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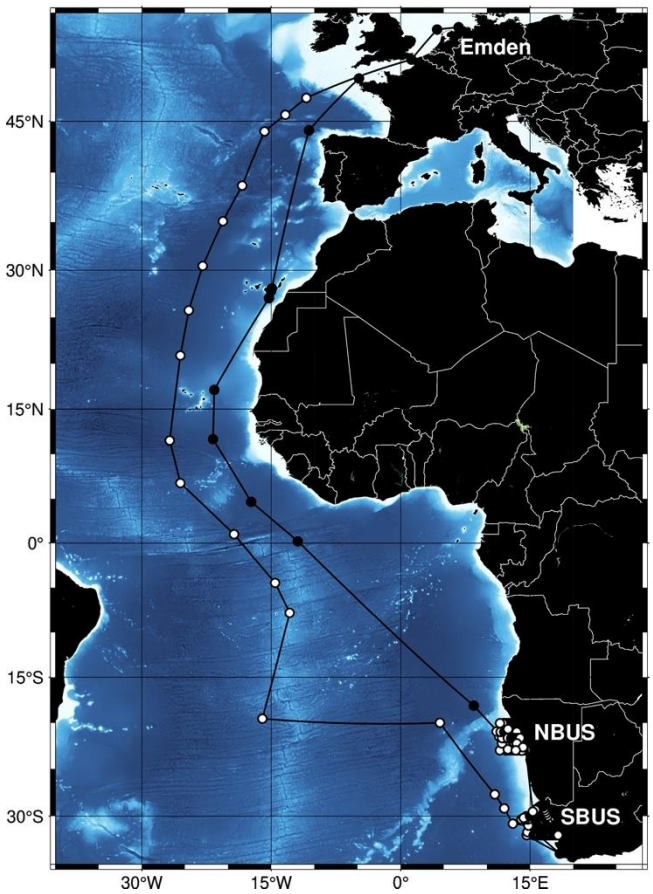
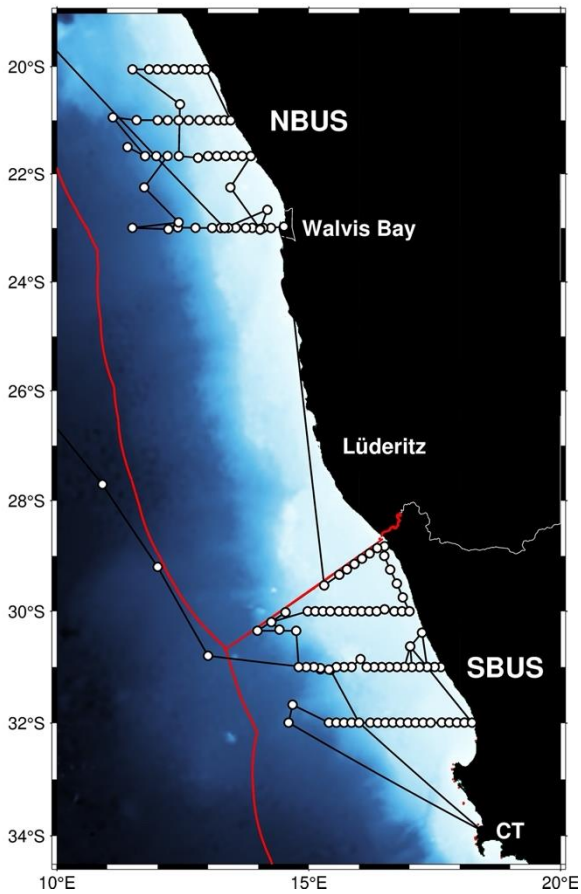
Short Cruise Report
RV SONNE, cruise SO285

Emden, Germany - Emden, Germany
August 20th – November 2nd 2021

Chief Scientist: Tim Rixen
Captain: Oliver Meyer





Objectives

The Benguela Upwelling System (BUS) is one of the global ocean's four main Eastern Boundary Upwelling Systems. It stretches from the Angola Benguela Frontal Zone (ABFZ) at ~15°S to Cape Agulhas (~35°S), while the Lüderitz Upwelling Cell at 26°40'S divides the BUS into a northern (NBUS) and a southern subsystem (SBUS, see front cover, red lines mark EEZs). Although the SBUS and NBUS are part of one system that is driven by the south-easterly trade winds, there are also fundamental differences between these two systems regarding seasonality, upwelling of source water masses, upwelling intensity, and response to global change.

Cruise SO285 is the second field campaign of the BMBF-funded joint project TRAFFIC (Trophic TRAnsfer eFFICiency in the Benguela Current). In contrast to the first TRAFFIC cruise with RV METEOR (M153) during the austral summer/autumn in 2019, cruise SO285 took place during the austral winter/spring in the year 2021. The main objective was to capture ecosystem responses to varying physical conditions and associated impacts on fisheries and sequestration of CO_2 with the overall aim to better understand climate change and human influences on marine ecosystems and their services to society.

During both cruises, we focused on two regions, one off Namibia (NBUS) and a second one off South Africa (SBUS, see front cover). However, the COVID-19 pandemic strongly affected the cruise SO285. This began with Emden, Germany, as port of embarkation and disembarkation, which caused a transit time of approximately twice three weeks and a request from the PIRATA (Prediction and Research Moored Array in the Tropical Atlantic) program to recover two of their observing buoys in the South Atlantic Ocean during the transit into the working area.

