



# Schmidt Ocean Insititute Expedition Report

## Microbes in Oxygen Minimum Zones

2024-04-12 - 2024-05-15

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Expedition ID:	FKt240414
Expedition Name:	Microbes in Oxygen Minimum Zones
Expedition Website:	<a href="https://schmidtoccean.org/cruise/unexplored-seamounts-of-the-salas-y-gomez-ridge/">https://schmidtoccean.org/cruise/unexplored-seamounts-of-the-salas-y-gomez-ridge/</a>
Chief Scientist:	Dr. Maria Pachiadaki
Vessel:	R/V <i>Falkor (too)</i>
Location	Southeast Pacific, Northern Chile
Start of Expedition :	2024-04-12
Departure Port:	Antofagasta, Chile
End of Expedition :	2024-05-15
Arrival port:	Antofagasta, Chile
Expedition Duration:	34 days

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## Description

Oxygen concentrations have been declining over the last decades in both coastal and open ocean systems and further warming related expansion of low oxygen regions is predicted. Oxygen depletion alters biogeochemical processes that influence the production of greenhouse gasses (nitrous oxygen and methane), as well as marine food web functionality. However, technical challenges have hindered our ability to predict deoxygenation effects on biogeochemical cycles and biota. The proposed project aims to address major gaps in our knowledge of low oxygen regions by applying in situ approaches to accurately measure rates of key microbiological processes (chemoautotrophy, nitrification, denitrification, anammox, oxygen consumption / aerobic respiration) and community structure. This work in the Eastern Tropical South Pacific (ETSP) oxygen minimum zone (OMZ) will 1) determine the in situ rates of microbial processes involved in carbon and nitrogen cycling, 2) reveal the genomic blueprint of active single cells involved in these processes, 3) obtain estimates of growth rates and relative contribution of the dominant chemoautotrophic and heterotrophic groups, and 4) examine the interactions among biotic and abiotic factors for all microbial domains from viruses to protists.

## Overview

R/V *Falkor (too)* shipboard raw data will be made available via the [Rolling Deck to Repository](#) after the expedition. ROV *SuBastian* raw data as well as any processed multibeam data from from R/V *Falkor (too)* shipboard multibeam sonar systems will be made available upon completion on [Marine Geoscience Data System](#). Additional data from the expedition will be made publicly available in appropriate data centers. See the individual expedition [website page](#) or search <https://schmidtoccean.org/> for full data and publication lists.

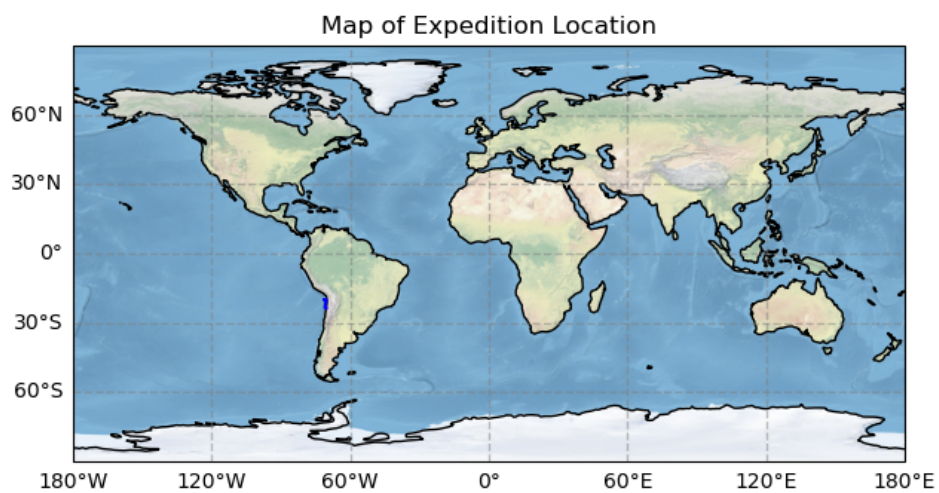
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CTD deployments	153
ROV <i>SuBastian</i> deployments	0
ROV <i>SuBastian</i> dive hours	0 hours 0 mins sec
ROV <i>SuBastian</i> samples	0

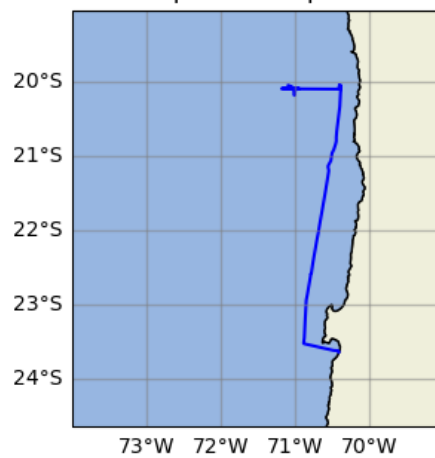
ARGO floats deployed	0
Data collected	0.1 TB
R/V <i>Falkor (too)</i> area mapped	3743.818 km <sup>2</sup>

## Location

This expedition took place in the Southeast Pacific, Northern Chile . Maps of the general location and expedition track are presented below.



Zoomed-in Map of the Expedition Location



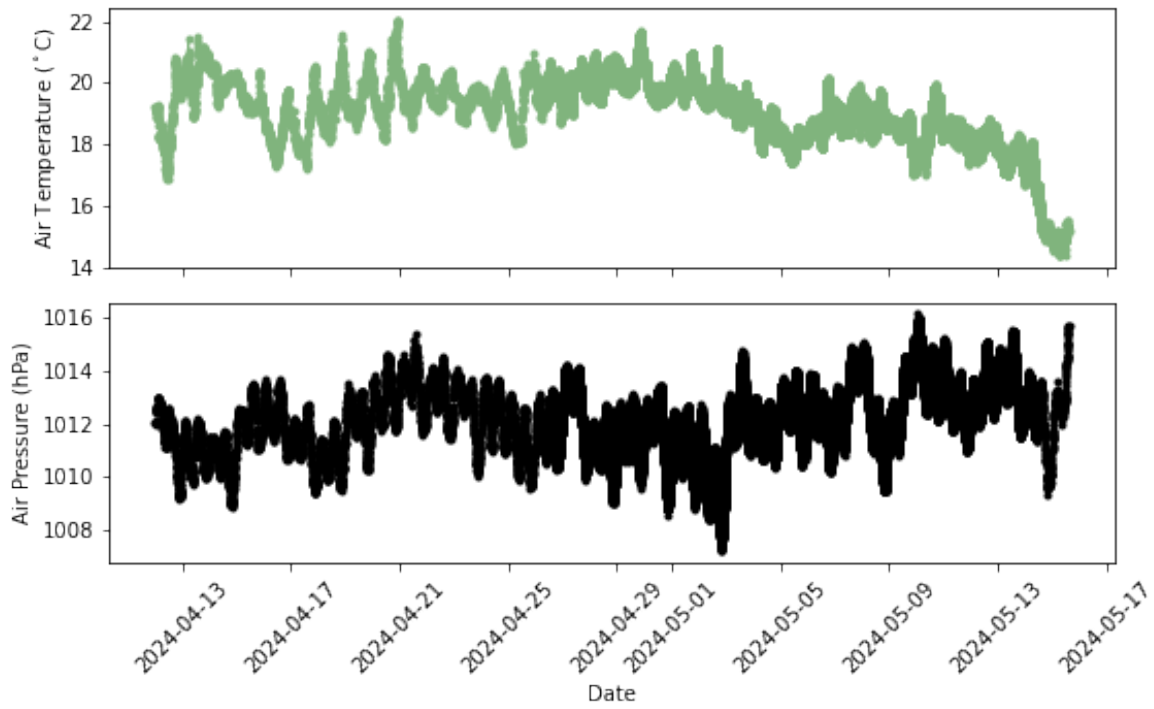
## Underway Systems

R/V *Falkor (too)*'s underway seawater sensors and meteorological sensors were run throughout the expedition per the team onboard. All sensor data will be made available via the [Rolling Deck to Repository](#) after the expedition. Statistics and graph shown in this report are based off the data in science systems event logger. The values are gathered on a 5 minute interval from raw data at a higher frequency. For statistics related to raw data values, please review all expedition data. Information below is an overview.

