Falkor 2018 cruise plan

1. Cruise information

Leg 1

Dates: Depart on 10 March and Return on 24 March 2018
Loading and briefing will commence on 8 March 2018
Address: UH Marine Center, 965 N. Nimitz Hwy, Honolulu, HI 96817
Research vessel: R/V Falkor
Cruise ID: FK180310_LegI
Chief scientist: Steve Poulos

Leg 2

Dates: Depart on 27 March and Return on 10 April 2018
Loading and briefing will commence on 25 March 2018
Address: UH Marine Center, 965 N. Nimitz Hwy, Honolulu, HI 96817
Research vessel: R/V Falkor
Cruise ID: FK180310_LegII
Chief scientist: Sam Wilson

Useful contact information:

- Steve Poulos: (office) 956-6650, (cell) 808-226-9543
- Sam Wilson: (office) 956-0573, (cell) 808-688-6141
- Tara Clemente: (office) 956-7779, (cell) 808-389-0544

Information about the Falkor and SOI: https://sites.google.com/a/schmidtocean.org/science_portal/

As the Falkor is a non-US vessel, all science personnel need to bring their passports which should be valid for 6 months beyond the cruise i.e. September 2018 and non-US citizens need to bring their visa paperwork

2. Scientific objectives and cruise structure

The main objective of the expedition is to conduct 4D mapping of the deep chlorophyll maximum within the center of a cyclonic eddy field. To achieve this objective, we will conduct Lagrangian 'drift' measurements following SVP drifters which transmit their position every 30 mins. To identify the optimal position of our sampling location, the shipboard ADCP will be monitored as we transit through the center of the eddy feature (Figure 1). At the approximate center, we will deploy a single Lagrangian SVP drifter which will serve as the reference point while we continue our transit north. Upon returning to the center of the eddy, two additional floats – a surface (15 m) and deep (120 m) Lagrangian SVP drifter will be deployed which will be the focal point for our water-column sampling. Based on previous measurements, it is anticipated that they will drift 2-3 km per day. Shipboard sampling will always occur within 0.5 mile of the deep drifter surface float. One of the LRAUVs will be deployed which will conduct undulating ('sawtooth') profiles in circular patterns centered on the DCM (Figure 4), and another will be deployed to conduct Lagranian sampling in "drift mode" over several diel cycles, within and above the DCM. A surface-based Waveglider will act as the communications module and transmit their positions in real-time. Additional autonomous instrumentation will also be deployed during this period and include a profiling float and a Wirewalker. During the sampling period, CTD casts will be conducted at sunrise, midday, and sunset. Samples will be collected at 5 m intervals between 90-150 m for nutrients, flow-cytometry based community analysis, and other relevant parameters. There will also be incubation arrays (productivity, N_2 fixation, sediment traps), bio-optical profiles, and seawater sampling via the TM-clean rosette.

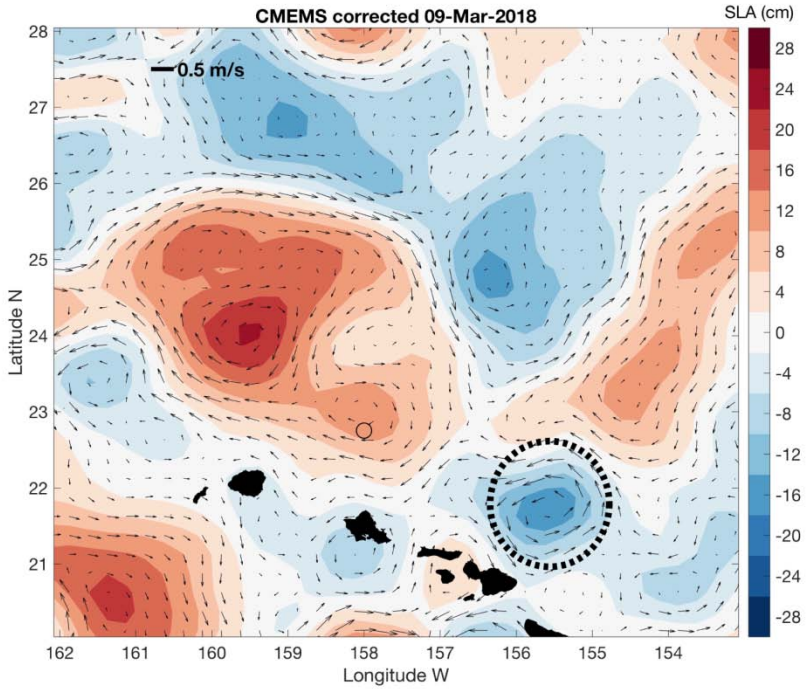

Figure 1. Chart showing Sea Level Anomaly (SLA) north of the Hawaiian Islands. The cyclone located at 22 N 155.5 W is the primary target at present.

