

Prof. Dr. Katrin Huhn
MARUM
Universität Bremen
Leobener Str.
D28359 Bremen, Germany

Tel.: +49-421-218 65860
Fax: +49-421-218 65872
email: khuhn@marum.de

Short Cruise Report
METEOR Cruise M154/2
Pointe-à-Pitre (Guadeloupe) - Pointe-à-Pitre (Guadeloupe)
29.04.2019 - 23.05.2019
Chief Scientist: Prof. Dr. Katrin Huhn
Captain: Rainer Hammacher



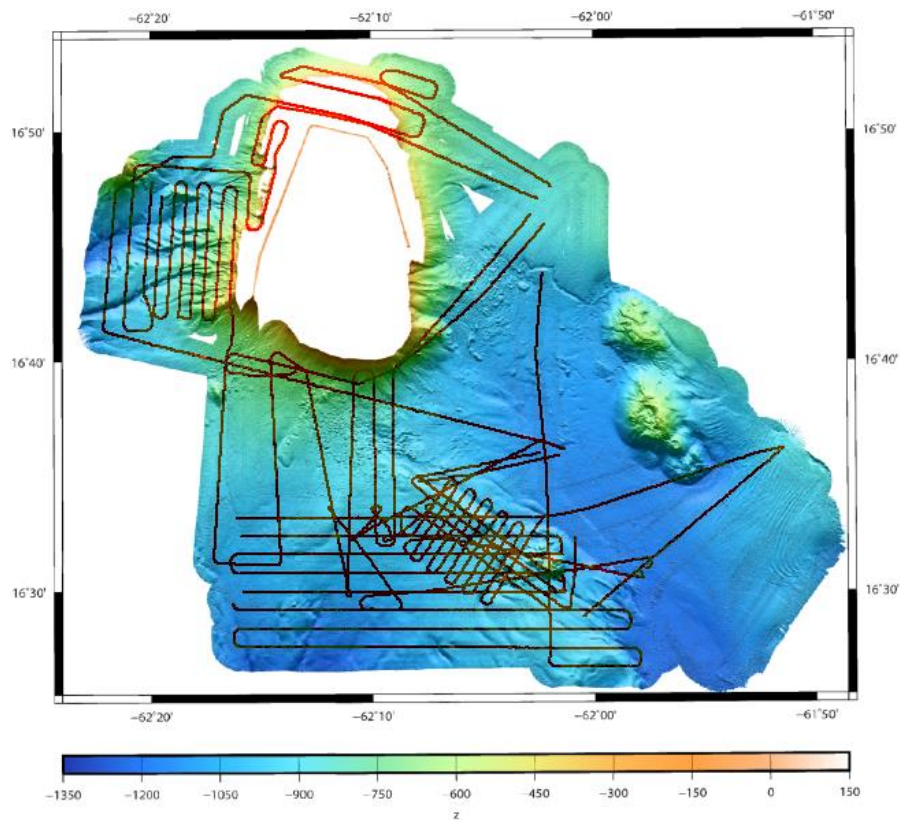
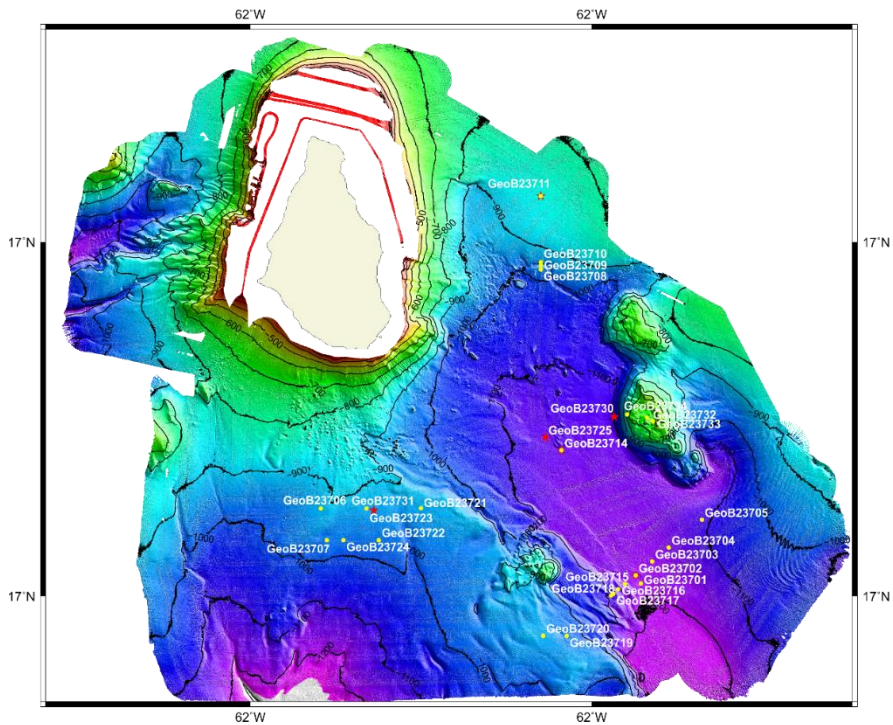


Fig 1: Bathymetric map with data collected on M154/1 and M154/2 (bin size of 10 m) showing overview of PARASOUND profiles acquired during M154/2.

Fig. 2: Overview of gravity cores (yellow circles) and MeBo (red stars) stations of M154/2.



Objectives

RV Meteor-Cruise M154/2 will contribute to understand the processes related to volcanic island collapses, their sources and emplacement as well as the relationship between landslides, eruption cycles and initiation of new volcanic centres. The aims were to answer the following research questions:

- 1) What type of material are the landslides made of, and where did that material originate from? How much seafloor sediment was incorporated into the landslides, and by what processes? What are the implications for tsunami generation?
- 2) Have the landslides been emplaced in one event, or multiple widely separated events?
- 3) What is the timing of major landslides relative to volcanic eruption cycles, initiation of new volcanic centres, or sea level change?

To achieve the scientific goals we investigated submarine landslides offshore the volcanic island arc island of Montserrat in the Lesser Antilles. This island has been affected by several large landslides in the past. Such landslides pose a significant hazard, both from the landslide itself, and from resulting tsunamis. The emplacement dynamics of these landslides and their relationship to volcanic eruption cycles or magmatic evolution are poorly understood at present, due to a lack of detailed studies of landslide deposits.

Scientific objectives were addressed by collecting parametric echosounder (PARASOUND) and multi-beam (Kongsberg EM122) data as well as sampling different components of landslides from the source to depositional area using different coring techniques: gravity corer, box corer, grab sampler and MeBo70 drilling. The latter was also combined with in-situ Cone Penetration Test (CPT) measurements as well as borehole logging. Therefore, a Spectrum Gamma Instrument (SGR), a magnetic susceptibility (MagSus) and Acoustic probe (AcousP) were successfully utilized.

