

Cadmium in the waters off South Morocco: nature of particles hosting Cd and insights into the mechanisms fractionating Cd from phosphate

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Introduction

This supporting information provides 3 figures: Sea surface temperatures during the Epure2 cruise, five day air mass back-trajectory at selected stations of the Epure2 cruise and a satellite image of the Boucraa-Laayoune area.

Table S1 provides the dates, positions of stations and data presented in this study.

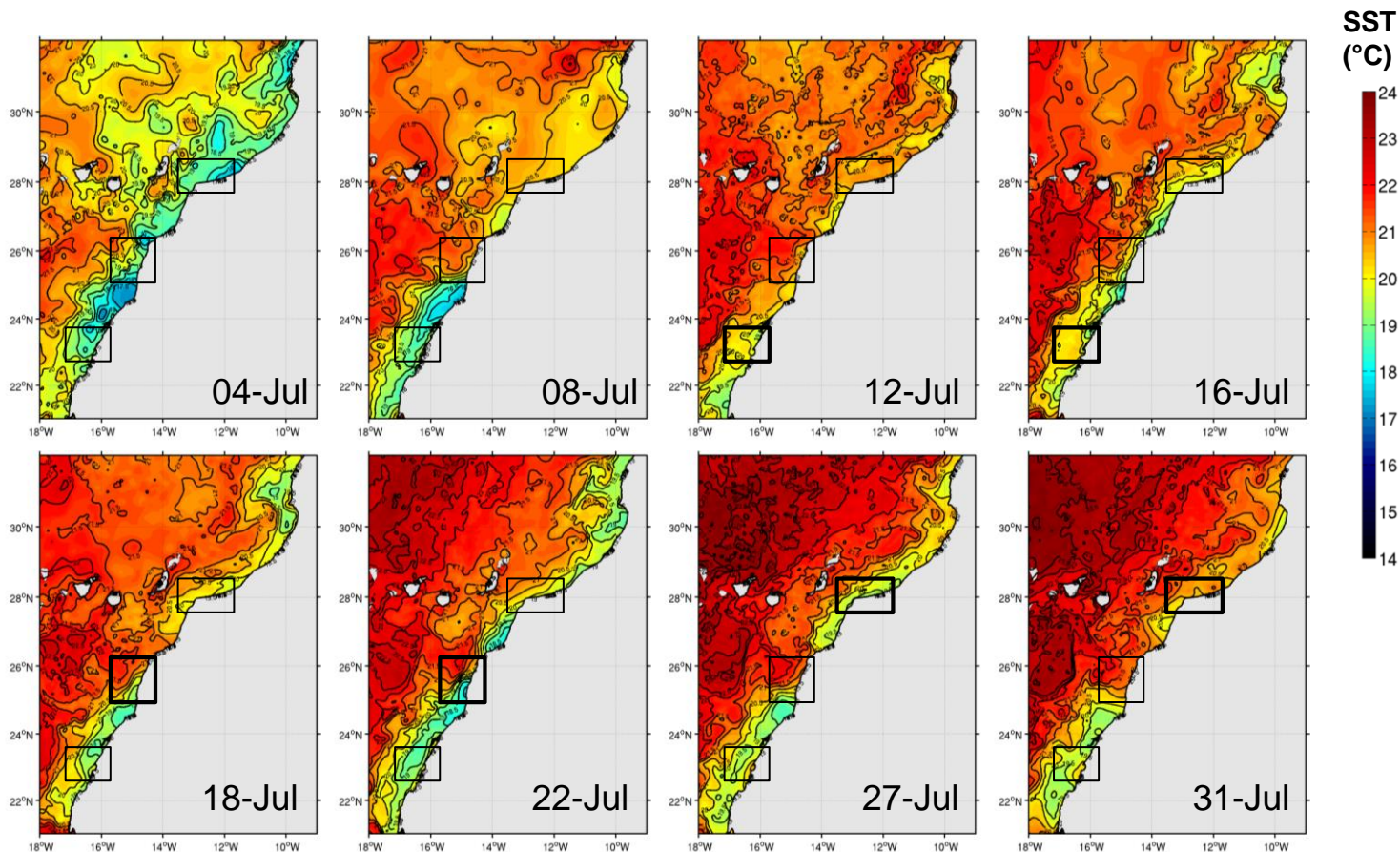


Figure S1. Sea surface temperature (SST, °C) of the waters off south Morocco in July 2013. Rectangles indicate the areas sampled for the EPURE2 campaign. Bold rectangles highlight the areas being sampled over particular periods (e.g. 12-16 July for the Southern area). SST data were obtained from the GHRSS (http://www.nodc.noaa.gov/SatelliteData/ghrsst/accessdata.html)

