



RV Investigator Voyage Plan

VOYAGE #:		IN2026_V06
Version Number:	FINAL	
Voyage title:	The Pacific Ocean physical, biogeochemical and biological environmental diversity: Tropics to Pole evolution (P-TROPOE)	
Mobilisation Leg 1:	Lautoka, Fiji, Saturday 26 September 2026	
Depart Leg 1:	Lautoka, Fiji, 1500 Sunday 27 September 2026	
Return Leg 1:	Wellington, NZ, Thursday 5 November 2026	
Mobilisation Leg 2:	Wellington, NZ, Wednesday 11 November 2026	
Depart Leg 2:	Wellington, NZ, 1500 Thursday 12 November 2026	
Return Leg 2:	Hobart, Wednesday 16 December 2026	
Demobilisation:	Hobart, Wednesday 16 December 2026	
VDC & VM Leg 1	Claire Grubb	
VM Leg 2:	Tegan Sime	
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Scientific objectives

The oceans have absorbed about 25% of the anthropogenic CO₂ and 93% of the resulting excess heat of the climate system, leading to ocean warming and acidification (Bindoff et al. 2019 and references therein). Our knowledge of how the oceans are changing with climate change has come from decadal observations. This project will measure the ocean structure and capture change along the critical 170°W section from the tropics to the pole as part of Australia's commitment to the GO-SHIP global collaboration.

In the Pacific Ocean, heat and carbon uptake has impacted the marine environment and ecosystems. At the Antarctic margins, the ocean circulation and sea-ice conditions have changed. Upwelled warm deep water has increased glacial ice mass loss and accelerated sea level rise. In the mid-low latitudes, sea level rise, ocean warming, and acidification have resulted in coastal flooding, increased ocean stratification, coral reef stress, and impacts on carbonate-producing organisms. Yet the highly intertwined relationships and feedback among the physical, biogeochemical, and biological ocean are still poorly understood.

The voyage will undertake multidisciplinary, full-depth physical, biogeochemical, and biological measurements to identify and quantify the key processes driving changes in the ocean's environmental properties and biological systems; provide new insights into the interactive relationships that exist among physical, biogeochemical, and biological environments from pole to equator and surface to deep ocean, including the identification of potential tipping points and major disruptors; and extend high-precision baseline data sets used to calibrate autonomous observations such as floats, gliders, moorings, and satellites, as well as to improve Earth system models.

These data, combined with other observational data and numerical models, will allow for the detection and attribution of ocean change and for more reliable climate predictions and projections. These predictions are used to guide adaptation and mitigation policy, critically needed by Australia and Pacific Island nations.

Voyage objectives

We will follow the standard operating procedures and accuracy of GO-SHIP and Bio-GO-SHIP (www.go-ship.org, <https://repository.oceanbestpractices.org/handle/11329/371>).

At Sea Methods

CTD Sensors and Operations: We will optimise use of the CTD data cable to collect CTD/O₂/Biological Optical sensors. Bio-optical sensors will include fluorescence and backscatter (Eco FLBB sensor), multi-spectral downwelling irradiance sensor, and transmissometer. The MNF lowered Acoustic Doppler Current Profiler (L-ADCP) instruments (150 kHz and 300 kHz) will collect full-depth horizontal velocity.

Rosette Water Samples: The 36 Niskin bottles will provide 12 L of in situ water for full nutrient, chemical and biological samples. The water budget will be tightly monitored due to heavy use. We will follow a strict water sampling order to ensure the highest quality samples. The water sampling order will be: (1) Oxygen, (2) Dissolved Organic Carbon, (3) Alkalinity, (4) Nutrients, (5) Salinity, (6) Oxygen isotope, (7) HPLC, (8) phytoplankton, (9) Omics, and (10) Flow cytometry. This order ensures that highly unstable gas samples are sampled immediately once a Niskin bottle is opened, less reactive samples follow, and large-volume samples are taken last. All samplers will be trained to produce high-quality samples that minimise water waste. During the downcast the CTD watch leader will determine water sampling depths and, in collaboration with sampling teams, nominate depth(s) for duplicate bottle samples.

Samples will be analysed onboard for nutrients (silicate, phosphate, nitrate, nitrite, ammonium; spectrophotometry), dissolved oxygen (Winkler titration), dissolved inorganic carbon (coulometry), pH (spectrophotometry), and total alkalinity (open cell potentiometric titration). Oxygen isotope samples will be stored in the fridge and off-loaded in Hobart at the end of leg 2 for analysis on shore-based laboratories.

We will align our workflows with the newly developed Bio-GO-SHIP procedures for sampling HPLC (pigments), omics, flow cytometry and particulate absorption (filter pad). Pigment, omics and particulate absorption samples are drawn from the Niskin bottles and/or underway line, filtered, and frozen at –80°C and held on the vessel until the end of leg 2 and then off-loaded for analysis on shore.

Triaxus: We will deploy the Triaxus along the equator between 168° 45.13W to 170° 00.00 W to observe the upper ocean (0-300 m) structure across the boundary of the Pacific equatorial warm pool and cold tongue. Combining the triaxus upper ocean data, with shipboard ADCP and atmospheric data will provide a comprehensive data set for the investigation of the air-sea exchange and fluxes across this important dynamical region. The Triaxus tow starting longitude and duration will be determined at the start of Leg 1 based on real-time observations in order to capture the targeted structure.

Underway Data: We will also collect underway ocean current, sea surface temperature and salinity, surface pCO₂, O₂, nutrients,, discrete sampling for biological optics (pigments (HPLC), particulate absorption), and meteorological data (wind speed, heat and freshwater fluxes, hyperspectral solar radiation). Omics sampling will be carried out by an automated underway sampling system. A FlowCytobot system can be installed to carry out high-frequency underway flow cytometry measurements.

Autonomous Ocean Platforms: We will deploy a total of 18 Argo floats including core, BGC, and deep floats, for the Australian, US and New Zealand One Argo programs. Floats will be deployed at the end of various CTD stations or on the transit from the P15S hydrographic sections.

All floats will be stored in the dirty wet laboratory following a storage plan that will enable easy access and identification of floats to avoid any confusion at sites deployment. A dedicated science team member in each shift will be in charge of coordinating float access, pre-deployment checks and deployment procedures with ship crew.

We will also deploy BOM and NOAA supplied surface drifters, part of the Global Drifter Program. 10 drifters are allocated to each leg. As for the floats, the drifters will be deployed after completing a CTD station, at selected sites between the equator and 10S in the first leg, and 45S and 60S in the second leg. Deployment locations are approximate at the time of writing, and will be refined during the voyage based on local conditions to better target particular surface currents.