Narrative of the Cruise

After all labs were set up and the MeBo70 equipping was successfully completed with the harbour basin test, we left after lunchtime of April 4 the Port of Pointe-à-Pitre (Guadeloupe). After a short transit of 7h, we arrived in our research area offshore Montserrat and immediately continued with the hydro-acoustic mapping of the target area, SE of the island. In the course of the morning of April 30, we collected 5 gravity cores in a transect across the distal part of the largest near-surface landslide deposit offshore Montserrat, named Deposit 2 (GeoB23701-GeoB23705). Core penetration depth was between 0.73mbsf (GeoB23701) and 2.98 mbsf at the site also selected for the first MeBo drilling (GeoB23702). Afterwards a Sound Velocity Profile (GeoB23702-2) was recorded at this site and MeBo70 was launched into water in the afternoon for its first operation (GeoB23702-3). During this first deployment, a newly developed CPT probe was successfully utilized to a depth of 12.6 mbsf, where the CPT hit a very stiff, sandy layer; and measurements were stopped. Following the CPT measurements, the flush tool was used to drill to the final borehole depth of 28.65 mbsf without coring. An Acoustic probe was successfully deployed in the borehole to measure a continuous v_p velocities profile from 27.7 mbsf to the seafloor while the drill string was dismantled. MeBo was back on deck at 1:00pm May 2. The following night was used to continue hydro-acoustic mapping. In the morning, we continued our gravity coring along a north-south trending profile crossing the distal part of the Deposit 3 south of the island (GeoB23706-GeoB23707). During the latter deployment GeoB23707, the gravity corer could penetrate only to a depth of 0.47 mbsf. After another gravity coring at site GeoB23702, MeBo was deployed a second time at this site at 2pm (GeoB23702-5). Aim was to core the slid masses of Deposit 2 down to the potential glide plane and to recover

undisturbed sediment sections underneath. Based on the sediment-physical data collected during first deployment, drilling parameters were adjusted. Drilling of GeoB23702-5 was continued until May 3 afternoon to a final depth of 30.3 mbsf. After drilling, a MagSus probe was lowered in the borehole and mapped in situ while the drill string was dismantled. MeBo70 was back on deck at 9pm. Core recovery was 56.87%. All cores were first scanned with the MSCS before whole rounds were taken and all cores were split and processed: (a) a first visual core description revealed that Deposit 2 is overlain moderately bioturbated hemipelagic muds interbedded with normally-graded silts and sands, with cm to dm thicknesses, deposited by mass flows and density. Parts of the MeBo core recovered mixed hemipelagic and volcanic lithologies, above the coarse gravel, while lower stratigraphy included volcanic beds with pumice clasts. (b) Sediment physical properties were measured. The following night was used to continue hydro-acoustic mapping. May 4 was organized by the same pattern. After hydro-acoustic mapping until 8am, the morning and early afternoon were used for gravity coring (GeoB23708-GeoB23711). Cores were taken along a NS-trending profile along the northern headwall of Deposit 2 crossing a prominent canyon structure. Here, gravity corer could not penetrate into the sediment. In contrast, just north of the canyon in the area of undisturbed, not destabilized slope sediments, material could be collected from the upper 1m of the sediment bed. At 3pm, MeBo was deployed at site GeoB23711 in the undisturbed slope area to utilize the CPT probe during a first operation (GeoB23711-2). CPT data were collected until a depth of 11.65 mbsf where again a layer of very stiff and solid sediments were reached. MeBo operation was stopped and the drill tool was back on deck at 12pm. We continued with hydro-acoustic mapping until 2pm, MeBo was deployed again at site GeoB23711 with the major aims to drill (a) material from the undisturbed slope to gain a deeper insight into background stratigraphy of the area, (b) the basal failure plane of Deposit 2b as well as (c) the undelaying strata 2a. This will enable to shed light on the age and timing of the different collapses and slid events. At May 7 lunchtime, MeBo was back on deck after drilling GeoB23711-3 down to the target depth of 65.3 mbsf. Core recovery was 41% and we could recover material from all lithological sequences. Afterwards the borehole was logged with the Acoustic probe. During the second half of the day, box corer (GeoB23712-1) and grab sampler (GeoB23713-1) were used to sample the seafloor near the MeBo site. In addition, these deployments served to test the newly installed camera system. The b/w image of the camera enable at least the visualization of coarse structures of the seabed. The rest of the day was used for further hydro-acoustic mapping. Directly after lunch of May 8, MeBo was deployed again at site GeoB23711-4 for 60 h until May 10 midnight. Major aim of this leg was (i) to utilize the CPT probe, which was successful until 23.7 mbsf. Further penetration was impossible because of increasing sediment strength; and (ii) to drill to the target depth of 70.30 mbsf. Alternating the flush tool and the drill tool were utilized and in total 26.6 m sediments could be recovered. Material was very well stratified with frequently embedded volcanic ashes and coarse grained volcanic sandy materials. Finally the MagSus probe was lowered in the bore string. Unfortunately, it got stuck in the drill string due to sediment penetrating from below. The rest of the night was used to continue the hydro-acoustic mapping. During May 11, 10 gravity cores were collected (GeoB23714-1 – GeoB23720-1) along a profile perpendicular the south-western flank of the Bouillante-Montserrat graben. Attached to the gravity corer, a heat flow probe was lowered into the shallow sediment section. Heat flow measurements were successful and a significant heat flow peak of 260 mW/m² was measured at site GeoB23715-1. These values indicate active fault zones at the edge the graben. Early in the evening, MeBo was deployed again at the central part of the slid masses (GeoB23714-2). Shortly after the start of drilling, the drilling had to be stopped in a depth of 5.30 mbsf as MeBo sank in strongly and tilted slightly. We have therefore decided to briefly lift MeBo a few meters into the water column, move it a few meters and start again (GeoB23714-3) flushing as the aim was not to drill rather to collect in-situ measurements. After 16 hours, MeBo had to be recovered at 4pm of May 12 after reaching a depth of 20.3 mbsf because of a broken flush tool. This

