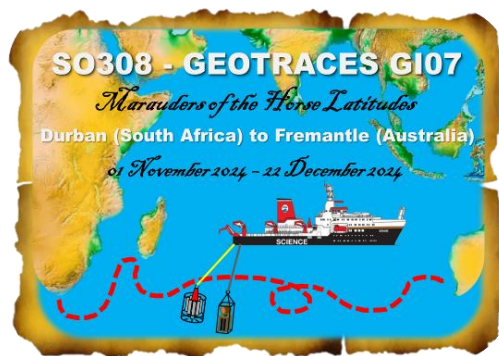


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Short Cruise Report RV SONNE, cruise SO308

Durban (South Africa) – Fremantle (Australia)

October 31 – December 22 2024

Chief Scientist: Eric P. Achterberg

Captain: Oliver Meyer

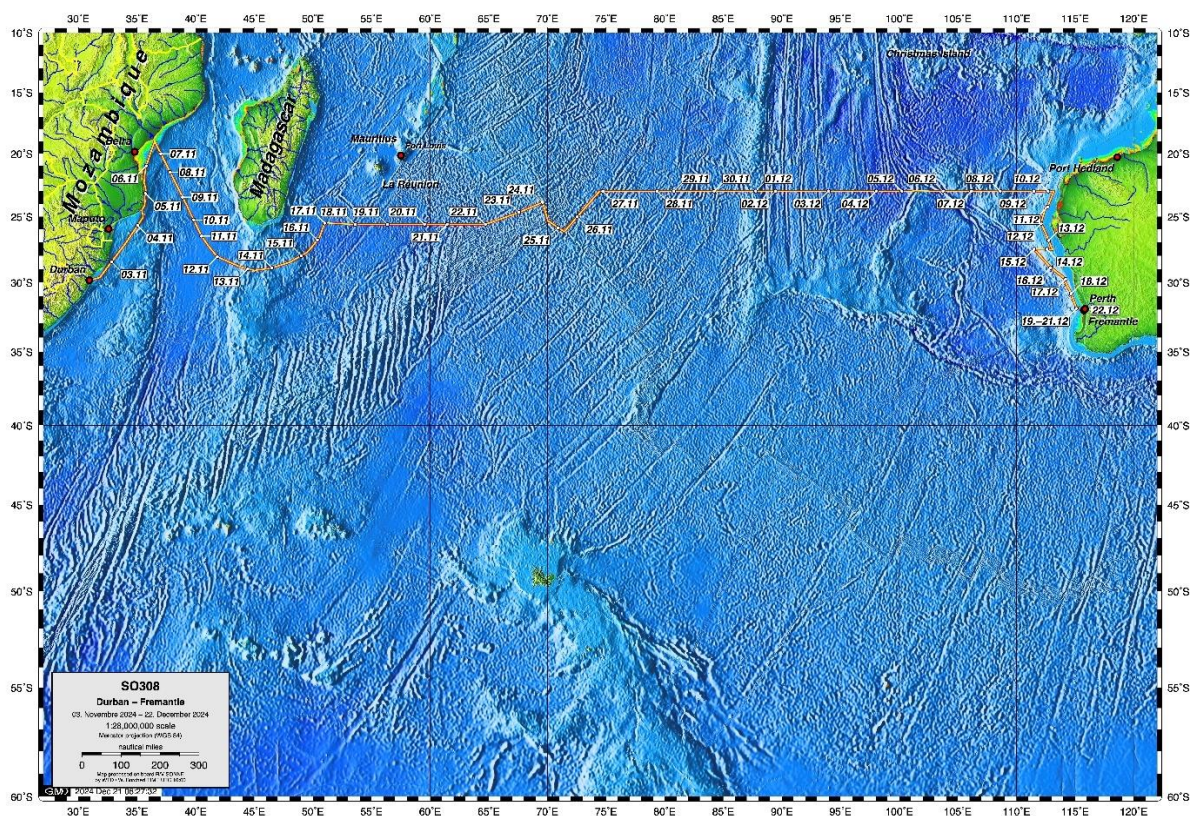


Fig. 1: Cruise track (yellow-red line) and stations locations (indicated by dates) of RV SONNE cruise SO308

Objectives

The main **scientific aim** of the cruise was to establish the distributions of TEIs, quantify their sources from the four major ocean boundaries (rivers, atmosphere, exchange with sediments, ocean crust), and determine their biogeochemical cycling and relationships to large scale ocean circulation along a cruise track in the SIO.

The cruise was conducted along a zonal section from Mozambique to Australia, which is an ideal section to assess the cycling of micronutrients in general, and in the SIO in particular. The section features important hydrothermal inputs to deep waters and pronounced contrasts in surface ocean productivity.

The **major questions** that were addressed on the cruise:

1. The SIO surface waters exhibits a transition from more productive waters along shelves and slopes to oligotrophic conditions with low concentrations of nitrate and micronutrients (Fe, cobalt (Co), zinc (Zn)) in the central gyre (P is reported to be replete). What are the proximally limiting or co-limiting (micro)nutrients for surface ocean productivity along cruise track, and how do N₂ fixation rates and diazotrophic communities change?
2. The sources, sinks, and internal cycling of TEIs in the SIO are poorly understood despite the importance of this region for the global cycling of nutrients and carbon. Which processes control the fluxes, supplies and cycling of TEIs?
3. Seafloor spreading centres along the Central Indian Ridge are known, but poorly investigated and reported. Are there notable hydrothermal Fe fluxes in the central SIO, and can we determine the length scales of the Fe plumes?
4. Are the Madagascar and Australian shelves and slope systems important sources of Fe and other TEIs to the Indian Ocean along our ocean section?
5. Enhanced productivity in the Mozambique Channel and near Madagascar facilitates particle export from the surface to deeper ocean. Can we observe a zonal variation in carbon export and nutrient utilisation (Si, Ba isotopes) related to productivity strength and supplied (micro)nutrients?
6. How does large scale ocean circulation affect the TEI distributions in surface and subsurface SIO water masses? Is the advection of intermediate depth water masses from the Southern Ocean reflected by their TEI distributions (including Nd isotopes, Rare Earth Elements (REEs))?

We have the following **major goals** that we wanted to achieve for the cruise:

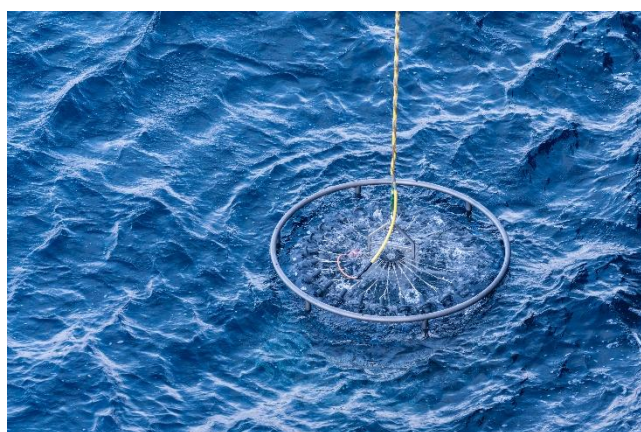
- Obj 1. Determine the distribution, as well as the physical and chemical speciation of TEIs, including micronutrients (such as Cd, Co, Cu, Fe, Mn, Mo, Ni, V, Zn, Cr), non-biologically essential elements (such as Al, Pb, Hg, Ti, Zr, Hf, Nb, U, W and REEs) and a range of isotope systems (including Th, Ra, Nd, Ba, Si, Pb, Fe, Cd) in high resolution full-depth profiles and along a continuous surface water section.
- Obj 2. Quantify the fluxes of these TEIs and micronutrients to the ocean from the four ocean boundaries: atmosphere, continent, ocean crust and sediments and assess the role of physical and chemical speciation of TEIs for their fluxes from the different sources.
- Obj 3. Assess, using chemical tracers and physical oceanography, the mixing and advection of the TEIs away from their sources into the ocean interior, and upwards into the surface ocean.
- Obj 4. Explore the relationship between macro- and micro-nutrient concentrations and fluxes, ocean productivity, particle and zooplankton distribution, metagenomic markers of particle export, nutrient utilization and limitation, diazotrophy, and nitrogen/carbon cycles.

