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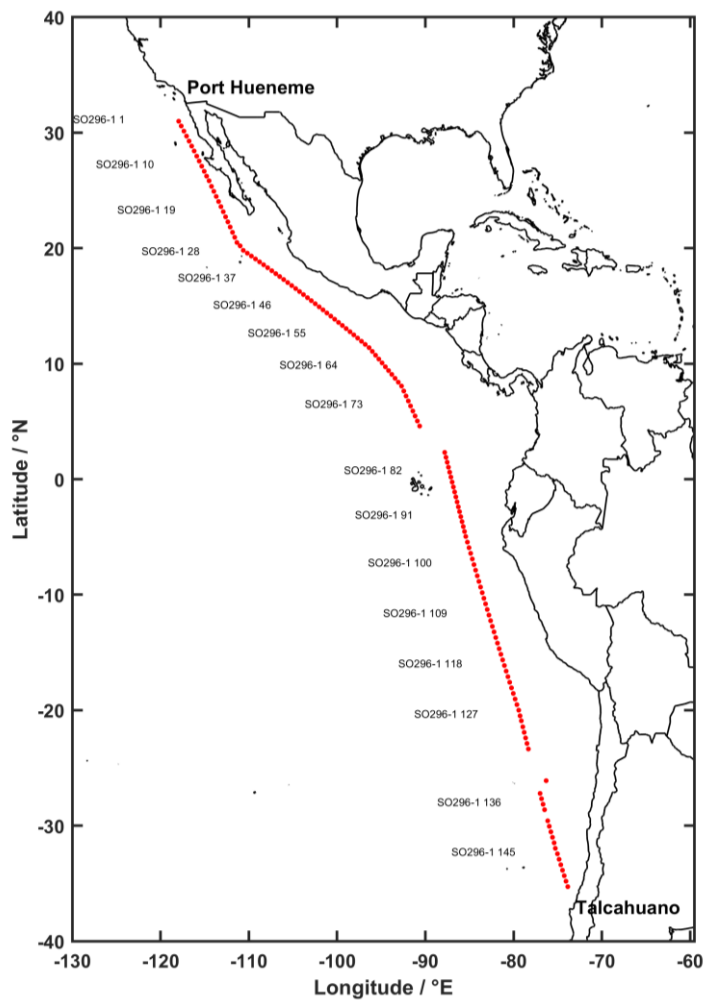
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Short Cruise Report RV SONNE SO296/1

Port Hueneme - Talcahuano
26.12.2022 – 18.01.2023

Chief Scientist: Prof. Dr. Detlef E. Schulz-Bull

Captain: Oliver Meyer



Objectives

The cruise SO296-1 aimed to investigate the marine environmental changes in the surface waters on the shelf of Central and South America (Mexico to Chile) to study the impact of the anthropogenic and natural changes on the marine ecosystem in terms of the goals of the Ocean Decade program. Therefore, surface water samples were collected to assess the extension of the pollution and resulting risks to the immediate coastal environment caused by inputs from rivers and the atmosphere.

The extension of the transect covers different biogeographic biomes, such as subtropical, tropical, and equatorial, in both the North and South Hemispheres. Thus, this expedition will give a unique opportunity to study the land-ocean exchange processes, changes in physical forcing, and anthropogenic fluxes (including carbon, nutrients, organic pollutants, microplastic, and antibiotics) due to a growing human population in the Central and South America coastal regions.

Our investigations will provide insights into the influence of environmental parameters on the changes in oceanic processes of marine matter cycles (N, P, C) and enable statements on the spatial and temporal variability of oceanic processes as well as anthropogenic ecosystem pollution.

The cruise contributed to the German DAM initiative "underway data" as well as to the Ocean Decade goals of a clean ocean (1), a healthy ocean (2), a living ocean (3), and a predictable ocean (4).

Narrative

On December 26th, 2022, around 13:00 (Pacific Time, PT), the scientific party and the Chilean observer embarked, and all participants realized the Covid tests, with the results of all participants being negative. At around 15:00 PT, the scientific crew set up the laboratories and prepared the measuring equipment for the cruise. RV SONNE sailed from Port Hueneme towards the working area in Mexican waters at 18:00 PT.