### Weather

R/V *Falkor (too)*'s meteorological sensors were run throughout the expedition per the team onboard. Subsampled values are included herein. The table describes the variability seen. A figure of air temperature and relative wind speed from sensors is included. All meteorological sensor data will be made available via the [Rolling Deck to Repository](#) after the expedition.

	count	mean	std	min	25%	50%	75%	max
air-pressure	161979	1012.21	1.39883	1007.18	1011.33	1012.22	1013.17	1016.16
air-temperature	161979	18.9867	0.973205	14.38	18.3	19.03	19.75	22.07
relative-wind-dir	161985	162.805	79.9449	0	121	155	190	359
relative-wind-speed	161982	6.14585	3.47091	0.097	3.616	5.618	7.97	23.443
true-wind-dir	161756	160.909	45.2567	0.097	139.05	162.748	184.68	359.984
true-wind-speed	161756	5.90786	3.28044	0.008	3.49	5.46	7.738	37.39



### Wind Speed (knots) and Direction

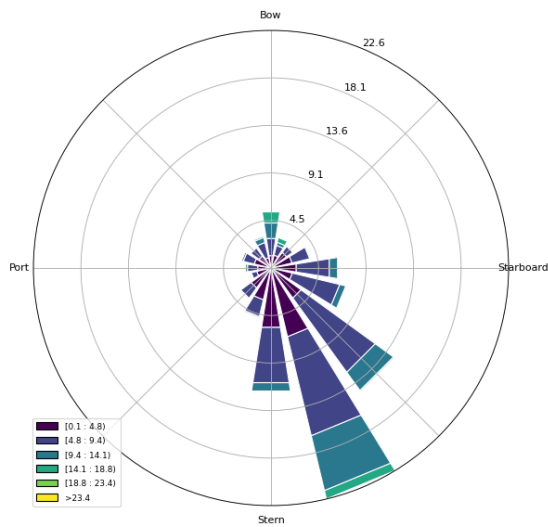


Figure 1: Relative Wind

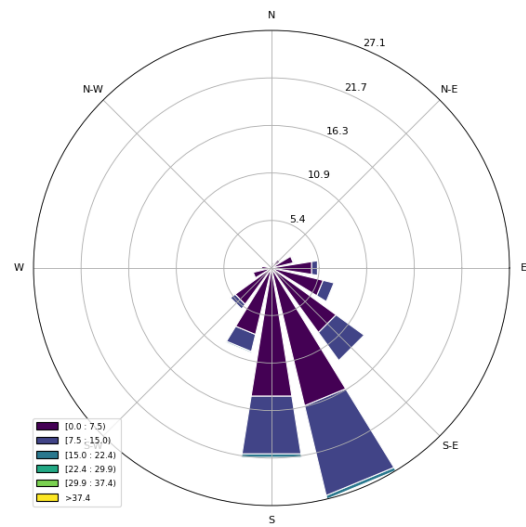
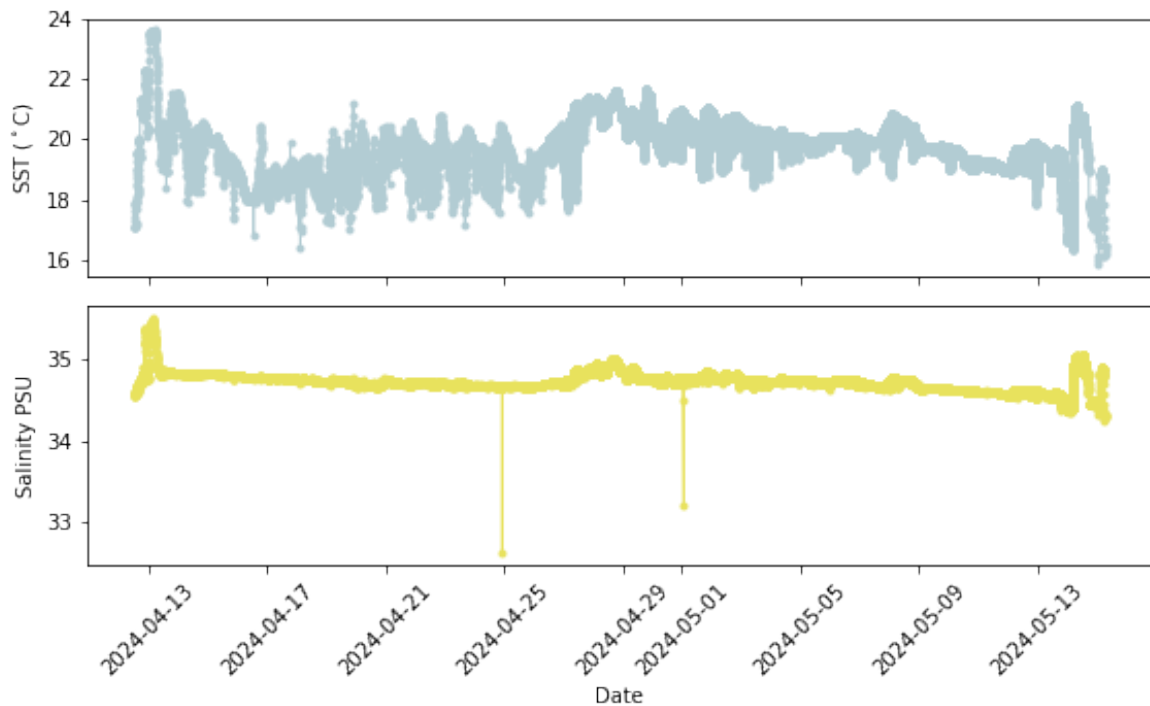


Figure 2: True Wind

## Seawater

R/V *Falkor (too)*'s underway seawater sensors were run throughout the expedition per the team on-board. Subsampled values are included herein. The table describes the variability seen. A figure of salinity and temperature from the seawater sensors is included. All seawater sensor data will be made available via the [Rolling Deck to Repository](#) after the expedition.

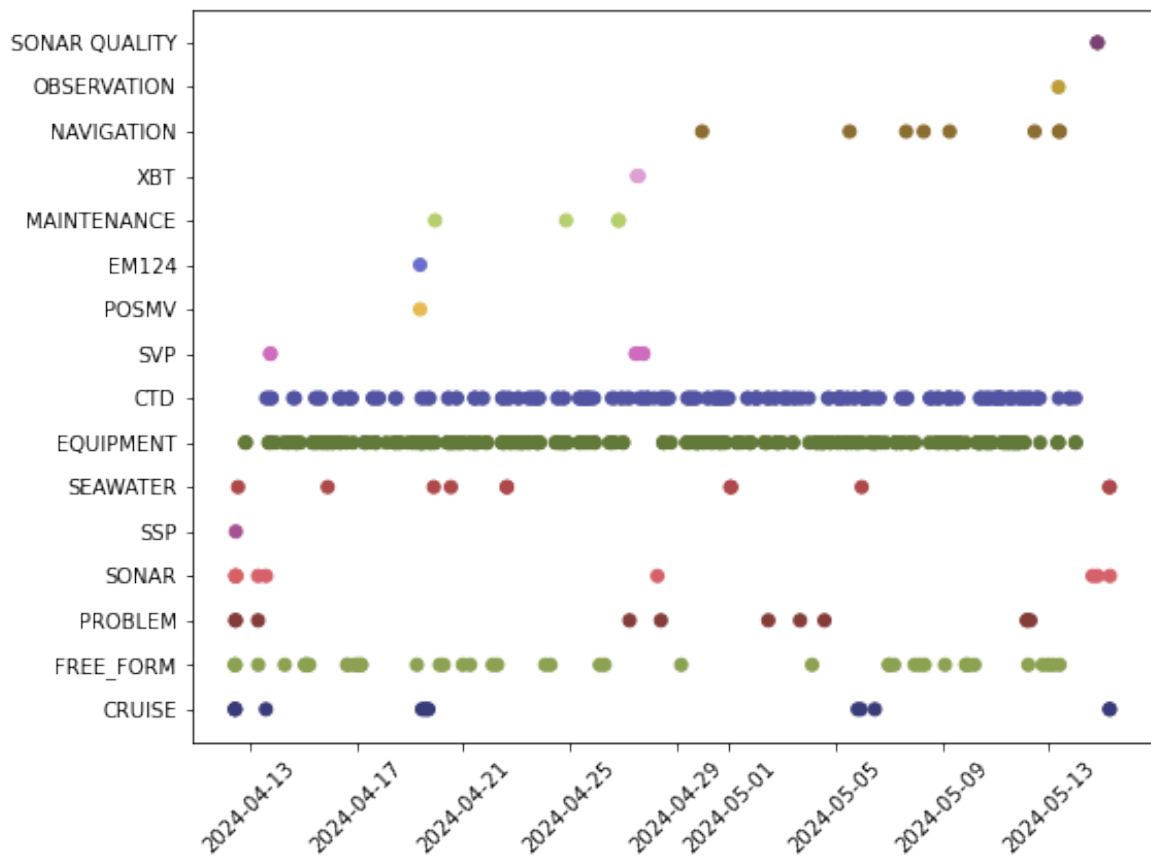
	count	mean	std	min	25%	50%	75%	max
calc-beam-atten-coef	161431	4.91995	1.02177	0.19	4.395	4.964	5.344	99.999
conductivity	161434	4.75774	0.0802441	0.298	4.715	4.761	4.809	5.223
corrected-signal-count	161431	4633.66	1187.03	0	4063	4468	5151	14737
fluorescence-raw	161428	303.63	242.723	46	137	203	396	8862
salinity	161434	34.7231	0.133239	1.823	34.645	34.737	34.769	35.512
sound-velocity	161432	1520.76	2.10866	1508.01	1519.78	1520.81	1522.2	1531.31
temperature	161434	19.9945	0.682483	15.825	19.648	20.012	20.441	23.616



## Event Summary

Events were logged using the classifications listed in the table below. ROV *SuBastian* events are logged separately. See dive reports for information on ROV *SuBastian*. For a list of all events from R/V *Falkor* see the file, FKt240414\_sealog\_export.csv.

event_value	count
ASnap	162432
CRUISE	13
CTD	205
EM124	1
EQUIPMENT	314
FREE_FORM	46
MAINTENANCE	4
NAVIGATION	8
OBSERVATION	1
POSMV	1
PROBLEM	11
SEAWATER	11
SONAR	10
SONAR QUALITY	2
SSP	1
SVP	6
XBT	2



A subset of events with some auxiliary data is provided below. For all events from R/V *Falkor* with auxiliary data, see the file, FKt240414\_sealogExport.csv in the exported data.