Narrative

October 28-November 1, 2024- Scientists and technicians travelled from their home laboratories to Durban (South Africa) to join RV SONNE. A group of GEOMAR scientists and



technicians had travelled already on October 27 and 28 to arrive earlier in Durban to unload containers and set up the equipment for the cruise. Fortunately, the port of Durban had loaded our containers before we arrived, and we could start unpacking immediately. Also, all the airfreight was delivered in time, with the exception of sample bottles for N₂O from Stanford University. All the cruise participants of SO308 were transferred to the vessel by minibuses in the morning of October 30. A total of 6 containers for SO308 were loaded plus the catering supplies containers for the cruise. Another 4 containers were already on the vessel for a later GEOMAR cruise. The GEOMAR trace metal clean winch container with a cable guiding deck block was installed by Florian Evers, as was our clean container for sample filtration. The CTD sensors, UVP, nitrate and pH sensor, PISCO camera and



other instruments were installed on the SONNE stainless steel CTD frame. The cruise participants installed their laboratories. We were delayed by 2.5 days in our departure because of problems with the ships' engines and winch system. We departed Durban in the afternoon of November 2 with calm sea conditions in the coastal waters off South Africa.

November 2-4, 2024- Following our departure from Durban on November 2, we

Fig. 2: Top: Winch with Kevlar conducting wire. Below: Deployment of titanium CTD frame. Photo E. Achterberg (top) and C. Rohleder (below).

transited to the first station in the EEZ of Mozambique. The cruise started sampling surface waters from our trace metal clean tow fish for trace

elements and biological variables upon arrival in the EEZ of Mozambique. This sampling activity using the tow fish continued until we reached the last station 51 near Fremantle (December 19). The surface waters were sampled for nitrogen fixation, nutrients and trace elements to establish the rates of nitrogen fixation, types of diazotrophs present (using nifH gene analysis), and the chemical environment of the diazotrophs. Nutrients and trace elements were sampled typically every 3 hours when steaming, and also upon arrival or departure at stations. The tow fish was taken out of the water for inspection or maintenance.

The ship's ADCP, multibeam, Parasound and TSG (underway T, S system) were switched on in the waters of Mozambique (until December 22) whilst the vessel was sailing. In addition, we sampled aerosols (until December 22). The aerosol collector was placed on the

top deck of the SONNE and filters changed every 72 h.

We have deployed 2 different CTDs (titanium GEOMAR CTD, stainless steel SONNE CTD) and also a set of 7 to 9 *in situ* pumps. The titanium GEOMAR CTD was operated by a dedicated winch system with a Kevlar cable (Fig. 5.1a), thereby preventing contamination of the samples during the sample collection. The deployments of the CTDs have been successful. The deployment of the *in situ* pumps was also very successful and greatly contributed to the success of the cruise. Two of the *in situ* pumps (KISP pumps) only operated during the first 2 stations and then had electronic issues. All the McLane pumps worked very well. We also deployed the GEOMAR mini MUC with 4 cores at stations, until December 6. From then on we deployed a mini corer (single core only). At shallow stations, the MUC was deployed separately, and at deep stations it was hung under the StSt CTD frame. All this worked well.

At each station, we sampled the full water column with the titanium GEOMAR CTD (Ti-TM CTD) for contamination prone variables, and using the stainless steel SONNE CTD (Stainless steel -CTD) for less contamination prone variables, including isotopes like Nd and Th. An additional Stainless steel-CTD (BIO-CTD) was deployed every day to about 300 m depth for collection of biological variables. In addition, every second day we performed an additional BIO-CTD for genomic material. Biological rate experiments of nitrogen fixation were conducted using water from the BIO-CTD (and tow fish). Phytoplankton resource limitation experiments were conducted in the ship-board laboratory and in incubation tanks on the aft deck.

We sampled a total of 51 stations on SO308, and 16 were so-called superstations. At the superstations, we deployed an additional StSt-CTD for the collection of additional waters for isotope measurements. In addition, at the superstations we deployed 7 to 9 *in situ* pumps on the stainless steel wire of the StSt-CTD. The pumps and StSt-CTD deployment occurred simultaneously. The stainless steel wire of the SONNE was quite clean and released relatively few particles. The freshwater rinsing system of the cable on the SONNE facilitated a clean CTD wire.

The *in-situ* pumps were used to collect particles for geochemical and biological investigations. Particulate Th isotopes (Th 234) obtained from the filters of the *in-situ* pumps will be analysed. In addition, a Mn cartridge was placed on the *in-situ* pumps, which allowed for the collection of long-lived Ra samples. We also sampled the Niskins from the Stainless steel-CTD for helium isotopes which we will use as a tracer of the hydrothermal fluid inputs to the ocean. The helium sampling was conducted from the Mozambique Channel to the Australian slope.

The first station on November 4, 2024 was conducted in coastal waters of Mozambique with a depth of just 94 m. The GEOMAR Ti CTD with OTE Niskin bottles worked well, as did the StSt SONNE CTD. The sediment sampling was not successful due to the hard seafloor. The occupation of the first station was finished within about 4 hour.

The next 6 stations were on the shelf, with station 6 as close as possible to the mouth of the Zambezi (37 m deep). We then moved from the shelf to the slope and to the deep waters of the Mozambique Channel (station 9 in the French EEZ). The station occupation took 6-7 hours to complete in the deeper waters (3000 m) . Also, the distance between the stations increased to 9 hours by station 10. Therefore, the sampling and sample processing teams were very busy during these days. The occupation of the superstations took more than 12

hours due to the deployment of a second CTD with *in situ* pumps. The pumps operated for about 3 hours to collect sufficient particles. After station 20 and until the Australian EEZ, the steaming times between stations ranged between 12 and 22 hours, and the depths were about 3000 to 5500 m, which allowed good time for sample handling and sleep between stations. We had permission to sample in EEZ waters of Mozambique, France (Bassas da India and Ile Europa), and Australia, but not in waters of Madagascar. Therefore, we sailed outside the EEZ of Madagascar. We also sailed south of the EEZ of Reunion (along 25°30'S), as that was appropriate due to hurricane forecasts in the area.