In the early afternoon of December 27th, 2022, the two observers from Ecuador embarked, and RV SONNE proceeded her way to the transect line. At 22:00 PT, the vessel reached the position of station SO296-1_1, and the first surface water samples were collected and filtrated. The collection and filtration of water samples occurred every 30 nm for nutrients and hormones along the entire transect route (roughly every three hours, with a constant ship speed of approximately 10 knots). On December 29th, 2022, the samples from the first 29 stations were analyzed using the nanomolar system. Over the next five days, surface water was collected in Mexican national waters at 59 stations (Fig. 1).

RV Sonne entered international waters on the night of January 3rd, 2023, and proceeded with the sampling of surface water every 30 n.m; until she entered Ecuador national waters around mid-day of January 6th, 2023. The sampling was stopped between January 6th, 14:49 UTC, and January 7th, 18:46 UTC, because the SONNE route passed the "Reserva Marine Hermandad." On the night of January 8th, SONNE crossed the Equator around 8:15 UTC. We proceeded with collecting surface water every 30 n.m., and on the night of January 13th, SONNE entered Chilean national waters. On January 14th at 16:23 UTC, the SONNE route crossed the Nazca-Desventuradas Marine Park, and the sampling was interrupted until the next day. After passing the Nazca-Desventuradas Marine Park, the sampling restarted every 30 n.m. until the last station on January 17th, 20:34 UTC. The scientific party finished the remaining filtrations and extractions and started to dismantle the laboratories and pack the equipment into the container.

During the entire transit time, surface water was filtrated daily for microplastic analysis for 8 hours in the first four days and 9 hours afterward. In addition, surface water was also filtered for organic pollutants for 9.5 hours at selected parts of the transect.

Also, over the entire transit time between station St. 296-1_1 in Mexican waters until the last station St. 296-1_151 in Chilean waters, currents in the upper water column down to 700 m (if possible) were registered using a 38 kHz Acoustic Doppler Current Profiler (ADCP). Sea surface temperature, salinity, chlorophyll *a* fluorescence, and turbidity were measured and registered by the ship's thermosalinograph system, as well as the recording of prevailing weather conditions, such as wind, humidity, air temperature, air pressure, and irradiance.

At 8:30 am LT on January 18th, RV SONNE reached the pier in Talcahuano, Chile and the cruise SO296-1 terminated. In the morning, the container was ready to be shipped home. After cleaning the laboratories, the scientific party disembarked at 2 pm LT to the hotel before heading home on January 20th.

Acknowledgements

We kindly acknowledge the financial support for the involved project at the German site. The chief scientist received funding for the cruise SO296-1 (MAPUCHE: Impact of pelagic Anoxia in the Upwelling Area off Concepción and in a pristine anoxic Fjord, and the postglacial Development of the Patagonian Fjord Region of Chile) from BMBF under contract number 03G0296A.

We owe our thanks as well to the Mexican, Ecuador, Peru, and Chilean authorities, which supported our activities by giving us work permission for studies within their

territorial waters. Finally, we thank the captain and the crew of RV SONNE for their continuous support during the cruise.

Teilnehmerliste / List of Participants

Name / Name	Tätigkeit / Task	Institut/Institute
1. Schulz-Bull, Detlef	Fahrtleiter / <i>Chief Scientist</i>	IOW
2. Frazao, Helena	Phys. Ozeanographie / <i>Phys. Oceanography</i>	IOW
3. Reineccius, Janika	Mikroplastik / <i>Microplastic</i>	IOW
4. Sadkowiak, Birgit	Nährstoffe / <i>Nutrients</i>	IOW
5. Kreuzer, Lars	Nährstoffe / <i>Nutrients</i>	IOW
6. Jeschek, Jenny	UV-filters	IOW
7. Dierken, Madleen	Hormon / <i>Hormones</i>	IOW
8. Beltran, Oscar	Filtration	IOW
9. Estelmann, Arne	DOM	IOW
10. Goldschmidt, Irina	Filtration	IOW
11. Hand, Ines	Org. Schadstoffe / <i>Org. Pollutants</i>	IOW
12. Klostermann, Birgit	Filtration	IOW
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14. Lynch Valdez, Renow Alfredo	Observer	INOCAR
15. Barahona Sanchez, Martha Gabriela	Observer	INOCAR