MNF Sustained Observation Program

The CSIRO Marine National Facility (MNF) operates a Sustained Observation Program (SOP) through the collection and analysis of a range of parameters. Where it does not conflict with Primary or Supplementary voyage activities, the MNF may undertake the following data collection and deployment activities:

- Meteorological data collection with Weather Radar and meteorological measurement suite
- Atmospheric aerosol, greenhouse gas, and reactive gas data collection with a suite of air sampling instrumentation
- Surface temperature, salinity and biogeochemical parameters with a suite of seawater sensors
- Bathymetry and geophysical data collection with multibeam echosounders, backscatter, sound velocity, and gravity measurement systems
- Water column data measurement with XBT deployments and on-board ADCP systems (Expendable Bathy-Thermosalinograph, Acoustic Doppler Current Profiler)
- Measurement of the abundance and distribution of mid-trophic biology with bio-acoustic echosounder systems
- Mixed layer plankton collection with a towed CPR (Continuous Plankton Recorder)
- Deployment of ARGO floats

These activities contribute to national and global public data repositories including:

- Integrated Marine Observing System (IMOS)
- AusSeabed
- World Meteorological Organisation Global Atmosphere Watch (WMO-GAW)

Piggyback projects

Developing Jonathan: An On-vessel Automated Seabird Detector, Carlie Devine, Rich Little (CSIRO)

The objective of this project is to collect seabird counts using an automatic on-vessel seabird edge detector in coastal and open ocean environments.

Planned activities include:

During IN2026_V06 the camera, processor will operate while Investigator is underway. The system will be supervised remotely from Hobart with DAP support on the vessel. A daily csv report and mp4 trip files will be saved to system hardware and backed up by DAP, indicating the number of seabirds detected at specific time intervals throughout daylight hours.

The expected outcome of this project is to bring together the hardware and software needed for an on-vessel seabird Edge detector that will provide a running count of seabirds seen by a fixed camera over the course of a day on a sea-going vessel. Successful development of such a system will be the first step in providing more comprehensive and detailed baseline environmental data.

This project has the appropriate CWLLA AEC approval in place.

Ice to Equator 2: Clouds, climate and atmospheric chemistry across the Southern Pacific Ocean, Joel Alroe (QUT)

Aerosol–cloud–radiation interactions, which exert strong influences on Earth's radiative balance, remain poorly constrained due to limited understanding of the underlying processes, making them a major source of uncertainty in climate models. These inaccuracies are particularly evident over the Southern Ocean and arise from uncertainties in the fluxes, transport and cloud interactions of natural aerosols and their gaseous precursors. Similarly, at low latitudes, tropical convection and tropical cloud systems remain a major challenge for numerical weather prediction which is, in part, due to inadequate cloud and precipitation observations in this region. Investigations of each of these processes suffer from a severe lack of vertically resolved observations across the southern hemisphere.

The project will deliver a comprehensive, high-resolution survey of cloud, precipitation, and aerosol processes along a rare full transect of the southern Pacific Ocean, spanning the tropics to Antarctic waters. By integrating highly detailed continuous gas and aerosol measurements with vertically resolved remote sensing as well as daily aerosol filter sampling and radiosonde deployment, it will provide an invaluable dataset for assessing aerosol–cloud interactions. Building on the previous winter campaign (IN2016_V03), the voyage enables direct evaluation of seasonal contrasts associated with enhanced springtime biological activity. Furthermore, the broader P-TROPOE program synergises and strengthens the investigation, adding concurrent hydrochemical and biological measurements to support a systems level understanding of ocean–atmosphere interactions.

By addressing some of the largest remaining uncertainties in marine cloud and precipitation processes, this project will improve projections of storms and extreme rainfall in the tropics while enhancing our ability to anticipate Antarctica's accelerating response to climate change.

Time estimates

The following time estimates are based on a steaming speed between stations of 10 knots, CTD descent and retrieval speed of 60m/min (30s for each bottle stop), and 15 minutes for manoeuvring the vessel onto and off the station. A transit speed of 11 knots is used for transit times between departure/arrival ports.

Leg 1 – Lautoka -> Wellington

After departing Lautoka, Fiji, complete ship inductions and finish setting up and securing laboratories. Our first test CTD is approximately a 70 hour transit from Lautoka. We will undertake a CTD to a maximum depth of 2000m at this CTD site. This CTD station will be used to training science personal on CTD deployment and recovery procedures and water sampling methods.

Once the test CTD station is completed we will continue to transit to the equator – a 42 hour transit from test CTD station. When we reach the equator, we will deploy the Triaxus and tow this until we reach the first CTD of the GO-SHIP P15S section (168 45.13'W, 0.31'N).

DATE	ACTIVITY
27/09/2026	0900-0930: Science party arrival and getting onboard 0930-1100: Seagoing induction, ship tour 1100-1300: Cabin install & lunch 1200: MNF latest possible arrival 1230: MNF seagoing induction 1300-1400: Muster & Passport control 1500: Departure & transit to Test CTD (~70hrs transit) 1600: VM Briefing
30/09/2026	Test CTD (CTD 1)
30/09/2026	Transit to Equator (~42hrs)
2/10/2026 – 4/10/2026	Triaxus tow – start point and length to be determined closer to departure
4/10/2026 – 16/10/2026	CTD2 – CTD40
17/10/2026	Anchorage at Pago-Pago for hull cleaning verification (TBC)
18/10/2026 – 31/2026	CTD41 – CTD89
31/10/2026	Transit into Wellington (2 weather days buffering this date)
5/11/2026	Arrival & Disembarkation

