



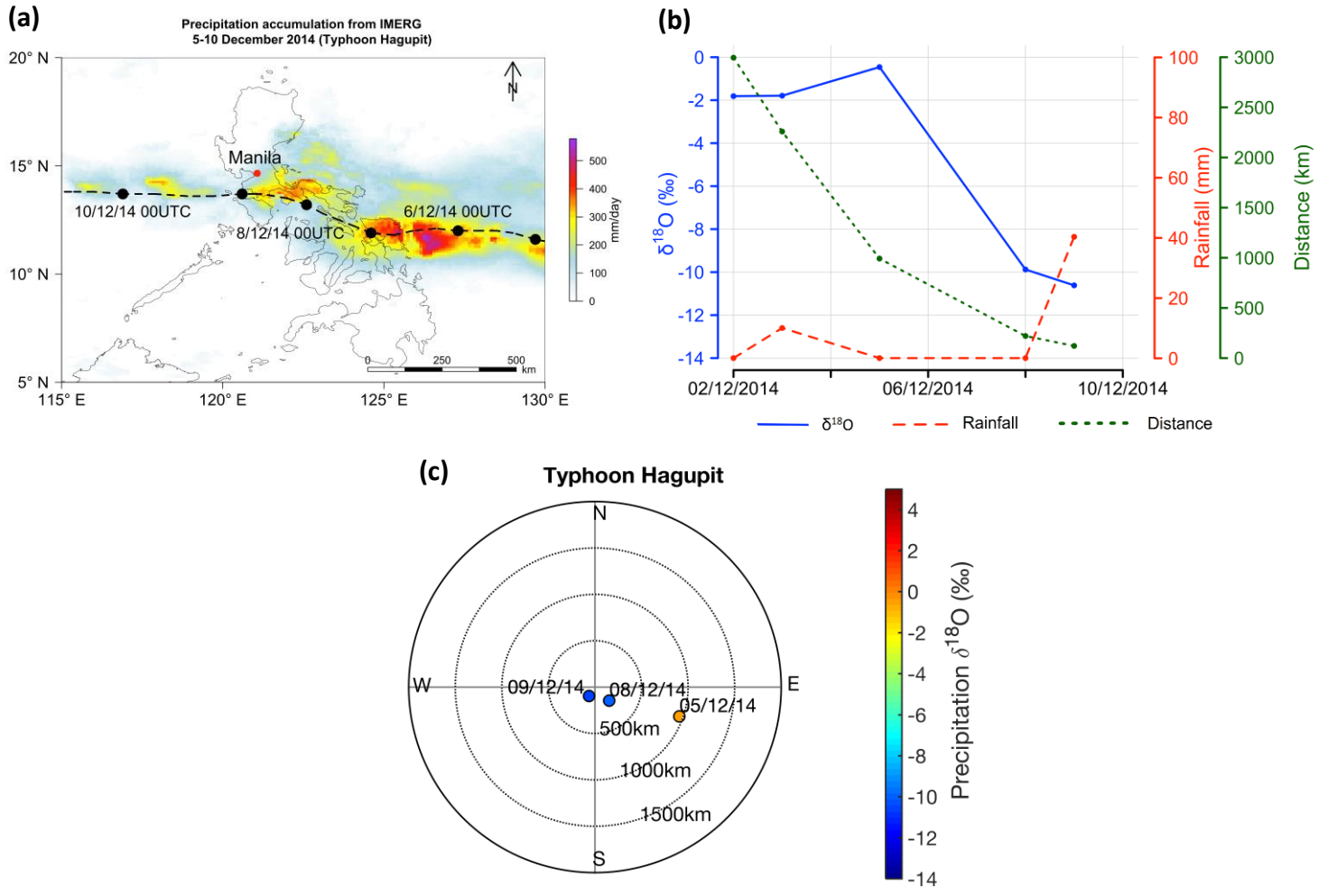
*Supplement of*

## **Precipitation stable isotopic signatures of tropical cyclones in Metropolitan Manila, Philippines, show significant negative isotopic excursions**

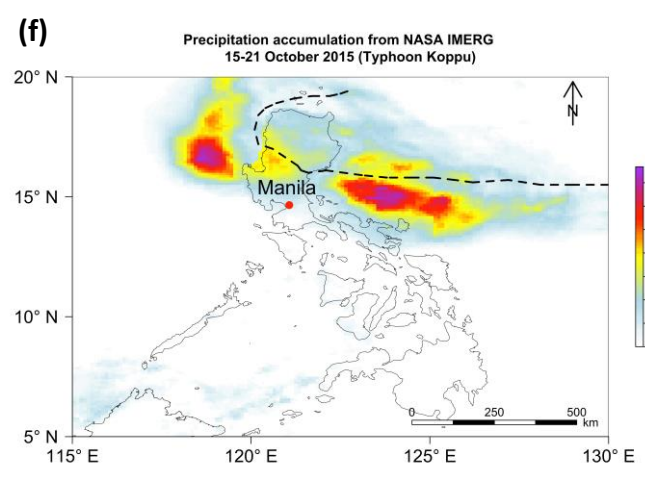
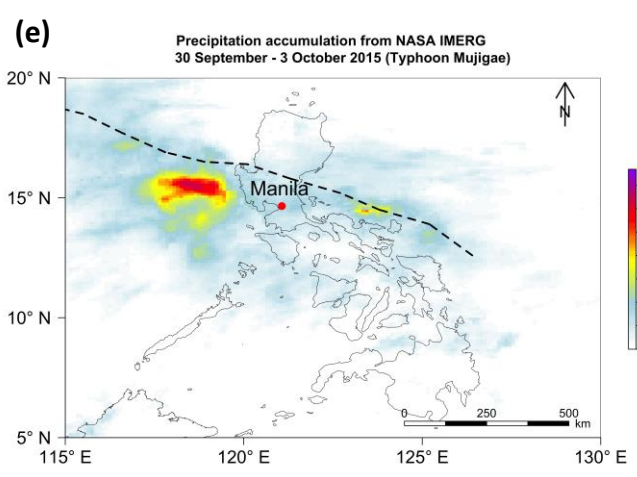
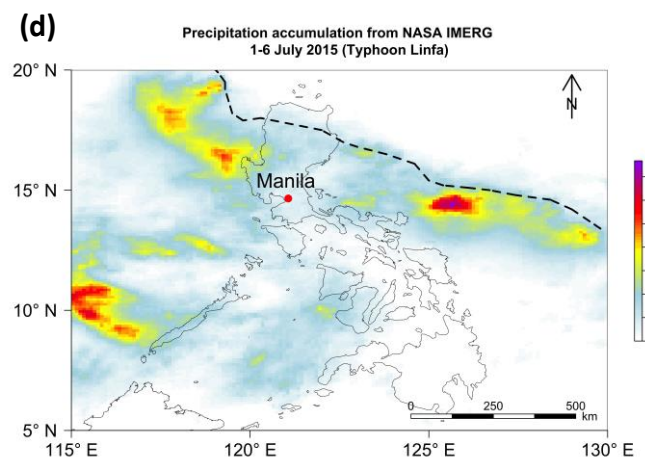
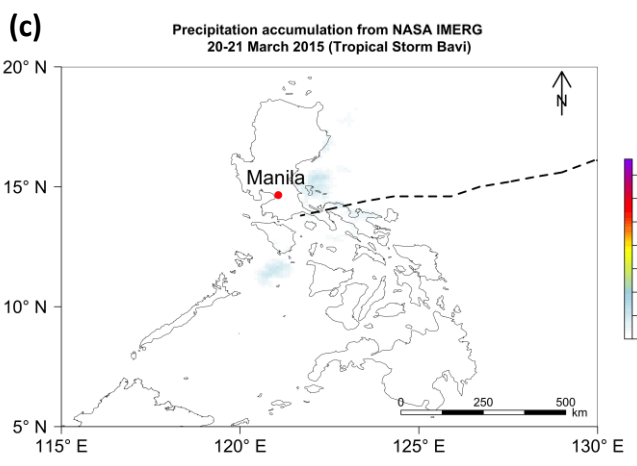
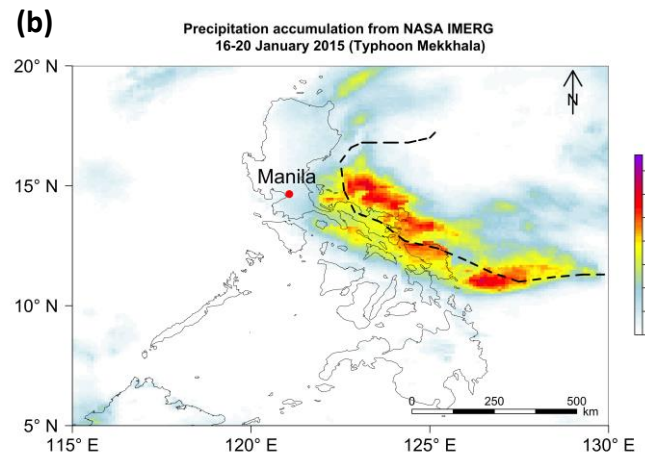
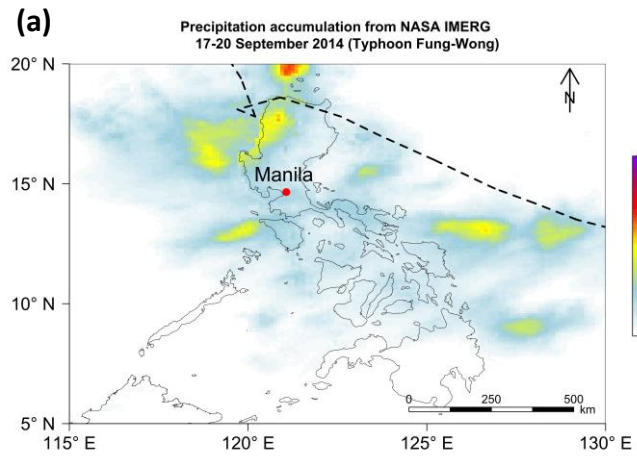
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**S 1 Typhoon Hagupit.** a) TC track and rainfall intensities, made with base layers from Natural Earth, b)  $\delta^{18}\text{O}$ , distance and rainfall amount, c) Spatiotemporal evolution of  $\delta^{18}\text{O}$ .



**S 2 TC track and rainfall intensities.** a) Fung-Wong, b) Mekkhala, c) Bavi, d) Linfa, e) Mujigae, f) Koppu. Made with base layers from Natural Earth.

**Table S 1.** Stable isotopes of precipitation from sampling location at University of the Philippines Diliman, rainfall amount, temperature and relative humidity from PAGASA and IBTrACS data

Date	$\delta^{18}\text{O}$ (‰)	$\delta^2\text{H}$ (‰)	d-excess (‰)	rain (mm)	Temperature (°C)	Relative Humidity (%)	IBTrACS name	IBTrACS lat	IBTrACS lon	IBTrACS distance (km)
11/03/2014	1.83	12.82	-1.80	0.2	27.10	74				
12/03/2014	0.44	5.86	2.31	1	26.20	75				
25/03/2014	-2.63	-14.62	6.38	9.3	24.9	87				
26/03/2014	-1.37	-6.54	4.39	8.7	26.3	86				
07/04/2014	-0.96	0.98	8.63	9.8	26.7	76	PEIPAH	6.87	133.17	1579
09/04/2014	4.00	16.85	-15.18	0.3	27.5	74	PEIPAH	8.55	130.25	1208
27/04/2014	-4.62	-31.45	5.55	4	28.5	76				
05/05/2014	-2.10	-8.17	8.66	11.9	29.8	73				
09/05/2014	-2.77	-15.06	7.11	13.4	29.8	71				
26/05/2014	-2.89	-11.37	11.76	27.5	28.8	79				
