

Prof. Michal Kucera  
Universität Bremen / MARUM  
Leobener Straße 8  
28359 Bremen  
Tel.: 0421 / 218 65970  
Fax: 0421 / 218 9865974  
email: mkucera@marum.de



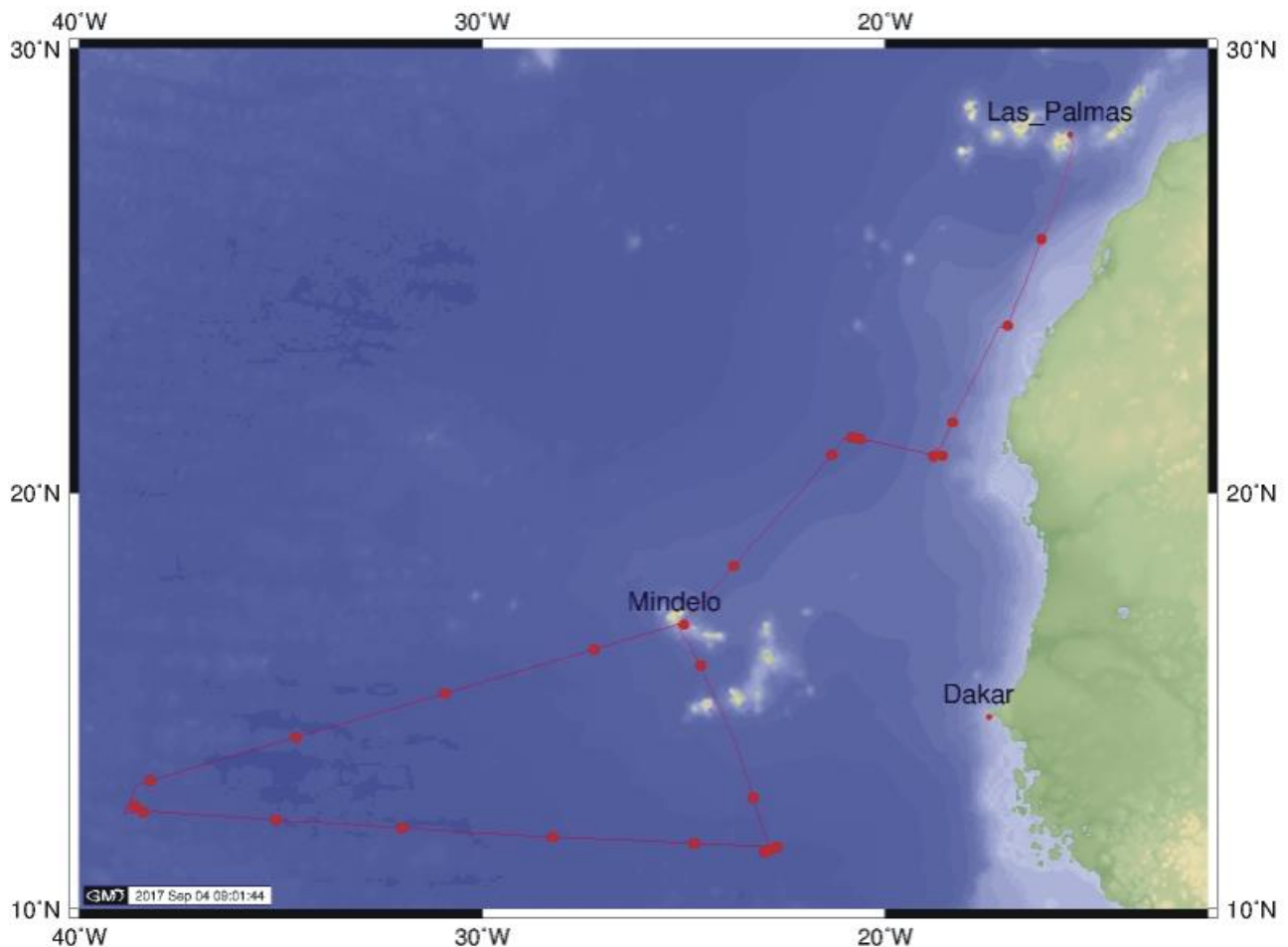
**Short Cruise Report**  
**RV METEOR M140 "FORAMFLUX"**

**Mindelo, Cabo Verde – Las Palmas, Spain**

**11.8. – 5.9.2017**

**Chief Scientists: Michal Kucera (Leg 1) / Michael Siccha (Leg 2)**

**Master: Detlef Korte**



## Objectives

The RV METEOR research cruise M140 combined sampling in the water column with recovery of data and samples from long-term observational platforms (sediment traps and dust collecting buoys) with the aim to provide data necessary to understand the ecology of planktonic foraminifera and to investigate how marine particle flux, mineral dust deposition and production of biomineral particle ballast varies in space and time and how they affect the marine biological pump. The cruise covered a transect from low productive offshore regions to high-productivity coastal upwelling in the central western Atlantic.