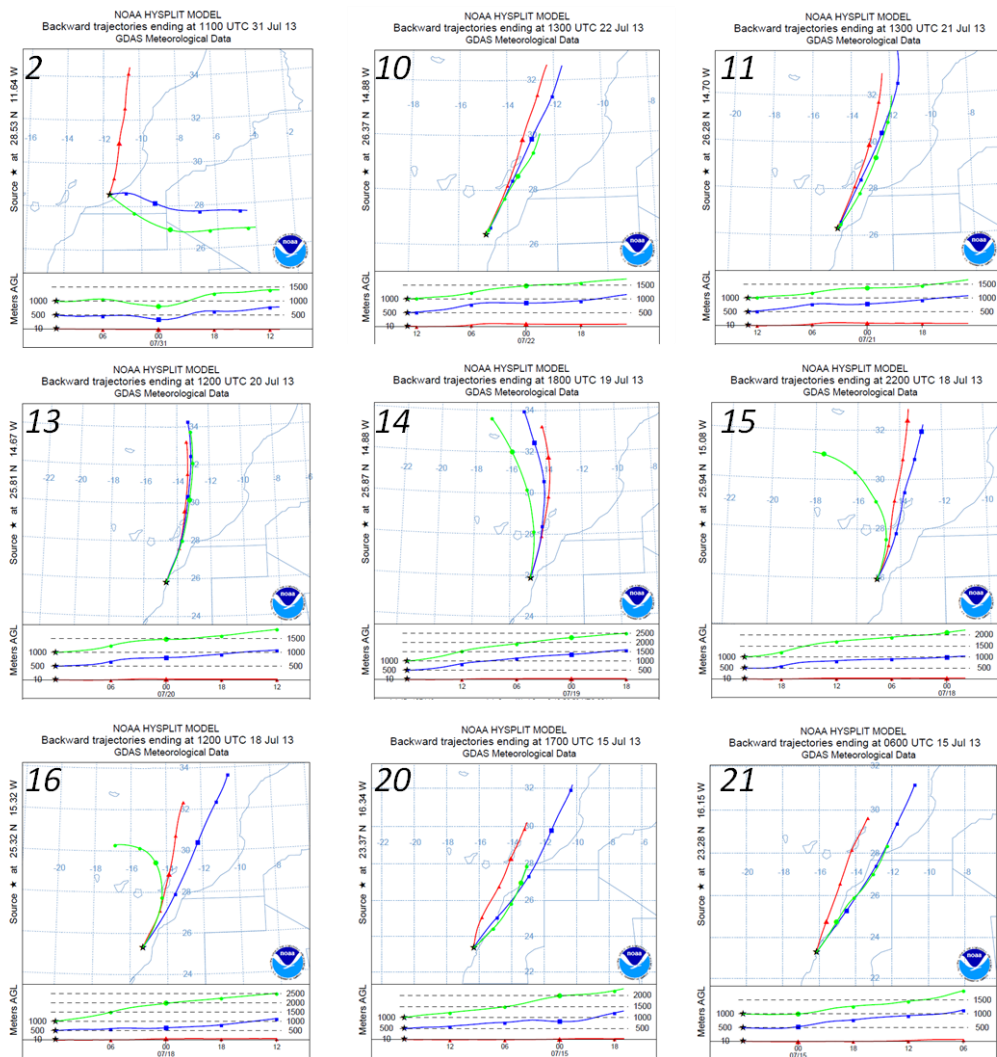


Figure S2. Five day air mass back-trajectory simulations at altitudes of 10 m (red), 500 m (blue) and 1000 m (green) at 9 stations of the EPURE2 cruise determined by the NOAA HYSPLIT model [Draxler and Rolph, 2011]. The back trajectories start at the station location at the time of sampling.