27/05/2014	-2.61	-14.50	6.41	14.5	28.6	79				
30/05/2014	-3.59	-19.51	9.25	3.4	29.2	79				
31/05/2014	-3.38	-12.40	14.61	28.4	28.3	84				
01/06/2014	-4.29	-24.97	9.33	5.8	29.3	78				
05/06/2014	-5.16	-30.70	10.54	71.2	28.6	83				
10/06/2014	-8.59	-53.31	15.39	49.8	27.2	90	MITAG	21.35	121.9	750
11/06/2014	-7.59	-44.44	16.27	16.1	26.8	90	MITAG	23.3	125.85	1085
12/06/2014	-7.64	-49.78	11.35	7.1	27.6	84	MITAG	28.85	135.85	2192
13/06/2014	-8.99	-60.32	11.57	16.5	27.8	85	HAGIBIS	18.8	116	710
16/06/2014	-6.04	-41.17	7.11	0	30.1	77	HAGIBIS	24.43	116.75	1177
18/06/2014	-6.55	-43.91	8.53	1	27.4	89	HAGIBIS	30.86	137.82	2483
19/06/2014	-10.44	-71.47	12.09	6.1	28.2	82	HAGIBIS	32.75	147.95	3379
21/06/2014	-9.02	-64.73	7.40	6.4	29.3	76	HAGIBIS	36.7	163.2	4827
23/06/2014	-6.41	-39.06	12.22	1	28.5	79				
24/06/2014	-4.08	-30.78	1.84	21.8	29.9	76				
26/06/2014	-4.37	-26.93	8.06	10.5	26.9	90				
27/06/2014	-7.42	-47.09	12.31	22.9	28.1	82				
02/07/2014	-4.48	-28.22	7.62	6.4	28.6	85				
03/07/2014	-4.58	-25.40	11.26	15.8	28.2	87	NEOGURI	9.23	145.63	2737
04/07/2014	-6.44	-37.57	13.96	16	28.2	84	NEOGURI	12.12	142.35	2318
05/07/2014	-4.64	-25.62	11.47	6.7	27.3	89	NEOGURI	15.25	138.18	1839
06/07/2014	-5.50	-32.24	11.73	11.7	27.9	88	NEOGURI	17.98	132.95	1320
07/07/2014	-6.31	-38.47	12.05	33.6	27.3	87	NEOGURI	20.42	128.3	999
08/07/2014	-4.37	-26.40	8.52	3.9	27.8	86	NEOGURI	24.98	126.05	1261
09/07/2014	-5.75	-35.36	10.60	2.4	26.8	90	NEOGURI	30.35	126.15	1821
10/07/2014	-7.35	-50.53	8.26	7.4	28.3	84	NEOGURI	32.28	131.32	2218
12/07/2014	-8.26	-54.77	11.35	5.4	30.5	73	RAMMASUN	13.62	144.5	2528
15/07/2014	-3.74	-22.08	7.82	1.2	26.4	90	RAMMASUN	12.73	125.65	539
16/07/2014	-13.84	-99.10	11.60	82.6	25.2	91	RAMMASUN	14.3	120.55	68