3. Timetable

Table 1. Summary of operations for Leg One. Duration of operations based on ship travelling at 8 knots.

Latitude	Longitude	Date/Time Begin	Operation
21°20' N	158°16' W	March 10 0800	Test operations in vicinity of Station Kahe Deploy and Recover 3 x LRAUVs and 1 x Waveglider, Conduct 1 x CTD cast #1
Begin 21°20' N *End* 21°20' N	*Begin* 158°16' W *End* 156°30' W	*Begin* March 11 1700 *End* March 12 0600	120 mile deadhead transit to southwest edge of cyclonic eddy (Station B).
Begin 21°20’ N *End* 21°45' N	*Begin* 156°30' W *End* 155°38' W	*Begin* March 12 0600 *End* March 12 1500	60 mile transit at a speed of 8 knots to center of cyclonic eddy (Station C). Underway CTD operations every 15 mins
21°45' N	155°38' W	March 12 1500	Arrive at eddy center (Station C). Conduct CTD cast #2. Deploy surface drifter #1
Begin 21°45' N *End* 22°30' N	*Begin* 155°38' W *End* 155°00' W	*Begin* March 12 1700 *End* March 13 0500	60 mile transit at a speed of 8 knots to northeast edge of cyclonic eddy (Station D). Underway CTD operations every 15 mins.
22°30' N	155°00' W	March 13 0500	Arrive at NE edge of eddy. Conduct CTD cast #3. Deploy LRAUV Opah
Begin 22°30' N *End* 21°45' N	*Begin* 155°00' W *End* 154°45' W	*Begin* March 13 0800 *End* March 13 1300	40 mile transit to southeast edge of cyclonic eddy (Station E).
21°45' N	154°45' W	March 13 1300	Arrive at E edge of eddy. Conduct CTD cast #4. Deploy LRAUV Ahi. Deploy Seaglider #1
Begin 21°45' N *End* 22° 00' N	*Begin* 154°45' W *End* 154°45' W	*Begin* March 13 1600 *End* March 14 0800	Reposition to deployment site of Seaglider #2 (Station F).
21°45' N	155°38' W	March 14 0800	Transit to center of the cyclonic eddy (Station C)
21°45’ N	155°38 W	March 14 1600	Deploy deep drifter (and surface drifter if repositioning). Deploy Waveglider. Deploy Float. Deploy Wirewalker.
21°45’ N	155°38 W	March 15 1100	LRAUVs arrived at eddy center. Begin three days of high-res DCM mapping tracking the Lagrangian drifters
21°45’ N	155°38 W	March 18 1400	Begin three days of yo-yo profiles, tracking the Lagrangian drifters
21°45’ N	155°38 W	March 21 1400	Recovery of 2 x LRAUVs. 1 x Waveglider, 2 x Seagliders, 1 x WireWalker, 1 x profiling float, 1 x sediment trap array remaining in the water for Leg2
			If time in the schedule, transit to center of anticyclone and conduct CTD cast

Table 2. Summary of LRAUV operations for Leg One.

Mission #	LRAUV	Lat.	Long.	Date/Time Begin	Date/Time End	Operation
1	Opah	22°30' N	155°00' W	March 13 0700	March 15 0500	Opah deployed at the northern edge of the cyclonic eddy. Conducts yo-yo dives to the center of the eddy (Station C)
2	Ahi	21°45' N	154°45' W	March 13 1400	March 15 0500	Ahi deployed at the eastern edge of the cyclonic eddy. Conducts yo-yo dives to the center of the eddy (Station C)
3	Opah and Ahi	21°45' N	155°38 W	March 15 1100	March 18 1400	Both AUVs are at the center and are already in the water. Ahi begins donut-mode diel sampling. Opah conducts corkscrew sampling around Ahi. Opah and waveglider acoustically track Ahi.
4	Opah and Ahi	21°45' N	155°38 W	March 19 1600	March 21 1600	Depth-profiles
	Opah and Ahi	21°45' N	155°38 W	March 21 1600	March 21 1800	Recovery of LRAUVs

Table 3. Summary of LRAUV operations for Leg Two.

