

5.27 Stable water isotope observation

(1) Personnel

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(2) Objective

It is well known that the variability of stable water isotopes (HDO and H₂¹⁸O) is closely related with the moisture origin and hydrological processes during the transportation from the source region to deposition site. Thus, water isotope tracer is recognized as the powerful tool to study of the hydrological cycles in the atmosphere. However, oceanic region is one of sparse region of the isotope data, it is necessary to fill the data to identify the moisture sources by using the isotope tracer. In this study, to fill this sparse observation area, intense water isotopes observation was conducted along the cruise track of MR11-07.

(3) Method

Following observation was carried out throughout this cruise.

- Atmospheric moisture sampling:

Ambient air sampling was conducted using both latest laser based water vapor isotope analyzer (WVIA) and conventional cryogenic cold trap method. We used different air-sampling tube lines for each sampling. Both air-sampling lines connected at the middle level (20m above the sea level) of the mast at the compass deck to the laboratory. Air was drawn by external pump at a flow rate of 2 Lmin⁻¹ for laser instrument and 1.5Lmin⁻¹ for cold trap method. As for laser based measurement, every 50 minutes, the 3-way valve in the instrument automatically switched from ambient inlet to WVIA reference air, and then reference air with a H₂O mixing ratio of 10000 ppmv was introduced to the WVIA during 10 minutes. After finishing reference gas measurement, the valve switches back to ambient inlet and ambient air sampling is resumed. The WVIA can measure HDO and H₂¹⁸O in the water vapor every second.

As for collection of vapor samples in cold trap, sampled air was passed through a glass trap in an ethanol bath, which was thermoelectrically cooled to -100 degree C. It is collected every 12 hour during the cruise. Amount of cold-trapped vapor was between 20 and 30g. After collection, water in the trap was subsequently thawed and poured into the 6ml glass bottle.

- Rainwater sampling

Rainwater samples gathered in rain/snow collector were collected just after precipitation events have ended. The collected sample was then transferred into glass bottle (6ml) immediately after the measurement of precipitation amount.

- Surface seawater sampling

Seawater sample taken by the pump from 4m depth were collected in glass bottle (6ml) around the noon at the local time.

(4) Water samples for isotope analysis

Sampling of water vapor for isotope analysis is summarized in Table 5.27-1 (127 samples). The detail of rainfall sampling (32 samples) is summarized in Table 5.27-2. Described rainfall amount is calculated from the collected amount of precipitation. Sampling of surface seawater taken by pump from 4m depths is summarized in Table 5.27-3 (63 samples).

(5) Data archive

The isotopic data of water vapor can obtain from the laser based water vapor isotope analyzer on board. The archived raw observed data was submitted to JAMSTEC Data Integration and Analysis Group (DIAG) after the cruise immediately. As for collected water samples, isotopes (HDO, H₂¹⁸O) analysis will be done at RIGC/JAMSTEC, and then analyzed isotopes data will be submitted to JAMSTEC DIAG.

(6) Acknowledgment

The operations were supported by Global Ocean Development Inc.