17/07/2014	-9.12	-61.88	11.07	59.4	25.3	94	RAMMASUN	16.33	115.75	600
18/07/2014	-6.26	-39.05	11.05	17.9	28.1	83	RAMMASUN	19.08	112.32	1053
20/07/2014	-5.27	-32.19	9.96	13.2	27.9	86	MATMO	12.82	129.7	954
21/07/2014	-6.14	-36.72	12.37	5	27.8	86	MATMO	16.5	127.32	700
22/07/2014	-7.24	-50.19	7.74	2.9	26.1	92	MATMO	20.5	123.7	707
23/07/2014	-8.44	-56.17	11.35	37.2	25.7	94	MATMO	24.38	120.1	1086
24/07/2014	-6.07	-38.29	10.24	18.4	26.4	92	MATMO	27.83	117.83	1503
25/07/2014	-3.95	-24.30	7.30	28.8	27.8	83	MATMO	33.72	119.38	2127

27/07/2014	-7.27	-49.52	8.62	21.8	27.1	86				
29/07/2014	-6.72	-46.58	7.19	0	27.3	88	HALONG	12.39	148.24	2947
30/07/2014	-6.67	-44.02	9.36	6.7	27.4	88	HALONG	13.85	145.47	2630
31/07/2014	-6.75	-45.56	8.41	49.4	26.5	94	HALONG	14.98	141.97	2246
01/08/2014	-3.89	-22.37	8.74	22.6	26.5	92	HALONG	14.32	139.18	1950
02/08/2014	-4.58	-26.20	10.41	24.7	26.8	90	HALONG	14.92	136.45	1654
03/08/2014	-4.61	-26.25	10.66	23	26.9	91	HALONG	15.23	133.9	1380
04/08/2014	-5.86	-38.17	8.71	23.6	26	94	HALONG	16.5	130.75	1057
05/08/2014	-5.73	-34.58	11.24	40.6	25.8	94	HALONG	19.18	129.8	1056
06/08/2014	-5.69	-36.97	8.55	12	27.7	87	HALONG	22.4	130.35	1303
07/08/2014	-1.86	-16.09	-1.20	2.6	28.1	88	HALONG	24.98	131.72	1598
15/08/2014	-3.89	-25.14	6.02	15.8	28.1	79	HALONG	47	151.9	4589
16/08/2014	-3.79	-23.68	6.63	5.2	27.6	82				
17/08/2014	-6.32	-39.67	10.85	27.4	27.5	82				
18/08/2014	-8.33	-58.88	7.80	0.5	26.5	90				
20/08/2014	-9.52	-64.04	12.10	22.8	26.8	88				
21/08/2014	-6.99	-47.84	8.08	40.2	26.9	89				
22/08/2014	-5.50	-36.32	7.71	9.2	28.1	80				
26/08/2014	-9.15	-61.21	12.03	60.6	25.5	93				
27/08/2014	-12.50	-86.45	13.57	21.1	28.2	83				
28/08/2014	-6.69	-48.00	5.51	1	24.6	92				