Planktonic foraminifera shells in marine sediments are the principle source of information on the state of past oceans. To unlock the signals preserved in these shells, the ecology of the organisms that produced them have to be constrained in detail. Combining observations from sediment traps, plankton samples and on-board experiments, the principle aim of the cruise was to investigate the extent and scale of population patchiness, ontogenetic and diel vertical migration, synchronisation of reproduction, symbiont presence and physiology and the extent of genetic diversity in the group. Together with mineral dust and other mineralised plankton, empty shells of planktonic foraminifera act as ballast to sinking particles and thus play an important role in ocean carbon cycling. To evaluate the significance of the ballasting and the role of variability in carbon transfer to the sea floor, the second aim of the expedition was to investigate particle flux and dust deposition in the same region.

Specific objectives for studies of population dynamics, ecology and physiology of planktonic foraminifera were to:

- obtain vertically resolved plankton samples along the cruise track, together with profiles of physical and chemical properties of the ambient water masses.
- carry out high-resolution spatial and temporal sampling over 24 hours, replicated at two locations.
- quantify photosynthetic activity of selected species and determine their photoadaptation.

The objectives for the characterisation of particle flux in the region were to:

- recover and redeploy moorings used for monitoring of particle fluxes off Mauritania.
- characterize short-term (daily) variability of size and types of sinking particles and their interactions with foraminifera in the water column.

To link the foraminifera and particle flux data to records of mineral dust deposition, the objectives were to:

- service moored samplers (buoys) and sediment traps monitoring Saharan dust deposition.
- recover and redeploy a mooring equipped with multiple sediment traps to provide high-resolution record of atmospheric deposition and marine particle flux.

## Narrative

On Friday, August 11<sup>th</sup> 2017, RV METEOR left the port of Mindelo, Cabo Verde, with fair weather conditions and a calm sea heading towards the NIOZ dust buoy Michelle. After completion of the obligatory safety drill, we had a first test station in the early afternoon, which yielded unexpectedly rich planktic foraminifera fauna and allowed for final adjustments of the multi-plankton-sampler (MPS) and our sampling procedures. In the next morning we had our first full station with three MPS casts, which yielded over 3000 individual planktic foraminifera. The first successful photophysiological measurements of multiple foraminifera species were carried out.

On the Sunday 13.8., we crossed the deepest parts of the Atlantic with over 6200 m water depth. Saharan dust covered the horizon, reducing the visibility to 9 km. We recovered the first samples from our continuous pumping system containing many benthic species, most probably from the ship's hull. On Monday 14.8. we encountered the first rain and the yield of foraminifera from the daily station was much lower than before. On Tuesday 15.8., we arrived at dust buoy "Michelle" in the early hours of the morning. The buoy was quickly sighted and hooked up for recovery via motor boat. It was recovered by 8 am, and was on deck by 12:00. We released a floating trap to collect pristine particles and commenced the first full-day-sampling of the plankton in the afternoon. Almost the whole next day we sampled station after station with the MPS, the scientific crew worked in two shifts to manage the workload. After 26 hours, the sampling was concluded with a total of 41 stations sampled. We recovered the drifting trap, which had remained in sight of the radar for most of the full-day-sampling and released the sediment trap mooring M3 in the late afternoon. The top buoy was sighted at 18:20 and by 19:30 the first sediment trap was safely on deck. Following the recovery, we released the first ARGO float as last task at station M3 and started sailing towards M1. Along the track, we continued with our daily MPS stations, which yielded very few foraminifera. On Saturday 19.8., we released the second ARGO float.

We reached the position of mooring M1 on the following Monday 21.8. We released the mooring at 10:20 am but it took until 12:30 when it was first sighted. The mooring recovery was accompanied by heavy rain and concluded by 15:00. Having M1 recovered, we headed in the direction of dust buoy "Laura" and deployed a test mooring of NIOZ halfway, which will serve as test setup to determine the durability of a new and reusable type of mooring cable. We spent the night near the dust buoy waiting for sunrise to commence the recovery procedure. On Tuesday 22.8. in the morning we began with the recovery of dust buoy "Laura". The recovery was completed by 14:00 and after that we released a drifting trap. At 14:30 we commenced the second full-day-sampling. This second scheme was completed after ~25 hours and 46 sampled stations. We headed towards the deployment position of the new M1 mooring and started the deployment at 17:45 on Wednesday 23.8., the bottom weight was dropped at 19:00. During the deployment, we witnessed a true tropical rainstorm with 38 mm rain in just 25 minutes and wind gusts of 9 Bf. On Thursday morning, we started the redeployment of dust buoy "Laura" with the first daylight. The whole mooring was first deployed with a dummy buoy on top, which was later caught and replaced by the real dust buoy. This procedure avoided an accidental submergence of the

dust buoy during the deployment of the anchor weight. The whole operation took 7.5 hours, the buoy was safely in the water by 13:30. The deployed drifting trap was recovered during heavy rain and another ARGO released at 15:15. This concluded the scientific program of the first leg and we headed towards Mindelo for the planned crew exchange on 26.8. We arrived in Mindelo as planned, entered the port at 9:00 and left again at around 11:00. In Mindelo three scientists left the METEOR, among them the chief scientist, and five scientist from MARUM and AWI were embarked for the second leg. After leaving the port in direction of the Cape Blanc working area, the ship's crew conducted a safety boat exercise in the protection of the bay.