Mission #	LRAUV	Lat.	Long.	Date/Time Begin	Date/Time End	Operation
1	Opah and Ahi	26 N	158.5 W	March 29 1400	April 1 1400	Both AUVs deployed at the center of the cyclone. Ahi begins donut-mode diel sampling. Opah conducts corkscrew sampling around Ahi. Opah and waveglider acoustically track Ahi.
2	Opah and Ahi	26 N	158.5 W	April 1 1400	April 4 1400	Depth-profiles
	Opah and Ahi	26 N	158.5 W	April 5 0900	April 5 1200	Recovery of LRAUVs

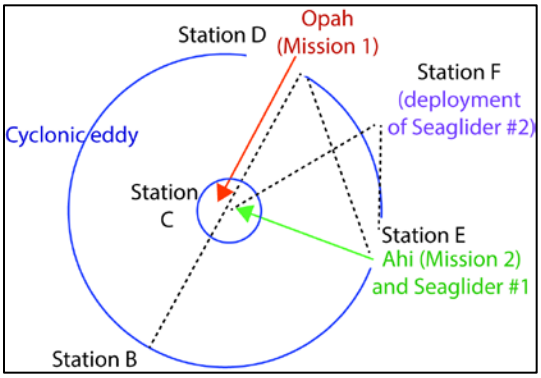

Figure 2. Schematic of the LRAUV missions #1 and #2 for Leg 1 in relation to the cyclonic eddy field shown in Figure 1.

4. Science personnel

Leg1

Name (male/female)	Position	Nationality	Institute
Tim Burrell (M)	Research Scientist	New Zealand	University of Hawaii
Tara Clemente (F)	Research Scientist	USA	University of Hawaii
Brett Hobson (M)	Engineer	USA	MBARI
Roman Marin (M)	Engineer	USA	MBARI
Tom O'Reilly (M)	Engineer	USA	MBARI
Steve Poulos (M)	Chief Scientist	USA	University of Hawaii
Chris Preston (F)	Research Scientist	USA	MBARI
Hans Ramm (M)	Engineer	USA	University of Hawaii
Anna Romano (F)	Research Scientist	USA	University of Hawaii
Brent Roman (M)	Engineer	USA	MBARI
Eric Shimabukuro (M)	Research Scientist	USA	University of Hawaii
Ryan Tabata (M)	Research Scientist	USA	University of Hawaii
Gabe Foreman (M)	Engineer	USA	University of Hawaii
Blake Watkins (M)	Engineer	USA	University of Hawaii
Fernanda Henderikx (F)	Scientist	Brazil	OSU
Angel White (F)	Scientist	USA	OSU
Elisha Wood-Charlson (F)	Research Scientist	USA	University of Hawaii
Yanwu Zhang (M)	Research Scientist	USA	MBARI

(*17 participants, 12 male, 5 female*)

Leg2

Name (male/female)	Position	Nationality	Institute	Lab Group
Kevin Becker (M)	Postdoctoral scholar	Germany	WHOI	(van Mooy lab)
Tim Burrell (M)	Research Scientist	NZ	U Hawaii	(SCOPE Ops)
Tara Clemente (F)	Research Scientist	USA	U Hawaii	(SCOPE Ops)
Paul Den Uyl (M)	Research Scientist	USA	U Hawaii	(DeLong lab)
Mathilde Dugenne (F)	Postdoctoral scholar	France	OSU	(White lab)
Gabe Foreman (M)	Engineer	USA	U Hawaii	(SCOPE Ops)
Rosie Gradoville (F)	Postdoctoral scholar	USA	UCSC	(Zehr lab)
Fernanda Henderikx (F)	Postdoctoral scholar	Brazil	OSU	(White lab)
Nick Hawco (M)	Postdoctoral scholar	USA	USC	(John lab)
Morgan Linney (F)	PhD student	USA	U Hawaii	(Karl lab)
Brian Kieft (M)	Engineer	USA	MBARI	(LRAUV)
Ana Maria Cabello (F)	Postdoctoral scholar	Spain	UCSC	(Zehr lab)
John Ryan (M)	Scientist	USA	MBARI	(Scholin/DeLong)
Gerianne Terlouw (F)	Research Scientist	Netherlands	U Hawaii	(Karl lab)
Tristy Vick-Majors (F)	Postdoctoral scholar	USA	UMontana	(Church lab)
Emma Wear (F)	Postdoctoral scholar	USA	UMontana	(Church lab)
Julia Weissenbach (F)	Postdoctoral scholar	Germany	Technion	(Lindell Lab)
Sam Wilson (M)	Chief Scientist	UK	U Hawaii	(SCOPE Ops)

(18 participants, 10 confirmed females, 8 confirmed males)

5. Scientific operations

Samples and data will be collected using a wide variety of instrumentation and incubation equipment that are summarized below. For all of the equipment that will be deployed, the University of Hawaii maintains a website which automatically updates with the latest position in the water. The website link is http://hahana.soest.hawaii.edu/hot/trackmap/TrackMap.html.