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Station log SO296

Abbreviations: Nutrients (Nut), Chlorophyll a (Chla), Particulate Organic Carbon (POC), Suspended Particulate Matter (SPM), Dissolved Organic Carbon (DOC), Dissolved Organic Matter (DOM), UV-filters (UV), Hormones (H), Organic Pollutants (Org), Microplastic (MP)

Station No.	Date	Time	Gear	Latitude	Longitude	Course	Speed (kn)	Wind Dir. (°)	Wind Speed (m/s)	Parameters sampled
SO296-1_1	28.12.2022	06:10	pump	30°59.265'N	117°56.609'W	172.8	10	250.1	5.4	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_2	28.12.2022	09:05	pump	30°34.470'N	117°39.421'W	149.3	10	258.5	6.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_3	28.12.2022	12:09	pump	30°07.880'N	117°21.048'W	149.9	9.7	268.2	7.1	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_4	28.12.2022	15:10	pump	29°41.960'N	117°03.301'W	149.2	10.2	244.7	4.7	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_5	28.12.2022	18:11	pump	29°16.096'N	116°45.774'W	149.3	9.9	217.4	6.4	Nut, Chla, POC, SPM, DOC, DOM, Org, UV, H, MP
SO296-1_6	28.12.2022	21:10	pump	28°50.234'N	116°28.428'W	149.4	10	222.6	5.5	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_7	29.12.2022	00:06	pump	28°24.602'N	116°11.404'W	149.1	10.1	242.8	4.3	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_8	29.12.2022	03:12	pump	27°57.875'N	115°53.818'W	149.6	10.1	223.4	2.6	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_9	29.12.2022	06:13	pump	27°32.359'N	115°37.178'W	149.2	10	202.9	5	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_10	29.12.2022	09:13	pump	27°05.693'N	115°19.952'W	149.6	9.8	258	5.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_11	29.12.2022	12:17	pump	26°39.106'N	115°02.937'W	149.5	10.1	250	7.1	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_12	29.12.2022	15:10	pump	26°13.939'N	114°46.973'W	150.1	10.5	244.6	6.9	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_13	29.12.2022	17:57	pump	25°49.930'N	114°29.956'W	150.5	10.6	290.6	4.6	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_14	29.12.2022	21:01	pump	25°20.935'N	114°13.761'W	152.5	10.7	219.9	4	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_15	29.12.2022	23:50	pump	24°55.060'N	113°57.768'W	149.9	9.8	258.4	6	Nut, Chla, POC, SPM, DOC, DOM, Org, UV, H, MP
SO296-1_16	30.12.2022	02:53	pump	24°28.464'N	113°41.441'W	151.1	9.9	298.8	6.3	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_17	30.12.2022	05:54	pump	24°02.113'N	113°25.419'W	150.7	9.9	292.3	5.3	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_18	30.12.2022	08:57	pump	23°35.635'N	113°09.426'W	150.5	9.8	293.8	5.4	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_19	30.12.2022	11:59	pump	23°09.160'N	112°53.577'W	150.9	9.9	341.3	6	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_20	30.12.2022	15:01	pump	22°42.512'N	112°37.741'W	150.7	10.1	331	5.5	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_21	30.12.2022	17:59	pump	22°16.430'N	112°22.327'W	150.8	10	328.8	5.6	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_22	30.12.2022	21:00	pump	21°49.751'N	112°06.703'W	150.2	9.9	217.5	2.1	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_23	31.12.2022	00:08	pump	21°22.241'N	111°50.724'W	151.4	10	12.7	2.8	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_24	31.12.2022	03:04	pump	20°56.348'N	111°35.761'W	151.9	10.1	14.2	4.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_25	31.12.2022	06:05	pump	20°29.470'N	111°20.793'W	135.2	9.8	13.1	5.4	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_26	31.12.2022	08:48	pump	20°11.849'N	110°58.757'W	130	9.9	15.1	4.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_27	31.12.2022	11:52	pump	19°48.563'N	110°37.547'W	139.4	9.9	34	3.7	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_28	31.12.2022	14:51	pump	19°33.825'N	110°10.062'W	118.9	9.9	16.8	6.8	Nut, Chla, POC, SPM, DOC, H, Org, MP
SO296-1_29	31.12.2022	17:51	pump	19°18.943'N	109°42.370'W	120.2	9.9	34.9	5.5	Nut, Chla, POC, SPM, DOC, DOM, UV, H, Org, MP
SO296-1_30	31.12.2022	20:55	pump	19°03.859'N	109°14.529'W	121.2	10.1	28.6	4.9	Nut, Chla, POC, SPM, DOC, H, Org, MP
SO296-1_31	31.12.2022	23:57	pump	18°48.770'N	108°46.844'W	120.6	10.1	43.4	7.3	Nut, Chla, POC, SPM, DOC, DOM, H, Org, MP
SO296-1_32	01.01.2023	02:58	pump	18°33.618'N	108°19.287'W	119.6	9.9	47.3	5.3	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_33	01.01.2023	05:59	pump	18°18.433'N	107°51.898'W	119.7	10	342.4	3.2	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_34	01.01.2023	09:06	pump	18°02.709'N	107°23.687'W	119.4	10	318.1	1.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_35	01.01.2023	12:04	pump	17°47.512'N	106°56.634'W	120.6	9.9	328.5	3.7	Nut, Chla, POC, SPM, DOC, DOM, H, MP