could be fixed very quickly and already after 5 hours MeBo was deployed again at this site (GeoB23714-4). It flushed down to a depth of 12.7 mbsf and started drilling with the aim to recover core material from the boundary layer at the base of Deposit 2b. After 2.6 m drilling, the drill string has gotten stuck at 15.3 mbsf and we had to finish this site. MeBo was back on deck at 1pm on May 13. Core recovery for the drilled sections was 87%. The material exhibit a very high stiffness. In addition, very coarse volcanic material stuck at the base of this section what clearly explains the difficulties during drilling. At 3:30pm, gravity coring was continued at GeoB23721 - GeoB23724 along an east-west trending profile cutting the southern edge of Deposit 3 south off Montserrat. The same evening, MeBo was deployed at site GeoB23725-1 slightly north-west of site GeoB23714. Aim was again to sample the slid masses from Deposit 2 at specific depth levels both above and below the potential interface between Deposit 2a and 2b. Comparison of sediment in both sections should enable to shed light on the timing between both slide events. After 44 h drilling down to 41 mbsf, MeBo was back on deck at 6:30pm (May 12). With the aim to sample specific depth sections, it was first flushed down to 25.3 mbsf and one core section was drilled from 25.3 mbsf; then washed down again and cored again from 40.3 mbsf. Core recovery in total was 48%. Finally, the borehole was logged with the Acoustic probe. The rest of the night was used to test the camera system attached to the box corer to collect volcanic samples at the seafloor (GeoB23726-GeoB23729). Afterwards, we continued with hydro-acoustic mapping. Still with the aim to sample Deposit 2 and additionally to test the hypotheses that this mass wasting event might overspill the volcanic cones, GeoB23730 was selected right at the foot of the volcanic cone. MeBo was deployed at site GeoB23730-1 at 2pm (May 16). Target depth was reached at 25.3 mbsf and the borehole was logged with the Acoustic probe. MeBo was recovered at 2am the following day. Afterwards, volcanic samples should be collected with the grab sampler and the box corer in the volcanic cones (GeoB23726, GeoB23727). The material turned out to be impossible to sample. Penetration depth was neglectable. After a short transit to Deposit 3 south off Montserrat, MeBo was deployed at site GeoB23731-1 at 3:30pm. This site was selected to sample a different sector of the volcano to gain a deeper insight into differences in the stratigraphy. MeBo was recovered Saturday May 18 at 2pm after drilling down to 25.3 mbsf and a successful logging of the borehole with the Acoustic probe. The next few hours were again used to collect samples from the inner parts of the volcanic cones (GeoB23732 – GeoB23734) because still less is known about the age of these volcanoes. However, there is no evidence of sedimentation in the cones from gravity coring. At 8:30pm, MeBo was already maintained again and ready for the 2nd deployment at site GeoB23731. Aim of the operation was to utilize the CPT probe down to the target depth of 29.2 mbsf beneath the potential glide plane of Deposit 3. In addition, geophysical data were collected in situ. The SGR has been used successfully whereas the magnetic susceptibility measurements failed. MeBo operation at site GeoB23731 was finished May 19 at 2pm. Since borehole measurements were excellent, we decided to log again GeoB23711 at the undisturbed slope section with the SGR and the MagSus probes. MeBo was therefore deployed again at this site at 8pm. MeBo flushed down to 55.3 mbsf and both probes logged successful. Site GeoB23711-5 was finished at 2pm May 20. Since we had also decided to focus on in situ measurements, the short transit to site GeoB23725 was already sufficient for maintenance of MeBo and it could be deployed already 4 hours later to flush down to the target depth of 55.3 mbsf. Afterwards, the SGR and the MagSus probe were lowered in the borehole and mapped in situ successfully. The recovery of MeBo turned out to be very time consuming as the drill string seems to be almost cemented in the very stiff sediments. However after passing the boundary between Deposit 2a and 2b, recovery relieved and MeBo was back on deck after a final successful deployment at 4am on the 22nd May. After a short transit we reached the Port of Pointe-à-Pitre (Guadeloupe) at 8am and started immediately with demobilisation of our equipment.

Acknowledgements

The scientific party of RV METEOR Cruise M154/2 gratefully acknowledges captain Rainer Hammacher and his crew for their excellent, ever-present and always friendly support during the voyage. The expedition was funded by the German Science Foundation (Project Sekt).

Participants

Name	Discipline	Institution
Huhn, Katrin	Chief scientist	MARUM
Bergenthal, Markus	MeBo Team	MARUM
Buelten, Jutta	MeBo Team	MARUM
Dehning, Klaus	Gravity coring	MARUM
Coulibaly, Ousmane	MeBo Team	MARUM
Freudenthal, Tim, Dr.	MeBo Team	MARUM
Gatter, Ricarda	Physical properties	MARUM
Hilgenfeldt, Christian	Gravity coring	MARUM
Hoenekopp, Leonie	Physical properties	MARUM
Hornbach, Matt, Prof. Dr.	Hydroacoustic	SMU Dallas
Klar, Steffen	MeBo Team	MARUM
Kuehn, Michel	Hydroacoustic	GEOMAR
Kuhlmann, Jannis, Dr.	Physical properties	MARUM
Kutterolf, Steffen, Dr.	Core description	GEOMAR
Linowski, Erik	MeBo Team	MARUM
Meyer-Schack, Birgit	Core curation	MARUM
Noorlander, Cornelius	MeBo Team	MARUM
Pallapies, Kilian	Hydroacoustic	MARUM
Rapp, Sophia Kristina	Physical properties	MARUM
Rehage, Ralf	MeBo Team	MARUM
Schmidt, Werner	MeBo Team	MARUM
Sievers, Carina	Core description	GEOMAR
Watt, Sebastian, Dr.	Core description	University of Birmingham
Stelzner, Martin	Meteorology	DWD