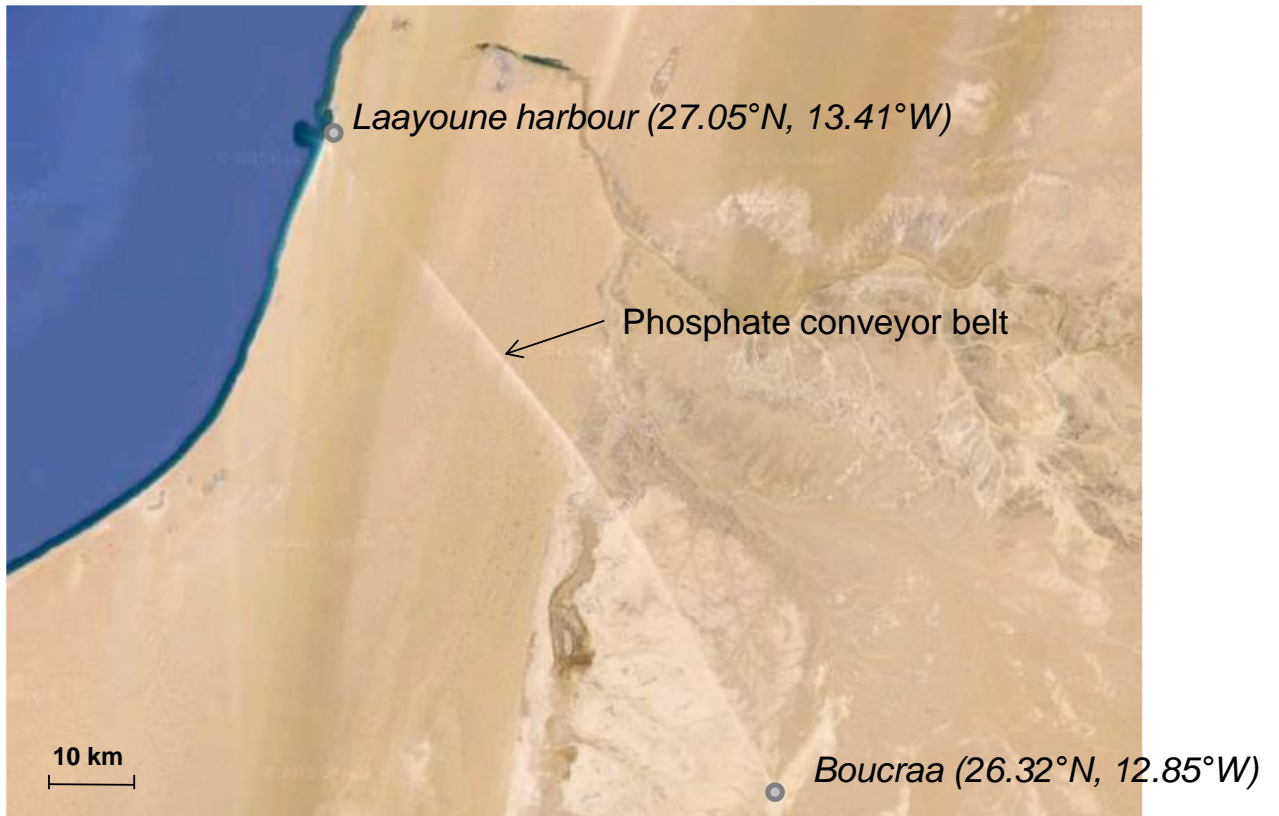


Figure S3. Satellite image (Data SIO, NOAA, U.S. Navy, GEBCO, Landsat) of the Boucraa-Laayoune area for showing spillage from the conveyor belt transporting phosphate from Boucraa to Laayoune harbour.

Table S1. Dates, positions of stations (St.) and data acquired during EPURE2 cruise. Cd (total dissolvable Cd, pM), P (Soluble Reactive Phosphorus, μM), pCd (particulate Cd, pM) and pP (particulate P, μM).