## CTD

ts	filename	status	longitude	latitude
2024-04-13T14:27:58.587Z	nan	CTD Deployed	-70.3834	-20.1051
2024-04-13T15:58:17.163Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-13T18:39:49.966Z	nan	CTD Deployed	-70.3834	-20.1049
2024-04-13T19:20:13.078Z	nan	CTD Recovered	-70.3834	-20.1049
2024-04-14T14:42:02.128Z	nan	CTD Deployed	-70.3834	-20.1053
2024-04-14T16:19:13.617Z	nan	CTD Recovered	-70.3867	-20.1053
2024-04-15T10:33:20.492Z	nan	CTD Deployed	-70.3832	-20.1051
2024-04-15T11:49:38.000Z	nan	CTD Recovered	-70.3832	-20.1051
2024-04-15T14:35:19.104Z	nan	CTD Deployed	-70.3833	-20.1049
2024-04-15T15:36:45.491Z	nan	CTD Recovered	-70.3833	-20.105
2024-04-16T08:02:55.867Z	nan	CTD Deployed	-70.3829	-20.1051
2024-04-16T09:09:32.000Z	nan	CTD Recovered	-70.3829	-20.1051
2024-04-16T10:06:32.000Z	nan	CTD Deployed	-70.3829	-20.1051
2024-04-16T10:46:10.131Z	nan	CTD Recovered	-70.3829	-20.1051
2024-04-16T16:33:40.435Z	nan	CTD Deployed	-70.3831	-20.1039
2024-04-16T17:19:17.170Z	nan	CTD Recovered	-70.3831	-20.1039
2024-04-16T18:37:52.354Z	nan	CTD Deployed	-70.3841	-20.1035
2024-04-16T19:33:28.411Z	nan	CTD Recovered	-70.384	-20.1035
2024-04-17T14:30:05.836Z	nan	CTD Deployed	-70.3943	-20.0751
2024-04-17T15:05:53.787Z	nan	CTD Recovered	-70.3947	-20.0751
2024-04-17T18:47:53.501Z	nan	CTD Deployed	-70.3844	-20.1053
2024-04-17T20:06:17.867Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-18T10:42:41.354Z	nan	CTD Deployed	-70.3834	-20.1048
2024-04-18T11:48:57.000Z	nan	CTD Recovered	-70.3834	-20.1048
2024-04-19T10:25:44.645Z	nan	CTD Deployed	-70.3833	-20.1048
2024-04-19T12:44:32.000Z	nan	CTD Recovered	-70.3833	-20.1048
2024-04-19T16:44:47.185Z	nan	CTD Deployed	-70.3832	-20.1059
2024-04-19T17:37:25.938Z	nan	CTD Recovered	-70.3833	-20.105
2024-04-20T10:18:31.159Z	nan	CTD Deployed	-70.3845	-20.1048
2024-04-20T11:11:03.243Z	nan	CTD Recovered	-70.3845	-20.1048
2024-04-20T17:32:57.429Z	nan	CTD Deployed	-70.3832	-20.105
2024-04-20T18:28:13.653Z	nan	CTD Recovered	-70.3832	-20.105
2024-04-21T09:59:49.000Z	nan	CTD Deployed	-70.3834	-20.105
2024-04-21T10:54:05.000Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-21T10:54:43.365Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-21T16:44:38.148Z	nan	CTD Deployed	-70.3833	-20.105
2024-04-21T18:01:22.715Z	nan	CTD Recovered	-70.3833	-20.105
2024-04-22T11:02:26.678Z	nan	CTD Deployed	-70.3835	-20.105
2024-04-22T11:44:05.774Z	nan	CTD Recovered	-70.3835	-20.105
2024-04-22T13:03:23.477Z	nan	CTD Deployed	-70.3835	-20.1049

ts	filename	status	longitude	latitude
2024-04-22T16:38:45.776Z	nan	CTD Deployed	-70.3835	-20.1049
2024-04-22T17:28:43.283Z	nan	CTD Recovered	-70.3835	-20.1049
2024-04-23T01:26:54.000Z	nan	CTD Deployed	-70.3833	-20.105
2024-04-23T02:08:37.903Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-23T10:29:48.111Z	nan	CTD Deployed	-70.3834	-20.105
2024-04-23T12:28:43.263Z	nan	CTD Deployed	-70.3834	-20.105
2024-04-23T13:45:49.739Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-23T16:49:07.704Z	nan	CTD Deployed	-70.3834	-20.105
2024-04-23T17:42:56.625Z	nan	CTD Recovered	-70.3834	-20.105
2024-04-23T19:37:24.438Z	nan	nan	-70.3833	-20.105
2024-04-23T20:27:36.229Z	nan	CTD Recovered	-70.3833	-20.105
2024-04-24T12:55:21.976Z	nan	CTD Deployed	-70.3833	-20.105
2024-04-24T13:34:20.067Z	nan	CTD Recovered	-70.3833	-20.105
2024-04-24T17:52:42.208Z	nan	CTD Deployed	-70.3825	-20.1047
2024-04-24T19:05:11.766Z	nan	CTD Recovered	-70.3826	-20.1047
2024-04-25T08:30:34.965Z	nan	CTD Deployed	-70.3832	-20.105
2024-04-25T09:16:30.000Z	nan	CTD Recovered	-70.3832	-20.105
2024-04-25T09:48:49.665Z	nan	CTD Deployed	-70.3832	-20.105
2024-04-25T12:34:32.695Z	nan	CTD Deployed	-70.3832	-20.105
2024-04-25T13:34:13.779Z	nan	CTD Recovered	-70.3832	-20.105
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2024-04-25T21:58:01.764Z	nan	CTD Recovered	-70.3834	-20.105
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2024-04-26T16:20:50.000Z	nan	CTD Recovered	-70.3848	-20.1038
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2024-04-27T04:05:57.000Z	nan	CTD Deployed	-70.3831	-20.105
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2024-04-27T14:42:20.230Z	nan	nan	-70.7097	-20.1023
2024-04-27T17:09:08.336Z	nan	CTD Recovered	-70.7899	-20.1017
2024-04-27T17:28:30.415Z	nan	CTD Deployed	-70.7898	-20.1017
2024-04-27T21:05:07.549Z	nan	CTD Recovered	-70.9059	-20.1007
2024-04-27T22:27:18.000Z	nan	CTD Recovered	nan	nan
2024-04-27T22:46:05.937Z	nan	CTD Deployed	-70.9926	-20.1001
2024-04-28T04:15:22.394Z	nan	CTD Recovered	-71.1793	-20.1001
2024-04-28T10:01:29.000Z	nan	CTD Deployed	-70.9998	-20.1
2024-04-28T11:07:25.966Z	nan	CTD Deployed	-70.9999	-20.1
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2024-04-28T17:32:37.447Z	nan	CTD Recovered	-70.9999	-20.0991
2024-04-29T10:03:41.184Z	nan	CTD Deployed	-70.9999	-20.0991
2024-04-29T11:04:58.435Z	nan	CTD Recovered	-70.9999	-20.0991

ts	filename	status	longitude	latitude
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2024-04-29T17:09:04.000Z	nan	CTD Deployed	nan	nan
2024-04-29T18:05:29.911Z	nan	CTD Recovered	-71.0031	-20.0988
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2024-04-30T23:18:44.634Z	nan	CTD Recovered	-70.9999	-20.0997
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2024-05-01T16:57:25.879Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-01T23:17:51.655Z	nan	CTD Deployed	-71.0004	-20.0992
2024-05-02T00:15:41.383Z	nan	CTD Recovered	-71.0004	-20.0992
2024-05-02T00:25:42.309Z	nan	CTD Deployed	-71.0004	-20.0992
2024-05-02T01:22:24.830Z	nan	CTD Recovered	-71.0004	-20.0992
2024-05-02T10:05:55.000Z	nan	CTD Deployed	-70.9994	-20.0996
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2024-05-03T01:39:12.431Z	nan	CTD Recovered	-71.0002	-20.0971
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2024-05-03T04:58:28.484Z	nan	CTD Recovered	-71.0002	-20.0975
2024-05-03T10:01:28.133Z	nan	CTD Deployed	-70.9991	-20.0993
2024-05-03T10:59:16.784Z	nan	CTD Recovered	-70.999	-20.0994
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2024-05-03T17:50:03.000Z	nan	CTD Recovered	-71	-20.0997
2024-05-03T23:37:59.000Z	nan	nan	-71	-20.0997
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2024-05-05T02:16:55.000Z	nan	nan	-70.9986	-20.0995
2024-05-05T02:48:16.000Z	nan	nan	-70.9986	-20.0995
2024-05-05T04:27:45.064Z	nan	CTD Recovered	-70.9986	-20.0995
2024-05-05T04:27:48.000Z	nan	nan	-70.9986	-20.0995
2024-05-05T05:02:34.304Z	nan	nan	-70.9986	-20.0995
2024-05-05T09:59:16.007Z	nan	CTD Deployed	-70.9991	-20.0993