Station List

Station No.		Date	Time	Gear	Latitude	Longitude	Water Depth	Remarks
METEOR	GeoB		[UTC]		[N]	[W]	[m]	
M154/2_1-1	23701-1	30.04.2019	11:59	GC	16°30.545'	61°57.839'	1190	in the water
M154/2_1-1	23701-1	30.04.2019	12:40	GC	16°30.545'	61°57.839'	1190	max depth/on ground
M154/2_1-1	23701-1	30.04.2019	13:05	GC	16°30.547'	61°57.837'	1190	on deck
M154/2_2-1	23702-1	30.04.2019	13:36	GC	16°30.893'	61°58.081'	1180	in the water
M154/2_2-1	23702-1	30.04.2019	14:00	GC	16°30.887'	61°58.064'	1180	max depth/on ground
M154/2_2-1	23702-1	30.04.2019	14:26	GC	16°30.888'	61°58.064'	1180	on deck
M154/2_3-1	23703-1	30.04.2019	14:54	GC	16°31.469'	61°57.348'	1176	in the water
M154/2_3-1	23703-1	30.04.2019	15:15	GC	16°31.469'	61°57.325'	1176	max depth/on ground
M154/2_3-1	23703-1	30.04.2019	15:42	GC	16°31.470'	61°57.324'	1176	on deck
M154/2_4-1	23704-1	30.04.2019	16:04	GC	16°32.062'	61°56.632'	1160	in the water
M154/2_4-1	23704-1	30.04.2019	16:29	GC	16°32.066'	61°56.618'	1161	max depth/on ground
M154/2_4-1	23704-1	30.04.2019	16:55	GC	16°32.066'	61°56.617'	1160	on deck
M154/2_5-1	23705-1	30.04.2019	17:35	GC	16°33.241'	61°55.165'	1112	in the water
M154/2_5-1	23705-1	30.04.2019	17:54	GC	16°33.246'	61°55.143'	1112	max depth/on ground
M154/2_5-1	23705-1	30.04.2019	18:18	GC	16°33.246'	61°55.143'	1111	on deck
M154/2_2-2	23702-2	30.04.2019	19:56	SVP	16°30.883'	61°58.070'	1182	in the water
M154/2_2-2	23702-2	30.04.2019	19:58	SVP	16°30.885'	61°58.070'	1181	max depth/on ground
M154/2_2-2	23702-2	30.04.2019	20:24	SVP	16°30.895'	61°58.049'	1180	on deck
M154/2_2-3	23702-3	30.04.2019	20:44	MEBO	16°30.899'	61°58.037'	1180	in the water
M154/2_2-3	23702-3	30.04.2019	23:02	MEBO	16°30.892'	61°58.033'	1181	max depth/on ground
M154/2_2-3	23702-3	30.04.2019	23:32	MEBO	16°30.893'	61°58.031'	1180	information
M154/2_2-3	23702-3	01.05.2019	23:33	MEBO	16°30.880'	61°58.029'	1183	information
M154/2_2-3	23702-3	01.05.2019	23:42	MEBO	16°30.879'	61°58.034'	1181	hoisting
M154/2_2-3	23702-3	02.05.2019	00:55	MEBO	16°30.936'	61°58.039'	1178	on deck
M154/2_6-1	23706-1	02.05.2019	12:23	GC	16°33.721'	62°11.904'	914	in the water
M154/2_6-1	23706-1	02.05.2019	12:43	GC	16°33.720'	62°11.897'	915	max depth/on ground
M154/2_6-1	23706-1	02.05.2019	13:10	GC	16°33.721'	62°11.898'	915	on deck
M154/2_7-1	23707-1	02.05.2019	13:52	GC	16°32.384'	62°11.649'	968	in the water
M154/2_7-1	23707-1	02.05.2019	14:12	GC	16°32.384'	62°11.627'	968	max depth/on ground
M154/2_7-1	23707-1	02.05.2019	14:37	GC	16°32.385'	62°11.627'	968	on deck
M154/2_2-4	23702-4	02.05.2019	16:30	GC	16°30.901'	61°58.070'	1179	in the water
M154/2_2-4	23702-4	02.05.2019	16:54	GC	16°30.890'	61°58.053'	1183	max depth/on ground

M154/2_2-4	23702-4	02.05.2019	17:20	GC	16°30.890'	61°58.053'	1184	on deck
M154/2_2-5	23702-5	02.05.2019	19:39	MEBO	16°30.886'	61°58.064'	1184	in the water
M154/2_2-5	23702-5	02.05.2019	21:42	MEBO	16°30.891'	61°58.038'	1182	max depth/on ground
M154/2_2-5	23702-5	02.05.2019	22:52	MEBO	16°30.892'	61°58.032'	1183	information
M154/2_2-5	23702-5	03.05.2019	19:35	MEBO	16°30.891'	61°58.032'	1185	information
M154/2_2-5	23702-5	03.05.2019	19:41	MEBO	16°30.888'	61°58.037'	1182	hoisting
M154/2_2-5	23702-5	03.05.2019	21:00	MEBO	16°30.892'	61°58.036'	1182	on deck
M154/2_8-1	23708-1	04.05.2019	10:02	GC	16°43.837'	62°02.236'	961	in the water
M154/2_8-1	23708-1	04.05.2019	10:21	GC	16°43.845'	62°02.236'	959	max depth/on ground
M154/2_8-1	23708-1	04.05.2019	10:43	GC	16°43.844'	62°02.236'	961	on deck
M154/2_8-1	23708-1	04.05.2019	10:46	GC	16°43.844'	62°02.236'	960	in the water
M154/2_8-1	23708-1	04.05.2019	11:04	GC	16°43.845'	62°02.237'	959	max depth/on ground
M154/2_8-1	23708-1	04.05.2019	11:27	GC	16°43.845'	62°02.235'	960	on deck
M154/2_9-1	23709-1	04.05.2019	11:46	GC	16°44.032'	62°02.233'	980	in the water
M154/2_9-1	23709-1	04.05.2019	12:04	GC	16°44.030'	62°02.231'	982	max depth/on ground
M154/2_9-1	23709-1	04.05.2019	12:25	GC	16°44.029'	62°02.231'	980	on deck
M154/2_10-1	23710-1	04.05.2019	12:39	GC	16°44.153'	62°02.227'	944	in the water
M154/2_10-1	23710-1	04.05.2019	13:00	GC	16°44.152'	62°02.213'	946	max depth/on ground
M154/2_10-1	23710-1	04.05.2019	13:22	GC	16°44.151'	62°02.214'	945	on deck
M154/2_11-1	23711-1	04.05.2019	13:54	GC	16°46.946'	62°02.223'	856	in the water
M154/2_11-1	23711-1	04.05.2019	14:15	GC	16°46.950'	62°02.216'	854	max depth/on ground
M154/2_11-1	23711-1	04.05.2019	14:36	GC	16°46.952'	62°02.215'	855	on deck
M154/2_11-2	23711-2	04.05.2019	15:08	MEBO	16°46.950'	62°02.217'	855	in the water
M154/2_11-2	23711-2	04.05.2019	16:53	MEBO	16°46.948'	62°02.194'	856	max depth/on ground
M154/2_11-2	23711-2	04.05.2019	17:44	MEBO	16°46.954'	62°02.189'	855	information
M154/2_11-2	23711-2	04.05.2019	23:01	MEBO	16°46.946'	62°02.195'	856	information
M154/2_11-2	23711-2	04.05.2019	23:02	MEBO	16°46.945'	62°02.195'	855	hoisting
M154/2_11-2	23711-2	04.05.2019	23:53	MEBO	16°46.954'	62°02.194'	855	on deck
M154/2_11-3	23711-3	05.05.2019	14:29	MEBO	16°46.943'	62°02.202'	856	in the water
M154/2_11-3	23711-3	05.05.2019	16:00	MEBO	16°46.945'	62°02.194'	855	max depth/on ground
M154/2_11-3	23711-3	05.05.2019	16:47	MEBO	16°46.945'	62°02.187'	854	information
M154/2_11-3	23711-3	07.05.2019	10:40	MEBO	16°46.948'	62°02.187'	856	information
M154/2_11-3	23711-3	07.05.2019	10:48	MEBO	16°46.949'	62°02.192'	855	hoisting
M154/2_11-3	23711-3	07.05.2019	11:58	MEBO	16°46.959'	62°02.191'	856	on deck
M154/2_12-1	23712-1	07.05.2019	14:01	BC	16°39.767'	62°13.329'	616	in the water
M154/2_12-1	23712-1	07.05.2019	14:20	BC	16°39.767'	62°13.317'	615	max depth/on ground