St.	Date	Lat.	Long.	Depth (m)	T ($^{\circ}\text{C}$)	S	O ₂ ($\mu\text{mol kg}^{-1}$)	Fluo. (mg m^{-3})	Cd (pM)	P (μM)	pCd (pM)	pP (μM)
1	07-31	28.41	-11.48	1.9	16.02	36.24	109.4	3.42	329	0.94		
1	07-31	28.41	-11.48	10.5	15.68	36.24	77.9	0.33	214	1.37		
1	07-31	28.41	-11.48	25.3	15.66	36.24	52.6	0.19	365	1.50		
2	07-30	28.53	-11.64	1.9	19.99	36.24	260.2	0.29		0.15	185	0.51
2	07-30	28.53	-11.64	9.5	17.95	36.30	259.9	0.43	89	0.38		
2	07-30	28.53	-11.64	18.2	16.33	36.34	203.2	3.89	222	0.58	72.9	0.24
2	07-30	28.53	-11.64	28.5	15.79	36.27	177.4	0.51	169	0.62		
2	07-30	28.53	-11.64	47.2	15.39	36.20	143.4	0.34	244	0.85	26.4	0.14
3	07-30	28.65	-11.79	1.8	20.43	36.26	243.3	0.36	62	0.10		
3	07-30	28.65	-11.79	10.5	18.43	36.34	232.0	0.15	80	0.19		
3	07-30	28.65	-11.79	27.0	16.52	36.37	192.1	0.33	62	0.41	7.4	0.03
3	07-30	28.65	-11.79	35.9	16.08	36.31	182.0	0.28	107	0.54	5.9	0.03
3	07-30	28.65	-11.79	58.0	15.82	36.27	159.6	0.12	205	0.71	3.7	0.02
4	07-29	28.41	-12.31	1.7	19.44	36.29	223.9	0.11	62	0.11		
4	07-29	28.41	-12.31	11.0	17.91	36.32	225.7	0.26	133	0.15		
4	07-29	28.41	-12.31	25.5	17.10	36.34	213.6	0.53	80	0.23	13.8	0.07
4	07-29	28.41	-12.31	34.8	16.52	36.37	197.0	0.42	107	0.38	6.5	0.04
4	07-29	28.41	-12.31	51.8	15.80	36.27	173.6	0.12	98	0.59	1.2	0.01
5	07-28	28.26	-12.24	2.0	20.97	36.24	261.9	0.55	53	0.16		
5	07-28	28.26	-12.24	8.0	18.44	36.25	286.7	0.84	116	0.21		
5	07-28	28.26	-12.24	15.0	16.28	36.29	190.9	7.71	196	0.44	218	0.79
5	07-28	28.26	-12.24	24.3	16.05	36.29	147.3	0.91	169	0.80	88.1	0.26
5	07-28	28.26	-12.24	43.0	15.91	36.29	132.4	0.15	88	0.89		
6	07-28	28.12	-12.16	1.5	18.37	36.25	244.5	1.10	240	0.59		
6	07-28	28.12	-12.16	8.8	16.04	36.30	110.3	3.23	365	1.05		
6	07-28	28.12	-12.16	15.6	15.91	36.28	70.5	0.48	249	1.33		
6	07-28	28.12	-12.16	23.6	15.91	36.28	70.2	0.40	231	1.26		
7	07-27	28.01	-12.92	1.8	18.96	36.28	288.4	4.46	142	0.36		
7	07-27	28.01	-12.92	7.7	18.66	36.28	279.2	4.91	160	0.64	127	0.63
7	07-27	28.01	-12.92	15.3	17.50	36.29	205.6	2.71	196	0.38		
7	07-27	28.01	-12.92	39.0	15.99	36.29	154.8	0.32	107	0.62	14.3	0.07
8	07-26	28.14	-13.06	2.0	20.87	36.33	217.7	0.04	53	0.00		
8	07-26	28.14	-13.06	19.2	17.92	36.41	228.3	0.85	78	0.10		
8	07-26	28.14	-13.06	25.7	17.54	36.41	216.9	0.62	69	0.21	6.3	0.04
8	07-26	28.14	-13.06	36.0	17.28	36.40	208.7	0.37	85	0.30		
8	07-26	28.14	-13.06	75.0	16.21	36.32	185.3	0.12	98	0.50	2.3	0.02
9	07-26	28.24	-13.15	1.7	20.99	36.38	212.8	0.01	41	0.07		
9	07-26	28.24	-13.15	27.8	18.30	36.43	220.7	0.62	71	0.22		
9	07-26	28.24	-13.15	36.0	17.52	36.42	211.7	0.48	44	0.31	8.3	0.05
9	07-26	28.24	-13.15	50.5	16.59	36.35	190.6	0.18	80	0.33	5.2	0.03
9	07-26	28.24	-13.15	156.0	14.94	36.11	172.5	0.00	107	0.50	2.4	0.02

Table S1 (continued)