We kept a close sampling distance (every about 90 nm) around the EEZ of Madagascar in order to study the supply of (micro-) nutrients which potentially supply the regularly occurring phytoplankton blooms off SE Madagascar. Near 70°E (stations 27-29), we sampled 3 hydrothermal sites which are part of the Central Indian Ridge: the Edmond Kairei and Pelagia systems. The sampling of the vents showed strong plume signals from particles in the neutrally buoyant plume (observed by the turbidity sensor on the CTD frame). In addition, we observed enhanced methane concentrations from measurements by Ingeborg Bussmann (AWI). Following the vent sampling, we headed northeast to our track along 23°S on the way to Australia. We occupied our sampling stations at a 3 or 4 degrees distance along 23°0S. Station occupation along the 23°0S continued until station 41 (December 11), following which we sailed south in the Australian waters of the Leeuwin Current. We occupied another 10 stations in the Australian EEZ (Leeuwin Current) to study shelf-slope transport processes and (micro-) nutrient supply to surface ocean microbial organisms. Following the occupation of station 51 and the processing of samples from this station, we packed up and loaded our containers. Station 51 was our last station and we arrived in Fremantle (Australia) on December 22. We completed 51 stations and sailed about 11500 km. A wonderful achievement.

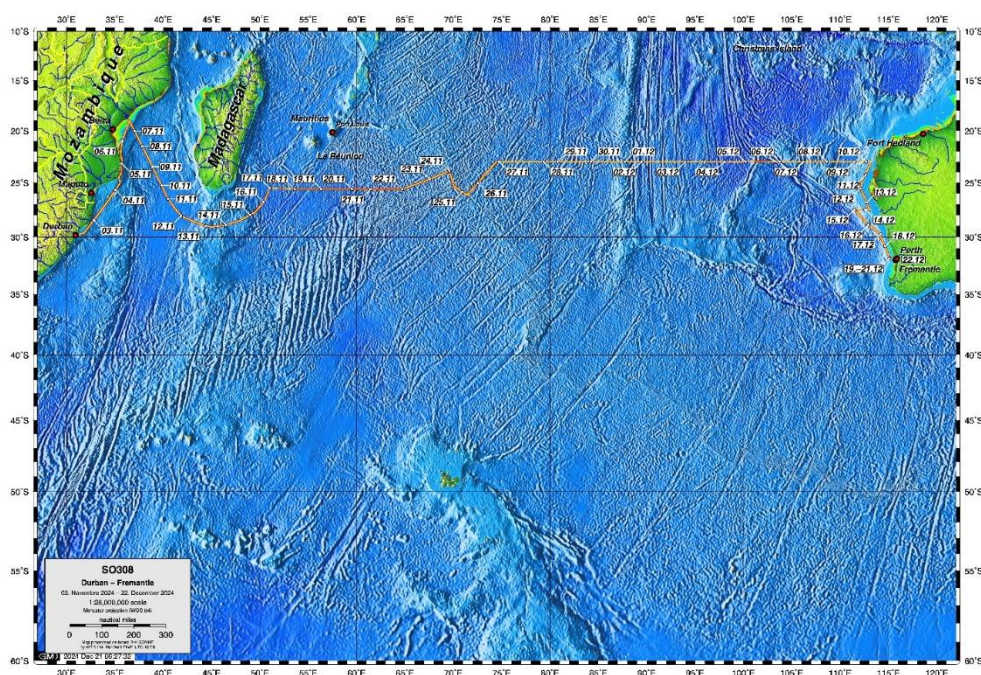


Fig. 3: Cruise track (yellow-red line) for SO308 with station locations as dates.

Acknowledgements

All the members of the SO308 GEOTRACES South Indian Ocean team are very grateful to the BMBF, the German Research Fleet Coordination Centre at the Universität Hamburg, the shipping company BRIESE RESEARCH and LPL Projects + Logistics GmbH for providing their outstanding support to science and ship logistics, which made this cruise possible. We also like to sincerely thank the captain, officers and crew on the RV Sonne who did a fantastic job at facilitating our research and making our life as pleasant as possible on board.

Participant list

Surname	First name	Function	Institute
Achterberg	Eric	Chief Scientist. Lead scientific operations on cruise. Liaise with captain and officers. Chemical Oceanography.	GEOMAR, Germany
Steiner	Zvi	Scientist. Co-lead scientific operations on cruise. Will lead trace element and isotope sampling. Chemical Oceanography.	GEOMAR, Germany
Mutzberg	Andre	Nutrient analysis on board ship. Chemical Oceanography.	GEOMAR, Germany
Gürses	Can	TEI sampling, collection and preservation of metal binding ligand samples. Chemical Oceanography.	Constructor Uni, Germany
Zhang	Wan	Th sampling and analysis of ²³⁴ Th on board ship Chemical Oceanography.	GEOMAR , Germany
Guo	Jinqiang	Particle characterisation Biogeochemical Oceanography.	GEOMAR, Germany
Yuan	Yi	Nd/Ba isotope PhD student, Chemical Oceanography.	GEOMAR, Germany
Gosnell	Kathleen Joehr	TEI analysis. Will undertake sampling and analysis of Hg. Chemical Oceanography.	GEOMAR , Germany
Bauer	Elisabeth Johanna Clarissa	CTD work; sensor handling Chemical Oceanography.	GEOMAR , Germany
Wang	Ru	TEI. Will undertake TEI sampling, nitrate isotope measurements. Chemical Oceanography.	GEOMAR, Germany
Theileis	Anton	Will undertake underwater camera observations. Biological Oceanography.	GEOMAR, Germany
Yuan	Zhongwei	Bioassay experiments. Biological Oceanography.	GEOMAR, Germany
Von Keitz	Tabea	Ra isotopes. Will assist with sampling and analysis of long-lived Ra isotopes. Hiwi. Chemical Oceanography.	GEOMAR, Germany
Liguori	Bianca	Isotope sampling. Paleo Oceanography.	GEOMAR, Germany
Kalamasnikovs	Aleksandr	Will undertake sampling of aerosols. Chemical Oceanography.	GEOMAR, Germany
Strickmann	Tobias	CTD Operation. Will undertake particle imaging work Biological Oceanography	GEOMAR, Germany