SO296-1_36	01.01.2023	15:01	pump	17°32.537'N	106°30.204'W	121.8	10	3.7	8.6	Nut, Chla, POC, SPM, DOC, H, Org, MP
SO296-1_37	01.01.2023	18:02	pump	17°17.034'N	106°02.984'W	120.9	9.9	0.2	10.9	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_38	01.01.2023	21:10	pump	17°01.382'N	105°35.639'W	120.8	10	32.3	7.1	Nut, Chla, POC, SPM, DOC, H, Org, MP
SO296-1_39	02.01.2023	00:13	pump	16°45.595'N	105°08.347'W	120.6	10	37.6	4.3	Nut, Chla, POC, SPM, DOC, DOM, H, Org, MP
SO296-1_40	02.01.2023	03:14	pump	16°29.917'N	104°41.366'W	121.5	10.1	17.8	3.1	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_41	02.01.2023	06:12	pump	16°14.505'N	104°14.999'W	122.1	10.1	340.9	2.3	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_42	02.01.2023	09:13	pump	15°58.804'N	103°48.282'W	121.9	10	316.1	3.3	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_43	02.01.2023	12:16	pump	15°42.755'N	103°21.211'W	120.8	10	35	1.5	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_44	02.01.2023	15:14	pump	15°27.204'N	102°55.099'W	122.1	10	20	2.1	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_45	02.01.2023	18:15	pump	15°11.263'N	102°28.443'W	121.7	10	39.2	6.4	Nut, Chla, POC, SPM, DOC, DOM, UV, H, Org, MP
SO296-1_46	02.01.2023	21:21	pump	14°55.120'N	102°01.685'W	122.3	6.8	344.4	5.2	Nut, Chla, POC, SPM, DOC, H, Org, MP
SO296-1_47	03.01.2023	00:22	pump	14°39.323'N	101°35.637'W	122.4	9.9	7.9	2.9	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_48	03.01.2023	03:24	pump	14°23.202'N	101°09.170'W	122.9	10	41.2	1.5	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_49	03.01.2023	06:26	pump	14°06.969'N	100°42.633'W	122	10	31.6	1.8	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_50	03.01.2023	09:27	pump	13°50.843'N	100°16.494'W	121.8	10	61.7	2.2	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_51	03.01.2023	12:29	pump	13°34.348'N	099°50.207'W	125.1	10	77.3	3.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_52	03.01.2023	15:34	pump	13°18.400'N	099°24.205'W	122.3	9.6	68.1	5.3	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_53	03.01.2023	19:00	pump	13°02.129'N	098°58.186'W	122.9	9.9	65.4	6.4	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_54	03.01.2023	22:06	pump	12°45.728'N	098°32.097'W	122.8	10	66.6	6	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_55	04.01.2023	01:09	pump	12°29.470'N	098°06.327'W	122.3	10.2	72.9	6.4	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_56	04.01.2023	04:10	pump	12°12.954'N	097°40.292'W	122.3	9.9	84.3	8.5	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_57	04.01.2023	07:16	pump	11°56.265'N	097°14.120'W	123.2	9.9	74.1	4.6	