Summary of equipment

Description	Ship vs *in situ*	Deployment strategy	Comms	Person responsible	Leg 1 or 2
Falkor CTD-rosette	Ship	Starboard	n/a	*SCOPE*	Leg 1 & 2
Trace metal clean Niskin	Ship	Port?	n/a	*Nick H*	Leg 1 & 2
Underway CTD	Ship	Stern?	n/a	*SCOPE*	Leg 1
Hyperpro	Ship	Stern/A-frame	n/a	*Fernanda/Matilde*	Leg 2
Flow cytometer 'SeaFlow'	Ship	Sampling from uncontaminated seawater	n/a	*Armbrust/SCOPE*	Leg 1 & 2
Transmissometer	Ship	Sampling from uncontaminated seawater	n/a	*Fernanda/Matilde*	Leg 1 & 2
LRAUVs	In situ	LARS?	Iridium	*Steve/Gabe*	Leg 1 & 2
Waveglider	In situ	Crane	Iridium	*Steve/Gabe*	Leg 1 & 2
Seaglider	In situ	A-frame/tagline	Iridium	*Steve/Gabe*	Leg 1 & 2
Surface Velocity Program (SVP) drifters	In situ	Dropped from stern	Iridium	*Sam*	Leg 1 & 2
Drifting Bio-Argo float	In situ	A-frame/tagline	Iridium	*Fernanda*	Leg 1 & 2
Drifting Teledyne float	In situ	A-frame/tagline	Iridium	*Fernanda*	Leg 1 & 2
Drifting profiling Wirewalker systems	In situ	A-frame/tagline	Iridium	*SCOPE*	Leg 2
Sediment trap array	In situ	A-frame/winch	Iridium	*Karl/SCOPE*	Leg 2
Productivity array	In situ	A-frame/winch	Iridium	*Karl/SCOPE*	Leg 2
N2 fixation array	In situ	A-frame/winch	Iridium	*Karl/Zehr*	Leg 2
Incubation array (x3)	In situ	A-frame/winch	Iridium	*Church*	Leg 2
Incubation array	In situ	A-frame/winch	Iridium	*Kevin/Julia*	Leg 2

Shipboard observations

- CTD & rosette operations (*SCOPE*) Vertical profiles of temperature, conductivity and depth will be made with an instrument package consisting of a Sea-Bird CTD attached to a 24-place rosette with 12 liter Niskin sampling bottles. We will need the ship's CTD winch and crane for these operations. Water samples for biogeochemical measurements will be collected on each cast. Additional CTD channels will be used for the following sensors: secondary temperature, secondary salinity, oxygen SBE43 sensor, Seapoint fluorometer, Wetlab fluorometer, c-star transmissometer, and scalar PAR sensor.

- Trace metal clean Niskin (*Nick*) Vertical profiles will be conducted for trace metal analysis using 5 liter Niskin sampling bottles. We will deploy the bottles using a trace metal clean delrin block and 1/4" Amsteel line using trace metal clean procedures

- Underway CTD (*SCOPE*) An underway CTD (Oceansciences) will be deployed from the stern of the ship during the cruise. The instrument uses a free-fall, internal-logging probe that is tethered to the ship by a high strength line that is loaded on a special tail spool before every cast. As the probe falls, the line on 8"" the tail spool is paid out at the same time as line is paid out from the winch on the ship, similar to the operation of an XBT or XCTD, but with the probe being recovered after each cast. The uCTD winch is used to recover the probe. The web link to the instrument is http://www.teledynemarine.com/underwayctd?BrandID=13. It is a different model to the Teledyne rapidCAST.

- Hyperpro (*Fernanda/Matilde*): Daily deployments of Satlantic radiometer to characterize irradiance and radiance. The Hyperpro is a profiling unit with one up-looking and one down-looking hyperspectral radiometer, a WET Labs ECO- BB2F triplet (measuring Chlorophyll-a fluorescence and backscattering in the blue and red wavelengths), temperature and conductivity sensors. This instrument also incorporates a ship mounted surface radiometer. The Hyperpro will be deployed from the stern through a small block hung from the A-frame. The instrument is hand-lowered and retrieved with assistance from the winch.

Shipboard instrumentation sampling from uncontaminated seawater supply

- Flow cytometer 'SeaFlow' (*Armbrust/SCOPE*). This instrument provides continuous measurements of cell abundance and cell size distributions will be used to generate hourly estimates of Prochlorococcus and other picophytoplankton growth and loss rates.

- Transmissometer (*Matilde*) This instrument is configured to auto-sample whole water for 50 mins and 0.2 μm filtered seawater for 10 mins at hourly intervals from the ship's underway system.

***In situ* autonomous vehicles**

- Long Range Autonomous Underwater Vehicles (*Steve/Gabe*) LRAUVs are 2.5 m in length, weigh 120 kg, and can support an 8 W sensor payload when travelling at 1 m/sec. The vehicles are based off the MBARI Tethys AUV design

- Waveglider (*Steve/Gabe*) A Waveglider (Liquid Robotics) will sit at the surface, equipped with sensors to conduct its own independent operations, and also act as a communication relay or 'mule' between one of the deployed LRAUVs and the R/V Falkor.