Jasinski	Dominik	TEI sampling. Will organise and undertake sampling and analysis of trace elements. Chemical Oceanography.	GEOMAR, Germany
Chen	Xuegang	TEI sampling. Will conduct sampling and analysis of trace elements. Chemical Oceanography.	Zhejiang Uni, China
Chen	Ze	Nitrogen fixation rate measurements. Biological Oceanography.	GEOMAR, Germany
Koch	Pia	Alkalinity and DIC sampling and analysis	GEOMAR, Germany
Van Horsten	Natasha	TEI sampling. Will conduct sampling and analysis of trace elements. Chemical Oceanography.	Constructor Uni, Germany
Guo	Yuping	TEI sampling. Will conduct sampling and analysis of trace elements. Chemical Oceanography.	GEOMAR, Germany
Welke	Alina	Alkalinity and DIC sampling and analysis	GEOMAR, Germany
Müller	Martin	CTD work; sensor handling Physical Oceanography.	ETH, Switzerland
Hartmann	Jacqueline	TEI sampling. Will conduct sampling and analysis of DOC. Chemical Oceanography.	GEOMAR, Germany
Melzer	Hannah	Will assist with sampling of long-lived Ra isotopes. Chemical Oceanography.	GEOMAR, Germany
Robinson	Tierra-Brandy	Will conduct light measurements	GEOMAR, Germany
Danke	Paula	CTD assistance	GEOMAR, Germany
Arx	Jan	Biological sampling	MPI Bremen, Germany
Wang	Xinyu	TEI particle sampling	Chengdu University, China
Tselykh	Polina	TEI sampling, collection and preservation of metal binding ligand samples. Chemical Oceanography.	Constructor Uni, Germany
Eckmann	Charlotte	Metagenomics sampling of water column	MBL, USA
Dames	Nicole	Metagenomic sampling of water column	MBL, USA
Milice	Paula	Observer from Mozambique	Mozambique
Butterley	Anita	Bioassay experiments. Biological Oceanography.	University of Tasmania, Australia
Schott	Thorsten	Additional WTD	Briese, Germany
Esti	Mertcan	Biological sampling	MPI Bremen, Germany
Von Ahn	Catia	Radium sampling and analysis	ZMT, Bremen, Germany
Bußmann	Ingeborg	Methane sampling and analysis	AWI, Germany
Ajmar	Marco	TEI analysis. Will undertake sampling and analysis of ammonium. Chemical Oceanography.	GEOMAR, Germany

Stationlist SO308

ISP= in situ pumps on SONNE SS-CTD. CTD used: SONNE stainless steel CTD (CTD) and SONNE stainless steel CTD for biology (BIO CTD), GEOMAR Ultra Clean Titanium CTD for geochemistry (TM CTD). Super denotes Superstations with a ISP deployment. MUC on SONNE CTD, or as separate MUC deployment (indicated as MUC). MSS is microstructure sensor. Float is ARGO Float deployment.

Station	Device Operation	Device	Event Time	Latitude S	Long. E	Depth m
0	SO308/1_0_Underway	VMADCP_38kHz	2024/12/19 04:00:00	31° 52,844	115° 06,289	295.0
0	SO308/1_0_Underway	EM710	2024/12/19 04:00:00	31° 52,844	115° 06,289	295.0
0	SO308/1_0_Underway	ADCP_300	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	WISS-DATA	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	ADCP	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	PS	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	VMADCP_75kHz	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	EM122	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	UWS	2024/12/19 04:02:00	31° 52,913	115° 06,308	300.0
0	SO308/1_0_Underway	TMF	2024/12/18 23:35:35	31° 51,013	115° 05,983	208.4
1	SO308/1_1-1	MSS	2024/11/04 19:46:55	24° 30,040	035° 23,980	82.2
1	SO308/1_1-2	BIO CTD	2024/11/04 19:48:10	24° 30,040	035° 23,981	81.5
1	SO308/1_1-3	TM CTD	2024/11/04 20:15:39	24° 30,127	035° 23,915	81.8
1	SO308/1_1-4	MUC	2024/11/04 20:47:07	24° 30,340	035° 23,782	81.5
1	SO308/1_1-5	MUC	2024/11/04 21:07:42	24° 30,494	035° 23,667	80.7
1	SO308/1_1-6	CTD	2024/11/04 21:25:17	24° 30,763	035° 23,496	81.9
1	SO308/1_1-7	MSS	2024/11/04 22:13:54	24° 30,959	035° 23,378	81.4
2	SO308/1_2-1	MSS	2024/11/05 05:46:48	23° 28,827	035° 38,995	113.0
2	SO308/1_2-2	BIO CTD	2024/11/05 05:58:12	23° 28,827	035° 38,996	113.7
2	SO308/1_2-3	TM CTD	2024/11/05 06:20:52	23° 28,828	035° 39,007	113.4
2	SO308/1_2-4	MUC	2024/11/05 06:53:32	23° 28,829	035° 39,002	112.6
2	SO308/1_2-5	CTD	2024/11/05 07:15:19	23° 28,828	035° 39,003	112.8
3	SO308/1_3-1	BIO CTD	2024/11/05 15:05:57	22° 21,044	035° 36,054	109.4
3	SO308/1_3-2	TM CTD	2024/11/05 15:30:13	22° 21,047	035° 36,046	107.7
3	SO308/1_3-3	MUC	2024/11/05 15:49:24	22° 21,047	035° 36,040	106.7
3	SO308/1_3-4	CTD	2024/11/05 16:12:19	22° 21,044	035° 36,042	107.3
super4	SO308/1_4-1	CTD with ISP	2024/11/05 23:54:41	21° 08,392	035° 43,982	542.9
4	SO308/1_4-2	TM CTD	2024/11/06 04:23:01	21° 08,969	035° 43,380	518.5

4	SO308/1_4-3	BIO CTD	2024/11/06 05:08:29	21° 08,973	035° 43,384	520.0
4	SO308/1_4-4	MUC	2024/11/06 06:32:30	21° 08,976	035° 43,398	520.7
4	SO308/1_4-5	CTD	2024/11/06 07:12:24	21° 08,978	035° 43,397	519.7
4	SO308/1_4-6	MSS	2024/11/06 08:20:29	21° 08,971	035° 43,385	516.1
5	SO308/1_5-1	BIO CTD	2024/11/06 15:24:56	20° 05,903	036° 06,001	58.5
5	SO308/1_5-2	TM CTD	2024/11/06 15:44:13	20° 05,908	036° 06,007	59.3
5	SO308/1_5-3	MUC	2024/11/06 16:01:25	20° 05,904	036° 06,005	59.0
5	SO308/1_5-4	CTD	2024/11/06 16:37:01	20° 05,901	036° 06,009	58.7
6	SO308/1_6-1	BIO CTD	2024/11/06 23:47:52	19° 00,035	036° 29,982	19.9
6	SO308/1_6-2	TM CTD	2024/11/07 00:07:20	19° 00,038	036° 29,983	20.2
6	SO308/1_6-3	MUC	2024/11/07 00:27:47	19° 00,042	036° 29,979	19.3
6	SO308/1_6-4	CTD	2024/11/07 00:56:44	19° 00,035	036° 29,977	18.8
7	SO308/1_7-1	BIO CTD	2024/11/07 04:32:52	19° 30,106	036° 44,927	150.0
7	SO308/1_7-2	TM CTD	2024/11/07 05:03:23	19° 30,105	036° 44,933	144.4
7	SO308/1_7-3	CTD	2024/11/07 05:26:15	19° 30,107	036° 44,934	144.5
7	SO308/1_7-4	MSS	2024/11/07 06:07:13	19° 30,100	036° 44,933	143.9
8	SO308/1_8-1	CTD	2024/11/07 11:45:13	20° 14,990	037° 09,585	1867.3
8	SO308/1_8-2	TM CTD	2024/11/07 13:41:39	20° 14,984	037° 09,586	1868.5
8	SO308/1_8-3	BIO CTD	2024/11/07 15:23:09	20° 14,999	037° 09,589	1867.6
super8	SO308/1_8-4	CTD with ISP	2024/11/07 16:32:40	20° 14,999	037° 09,589	1870.0
8	SO308/1_8-5	MSS	2024/11/07 20:31:25	20° 14,993	037° 09,592	1868.3
9	SO308/1_9-1	BIO CTD	2024/11/08 06:59:03	21° 29,966	037° 49,724	3082.0
9	SO308/1_9-2	TM CTD	2024/11/08 07:22:47	21° 29,978	037° 49,700	3082.7
9	SO308/1_9-3	CTD	2024/11/08 10:01:39	21° 29,967	037° 49,700	3079.1
9	SO308/1_9-4	MSS	2024/11/08 12:51:38	21° 29,600	037° 49,349	3077.1
10	SO308/1_10-1	BIO CTD	2024/11/08 23:02:26	22° 44,977	038° 29,997	3266.0
10	SO308/1_10-3	TM CTD	2024/11/09 01:56:21	22° 45,002	038° 30,008	3266.9
10	SO308/1_10-4	MSS	2024/11/09 04:16:04	22° 45,002	038° 29,999	3266.0
10	SO308/1_10-5	FLOAT	2024/11/09 05:13:57	22° 45,567	038° 30,312	3269.4
11	SO308/1_11-1	CTD	2024/11/09 13:28:02	24° 00,065	039° 09,612	3264.3
11	SO308/1_11-2	TM CTD	2024/11/09 16:08:28	24° 00,048	039° 09,621	3265.3
11	SO308/1_11-3	BIO CTD	2024/11/09 18:34:29	24° 00,038	039° 09,615	3263.3
11	SO308/1_11-4	BIO CTD	2024/11/09 19:00:27	24° 00,040	039° 09,611	3265.0
super11	SO308/1_11-5	CTD with ISP	2024/11/09 19:44:53	24° 00,045	039° 09,606	3260.7
11	SO308/1_11-6	MSS	2024/11/10 01:07:19	24° 00,148	039° 09,983	3263.7