On our way to dust buoy "Carmen", the third ARGO float was released. The station was reached on 27.8. at night. On the next morning, we started with the recovery of "Carmen" which was completed quickly by collaborative work of both mooring teams from NIOZ and MARUM. Afterwards we recovered mooring CB-28 and deployed two drifting traps. On the 29.8. the dust buoy "Carmen" as well as mooring CB-29 were redeployed. We recorded several particle camera profiles before recovering the two drifting traps, which had collected material for approximately 24 hours. During the night, we reached the position of the eutrophic sediment mooring CBi-15, closer to the Mauritanian coast. We retrieved the mooring on the following morning, deployed a drifting trap and recorded particle camera profiles for most of the day, while the CBi mooring was prepared for redeployment. Thursday 31.8. was almost completely dedicated to the particle camera. We recorded six camera profiles in circumference to the future deployment position of CBi. In the afternoon we exchanged the deployed drifting trap in order of obtain two consecutive days of sampling. During all the mooring work conducted in the Cape Blanc area, the planktic foraminifera team worked hard in laboratories of the METEOR, processing the 200 samples of the first full-day-sampling scheme. Friday 1.9. was the last full working day of M140. We redeployed CBi-16 without incident and recorded particle camera profiles on the mooring position until 17:00, when we ended station work and headed towards Las Palmas. On 3.9. we conducted our last MPS daily station. The cruise ended with the METEOR entering the port of Las Palmas at 10:00 on the 5<sup>th</sup> September 2017.

All aims of the cruise have been met – the plankton sampling and particle characterization studies were carried out successfully and all moorings and buoys could be recovered and/or redeployed as planned.

## **Acknowledgements**

We thank Captain Korte and the entire crew of RV METEOR for their excellent support during the cruise. The professional working environment and friendly atmosphere on the METEOR is greatly appreciated. The expedition was made possible through funding from the German Research Foundation (DFG) and further support from MARUM and the NIOZ.

## List of Participants

1.	Michal Kucera	Chief Scientist 1. Leg	MARUM
2.	Michael Siccha	Chief Scientist 2. Leg	MARUM
3.	Raphael Morard	Plankton genetics	MARUM
4.	Lukas Jonkers	Sediment traps	MARUM
5.	Christiane Schmidt	Photophysiology	MARUM
6.	Philipp Munz	Multi-Plankton-Sampler	UniTü
7.	Jeroen Groeneveld	Water chemistry	MARUM
8.	Gerhard Fischer	Sediment traps	MARUM
9.	Götz Ruhland	Moorings	MARUM
10.	Marco Klann	Moorings	MARUM
11.	Morten Iversen	Particle camera	MARUM / AWI
12.	Christian Konrad	Particle camera	MARUM /AWI
13.	Jan-Berend Stuit	Dust buoys	NIOZ / MARUM
14.	Geert-Jan Brummer	Sediment traps	NIOZ / VU
15.	Bob Koster	Dust buoys	NIOZ
16.	Yvo Witte	Moorings	NIOZ
17.	Jan-Dirk de Visser	Moorings	NIOZ
18.	Manuel Weinkauf	Plankton analysis	UGeneva
19.	Haruka Takagi	Photophysiology	AORI
20.	Julie Meilland	Plankton analysis	Ocean Zoom Society
21.	Ulrike Baranowski	Plankton analysis	GEES
22.	Marina Rillo	Plankton analysis	MARUM
23.	Jaqueline Bertlich	Water chemistry	GEOMAR
24.	Theresa Fritz-Endres	Plankton analysis	CEOAS
25.	Gurjit Theara	Plankton analysis	MARUM
26.	Adrian Baumeister	Plankton analysis	MARUM
27.	Paul Debray	Plankton analysis	MARUM
28.	Jasper Leonard Magerl	Plankton analysis	UniTü
29.	Andreas Raeke	Weather technician	DWD

## Institutes

### AORI

Atmosphere and Ocean Research Institute, The University of Tokyo  
5-1-5, Kashiwanoha, Kashiwa, Chiba 277-8564 / Japan  
[www.aori.u-tokyo.ac.jp/english](http://www.aori.u-tokyo.ac.jp/english)

### AWI

Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar und Meeresforschung  
Am Alten Hafen 26, D-27568 Bremerhaven / Germany  
[www.awi.de](http://www.awi.de)