M154/2_12-1	23712-1	07.05.2019	14:36	BC	16°39.766'	62°13.317'	617	on deck
M154/2_12-2	23712-2	07.05.2019	16:16	GRAB	16°39.768'	62°13.311'	613	in the water
M154/2_12-2	23712-2	07.05.2019	16:31	GRAB	16°39.768'	62°13.311'	613	max depth/on ground
M154/2_12-2	23712-2	07.05.2019	16:52	GRAB	16°39.768'	62°13.311'	614	on deck
M154/2_13-1	23713-1	07.05.2019	17:15	GRAB	16°39.825'	62°13.405'	609	in the water
M154/2_13-1	23713-1	07.05.2019	17:30	GRAB	16°39.824'	62°13.407'	612	max depth/on ground
M154/2_13-1	23713-1	07.05.2019	17:51	GRAB	16°39.825'	62°13.407'	667	on deck
M154/2_11-4	23711-4	08.05.2019	13:16	MEBO	16°46.948'	62°02.199'	855	in the water
M154/2_11-4	23711-4	08.05.2019	15:05	MEBO	16°46.954'	62°02.200'	855	max depth/on ground
M154/2_11-4	23711-4	08.05.2019	16:07	MEBO	16°46.951'	62°02.194'	855	information
M154/2_11-4	23711-4	10.05.2019	23:38	MEBO	16°46.957'	62°02.195'	855	information
M154/2_11-4	23711-4	10.05.2019	23:41	MEBO	16°46.956'	62°02.199'	856	hoisting
M154/2_11-4	23711-4	11.05.2019	00:38	MEBO	16°46.981'	62°02.210'	855	on deck
M154/2_14-1	23714-1	11.05.2019	10:10	GC	16°36.190'	62°01.349'	1139	in the water
M154/2_14-1	23714-1	11.05.2019	10:38	GC	16°36.194'	62°01.325'	1140	max depth/on ground
M154/2_14-1	23714-1	11.05.2019	11:02	GC	16°36.195'	62°01.324'	1139	on deck
M154/2_15-1	23715-1	11.05.2019	11:55	GC	16°30.525'	61°58.543'	1166	in the water
M154/2_15-1	23715-1	11.05.2019	12:27	GC	16°30.524'	61°58.534'	1166	max depth/on ground
M154/2_15-1	23715-1	11.05.2019	12:58	GC	16°30.525'	61°58.534'	1167	on deck
M154/2_16-1	23716-1	11.05.2019	13:35	GC	16°30.299'	61°58.836'	1140	in the water
M154/2_16-1	23716-1	11.05.2019	13:59	GC	16°30.297'	61°58.826'	1139	max depth/on ground
M154/2_16-1	23716-1	11.05.2019	14:32	GC	16°30.299'	61°58.826'	1139	on deck
M154/2_17-1	23717-1	11.05.2019	15:02	GC	16°30.110'	61°59.036'	1104	in the water
M154/2_17-1	23717-1	11.05.2019	15:25	GC	16°30.107'	61°59.028'	1106	max depth/on ground
M154/2_17-1	23717-1	11.05.2019	16:00	GC	16°30.109'	61°59.028'	1103	on deck
M154/2_18-1	23718-1	11.05.2019	16:31	GC	16°30.031'	61°59.137'	1101	in the water
M154/2_18-1	23718-1	11.05.2019	16:57	GC	16°30.033'	61°59.134'	1102	max depth/on ground
M154/2_18-1	23718-1	11.05.2019	17:26	GC	16°30.032'	61°59.133'	1101	on deck
M154/2_19-1	23719-1	11.05.2019	18:05	GC	16°28.322'	62°01.126'	967	in the water
M154/2_19-1	23719-1	11.05.2019	18:27	GC	16°28.322'	62°01.092'	967	max depth/on ground
M154/2_19-1	23719-1	11.05.2019	18:55	GC	16°28.323'	62°01.092'	968	on deck
M154/2_20-1	23720-1	11.05.2019	19:28	GC	16°28.331'	62°02.125'	929	in the water
M154/2_20-1	23720-1	11.05.2019	19:50	GC	16°28.330'	62°02.111'	929	max depth/on ground
M154/2_20-1	23720-1	11.05.2019	20:17	GC	16°28.329'	62°02.112'	929	on deck
M154/2_14-2	23714-2	11.05.2019	21:21	MEBO	16°36.190'	62°01.300'	1141	in the water
M154/2_14-2	23714-2	11.05.2019	23:12	MEBO	16°36.188'	62°01.297'	1139	max depth/on ground