12	SO308/1_12-1	CTD	2024/11/10 09:15:14	25° 15,025	039° 49,819	3961.9
12	SO308/1_12-2	Ti CTD	2024/11/10 12:29:16	25° 15,000	039° 49,798	3967.2
12	SO308/1_12-3	BIO CTD	2024/11/10 15:26:05	25° 15,004	039° 49,800	3969.8
12	SO308/1_12-4	MSS	2024/11/10 15:47:06	25° 14,989	039° 49,803	3972.2
13	SO308/1_13-1	BIO CTD	2024/11/11 01:30:05	26° 30,048	040° 29,975	4390.6
13	SO308/1_13-2	TM CTD	2024/11/11 01:53:07	26° 30,046	040° 29,976	4392.3
13	SO308/1_13-3	CTD	2024/11/11 05:06:45	26° 30,028	040° 29,992	4391.9
13	SO308/1_13-4	CTD	2024/11/11 07:56:44	26° 30,027	040° 29,993	4391.5
13	SO308/1_13-5	CTD	2024/11/11 09:46:43	26° 30,024	040° 29,993	4391.4
13	SO308/1_13-6	FLOAT	2024/11/11 10:44:23	26° 30,027	040° 29,992	4393.0
super14	SO308/1_14-1	CTD with ISP	2024/11/12 00:00:05	28° 04,990	041° 51,010	4541.3
14	SO308/1_14-2	TM CTD	2024/11/12 05:11:38	28° 04,977	041° 51,013	4541.3
14	SO308/1_14-3	BIO CTD	2024/11/12 08:36:18	28° 04,977	041° 51,008	4541.4
14	SO308/1_14-4	CTD	2024/11/12 08:59:59	28° 04,980	041° 51,013	4541.8
14	SO308/1_14-5	MSS	2024/11/12 13:09:49	28° 04,968	041° 51,059	4544.5
15	SO308/1_15-1	CTD	2024/11/12 23:06:02	28° 42,448	043° 27,896	3539.6
15	SO308/1_15-2	TM CTD	2024/11/13 01:25:01	28° 42,443	043° 27,930	3514.5
15	SO308/1_15-3	BIO CTD	2024/11/13 04:11:38	28° 42,445	043° 27,927	3521.3
15	SO308/1_15-4	MSS	2024/11/13 04:36:14	28° 42,468	043° 27,947	3526.9
16	SO308/1_16-1	CTD	2024/11/13 12:59:53	29° 06,171	044° 58,803	2430.5
16	SO308/1_16-2	TM CTD	2024/11/13 15:08:14	29° 06,050	044° 58,861	2469.1
16	SO308/1_16-3	BIO CTD	2024/11/13 17:06:42	29° 06,047	044° 58,869	2467.0
super16	SO308/1_16-4	CTD with ISP	2024/11/13 18:01:58	29° 06,051	044° 58,863	2465.6
16	SO308/1_16-5	MSS	2024/11/13 23:04:34	29° 06,049	044° 58,860	2468.9
17	SO308/1_17-1	BIO CTD	2024/11/14 07:31:36	28° 54,744	046° 29,866	3106.2
17	SO308/1_17-2	BIO CTD	2024/11/14 08:05:54	28° 54,737	046° 29,857	3111.7
17	SO308/1_17-3	TM CTD	2024/11/14 09:06:23	28° 54,738	046° 29,855	3111.6
17	SO308/1_17-4	CTD	2024/11/14 11:29:27	28° 54,742	046° 29,852	3110.6
17	SO308/1_17-5	MSS	2024/11/14 14:05:44	28° 54,712	046° 29,750	3114.2
18	SO308/1_18-1	BIO CTD	2024/11/14 23:03:53	28° 30,007	047° 59,968	2670.6
18	SO308/1_18-2	TM CTD	2024/11/14 23:31:28	28° 30,002	047° 59,965	2670.5
18	SO308/1_18-3	CTD	2024/11/15 01:47:19	28° 30,004	047° 59,964	2670.9
18	SO308/1_18-4	MSS	2024/11/15 03:35:13	28° 30,007	047° 59,968	2669.0
19	SO308/1_19-1	CTD	2024/11/15 12:46:53	27° 44,532	049° 29,446	4749.0
19	SO308/1_19-2	TM CTD	2024/11/15 16:22:39	27° 44,532	049° 29,445	4741.1