### CEOAS

College of Earth, Ocean, and Atmospheric Sciences, Oregon State University  
104 CEOAS Administration Building, Corvallis, OR 97331-5503 / USA  
[www.ceoas.oregonstate.edu](http://www.ceoas.oregonstate.edu)

## DWD

Deutscher Wetterdienst, Seeschiffahrtsberatung  
Bernhard-Nocht-Straße 76, 20359 Hamburg / Germany  
[www.dwd.de](http://www.dwd.de)

## GEES

School of Geography, Earth and Environmental Sciences, University of Birmingham  
Edgbaston, Birmingham B15 2TT / UK  
[www.birmingham.ac.uk/schools/gees](http://www.birmingham.ac.uk/schools/gees)

## GEOMAR

Helmholtz-Zentrum für Ozeanforschung Kiel  
Wishhofstraße 1-3, D-24148 Kiel / Germany  
[www.geomar.de](http://www.geomar.de)

## GeoTü

Fachbereich Geowissenschaften, Eberhard-Karls-Universität Tübingen  
Hölderlinstraße 12, D-72074 Tübingen / Germany  
[www.geo.uni-tuebingen.de](http://www.geo.uni-tuebingen.de)

## MARUM

Zentrum für Marine Umweltwissenschaften, Universität Bremen  
Leobener Straße 8, D-28359 Bremen / Germany  
[www.marum.de](http://www.marum.de)

## NIOZ

Royal Netherlands Institute of Sea Research  
PO Box 59, 1790 AB Den Burg (Texel) / The Netherlands  
[www.nioz.nl](http://www.nioz.nl)

## Ocean Zoom Society

UFR Sciences et Techniques  
2 rue de la Houssinière, BP 92208, 44322 Nantes Cedex 3 / France  
[www.oceanzoom.fr](http://www.oceanzoom.fr)

## UGeneva

University of Geneva, Faculty of Science, Department of Earth Sciences  
12 Rue de Maraichers, 1205 Geneve / Switzerland  
[www.unige.ch](http://www.unige.ch)

## Station list

Device key – A = ARGO float; CTD = Shipboard CTD with water rosette sampler; DT = Drifting trap (R = recovery; D = deployment); M = Mooring (R/D as drifting trap); MPS = Multi-Plankton-sampler with on-board CTD and water sampler; PC = particle camera.