In the working area, the following topics were on our agenda:

- underway measurements of greenhouse gases and associated parameters,
- shipboard measurements of the EK60 echo sounder to obtain information on vertical distribution of plankton and nekton organisms of different size classes,
- recovery and deployment of sediment trap moorings and drifters to quantify the export of organic matter from the euphotic zone,
- deployment of five ARGO-floats and one Bio-ARGO-float,
- station work along transects mostly perpendicular to the coast including the operation of seven different gears as well as hook and line fishing.

Table 1 provides a summary of the used gears as well as the deployments and recoveries and acronyms used in the station list below.

Table 1 Summary of instruments in operation

No	Gear	Acronym station list	Sampling object
1	CTD Rosette	CTD	Water / Pico-, Nano-, Microplankton / Phytopigments
2	Apstein Net	APT.	Phytoplankton
3	MultiNet Midi 55 µm	55	Phytoplankton
4	MultiNet Midi 200 µm	200	Zooplankton
5	MultiNet Maxi 500 µm	Maxi	Ichthyo- & Zooplankton
6	Neuston Catamaran	CAT	Neuston
7	Rectangular Mid-Water Trawl	RMT	Mesopelagic fish
8	Hook and Line Fishing		Squid /Fish
Instruments which have been deployed and recovered			
9	Sediment Trap Drifter	DRI	Sinking particles
10	Sediment Trap Moorings	MOO	Sinking particles
11	ARGO-floats	ARG	autonomously operating CTD profilers
12	BIO-ARGO floats	BIO	ARGO float including an oxygen and nitrate sensor
13	PIRATA	PIRA	oceanographic observation buoys

Narrative

In contrast to the previous RV SONNE cruises SO283 and SO284, which were both considered as rescue missions for the recovery of long-term observation systems in the Atlantic Ocean, cruise SO285 was once again dedicated to project-oriented marine field work but still under COVID-19 related safety measures. Even though this included the ban to board or disembark in foreign ports, we had to call into the ports of Cape Town, South Africa, and Walvis Bay, Namibia, as well as Las Palmas, Canary Islands, Spain, because of logistic requirements. Furthermore, since South Africa was declared as a high-risk area due to the spread of COVID-19 variants, South African passport holders got no visa to travel to Emden and join the cruise. All our attempts failed to get an exception for our colleagues from South Africa so that finally, only two participants from the University of Cape Town could participate in the cruise, because they are German and British passport holders.

The transit time and the resulting total duration of the cruise of more than ten weeks was another challenge, which created a number of other issues. Their discussion would go far beyond the scope of this chapter but in a nut shell, it led to a rescue mission of (PIRATA) buoys during the transit into the work area and a sampling strategy, which differed from the one of cruise M153. The two PIRATA buoys which cut loose from their anchors were recovered on September 5th and 7th. The sampling strategy, in turn, had to be changed due to the TRXIUS, which was unavailable during the cruise SO285.

The TRIAXUS is a high speed remotely operated towed vehicle, which is equipped with a number of instruments and undulated vertically at water depths between 5 and 180 m. Its use during the M153 cruise was a real success as the obtained highly resolved water column profiles showed clearly the upwelling front in the SBUS for the first time. In order to compensate for the missing TRIAXUS, we increased the station density along transects perpendicular to the coast and equipped the CTD rosette sampler with a Seascan SUNADeep Nitrate Sensor and an Underwater Vision Profiler (UVP) in order to prove the existence of the upwelling front during the austral winter and to check, whether similar fronts establish in the NBUS.