ts	filename	status	longitude	latitude
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2024-05-05T16:27:55.028Z	nan	CTD Deployed	-71	-20.1003
2024-05-05T17:20:00.000Z	nan	CTD Recovered	-71	-20.1003
2024-05-06T00:25:28.035Z	nan	CTD Deployed	-71.0029	-20.111
2024-05-06T01:33:42.799Z	nan	CTD Recovered	-71.0029	-20.111
2024-05-06T01:36:47.711Z	nan	nan	-71.0029	-20.1109
2024-05-06T01:43:59.000Z	nan	nan	-71.0028	-20.1105
2024-05-06T03:33:23.366Z	nan	CTD Recovered	-71.002	-20.1077
2024-05-06T03:36:06.963Z	nan	nan	-71.0019	-20.1076
2024-05-06T04:00:36.704Z	nan	nan	-71.0015	-20.1062
2024-05-06T04:18:29.935Z	nan	CTD Deployed	-71.0012	-20.1053
2024-05-06T05:06:05.849Z	nan	CTD Recovered	-71.0012	-20.1053
2024-05-06T10:27:00.000Z	nan	CTD Deployed	-70.9988	-20.0994
2024-05-06T14:31:00.438Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-06T15:28:53.824Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-07T10:51:50.000Z	nan	CTD Deployed	-70.9987	-20.0997
2024-05-07T11:59:07.953Z	nan	CTD Recovered	-70.9987	-20.0997
2024-05-07T14:34:08.197Z	nan	CTD Deployed	-70.9987	-20.0997
2024-05-07T15:25:27.086Z	nan	CTD Recovered	-70.9987	-20.0997
2024-05-07T16:22:38.278Z	nan	CTD Deployed	-70.9987	-20.0997
2024-05-08T12:37:50.000Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-08T13:41:29.953Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-08T14:33:43.626Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-08T18:55:03.984Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-08T20:46:16.790Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-08T21:10:28.702Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-09T04:31:51.490Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-09T05:41:24.000Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-09T05:42:57.000Z	nan	nan	-70.9999	-20.0997
2024-05-09T06:16:51.619Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-09T06:50:59.000Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-09T08:02:39.896Z	nan	CTD Deployed	-70.9981	-20.0998
2024-05-09T13:09:54.689Z	nan	CTD Deployed	-70.9969	-20.0999
2024-05-09T14:06:04.420Z	nan	CTD Recovered	-70.9969	-20.0999
2024-05-10T09:53:56.000Z	nan	CTD Deployed	-70.9984	-20.0992
2024-05-10T10:47:54.844Z	nan	CTD Recovered	-70.9984	-20.0992
2024-05-10T11:55:50.000Z	nan	CTD Recovered	nan	nan
2024-05-10T15:00:02.836Z	nan	CTD Deployed	-71	-20.0997
2024-05-10T15:48:05.378Z	nan	CTD Recovered	-71	-20.0997
2024-05-10T18:10:36.744Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-10T19:04:08.553Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-10T22:45:55.000Z	nan	CTD Deployed	-70.9997	-20.0997
2024-05-11T00:07:54.000Z	nan	CTD Recovered	-70.9996	-20.0997
2024-05-11T01:40:46.285Z	nan	CTD Deployed	-70.9997	-20.0997
2024-05-11T02:50:53.000Z	nan	CTD Recovered	-70.9997	-20.0997
2024-05-11T02:53:26.357Z	nan	nan	-70.9997	-20.0997
2024-05-11T03:24:09.000Z	nan	nan	-70.9997	-20.0997

ts	filename	status	longitude	latitude
2024-05-11T03:32:14.719Z	nan	CTD Deployed	-70.9997	-20.0997
2024-05-11T04:37:36.000Z	nan	CTD Recovered	-70.9997	-20.0997
2024-05-11T05:23:24.084Z	nan	CTD Deployed	-70.9997	-20.0997
2024-05-11T06:33:48.406Z	nan	CTD Recovered	-70.9997	-20.0997
2024-05-11T11:59:32.028Z	nan	CTD Deployed	-70.9989	-20.0992
2024-05-11T13:04:14.194Z	nan	CTD Recovered	-71	-20.0997
2024-05-11T14:32:09.645Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-11T15:22:49.817Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-11T21:19:19.071Z	nan	CTD Deployed	-70.9998	-20.0989
2024-05-11T21:40:44.830Z	nan	CTD Recovered	-70.9999	-20.0997
2024-05-12T00:57:23.637Z	nan	CTD Deployed	-71	-20.0997
2024-05-12T01:18:30.000Z	nan	CTD Recovered	-71	-20.0997
2024-05-12T02:38:18.179Z	nan	CTD Deployed	-71	-20.0997
2024-05-12T05:23:59.749Z	nan	CTD Recovered	-71	-20.0997
2024-05-12T06:24:44.655Z	nan	CTD Deployed	-71	-20.0997
2024-05-12T07:23:24.431Z	nan	CTD Recovered	-71	-20.0997
2024-05-12T12:22:53.527Z	nan	CTD Deployed	-70.9969	-20.0991
2024-05-12T13:12:15.531Z	nan	CTD Recovered	-70.9969	-20.0991
2024-05-12T14:36:35.243Z	nan	CTD Deployed	-70.9992	-20.0996
2024-05-12T15:47:35.264Z	nan	CTD Recovered	-70.9992	-20.0996
2024-05-13T09:06:18.559Z	nan	CTD Deployed	-70.9999	-20.0997
2024-05-13T18:50:47.000Z	nan	CTD Recovered	-70.5952	-20.103
2024-05-13T19:00:40.000Z	nan	CTD Deployed	-70.5952	-20.103
2024-05-14T00:09:28.625Z	nan	CTD Recovered	-70.383	-20.1047

## EQUIPMENT

ts	event_free_text	status
2024-04-12T19:15:59.000Z	Two McLane Pumps deployed off starboard aft crane for weight in water test. To be left down at 7m for 20min to ensure there are no leaks in the housings.	nan
2024-04-12T20:10:18.000Z	Two McLane Pumps recovered and on deck.	nan
2024-04-13T16:30:05.000Z	50m drop then jo-jo 4 x 0-20m one last cast from 0-50m.	DEPLOYED
2024-04-13T17:11:46.000Z	Recovered	RECOVERED
2024-04-13T19:49:34.473Z	Down to 250m for 2.5 hours	DEPLOYED
2024-04-13T22:54:03.000Z	empty	RECOVERED
2024-04-14T06:15:36.000Z	Depth max 250m for around 3 hours.	DEPLOYED
2024-04-14T09:47:55.714Z	Beacon Juliet on PPS turned off.	nan
2024-04-14T09:51:36.523Z	empty	RECOVERED
2024-04-14T13:32:58.308Z	100m target depth for primary test. Recovery set for 1545. ; 1030 start time local (GMT -4)	DEPLOYED
2024-04-14T16:54:10.502Z	Jojo to 50m x 3	DEPLOYED

ts	event_free_text	status
2024-04-14T17:34:38.350Z	Depth sensor not reading	ABORTED
2024-04-14T18:02:06.865Z	Re attempt 3 x 50m yoyo	DEPLOYED
2024-04-14T21:09:48.062Z	Recovered, stbd pump worked, port failed.	RECOVERED
2024-04-15T08:10:20.000Z	Max depth 120m, duration 45min - 1hour	DEPLOYED
2024-04-15T08:18:07.000Z	Juliet on PPS	nan
2024-04-15T10:19:49.000Z	empty	RECOVERED
2024-04-15T10:34:45.259Z	ECHO on CTD	nan
2024-04-15T12:44:04.131Z	3 x yoyo to 50m	DEPLOYED
2024-04-15T13:15:59.000Z	Successful cast with help from bridge and DP. 0.3kts aft and 0.2kts lateral to stbd.	RECOVERED
2024-04-15T16:27:08.284Z	3 tow yos to 60m	DEPLOYED
2024-04-15T16:54:05.537Z	On deck.	RECOVERED
2024-04-15T17:22:32.897Z	Off deck. Juliet on PPS	DEPLOYED
2024-04-15T20:03:49.917Z	Recovered. Juliet beacon turned off	RECOVERED
2024-04-15T20:34:17.849Z	Deployment	DEPLOYED
2024-04-15T20:58:08.101Z	On deck with 3 tow yos completed	RECOVERED
2024-04-15T22:39:22.282Z	Foxtrox tracking	DEPLOYED
2024-04-16T00:07:06.124Z	empty	RECOVERED
2024-04-16T02:10:41.117Z	Test deployment from CTD bay. Foxtrot tracking	DEPLOYED
2024-04-16T02:12:54.688Z	Foxtrot on Cocktail sensor package	nan
2024-04-16T03:34:52.561Z	On deck. Foxtrot beacon stopped tracking	RECOVERED
2024-04-16T08:05:58.493Z	ECHO on CTD	nan
2024-04-16T09:09:11.000Z	Echo stopped tracking	nan
2024-04-16T10:07:04.000Z	ECHO on CTD	nan
2024-04-16T14:48:35.760Z	Deploying to 100m om the mooring. Planned recovery at 1300 tomorrow.	DEPLOYED
2024-04-16T20:50:59.282Z	17:30 time at 380m ;20:40 time at 200m; 00:00 time at 100m; Recover at 03:00	DEPLOYED
2024-04-17T07:09:54.000Z	Foxtrot stopped tracking, beacon turned OFF.	nan
2024-04-17T07:10:40.000Z	empty	RECOVERED
2024-04-17T08:11:50.026Z	empty	DEPLOYED
2024-04-17T11:50:48.679Z	empty	RECOVERED
2024-04-17T16:21:58.483Z	60m with 3 yoyos	DEPLOYED
2024-04-17T16:52:31.172Z	Aborted. Depth signal issue	ABORTED
2024-04-17T17:31:39.932Z	Recovered on deck	RECOVERED
2024-04-18T02:50:17.498Z	Tracking Foxtrot	DEPLOYED
2024-04-18T10:03:55.488Z	Foxtrot depth lost at 40m below surface.	nan
2024-04-18T10:07:02.000Z	Beacon lost tracking around 40m below surface.	RECOVERED
2024-04-18T10:46:25.209Z	empty	nan
2024-04-18T12:39:35.389Z	Down to 100m using Juliet beacon	DEPLOYED
2024-04-18T14:52:42.888Z	Recovered	RECOVERED
2024-04-18T15:00:56.815Z	Deployed off frame with usbl beacon foxtrot	TESTING
2024-04-18T22:16:34.308Z	Recovered from j-frame	TESTING
2024-04-19T02:11:47.612Z	Launching off a frame. Foxtrot tracking	TESTING
2024-04-19T02:21:49.483Z	SID at depth 110m foxtrot tracking	TESTING
2024-04-19T06:03:33.000Z	Beacon is Juliet	DEPLOYED