29/08/2014	-7.50	-56.52	3.45	6.6	26.2	90				
30/08/2014	-9.05	-61.60	10.82	42.2	27.9	83				
14/09/2014	-8.88	-61.10	9.93	29.7	25.3	95	KALMAEGI	16.43	124.55	422
15/09/2014	-11.39	-79.69	11.45	85.1	26.8	84	KALMAEGI	18.02	118.05	494
16/09/2014	-7.25	-52.41	5.63	1.6	27.9	78	KALMAEGI	19.8	111.45	1170
19/09/2014	-7.77	-51.05	11.07	268	24.9	97	FUNG-WONG	17.88	122.6	394
20/09/2014	-12.16	-86.08	11.18	175.2	26.8	89	FUNG-WONG	19.3	119.78	534
22/09/2014	-4.66	-26.16	11.13	3.2	27.6	87	FUNG-WONG	27.25	121.97	1404
24/09/2014	-5.96	-36.84	10.86	8.7	27.6	85	FUNG-WONG	33.16	125.06	2097
25/09/2014	-4.64	-33.90	3.23	18.3	26.7	90	FUNG-WONG	37.5	138.5	3068
26/09/2014	-5.45	-30.29	13.29	23	27.3	85				
30/09/2014	-4.75	-28.21	9.78	10	27.9	83	PHANFONE	15.3	148.03	2895
02/10/2014	-5.61	-31.62	13.24	29	27.2	84	PHANFONE	19.5	139	1979
03/10/2014	-5.76	-33.51	12.57	18	27.7	83	PHANFONE	22.27	135.47	1737
05/10/2014	-5.17	-26.81	14.54	0.1	26.8	84	PHANFONE	29	131.3	1911
07/10/2014	-5.11	-24.97	15.89	12	27.6	83	VONGFONG	16.95	136.47	1667
08/10/2014	-3.98	-18.37	13.43	46.8	26.3	91	VONGFONG	17.9	132.2	1241
12/10/2014	-6.50	-38.63	13.38	0	27.3	83	VONGFONG	27.72	127.25	1587
13/10/2014	-6.40	-38.33	12.87	44.5	26.1	90	VONGFONG	31.38	130.35	2086
15/10/2014	-7.91	-52.34	10.95	70	27.3	85	VONGFONG	46.75	156.1	4821
17/10/2014	-0.96	-8.57	-0.88	0	25.8	85				
18/10/2014	-9.44	-67.40	8.16	10.1	25.6	89				
20/10/2014	-4.32	-25.28	9.26	0	26.8	88				
22/10/2014	-4.36	-25.66	9.25	25.5	26.3	88				
28/10/2014	-5.63	-43.19	1.88	0	27.1	83				
29/10/2014	-2.88	-13.48	9.54	4.4	25.1	93				

30/10/2014	-4.56	-27.74	8.72	9	26.9	80	NURI	12.77	140.87	2149
02/11/2014	-3.62	-19.87	9.11	17.6	28.1	82	NURI	15.45	132.75	1257