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_58	04.01.2023	10:14	pump	11°40.014'N	096°48.712'W	122.4	9.9	53.9	6.2	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_59	04.01.2023	13:19	pump	11°23.237'N	096°22.558'W	123.1	10.1	57.8	8.6	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_60	04.01.2023	16:14	pump	11°03.665'N	096°00.596'W	131.9	10.3	66.3	10.8	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_61	04.01.2023	19:15	pump	10°43.777'N	095°38.364'W	132	9.7	65.9	9.8	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_62	04.01.2023	22:12	pump	10°23.869'N	095°16.186'W	132	9.8	73.1	8	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_63	05.01.2023	01:14	pump	10°03.948'N	094°54.070'W	132.2	9.7	79.9	9.5	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_64	05.01.2023	04:13	pump	09°43.733'N	094°31.716'W	132.4	10.1	64.4	11.2	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_65	05.01.2023	07:06	pump	09°24.219'N	094°10.177'W	133.6	9.9	64.1	11	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_66	05.01.2023	10:04	pump	09°04.218'N	093°48.190'W	132.7	10	63.8	11.1	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_67	05.01.2023	13:03	pump	08°43.998'N	093°26.001'W	130.6	9.8	50.8	12.3	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_68	05.01.2023	16:05	pump	08°23.774'N	093°03.889'W	133.7	9.5	54	12	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_69	05.01.2023	19:11	pump	08°03.678'N	092°41.970'W	132.8	9.3	63.6	16.7	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_70	05.01.2023	22:23	pump	07°37.832'N	092°26.509'W	148.5	9.8	62.2	12.4	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_71	06.01.2023	01:16	pump	07°12.044'N	092°11.228'W	147.7	10.2	49.9	15.1	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_72	06.01.2023	04:15	pump	06°46.090'N	091°55.886'W	148.8	10.1	93	9.3	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_73	06.01.2023	07:13	pump	06°20.183'N	091°40.536'W	149.9	10.1	127.9	5.2	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_74	06.01.2023	10:14	pump	05°54.004'N	091°24.982'W	149	10.2	144.3	5.4	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_75	06.01.2023	13:10	pump	05°28.214'N	091°09.777'W	148.6	10.1	161.9	6.5	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_76	06.01.2023	16:11	pump	05°02.134'N	090°54.275'W	149.4	10	170.6	4.6	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_77	06.01.2023	19:17	pump	04°35.926'N	090°38.706'W	149.2	10.1	107.2	12.3	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_78	07.01.2023	17:40	pump	02°19.004'N	087°48.492'W	118.9	9.9	187.7	10.6	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP

SO296-1_79	07.01.2023	20:22	pump	01°53.557'N	087°39.833'W	162.9	10	183.9	7.8	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_80	07.01.2023	23:03	pump	01°27.933'N	087°31.462'W	161.7	9.9	176.3	8.6	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_81	08.01.2023	01:51	pump	01°02.100'N	087°23.021'W	161.7	10.1	159.4	5.6	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_82	08.01.2023	04:30	pump	00°36.198'N	087°14.566'W	162.1	10	173.9	5	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_83	08.01.2023	07:08	pump	00°10.787'N	087°06.270'W	161.5	10.2	162	3.7	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_84	08.01.2023	09:49	pump	00°15.118'S	086°57.812'W	161.9	10.3	154.9	4.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_85	08.01.2023	12:28	pump	00°40.685'S	086°49.466'W	163.1	10.2	162.6	6.1	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_86	08.01.2023	15:11	pump	01°06.388'S	086°41.077'W	162.1	10.2	159.5	6	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_87	08.01.2023	17:48	pump	01°32.106'S	086°32.673'W	162.1	10.2	167.3	6.1	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_88	08.01.2023	20:30	pump	01°58.134'S	086°24.171'W	159.7	9.9	170.1	5.7	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_89	08.01.2023	23:10	pump	02°23.834'S	086°15.768'W	160.2	10	159.8	4.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_90	09.01.2023	01:51	pump	02°48.895'S	086°07.583'W	160.8	10.1	148.5	4.8	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_91	09.01.2023	04:28	pump	03°14.857'S	085°59.079'W	162.9	10.3	151.3	5.2	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_92	09.01.2023	07:09	pump	03°40.477'S	085°50.670'W	162	9.9	149.6	5.7	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_93	09.01.2023	09:54	pump	04°06.087'S	085°42.255'W	162.2	9.9	123.4	4.7	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_94	09.01.2023	12:33	pump	04°31.898'S	085°33.787'W	163.7	10	99.6	5.4	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_95	09.01.2023	15:16	pump	04°57.778'S	085°25.287'W	161.9	9.9	93	7	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_96	09.01.2023	18:22	pump	05°26.932'S	085°14.223'W	156.6	9.9	114.8	3.6	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_97	09.01.2023	21:28	pump	05°56.029'S	085°03.168'W	157.9	10.1	98.2	2.6	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_98	10.01.2023	00:38	pump	06°25.304'S	084°51.986'W	159.3	9.9	121.7	3.6	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_99	10.01.2023	03:42	pump	06°54.544'S	084°40.831'W	158.9	10.1	167.9	2.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_100	10.01.2023	06:51	pump	07°23.929'S	084°29.582'W	159	9.8	108.5	3.8	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_101	10.01.2023	09:55	pump	07°52.797'S	084°18.518'W	159.9	10.1	122.5	4	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_102	10.01.2023	13:01	pump	08°22.045'S	084°07.263'W	159.3	10	124.2	2.8	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_103	10.01.2023	16:06	pump	08°51.144'S	083°56.045'W	158.9	10	79.2	4.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_104	10.01.2023	19:14	pump	09°20.332'S	083°44.757'W	160	9.9	179	2.1	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_105	11.01.2023	00:06	pump	09°49.610'S	083°33.400'W	159.9	9.9	188.9	3	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_106	11.01.2023	03:13	pump	10°18.773'S	083°22.051'W	160.4	9.9	158.1	2.2	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_107	11.01.2023	06:22	pump	10°47.820'S	083°10.720'W	157.6	9.9	105.4	2.6	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_108	11.01.2023	09:25	pump	11°16.934'S	082°59.315'W	159.4	9.8	92.5	6.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_109	11.01.2023	12:32	pump	11°46.079'S	082°47.859'W	158	10.3	91.7	8.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_110	11.01.2023	15:39	pump	12°15.233'S	082°36.350'W	157.7	10.3	99.2	11.8	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_111	11.01.2023	18:47	pump	12°44.665'S	082°24.678'W	158.4	9.9	111	9.1	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_112	11.01.2023	21:51	pump	13°13.363'S	082°13.270'W	159.4	10.1	156.1	6.6	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_113	12.01.2023	00:59	pump	13°42.646'S	082°01.565'W	158.7	10	154.1	7.3	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_114	12.01.2023	04:05	pump	14°11.639'S	081°49.928'W	158.2	10.1	130.4	6.8	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_115	12.01.2023	07:15	pump	14°40.647'S	081°38.234'W	158.7	9.9	156.8	5.6	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_116	12.01.2023	10:22	pump	15°09.829'S	081°26.413'W	157.6	10.1	116.8	10.8	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_117	12.01.2023	13:25	pump	15°38.853'S	081°14.598'W	159.2	9.9	125.7	8.4	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_118	12.01.2023	16:36	pump	16°07.923'S	081°02.706'W	158.8	10	132.7	9.4	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_119	12.01.2023	19:47	pump	16°37.050'S	080°50.691'W	156.5	9.9	150.1	7.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_120	12.01.2023	22:54	pump	17°06.055'S	080°38.727'W	158.2	9.9	145.4	11.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_121	13.01.2023	02:00	pump	17°35.028'S	080°26.666'W	158	10.1	134.7	9.4	Nut, Chla, POC, SPM, DOC, H, MP