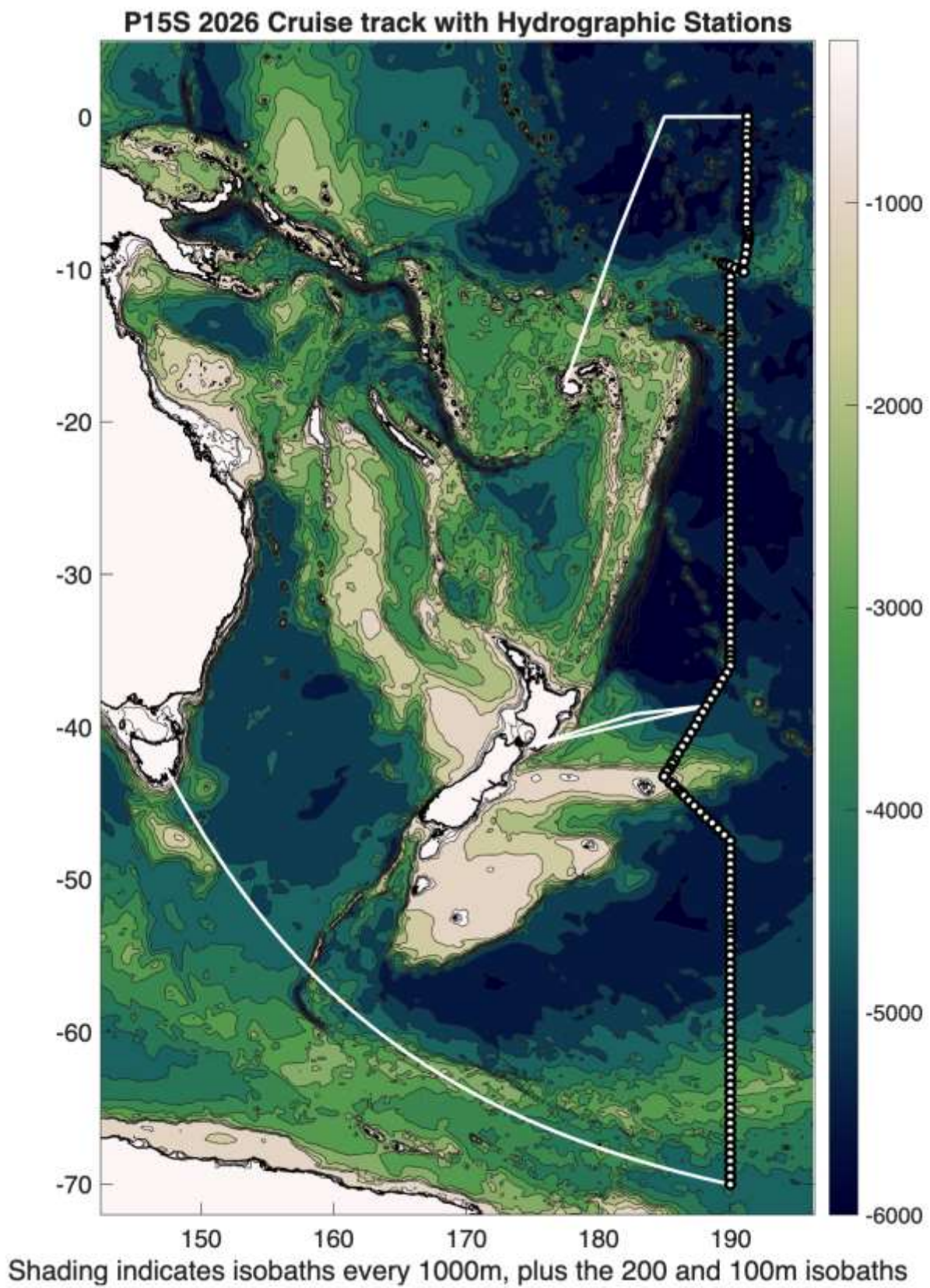
Leg 2 – Wellington -> Hobart

After departing Wellington, NZ, complete ship inductions and finish setting up and securing laboratories. Our first test CTD is approximately a 40 hour transit from Wellington. We will undertake a CTD to a maximum depth of 2000m at this CTD site. This CTD station will be used to training science personal on CTD deployment and recovery procedures and water sampling methods.

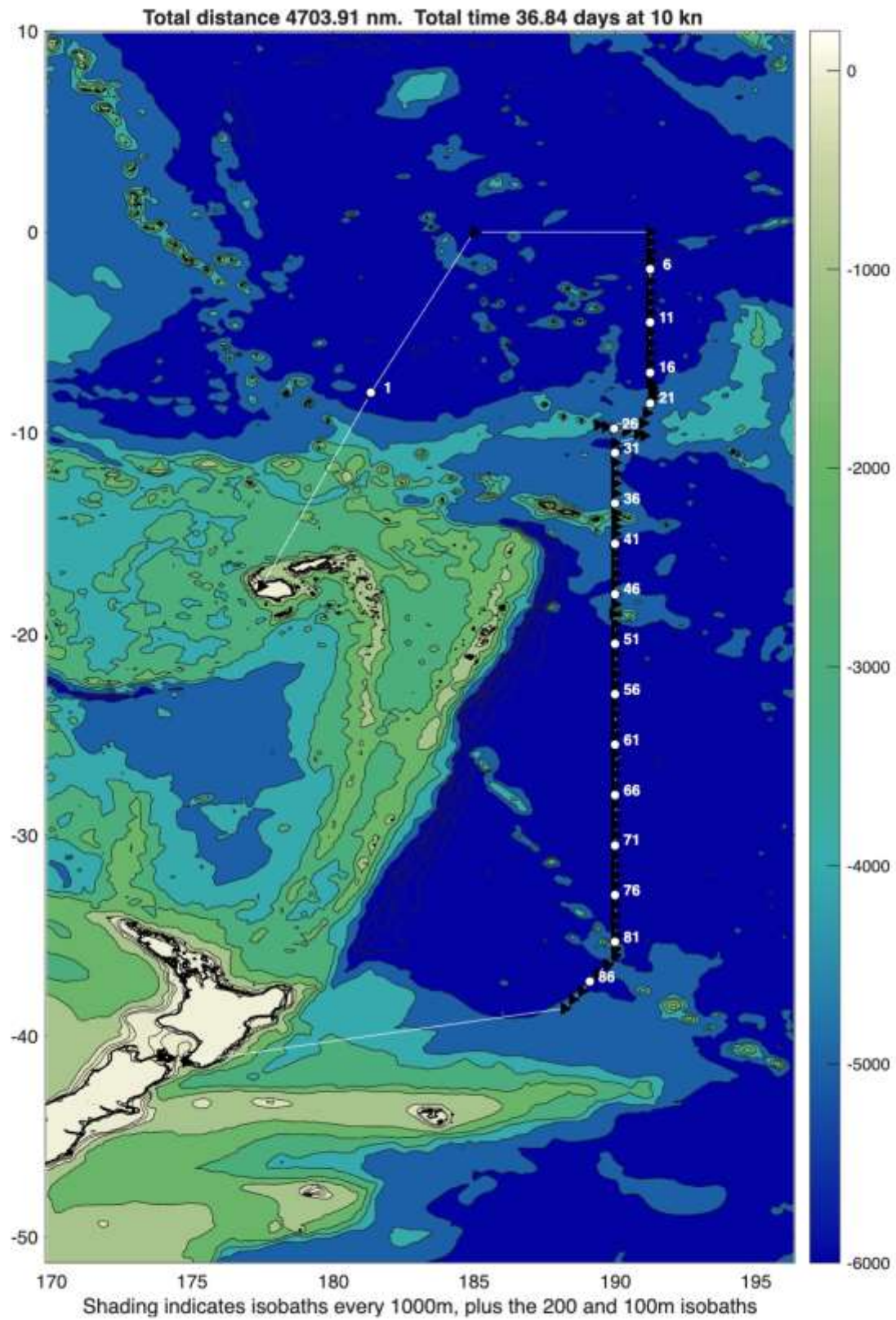
Once the test CTD station is completed we will continue to transit (~26hrs) to the first science CTD station for Leg 2. This is repeating the last CTD station from Leg 1.