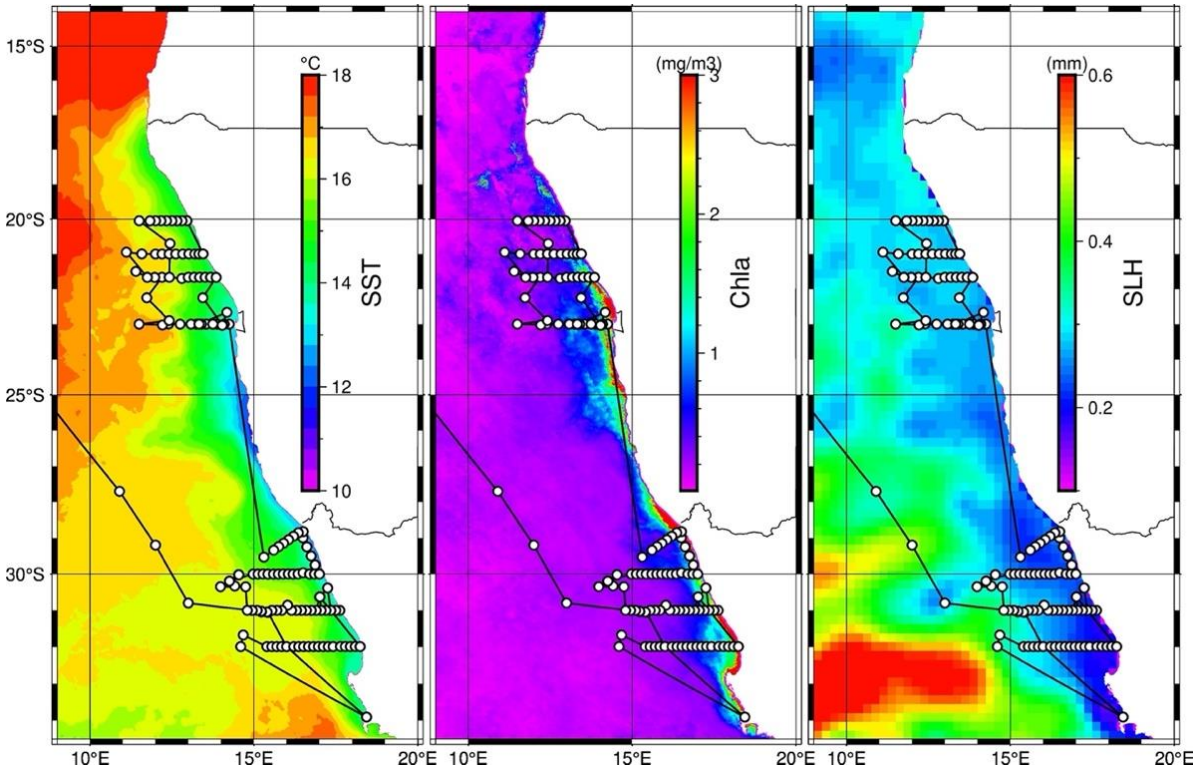


Figure 1: Satellite data (left: sea surface temperature (SST), middle: chlorophyll a concentrations (Chla), right: sea level height anomaly (SHL)) obtained form NEODAAS averaged for the period of the cruise. The white circles mark our sampling sites.

Furthermore, satellite data, which we received from our partners of NEODAAS at Plymouth Marine Laboratory, UK, guided the planning of field work in the BUS regions and will later support the interpretation of data obtained during the cruise. However, high chlorophyll *a* concentrations (Chl *a*) in a narrow belt along the coast, in addition to low sea surface temperatures (SST < 16°C) and low sea level anomalies (SLH) indicate a relatively strong upwelling south of Walvis Bay at 23°S and reveal that our SO285 transects covered the region influenced by coastal upwelling (Figure 1).
In addition to coastal upwelling, also clockwise and counter-clockwise rotating mesoscale eddies as well as filaments emerging between the eddies, existed in this upwelling region and influenced horizontal advection and development of upwelling-triggered plankton blooms (Figure 2). In order to get a first glimpse on effects of eddies on plankton development along the South African continental slope, we started our TRAFFIC field work at station SO285-16 at 1 o'clock at night on September 13th 2021 at the outer rim of the SBUS in the Benguela Current. Here, satellite data indicate the occurrence of three pronounced clockwise and two counter-clockwise rotating eddies (Figure 2). The comparison of satellite data with our underway measurements shows that similar to the sea level also chlorophyll *a* concentrations rise and fall, implying close links between the ocean's physics and pelagic ecosystems. To better understand this relationship and the influence of eddies on the ecosystem, plankton nets and CTD devices were also deployed at the eddy locations.