super19	SO308/1_19-3	CTD with ISP	2024/11/15 20:21:38	27° 44,534	049° 29,448	4745.5
19	SO308/1_19-4	BIO CTD	2024/11/16 02:14:24	27° 44,526	049° 29,443	4747.1
19	SO308/1_19-5	MSS	2024/11/16 02:54:58	27° 44,528	049° 29,481	4735.5
20	SO308/1_20-1	CTD	2024/11/16 11:33:28	26° 35,704	050° 33,563	5254.6
20	SO308/1_20-2	TM CTD	2024/11/16 15:00:17	26° 35,704	050° 33,558	5253.4
20	SO308/1_20-3	BIO CTD	2024/11/16 20:53:02	26° 35,706	050° 33,562	5251.7
20	SO308/1_20-4	BIO CTD	2024/11/16 21:22:57	26° 35,707	050° 33,567	5253.2
20	SO308/1_20-5	MSS	2024/11/16 22:19:10	26° 35,711	050° 33,563	5253.9
21	SO308/1_21-1	BIO CTD	2024/11/17 06:24:07	25° 30,052	050° 59,958	5115.5
21	SO308/1_21-2	TM CTD	2024/11/17 06:48:43	25° 30,049	050° 59,965	5114.6
21	SO308/1_21-3	CTD	2024/11/17 12:25:29	25° 30,059	050° 59,965	5115.0
21	SO308/1_21-4	MSS	2024/11/17 15:35:25	25° 30,046	050° 59,977	5116.0
21	SO308/1_21-5	FLOAT	2024/11/17 16:15:59	25° 29,040	051° 00,410	5106.2
21	SO308/1_21-6	FLOAT	2024/11/17 16:16:33	25° 29,014	051° 00,432	5106.9
22	SO308/1_22-1	CTD	2024/11/18 05:57:35	25° 36,078	053° 35,979	5303.8
22	SO308/1_22-2	TM CTD	2024/11/18 09:30:08	25° 36,073	053° 35,971	5306.5
22	SO308/1_22-3	BIO CTD	2024/11/18 15:34:16	25° 36,104	053° 35,786	5377.6
super22	SO308/1_22-4	CTD with ISP	2024/11/18 16:33:09	25° 36,106	053° 35,781	5373.7
22	SO308/1_22-5	MSS	2024/11/18 21:24:12	25° 36,105	053° 35,778	5376.7
23	SO308/1_23-1	CTD	2024/11/19 11:12:27	25° 36,016	056° 35,994	5187.4
23	SO308/1_23-2	TM CTD	2024/11/19 14:35:28	25° 35,999	056° 35,999	5178.3
23	SO308/1_23-3	BIO CTD	2024/11/19 18:35:19	25° 36,007	056° 35,976	5182.3
23	SO308/1_23-4	BIO CTD	2024/11/19 19:29:56	25° 36,007	056° 35,982	5192.1
23	SO308/1_23-5	MSS	2024/11/19 19:53:37	25° 36,004	056° 35,984	5181.7
24	SO308/1_24-1	CTD	2024/11/20 11:56:31	25° 36,034	059° 54,057	4407.7
24	SO308/1_24-2	TM CTD	2024/11/20 14:42:07	25° 36,046	059° 54,047	4406.3
24	SO308/1_24-3	BIO CTD	2024/11/20 18:06:09	25° 36,043	059° 54,035	4407.7
super24	SO308/1_24-4	CTD with ISP	2024/11/20 18:59:51	25° 36,053	059° 54,035	4406.0
24	SO308/1_24-5	MSS	2024/11/20 23:43:12	25° 36,066	059° 54,001	4411.0
24	SO308/1_24-6	FLOAT	2024/11/21 00:20:13	25° 36,172	059° 54,433	4443.1
25	SO308/1_25-1	BIO CTD	2024/11/22 01:56:10	25° 35,999	064° 42,877	5180.7
25	SO308/1_25-2	TM CTD	2024/11/22 02:20:08	25° 35,999	064° 42,885	5189.8
25	SO308/1_25-3	CTD	2024/11/22 06:56:20	25° 36,000	064° 42,886	5189.6
25	SO308/1_25-4	MSS	2024/11/22 10:21:52	25° 35,995	064° 42,878	5184.5
26	SO308/1_26-1	CTD	2024/11/23 02:12:31	24° 41,997	067° 29,993	3423.4

26	SO308/1_26-2	TM CTD	2024/11/23 04:39:06	24° 41,984	067° 29,982	3428.6
26	SO308/1_26-3	BIO CTD	2024/11/23 07:20:10	24° 41,982	067° 29,969	3432.7
26	SO308/1_26-4	BIO CTD	2024/11/23 07:46:46	24° 41,978	067° 29,973	3430.3
26	SO308/1_26-5	MSS	2024/11/23 08:44:44	24° 41,977	067° 29,973	3429.8
26	SO308/1_26-6	FLOAT	2024/11/23 09:27:54	24° 42,022	067° 31,122	3689.5
27	SO308/1_27-1	BIO CTD	2024/11/23 22:22:17	23° 52,665	069° 35,792	3341.6
27	SO308/1_27-2	TM CTD	2024/11/23 22:48:28	23° 52,687	069° 35,829	3296.9
27	SO308/1_27-3	CTD	2024/11/24 01:25:37	23° 52,684	069° 35,829	3303.4
super27	SO308/1_27-4	CTD with ISP	2024/11/24 03:49:57	23° 52,679	069° 35,831	3297.3
27	SO308/1_27-5	MSS	2024/11/24 10:32:10	23° 52,697	069° 35,812	3301.1
28	SO308/1_28-1	BIO CTD	2024/11/24 21:52:41	25° 19,278	070° 02,423	2464.6
28	SO308/1_28-2	BIO CTD	2024/11/24 21:52:41	25° 19,278	070° 02,423	2464.6
28	SO308/1_28-3	TM CTD	2024/11/24 23:23:20	25° 19,258	070° 02,451	2443.1
28	SO308/1_28-4	CTD	2024/11/25 01:30:49	25° 19,255	070° 02,450	2430.1
28	SO308/1_28-5	MSS	2024/11/25 03:25:49	25° 19,264	070° 02,452	2443.9
29	SO308/1_29-1	CTD	2024/11/25 13:13:07	26° 09,461	071° 26,249	3679.9
29	SO308/1_29-2	TM CTD	2024/11/25 15:32:07	26° 09,455	071° 26,253	3681.8
29	SO308/1_29-3	BIO CTD	2024/11/25 18:29:45	26° 09,449	071° 26,255	3681.3
super29	SO308/1_29-4	CTD with ISP	2024/11/25 19:02:54	26° 09,454	071° 26,258	3679.6
29	SO308/1_29-5	MSS	2024/11/26 00:10:26	26° 09,476	071° 26,244	3681.2
30	SO308/1_30-1	BIO CTD	2024/11/27 01:46:00	22° 59,983	074° 27,630	3910.6
30	SO308/1_30-2	TM CTD	2024/11/27 02:11:02	22° 59,991	074° 27,616	3910.0
30	SO308/1_30-3	CTD	2024/11/27 05:10:27	22° 59,995	074° 27,607	3907.9
30	SO308/1_30-4	MSS	2024/11/27 07:40:05	23° 00,000	074° 27,603	3887.8
30	SO308/1_30-5	FLOAT	2024/11/27 08:14:09	23° 00,387	074° 28,074	3910.7
30	SO308/1_30-6	FLOAT	2024/11/27 08:19:00	23° 00,466	074° 28,221	3939.0
31	SO308/1_31-1	CTD	2024/11/28 08:06:27	23° 00,007	079° 20,411	4459.3
31	SO308/1_31-2	TM CTD	2024/11/28 10:55:41	23° 00,001	079° 20,387	4468.1
31	SO308/1_31-3	BIO CTD	2024/11/28 14:40:46	22° 59,957	079° 20,377	4447.4
31	SO308/1_31-4	BIO CTD	2024/11/28 15:25:02	22° 59,951	079° 20,382	4431.8
31	SO308/1_31-5	MUC	2024/11/28 15:45:46	22° 59,948	079° 20,382	4430.0
super31	SO308/1_31-6	CTD with ISP	2024/11/28 19:08:20	22° 59,949	079° 20,381	4464.6
31	SO308/1_31-7	MSS	2024/11/28 23:53:19	22° 59,997	079° 20,390	4456.3
31	SO308/1_31-8	FLOAT	2024/11/29 00:33:18	23° 00,192	079° 21,081	4483.6
32	SO308/1_32-1	BIO CTD	2024/11/30 08:14:10	22° 59,977	084° 13,173	4799.5

