120 | max | WS1806b-S04 -002.P | |
| | | max 26 20.736 | 76 54.601 | 2:49 | | | | | | |
| | | end 26 20.585 | 76 53.314 | 03:30 | | | | | | |
| 4 | 13/3 2018 | start 26 20.586 | 76 53.008 | 03:37 | | 3158 | 800 | max | WS1806b-S04 -004.P | (003 - mis start) Shi still spiky - dry out when opposing presents |
| | | max 26 20.527 | 76 51.200 | 03:58 | | | | | | |
| | | end 26 20.197 | 76 50.549 | 04:42 | | | | | | |
| 4 | 13/3 2018 | start 26 20.093 | 76 50.311 | 04:49 | | 3749 | 750 | max | WS1806b-S04 -005.P -006.P | Recovered due to weather. shipped, re-shipped on spec. 1803 on spec |
| | | max 26 20.035 | 76 49.428 | 05:09 | | | | | | |
| | | end 26 19.19 | 76 47.48 | 06:23 | | | | | | |
| 5 | | start 26 07.44 | 77 9.000 | 18:27 | ACMG | 500 | 430 | max | WS1806b-S04 -007.P | # Needs to be remained to -505-001 |
| | | max 26 07.423 | 77 8.527 | 18:39 | | ?? | 430 | | | |
| | | end 26 7.409 | 77 9.700 | 19:48 | | | | | | |
| | | start 26 7.411 | 77 9.230 | 18:50 | | ?? | 1078 | max | WS1806b-S04 -008.P | |
| | | max 7.306 | 77 9.712 | 19:14 | | ?? | 1078 | | | |
| | | end 26 7.515 | 77 7.069 | 19:45 | | >1000 | | | | |

D XCP logsheets

XCP Deployment Log Sheet

| | | | |
|--|-------------------------------------|----------------------|----------|
| Cruise | WS18066 | XCP serial # | 15061034 |
| Ship name | Walton Smith | Latitude | 26° |
| Date (YYYYMMDD) | 20180314 | Longitude | 76° |
| Time GMT (HHMM) | 1120 | Operator | efw |
| Calibration data | | | |
| Compass voltage gain (GCCA) | X 1835.32 | | |
| Correction voltage gain (GCORA) | X 909.97 | | |
| Electric field voltage gain (GEFA) | X 24971.54 | | |
| Electric field deviation (GEVFA) | 500.05 Hz/V | | |
| Compass deviation (GCVFA) | 495.64 Hz/V | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | Slightly shrunken | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | Constants from igt.m | |
| Turn on recorder | <input type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 1123 | | |
| Latitude in water | 26 11.956 | | |
| Longitude in water | 76 56.605 | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 1131 | | |
| End latitude | 26°12.11' | | |
| End longitude | 76°56.73' | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: | | | |
| Dx 25029.966 By - 3845.614 Bz 35515.770 WS18066 - 506 - 001 . MAT | | | |

XCP Deployment Log Sheet

| | | | |
|---------------------------------------|-------------------------------------|-----------------|------------|
| Cruise | WS18066 | XCP serial # | 15061030 |
| Ship name | Walton Smith | Latitude | 26° 12.625 |
| Date (YYMMDD) | 14/03/2018 | Longitude | 76° 57.163 |
| Time GMT (HHMM) | 12:32 | Operator | efw dge |
| Calibration data | | | |
| Compass voltage gain (GCCA) | X1836.12 | | |
| Correction voltage gain (GCORA) | X909.98 | | |
| Electric field voltage gain (GEFA) | X24969.27 | | |
| Electric field deviation (GEVFA) | 501.32 Hz/V | | |
| Compass deviation (GCVFA) | 49°5.42 Hz/V | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | both shrunken | |
| Remove probe retainer tape | <input type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 1240 | | |
| Latitude in water | 26° 12.68 | | |
| Longitude in water | 76° 57.205 | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 1249 | | |
| End latitude | 26° 12.76 | | |
| End longitude | 76° 57.27 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: | | | |
| WS18066 - 506 - 002 . MAT | | | |