ts	event_free_text	status
2024-04-19T06:08:58.000Z	Juliet tracking	nan
2024-04-19T09:55:50.073Z	empty	RECOVERED
2024-04-19T09:56:09.000Z	empty	RECOVERED
2024-04-19T09:56:15.138Z	Juliet stopped tracking	nan
2024-04-19T10:06:48.000Z	Foxtrot stopped tracking	nan
2024-04-19T10:07:57.000Z	Deployed via the A-Frame	RECOVERED
2024-04-19T10:31:04.707Z	empty	nan
2024-04-19T13:11:57.563Z	empty	ABORTED
2024-04-19T13:15:29.000Z	Recovered to transit away from Chilean Navy testing operations.	nan
2024-04-19T16:36:12.136Z	Back on station, Stbd USBL pole deployed.	nan
2024-04-19T18:25:45.431Z	Off a frame, no mooring	DEPLOYED
2024-04-19T18:48:44.731Z	empty	DEPLOYED
2024-04-19T19:18:06.448Z	Down to 120m	DEPLOYED
2024-04-19T22:04:53.325Z	Recovered	RECOVERED
2024-04-19T22:56:47.588Z	Down to 130m initiating at 19:20. ;	DEPLOYED
2024-04-20T09:59:55.000Z	DELTA on MS pump OFF	nan
2024-04-20T10:00:25.000Z	empty	RECOVERED
2024-04-20T10:19:08.648Z	ECHO on CTD	nan
2024-04-20T11:10:39.000Z	ECHO tracking is OFF	nan
2024-04-20T13:01:46.000Z	empty	DEPLOYED
2024-04-20T13:17:32.000Z	empty	RECOVERED
2024-04-20T14:00:54.000Z	empty	DEPLOYED
2024-04-20T14:17:19.000Z	empty	RECOVERED
2024-04-20T16:36:15.948Z	Deployment down to 60m with 3 yos	DEPLOYED
2024-04-20T16:57:38.222Z	Recovered 3 yos	RECOVERED
2024-04-20T19:23:53.218Z	Deployed to 60 m with 3 yos	DEPLOYED
2024-04-20T19:51:06.669Z	Recovered	RECOVERED
2024-04-20T21:09:54.402Z	20 m with 3 yos	DEPLOYED
2024-04-20T21:25:44.726Z	Recovered with 3 yos to 40/50m	RECOVERED
2024-04-20T23:32:12.000Z	Cocktail on A-Frame	RECOVERED
2024-04-20T23:40:58.880Z	Foxtrot ran out of battery power - taken off for a charge	nan
2024-04-21T06:04:39.000Z	empty	DEPLOYED
2024-04-21T06:12:24.827Z	JULIET on PPS	nan
2024-04-21T09:46:56.000Z	JULIET on PPS is OFF	nan
2024-04-21T09:47:22.000Z	empty	RECOVERED
2024-04-21T10:04:31.193Z	ECHO on CTD	nan
2024-04-21T10:51:40.000Z	ECHO on CTD is OFF	nan
2024-04-21T13:05:12.244Z	150m with single cocktail unit	DEPLOYED
2024-04-21T13:07:07.448Z	Foxtrot deployed on cocktail SID_008 deployment	nan
2024-04-21T18:53:03.463Z	empty	DEPLOYED
2024-04-21T21:15:50.417Z	Recovered, on deck	RECOVERED
2024-04-21T21:41:42.145Z	150m starting at 18:10	DEPLOYED
2024-04-22T10:52:06.000Z	empty	RECOVERED
2024-04-22T11:06:21.818Z	ECHO on CTD	nan

ts	event_free_text	status
2024-04-22T12:11:54.349Z	Recovered single unit	RECOVERED
2024-04-22T13:06:19.102Z	empty	nan
2024-04-22T14:12:34.620Z	60m depth, no sun, baseline measurement	DEPLOYED
2024-04-22T18:12:54.829Z	empty	DEPLOYED
2024-04-22T18:31:35.673Z	On deck with 3 yos to 60	RECOVERED
2024-04-22T19:21:43.920Z	Deploying to 150. Single unit.	DEPLOYED
2024-04-22T22:09:12.207Z	empty	RECOVERED
2024-04-23T00:08:53.156Z	Foxtrot tracking going to 200m.	DEPLOYED
2024-04-23T01:30:52.000Z	ECHO on CTD	nan
2024-04-23T03:08:43.631Z	Recovered to deck	RECOVERED
2024-04-23T03:14:54.145Z	Foxtrot on Cocktail/SID is OFF	nan
2024-04-23T05:09:13.000Z	Cocktail/SID on A-Frame	DEPLOYED
2024-04-23T05:11:07.000Z	Foxtrot on Cocktail	nan
2024-04-23T06:05:55.484Z	empty	DEPLOYED
2024-04-23T06:14:42.310Z	PPS Juliet	nan
2024-04-23T10:16:21.852Z	empty	RECOVERED
2024-04-23T10:35:04.583Z	Echo on CTD	nan
2024-04-23T12:17:36.728Z	empty	RECOVERED
2024-04-23T17:55:37.447Z	Going to 60m	DEPLOYED
2024-04-23T18:12:18.187Z	empty	RECOVERED
2024-04-23T18:27:47.404Z	Deployed with scotchkote repair to split in cable just behind the termination. Juliet beacon.	DEPLOYED
2024-04-23T18:45:23.998Z	Aborted due to water leak in hose. Landed on deck and a ctd to take its place.	ABORTED
2024-04-23T20:30:01.991Z	Foxtrot beacon	DEPLOYED
2024-04-23T21:14:32.441Z	Deploying to 250m ;210m @ 22:05; 108m @ 02:40; Start recovery @06:55	DEPLOYED
2024-04-24T11:03:55.422Z	empty	RECOVERED
2024-04-24T12:19:15.701Z	empty	RECOVERED
2024-04-24T14:27:26.172Z	empty	nan
2024-04-24T14:45:59.824Z	Launched on high flyer with iridium beacon and usbl nano beacon LIMA	DEPLOYED
2024-04-24T16:36:32.900Z	Deployed to 250m using MIKE beacon	DEPLOYED
2024-04-24T17:32:32.575Z	empty	RECOVERED
2024-04-24T18:54:14.250Z	On deck	RECOVERED
2024-04-24T19:18:56.356Z	60m	DEPLOYED
2024-04-24T19:38:21.595Z	empty	RECOVERED
2024-04-24T20:37:22.653Z	Recovered with workboat by Jonno, June and Chris B.	RECOVERED
2024-04-24T22:12:14.870Z	250m with beacon Mike	DEPLOYED
2024-04-25T08:35:07.000Z	ECHO on CTD	nan
2024-04-25T09:14:00.000Z	ECHO on CTD is OFF	nan
2024-04-25T12:24:08.093Z	empty	RECOVERED
2024-04-25T15:09:42.745Z	Echo on CTD	nan
2024-04-25T18:23:02.322Z	To 250m with beacon MIKE	DEPLOYED
2024-04-25T22:34:46.277Z	empty	nan

ts	event_free_text	status
2024-04-25T22:36:57.586Z	Deployed with DELTA beacon with mTEAM pressure housing attached for a leak test. ;; Deploying to 380m; 340m at 23:10; 76m at 03:30; Recover at 07:30	DEPLOYED
2024-04-26T11:46:02.000Z	empty	RECOVERED
2024-04-26T13:28:36.815Z	empty	DEPLOYED
2024-04-26T14:08:40.948Z	Echo on CTD ;	nan
2024-04-26T16:59:43.878Z	Deploying to 60m	DEPLOYED
2024-04-27T00:07:32.000Z	MIKE on SID is OFF	nan
2024-04-27T00:08:01.000Z	empty	RECOVERED
2024-04-28T12:29:46.640Z	empty	nan
2024-04-28T12:30:59.878Z	Beacon MIKE	DEPLOYED
2024-04-28T13:24:48.197Z	CTD Echo ;	nan
2024-04-28T19:16:57.408Z	Start at 300m ;150m @ 20:05; 120m @ 00:40; Begin recovery @ 05:00 local time	DEPLOYED
2024-04-29T09:12:55.000Z	empty	RECOVERED
2024-04-29T10:07:47.530Z	CTD Echo ;	nan
2024-04-29T12:38:44.277Z	empty	DEPLOYED
2024-04-29T16:29:20.715Z	Deployment on Starboard side of vessel	DEPLOYED
2024-04-29T16:53:26.158Z	On deck on Starboard side. 0.4 knot move to port	RECOVERED
2024-04-29T18:42:10.817Z	empty	RECOVERED
2024-04-29T18:51:23.453Z	Testing new terminations and Yale grip. ;; Deploying to 5m and running pump for 15 min	TESTING
2024-04-29T19:22:25.648Z	Recovered and on deck. Pump working and all comms stable.	TESTING
2024-04-29T19:29:57.551Z	Deployed from the Port side	DEPLOYED
2024-04-29T19:50:00.321Z	Recovered	RECOVERED
2024-04-30T00:13:17.558Z	Full cocktail setup off Aframe. Target depth 240m	DEPLOYED
2024-04-30T00:33:34.267Z	MIKE on Mooring SID	nan
2024-04-30T04:24:14.154Z	ECHO on CTD. Beacons info received	nan
2024-04-30T07:38:58.000Z	Beacon JULIET	DEPLOYED
2024-04-30T07:44:55.000Z	JULIET on PPS	nan
2024-04-30T10:06:27.200Z	empty	RECOVERED
2024-04-30T14:12:37.000Z	Depth sensor issue	ABORTED
2024-04-30T14:59:04.000Z	empty	DEPLOYED
2024-04-30T15:25:25.892Z	CTD Echo ;	nan
2024-04-30T17:29:55.952Z	Deployed on port side	DEPLOYED
2024-04-30T17:52:39.431Z	On deck 3 yos to 60 m	RECOVERED
2024-04-30T20:23:24.052Z	Launch on port side	DEPLOYED
2024-04-30T20:48:22.715Z	Recovered	RECOVERED
2024-05-01T06:40:23.000Z	Full CockTAIL package	RECOVERED
2024-05-01T06:47:26.478Z	MIKE on CockTAIL is OFF	nan
2024-05-01T09:09:13.000Z	Beacon is LIMA	DEPLOYED
2024-05-01T11:44:53.000Z	empty	DEPLOYED
2024-05-01T18:02:13.113Z	250m	DEPLOYED