- Seaglider (*Steve/Gabe*): We anticipate deploying one Seaglider during the cruise to survey the region of interest. It is possible that the glider will be recovered during the course of the cruise.

Free drifting floats, nets, and arrays

For the free-drifting arrays that are used to incubate seawater samples, we would like to deploy them off the stern using the A-frame and a winch which we will bring with us. The winch we are currently bringing is a 460 VAC 3 ph, similar to a SeaMac 1025EHS winch..

- SVP Drifters (*Wilson*) We will deploy two Surface Velocity Program (SVP) drifters that comprise of a spherical surface float (equipped with a solar LED) and a "holey-sock" drogue. One drifter will be centered at 15 m below the surface and the other at 120 m below the surface. The drifter transmits its position using iridium and drift along with the surface. We will sample alongside

two drifters whose location is transmitted every 30 minutes. The positions are recorded at PacificGyre.com (username C-MORE, login microstar) and are transmitted via email to sdrifter@soest.hawaii.edu. They can also be forwarded to any email account that the UH Marine Center or the Falkor would like to receive them at.

- APEX float (*Fernanda*) One Bio-Argo APEX-style profiling float will be deployed. The float weighs approximately 75 pounds and can be handled by a single person. The float can be deployed using the ship's A-frame and a tag-line. Once deployed in the water, the instrument will sink and self-activate. At the end of the cruise, the float will be recovered using the small boat, weather-permitting.

- Teledyne Webb float (*Fernanda*) The profiling float weighs approximately 75 pounds and can be handled by a single person. The float can be deployed using the ship's A-frame and a tag-line. Once deployed in the water, the instrument will sink and self-activate. At the end of the cruise, the float will be recovered using the small boat, weather-permitting.

- Drifting profiling systems (*SCOPE*) Two wave-powered drifting profiling systems (Wirewalker, Del Mar Oceanographic) will be deployed in the first days of the cruise and recovered after 10-15 days. We request the use of the A-frame and the Sea-Mac winch for deployments and recoveries. Profiling systems are equipped with two ARGOS satellite transmitters (platform # emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), and a strobe light.

- Sediment trap arrays (*Karl*) A floating sediment trap array will be deployed in the first few days of the cruise, and recovered toward the end of the cruise. The arrays will drift for about 6-7 days before recovery. Arrays are equipped with ARGOS satellite transmitters (platform #'s), strobe lights, and radio transmitters (channel , MHz).

- Productivity array (*Karl*) Pre-dawn, a free drifting incubation array will be deployed for a 12 hr period to measure primary production. The array will be recovered at dusk

- Incubation arrays (*Church, Karl*) Free-drifting incubation arrays will be deployed multiple times during the cruise, for 12, 24 and 72 hours deployments. We request the use of the A-frame and the Sea-Mac winch for deployments and recoveries. Arrays are equipped with two ARGOS satellite transmitters, a strobe light and a radio transmitter.

Ship: R/V *Falkor* **Date: 10 March – 24 March** **Sunrise: 0630 Sunset: 1830**

<table>
<tr><th>TIME</th><th>Saturday 3/10</th><th>Sunday 3/11</th><th>Monday 3/12</th><th>Tuesday 3/13</th><th>Wednes 3/14</th></tr>
<tr><td>0000</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>0100</td><td></td><td></td><td></td><td></td><td></td></tr>
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<tr><td>0300</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>0400</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>0500</td><td></td><td></td><td>Arrive at Station B</td><td>Arrive at Station D</td><td></td></tr>
<tr><td>0600</td><td></td><td></td><td rowspan="5">Begin eddy survey with underway CTD profiles every 15 mins and ship travelling at 8 knots</td><td>CTD cast #3</td><td>Deploy Seaglider #2</td></tr>
<tr><td>0700</td><td></td><td></td><td>Deploy LRAUV Opah</td><td>Transit to eddy center</td></tr>
<tr><td>0800</td><td>Cruise departs</td><td></td><td>Transit to SE edge of eddy (Station E)</td><td>CTD cast #5</td></tr>
<tr><td>0900</td><td>Fuel dock</td><td>CTD cast #1</td><td></td><td></td></tr>
<tr><td>1000</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1100</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1200</td><td>Transit to test station</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1300</td><td></td><td></td><td></td><td>Arrive at SE of eddy (Station E)</td><td>Arrive at eddy center</td></tr>
<tr><td>1400</td><td></td><td></td><td></td><td>Deploy LRUV Ahi</td><td rowspan="2">Deploy deep SVP drifter and potentially surface</td></tr>
<tr><td>1500</td><td>Deploy 3 LRAUVs and 1 Waveglider</td><td></td><td>Arrive at eddy center (Station C)</td><td>Deploy Seaglider #1</td></tr>
<tr><td>1600</td><td></td><td>Recover 3 LRAUVs and 1 Waveglider</td><td>Deploy SVP drifter #1</td><td>CTD cast #4</td><td>Deploy profiling float</td></tr>
<tr><td>1700</td><td rowspan="2">Begin 1 day of engineering and communications testing</td><td></td><td>CTD cast #2</td><td></td><td>Deploy Wirewalker</td></tr>
<tr><td>1800</td><td></td><td></td><td>Transit to second SG deployment site</td><td>CTD cast #6</td></tr>
<tr><td>1900</td><td></td><td rowspan="4">Deadhead 10 knot transit to SW edge of cyclonic eddy (Station B)</td><td rowspan="5">Continue eddy survey with underway CTD profiles every 15 mins and ship travelling at 8 knots</td><td></td><td></td></tr>
<tr><td>2000</td><td></td><td></td><td></td></tr>
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Ship: R/V *Falkor* **Date: 10 - 24 March** **Sunrise: 0630 Sunset: 1830**