M154/2_14-2	23714-2	11.05.2019	23:58	MEBO	16°36.178'	62°01.292'	1141	information
M154/2_14-2	23714-2	12.05.2019	05:36	MEBO	16°36.170'	62°01.299'	1139	information
M154/2_14-3	23714-3	12.05.2019	06:48	MEBO	16°36.173'	62°01.297'	1140	max depth/on ground
M154/2_14-3	23714-3	12.05.2019	07:08	MEBO	16°36.171'	62°01.292'	1140	information
M154/2_14-3	23714-3	12.05.2019	14:05	MEBO	16°36.173'	62°01.294'	1140	hoisting
M154/2_14-3	23714-3	12.05.2019	15:57	MEBO	16°36.224'	62°01.291'	1139	on deck
M154/2_14-4	23714-4	12.05.2019	21:13	MEBO	16°36.190'	62°01.318'	1139	in the water
M154/2_14-4	23714-4	12.05.2019	22:50	MEBO	16°36.194'	62°01.300'	1142	max depth/on ground
M154/2_14-4	23714-4	12.05.2019	23:21	MEBO	16°36.198'	62°01.296'	1139	information
M154/2_14-4	23714-4	13.05.2019	11:23	MEBO	16°36.191'	62°01.294'	1139	information
M154/2_14-4	23714-4	13.05.2019	11:28	MEBO	16°36.188'	62°01.300'	1139	hoisting
M154/2_14-4	23714-4	13.05.2019	12:47	MEBO	16°36.146'	62°01.310'	1140	on deck
M154/2_21-1	23721-1	13.05.2019	15:34	GC	16°33.730'	62°07.501'	928	in the water
M154/2_21-1	23721-1	13.05.2019	15:51	GC	16°33.732'	62°07.494'	928	max depth/on ground
M154/2_21-1	23721-1	13.05.2019	16:19	GC	16°33.733'	62°07.495'	928	on deck
M154/2_22-1	23722-1	13.05.2019	16:53	GC	16°32.400'	62°09.364'	969	in the water
M154/2_22-1	23722-1	13.05.2019	17:12	GC	16°32.378'	62°09.347'	969	max depth/on ground
M154/2_22-1	23722-1	13.05.2019	17:35	GC	16°32.379'	62°09.346'	970	on deck
M154/2_23-1	23723-1	13.05.2019	18:05	GC	16°33.719'	62°09.895'	929	in the water
M154/2_23-1	23723-1	13.05.2019	18:26	GC	16°33.716'	62°09.879'	929	max depth/on ground
M154/2_23-1	23723-1	13.05.2019	18:48	GC	16°33.717'	62°09.880'	929	on deck
M154/2_24-1	23724-1	13.05.2019	19:26	GC	16°32.375'	62°10.899'	971	in the water
M154/2_24-1	23724-1	13.05.2019	19:47	GC	16°32.381'	62°10.891'	971	max depth/on ground
M154/2_24-1	23724-1	13.05.2019	20:15	GC	16°32.380'	62°10.891'	971	on deck
M154/2_25-1	23725-1	13.05.2019	21:28	MEBO	16°36.763'	62°02.077'	1134	in the water
M154/2_25-1	23725-1	13.05.2019	23:04	MEBO	16°36.729'	62°01.997'	1133	max depth/on ground
M154/2_25-1	23725-1	13.05.2019	23:40	MEBO	16°36.732'	62°01.991'	1133	information
M154/2_25-1	23725-1	15.05.2019	17:19	MEBO	16°36.755'	62°01.998'	1132	information
M154/2_25-1	23725-1	15.05.2019	17:31	MEBO	16°36.748'	62°02.001'	1134	hoisting
M154/2_25-1	23725-1	15.05.2019	18:46	MEBO	16°36.762'	62°02.001'	1132	on deck
M154/2_26-1	23726-1	15.05.2019	20:15	BC	16°31.582'	62°02.963'	855	in the water
M154/2_26-1	23726-1	15.05.2019	21:02	BC	16°31.590'	62°02.931'	834	max depth/on ground
M154/2_26-1	23726-1	15.05.2019	21:47	BC	16°31.589'	62°02.934'	832	on deck
M154/2_26-2	23726-2	15.05.2019	22:00	BC	16°31.589'	62°02.934'	832	in the water
M154/2_26-2	23726-2	15.05.2019	22:31	BC	16°31.589'	62°02.935'	829	max depth/on ground
M154/2_26-2	23726-2	15.05.2019	22:40	BC	16°31.589'	62°02.934'	830	hoisting

M154/2_27-1	23727-1	15.05.2019	23:11	BC	16°31.588'	62°02.840'	914	lowering
M154/2_27-1	23727-1	15.05.2019	23:19	BC	16°31.589'	62°02.845'	829	max depth/on ground
M154/2_27-1	23727-1	15.05.2019	23:25	BC	16°31.588'	62°02.847'	952	hoisting
M154/2_28-1	23728-1	15.05.2019	23:54	BC	16°31.584'	62°02.626'	848	lowering
M154/2_28-1	23728-1	16.05.2019	00:00	BC	16°31.584'	62°02.627'	847	max depth/on ground
M154/2_28-1	23728-1	16.05.2019	00:10	BC	16°31.586'	62°02.625'	846	hoisting
M154/2_29-1	23729-1	16.05.2019	00:27	BC	16°31.582'	62°02.489'	913	lowering
M154/2_29-1	23729-1	16.05.2019	00:32	BC	16°31.582'	62°02.490'	828	max depth/on ground
M154/2_29-1	23729-1	16.05.2019	01:04	BC	16°31.584'	62°02.491'	827	on deck
M154/2_30-1	23730-1	16.05.2019	12:30	MEBO	16°37.565'	61°59.010'	1088	in the water
M154/2_30-1	23730-1	16.05.2019	14:14	MEBO	16°37.594'	61°59.012'	1089	max depth/on ground
M154/2_30-1	23730-1	16.05.2019	14:49	MEBO	16°37.595'	61°59.006'	1085	information
M154/2_30-1	23730-1	17.05.2019	00:25	MEBO	16°37.592'	61°59.005'	1086	information
M154/2_30-1	23730-1	17.05.2019	00:33	MEBO	16°37.590'	61°59.010'	1087	hoisting
M154/2_30-1	23730-1	17.05.2019	01:42	MEBO	16°37.643'	61°59.028'	1091	on deck
M154/2_26-3	23726-3	17.05.2019	10:00	GRAB	16°31.586'	62°02.961'	803	in the water
M154/2_26-3	23726-3	17.05.2019	10:33	GRAB	16°31.592'	62°02.918'	884	max depth/on ground
M154/2_26-3	23726-3	17.05.2019	10:53	GRAB	16°31.593'	62°02.924'	957	on deck
M154/2_26-4	23726-4	17.05.2019	11:32	BC	16°31.591'	62°02.929'	833	in the water
M154/2_26-4	23726-4	17.05.2019	12:12	BC	16°31.577'	62°02.918'	818	max depth/on ground
M154/2_26-4	23726-4	17.05.2019	12:42	BC	16°31.578'	62°02.919'	821	on deck
M154/2_27-2	23727-2	17.05.2019	12:56	BC	16°31.576'	62°02.845'	829	in the water
M154/2_27-2	23727-2	17.05.2019	13:36	BC	16°31.575'	62°02.832'	828	max depth/on ground
M154/2_27-2	23727-2	17.05.2019	14:09	BC	16°31.579'	62°02.832'	905	on deck
M154/2_31-1	23731-1	17.05.2019	15:37	MEBO	16°33.723'	62°09.574'	930	in the water
M154/2_31-1	23731-1	17.05.2019	16:59	MEBO	16°33.717'	62°09.570'	929	max depth/on ground
M154/2_31-1	23731-1	17.05.2019	17:31	MEBO	16°33.717'	62°09.565'	930	information
M154/2_31-1	23731-1	18.05.2019	12:45	MEBO	16°33.713'	62°09.563'	929	information
M154/2_31-1	23731-1	18.05.2019	12:48	MEBO	16°33.714'	62°09.569'	928	hoisting
M154/2_31-1	23731-1	18.05.2019	13:48	MEBO	16°33.637'	62°09.575'	931	on deck
M154/2_32-1	23732-1	18.05.2019	15:58	GC	16°37.556'	61°57.558'	672	in the water
M154/2_32-1	23732-1	18.05.2019	16:13	GC	16°37.555'	61°57.557'	672	max depth/on ground
M154/2_32-1	23732-1	18.05.2019	16:30	GC	16°37.556'	61°57.558'	672	on deck
M154/2_33-1	23733-1	18.05.2019	16:45	GC	16°37.413'	61°57.307'	671	in the water
M154/2_33-1	23733-1	18.05.2019	17:00	GC	16°37.415'	61°57.306'	671	max depth/on ground
M154/2_33-1	23733-1	18.05.2019	17:16	GC	16°37.414'	61°57.305'	671	on deck