DATE	ACTIVITY
12/11/2026	0900-0930: Science party arrival and getting onboard 0930-1100: Seagoing induction, ship tour 1100-1300: Cabin install & lunch 1200: MNF latest possible arrival 1230: MNF seagoing induction 1300-1400: Muster & Passport control 1500: Departure & transit to Test CTD (~40hrs transit) 1600: VM Briefing
13/11/2026	Test CTD (CTD 90) (~26hrs transit to first science cast, CTD91)
15/11/2026 – 1/12/2026	CTD91 – CTD142
1/12/2026	60°S and entering Antarctic Treaty Area
1/12/2026 – 6/12/2026	CTD143 – CTD161
7/12/2026	Transit to Hobart (3 weather days buffering this date)
16/12/2026	Arrival & Disembarkation

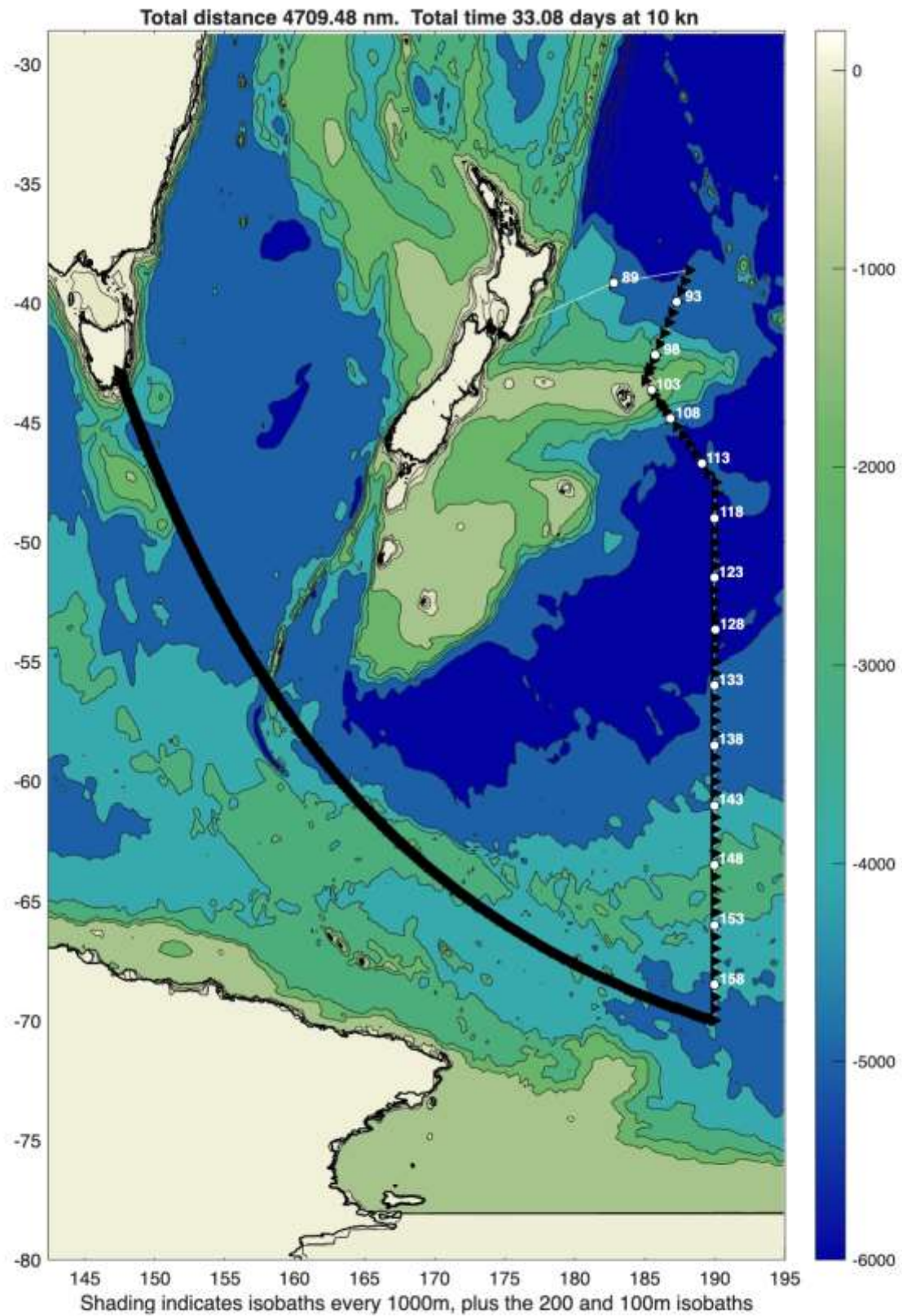
Voyage track



Leg 1



Leg 2



Waypoints and stations

NOTE: Argo & Float deployments are “nominal targets”. In practice the location will just be wherever we are when we finish the preceding CTD.

Way point Name	Activity ID	DD Lat	DD Long	Water Depth	Distance	Total Distance
	Lautoka					
N001	Test CTD (CTD 1)	-6.56283	-177.404	5907m	737.09	737.09
N002	Triaxus Start	0.005167	-175.000		420.04	1157.13
N003	Triaxus End	0.005167	-168.750		375	1532.13
N004	CTD2	0.005167	-168.752	5652m	0.22	1532.25
	Core Argo – sn AI2600-25AU012	0	-170			
	Drifter TBC					
N005	CTD3	-0.49617	-168.748	5486m	30.1	1562.35
N006	CTD4	-0.99083	-168.758	5708m	29.71	1592.06
	Drifter TBC					
N007	CTD5	-1.40583	-168.764	6000m	24.92	1616.98
N008	CTD6	-1.84383	-168.747	5299m	26.32	1643.3
	Drifter TBC					
N009	CTD7	-2.48967	-168.760	5343m	38.78	1682.08
N010	CTD8	-2.99617	-168.753	5382m	30.41	1712.49
	Drifter TBC					
N011	CTD9	-3.48917	-168.756	4987m	29.6	1742.09
N012	CTD10	-3.99817	-168.751	5216m	30.56	1772.65
	Drifter TBC					
N013	CTD11	-4.49533	-168.758	5478m	29.85	1802.5
N014	CTD12	-4.99550	-168.759	5582m	30.03	1832.53
	Core Argo – sn AI2600-25AU016	-5	-170			
	Drifter TBC					
N015	CTD13	-5.50583	-168.765	5320m	30.64	1863.17
N016	CTD14	-5.99233	-168.755	5667m	29.22	1892.39
	Drifter TBC					
N017	CTD15	-6.50117	-168.760	5665m	30.55	1922.94
N018	CTD16	-6.98400	-168.763	5542m	28.99	1951.93
	Drifter TBC					
N019	CTD17	-7.49983	-168.757	5279m	30.97	1982.9
N020	CTD18	-7.75400	-168.678	5316m	15.96	1998.86
N021	CTD19	-8.00383	-168.628	5150m	15.3	2014.16
	Drifter TBC					
N022	CTD20	-8.24983	-168.698	4934m	15.36	2029.52
N023	CTD21	-8.50183	-168.757	5171m	15.53	2045.05
N024	CTD22	-8.99317	-168.878	4823m	30.36	2075.41
	Drifter TBC					
N025	CTD23	-9.49267	-169.000	5330m	30.86	2106.27