Station data							Devices					
Station	GeoB No.	Date [UTC]	Time [UTC]	Latitude	Longitude	Depth [m]	A	CTD	DT	M	MPS	PC
984-1	22401-01	11.08.2017	16:28	16° 38,88' N	026° 00,86' W	4328,4					X	
985-1	22402-01	12.08.2017	09:07	15° 52,24' N	028° 44,71' W	5140,8					X	
985-2	22402-02	12.08.2017	10:11	15° 52,24' N	028° 44,71' W	5136,2					X	
985-3	22402-03	12.08.2017	10:34	15° 52,25' N	028° 44,71' W	5140,3					X	
986-1	22403-01	13.08.2017	09:36	14° 47,44' N	032° 30,40' W	5798,5					X	
986-2	22403-02	13.08.2017	10:35	14° 47,40' N	032° 31,13' W	5808,1					X	
986-3	22403-03	13.08.2017	10:55	14° 47,40' N	032° 31,38' W	5810,4					X	
987-1	22404-01	14.08.2017	09:31	13° 43,25' N	036° 12,91' W	5537,2					X	
987-2	22404-02	14.08.2017	10:32	13° 43,43' N	036° 13,21' W	5489,1					X	
987-3	22404-03	14.08.2017	10:53	13° 43,49' N	036° 13,27' W	5471,7					X	
988-1	NA	15.08.2017	08:01	12° 20,75' N	038° 52,19' W	4921,0				R		
989-1	NA	15.08.2017	14:35	12° 23,88' N	038° 38,24' W	4693,9			D			
990-1	22405-01	15.08.2017	15:40	12° 24,66' N	038° 38,08' W	4748,2					X	
991-1	22405-02	15.08.2017	16:24	12° 25,40' N	038° 40,40' W	5077,3					X	
992-1	22405-03	15.08.2017	17:07	12° 26,04' N	038° 39,92' W	5030,4					X	
993-1	22405-04	15.08.2017	17:35	12° 26,54' N	038° 39,88' W	5055,0					X	
994-1	22405-05	15.08.2017	18:10	12° 27,02' N	038° 40,26' W	5135,3					X	
995-1	22405-06	15.08.2017	18:51	12° 26,30' N	038° 38,37' W	4949,1					X	
996-1	22405-07	15.08.2017	19:28	12° 27,43' N	038° 38,47' W	5166,4					X	
997-1	22405-08	15.08.2017	20:08	12° 27,61' N	038° 36,39' W	4860,7					X	
998-1	22405-09	15.08.2017	20:51	12° 28,84' N	038° 37,13' W	5128,8					X	
999-1	22405-10	15.08.2017	21:27	12° 30,62' N	038° 36,87' W	5366,9					X	
1000-1	22405-11	15.08.2017	22:15	12° 30,24' N	038° 35,33' W	5134,9					X	
1001-1	22405-12	15.08.2017	22:53	12° 32,09' N	038° 36,34' W	5461,3					X	
1002-1	22405-13	15.08.2017	23:39	12° 32,15' N	038° 37,97' W	5412,8					X	
1003-1	22405-14	16.08.2017	00:15	12° 30,03' N	038° 38,22' W	5315,6					X	
1004-1	22405-15	16.08.2017	00:59	12° 31,57' N	038° 38,90' W	5413,8					X	
1005-1	22405-16	16.08.2017	01:29	12° 31,95' N	038° 39,88' W	5547,3					X	
1006-1	22405-17	16.08.2017	02:06	12° 31,74' N	038° 40,62' W	5435,3					X	
1007-1	22405-18	16.08.2017	02:39	12° 32,79' N	038° 40,48' W	5512,7					X	
1008-1	22405-19	16.08.2017	03:16	12° 32,49' N	038° 40,08' W	5558,3					X	
1009-1	22405-20	16.08.2017	03:50	12° 33,05' N	038° 39,44' W	5582,1					X	
1010-1	22405-21	16.08.2017	04:39	12° 32,76' N	038° 37,39' W	5530,0					X	
1011-1	22405-22	16.08.2017	05:16	12° 32,39' N	038° 35,39' W	5316,2					X	
1012-1	22405-23	16.08.2017	05:49	12° 32,72' N	038° 35,43' W	5432,1					X	
1013-1	22405-24	16.08.2017	06:28	12° 32,46' N	038° 33,60' W	5364,1					X	
1014-1	22405-25	16.08.2017	07:05	12° 31,69' N	038° 33,43' W	5340,8					X	
1015-1	22405-26	16.08.2017	07:41	12° 32,44' N	038° 32,01' W	5583,0					X	
1016-1	22405-27	16.08.2017	08:20	12° 31,32' N	038° 31,19' W	5567,0					X	
1017-1	22405-28	16.08.2017	08:45	12° 31,15' N	038° 30,94' W	5563,4					X	
1018-1	22405-29	16.08.2017	09:30	12° 30,54' N	038° 30,83' W	5495,8					X	
1019-1	22405-30	16.08.2017	10:02	12° 29,91' N	038° 31,40' W	5471,6					X	
1020-1	22405-31	16.08.2017	10:50	12° 29,28' N	038° 32,57' W	5200,5					X	
1021-1	22405-32	16.08.2017	11:14	12° 29,54' N	038° 32,88' W	5202,1					X	
1022-1	22405-33	16.08.2017	11:52	12° 29,03' N	038° 34,19' W	5087,5					X	
1023-1	22405-34	16.08.2017	12:29	12° 28,29' N	038° 32,81' W	5165,1					X	
1024-1	22405-35	16.08.2017	13:10	12° 27,50' N	038° 32,68' W	5247,7					X	
1025-1	22405-36	16.08.2017	13:56	12° 26,14' N	038° 35,32' W	4746,9					X	
1026-1	22405-37	16.08.2017	14:32	12° 25,78' N	038° 35,51' W	4743,2					X	
1027-1	22405-38	16.08.2017	15:06	12° 25,45' N	038° 34,65' W	4791,7					X	
1028-1	22405-39	16.08.2017	15:57	12° 23,10' N	038° 34,67' W	4740,1					X	
1029-1	22405-40	16.08.2017	16:41	12° 23,30' N	038° 36,36' W	4721,1					X	
1030-1	22405-41	16.08.2017	17:07	12° 23,03' N	038° 36,83' W	4718,0					X	
1031-1	NA	16.08.2017	17:53	12° 22,24' N	038° 35,66' W	4645,3			R			
1032-1	NA	16.08.2017	18:06	12° 22,22' N	038° 35,83' W	NA				R		
1033-1	NA	16.08.2017	22:23	12° 22,52' N	038° 39,29' W	4771,3	X					
1034-1	22406-01	17.08.2017	09:35	12° 17,58' N	036° 56,55' W	5410,3					X	
1034-2	22406-02	17.08.2017	10:38	12° 17,59' N	036° 56,63' W	5405,9					X	
1034-3	22406-03	17.08.2017	10:55	12° 17,66' N	036° 56,70' W	5409,8					X	
1035-1	22407-01	18.08.2017	09:30	12° 05,75' N	033° 47,10' W	5989,9					X	
1035-2	22407-02	18.08.2017	10:44	12° 05,93' N	033° 47,57' W	6031,7					X	
1035-3	22407-03	18.08.2017	11:08	12° 05,98' N	033° 47,70' W	6049,3					X	
1036-1	22408-01	19.08.2017	09:32	11° 52,85' N	030° 22,61' W	5752,5					X	
1036-2	22408-02	19.08.2017	10:33	11° 52,83' N	030° 22,33' W	5739,0					X	
1036-3	22408-03	19.08.2017	10:52	11° 52,81' N	030° 22,16' W	5694,1					X	