ts	event_free_text	status
2024-05-01T18:02:13.634Z	empty	nan
2024-05-01T19:13:26.917Z	empty	nan
2024-05-01T19:14:01.384Z	empty	RECOVERED
2024-05-02T07:35:59.000Z	Beacon is Juliet. Max depth is 150m	DEPLOYED
2024-05-02T07:39:42.000Z	Juliet on PPS	nan
2024-05-02T09:27:14.034Z	empty	RECOVERED
2024-05-02T09:50:57.000Z	Beacon is LIMA. Sensor at 180m depth.	DEPLOYED
2024-05-02T10:08:35.000Z	ECHO on CTD	nan
2024-05-02T18:06:22.000Z	empty	RECOVERED
2024-05-02T18:41:38.078Z	NO experiments	DEPLOYED
2024-05-02T20:00:33.967Z	Recovered	RECOVERED
2024-05-02T20:02:59.324Z	Heading to recover mini drifter	nan
2024-05-02T20:59:47.016Z	Recovered with vessel on port side crane	RECOVERED
2024-05-03T00:07:03.919Z	Heading to depth of 150m	DEPLOYED
2024-05-03T09:12:08.000Z	Beacon LIMA, 120m depth	DEPLOYED
2024-05-03T09:17:11.000Z	LIMA on Mini-drifter	nan
2024-05-03T23:53:15.572Z	Foxtrox tracking again for CTD_CW001	nan
2024-05-04T06:04:56.000Z	MIKE on CockTAIL_SID stopped	nan
2024-05-04T06:05:10.000Z	empty	RECOVERED
2024-05-04T06:12:26.000Z	empty	nan
2024-05-04T08:11:12.000Z	empty	RECOVERED
2024-05-04T09:25:21.000Z	empty	nan
2024-05-04T09:34:09.818Z	Juliet	DEPLOYED
2024-05-04T11:35:56.000Z	empty	RECOVERED
2024-05-04T12:23:24.251Z	180m	DEPLOYED
2024-05-04T12:37:21.510Z	empty	nan
2024-05-04T12:37:38.651Z	25L for N-cycle	DEPLOYED
2024-05-04T13:31:26.076Z	empty	RECOVERED
2024-05-04T18:29:56.444Z	Deployment off port side	DEPLOYED
2024-05-04T18:56:57.164Z	On deck	RECOVERED
2024-05-04T19:33:16.468Z	Deployment od PPS with Juliet beacon	DEPLOYED
2024-05-05T00:49:49.340Z	Recovered.	RECOVERED
2024-05-05T02:12:09.055Z	ECHO on CTD is OFF	nan
2024-05-05T04:28:25.896Z	ECHO on CTD is OFF	nan
2024-05-05T09:14:49.000Z	Beacon on drifter is LIMA; max sensor depth is 100m	DEPLOYED
2024-05-05T09:16:44.000Z	LIMA on Mini-Drifter	nan
2024-05-05T10:00:18.747Z	CTD Echo ;	nan
2024-05-05T13:35:27.000Z	empty	DEPLOYED
2024-05-05T13:55:07.001Z	empty	RECOVERED
2024-05-05T18:11:26.834Z	Recovered with Mike Beacon	RECOVERED
2024-05-05T18:30:49.000Z	Deployed with Juliet	DEPLOYED
2024-05-05T20:26:41.563Z	Recovered	RECOVERED
2024-05-05T20:33:45.308Z	Deploying workboat for mini drifter recovery	RECOVERED
2024-05-06T00:10:53.493Z	Mike Beacon tracking. Going 120m	DEPLOYED
2024-05-06T07:31:47.000Z	Beacon is Juliet.	DEPLOYED
2024-05-06T07:35:24.146Z	Juliet on PPS	nan

ts	event_free_text	status
2024-05-06T09:34:30.562Z	empty	RECOVERED
2024-05-06T10:10:25.000Z	Beacon is LIMA. Max sensor depth is 80m.	DEPLOYED
2024-05-06T10:11:32.000Z	LIMA on drifter	nan
2024-05-06T10:28:36.000Z	ECHO on CTD	nan
2024-05-06T12:17:54.000Z	empty	DEPLOYED
2024-05-06T12:37:11.000Z	empty	RECOVERED
2024-05-06T16:38:50.000Z	Deployed off CTD Wire. Tracking with Delta beacon. ;Time (Local)/Depths;; 17:35 @360m; 18:30 @ 340m; 19:25 @ 320m; 20:20 @ 300m; 00:30 @ 240m; 06:20 Start Recovery	DEPLOYED
2024-05-06T20:54:35.975Z	empty	RECOVERED
2024-05-07T06:04:58.000Z	Beacon is MIKE	RECOVERED
2024-05-07T06:06:39.000Z	MIKE on SID Mooring is OFF.	nan
2024-05-07T06:41:44.000Z	Sensor at 180m depth	DEPLOYED
2024-05-07T06:43:20.000Z	Beacon LIMA on Mini-Drifter	nan
2024-05-07T10:32:50.000Z	empty	RECOVERED
2024-05-07T10:33:19.000Z	DELTA on MS Pump is OFF	nan
2024-05-07T10:52:33.000Z	ECHO on CTD	nan
2024-05-07T12:22:43.884Z	With beacon MIKE	DEPLOYED
2024-05-07T18:34:47.015Z	empty	RECOVERED
2024-05-07T19:35:40.147Z	mTAIL attached Deploy to 120m ;Local Time/Depth; 19:00 @ 110m; 23:30 @ 100m; 04:00 @ 95m; 08:15 - Start recovery	DEPLOYED
2024-05-07T19:36:10.000Z	mTAIL Attached ;Deploy to 120m; Local time/Depth; 19:00 @ 110m; 23:30 @ 100m; 04:00 @ 95m; Start Recovery at 08:15	DEPLOYED
2024-05-07T20:11:46.812Z	Three wire ops 120m	DEPLOYED
2024-05-07T20:29:29.621Z	Recovered to swap beacons Juliet for Echo	RECOVERED
2024-05-07T20:36:44.717Z	Redeployment with Echo beacon	DEPLOYED
2024-05-07T23:35:22.941Z	Recovered. Beacon on PPS was Echo with 3 Wire ops.	RECOVERED
2024-05-08T12:23:29.000Z	Recovered with Beacon Delta	RECOVERED
2024-05-08T18:05:25.855Z	Mike beacon	RECOVERED
2024-05-08T20:12:26.000Z	Additional footage with go pro just below surface for Alex Ingle.	DEPLOYED
2024-05-08T20:59:08.047Z	Alex Ingle photo shoot complete	RECOVERED
2024-05-08T21:17:27.000Z	Water pumping and depth determined by beacon ECHO	DEPLOYED
2024-05-09T02:04:03.104Z	Half cocktail deployment to about 85m	DEPLOYED
2024-05-09T02:05:04.804Z	Mike on cocktail	nan
2024-05-09T04:05:21.000Z	empty	RECOVERED
2024-05-09T04:31:18.827Z	empty	DEPLOYED
2024-05-09T04:33:02.000Z	NOVEMBER on CTD	nan
2024-05-09T08:28:35.000Z	10m depth only (surface water only)	DEPLOYED
2024-05-09T12:30:10.000Z	empty	RECOVERED
2024-05-09T12:30:44.909Z	empty	DEPLOYED
2024-05-09T12:57:46.566Z	empty	RECOVERED