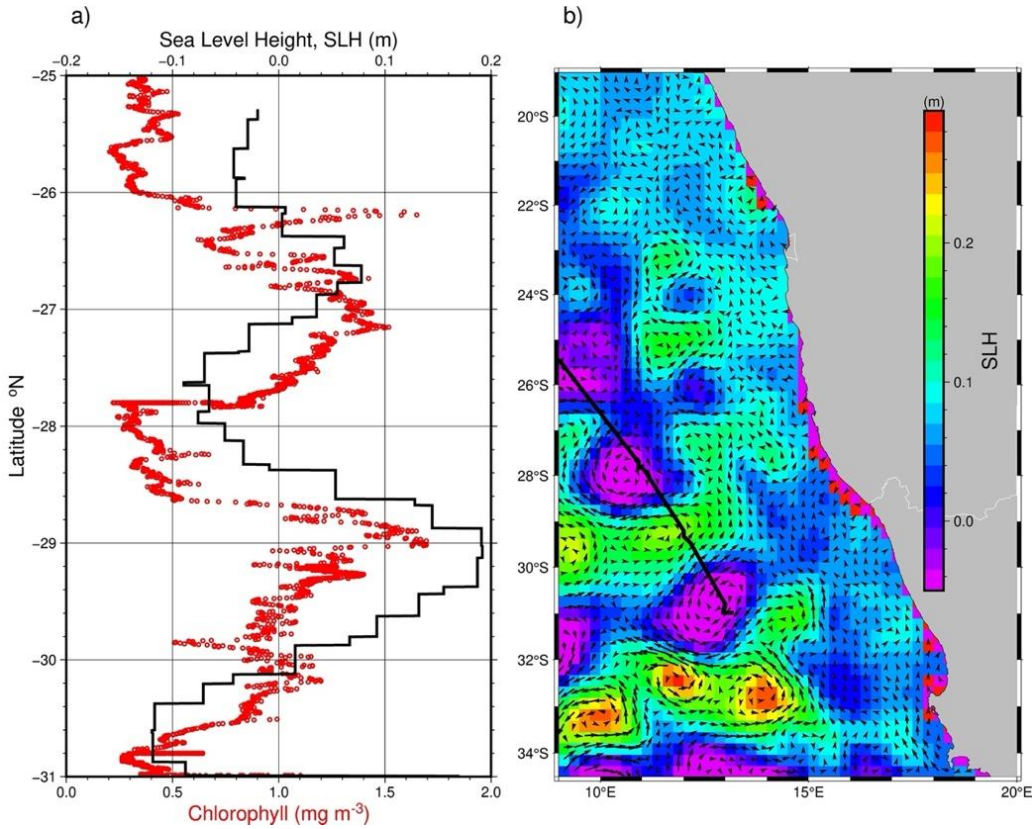


Figure 2: (a) Sea level height (SLH) (from satellite data, black line) and chlorophyll a concentration (own measurements, red dots) along the cruise transect, plotted against latitude. (b) SLH and resulting surface currents (black arrows). The bold black line depicts our cruise track.

On September 16th, three days after our first TRAFFIC station, we reached Cape Town in South Africa to bunker fuel and already a day later, on September 17th at 19:11 our SBUS work started at station SO285_21 (see station list). The station list (see below) provides detailed information on the timing as well as on the deployment of gears during the station work. In addition to our regular station work we also deployed five ARGO and one BIO-ARGO floats at stations 21, 22, 69, 111, 112, and 120. The respective WMO number is 69041 with the following endnumbers: 18, 19, 35, 36, 37 and 38. The data obtained by these floats are already online and can be downloaded at https://fleetmonitoring.euro-argo.eu/dashboard.

In the SBUS our work included stations aligned along five transects. Three transects (at 32 °S, 31°S and 30°) were perpendicular to the coast, one transect was parallel to the coast, and one transect parallel to the Namibian and South African border. The transects perpendicular to the coast covered the stations SO285_21 – 41 (32°S transect), SO285_46 – 67 (31°S transect), and SO285_69 – 88 whereas the transect parallel to the coast includes stations SO285_88 – 93. Since we could not directly continue our work in the Namibian part of the SBUS, due to a newly introduced Namibian regulation, we adapted the fifth transect to the Namibian and South African border as mentioned before. This transect included stations SO285_95 – 100. On September 28th at about noon (12:42) we finished our work after about 11 days in South African waters, at station SO285_100.

Before we could continue our work in the NBUS we had to enter the port of Walvis Bay as this was a requirement associated with Namibian work permit. However, already two days after we had left station SO285_100 in the SBUS, we continued our field work in the NBUS on September 30st at 16:31 at station SO285_101. The NBUS work contained four transects perpendicular to the coast at 23°S, 21° 40' S, 21°S, and 20°S. Due to bad weather conditions not all of the planned gears could be used on the 23°S-transect after we had left Walvis Bay so that this transect was revisited on October 9th which was also our last working day. Hence, the 23°S transect contains the stations SO285_101 – 112 and SO285_150 – 154. Due to logistical constrains also the second transect at 21° 40' S was split into two parts. The first part was sampled on October 3rd while the second part was sampled between October 6th and 7th. The first part included stations SO285_115 - 119 and the second part comprised stations SO285_141 – 148. The other two transects at 21°S, and 20°S contained the stations SO285_120 – 130 and SO285_131– 139 and were sampled between October 4th and 5th as well as between October 6th and 7th. As mentioned before, on October 9th at about 10 o'clock at night we finished our NBUS station work after about 10 days on the 23°S transect at station SO285_154.

After this last station we again had to dock in the port of Walvis Bay to close the work permit before leaving Namibian waters. Thereafter, the transit back to Emden started, which was interrupted by an additional call into the port of Las Palmas on October 24th to solve problems with the ship's satellite antenna. During the transit back to Emden we packed the equipment, cleaned the laboratories and started to write reports. The eleven weekly reports, which are accessible on the website of German Research Fleet Coordination Centre, provide a more detailed view on our daily work and topics we discussed on board. They also include pictures, photographs, and some preliminary findings.

Acknowledgements

Our gratitude goes to captain Oliver Meyer and his crew for their excellent support during the cruise as well as to our project partners in Namibia and South Africa and the ministries, agencies and companies, which we list below, for their support, patience and flexibility to make this cruise possible and successful under these exceptional COVID-19 conditions.

- German Federal Ministry of Education and Research (BMBF),
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- German Research Fleet Coordination Centre at the Universität Hamburg (LDF),
- 'Projektträger Jülich' at the Jülich Research Centre GmbH (PtJ),
- German Ministry of Foreign Affairs,
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- South African Department of International Relations and Cooperation (DIRCO),
- South African Department of Forestry, Fisheries, and the Environment,
- Namibian National Commission of Research Science and Technology,
- Namibian Ministry of International Relations and Cooperation,
- Namibian Ministry of Environment, Forestry and Tourism,
- Namibian Ministry of Fisheries and Marine Resources,
- Namibian National Marine Information and Research Centre (NatMIRC),
- Shipping Company BRIESE RESEARCH,
- German Academic Exchange Service (DAAD),
- LPL Projects + Logistics GmbH.