N026	CTD24	-9.58667	-170.601	4051m	94.93	2201.2
N027	CTD25	-9.68967	-170.327	4319m	17.36	2218.56
N028	CTD26	-9.78150	-170.051	5007m	17.24	2235.8
N029	CTD27	-9.92283	-169.633	5235m	26.12	2261.92
N030	CTD28	-10.0598	-169.205	5298m	26.64	2288.56
	Core Argo – sn AI2600-25AU017					
	Drifter TBC					
N031	CTD29	-10.1405	-168.981	4668m	14.08	2302.64
N032	CTD30	-10.5000	-169.999	4882m	63.9	2366.54
N033	CTD31	-10.9998	-170.000	5138m	30.01	2396.55
N034	CTD32	-11.4962	-169.999	5068m	29.8	2426.35
N035	CTD33	-11.9988	-170.003	5105m	30.18	2456.53
N036	CTD34	-12.4992	-170.000	5018m	30.04	2486.57
N037	CTD35	-12.9997	-169.999	4993m	30.05	2516.62
N038	CTD36	-13.5040	-170.002	4888m	30.28	2546.9
N039	CTD37	-13.9713	-170.000	2976m	28.06	2574.96
N040	CTD38	-14.2822	-169.999	3543m	18.66	2593.62
N041	CTD39	-14.6662	-169.999	3335m	23.06	2616.68
N042	CTD40	-15.0030	-170.001	4831m	20.22	2636.9
	BGC Argo – sn 24475	-15.0000	-170.000			
N043	CTD41	-15.4980	-170.001	5097m	29.72	2666.62
N044	CTD42	-16.0018	-170.001	5152m	30.25	2696.87
N045	CTD43	-16.5028	-169.999	5136m	30.08	2726.95
N046	CTD44	-17.0018	-170.002	5003m	29.96	2756.91
N047	CTD45	-17.4997	-170.001	5040m	29.89	2786.8
N048	CTD46	-18.0010	-170.000	4921m	30.1	2816.9
N049	CTD47	-18.5012	-170.002	5254m	30.03	2846.93
N050	CTD48	-19.0035	-170.058	2983m	30.33	2877.26
N051	CTD49	-19.4967	-170.002	4919m	29.78	2907.04
N052	CTD50	-19.9995	-170.002	5338m	30.19	2937.23
	BGC Argo – sn 24430	-20.0000	-170.000			
N053	CTD51	-20.5027	-170.001	5647m	30.21	2967.44
N054	CTD52	-20.9987	-169.999	5506m	29.78	2997.22
N055	CTD53	-21.5032	-169.999	5455m	30.29	3027.51
N056	CTD54	-22.0005	-170.000	5629m	29.86	3057.37
N057	CTD55	-22.5002	-170.001	5670m	30	3087.37
N058	CTD56	-22.9975	-169.997	5698m	29.86	3117.23
N059	CTD57	-23.5030	-169.997	5688m	30.35	3147.58
N060	CTD58	-23.9998	-170.000	5702m	29.83	3177.41
N061	CTD59	-24.5002	-170.002	5695m	30.04	3207.45
N062	CTD60	-25.0007	-170.001	5704m	30.05	3237.5
	BGC Argo – sn 24855	-25.0000	-170.000			
N063	CTD61	-25.5032	-169.997	5815m	30.17	3267.67
N064	CTD62	-26.0023	-169.994	5618m	29.97	3297.64
N065	CTD63	-26.4950	-169.998	5597m	29.58	3327.22
N066	CTD64	-27.0013	-169.998	5366m	30.4	3357.62

N067	CTD65	-27.5000	-170.001	5392m	29.94	3387.56
N068	CTD66	-27.9993	-170.000	4902m	29.98	3417.54
N069	CTD67	-28.5020	-169.998	5435m	30.18	3447.72
N070	CTD68	-29.0068	-169.997	5566m	30.31	3478.03
N071	CTD69	-29.5018	-170.002	5102m	29.72	3507.75
N072	CTD70	-29.9985	-169.994	5421m	29.82	3537.57
	BGC Argo – sn 24436	-30.0000	-170.000			
N073	CTD71	-30.5052	-169.996	5552m	30.42	3567.99
N074	CTD72	-31.0020	-169.996	5671m	29.83	3597.82
N075	CTD73	-31.5008	-169.996	5557m	29.95	3627.77
N076	CTD74	-32.0007	-169.997	5697m	30.01	3657.78
N077	CTD75	-32.5012	-169.998	5579m	30.05	3687.83
N078	CTD76	-33.0008	-170.003	5640m	30	3717.83
N079	CTD77	-33.5005	-170.000	5463m	30	3747.83
N080	CTD78	-33.9972	-169.999	5577m	29.82	3777.65
N081	CTD79	-34.5035	-170.007	5501m	30.4	3808.05
N082	CTD80	-35.0137	-169.996	5257m	30.64	3838.69
	BGC Argo – sn 24806	-35.0000	-170.000			
N083	CTD81	-35.3340	-169.999	4934m	19.23	3857.92
N084	CTD82	-35.6730	-170.008	4326m	20.36	3878.28
N085	CTD83	-36.0020	-169.999	5075m	19.76	3898.04
N086	CTD84	-36.4498	-170.296	5077m	30.48	3928.52
N087	CTD85	-36.8727	-170.606	5301m	29.46	3957.98
N088	CTD86	-37.3060	-170.892	5150m	29.41	3987.39
N089	CTD87	-37.7593	-171.199	5019m	30.9	4018.29
N090	CTD88	-38.1872	-171.501	4951m	29.39	4047.68
N091	CTD89	-38.6290	-171.808	4925m	30.21	4077.89
	Wellington				665.07	4742.96

Leg 2 (CTD91 is a repeat of CTD89 location from Leg1).

Leg 2 final stations will be determined by Master with consideration of the ice situation at the time

Way point Name	Activity ID	DD Lat	DD Long	Water Depth	Distance	Total Distance
	Wellington					
S001	Test CTD (CTD 90)	-39.1667	-177.245	2000m	387.0	387
S002	CTD91	-38.6290	-171.808	4925m	255.9	642.9
S003	CTD92	-39.0688	-172.118	4853m	30.12	695.19
S004	CTD93	-39.5113	-172.412	4787m	29.87	725.06
S005	CTD94	-39.9603	-172.710	4745m	30.27	755.33
	BGC Argo – sn 24428	-40.0000	-170.000			
S006	CTD95	-40.3948	-173.034	4600m	30.02	785.35
S007	CTD96	-40.8315	-173.330	4171m	29.5	814.85
S008	CTD97	-41.2727	-173.638	3292m	29.94	844.79
S009	CTD98	-41.7192	-173.949	3123m	30.23	875.02
S010	CTD99	-42.1667	-174.249	2858m	30.04	905.06