ts	event_free_text	status
2024-05-09T13:17:24.830Z	CTD Nov	nan
2024-05-09T14:10:56.097Z	empty	DEPLOYED
2024-05-09T14:35:13.539Z	empty	RECOVERED
2024-05-09T15:10:32.000Z	Delta Beacon Tracking; ;Deploy to 500m Local time/Depth; 17:15 @ 300m; 18:15 @ 200m; 20:00 @ 120m; 01:05 @ 85m; Start Recovery at 05:30	DEPLOYED
2024-05-09T21:10:08.000Z	MS in the water as well as cocktail	RECOVERED
2024-05-10T07:36:06.000Z	Lima Beacon	DEPLOYED
2024-05-10T07:42:54.527Z	LIMA ;	nan
2024-05-10T08:08:43.000Z	empty	RECOVERED
2024-05-10T08:16:21.338Z	MIKE on SID_Mooring is OFF	nan
2024-05-10T09:37:53.648Z	empty	RECOVERED
2024-05-10T09:38:32.443Z	DELTA on MS pump is OFF	nan
2024-05-10T09:57:30.663Z	November on CTD	nan
2024-05-10T10:48:50.769Z	November on CTD is OFF	nan
2024-05-10T11:03:36.000Z	empty	DEPLOYED
2024-05-10T14:48:08.039Z	Mike	DEPLOYED
2024-05-10T14:52:27.000Z	empty	RECOVERED
2024-05-10T16:06:20.619Z	Deployment on port side	DEPLOYED
2024-05-10T16:24:11.974Z	Recovered with 3 yos	RECOVERED
2024-05-10T17:33:36.652Z	Recovered with work boat	RECOVERED
2024-05-10T19:14:48.869Z	Port side	DEPLOYED
2024-05-10T19:32:41.103Z	Recovered on deck	RECOVERED
2024-05-10T19:40:04.000Z	empty	DEPLOYED
2024-05-10T21:12:12.000Z	empty	RECOVERED
2024-05-11T05:27:08.414Z	November CTD	nan
2024-05-11T07:24:26.000Z	empty	DEPLOYED
2024-05-11T07:25:11.000Z	LIMA on Mini-Drifter	nan
2024-05-11T09:04:59.000Z	empty	DEPLOYED
2024-05-11T09:09:25.078Z	ECHO on PPS	nan
2024-05-11T11:23:48.000Z	empty	RECOVERED
2024-05-11T11:32:53.000Z	empty	DEPLOYED
2024-05-11T11:50:19.000Z	empty	RECOVERED
2024-05-11T13:37:58.000Z	empty	DEPLOYED
2024-05-11T13:55:22.000Z	empty	RECOVERED
2024-05-11T16:22:49.015Z	Deployed off port side	DEPLOYED
2024-05-11T16:28:20.369Z	On deck after 1 yo due to instrument coms issue	RECOVERED
2024-05-11T16:29:23.740Z	Port side deploy attempt 2	DEPLOYED
2024-05-11T16:48:29.339Z	On deck 3 yos	RECOVERED
2024-05-11T18:13:50.000Z	Deployed on Port side	DEPLOYED
2024-05-11T18:32:26.116Z	Deployed on port side with 3 yos to 60m	RECOVERED
2024-05-11T19:46:13.029Z	Recovered with work boat	RECOVERED
2024-05-11T20:47:58.125Z	Recovered. Mike beacon on Cocktail	RECOVERED
2024-05-11T20:55:46.664Z	Port side	DEPLOYED
2024-05-11T21:14:20.413Z	Recovered with 3 yos to 60m	RECOVERED
2024-05-11T21:49:47.326Z	empty	DEPLOYED
2024-05-12T01:28:42.215Z	Recovered with ECHO beacon tracking	RECOVERED

ts	event_free_text	status
2024-05-12T02:07:39.336Z	Deployment with Mike beacon	DEPLOYED
2024-05-12T16:10:24.294Z	empty	DEPLOYED
2024-05-13T08:04:58.000Z	MIKE on SID Mooring is OFF	nan
2024-05-13T08:06:32.000Z	empty	RECOVERED
2024-05-13T08:44:12.000Z	DELTA on MS pump is OFF	nan
2024-05-13T08:45:17.000Z	Quick wire transfer to CTD for Tow-Yo	RECOVERED
2024-05-14T00:10:19.194Z	November on CTD is OFF	nan
2024-05-14T00:16:16.866Z	empty	nan

## SONAR

ts	status	system	longitude	latitude
2024-04-12T10:45:58.498Z	Sonar Started	EM712	-70.4134	-23.6324
2024-04-12T10:57:20.530Z	Sonar Started	ADCP- OS38;ADCP- WH300	-70.4417	-23.6296
2024-04-12T11:00:21.382Z	Sonar Started	EM124	-70.4504	-23.6296
2024-04-12T11:04:24.470Z	Sonar Stopped	EM712	-70.4622	-23.6294
2024-04-13T07:03:25.844Z	Setting Change	SBP29	-70.5164	-21.0734
2024-04-13T14:14:23.726Z	Sonar Stopped	EM124;SBP29	-70.3832	-20.1045
2024-04-28T07:08:27.491Z	Sonar Stopped	EM124	-71.0042	-20.0943
2024-05-14T15:30:05.296Z	Sonar Started	SBP29;EM124	-70.6692	-22.0148
2024-05-14T19:54:13.038Z	Sonar Stopped	EM124;SBP29	-70.7995	-22.4268
2024-05-15T07:12:00.078Z	Sonar Stopped	ADCP- WH300;ADCP- OS38	-70.8404	-23.5528

## Sensor Metadata

Information related to science systems owned and operated by R/V *Falkor (too)* are listed below.

### Navigational Systems

index	0
label	Trimble Applanix POSMV global positioning system
definition	The Position and Orientation Systems for Marine Vessels (POSMV) is a real time kinematic (RTK) and differential global positioning system (DGPS) receiver for marine navigation. It includes an inertial system that provides platform attitude information. The instrument provides accurate location, heading, velocity, attitude, heave, acceleration and angular rate measurements.
instrument_type	Differential Global Positioning System receivers
soi_device	posmv
index	1
label	Kongsberg Seatex Seapath 380 heading, attitude and positioning sensor series
definition	Heading, attitude and positioning sensor series, designed to support hydrographic surveying and dredging activities with high precision navigation measurements. Seapath 380 instruments are composed of a 555-channel dual frequency Real Time Kinematics (RTK) Global Navigation Satellite System (GNSS) receiver and a Motion Reference Unit (MRU) inertial sensor. Different Seapath 380 models within the series determine the type of MRU mounted on the instrument: MRU models be either 5+, 5, H or 3, with associated RMS roll and pitch accuracy of 0.008 deg, 0.02 deg, 0.03 deg and 0.08 deg respectively. Each instrument features 2 cm heave accuracy (delayed signal), and position accuracy of 0.01 m + 1 ppm RMS (X and Y) can be achieved through post processing of satellite and Inertial Measurement Unit (IMU) data. The position solution can use all available satellites, including GPS, GLONASS, Galileo, Beidou and QZSS.
instrument_type	Differential Global Positioning System receivers
soi_device	seapath380

index	2
label	
definition	
instrument_type	
soi_device	f

### Flow Through Seawater System Sensors

index	0
label	WET Labs ECO FL Fluorometer
definition	An open flat-face fluorometer that can be used to measure relative chlorophyll, CDOM, uranine, phycocyanin, or phycoerythrin concentrations by directly measuring the amount of fluorescence emission in a sample volume of water.
instrument_type	fluorometer
soi_device	fluorometer
example_output	2023-12-13T00:00:00.906560Z,99/99/99 99:99:99 0.11 695 61 526
file_header	Timestamp, Date, Time, ChlSig_ug/l, NU, ChlSigRaw, Therm*Checksum

index	1
label	Sea-Bird SBE-45 TSG (Thermosalinograph)
definition	A small externally powered, high-accuracy instrument, designed for shipboard determination of sea surface (pumped-water) conductivity and temperature. It is constructed of plastic and titanium to ensure long life with minimum maintenance. It may optionally be interfaced to an external SBE 38 hull temperature sensor.
instrument_type	thermosalinograph
soi_device	tsg_sbe45
example_output	2023-12-03T10:29:29.558455Z, 28.7849, 5.15907, 31.2515
file_header	Timestamp,t1=Temperature1_C, c1=Conductivity_S/m, s=Salinity_PSU, sv=SoundVelocity_m/s, t2=SBE38_Temperature_C

index	2
label	Sunburst AFT pH
definition	Instruments that measure the hydrogen ion concentration in the water column
instrument_type	pH sensors
soi_device	sunburst_pH
example_output	2023-12-15T00:10:41.308769Z,\$SBSPH,349.0069,29.57,35.00,7.9368,8.62,2023-12-15,00:09:59
file_header	Timestamp,Header,Year_Day, Temperature_C, Salinity_Constant, pH, Battery_Voltage, Date, Time
index	3
label	Valeport MiniSVS SSV (Sound Speed Velocimeter)
definition	A sound velocity profiler used to measure the speed of sound in water. Each sound velocity measurement is made using a single pulse of sound traveling over a known distance. It uses Valeport's digital time of flight technology to provide accurate, low noise, low resolution data. The miniSVS has RS232 and RS485 output. RS232 data may be taken over cables up to 200 m long, whereas RS485 is suitable for longer cables (up to 1000 m), and allows for multiple addressed units on a single cable. The miniSVS may be optionally supplied with either a pressure or temperature sensor (but not both), and is available in a variety of sizes; 100 mm, 50 mm and 25 mm. It measures sound velocity over the instrument_range 1375-1900 m/s in water temperatures ranging from -5 to +35 degC. It is depth rated to 6000 m. Its accuracy is dependent on the sensor size chosen, and has a resolution of 0.001 m/s.
instrument_type	Sound Speed Velocimeter
soi_device	minisvs
example_output	2023-12-01T21:02:54.793533Z, 1537.366
file_header	Timestamp,SoundVelocity_m/s
index	4
label	WET Labs (Sea-Bird WETLabs) C-Star transmissometer
definition	An underwater optical beam transmissometer capable of free-space measurements or mounting in a flow tube with a pump for underway or moored applications. It is available in a variety of wavelengths, typically red, blue or green, with a path length of 10 or 25 cm, and in deep or shallow options.
instrument_type	transmissometer
soi_device	sbe_cst
example_output	2023-12-03T08:47:10.389455Z,CST-2187DR 09964 13004 15300 00.040 532

index	4
file_header	Timestamp,SerialNum ReferenceRawCount SignalRawCount CorrectedSignalRawCount CalcBeamAttenCoef_1 / m ThermistorRawCount