Scientific Party

No.	Name	Discipline	Institution
1	Rixen, Tim	Marine Biogeochemistry / Chief Scientist	ZMT
2	Borowski, Philina	Primary Production, Trophic Dead Ends	IMF
3	Duncan, Sabrina	Mesopelagic fish	TI
4	Heinatz, Knut	Primary Production, Trophic Dead Ends	IMF
5	Hirschmann, Sophia	Primary Production, Trophic Dead Ends	IMF
6	Horton, Matt	Ichthyoplankton	DFFE/UCT
7	Hüge, Fabian	Marine Biogeochemistry	ZMT
8	Janßen, Silke	Primary Production, Trophic Dead Ends	IMF
9	Jordan, Tine	Zooplankton ecology	BreMarE
10	Kaufmann, Manfred	Primary Production, Trophic Dead Ends	UMa
11	Kremer, Kira	Mesopelagic fish	TI
12	Labis, Emma	Ichthyoplankton	ZMT
13	Martin, Bettina	Primary Production, Trophic Dead Ends	IMF
14	Mayer, Bernhard	Physical Oceanography	IFM
15	Meiritz, Luisa	Marine Biogeochemistry	IFG
16	Paulus, Eva	Mesopelagic fish	IFG
17	Pinter, Sina	Marine Biogeochemistry	ZMT
18	Plewka, Julia	Ichthyoplankton	ZMT
19	Reule, Natalie	Marine Biogeochemistry	ZMT
20	Rommel, Alix Claire Maria	Zooplankton ecology	BreMarE
21	Schneider, Tabea	Primary Production, Trophic Dead Ends	IMF
22	Siddiqui, Claire	Marine Biogeochemistry	ZMT
23	Springer, Barbara	Primary Production, Trophic Dead Ends	UMa
24	Stanbro, Kelsey	Mesopelagic fish	TI
25	Stegeman, Hanna	Zooplankton ecology	BreMarE
26	Wallschuss, Sina	Marine Biogeochemistry	UCT
27	Welsch, Andreas	Physical Oceanography	IFM
28	Wenzel, Julia	Meteorology	DWD
29	Witting, Kea	Zooplankton ecology	ZMT
30	Zankl, Solvin	Photographer	

BreMarE	Bremen Marine Ecology, University of Bremen, Germany
DFFE	Department of Forestry, Fisheries, and the Environment, Cape Town, South Africa
DWD	Deutscher Wetterdienst, Geschäftsfeld Seeschifffahrt, Hamburg, Germany
IfGM	Institute of Geology, Universität Hamburg, Germany
IMF	Institute for Marine Systems and Fisheries Science, University of Hamburg, Germany
IFM	Institute of Oceanography, University of Hamburg, Germany
TI	Thünen Institute for Sea Fisheries, Bremerhaven, Germany
UCT	University of Cape Town, South Africa
UK	University of Konstanz, Germany
UMa	Universidade da Madeira, Funchal, Portugal
ZMT	Leibniz Centre for Tropical Marine Research, Bremen, Germany

Station list

No	Station No	Date	Time	Lat.	Lon.	Water Depth	Wind	Number of CTD casts and net hauls (Table 1 explains acronyms)							Number of deployments / recoveries (Table 1 explains acronyms)				
		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
1	SO285 1	22.08.	19:37	47.2184	-10.9339	4708.5	2.	1.	2.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
2	SO285 2	23.08.	08:16	45.6163	-13.3579	4256.8	4.	1.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.
3	SO285 3	23.08.	19:35	44.0142	-15.7820	5495.0	5.	1.	2.	1.	1.	1.	1.	1.	0.	0.	0.	0.	0.
4	SO285 4	25.08.	06:56	38.6811	-18.3673	5282.7	2.	1.	2.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
5	SO285 5	26.08.	03:42	35.0731	-20.6052	4808.4	5.	1.	3.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
6	SO285 6	27.08.	11:21	30.4491	-22.9402	5263.0	3.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	SO285 7	28.08.	09:43	25.7506	-24.5515	5173.8	4.	1.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	SO285 8	29.08.	07:34	20.8784	-25.5273	4976.8	4.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	SO285 9	31.08.	01:32	11.5078	-26.7671	5415.6	3.	1.	3.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	SO285 10	01.09.	00:05	6.7545	-25.5275	4494.1	5.	1.	0.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
11	SO285 11	02.09.	15:54	0.9993	-19.3175	4170.2	3.	1.	3.	1.	1.	0.	1.	0.	0.	0.	0.	0.	0.
12	SO285 12	04.09.	05:07	-4.4665	-14.5502	3816.0	4.	1.	2.	1.	1.	0.	1.	0.	0.	0.	0.	0.	0.
13	SO285 13	05.09.	07:15	-7.8279	-12.8667	3556.0	5.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
14	SO285 14	07.09.	12:12	-19.5548	-16.0302	4002.7	4.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
15	SO285 15	11.09.	03:46	-20.0001	4.5459	5456.1	5.	1.	2.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	SO285 16	13.09.	01:00	-27.7047	10.9029	4738.3	6.	1.	2.	1.	2.	1.	0.	2.	0.	0.	0.	0.	0.
17	SO285 17	13.09.	18:00	-29.1999	12.0001	3880.4	5.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
18	SO285 18	14.09.	08:03	-30.7988	12.9996	3325.0	5.	1.	2.	1.	1.	1.	1.	1.	0.	0.	0.	0.	0.
19	SO285 19	15.09.	00:50	-31.0496	15.4316	939.5	4.	1.	0.	0.	1.	0.	0.	2.	0.	0.	0.	0.	0.
20	SO285 20	15.09.	11:28	-31.9935	15.9993	833.5	4.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
21	SO285 21	17.09.	19:11	-31.9934	14.5994	2703.5	7.	1.	0.	0.	1.	0.	0.	0.	0.	0.	1.	0.	0.
22	SO285 22	18.09.	00:23	-31.6741	14.6786	2560.9	7.	2.	2.	1.	1.	2.	0.	5.	0.	0.	1.	0.	0.
23	SO285 23	18.09.	16:25	-31.9933	15.4000	2091.6	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	SO285 24	18.09.	18:31	-31.9933	15.5500	1731.5	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25	SO285 25	18.09.	20:55	-31.9939	15.7002	1320.5	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26	SO285 26	18.09.	22:46	-31.9932	15.8501	1056.0	5.	1.	0.	0.	0.	0.	0.	2.	1.	0.	0.	0.	0.
27	SO285 27	19.09.	04:56	-31.9934	15.9997	823.4	4.	1.	2.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
28	SO285 28	19.09.	11:11	-31.9939	16.2209	514.8	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