SO296-1_122	13.01.2023	05:07	pump	18°04.025'S	080°14.535'W	158	10.1	132.6	8.4	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_123	13.01.2023	08:15	pump	18°33.107'S	080°02.302'W	157.7	9.9	120.8	7.3	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_124	13.01.2023	11:22	pump	19°02.202'S	079°49.985'W	157.7	10.1	159.9	5.7	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_125	13.01.2023	14:41	pump	19°31.067'S	079°37.673'W	150.5	9	149.8	9.4	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_126	13.01.2023	17:58	pump	20°00.064'S	079°25.258'W	158.2	9.2	157.9	8.5	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_127	13.01.2023	21:17	pump	20°29.251'S	079°16.353'W	165.1	9.6	142.7	10.8	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_128	14.01.2023	00:03	pump	20°55.193'S	079°07.632'W	162.3	10.3	146.2	11.4	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_129	14.01.2023	03:16	pump	21°26.421'S	078°57.516'W	163.1	10.6	142.6	11.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_130	14.01.2023	06:13	pump	21°55.088'S	078°48.196'W	162.8	10.3	128.5	10.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_131	14.01.2023	09:15	pump	22°24.157'S	078°38.676'W	162.8	10.2	148.2	7.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_132	14.01.2023	12:11	pump	22°52.839'S	078°29.217'W	163	10	137.5	8.3	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_133	14.01.2023	15:15	pump	23°21.462'S	078°19.708'W	163.6	9.7	168.7	8.2	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_134	15.01.2023	15:30	pump	27°12.357'S	077°00.184'W	162.7	10.2	140.3	12.8	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_135	15.01.2023	18:24	pump	27°39.946'S	076°50.313'W	162.5	10	172.4	8.3	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_136	15.01.2023	21:27	pump	28°08.681'S	076°39.933'W	162.7	10.1	162.9	11.5	Nut, Chla, POC, SPM, DOC, DOM, Org, H, MP
SO296-1_137	16.01.2023	00:22	pump	28°36.994'S	076°29.615'W	162.8	10	175	10.5	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_138	16.01.2023	03:28	pump	29°06.073'S	076°18.906'W	164	10	187.3	10.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_139	16.01.2023	06:32	pump	29°34.600'S	076°08.309'W	162.6	9.2	177	10.8	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_140	16.01.2023	09:38	pump	30°03.109'S	075°57.611'W	162.4	9.7	180	12.4	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_141	16.01.2023	12:40	pump	30°31.752'S	075°46.754'W	162.2	10.3	189	8.9	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_142	16.01.2023	12:40	pump	31°00.271'S	075°35.825'W	160.9	9.8	191.3	8.6	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_143	16.01.2023	15:39	pump	31°29.034'S	075°24.686'W	160.6	10.2	183	7.4	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_144	16.01.2023	18:41	pump	31°57.539'S	075°13.525'W	161.1	9.5	187.5	9.7	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_145	16.01.2023	21:54	pump	32°25.901'S	075°02.296'W	160.4	9.4	179.3	8.7	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_146	17.01.2023	01:02	pump	32°54.429'S	074°50.886'W	159.8	9.9	185	7.9	Nut, Chla, POC, SPM, DOC, DOM, UV, H, MP
SO296-1_147	17.01.2023	04:07	pump	33°23.062'S	074°39.298'W	161.1	9.9	181.2	10	Nut, Chla, POC, SPM, DOC, H, MP
SO296-1_148	17.01.2023	07:09	pump	33°51.369'S	074°27.710'W	161.3	9.7	174	8.9	Nut, Chla, POC, SPM, DOC, DOM, H, MP
SO296-1_149	17.01.2023	10:08	pump	34°19.814'S	074°15.914'W	161.1	10.4	181.6	7.5	Nut, Chla, POC, SPM, DOC, Org, H, MP
SO296-1_150	17.01.2023	13:12	pump	34°48.315'S	074°03.975'W	163.4	9.6	218	8.2	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP
SO296-1_151	17.01.2023	16:12	pump	35°16.759'S	073°51.911'W	160.9	7.7	214.7	9.5	Nut, Chla, POC, SPM, DOC, DOM, UV, Org, H, MP