S011	CTD100	-42.4013	-174.414	2659m	15.87	920.93
S012	CTD101	-42.7465	-174.655	1591m	23.31	944.24
S013	CTD102	-42.9313	-174.788	1055m	12.54	956.78
S014	CTD103	-43.2528	-174.998	786m	21.4	978.18
S015	CTD104	-43.6450	-174.535	800m	31.02	1009.2
S016	CTD105	-43.8478	-174.294	1013m	16.04	1025.24
S017	CTD106	-44.1563	-173.937	1900m	24.11	1049.35
S018	CTD107	-44.3248	-173.748	3102m	12.97	1062.32
S019	CTD108	-44.5242	-173.501	3407m	15.98	1078.3
S020	CTD109	-44.8332	-173.145	3813m	23.99	1102.29
S021	CTD110	-45.1762	-172.732	4660m	27.04	1129.33
	BGC Argo – sn 24204	-45.0000	-170.000			
	Drifter TBC					
S022	CTD111	-45.5587	-172.279	4973m	29.89	1159.22
S023	CTD112	-45.9402	-171.831	5150m	29.61	1188.83
S024	CTD113	-46.3283	-171.375	5100m	30.04	1218.87
	Drifter TBC					
S025	CTD114	-46.7193	-170.914	5296m	30.22	1249.09
S026	CTD115	-47.1092	-170.467	5415m	29.74	1278.83
S027	CTD116	-47.5032	-169.991	5352m	30.57	1309.4
S028	CTD117	-47.9940	-169.993	5300m	29.47	1338.87
	Drifter TBC					
S029	CTD118	-48.5010	-170.003	5300m	30.44	1369.31
S030	CTD119	-48.9945	-170.003	5279m	29.63	1398.94
S031	CTD120	-49.5055	-170.017	5247m	30.69	1429.63
	Drifter TBC					
S032	CTD121	-50.0050	-169.997	5380m	30	1459.63
	BGC Argo – sn 24136	-50.0000	-170.000			
S033	CTD122	-50.4977	-169.999	5058m	29.58	1489.21
S034	CTD123	-51.0027	-170.010	5248m	30.32	1519.53
	Drifter TBC					
S035	CTD124	-51.4950	-170.015	4739m	29.56	1549.09
S036	CTD125	-52.0015	-170.078	4870m	30.5	1579.59
S037	CTD126	-52.5043	-170.013	5098m	30.29	1609.88
S038	CTD127	-53.0030	-170.012	5221m	29.94	1639.82
S039	CTD128	-53.3335	-169.995	5318m	19.85	1659.67
	Drifter TBC					
S040	CTD129	-53.6645	-169.991	5142m	19.87	1679.54
S041	CTD130	-53.9973	-169.989	5040m	19.98	1699.52
	Deep Argo – sn tbc	-54.0000	-170.000			
S042	CTD131	-54.4967	-170.005	4832m	29.99	1729.51
S043	CTD132	-54.9960	-170.006	4814m	29.98	1759.49
	BGC Argo – sn 24232	-55.0000	-170.000			
	Drifter TBC					
S044	CTD133	-55.5138	-170.012	4722m	31.09	1790.58
S045	CTD134	-56.0030	-170.011	5131m	29.37	1819.95

S046	CTD135	-56.4980	-170.008	5080m	29.72	1849.67
	Drifter TBC					
S047	CTD136	-57.0038	-170.000	5186m	30.37	1880.04
	Deep Argo – sn	-57.0000	-170.000			
S048	CTD137	-57.5038	-170.007	5019m	30.02	1910.06
S049	CTD138	-58.0005	-170.014	4421m	29.82	1939.88
	Drifter TBC					
S050	CTD139	-58.4917	-170.017	5201m	29.49	1969.37
S051	CTD140	-59.0013	-170.012	4823m	30.6	1999.97
	Deep Argo – sn	-59.0000	-170.000			
S052	CTD141	-59.4977	-169.997	4004m	29.8	2029.77
	Drifter TBC					
S053	CTD142	-60.0002	-170.008	3945m	30.17	2059.94
S054	CTD143	-60.4973	-169.997	3997m	29.85	2089.79
S055	CTD144	-61.0015	-170.010	4393m	30.27	2120.06
S056	CTD145	-61.4900	-170.001	3458m	29.33	2149.39
S057	CTD146	-61.9998	-170.005	3131m	30.61	2180
S058	CTD147	-62.4990	-169.996	2497m	29.97	2209.97
S059	CTD148	-62.9995	-170.025	3068m	30.06	2240.03
	BGC Argo – sn 24182	-63.0000	-170.000			
S060	CTD149	-63.4952	-170.005	2927m	29.76	2269.79
S061	CTD150	-63.9922	-170.038	2810m	29.85	2299.64
S062	CTD151	-64.5013	-170.006	2357m	30.58	2330.22
S063	CTD152	-64.9942	-170.016	2870m	29.59	2359.81
S064	CTD153	-65.5000	-170.000	3046m	30.37	2390.18
S065	CTD154	-66.0000	-170.000	3136m	30.02	2420.2
S066	CTD155	-66.5000	-170.000	3806m	30.02	2450.22
S067	CTD156	-67.0000	-170.000	3394m	30.02	2480.24
	BGC Argo – sn 24641	-67.0000	-170.000			
S068	CTD157	-67.5000	-170.000	4273m	30.02	2510.26
S069	CTD158	-68.0000	-170.000	3619m	30.02	2540.28
S070	CTD159	-68.5000	-170.000	4092m	30.02	2570.3
S071	CTD160	-69.0000	-170.000	3973m	30.02	2600.32
S072	CTD161	-69.5000	-170.000	4194m	30.02	2630.34
	Deep Argo – sn	-58.5	162 (deployment by latitude in transit)			
	Hobart	-42.8800	147.325		2,331.59	4961.93

Permits

Foreign Clearances

- Fiji – Underway, Port call (Lautoka)
- American Samoa & Howland Baker Islands (US) – Underway, sampling stations
- Kiribati – Underway, sampling stations
- New Zealand & Tokelau – Underway, sampling stations, port call (Wellington)
- Niue – Underway, sampling stations
- Tuvalu – Underway, sampling stations

******Not all foreign clearances are in place at the time of document finalisation (9/09/2026). A decision tree workflow has been established with MNF GL Ops for active follow up with DFAT.

Antarctic ATEP & AMLRC (Leg 2)

Permit	Permit Number & Owner	Permit Expiry Date
Notice of Determination & Authorisation Antarctic Treaty (RV Investigator)	25/1285 (A. Martini)	31 May 2027
Notice of Determination & Authorisation Antarctic Treaty (Laura Herraiz Borreguero Project 4640: Linking East Antarctic's Carbon cycling and ocean variability)	26/503 (Laura Herraiz Borreguero)	31 May 2031
Notice of Determination & Authorisation Antarctic Treaty (Joel Alroe - Aerosol & Ice Nucleating Particle Sampling Onboard RV Investigator (2026/27))	26/971 (Joel Alroe)	31 May 2027
RADIOSONDE	Application ongoing 9/9/2026	
AMLRC Permit (Laura Herraiz Borreguero Project 4640: Linking East Antarctica's Carbon cycling and ocean variability)	26/503 (Laura Herraiz Borreguero)	31 May 2031

MNF blanket MPA

Leg 2 may traverse through the following Marine Parks on the transit back to Hobart:

- Huon Marine Park
- South Tasman Rise Marine Park
 - PA2020-00041-1 Permit - South-east Network, Permit variation PA2020-00041-7 - South-east Network, Permit variation PA2020-00041-14 - South East Network
- Macquarie Island Marine Park
 - NOTE: This MPA is not covered by any permit, so no underway sampling is permitted.