No	Station No	Date	Time	Lat.	Lon.	Water Depth	Wind	Number of CTD casts and net hauls (Table 1 explains acronyms)							Number of deployments / recoveries (Table 1 explains acronyms)				
		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
29	SO285 29	19.09.	12:37	-31.9946	16.3705	406.8	5.	1.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
30	SO285 30	19.09.	19:39	-31.9929	16.5201	369.2	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	SO285 31	19.09.	21:05	-31.9931	16.6698	335.8	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
32	SO285 32	19.09.	22:26	-31.9931	16.8200	295.8	3.	1.	0.	0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
33	SO285 33	20.09.	01:07	-31.9934	16.9695	261.4	4.	1.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.
34	SO285 34	20.09.	03:37	-31.9937	17.1202	220.4	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
35	SO285 35	20.09.	04:57	-31.9936	17.2705	178.3	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
36	SO285 36	20.09.	06:07	-31.9933	17.4203	153.9	4.	1.	2.	1.	1.	0.	1.	0.	0.	0.	0.	0.	0.
37	SO285 37	20.09.	10:05	-31.9918	17.6430	142.9	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
38	SO285 38	20.09.	11:24	-31.9909	17.7913	128.1	6.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
39	SO285 39	20.09.	13:25	-31.9920	17.9419	118.1	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
40	SO285 40	20.09.	14:33	-31.9916	18.0915	107.7	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
41	SO285 41	20.09.	15:40	-31.9929	18.2430	55.0	5.	1.	4.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
42	SO285 42	21.09.	00:47	-30.9977	17.3499	156.0	6.	1.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
43	SO285 43	21.09.	04:42	-30.6337	17.0119	2295.1	6.	1.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
44	SO285 44	21.09.	08:30	-30.3827	17.2495	107.8	3.	1.	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
45	SO285 45	21.09.	12:59	-30.9983	17.3492	153.0	7.	1.	3.	1.	1.	0.	0.	0.	1.	0.	0.	0.	0.
46	SO285 46	21.09.	17:29	-31.0000	17.6239	69.0	6.	1.	3.	1.	1.	1.	0.	0.	0.	0.	0.	0.	0.
47	SO285 47	21.09.	19:42	-30.9993	17.4988	131.7	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
48	SO285 48	21.09.	20:58	-30.9996	17.3492	152.9	5.	1.	0.	1.	1.	1.	1.	5.	0.	0.	0.	0.	0.
49	SO285 49	22.09.	03:20	-30.9998	17.1999	173.7	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
50	SO285 50	22.09.	04:45	-31.0000	17.0498	195.0	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
51	SO285 51	22.09.	07:20	-30.6293	17.0137	716.9	5.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
52	SO285 52	22.09.	10:36	-30.9989	16.9002	219.5	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
53	SO285 53	22.09.	11:47	-30.9993	16.7512	239.3	4.	1.	3.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
54	SO285 54	22.09.	15:33	-30.9998	16.6001	260.6	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
55	SO285 55	22.09.	16:49	-31.0001	16.4500	289.4	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
56	SO285 56	22.09.	18:14	-31.0000	16.3000	276.7	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
57	SO285 57	22.09.	19:27	-30.9997	16.1496	297.9	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58	SO285 58	22.09.	21:13	-30.8578	16.0284	237.3	4.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.