1037-1	NA	19.08.2017	19:34	11° 47,55' N	028° 59,76' W	5734,9	X						
1038-1	22409-01	20.08.2017	10:01	11° 41,26' N	026° 39,34' W	5488,2						X	
1038-2	22409-02	20.08.2017	11:04	11° 41,25' N	026° 39,56' W	5743,6						X	
1038-3	22409-03	20.08.2017	11:27	11° 41,26' N	026° 39,70' W	5488,2						X	
1039-1	NA	21.08.2017	11:28	11° 30,74' N	022° 41,72' W	5065,4						R	
1040-1	NA	21.08.2017	18:50	11° 27,57' N	022° 50,05' W	5349,2						R	
1041-1	22410-01	21.08.2017	19:48	11° 26,89' N	022° 49,64' W	5094,1		X					
1042-1	22410-01	21.08.2017	21:11	11° 26,58' N	022° 49,38' W	5094,4							X
1042-2	22410-02	21.08.2017	22:20	11° 26,20' N	022° 49,05' W	5094,1							X
1042-3	22410-03	21.08.2017	22:36	11° 26,14' N	022° 49,00' W	5094,7							X
1043-1	NA	22.08.2017	09:21	11° 25,05' N	022° 56,01' W	5111,0						R	
1044-1	NA	22.08.2017	14:53	11° 23,39' N	022° 57,22' W	5112,6					D		
1045-1	22411-01	22.08.2017	15:49	11° 23,14' N	022° 57,05' W	5110,5							X
1046-1	22411-02	22.08.2017	16:18	11° 22,57' N	022° 57,31' W	5109,5							X
1047-1	22411-03	22.08.2017	16:49	11° 22,17' N	022° 57,54' W	5108,6							X
1048-1	22411-04	22.08.2017	17:18	11° 21,78' N	022° 57,63' W	5109,2							X
1049-1	22411-05	22.08.2017	17:52	11° 21,26' N	022° 57,47' W	5114,5							X
1050-1	22411-06	22.08.2017	18:15	11° 20,76' N	022° 57,58' W	5111,7							X
1051-1	22411-07	22.08.2017	18:58	11° 20,49' N	022° 57,72' W	5113,5							X
1052-1	22411-08	22.08.2017	19:33	11° 20,44' N	022° 59,32' W	5116,5							X
1053-1	22411-09	22.08.2017	20:07	11° 20,62' N	022° 59,19' W	5117,7							X
1054-1	22411-10	22.08.2017	20:38	11° 21,84' N	022° 59,82' W	5116,7							X
1055-1	22411-11	22.08.2017	21:13	11° 22,18' N	022° 59,80' W	5117,3							X
1056-1	22411-12	22.08.2017	21:57	11° 22,41' N	022° 58,43' W	5114,5							X
1057-1	22411-13	22.08.2017	22:42	11° 22,67' N	022° 58,90' W	5117,5							X
1058-1	22411-14	22.08.2017	23:13	11° 23,16' N	022° 59,38' W	5118,5							X
1059-1	22411-15	22.08.2017	23:55	11° 23,93' N	022° 59,65' W	5119,3							X
1060-1	22411-16	23.08.2017	00:37	11° 24,15' N	022° 58,01' W	5115,5							X
1061-1	22411-17	23.08.2017	01:11	11° 24,58' N	022° 58,34' W	5118,8							X
1062-1	22411-18	23.08.2017	01:43	11° 25,22' N	022° 58,36' W	5119,0							X
1063-1	22411-19	23.08.2017	02:18	11° 24,77' N	022° 58,57' W	5117,1							X
1064-1	22411-20	23.08.2017	02:45	11° 24,71' N	022° 59,04' W	5118,4							X
1065-1	22411-21	23.08.2017	03:32	11° 25,60' N	022° 59,30' W	5116,9							X
1066-1	22411-22	23.08.2017	03:59	11° 25,60' N	022° 59,73' W	5117,1							X
1067-1	22411-23	23.08.2017	04:32	11° 26,00' N	022° 59,55' W	5115,9							X
1068-1	22411-24	23.08.2017	05:04	11° 26,39' N	022° 58,90' W	5115,9							X
1069-1	22411-25	23.08.2017	05:34	11° 26,70' N	022° 58,56' W	5115,4							X
1070-1	22411-26	23.08.2017	06:01	11° 26,64' N	022° 58,55' W	5115,1							X