Biosecurity

Permit	Permit Number & Owner	Permit Expiry Date
eDNA samples	0010379192 Dr Levente Bodrossy	15 May 2029
Pigments and flow cytometry filtered samples	0009241520 Dr Albertina Dias	4 September 2028
Atmospheric filters	0012230262 Dr Jakob Pernov	1 September 2030

Communication plan

CSIRO will work in close collaboration with the Primary Agency to support the successful delivery of their voyage communication plan. In addition, CSIRO may also seek opportunities during the voyage to profile and promote the scientific infrastructure, equipment and expertise that are enabling the research, which it would do in consultation with the Primary Agency.

Media and other forms of engagement throughout the voyage will be guided by the communication plan prepared by the CSIRO comms team, in consultation with media teams from our regional partners (including SPC, POGO and Earth Science New Zealand). The plan includes activities targeted at the general public, ranging from blogs and social media post, to radio and written media. The plan also includes opportunities to connect with schools and other members of the public in the Pacific countries whose waters we will be transiting through. Working in collaboration with DFAT, one live cross event is being planned for each leg of the voyage.

With the voyage coinciding with UNFCCC Pre-COP and COP31, and the participation on board of 4 Early Career Ocean Professionals from the Pacific, the voyage also provides a unique opportunity to feature our science in Pre-COP31 and COP31 activities, to amplify Pacific voices, and showcase how regional partnerships and international collaboration can strengthen resilience in our region.

Indigenous engagement

Engagement with Hokotehi Moriori Trust and Ngāti Mutunga o Wharekauri Iwi Trust, representing Chatham Islands iwi and imi, was managed by Earth Science New Zealand through an established, culturally appropriate consultation process facilitated by Mahaanui Kurataiao Ltd. This process included providing information on the voyage research programme and its objectives, methodology and proposed activities and their location, to assess potential cultural, environmental and community considerations. At the time of writing, consultation remains ongoing, with information being shared with the chairs and managers of both trusts. The opportunity for a participant from Chatham Islands to join Leg 2 of the voyage (12 November–16 December 2026, Wellington to Hobart) is under consideration. Feedback and any questions regarding the research are expected to be received by the end of September 2026, at which point the consultation process will be finalised.

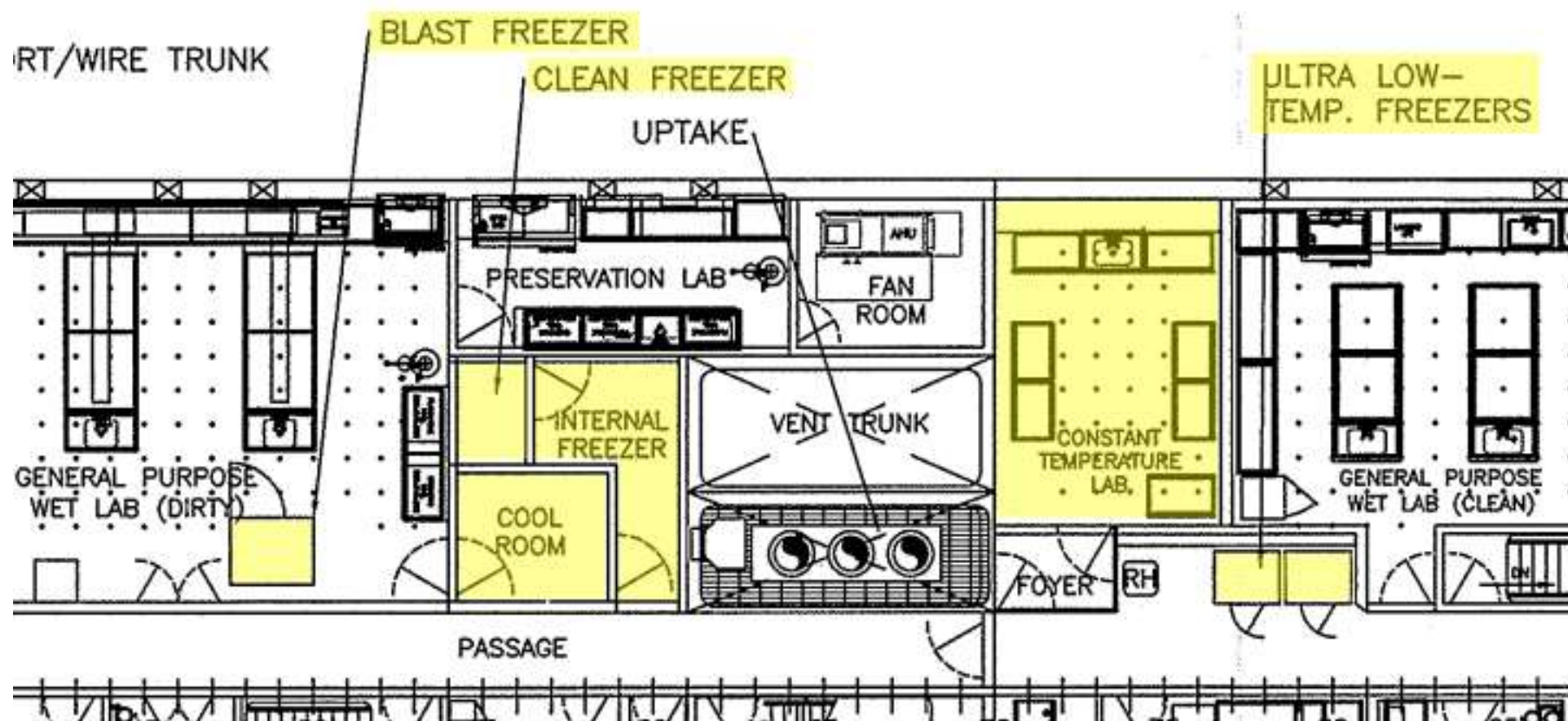
Appendix A

Scientific equipment and facilities provided by the Marine National Facility

Some equipment items on the list may not be available at the time of sailing. Applicants will be notified directly of any changes. Indicate what equipment and facilities you require from the Marine National Facility by placing an **X** in the relevant box.

STANDARD LABORATORIES AND FACILITIES		
NAME	REQUIRED	NOTES/COMMENTS
Aerosol Sampling Lab	X	
Air Chemistry Lab	X	
Preservation Lab		
Constant Temperature Lab (Min temp: ~4°C / Max temp ~35°C)		
Underway Seawater Analysis Laboratory		
GP Wet Lab (Dirty)	X	Argo float and Drifter staging area
GP Wet Lab (Clean)	X	Carbon Lab
GP Dry Lab (Clean)		
Sheltered Science Area		
Observation Deck 07 Level		
Internal Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C) Volume: >20m ³		
Clean Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C)	X	Storage of atmospheric filter samples

STANDARD LABORATORIES AND FACILITIES		
NAME	REQUIRED	NOTES/COMMENTS
Volume: >2.5m ³ Co-located within the Internal freezer and separated by a door		
Blast Freezer (Dirty Wet lab) (Min temp -30°C / Max temp 0°C) Internal volume >1.5m ³ Capable of reducing the temperature of 150kg of water from +20C to -30C in one hour.		
Cool Room (Dirty Wet lab) (Min temp 0°C / Max temp 10°C)		
Ultra-Low Temperature Freezers x2 (Main Deck) Min temp -80°C / Max temp -80°C)		
YODA Freezers (x2) (Clean Dry lab) (Min temp -20°C / Max temp 10°C)		


MOBILE LABORATORY AND FACILITIES (MAY REQUIRE ADDITIONAL SUPPORT)

NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Modular Isotope Laboratory			
Trace Metal Niskin Sampling Container (TM1-blue - 20ft)			

MOBILE LABORATORY AND FACILITIES (MAY REQUIRE ADDITIONAL SUPPORT)			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Trace Metal Seawater Analysis Laboratory (TM2-white - 20ft)			
Trace Metal Rosette and Niskin Storage Container			
Modular Hazchem Locker			
Stabilised Platform Container			
Clothing Container	LEG 2		Onboard for Leg 2 – located in iso-hold.