TIME	Thursday 3/15	Friday 3/16	Saturday 3/17	Sunday 3/18	Monday 3/19
0000					
0100					
0200					
0300					
0400	LRAUVs return to eddy center				
0500					
0600	CTD cast #5	CTD cast #9	CTD cast #13	CTD cast #17	CTD cast #21
0700					
0800					
0900					
1000					
1100	Begin LRAUV mission #3				
1200	CTD cast #6	CTD cast #10	CTD cast #14	CTD cast #18	CTD cast #22
1300	HyperPro	HyperPro	HyperPro	HyperPro	HyperPro
1400				End LRAUV mission #3	
1500	CTD cast #7	CTD cast #11	CTD cast #15	CTD cast #19	CTD cast #23
1600				Begin LRAUV mission #4	
1700					
1800	CTD cast #8	CTD cast #12	CTD cast #16	CTD cast #20	CTD cast #24
1900					
2000					
2100					
2200					
2300					

Ship: R/V *Falkor* **Date: 10 - 24 March 2018** **Sunrise: 0630 Sunset: 1830**

TIME	Tuesday 3/20	Wednesday 3/21	Thursday 3/22	Friday 3/23	Saturday 3/24
0000					
0100					
0200					
0300					
0400					
0500					
0600	CTD cast #25	CTD cast #28			Arrive in port
0700					
0800					
0900			Arrive at center of anticyclonic eddy		
1000			CTD cast #34		
1100					
1200	CTD cast #26	CTD cast #32			
1300	HyperPro	HyperPro			
1400					
1500	CTD cast #27	CTD cast #33			
1600		End LRAUV Mission #4			
1700		Recovery of LRAUVs			
1800	CTD cast #30	Deploy sediment traps			
1900		Transit to anticyclonic eddy			
2000					
2100					
2200					
2300					

Time	Depth	Sample	#Bottles
Station Kahe			
S1C1	800m	O2 and chl 1@770,700, 600, 500,400,300,200,175,150,100,75,45,25,5 (Sensor cal)	
Center of cyclone			
S2C1	400m		
Northern edge of cyclone			
S3C1	400 m	AR 1@5,25,75,100,125, DCM +/- 3 depths, 150,175,200	
Southeastern edge of cyclone			
S4C1	400m	AR 1@5,25,75,100,125, DCM +/- 3 depths, 150,175,200	
Second seaglider deployment site			
S5C1	400m		
Second seaglider deployment site			
S6C1	400m		
March 15			
S7C1	400m	AR 1@25, DCM, 200	
S8C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S9C1	400m	AR 1@25, TC 2@5, 25, 45, 75, 100, 125, 150, 175 (Biogeochem cast)	
S10C1	400m	AR 1@25, DCM, 200	
March 16			
S11C1	400m	AR 1@25, DCM, 200	
S12C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S13C1	400m	AR 1@DCM	
S14C1	400m	AR 1@25, DCM, 200	
March 17			
S15C1	400m	AR 1@25, DCM, 200	
S16C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S17C1	400m	AR 1@200	
S18C1	400m	AR 1@25, DCM, 200	

Time	Depth	Sample	#Bottles
March 18			
S19C1	400m	AR 1@25, DCM, 200	
S20C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S21C1	800m	AR 1@25; TC O2 and chl 1@770,700, 600, 500,400,300,200,175,150,100,75,45,25,5	
S22C1	400m	AR 1@25, DCM, 200	
March 19			
S23C1	400m	AR 1@25, DCM, 200	
S24C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S25C1	400m	AR 1@DCM	
S26C1	400m	AR 1@25, DCM, 200	
March 20			
S27C1	400m	AR 1@25, DCM, 200	
S28C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S29C1	400m	AR 1@200	
S30C1	400m	AR 1@25, DCM, 200	
March 21			
S31C1	400m	AR 1@25, DCM, 200	
S32C1	400 m	AR 1@25, DCM, 200; TC1@15, DCM +/- 3 depths (FCM and Nuts)	
S33C1	400m	AR 1@25; TC 2@5, 25, 45, 75, 100, 125, 150, 175 (Biogeochem cast)	
S34C1	400m	AR 1@25, DCM, 200	