04/11/2014	-1.15	-4.28	4.90	2.4	26.1	88	NURI	21.3	134.97	1644
09/11/2014	-0.83	3.81	10.42	2.4	27.3	76				
15/11/2014	-10.58	-79.48	5.17	3	24.8	91				
18/11/2014	-5.40	-36.60	6.60	0	28.3	79				
19/11/2014	-5.42	-36.69	6.65	0	27	82				
20/11/2014	-5.43	-36.68	6.74	3	27	78				
23/11/2014	-7.44	-51.69	7.86	8.4	26.2	88				
28/11/2014	-2.58	-14.15	6.51	11.2	27.8	76	SINLAKU	10.98	117.25	582
30/11/2014	-1.45	-0.71	10.88	11.8	27.1	83	SINLAKU	13.56	108.47	1364
02/12/2014	-1.81	-4.75	9.75	0	25.6	89	HAGUPIT	5.92	147	2995
03/12/2014	-1.79	-4.55	9.79	10	27.6	74	HAGUPIT	7.53	140.47	2259
05/12/2014	-0.46	3.13	6.82	0	26.6	79	HAGUPIT	11.65	129.7	992
08/12/2014	-9.88	-69.39	9.62	0	25.2	69	HAGUPIT	13.27	122.53	220
09/12/2014	-10.62	-74.93	9.99	40.3	23.9	90	HAGUPIT	13.73	120.47	121
14/12/2014	-3.27	-15.10	11.02	50.5	26.1	83				
17/12/2014	-5.24	-30.42	11.54	3.3	25.9	78				
14/01/2015	-2.57	-9.97	10.60	0	24.1	84	MEKKHALA	10.01	139.74	2092
19/01/2015	-10.77	-78.84	7.34	21.6	25.6	80	MEKKHALA	16.5	122.83	279
16/02/2015	-0.66	-19.70	-14.41	0.3	26.1	83				
20/03/2015	0.01	9.81	9.74	0	29.2	62	BAVI	15	126.65	601
24/03/2015	-1.41	-1.92	9.33	3	25.7	81				
16/06/2015	1.71	8.35	-5.30		29.9	70				
18/06/2015	-3.91	-22.19	9.06	50.6	27.9	83				
19/06/2015	-6.81	-40.63	13.88	38	29.3	75				
22/06/2015	-11.52	-77.79	14.39	2.4	29.1	72	KUJIRA	17.95	111.18	1117
23/06/2015	-10.76	-72.58	13.48	3.8	29.5	72	KUJIRA	19.65	109.28	1370
25/06/2015	-6.01	-35.46	12.66	1.2	30.2	74	KUJIRA	22.4	105.9	1815
29/06/2015	-3.40	-20.03	7.14	20	29.1	76				
30/06/2015	-3.47	-15.45	12.34	22.2	29.6	76	CHAN-HOM	9.49	160.86	4359
01/07/2015	-3.69	-16.06	13.48	0.8	30.1	73	CHAN-HOM	10.61	158.09	4038
03/07/2015	-6.74	-40.74	13.16		29.3	78	LINFA	15.15	126.68	606