St.	Date	Lat.	Long.	Depth (m)	T (°C)	S	O ₂ (μmol kg ⁻¹)	Fluo. (mg m ⁻³)	Cd (pM)	P (μM)	pCd (pM)	pP (μM)
10	07-22	26.37	-14.88	1.7	21.64	36.79	208.3	0.03	18	0.00		
10	07-22	26.37	-14.88	56.0	19.14	36.62	215.5	0.25	19	0.04		
10	07-22	26.37	-14.88	60.8	18.93	36.60	214.8	0.30	18	0.07	2.5	0.03
10	07-22	26.37	-14.88	98.0	17.65	36.58	196.6	0.03	17	0.21	4.9	0.04
10	07-22	26.37	-14.88	814.0	8.21	35.16	85.9	0.00	400	1.89	0.6	0.00
11	07-21	26.27	-14.71	2.0	21.69	36.75	206.7	0.02	42	0.00		
11	07-21	26.27	-14.71	40.0	18.88	36.56	218.7	0.13	36	0.10		
11	07-21	26.27	-14.71	47.0	18.18	36.59	210.5	0.30	54	0.11	1.8	0.01
11	07-21	26.27	-14.71	55.0	18.06	36.59	207.6	0.26	48	0.14	1.4	0.01
11	07-21	26.27	-14.71	160.0	15.29	36.18	186.0	0.00	89	0.46	0.6	0.00
12	07-21	26.20	-14.51	1.8	18.25	36.44	202.1	0.80	160	0.55		
12	07-21	26.20	-14.51	8.0	18.20	36.44	200.6	0.81	107	0.53	46.6	0.40
12	07-21	26.20	-14.51	37.0	16.33	36.35	189.1	0.16	53	0.34		
13	07-20	25.81	-14.68	20.0	17.67	36.50	203.4	0.51	73	0.25	40.6	0.38
13	07-20	25.81	-14.68	25.0	17.20	36.47	195.5	0.29	107	0.27		
13	07-20	25.81	-14.68	39.0	17.08	36.46	194.6	0.21	98	0.32		
14	07-19	25.86	-14.87	25.0	19.72	36.71	215.3	0.05	58	0.02		
14	07-19	25.86	-14.87	63.0	17.87	36.61	203.3	0.15	27	0.06	3.1	0.02
14	07-19	25.86	-14.87	73.0	17.44	36.55	197.5	0.07	62	0.14	1.2	0.01
14	07-19	25.86	-14.87	89.0	17.31	36.53	191.9	0.04	50	0.17	2.4	0.02
15	07-22	25.94	-15.08	55.0	20.07	36.75	217.6	0.10	62	0.07		
15	07-22	25.94	-15.08	85.0	19.22	36.78	212.5	0.21	27	0.06	1.3	0.01
15	07-22	25.94	-15.08	100.0	18.86	36.75	207.6	0.15	16	0.09	0.9	0.01
15	07-22	25.94	-15.08	170.0	16.88	36.46	192.0	0.02	285	0.25	0.6	0.01
16	07-18	25.32	-15.32	2.0	19.92	36.62	216.1	0.15	62	0.05		
16	07-18	25.32	-15.32	36.0	18.85	36.53	214.9	0.77	36	0.06	14.3	0.08
16	07-18	25.32	-15.32	45.0	18.80	36.53	213.7	0.62	80	0.07	18.5	0.11
16	07-18	25.32	-15.32	77.0	19.01	36.70	200.4	0.14		0.07	3.0	0.02
17	07-17	25.26	-15.11	17.0	18.74	36.59	208.7	0.41	46	0.08		
17	07-17	25.26	-15.11	22.0	18.88	36.66	203.3	0.24		0.08	8.1	0.03
17	07-17	25.26	-15.11	30.0	18.87	36.67	203.3	0.23	14	0.08	7.1	0.03
17	07-17	25.26	-15.11	60.0	18.85	36.66	202.7	0.19		0.08	4.1	0.02
18	07-17	25.20	-14.89	5.7	16.95	36.35	190.7	0.64	205	0.36		
18	07-17	25.20	-14.89	9.5	16.90	36.35	189.4	0.76	133	0.38	15.8	0.10
18	07-17	25.20	-14.89	18.0	16.83	36.36	183.8	0.71	98	0.41	2.8	0.02
18	07-17	25.20	-14.89	42.0	16.81	36.36	179.6	0.35	80	0.37	15.5	0.07
19	07-16	23.26	-16.17	2.0	18.47	36.39	174.9	1.13	107	0.57		
19	07-16	23.26	-16.17	10.0	18.47	36.43	173.0	1.62	89	0.48	40.3	0.29
19	07-16	23.26	-16.17	15.0	18.40	36.44	166.3	1.11	116	0.49		
20	07-15	23.36	-16.34	10.5	18.31	36.45	204.4	0.69	89	0.17		
20	07-15	23.36	-16.34	18.0	18.17	36.45	176.7	1.18	98	0.32	36.4	0.15
20	07-15	23.36	-16.34	25.0	18.16	36.45	173.1	0.92	125	0.31		