XCP Deployment Log Sheet

| | | | |
|---------------------------------------|-------------------------------------|-------------------|----------|
| Cruise | WS18066 | XCP serial # | 15061040 |
| Ship name | R/V Walton Smith | Latitude | 26°13.26 |
| Date (YYYYMMDD) | 20180314 | Longitude | 76°57.63 |
| Time GMT (HHMM) | 1354 | Operator | DGE/EAJ |
| Calibration data | | | |
| Compass voltage gain (GCCA) | x 1835.20 | | |
| Correction voltage gain (GCORA) | x 908.83 | | |
| Electric field voltage gain (GEFA) | x 2495.10 | | |
| Electric field deviation (GEVFA) | 500.61 Hz/V | | |
| Compass deviation (GCVFA) | 495.20 Hz/V | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | Slightly shrunken | |
| Remove probe retainer tape | <input type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 1422 | | |
| Latitude in water | 26°13.73 | | |
| Longitude in water | 76°57.88 | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 1429 | | |
| End latitude | 26°13.90 | | |
| End longitude | 76°57.988 | | |
| Select <Exit Probe Drop> | <input type="checkbox"/> | | |
| Comments: | | | |
| WS18066-506-009.MAT | | | |

XCP Deployment Log Sheet

| | | | |
|---|-------------------------------------|-----------------|--------------|
| Cruise | WS18066 | XCP serial # | 15071042 |
| Ship name | R/V WALTON SMITH | Latitude | 26° 14.94 |
| Date (YYYYMMDD) | 20180314 | Longitude | 76° 58.68 |
| Time GMT (HHMM) | 1528 | Operator | DGE/EFV/ACNG |
| Calibration data | | | |
| Compass voltage gain (GCCA) | 1831.80 | | |
| Correction voltage gain (GCORA) | 917.13 | | |
| Electric field voltage gain (GEFA) | 24887.10 | | |
| Electric field deviation (GEVFA) | 500.13 Hz/V | | |
| Compass deviation (GCVFA) | SN 494.15 Hz/V | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 1539 ← | | |
| Latitude in water | 26° 15.17 | | |
| Longitude in water | 76° 58.83 | | |
| Begin recording ^{1 min before} | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 1546 | | |
| End latitude | 26° 15.32 | | |
| End longitude | 76° 58.93 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: WS18066_506_004.MAT | | | |

XCP Deployment Log Sheet

| | | | |
|---------------------------------------|-------------------------------------|-----------------|-----------|
| Cruise | WS1806G | XCP serial # | 15061002 |
| Ship name | R/V Walton Smith | Latitude | 26°16.29 |
| Date (YYYYMMDD) | 20180314 | Longitude | 76°59.63 |
| Time GMT (HHMM) | 1644 | Operator | DGS / EFW |
| Calibration data | | | |
| Compass voltage gain (GCCA) | 1835.06 | | |
| Correction voltage gain (GCORA) | 908.87 | | |
| Electric field voltage gain (GEFA) | 24919.32 | | |
| Electric field deviation (GEVFA) | 500.49 | | |
| Compass deviation (GCVFA) | 494.61 | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | partial shrink | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input type="checkbox"/> | | |
| <UW APL defaults> | <input type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 170.3 | | |
| Latitude in water | 26°16.59 | | |
| Longitude in water | 76°59.84 | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 1709 | | |
| End latitude | 26°16.69 | | |
| End longitude | 76°59.92 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: WS1806G-506-005.mat | | | |

XCP Deployment Log Sheet

| | | | |
|--|-------------------------------------|----------------------------|----------------|
| Cruise | WS1806G | XCP serial # | 15071030 |
| Ship name | R/V WALTON SMITH | Latitude | |
| Date (YYYYMMDD) | 20180314 | Longitude | |
| Time GMT (HHMM) | 2213 | Operator | DGE / ERW / KP |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | slightly shrunk | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input checked="" type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 2225 | | |
| Latitude in water | 25° 49.755' | | |
| Longitude in water | 77° 2.323' | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | WinMK Crashed, Audio only. | |
| End time | 2231 | | |
| End latitude | 25° 49.61' | | |
| End longitude | 77° 2.5' | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: 1035.WAV Cast 1 WS1806G-507-001.MAT | | | |