1071-1	22411-27	23.08.2017	06:42	11° 26,38' N	022° 57,72' W	5115,1							X
1072-1	22411-28	23.08.2017	07:06	11° 26,03' N	022° 57,53' W	5119,0							X
1073-1	22411-29	23.08.2017	07:43	11° 25,95' N	022° 56,75' W	5118,5							X
1074-1	22411-30	23.08.2017	08:09	11° 25,91' N	022° 56,49' W	5118,7							X
1075-1	22411-31	23.08.2017	08:39	11° 26,17' N	022° 56,34' W	5120,1							X
1076-1	22411-32	23.08.2017	09:06	11° 26,24' N	022° 55,56' W	5121,1							X
1077-1	22411-33	23.08.2017	09:39	11° 26,66' N	022° 55,58' W	5120,8							X
1078-1	22411-34	23.08.2017	10:07	11° 27,32' N	022° 55,47' W	5118,1							X
1079-1	22411-35	23.08.2017	10:49	11° 26,96' N	022° 54,26' W	5111,6							X
1080-1	22411-36	23.08.2017	11:22	11° 27,09' N	022° 53,52' W	5108,4							X
1081-1	22411-37	23.08.2017	11:52	11° 26,99' N	022° 53,60' W	5108,1							X
1082-1	22411-38	23.08.2017	12:28	11° 25,84' N	022° 54,57' W	5091,4							X
1083-1	22411-39	23.08.2017	13:00	11° 25,65' N	022° 54,71' W	5054,4							X
1084-1	22411-40	23.08.2017	13:32	11° 25,55' N	022° 55,35' W	5106,7							X
1085-1	22411-41	23.08.2017	14:07	11° 25,64' N	022° 55,75' W	5113,7							X
1086-1	22411-42	23.08.2017	14:35	11° 25,04' N	022° 55,46' W	5105,8							X
1087-1	22411-43	23.08.2017	15:22	11° 24,69' N	022° 54,19' W	5074,7							X
1088-1	22411-44	23.08.2017	15:46	11° 24,78' N	022° 54,04' W	5079,2							X
1089-1	22411-45	23.08.2017	16:23	11° 23,60' N	022° 53,21' W	5107,7							X
1090-1	22411-46	23.08.2017	16:44	11° 23,64' N	022° 53,44' W	5107,4							X
1091-1	NA	23.08.2017	18:54	11° 29,08' N	022° 40,01' W	5055,5						D	
1092-1	NA	24.08.2017	07:00	11° 27,92' N	022° 55,61' W	5110,9						D	
1093-1	NA	24.08.2017	15:29	11° 27,85' N	022° 51,53' W	5097,9						R	
1094-1	NA	24.08.2017	16:03	11° 27,84' N	022° 51,37' W	5099,5	X						
1095-1	22412-01	25.08.2017	09:32	14° 06,70' N	023° 44,43' W	4252,8							X
1095-2	22412-02	25.08.2017	10:44	14° 06,41' N	023° 44,50' W	4257,4							X
1095-3	22412-03	25.08.2017	11:07	14° 06,28' N	023° 44,61' W	4258,1							X
1096-1	22413-01	27.08.2017	10:31	19° 31,20' N	022° 35,44' W	3851,2							X
1096-2	22413-01	27.08.2017	11:41	19° 31,40' N	022° 35,36' W	3854,6							X
1096-3	22413-01	27.08.2017	12:05	19° 31,46' N	022° 35,36' W	3854,6							X
1097-1	NA	27.08.2017	21:59	20° 39,64' N	021° 32,09' W	4136,0	X						
1098-1	22414-01	28.08.2017	04:02	21° 14,18' N	021° 02,00' W	4227,1							X
1098-2	22414-02	28.08.2017	04:23	21° 14,23' N	021° 02,04' W	4227,2							X
1098-3	22414-03	28.08.2017	04:56	21° 14,33' N	021° 02,14' W	4229,7							X
1098-4	22414-04	28.08.2017	05:19	21° 14,40' N	021° 02,20' W	4230,5							X
1098-5	22414-05	28.08.2017	05:43	21° 14,48' N	021° 02,27' W	4231,3							X
1099-1	22414-06	28.08.2017	07:12	21° 16,40' N	020° 59,91' W	4215,5						R	