### Flow Through Seawater System Installations

label	location_long	filename_prefix	installed_date	removal_date	calibration_date	serial_numbers
Sea-Bird SBE-45 TSG (Thermosalinograph)	Flowthrough seawater system, primary	tsg_sbe45_1	2023-12-01		sbe38 : 2022-03-03, sbe45 : 2022-05-15	sbe38 : 0680, sbe45 : 0800
Sea-Bird SBE-45 TSG (Thermosalinograph)	Flowthrough seawater system, secondary	tsg_sbe45_2	2023-12-01		sbe38 : 2022-03-03, sbe45 : 2022-05-03	sbe38 : 0655, sbe45 : 0799
WET Labs ECO FL Fluorometer	Flowthrough seawater system, primary	fluorometer_1	2023-12-01		unit : 2022-03-01	unit : 4906
WET Labs ECO FL Fluorometer	Flowthrough seawater system, secondary	fluorometer_2	2023-12-01		unit : 2022-04-01	unit : 7472
Sunburst AFT pH	Flowthrough seawater system, secondary	pH_2	2023-02-02		unit : 2021-01-11	unit : AP0013
	Flowthrough seawater system, primary	transmissometer_1	2023-02-05		unit : 2022-04-08	unit : 2187
	Flowthrough seawater system,secondary	transmissometer_2	2023-10-18	nan	unit : 2022-03-31	unit : 2186
Valeport MiniSVS SSV (Sound Speed Velocimeter)	Aft launch tube		2023-05-02		unit : 2022-03-16	unit : 35821
Valeport MiniSVS SSV (Sound Speed Velocimeter)	Foreward launch tube		2023-05-15		unit : 2022-02-24	unit : 44486

## Meteorological System Sensors

index	0
label	Gill MetPak Pro Weather Station
definition	A multiparameter weather station for measuring various meteorological parameters in marine environments. These include wind speed and direction, temperature, relative humidity, barometric pressure and dew point. The base station combines a Gill WindSonic ultrasonic wind speed and direction sensor, a barometric pressure sensor and Totronic Hygroclip temperature and humidity probe. MetPak Pro includes Gill's MetSet configuration software and MetView data logging and visualisation software. It is also supplied with mast mounting kits. Up to four additional external devices can be connected, such as a Pt100 temperature sensor and tipping bucket rain gauge, plus two analogue sensors. Alternatively, the base station itself can be configured with an optional rain gauge and various remote wind sensors. It can measure wind speeds from 0-60 m/s between 0-359 degrees at +/- 2 percent accuracy in speed and +/- 3 degrees accuracy in direction (at 12 m/s). It measures air temperature from -50 to +100 degC at +/- 0.1 degC accuracy and 0.1 degC resolution.
instrument_type	meteorological packages
soi_device	metpakpro
example_output	2023-12-02T00:00:00.878301Z, Q,132,001.14,1006.4,077.6,+029.9,+025.6,,+99998.0006,+99998.0004,0000.000,+11.7,00, 4F
file_header	Timestamp,NodeLetter,WindDir_deg,WindSpd_m/s,AirPres_hPa,Humidity_%, AirTemp_C, DewPoint, PRT, AnI/P1, AnI/P2, DigI/P, SupplyVoltage, SupplyCode, CheckSum
index	1
label	Paroscientific Met4
definition	
instrument_type	meteorological packages
soi_device	met4
example_output	2023-12- 01T21:03:05.545211Z,\$WIXDR,P,1004.502,hPa,DQ153542,C,31.12,C,DQ20408332,H,70.57,P,DQ20408332
file_header	Timestamp,Header,P,AirPres_hPa,hPa,PresSensorSN, C,AirTemp_C,C, TempSensorSN,H,Humidity_%,P,HumidSensorSN

index	2
label	Biospherical Instruments QSR 2200 surface reference radiometer
definition	A surface reference radiometer to measure scalar irradiance from sunlight with a PAR response. These sensors are often used on ships during on-deck incubations, or while a QSP sensor is vertically profiling, for example, when mounted on a CTD. The QSR-2200 outputs a linear analog signal and is compatible with data loggers that can accept a wide instrument_range of signal voltages. QSR sensors are equipped with a detachable field-of-view cutoff shield to limit its response to light from the upper hemisphere ( $2\pi$ steradians).
instrument_type	radiometer
soi_device	par
example_output	2024-04-13T00:00:00.945723Z,1,0,7,0.001068
file_header	Timestamp,channel,mode,raw_value,scaled_value
index	3
label	Eppley SPP / PIR Radiometers
definition	This systems is composed of the Eppley PIR and Eppley SPP. The Eppley Precision Infrared Radiometer (PIR) pyrgeometer measures longwave (infrared) radiation. It is housed in a weatherproof titanium canister that has been painted with a very flat black paint that absorbs radiation. A small glass dome at the top of the instrument is covered with an 'interference coating' which allows only infrared radiation to come through. Light levels are detected as temperature changes creating voltages in fine wire coil detectors. A precision radiometer used to measure total energy from the sun. This can be either global shortwave irradiance or total irradiance in the plane of array (TPA). It can also be used to measure reflected or albedo irradiance, as well as diffuse shortwave irradiance. It is based on the design of the Eppley PSP pyranometer ( <a href="https://vocab.nerc.ac.uk/collection/L22/current/TOOL0666/">https://vocab.nerc.ac.uk/collection/L22/current/TOOL0666/</a> ) but exhibits a faster response time, reduced thermal offset and improved cosine response. The SPP has a spectral range from 295-2800 nm, a sensitivity of 8 uV / Wm-2 and an impedance of approximately 700 ohms. It has an operating temperature from -50 to +80 degC. Hourly average measurement uncertainty is approximately 2 percent, daily average measurement uncertainty is approximately 1 percent.
instrument_type	radiometer
soi_device	rad
example_output	2023-12-01T21:03:11.040268Z,\$WIR39,23/12/01,21:15:40, 175, -208.5, 440.54, 33.03, 32.44, 364.47, 39.9, 10.0
file_header	Timestamp,Header,InstrumentDate,InstrumentTime, Samples,PIR_mV,LW_Wm-2, CaseTemp_C, DomeTemp_C, SW_Wm-2, BoardTemp_C,BattVoltage_V

index	4
label	Gill Windsonic anemometer
definition	A 2-axis sonic anemometer measuring horizontal wind speed and direction that is suitable for land-based and marine environments. Available in four options, providing a number of different digital and analogue outputs.
instrument_type	anemometer
soi_device	windsonic
example_output	2023-12-09T00:00:00.004430Z,\$WIMWV,327,R,001.14,M,A*0C
file_header	Timestamp,Header,RelWindDir_deg,R,RelWindSpd_m/s,M*Checksum

index	5
label	OSi APG-815 Optical Rain Gauge
definition	A series of optical scintillation rain gauges that measure rain rate in the instrument_range 0.1 to 500 mm/hr; rain accumulation in the instrument_range 0.001 to 999.999 mm with accuracy of 5% accumulation. They operate in temperatures from -40 to 50 degrees C. Versions differ by their electrical outputs , output connections and detection capabilities. Digital output versions include - ORG-815-DR, ORG-815-DS, ORG-815-DC which are capable of distinguishing precipitation by rain or snow. Analog output versions include - ORG-815-DA which does not distinguish precipitation type.
instrument_type	precipitation gauges
soi_device	raingauge
example_output	00 .000 113.127 01*0 4999 0040 0040 019
file_header	Timestamp,WMOCode PrecipRate_mm/hr PrecipAccum_mm 01 D1 D2 D3 D4

## Meterological System Installations

label	location _long	filename _prefix	installed _date	removal _date	calibration _date	serial _numbers
Gill MetPak Pro Weather Station	Foremast	mpp_fm	2023-02-02		unit : 2021-11-22	anemometer : 20100008, bracket : 20100024, hydroclip : 20269221
Gill MetPak Pro Weather Station	Wheelhouse Top Starboard Side	mpp_wh_stb	2024-04-19		unit :	anemometer : 17460042, bracket : 17460023, hydroclip : 20393894
Paroscientific Met4	Foremast	met4_fm	2023-02-02		unit : 2021-10-08	unit : 153542
Biospherical Instruments QSR 2200 surface reference radiometer	Foremast - Starboard Side	par_fm_stb	2023-02-02	2024-04-24	unit : 2022-04-19	unit : 20613
Biospherical Instruments QSR 2200 surface reference radiometer	Foremast - Starboard Side	par_fm_stb	2024-04-24		unit : 2022-04-19	unit : 20589
Biospherical Instruments QSR 2200 surface reference radiometer	Foremast - Port Side	par_fm_port	2024-04-26		unit : 2022-04-19	unit : 20613
	Foremast	rad_fm	2023-02-02		unit : 2020-12-10	IR Ra- diometer : 389613, Pyranometer : 38990F3
Gill Windsonic anemometer	Foremast	windsonic_fm	2023-02-02		unit : 2022-05-28	unit : 224900005

label	location _long	filename _prefix	installed _date	removal _date	calibration _date	serial _numbers
OSi APG-815 Optical Rain Gauge	Foremast	raingauge_fm	2024-01-01		unit : 2022-07-18	unit : 22080547