M154/2_34-1	23734-1	18.05.2019	17:51	GC	16°37.702'	61°58.443'	760	in the water
M154/2_34-1	23734-1	18.05.2019	18:08	GC	16°37.705'	61°58.443'	760	max depth/on ground
M154/2_34-1	23734-1	18.05.2019	18:27	GC	16°37.706'	61°58.443'	760	on deck
M154/2_31-2	23731-2	18.05.2019	20:26	MEBO	16°33.724'	62°09.573'	930	in the water
M154/2_31-2	23731-2	18.05.2019	21:46	MEBO	16°33.713'	62°09.571'	930	max depth/on ground
M154/2_31-2	23731-2	18.05.2019	22:27	MEBO	16°33.711'	62°09.564'	930	information
M154/2_31-2	23731-2	19.05.2019	12:41	MEBO	16°33.698'	62°09.568'	929	information
M154/2_31-2	23731-2	19.05.2019	12:45	MEBO	16°33.700'	62°09.574'	930	hoisting
M154/2_31-2	23731-2	19.05.2019	13:39	MEBO	16°33.614'	62°09.604'	933	on deck
M154/2_11-5	23711-5	19.05.2019	18:09	MEBO	16°46.945'	62°02.206'	855	in the water
M154/2_11-5	23711-5	19.05.2019	19:41	MEBO	16°46.943'	62°02.206'	855	max depth/on ground
M154/2_11-5	23711-5	19.05.2019	20:21	MEBO	16°46.960'	62°02.200'	890	information
M154/2_11-5	23711-5	20.05.2019	12:49	MEBO	16°46.961'	62°02.201'	854	information
M154/2_11-5	23711-5	20.05.2019	12:52	MEBO	16°46.959'	62°02.206'	855	hoisting
M154/2_11-5	23711-5	20.05.2019	13:44	MEBO	16°46.905'	62°02.204'	855	on deck
M154/2_25-2	23725-2	20.05.2019	18:10	MEBO	16°36.736'	62°01.998'	1132	in the water
M154/2_25-2	23725-2	20.05.2019	19:34	MEBO	16°36.735'	62°01.998'	1133	max depth/on ground
M154/2_25-2	23725-2	20.05.2019	20:32	MEBO	16°36.735'	62°01.993'	1133	information
M154/2_25-2	23725-2	22.05.2019	03:00	MEBO	16°36.714'	62°01.998'	1132	information
M154/2_25-2	23725-2	22.05.2019	03:05	MEBO	16°36.717'	62°02.002'	1133	hoisting
M154/2_25-2	23725-2	22.05.2019	04:19	MEBO	16°36.636'	62°01.902'	1134	on deck

Parasound Profile List

Parasound FFN End	Date	Time Start	Time End	Latitude Start	Longitude Start	Latitude End	Longitude End	EM122	Parasound
		[UTC]	[UTC]	[N]	[W]	[N]	[W]		
P1000	01.05.2019	00:50	02:54	16°28.937	62°00.434	16°36.072	61°51.590	x	x
P1001	01.05.2019	02:54	03:58	16°36.072	61°51.590	16°33.199	62°02.876	x	x
P1002	01.05.2019	03:58	06:20	16°33.199	62°02.876	16°33.160	62°16.383	x	x
P1003	01.05.2019	06:20	06:41	16°33.160	62°16.383	16°32.390	62°15.970	x	x
P1004	01.05.2019	06:41	09:12	16°32.390	62°15.970	16°32.370	62°01.814	x	x
P1005	01.05.2019	09:12	09:26	16°32.370	62°01.814	16°31.573	62°01.940	x	x
P1006	01.05.2019	09:26	13:29	16°31.573	62°01.940	16°30.841	61°57.990	x	x
P2001	02.05.2019	01:30	04:18	16°31.572	62°01.556	16°31.628	62°15.625	x	x
P2002	02.05.2019	04:18	04:42	16°31.628	62°15.625	16°30.810	62°16.039	x	x
P2003	02.05.2019	04:42	06:22	16°30.810	62°16.039	16°30.754	62°4.400	x	x
P2004	02.05.2019	06:22	06:49	16°30.754	62°4.400	16°30.742	62°1.731	x	x
P2005	02.05.2019	06:49	09:31	16°30.742	62°1.731	16°30.000	62°16.050	x	x
P2006	02.05.2019	09:31	09:40	16°30.000	62°16.050	16°29.455	62°16.355	x	x
P2007	02.05.2019	09:40	11:00	16°29.455	62°16.355	16°29.162	62°08.956	x	x