1100-1	22414-07	28.08.2017	13:50	21° 12,35' N	020° 53,26' W	NA				R		
1101-2	NA	28.08.2017	17:17	21° 14,98' N	020° 50,69' W	4161,7			D			
1102-1	NA	28.08.2017	18:07	21° 15,95' N	020° 50,14' W	4172,9			D			
1103-1	22414-08	28.08.2017	19:15	21° 16,87' N	020° 49,61' W	4177,6						X
1104-1	22414-09	28.08.2017	20:26	21° 16,89' N	020° 49,60' W	4175,0					X	
1104-2	22414-10	28.08.2017	21:27	21° 17,02' N	020° 49,37' W	4174,4					X	
1104-3	22414-11	28.08.2017	21:51	21° 17,04' N	020° 49,30' W	4172,5					X	
1105-1	22414-13	28.08.2017	22:44	21° 17,02' N	020° 49,26' W	4172,8						X
1105-2	22414-14	29.08.2017	00:08	21° 17,23' N	020° 49,37' W	4173,4						X
1105-3	22414-15	29.08.2017	04:35	21° 18,02' N	020° 50,13' W	4178,2						X
1106-1	NA	29.08.2017	07:00	21° 14,61' N	021° 01,69' W	4226,9				D		
1107-1	NA	29.08.2017	14:30	21° 14,05' N	020° 52,06' W	4161,2				D		
1108-1	22415-02	29.08.2017	17:36	21° 15,59' N	020° 50,53' W	4166,0						X
1109-1	NA	29.08.2017	18:45	21° 16,04' N	020° 50,51' W	4168,2				R		
1110-1	NA	29.08.2017	19:54	21° 17,17' N	020° 49,57' W	4176,1				R		
1111-1	22415-03	29.08.2017	20:39	21° 17,33' N	020° 49,47' W	4174,1						X
1112-1	22415-05	29.08.2017	22:00	21° 17,38' N	020° 49,48' W	4174,8					X	
1113-1	NA	30.08.2017	12:07	20° 51,53' N	018° 45,74' W	NA				R		
1114-1	22416-02	30.08.2017	14:35	20° 50,66' N	018° 47,59' W	2800,4						X
1115-1	NA	30.08.2017	15:49	20° 50,66' N	018° 47,60' W	2798,0				D		
1116-1	22416-03	30.08.2017	16:29	20° 50,61' N	018° 47,79' W	2807,4					X	
1117-1	22416-04	30.08.2017	17:13	20° 50,70' N	018° 47,96' W	2818,9		X				
1118-1	22416-05	30.08.2017	18:34	20° 50,71' N	018° 47,96' W	2816,3						X
1118-2	22416-06	30.08.2017	19:53	20° 50,78' N	018° 48,08' W	2826,5						X
1118-3	22416-07	30.08.2017	21:11	20° 50,96' N	018° 48,42' W	2840,2						X
1118-4	22416-08	31.08.2017	07:44	20° 51,85' N	018° 50,63' W	2939,1						X
1119-1	22417-01	31.08.2017	09:35	20° 52,15' N	018° 56,26' W	3088,8					X	
1119-2	22417-02	31.08.2017	10:36	20° 52,18' N	018° 56,31' W	3088,2					X	
1119-3	22417-03	31.08.2017	10:57	20° 52,18' N	018° 56,32' W	3088,5					X	
1120-1	22418-01	31.08.2017	11:44	20° 52,19' N	018° 56,35' W	3091,1						X
1121-1	22418-02	31.08.2017	14:36	20° 42,02' N	018° 45,46' W	2788,8						X
1122-1	NA	31.08.2017	17:13	20° 52,77' N	018° 47,01' W	2818,3				D		
1123-1	NA	31.08.2017	17:55	20° 52,93' N	018° 46,94' W	2817,3				R		
1124-1	22419-02	31.08.2017	18:33	20° 53,19' N	018° 46,99' W	2826,7						X
1125-1	22418-03	31.08.2017	20:47	21° 02,13' N	018° 45,45' W	2849,6						X
1126-1	22418-04	31.08.2017	21:53	21° 02,18' N	018° 45,58' W	2856,6					X	
1127-1	22418-05	01.09.2017	00:17	20° 52,11' N	018° 34,67' W	2346,8						X
1128-1	22418-06	01.09.2017	02:39	20° 49,93' N	018° 44,98' W	2699,1						X
1128-2	22418-07	01.09.2017	03:55	20° 49,92' N	018° 44,98' W	2700,4						X
1128-3	22418-08	01.09.2017	07:55	20° 49,36' N	018° 45,21' W	2702,8						X
1129-1	NA	01.09.2017	09:08	20° 49,38' N	018° 45,27' W	2704,0				D		
1130-1	22420-02	01.09.2017	11:14	20° 50,47' N	018° 44,67' W	2694,6						X
1131-1	22419-03	01.09.2017	13:04	20° 53,36' N	018° 44,33' W	2746,7						X
1131-2	22419-04	01.09.2017	14:21	20° 53,36' N	018° 44,33' W	2748,3						X
1131-3	22419-05	01.09.2017	16:48	20° 53,36' N	018° 44,33' W	2747,9						X
1132-2	NA	01.09.2017	18:04	20° 53,50' N	018° 43,21' W	2717,8				R		
1133-1	NA	02.09.2017	10:00	22° 59,11' N	017° 37,67' W	1544,6	X					
1134-1	22421-01	03.09.2017	10:23	24° 43,73' N	016° 34,36' W	864,9					X	
1134-2	22421-02	03.09.2017	11:26	24° 43,73' N	016° 34,36' W	865,3					X	
1134-3	22421-03	03.09.2017	11:54	24° 43,73' N	016° 34,36' W	865,0					X	