32	SO308/1_32-2	TM CTD	2024/11/30 08:40:32	22° 59,972	084° 13,188	4797.3
32	SO308/1_32-3	CTD	2024/11/30 12:53:02	23° 00,002	084° 13,206	4796.9
32	SO308/1_32-4	MSS	2024/11/30 15:48:33	22° 59,998	084° 13,207	4791.1
super33	SO308/1_33-1	CTD with ISP	2024/12/01 16:46:12	22° 59,992	089° 05,941	4901.9
33	SO308/1_33-2	TM CTD	2024/12/01 21:16:35	22° 59,989	089° 05,942	4887.7
33	SO308/1_33-2	BIO CTD	2024/12/02 01:33:49	22° 59,986	089° 05,945	4881.9
33	SO308/1_33-3	BIO CTD	2024/12/02 01:34:29	22° 59,987	089° 05,945	4882.4
33	SO308/1_33-4	CTD	2024/12/02 02:34:07	22° 59,985	089° 05,953	4887.3
33	SO308/1_33-5	CTD	2024/12/02 03:20:11	22° 59,988	089° 05,945	4886.8
33	SO308/1_33-6	MSS	2024/12/02 07:16:02	23° 00,001	089° 05,929	4889.5
33	SO308/1_33-7	FLOAT	2024/12/02 07:53:45	22° 59,988	089° 05,937	4879.2
33	SO308/1_33-8	FLOAT	2024/12/02 08:01:05	23° 00,030	089° 06,025	4876.0
34	SO308/1_34-1	BIO CTD	2024/12/03 06:49:38	22° 59,962	093° 58,766	5041.6
34	SO308/1_34-2	TM CTD	2024/12/03 10:38:06	22° 59,866	093° 59,021	5037.5
34	SO308/1_34-3	CTD	2024/12/03 15:01:56	22° 59,872	093° 59,010	5041.5
34	SO308/1_34-4	MSS	2024/12/03 15:26:18	22° 59,869	093° 59,006	5037.4
34	SO308/1_34-5	FLOAT	2024/12/03 16:41:53	23° 01,030	094° 00,233	4934.6
35	SO308/1_35-1	CTD	2024/12/04 13:35:26	23° 00,007	098° 51,634	5686.2
35	SO308/1_35-2	TM CTD	2024/12/04 17:03:36	23° 00,014	098° 51,650	5702.8
35	SO308/1_35-3	BIO CTD	2024/12/05 01:19:45	23° 00,013	098° 51,646	5703.9
35	SO308/1_35-4	BIO CTD	2024/12/05 02:13:36	23° 00,012	098° 51,645	5700.7
35	SO308/1_35-5	MSS	2024/12/05 02:38:49	23° 00,002	098° 51,648	5701.6
35	SO308/1_35-6	FLOAT	2024/12/05 03:21:04	23° 00,926	098° 52,114	5716.6
35	SO308/1_35-7	FLOAT	2024/12/05 03:21:48	23° 00,945	098° 52,152	5741.6
super36	SO308/1_36-1	CTD with ISP	2024/12/06 00:23:33	23° 00,012	103° 44,369	3546.8
36	SO308/1_36-2	TM CTD	2024/12/06 04:50:36	23° 00,017	103° 44,389	3551.1
36	SO308/1_36-3	CTD	2024/12/06 08:18:53	23° 00,021	103° 44,377	3540.8
36	SO308/1_36-4	CTD with MUC	2024/12/06 10:40:00	23° 00,006	103° 44,384	3552.4
36	SO308/1_36-5	BIO CTD	2024/12/06 13:19:50	23° 00,000	103° 44,382	3555.4
36	SO308/1_36-6	MSS	2024/12/06 13:39:42	22° 59,999	103° 44,387	3556.3
36	SO308/1_36-7	FLOAT	2024/12/06 14:20:49	22° 59,970	103° 44,481	3555.7
37	SO308/1_37-1	BIO CTD	2024/12/07 03:55:34	22° 59,972	106° 10,726	5004.7
37	SO308/1_37-2	BIO CTD	2024/12/07 05:05:23	22° 59,975	106° 10,728	5002.9
37	SO308/1_37-3	TM CTD	2024/12/07 05:24:37	22° 59,978	106° 10,727	5001.2
37	SO308/1_37-4	CTD	2024/12/07 10:22:08	22° 59,994	106° 10,811	5006.2

37	SO308/1_37-5	MSS	2024/12/07 13:30:16	23° 00,003	106° 10,797	5007.2
38	SO308/1_38-1	BIO CTD	2024/12/08 04:04:02	23° 00,063	108° 37,196	3317.8
38	SO308/1_38-2	TM CTD	2024/12/08 04:29:04	23° 00,061	108° 37,208	3312.7
38	SO308/1_38-3	CTD	2024/12/08 07:49:06	23° 00,055	108° 37,214	3314.6
38	SO308/1_38-4	FLOAT	2024/12/08 09:55:39	23° 00,051	108° 37,211	3315.8
39	SO308/1_39-1	CTD	2024/12/09 02:57:49	22° 59,968	111° 29,991	4909.6
39	SO308/1_39-2	TM CTD	2024/12/09 06:04:42	22° 59,969	111° 29,978	4906.1
39	SO308/1_39-3	BIO CTD	2024/12/09 11:02:49	22° 59,966	111° 29,971	4910.9
39	SO308/1_39-4	BIO CTD	2024/12/09 12:02:48	22° 59,970	111° 29,975	4910.2
39	SO308/1_39-5	MSS	2024/12/09 12:24:17	22° 59,995	111° 29,973	4906.1
super40	SO308/1_40-1	CTD with ISP	2024/12/10 00:00:16	23° 00,059	112° 42,025	1161.4
40	SO308/1_40-2	TM CTD	2024/12/10 04:51:51	23° 00,055	112° 42,021	1159.2
40	SO308/1_40-3	CTD	2024/12/10 06:06:42	23° 00,062	112° 42,022	1159.4
40	SO308/1_40-4	MUC	2024/12/10 07:17:25	23° 00,056	112° 42,021	1162.8
40	SO308/1_40-5	BIO CTD	2024/12/10 08:50:28	23° 00,060	112° 42,026	1160.4
40	SO308/1_40-6	MSS	2024/12/10 09:17:24	23° 00,085	112° 42,006	1161.4
41	SO308/1_41-1	BIO CTD	2024/12/10 20:55:58	22° 59,997	113° 12,004	572.2
41	SO308/1_41-2	TM CTD	2024/12/10 21:18:04	23° 00,000	113° 11,998	573.2
41	SO308/1_41-3	CTD	2024/12/10 22:16:15	22° 59,997	113° 12,006	574.6
41	SO308/1_41-4	MUC	2024/12/10 23:00:17	23° 00,004	113° 11,998	572.1
41	SO308/1_41-5	MUC	2024/12/10 23:50:02	23° 00,001	113° 11,995	572.6
41	SO308/1_41-6	MSS	2024/12/11 00:50:28	23° 00,000	113° 12,004	572.7
42	SO308/1_42-1	CTD	2024/12/11 09:06:44	24° 15,006	112° 38,903	153.1
42	SO308/1_42-2	TM CTD	2024/12/11 09:24:24	24° 15,007	112° 38,900	153.1
42	SO308/1_42-3	MUC	2024/12/11 09:51:51	24° 15,001	112° 38,901	152.1
42	SO308/1_42-4	BIO CTD	2024/12/11 10:27:06	24° 15,006	112° 38,906	154.0
42	SO308/1_42-5	BIO CTD	2024/12/11 11:25:17	24° 15,007	112° 38,908	151.3
42	SO308/1_42-6	MSS	2024/12/11 11:46:54	24° 15,038	112° 38,899	154.1
super43	SO308/1_43-1	CTD with ISP	2024/12/11 23:00:05	25° 29,969	112° 05,978	526.3
43	SO308/1_43-2	TM CTD	2024/12/12 03:36:46	25° 30,059	112° 05,910	523.1
43	SO308/1_43-3	CTD	2024/12/12 04:26:04	25° 30,067	112° 05,906	523.0
43	SO308/1_43-4	MUC	2024/12/12 04:35:38	25° 30,067	112° 05,903	527.2
43	SO308/1_43-5	BIO CTD	2024/12/12 05:25:22	25° 30,070	112° 05,910	524.1
43	SO308/1_43-6	MSS	2024/12/12 06:07:40	25° 30,063	112° 05,907	524.3
44	SO308/1_44-1	BIO CTD	2024/12/12 22:56:37	26° 30,002	112° 35,995	176.8