P2008	02.05.2019	11:00	11:40	16°29.162	62°08.956	16°33.706	62°11.925	X	X
P2009	03.05.2019	21:35	22:48	16°31.009	61°57.529	16°29.209	62°10.104	X	X
P2010	03.05.2019	22:48	00:49	16°29.209	62°10.104	16°29.101	61°58.703	X	X
P2011	04.05.2019	00:49	04:05	16°29.101	61°58.703	16°28.398	62°15.960	X	X
P2012	04.05.2019	04:05	04:21	16°28.398	62°15.960	16°27.603	62°15.866	X	X
P2013	04.05.2019	04:21	07:27	16°27.603	62°15.866	16°27.474	61° 58.249	X	X
P2014	04.05.2019	07:27	07:41	16°27.474	61° 58.249	16°26.672	61° 58.390	X	X
P2015	04.05.2019	07:41	08:18	16°26.672	61° 58.390	16°33.516	62°2.135	X	X
P2016	04.05.2019	08:18	09:49	16°33.516	62°2.135	16°43.854	62°2.23	X	X
P3000	05.05.2019	01:08	01:53	16°45.837	62°2.378	16°39.702	62°08.995	X	X
P3001	05.05.2019	01:53	03:15	16°39.702	62°08.995	16°32.222	62°09.072	X	X
P3002	05.05.2019	03:15	03:25	16°32.222	62°09.072	16°32.113	62°09.829	X	X
P3003	05.05.2019	03:25	04:43	16°32.113	62°09.829	16°39.356	62°09.964	X	X
P3004	05.05.2019	04:43	04:57	16°39.356	62°09.964	16°39.232	62°10.850	X	X
P3005	05.05.2019	04:57	06:34	16°39.232	62°10.850	16°30.084	62°11.160	X	X
P3006	05.05.2019	06:34	08:33	16°30.084	62°11.160	16°39.948	62°13.594	X	X
P3007	05.05.2019	08:33	08:43	16°39.948	62°13.594	16°40.385	62°14.313	X	X
P3008	05.05.2019	08:43	10:24	16°40.385	62°14.313	16°31.411	62°14.192	X	X
P3009	05.05.2019	10:24	10:54	16°31.411	62°14.192	16°31.224	62°16.993	X	X
P3010	05.05.2019	10:54	12:30	16°31.224	62°16.993	16°39.953	62°16.644	X	X
P3011	05.05.2019	12:30	14:05	16°39.953	62°16.644	16°46.542	62°02.697	X	X
P3012	07.05.2019	18:12	20:10	16°39.532	62°13.526	16°47.269	62°16.735	X	X
P3013	07.05.2019	20:10	21:14	16°47.269	62°16.735	16°42.091	62°17.686	X	X
P3014	07.05.2019	21:14	22:24	16°42.091	62°17.686	16°47.373	62°17.894	X	X
P3015	07.05.2019	22:24	23:40	16°47.373	62°17.894	16°43.032	62°18.691	X	X
P3016	07.05.2019	23:40	00:36	16°43.032	62°18.691	16°47.777	62°18.795	X	X
P3017	08.05.2019	00:36	01:45	16°47.777	62°18.795	16°42.084	62°19.848	X	X
P3018	08.05.2019	01:45	02:55	16°42.084	62°19.848	16°47.783	62°19.946	X	X
P3019	08.05.2019	02:55	04:25	16°47.783	62°19.946	16°42.194	62°21.217	X	X
P3020	08.05.2019	04:25	05:34	16°42.194	62°21.217	16°48.548	62°20.554	X	X
P3021	08.05.2019	05:34	06:29	16°48.548	62°20.554	16°48.207	62°15.781	X	X
P3022	08.05.2019	06:29	07:09	16°48.207	62°15.781	16°46.676	62°14.825	X	X
P3023	08.05.2019	07:09	07:46	16°46.676	62°14.825	16°50.333	62°13.898	X	X
P3024	08.05.2019	07:46	08:10	16°50.333	62°13.898	16°48.638	62°14.886	X	X
P3025	08.05.2019	08:10	08:35	16°48.638	62°14.886	16°50.717	62°14.850	X	X
P3026	08.05.2019	08:35	09:46	16°50.717	62°14.850	16°46.994	62°2.370	X	X
P4000	11.05.2019	01:41	02:29	16°47°435	62°01.905	16°52°621	62°09.176	X	X
P4001	11.05.2019	02:29	03:00	16°52°621	62°09.176	16°51°407	62°07.385	X	X
P4002	11.05.2019	03:00	03:23	16°51°407	62°07.385	16°52°081	62°09.571	X	X
P4003	11.05.2019	03:23	04:03	16°52°081	62°09.571	16°52°775	62°13.290	X	X
P4004	11.05.2019	04:03	04:11	16°52°775	62°13.290	16°52.538	62°14.027	X	X
P4005	11.05.2019	04:11	05:26	16°52.538	62°14.027	16°50.645	62°07.717	X	X
P4006	11.05.2019	05:26	05:40	16°50.645	62°07.717	16°49.806	62°08.400	X	X
P4007	11.05.2019	05:40	06:58	16°49.806	62°08.400	16°51.483	62°15.877	X	X
P4008	11.05.2019	06:58	08:07	16°51.483	62°15.877	16°41.617	62°22.167	X	X
P4009	11.05.2019	08:07	10:02	16°41.617	62°22.167	16°36.155	62°1.367	X	X
P4010	12.05.2019	16:52	17:32	16°35.926	62°1.467	16°34.883	62°7.849	X	X

P4011	12.05.2019	17:32	19:06	16°34.883	62°7.849	16°30.189	62°2.035	x	x
P4012	12.05.2019	19:06	20:26	16°30.189	62°2.035	16°34.867	62°8.177	x	x
P4013	12.05.2019	20:26	20:56	16°34.867	62°8.177	16°36.051	62°2.117	x	x
P4014	13.05.2019	13:38	13:58	16°32.325	62°00.898	16°29.443	62°01.736	x	x
P4015	13.05.2019	13:58	15:07	16°29.443	62°01.736	16°33.277	62°07.200	x	x
P4016	13.05.2019	15:07	20:15	16°33.277	62°07.200	16°32.380	62°10.891	x	x
P4017	13.05.2019	20:15	21:11	16°32.380	62°10.891	16°36.629	62°02.223	x	x
P4018	16.05.2019	02:08	03:43	16°29.223	62°02.178	16°32.719	62°08.720	x	x
P4019	16.05.2019	03:43	04:28	16°32.719	62°08.720	16°34.551	62°06.246	x	x
P4020	16.05.2019	04:28	05:10	16°34.551	62°06.246	16°31.356	62°07.909	x	x
P4021	16.05.2019	05:10	05:59	16°31.356	62°07.909	16°34.073	62°05.449	x	x
P4022	16.05.2019	05:59	06:45	16°34.073	62°05.449	16°30.888	62°07.117	x	x
P4023	16.05.2019	06:45	07:32	16°30.888	62°07.117	16°33.573	62°04.750	x	x
P4024	16.05.2019	07:32	08:22	16°33.573	62°04.750	16°30.880	62°6.034	x	x
P4025	16.05.2019	08:22	09:06	16°30.880	62°6.034	16°32.970	62°4.102	x	x
P4026	16.05.2019	09:06	09:49	16°32.970	62°4.102	16°30.000	62°5.495	x	x
P4027	16.05.2019	09:49	10:39	16°30.000	62°5.495	16°32.509	62°3.364	x	x
P4028	16.05.2019	10:39	11:00	16°32.509	62°3.364	16°30.757	62°4.473	x	x
P4029	16.05.2019	11:00	11:34	16°30.757	62°4.473	16°33.570	62°2.059	x	x
P4030	17.05.2019	02:32	03:20	16°36.396	61°58.826	16°26.668	62°01.474	x	x
P4031	17.05.2019	03:20	06:07	16°26.668	62°01.474	16°26.576	62°17.711	x	x
P4032	17.05.2019	06:07	08:17	16°26.576	62°17.711	16°38.710	62°18.228	x	x
P4033	17.05.2019	08:17	09:53	16°38.710	62°18.228	16°31.584	62°2.964	x	x
P4034	19.05.2019	14:39	17:31	16°34.046	62°09.466	16°47.052	62°02.795	x	x
P4035	20.05.2019	14:28	16:22	16°46.270	62°01.488	16°37.083	61°53.950	x	x
P4036	20.05.2019	16:22	17:33	16°37.083	61°53.950	16°36.733	62°01.639	x	x