Anna Ritchie (AR), Tara Clemente (TC),

Ship: R/V *Falkor* **Date: 27 March – 10 April** **Sunrise: 0630 Sunset: 1830**

TIME	Tuesday 3/27	Wednesday 3/28	Thurs 3/29	Friday 3/30	Saturday 3/31
0000					CTD cast #13 AC
0100					
0200				CTD cast #7	CTD cast #14
0300			CTD cast #3 KB		
0400				Array KB #2 out	Array PP#1 in
0500			Array KB#1 in	Array TV#1and Gas#1 in	Array TV#1 and Gas#1 out
0600			CTD cast #4	CTD cast #8	CTD cast #15
0700					
0800	Cruise departs Transit to eddy				
0900					
1000			TM cast	TM cast	TM cast
1100					
1200			CTD cast #5	CTD cast #9	CTD cast #16
1300			HyperPro	HyperPro	HyperPro
1400		Arrival at eddy			
1500		Deploy LRAUVs		CTD cast #10 AC	CTD cast #17 AC
1600		Deploy anyother gear from Leg 1			
1700					
1800		CTD cast #1	CTD cast #6	CTD cast #11	CTD cast cast #18
1900		CTD cast #2	Array KB#1 out Array KB #2 in	Array NH#1 in	Array PP#1 out
2000					
2100				CTD cast #12 AC	CTD cast #19 AC
2200					
2300					

Ship: R/V *Falkor* **Date: 27 March – 10 April** **Sunrise: 0630 Sunset: 1830**

TIME	Sunday 4/01	Monday 4/02	Tuesday 4/03	Wednesday 4/04	Thurs 4/05
0000	CTD cast #20 AC	CTD cast #28 AC			
0100					
0200	CTD cast #21	CTD cast#29	CTD cast#33		CTD cast #41
0300	CTD cast #22KB			CTD cast #37	
0400		Array KB #4 out	Array PP#2 in		Array KB #5 out
0500	Array KB#3 in	Array TV#2 and Gas#2 in	Array TV#2 and Gas#2 out	Array KB#5 in	Array TV#3 and Gas#3 in
0600	CTD cast#23	CTD cast #30	CTD cast #34	CTD cast #38	CTD cast #42
0700					
0800					
0900					
1000	TM cast	TM cast	TM cast	TM cast	TM cast
1100					
1200	CTD cast #24	CTD cast#31	CTD cast #35	CTD cast #39	CTD cast #42
1300	HyperPro	HyperPro	HyperPro	HyperPro	HyperPro
1400					
1500	CTD cast #25 AC				
1600					
1700					
1800	CTD cast #26	CTD cast#32	CTD cast #36	CTD cast #40	CTD cast #44
1900	Array KB#3 out Array KB #4 in		Array PP#2 out	Array KB#5 out Array KB #6 in	Array NH#1 out
2000					Array sedtrap#1 out
2100	CTD cast #27 AC				
2200					
2300					

Ship: R/V *Falkor* **Date: 27 March – 10 April** **Sunrise: 0630 Sunset: 1830**

TIME	Friday 4/06	Saturday 4/07	Sunday 4/08	Monday 4/09	Tuesday 4/10
0000					
0100					
0200			CTD cast#51		
0300		CTD cast #47			
0400			Array Gas#4 in		
0500	Array TV#3 out Array Gas#3 out		Array PP#3 in	Array Gas#4 out	
0600	Recovery of floats		CTD cast#52	Transit Home	
0700	Recovery of Wirewalkers	CTD cast #48			
0800	Recovery of Waveglider				
0900	Recovery of LRAUVs		TM cast		
1000					
1100		Arrive at center of anticyclone			
1200	Transit across frontal area	CTD cast #49	CTD cast#53		
1300		HyperPro	HyperPro		
1400					
1500					
1600	CTD cast #45				
1700					
1800		CTD cast #50	CTD cast#54		
1900	Transit across frontal area		PP array #3 out		
2000	CTD cast #46				
2100					
2200					
2300					