XCP Deployment Log Sheet

| Cruise | WS18066 | XCP serial # | 15061025 |
|--|-------------------------------------|-----------------|------------|
| Ship name | R/V Walton Smith | Latitude | |
| Date (YYYYMMDD) | 20190314 | Longitude | |
| Time GMT (HHMM) | | Operator | DGE/EFW/KP |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | Slightly shrunk | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input checked="" type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 2239 | | |
| Latitude in water | 25° 49.381 | | |
| Longitude in water | 77° 2.91 | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 2247 | | |
| End latitude | 25 49.218 | | |
| End longitude | 77 2.950 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: 1041, WAV Cast 2 WS18066-07-002.MAT | | | |

XCP Deployment Log Sheet

| Cruise | WS18066 | XCP serial # | 15071008 |
|---|-------------------------------------|---------------|----------|
| Ship name | R/V Walton Smith | Latitude | |
| Date (YYYYMMDD) | 20180314 | Longitude | |
| Time GMT (HHMM) | 2248 | Operator | |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | Very shrunken | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input checked="" type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 135 2254 | | |
| Latitude in water | 25° 49.14' | | |
| Longitude in water | 77° 3.45' | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 2301 | | |
| End latitude | 25° 49.00' | | |
| End longitude | 77° 3.5' | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: 1042.WAV Cast 3 WS18066-507-003 MAT lots of noise in profile. | | | |

XCP Deployment Log Sheet

| | | | |
|--|-------------------------------------|-----------------|----------|
| Cruise | WS18066 | XCP serial # | 15061004 |
| Ship name | R/V Walton Smith | Latitude | |
| Date (YYYYMMDD) | 20180314 | Longitude | |
| Time GMT (HHMM) | 2303 | Operator | |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | Shrink | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input checked="" type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 2306 | | |
| Latitude in water | 25° 48.88248 N | | |
| Longitude in water | 77° 03.91863 W | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 2314 | | |
| End latitude | 25° 48.724 | | |
| End longitude | 77° 3.94 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: | | | |
| 104K.WAV Cast 4 WS18066-307.004.MPT 3 | | | |

XCP Deployment Log Sheet

| | | | |
|--|-------------------------------------|-----------------|-----------|
| Cruise | WS18066.WAV | XCP serial # | 15061023 |
| Ship name | R/V Walton Smith | Latitude | |
| Date (YYYYMMDD) | 20180314 | Longitude | |
| Time GMT (HHMM) | 2323 | Operator | DGE/KP/SW |
| Calibration data | | | |
| Compass voltage gain (GCCA) | | | |
| Correction voltage gain (GCORA) | | | |
| Electric field voltage gain (GEFA) | | | |
| Electric field deviation (GEVFA) | | | |
| Compass deviation (GCVFA) | | | |
| Pre-deployment check | | Comments | |
| Remove tape from antenna | <input checked="" type="checkbox"/> | | |
| Remove electrode tape | <input checked="" type="checkbox"/> | | |
| Inspect agar jelly | <input checked="" type="checkbox"/> | One side stuck | |
| Remove probe retainer tape | <input checked="" type="checkbox"/> | | |
| Dry test probe transmission (20 secs) | <input checked="" type="checkbox"/> | | |
| Recording and WinMK21 set-up | | Comments | |
| <New Drop Express> | <input checked="" type="checkbox"/> | | |
| <UW APL defaults> | <input checked="" type="checkbox"/> | | |
| Turn on recorder | <input checked="" type="checkbox"/> | | |
| Deployment | | Comments | |
| Time in water | 2332 | | |
| Latitude in water | 25° 48.283 N | | |
| Longitude in water | 170° 5.002 W | | |
| Begin recording | <input checked="" type="checkbox"/> | | |
| Confirm RF quieting | <input checked="" type="checkbox"/> | | |
| Confirm probe release | <input checked="" type="checkbox"/> | | |
| Confirm probe signal data acquisition | <input checked="" type="checkbox"/> | | |
| End time | 2339 | | |
| End latitude | 25° 48.130 | | |
| End longitude | 170° 5.044 | | |
| Select <Exit Probe Drop> | <input checked="" type="checkbox"/> | | |
| Comments: | | | |
| 1046.WAV Cast 6. WS18066-507-006.MAT | | | |