No	Station No	Date	Time	Lat.	Lon.	Water Depth	Wind	Number of CTD casts and net hauls (Table 1 explains acronyms)							Number of deployments / recoveries (Table 1 explains acronyms)				
		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
59	SO285 59	23.09.	02:53	-30.9996	15.8508	322.2	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
60	SO285 60	23.09.	04:16	-30.9999	15.7000	410.4	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
61	SO285 61	23.09.	05:35	-31.0002	15.5501	631.6	4.	1.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.	0.
62	SO285 62	23.09.	08:12	-31.0451	15.3999	981.5	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
63	SO285 63	23.09.	09:43	-31.0396	15.2311	1276.7	3.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
64	SO285 64	23.09.	11:28	-31.0198	15.2308	1255.0	3.	1.	0.	0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
65	SO285 65	23.09.	14:41	-31.0003	15.1016	1880.5	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
66	SO285 66	23.09.	16:23	-31.0003	14.9503	2062.1	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
67	SO285 67	23.09.	18:06	-30.9999	14.8003	2198.2	2.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
68	SO285 68	24.09.	04:57	-30.3500	14.7499	773.5	4.	1.	0.	0.	1.	0.	0.	0.	1.	0.	0.	0.	0.
69	SO285 69	24.09.	11:04	-30.3494	13.9817	2220.5	3.	1.	0.	0.	0.	1.	1.	0.	0.	0.	0.	1.	0.
70	SO285 70	24.09.	17:41	-30.0186	14.5393	648.5	3.	1.	0.	1.	1.	1.	1.	4.	0.	0.	0.	0.	0.
71	SO285 71	25.09.	05:00	-30.0186	14.5392	649.2	4.	2.	2.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
72	SO285 72	25.09.	09:25	-30.1937	14.2582	1502.8	4.	1.	0.	0.	1.	1.	1.	0.	0.	0.	0.	0.	0.
73	SO285 73	25.09.	14:15	-30.3289	14.4182	1385.2	4.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
74	SO285 74	25.09.	16:50	-30.1938	14.2581	1505.0	4.	1.	2.	1.	1.	1.	1.	4.	0.	0.	0.	0.	0.
75	SO285 75	26.09.	05:43	-30.0002	14.9797	438.0	6.	1.	2.	1.	1.	1.	0.	0.	0.	0.	0.	0.	0.
76	SO285 76	26.09.	09:43	-29.9997	15.1298	320.4	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
77	SO285 77	26.09.	11:01	-29.9990	15.2813	229.0	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
78	SO285 78	26.09.	12:31	-29.9998	15.4285	224.8	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
79	SO285 79	26.09.	13:53	-29.9993	15.5987	202.0	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
80	SO285 80	26.09.	15:06	-29.9998	15.7502	208.0	6.	1.	2.	1.	1.	1.	0.	2.	0.	0.	0.	0.	0.
81	SO285 81	26.09.	19:40	-29.9988	15.8998	194.1	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
82	SO285 82	26.09.	21:02	-29.9991	16.0503	188.2	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
83	SO285 83	26.09.	22:25	-29.9996	16.2001	181.7	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
84	SO285 84	26.09.	23:43	-29.9989	16.3486	187.8	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
85	SO285 85	27.09.	00:59	-29.9653	16.5059	174.0	4.	1.	3.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
86	SO285 86	27.09.	05:55	-29.9999	16.7000	157.6	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
87	SO285 87	27.09.	07:17	-29.9996	16.8510	137.1	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
88	SO285 88	27.09.	08:38	-29.9999	17.0000	122.4	3.	1.	3.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.

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		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
89	SO285 89	27.09.	13:12	-29.7492	16.8676	126.4	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
90	SO285 90	27.09.	15:14	-29.4999	16.7502	126.2	4.	1.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
91	SO285 91	27.09.	17:35	-29.2499	16.6166	123.9	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
92	SO285 92	27.09.	19:39	-29.0000	16.4987	121.5	5.	1.	2.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
93	SO285 93	27.09.	22:01	-28.8263	16.5054	54.2	5.	1.	3.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
94	SO285 94	27.09.	23:49	-28.8598	16.3586	109.7	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
95	SO285 95	28.09.	01:21	-28.9553	16.2085	134.5	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
96	SO285 96	28.09.	02:44	-29.0514	16.0583	162.8	5.	1.	2.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
97	SO285 97	28.09.	05:08	-29.1483	15.9081	171.1	5.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.
98	SO285 98	28.09.	07:03	-29.2446	15.7582	175.1	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
99	SO285 99	28.09.	08:29	-29.3399	15.6068	178.2	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
100	SO285 100	28.09.	10:41	-29.5324	15.3072	166.1	5.	1.	2.	1.	1.	1.	0.	0.	0.	0.	0.	0.	0.
101	SO285 101	30.09.	16:31	-22.9998	14.2502	99.3	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
102	SO285 102	30.09.	17:52	-22.9999	14.0958	131.2	6.	1.	3.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.
103	SO285 103	30.09.	21:00	-22.9991	13.8793	142.8	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
104	SO285 104	30.09.	22:13	-22.9995	13.7498	144.7	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
105	SO285 105	30.09.	23:53	-22.9987	13.5507	160.8	5.	1.	3.	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.
106	SO285 106	01.10.	02:35	-22.9985	13.4004	316.9	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
107	SO285 107	01.10.	04:16	-22.9999	13.2502	363.2	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
108	SO285 108	01.10.	05:45	-22.9999	13.0807	355.5	5.	1.	3.	2.	1.	1.	1.	0.	0.	0.	0.	0.	0.
109	SO285 109	01.10.	11:04	-22.9989	12.7497	1015.9	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
110	SO285 110	01.10.	14:13	-22.9922	12.4003	1887.5	5.	2.	3.	2.	1.	1.	0.	2.	1.	1.	0.	0.	0.
111	SO285 111	02.10.	01:03	-23.0238	12.2125	2336.3	6.	1.	0.	0.	0.	1.	0.	2.	0.	0.	1.	0.	0.
112	SO285 112	02.10.	10:14	-22.9990	11.4988	3240.3	6.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.
113	SO285 113	02.10.	15:35	-22.8980	12.4169	1887.8	7.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
114	SO285 114	02.10.	21:34	-22.2487	11.7330	2511.0	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
115	SO285 115	03.10.	02:41	-21.6648	12.1956	1365.6	6.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
116	SO285 116	03.10.	05:12	-21.6669	11.9735	1705.9	7.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
117	SO285 117	03.10.	07:33	-21.6659	11.7488	1952.2	6.	2.	0.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
118	SO285 118	03.10.	13:07	-21.4991	11.3999	2481.5	5.	1.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.	0.