Time	Depth	Sample		#Bottles
28 March				
S1C1	400m	JW collect ultra-filtered water RG 1@5, 15, 25, 35, 45, 55, 75, 85, 100		
S2C1	400m	O2 and chl 1@400,300,200,175,150,125,100,75,45,25,5		
29 March				
S3C1	400m	KB 4@15, 4@125, JW 2@15, 2@125		
S4C1	400 m	TC 2@5, 25, 45, 75, 100, 125, 150, 175 GT 1@5,25, KB1@25,125		19
S5C1	400 m	PD 1@25,DCM,200		
S6C1	400 m	PD 1@25,DCM,200, GT 1@5,25 KB 4@15, 4@125, JW 2@15, 2@125		
30 March				
S7C1	400m	SW 3@5, 25, 45, 75, 100, 125 TVM 1@ 100, 125, 150, 175, 200, 300, 500, 750 m		24
S8C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125	19	
S9C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125		
S10C1	100 m	AC 1@15,75,125		
S11C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125		
S12C1	100 m	AC 2@5,75,125		
31 March				
S13C1	100 m	AC 2@5,75,125		
S14C1	400 m	GT 1@5, 25, 45, 75, 100, 125, AC 2@5,75,125		
S15C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125		
S16C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125		
S17C1	100 m	AC 2@5,75,125		
S18C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125		
S19C1	100 m	AC 2@5,75,125		

1 April

S20C1	100 m	AC 2@5,75,125	
S21C1	100 m	AC 2@5,75,125	
S22C1	100 m	KB 4@15, 4@125, JW 2@15, 2@125	
S23C1	400 m	AC 2@5,75,125, PD 1@25,DCM,200 GT 1@5,25, KB1@25,125	
S24C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125	
S25C1	400 m	AC 2@5,75,125	
S26C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125	
S27C1	100 m	AC 2@5,75,125	

2 April

S28C1	100 m	AC 2@5,75,125	
S29C1	600m	SW 3@5, 25, 45, 75, 100, 125, AC 2@5,75,125 TVM 1@ 100, 125, 150, 175, 200, 225, 475, and 550	24
S30C1	400 m	PD 1@25,DCM,200, AC 2@5,75,125 GT 1@5,25, KB1@25,125	
S31C1	400 m	PD 1@25,DCM,200	
S32C1	400 m	PD 1@25,DCM,200 GT 1@5,25, KB1@25,125	

3 April

S33C1	400 m	GT 1@5, 25, 45, 75, 100, 125	
S34C1	400 m	PD 1@25,DCM,200, TC 2@5, 25, 45, 75, 100, 125, 150, 175 GT 1@5,25, KB1@25,125	
S35C1	400 m	PD 1@25,DCM,200	
S36C1	400 m	PD 1@25,DCM,200 GT 1@5,25, KB1@25,125	

4 April

S37C1	400 m	KB 4@15, 4@125, JW 2@15, 2@125	
S38C1	400 m	PD 1@25,DCM,200, GT 1@5,25 TC - Anitra	
S39C1	400 m	PD 1@25,DCM,200	
S40C1	400 m	GT 1@5,25, KB1@25,125	

5 April

S41C1 800 m SW 3@5, 25, 45, 75, 100, 125
TVM 1@ 100, 125, 150, 175, 200, 300, 500, 750

S42C1 400 m GT 1@5,25, RG 1@5, 25, 45, 75, 100, 125
TC – Sonya, Dave C

S43C1 400 m PD 1@5,25,75,100,125, DCM +/- 3 depths, 150,175,200

S44C1 400 m O2 and chl 1@400,300,200,175,150,125,100,75,45,25,5

Kevin Becker (KB), Tara Clemente (TC), Paul Den Uyl (PD), Rosie Gradoville (RG), Morgan Linney (ML), Ana Maria Cabello (AC), Gerianne Terlouw (GT), Tristy Vick-Majors (TVM), Emma Wear (EW), Julia Weissenbach (JW), Sam Wilson (SW), (AI) Anitra Ingalls, SD (Sonya Dyhrman)

6 April

S44C1 400 m EW 1@25,DCM, TC 1@5, 25, 45, 75, 100, 125 (FCM, Nuts, PC/PN/PPO4)

S45C1 400 m EW 1@25,DCM, TC 1@5, 25, 45, 75, 100, 125 (FCM, Nuts, PC/PN/PPO4)
PD 1@5,25,75,100,125, DCM +/- 3 depths, 150,175,200

7 April

S46C1 400 m EW 1@25,DCM, TC 1@5, 25, 45, 75, 100, 125 (FCM, Nuts, PC/PN/PPO4)

S47C1 400 m EW 1@25,DCM, TC 1@5, 25, 45, 75, 100, 125 (FCM, Nuts, PC/PN/PPO4)

Anticyclone
S48C1

S49C1

8 April

S50C1

S51C1 400 m AI(TC) 8@25,DCM,400

S52C1 400 m PD 1@5,25,75,100,125, DCM +/- 3 depths, 150,175,200

S53C1