Table S1 (continued)

St.	Date	Lat.	Long.	Depth (m)	T (°C)	S	O ₂ (μmol kg ⁻¹)	Fluo. (mg m ⁻³)	Cd (pM)	P (μM)	pCd (pM)	pP (μM)
21	07-15	23.47	-16.51	18.0	18.53	36.41	217.4	0.30	116	0.10	9.4	0.08
21	07-15	23.47	-16.51	25.0	17.94	36.44	143.7	0.69	107	0.51	11.9	0.08
21	07-15	23.47	-16.51	35.0	17.92	36.44	134.7	0.57	71	0.58	10.2	0.06
22	07-14	23.26	-16.81	11.0	19.84	36.43	222.3	0.50	178	0.02		
22	07-14	23.26	-16.81	26.0	18.86	36.46	194.7	0.38	70	0.11		
22	07-14	23.26	-16.81	46.0	18.16	36.43	168.6	0.13	89	0.45		
22	07-14	23.26	-16.81	60.0	17.69	36.39	150.4	0.12	178	0.82		
23	07-14	23.20	-16.60	2.0	20.23	36.40	230.2	0.17	62	0.00	2.7	0.04
23	07-14	23.20	-16.60	15.0	19.90	36.40	234.6	0.27	46	0.05	2.7	0.06
23	07-14	23.20	-16.60	21.0	18.65	36.42	242.5	0.42	62	0.22	5.8	0.07
23	07-14	23.20	-16.60	26.0	17.65	36.39	152.6	1.41	169	0.42	57.3	0.20
23	07-14	23.20	-16.60	35.0	17.29	36.37	130.8	0.33	133	0.59	31.6	0.10
24	07-13	23.06	-16.34	1.6	19.94	36.40	227.8	0.66	62	0.13	6.8	0.07
24	07-13	23.06	-16.34	11.0	19.90	36.40	228.0	0.72	71	0.16	14.2	0.09
24	07-13	23.06	-16.34	15.8	18.27	36.41	185.8	0.96	116	0.26	10.7	0.05
24	07-13	23.06	-16.34	27.0	18.24	36.41	176.2	0.85	89	0.46	14.0	0.09
25	07-12	22.75	-16.41	1.5	19.55	36.42	216.5	0.78	89	0.07	16.8	0.25
25	07-12	22.75	-16.41	5.0	19.29	36.42	214.7	1.34	116	0.11	20.5	0.22
25	07-12	22.75	-16.41	10.0	19.28	36.42	214.9	1.57	347	0.12	53.0	0.41
25	07-12	22.75	-16.41	20.0	18.46	36.43	193.7	0.76	240	0.24	27.7	0.12
25	07-12	22.75	-16.41	30.0	17.64	36.39	128.7	0.50	418	0.92	81.7	0.34
26	07-11	22.84	-16.66	1.8	20.06	36.42	256.0	0.64	53	0.05	10.3	0.08
26	07-11	22.84	-16.66	10.5	18.94	36.41	242.1	1.30	125	0.14	15.4	0.10
26	07-11	22.84	-16.66	20.9	18.38	36.41	198.1	0.52	62	0.37	26.8	0.10
26	07-11	22.84	-16.66	30.7	18.23	36.41	189.0	0.41	45	0.41	22.4	0.08
26	07-11	22.84	-16.66	41.0	17.22	36.33	128.9	0.35	89	0.93	25.6	0.07
27	07-11	22.84	-16.87	1.6	19.80	36.42	241.1	0.38	71	0.05	7.3	0.07
27	07-11	22.84	-16.87	10.5	19.07	36.42	226.8	0.52	62	0.13	12.3	0.05
27	07-11	22.84	-16.87	20.0	18.71	36.42	210.5	0.34	71	0.17	20.1	0.07
27	07-11	22.84	-16.87	41.0	18.53	36.41	198.9	0.21	71	0.30	8.3	0.03
27	07-11	22.84	-16.87	55.0	17.42	36.36	143.2	0.48	133	0.73	14.9	0.06