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		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
119	SO285 119	03.10.	17:38	-21.6669	11.7500	1951.1	7.	1.	0.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
120	SO285 120	04.10.	01:41	-20.9463	11.1101	2327.0	5.	2.	2.	1.	1.	1.	1.	3.	0.	0.	1.	0.	0.
121	SO285 121	04.10.	12:36	-20.9985	11.5811	1634.5	4.	1.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
122	SO285 122	04.10.	16:46	-20.9999	12.0000	998.0	5.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
123	SO285 123	05.10.	01:49	-20.9995	12.1998	761.9	3.	1.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.
124	SO285 124	05.10.	05:54	-21.0001	12.4169	508.4	4.	1.	0.	0.	0.	0.	1.	0.	1.	0.	0.	0.	0.
125	SO285 125	05.10.	08:54	-20.9998	12.6181	374.0	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
126	SO285 126	05.10.	10:36	-21.0001	12.8332	296.9	3.	1.	2.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
127	SO285 127	05.10.	14:43	-20.9993	13.0169	150.8	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
128	SO285 128	05.10.	16:12	-21.0002	13.2003	118.5	4.	1.	0.	0.	0.	0.	1.	0.	0.	0.	0.	0.	0.
129	SO285 129	05.10.	18:07	-20.9997	13.3252	91.9	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
130	SO285 130	05.10.	19:13	-20.9993	13.4497	60.9	5.	1.	4.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
131	SO285 131	06.10.	02:19	-20.0498	12.9581	126.3	4.	1.	4.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
132	SO285 132	06.10.	05:23	-20.0499	12.8065	149.0	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
133	SO285 133	06.10.	06:46	-20.0502	12.6536	129.8	2.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
134	SO285 134	06.10.	08:06	-20.0497	12.4994	152.6	2.	1.	3.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
135	SO285 135	06.10.	11:28	-20.0492	12.3337	232.4	3.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
136	SO285 136	06.10.	12:50	-20.0488	12.1661	279.8	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
137	SO285 137	06.10.	14:27	-20.0497	11.9991	338.2	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
138	SO285 138	06.10.	15:53	-20.0500	11.8301	426.1	3.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
139	SO285 139	07.10.	00:09	-20.0494	11.5004	799.8	4.	1.	2.	1.	1.	1.	1.	2.	0.	0.	0.	0.	0.
140	SO285 140	07.10.	12:01	-20.7020	12.4425	316.9	4.	1.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.	0.
141	SO285 141	07.10.	18:56	-21.6658	12.4200	935.6	4.	1.	2.	1.	1.	1.	1.	1.	0.	0.	0.	0.	0.
142	SO285 142	08.10.	02:58	-21.6987	12.8022	316.6	4.	1.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.
143	SO285 143	08.10.	07:27	-21.6662	13.0005	270.3	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
144	SO285 144	08.10.	08:49	-21.6665	13.1801	166.2	4.	1.	3.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
145	SO285 145	08.10.	12:07	-21.6657	13.3466	140.3	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
146	SO285 146	08.10.	13:28	-21.6645	13.5148	115.9	5.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
147	SO285 147	08.10.	14:56	-21.6657	13.6812	97.4	5.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
148	SO285 148	08.10.	16:24	-21.6670	13.8499	48.0	5.	1.	4.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.

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		2021	[UTC]	[°N]	[°E]	[m]	[Bft]	CTD	APT.	55	200	Maxi	CAT	RMT	DRI	MOO	ARG	BIO	PIRA
149	SO285 149	08.10.	21:43	-22.2492	13.4439	163.7	5.	1.	0.	0.	0.	0.	0.	3.	0.	0.	0.	0.	0.
150	SO285 150	09.10.	05:09	-23.0194	14.0343	129.7	5.	0.	0.	0.	0.	0.	0.	0.	0.	1.	0.	0.	0.
151	SO285 151	09.10.	07:38	-22.9996	13.7493	146.4	5.	1.	0.	0.	0.	1.	1.	0.	0.	0.	0.	0.	0.
152	SO285 152	09.10.	10:29	-23.0311	14.0349	134.8	4.	0.	0.	0.	0.	1.	1.	0.	0.	1.	0.	0.	0.
153	SO285 153	09.10.	14:52	-22.6639	14.1788	93.6	4.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
154	SO285 154	09.10.	19:42	-23.0000	13.3290	349.3	5.	1.	0.	0.	0.	0.	0.	2.	0.	0.	0.	0.	0.