04/07/2015	-6.74	-40.84	13.07	8.4	28.4	83	LINFA	16.15	124.47	401
05/07/2015	-6.73	-40.82	13.00	6.6	25.4	88	LINFA	17.62	121.85	340
06/07/2015	-6.77	-40.70	13.45	51	24.1	92	LINFA	18.68	119.4	482
07/07/2015	-8.47	-53.13	14.66	62.8	27.6	89	LINFA	20.23	118.95	659
08/07/2015	-3.07	-13.94	10.61	92	26.3	93	LINFA	21.45	118.7	796
09/07/2015	-6.56	-43.71	8.76	76.5	25.6	94	LINFA	22.72	116.88	999
10/07/2015	-6.94	-49.04	6.51	80.5	26.3	88	LINFA	21.4	111.2	1284
11/07/2015	-7.28	-33.95	24.31	19.6	28.2	79	CHAN-HOM	28.62	122.82	1563
16/07/2015	-2.37	-13.75	5.21	0	28.4	81				
21/07/2015	-3.27	-15.35	10.81	22.8	28.6	74				
23/07/2015	-7.71	-54.60	7.04	67.4	26.6	80	TWELVE	16.98	123.24	348
24/07/2015	-4.46	-23.07	12.60	0	28.5	78	TWELVE	18	123.6	460
26/07/2015	-6.83	-45.10	9.52	18.2	26.8	81				
27/07/2015	-7.46	-46.54	13.13	0.4	26.6	80				
29/07/2015	-7.17	-46.47	10.87	2.8	27.1	82				
30/07/2015	-6.42	-42.61	8.78	3	26.8	82	SOUDELOR	13.68	160.72	4271
02/08/2015	-4.78	-27.44	10.82	44.7	27.4	81	SOUDELOR	14.6	148.18	2915
03/08/2015	-4.75	-27.44	10.55	1	28.1	78	SOUDELOR	16.2	144	2463
04/08/2015	-2.34	-11.09	7.63	10.6	27.8	82	SOUDELOR	18.27	139.6	2016

05/08/2015	-3.42	-18.69	8.63	21.7	28.2	82	SOUDELOR	19.52	134.88	1564
06/08/2015	-3.14	-17.34	7.81	5.2	28.7	80	SOUDELOR	20.45	130.2	1163
07/08/2015	-3.81	-17.30	13.15	5.2	27.7	75	SOUDELOR	21.88	125.8	946
10/08/2015	-6.83	-43.91	10.70	23.7	27.3	84	SOUDELOR	29.9	116.8	1751
12/08/2015	-2.58	-20.29	0.32	1.6	26.9	90	SOUDELOR	33.5	126.7	2171
13/08/2015	-9.96	-69.46	10.22	79.7	27.3	89				
14/08/2015	-5.21	-30.54	11.15	52	29	79	GONI	12.24	150.38	3179
18/08/2015	-9.26	-62.23	11.82	13.2	29.6	76	GONI	18.2	136.05	1645
19/08/2015	-5.87	-41.81	5.15	24.7	27.5	80	GONI	18.85	129.82	1042
21/08/2015	-4.47	-23.57	12.16	13.6	26.9	83	GONI	19.23	122.93	546