STANDARD SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Continuous Plankton Recorder (CPR)			

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
TRIAXUS – Underway Profiling CTD	X		Requested for tow along Equator only
Desired towing profile:			0-300m seesaw pattern
Additional instrumentation:			
Piston Coring System			
Gravity Coring System			
Multi Corer			

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
Kasten Corer			
Smith Mac Grab			
Rock Dredges			
Rock Saw			
Seaspy Magnetometer			
Portable Pot Hauler			
Equipment to measure seawater sound velocity/CTD:			
XBT System			2 per day provided if requested
Valeport Rapid SV			
Valeport Rapid CTD			
Valeport SVX2			
Trace Metal Rosette and Bottles			
Trace Metal In-situ Pumps (x6)			
Deep Towed Camera			
Drop Camera			
Sherman Epibenthic Sled			
Brenke Sled			

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
Hydro-Bios MultiNet (Mammoth) (1m x 1m)			
Surface Net (1m x 1m)			
Bongo Net			
Beam Trawl			
MIDOC			
Pelagic Trawl System (net, doors)			
Demersal Trawl System (net, doors)			
RMT-16 (Rectangular Midwater Trawl)			
Trawl Monitoring Instrumentation (ITI) (2,000m depth limit)			
Stern ramp		INSTALLED	

RESEARCH SUPPORT INFRASTRUCTURE			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Saltwater Ice Machine (Dirty Wet lab)			
Radiosonde Receiver System	X		
Laboratory Incubators (Clean Dry lab)			
Deck Incubators			
Milli-Q System	X		
Sonardyne USBL System			

SCIENTIFIC / SAMPLE ANALYSIS SYSTEMS				
MICROSCOPES:				NOTES/COMMENTS
BRAND / MODEL	TYPE	ESSENTIAL	DESIRABLE	
Leica / M80	Dissecting			
Leica / M80	Dissecting			
Leica /MZ6	Dissecting			
Olympus / CH	Compound			
Olympus /CH	Compound			
Leica / MTU282	Camera tube			
Adapters for tube / Nikon	Pentax			
Ring Light *2 / MEB121	LED			
Heavy Duty Electronic Balance (80kg)				
Medium Duty Electronic Balance (15kg/5g resolution)				
Light Duty Electronic Balance (3kg/1g resolution)				

Underway systems

ACOUSTIC UNDERWAY SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
75kHz ADCP	X		To be run continuously
38kHz ADCP	x		To be run continuously

ACOUSTIC UNDERWAY SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
150kHz ADCP	X		To be run continuously
Multi Beam Echo Sounder EM2040-MKII 200-700kHz (0 – 250m approx.)			
Multi Beam Echo Sounder EM124 12kHz (100m to full ocean depth)			
Multi Beam Echo Sounder EM712 70-100kHz (0 –1000-m approx.)			
Sub-Bottom Profiler SBP29			
Scientific Narrowband/Broadband Echo Sounders EK80 (6 bands, 18kHz-333kHz)			EK80 will only be functioning if they do not interfere with current velocity ADCPs (38, 75 and 150 kHz). Ocean velocity is the highest priority of this research voyage. Currently the EK80 will be turned off until the Chief Scientist she is involved in discussion on interfere between acoustic systems
Multibeam Scientific Echo Sounder ME70 (70100 kHz)			
Omnidirectional Echo Sounder SH90			
Gravity Meter			

ATMOSPHERIC UNDERWAY SENSORS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Nephelometer	X		
Multi Angle Absorption Photometer (MAAP)	X		
Scanning Mobility Particle Sizer (SMPS)	X		
Radon Detector	X		

ATMOSPHERIC UNDERWAY SENSORS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Ozone Detector	X		
Condensation Particle Counter (CPC)	X		
Picarro Spectrometer (analysis of CO ₂ /CH ₄ /H ₂ O)	X		
Aerodyne Spectrometer (analysis of N ₂ O/CO/H ₂ O)	X		
Cloud Condensation Nuclei (CCN)	X		
Polarimetric Weather Radar	X		
Filter Aerosol Sampling units (FAS) x 3	X		

UNDERWAY SEAWATER SYSTEMS AND INSTRUMENTATION			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Thermosalinograph	X		
Fluorometer	X		
Optode	X		
pCO ₂	X		

SEAWATER SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Trace metal clean seawater supply			
Scientific clean seawater supplied to laboratories			

SEAWATER SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Raw seawater available on deck and in laboratories			

CTD Configuration

User supplied micro-structure instrument will be installed ahead of Leg 1.	PLEASE SELECT:
Fundamentals	
Which CTD rosette to be used for this voyage (24 or 36 Niskin bottles):	36
Likely total number of casts:	Leg 1 89, Leg 2 73
Likely maximum depth of deepest cast:	6000 m
Standard CTD Configuration - Instrumentation (maximum 6 auxiliary channels plus 2 x DO) 6000m	
1 x SBE9+ (CTD)	Yes/No
2 x SBE3P Temperature Sensors	
2 x SBE4C Conductivity Sensors	
2 x SBE5T pumps	
2 x SBE43 Dissolved Oxygen Sensors	Yes
1 x Tritech PA200/500 Altimeter	Yes
1 x Biospherical QCP2300HP PAR Sensor	Yes
1 x Wetlabs C-Star 25cm Transmissometer	Yes
1 x Wetlabs ECO FLCDRTD Fluorometer – CDOM (370/460nm)	No
1 x Wetlabs ECO FLBBRTD Fluorometer – Chlorophyll-a & Backscatter (2 x channels - 470/695nm)	Yes
Alternative Instruments (Instruments highlighted in grey can be substituted from standard configuration)	
Seapoint Turbidity Meter – Nephelometer	
Seabird SUNA – Ultraviolet Nitrate Analyzer (Serial Connection - 2000m)	
Standard LADCP Configuration – Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up)	Yes
1 x Teledyne 150 kHz LADCP (Master - Down)	
1 x 48V Deep Sea Battery	
Alternative LADCP Configuration - Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up)	
1 x Teledyne 300 kHz LADCP (Master - Down)	
1 x 48V Deep Sea Battery	
Hydrochemistry Analyses	
Salinity	Yes
Dissolved Oxygen	Yes
Nutrients: Nitrate	Yes
Nutrients: Phosphate	Yes
Nutrients: Silicate	Yes
Nutrients: Nitrite	Yes
Nutrients: Ammonia	No