44	SO308/1_44-2	BIO CTD	2024/12/12 23:54:10	26° 30,001	112° 36,003	175.2
44	SO308/1_44-3	TM CTD	2024/12/13 00:01:08	26° 30,001	112° 36,006	175.2
44	SO308/1_44-4	CTD	2024/12/13 00:36:29	26° 29,999	112° 36,006	175.1
44	SO308/1_44-5	MUC	2024/12/13 00:57:41	26° 29,992	112° 36,009	174.8
44	SO308/1_44-6	MUC	2024/12/13 01:25:05	26° 29,993	112° 36,012	173.0
44	SO308/1_44-7	MSS	2024/12/13 01:44:24	26° 29,990	112° 36,008	177.0
45	SO308/1_45-1	BIO CTD	2024/12/13 23:00:17	27° 30,002	113° 05,997	171.6
45	SO308/1_45-2	TM CTD	2024/12/13 23:22:01	27° 30,002	113° 06,000	171.6
45	SO308/1_45-3	CTD	2024/12/14 00:41:42	27° 30,002	113° 05,999	171.9
45	SO308/1_45-4	MUC	2024/12/14 01:05:38	27° 30,001	113° 05,998	170.4
45	SO308/1_45-5	MUC	2024/12/14 01:30:21	27° 30,335	113° 05,922	173.2
45	SO308/1_45-5	MUC	2024/12/14 01:55:12	27° 30,913	113° 05,810	175.7
46	SO308/1_46-1	CTD	2024/12/14 05:29:27	27° 30,052	112° 35,975	740.1
46	SO308/1_46-2	TM CTD	2024/12/14 06:12:34	27° 30,049	112° 35,968	744.3
46	SO308/1_46-3	MUC	2024/12/14 07:26:34	27° 30,056	112° 35,975	740.4
46	SO308/1_46-4	BIO CTD	2024/12/14 08:24:21	27° 30,059	112° 35,973	739.2
46	SO308/1_46-5	BIO CTD	2024/12/14 09:17:20	27° 30,050	112° 35,972	739.5
46	SO308/1_46-6	MSS	2024/12/14 09:37:33	27° 30,128	112° 35,916	739.6
super47	SO308/1_47-1	CTD with ISP	2024/12/14 21:58:40	27° 30,004	111° 30,000	3893.2
47	SO308/1_47-2	TM CTD	2024/12/15 03:03:10	27° 30,009	111° 30,000	3894.3
47	SO308/1_47-3	CTD	2024/12/15 06:45:55	27° 30,038	111° 30,421	3837.6
47	SO308/1_47-4	MUC	2024/12/15 09:12:47	27° 30,046	111° 30,355	3843.7
47	SO308/1_47-5	BIO CTD	2024/12/15 12:45:24	27° 30,040	111° 30,419	3832.2
47	SO308/1_47-6	MSS	2024/12/15 13:09:29	27° 30,038	111° 30,608	3823.0
48	SO308/1_48-1	CTD	2024/12/16 01:00:12	28° 49,785	112° 51,004	2573.0
48	SO308/1_48-2	TM CTD	2024/12/16 03:04:50	28° 49,785	112° 51,250	2586.8
48	SO308/1_48-3	BIO CTD	2024/12/16 06:18:42	28° 49,733	112° 52,485	2948.9
48	SO308/1_48-4	BIO CTD	2024/12/16 06:44:27	28° 49,746	112° 52,643	2931.8
48	SO308/1_48-5	MSS	2024/12/16 07:37:23	28° 49,725	112° 52,403	2956.4
49	SO308/1_49-1	CTD	2024/12/16 23:56:07	29° 45,007	114° 12,013	734.3
49	SO308/1_49-2	TM CTD	2024/12/17 00:40:23	29° 45,007	114° 12,010	738.3
49	SO308/1_49-3	MUC	2024/12/17 01:57:02	29° 45,008	114° 12,021	739.5
49	SO308/1_49-4	BIO CTD	2024/12/17 02:59:42	29° 45,006	114° 12,019	738.0
49	SO308/1_49-5	MSS	2024/12/17 03:22:49	29° 45,010	114° 12,021	737.5
50	SO308/1_50-1	BIO CTD	2024/12/17 23:52:30	30° 48,045	114° 39,009	784.8

50	SO308/1_50-2	BIO CTD	2024/12/18 00:43:03	30° 48,041	114° 39,011	782.4
50	SO308/1_50-3	TM CTD	2024/12/18 01:16:43	30° 48,104	114° 39,133	779.2
50	SO308/1_50-4	CTD	2024/12/18 02:35:11	30° 48,701	114° 39,345	760.9
50	SO308/1_50-5	MSS	2024/12/18 04:27:45	30° 48,874	114° 39,415	759.8
51	SO308/1_51-1	BIO CTD	2024/12/18 23:00:24	31° 51,001	115° 05,988	208.3
51	SO308/1_51-2	MUC	2024/12/18 23:56:19	31° 51,721	115° 05,986	215.8
51	SO308/1_51-3	MUC	2024/12/19 00:20:46	31° 51,721	115° 05,984	218.6
51	SO308/1_51-4	TM CTD	2024/12/19 00:47:30	31° 51,725	115° 05,993	216.2
51	SO308/1_51-5	CTD	2024/12/19 01:18:05	31° 51,719	115° 05,979	218.1
51	SO308/1_51-6	MUC	2024/12/19 01:40:54	31° 51,718	115° 05,986	216.2
51	SO308/1_51-7	MSS	2024/12/19 03:17:41	31° 51,721	115° 05,997	218.0