22/08/2015	-5.12	-29.76	11.23	48	27.3	84	GONI	20.1	122.6	627
24/08/2015	-6.20	-36.86	12.74	31.4	26.8	85	GONI	26.22	125.9	1381
25/08/2015	-5.79	-36.36	10.00	10.2	27.1	87	GONI	33.9	130.47	2340
26/08/2015	-5.08	-30.30	10.33	4	28.8	74	GONI	39.14	133.49	2981
28/08/2015	-4.22	-24.03	9.69	5.6	27.6	82	GONI	44	126.4	3302
30/08/2015	-6.98	-44.94	10.88	1.2	27.1	81	GONI	45.5	125.8	3459
01/09/2015	-5.25	-29.80	12.21	0	28.3	81				
03/09/2015	-5.34	-35.36	7.39	2.4	28.6	81				
06/09/2015	-6.08	-37.63	11.02	18	28.8	76				
07/09/2015	-6.06	-37.59	10.93	4.8	27.7	84				
08/09/2015	-4.99	-28.38	11.56	6	28.3	80				
09/09/2015	-6.83	-40.71	13.96	79.2	29.2	79				
10/09/2015	-7.51	-46.79	13.31	40.8	27.2	88				
11/09/2015	-8.17	-53.23	12.15	33.2	26.6	87				
12/09/2015	-7.08	-44.60	12.01	4.3	27.7	80				
14/09/2015	-7.12	-44.13	12.86	24.6	27.4	81				
16/09/2015	-8.28	-55.01	11.22	46.5	26.9	83				
20/09/2015	-2.82	-13.55	8.99	16.4	27.4	85	DUJUAN	13.8	148	2903
21/09/2015	-3.56	-14.85	13.62	48.4	26.7	85	DUJUAN	15.13	144.53	2521
23/09/2015	-6.62	-37.88	15.05	34.9	28.6	79	DUJUAN	17.67	136.27	1657
28/09/2015	-4.67	-23.69	13.70	27.1	27.6	85	DUJUAN	23.33	123.9	1010
30/09/2015	-7.47	-49.89	9.84		27.8	86	MUJIGAE	11.9	130.3	1045
01/10/2015	-7.47	-49.75	9.98	27.1	25.7	93	MUJIGAE	14.02	125.4	472
02/10/2015	-7.49	-49.90	10.02	51	25.9	87	MUJIGAE	16.25	119.97	213
05/10/2015	-6.06	-37.43	11.03	43.2	27.7	82	MUJIGAE	23.48	108.28	1662
06/10/2015	-4.10	-19.67	13.15		28	79				
14/10/2015	-3.91	-21.06	10.26	0.5	26.7	84	KOPPU	15.75	136.12	1619
19/10/2015	-8.70	-65.43	4.18	38.2	28	79	KOPPU	17.45	120.03	330
20/10/2015	-9.72	-68.00	9.79	26.2	28.3	74	KOPPU	18.77	120.54	461
27/10/2015	-2.67	-15.14	6.21	0.4	27.9	74				