Table 5.27-1 Summary of water vapor sampling for isotope analysis

Sample	Date	Time (UT)	Date	Time (UT)	Lon	Lat	T.M. (m ³)	Sam. (ml)	H2O ppm
V-1	9.25	12:25	9.26	01:29	89-09.5E	02-12.4N	1.75	36.0	25600
V-2	9.26	01:30	9.26	12:59	87-18.3E	00-51.3N	1.56	32.0	25527
V-3	9.26	13:00	9.27	02:01	85-09.6E	00-39.4S	1.75	36.4	25884
V-4	9.27	02:04	9.27	14:00	83-23.7E	01-56.3S	1.39	28.5	25516
V-5	9.27	14:05	9.28	02:04	81-28.5E	03-18.8S	1.27	26.0	25477
V-6	9.28	02:10	9.28	14:00	79-41.1E	04-23.8S	1.27	26.0	25477
V-7	9.28	14:04	9.29	02:00	78-22.6E	05-07.7S	1.26	25.5	25185
V-8	9.29	02:03	9.29	14:00	78-47.2E	05-56.0S	1.25	26.0	25884
V-9	9.29	14:01	9.30	02:05	80-20.9E	07-48.4S	1.22	24.0	24481
V-10	9.30	02:07	9.30	14:00	80-30.6E	08-00.7S	1.19	22.0	23007
V-11	9.30	14:01	10.1	02:02	80-31.0E	08-00.4S	1.21	23.2	23860
V-12	10.1	02:04	10.1	14:00	80-30.2E	07-59.7S	1.20	23.1	23956
V-13	10.1	14:02	10.2	02:35	80-30.3E	07-59.8S	1.26	24.0	23704
V-14	10.2	02:37	10.2	14:00	80-30.8E	08-01.0S	1.15	22.0	23807
V-15	10.2	14:02	10.3	02:00	80-30.9E	08-00.9S	1.20	20.2	20948
V-16	10.3	02:02	10.3	14:00	80-30.5E	08-00.4S	1.17	21.0	22336
V-17	10.3	14:02	10.4	04:36	80-31.0E	08-01.2S	1.47	26.4	22349
V-18	10.4	04:40	10.4	14:00	80-30.5E	07-59.6S	0.94	18.0	23830
V-19	10.4	14:02	10.5	02:00	80-30.1E	08-00.6S	1.21	22.2	22832
V-20	10.5	02:02	10.5	14:00	80-29.6E	08-00.1S	1.21	23.8	24478
V-21	10.5	14:02	10.6	02:00	80-30.1E	08-00.8S	1.21	21.8	22421
V-22	10.6	02:02	10.6	14:00	80-30.0E	08-00.1S	1.21	23.5	24169
V-23	10.6	14:01	10.7	02:01	80-30.8E	08-01.1S	1.21	23.0	23655
V-24	10.7	02:02	10.7	14:00	80-29.9E	07-59.7S	1.22	23.8	24277
V-25	10.7	14:02	10.8	02:00	80-31.2E	08-00.7S	1.22	22.2	22645
V-26	10.8	02:01	10.8	14:00	80-30.9E	08-01.0S	1.23	23.0	23270
V-27	10.8	14:02	10.9	02:00	80-30.5E	08-01.0S	1.23	22.4	22663
V-28	10.9	02:01	10.9	14:01	80-29.9E	07-59.9S	1.12	20.1	22333
V-29	10.9	14:03	10.10	02:00	80-30.6E	08-00.7S	1.17	22.6	24038
V-30	10.10	02:00	10.10	14:00	80-30.1E	08-00.0S	1.17	22.0	23400
V-31	10.10	14:00	10.11	02:00	80-30.4E	08-00.9S	1.17	21.8	23187
V-32	10.11	02:01	10.11	14:00	80-30.7E	08-00.4S	1.17	19.5	20741
V-33	10.11	14:01	10.12	02:00	80-30.6E	08-00.4S	1.17	20.0	21273
V-34	10.12	02:01	10.12	14:00	80-30.3E	07-59.6S	1.17	21.3	22655
V-35	10.12	14:02	10.13	02:01	80-31.1E	08-00.5S	1.17	20.0	21273
V-36	10.13	02:05	10.13	14:00	80-29.9E	08-00.2S	1.16	21.0	22529
V-37	10.13	14:02	10.14	02:01	80-30.9E	08-00.5S	1.17	21.4	22762
V-38	10.14	02:02	10.14	14:00	80-31.0E	08-00.5S	1.17	22.1	23506
V-39	10.14	14:02	10.15	02:02	80-30.7E	08-00.3S	1.17	22.2	23613
V-40	10.15	02:04	10.15	14:01	80-30.0E	07-59.6S	1.17	24.0	25527
V-41	10.15	14:02	10.16	02:00	80-30.9E	08-00.4S	1.17	22.0	23400
V-42	10.16	02:01	10.16	14:00	80-30.5E	07-59.7S	1.18	24.1	25416
V-43	10.16	14:02	10.17	02:01	80-30.2E	08-00.9S	1.18	22.0	23202
V-44	10.17	02:02	10.17	14:00	80-30.6E	08-00.7S	1.18	21.8	22991

V-45	10.17	14:02	10.18	02:00	80-30.7E	08-01.0S	1.15	21.4	23157
V-46	10.18	02:02	10.18	14:00	80-30.1E	07-59.9S	1.14	22.0	24016
V-47	10.18	14:01	10.19	02:00	80-30.9E	08-00.6S	1.15	21.0	22725
V-48	10.19	02:02	10.19	14:00	80-30.8E	07-59.5S	1.14	20.9	22815
V-49	10.19	14:02	10.20	02:00	80-31.2E	08-00.7S	1.14	20.0	21832
V-50	10.20	02:01	10.20	14:00	80-31.5E	07-59.3S	1.14	22.0	24016
V-51	10.20	14:02	10.21	02:00	80-31.3E	07-59.2S	1.14	21.8	23797
V-52	10.21	02:02	10.21	14:00	80-30.7E	07-59.6S	1.14	22.5	24561
V-53	10.21	14:02	10.22	02:00	80-30.8E	08-00.3S	1.14	22.0	24016
V-54	10.22	02:01	10.22	14:01	80-30.4E	07-59.5S	1.14	21.8	23797
V-55	10.22	14:02	10.23	02:00	80-31.5E	07-59.7S	1.14	19.8	21614
V-56	10.23	02:00	10.23	14:00	80-31.3E	07-59.9S	1.14	20.2	22051
V-57	10.23	14:02	10.24	02:00	80-31.6E	07-59.8S	1.14	20.4	22269
V-58	10.24	02:02	10.24	14:00	80-29.8E	06-15.8S	1.14	20.5	22378
V-59	10.24	14:01	10.25	2:00	80-30.1E	03-19.7S	1.15	21.4	23157
V-60	10.25	02:03	10.25	15:00	80-04.9E	00-16.7S	1.23	24.5	24788
V-61	10.25	15:01	10.26	00:00	NAN	NAN	0.86	16.2	23442
V-62	10.29	00:14	10.29	14:15	80-12.0E	01-01.9S	1.25	22.4	22300
V-63	10.29	14:22	10.30	02:01	80-29.4E	03-49.0S	1.05	20.5	24296
V-64	10.30	02:09	10.30	14:00	80-29.9E	06-23.6S	1.07	21.7	25238
V-65	10.30	14:05	10.31	02:02	80-31.1E	08-00.5S	1.08	21.0	24198
V-66	10.31	02:07	10.31	14:00	80-31.2E	08-00.8S	1.07	20.4	23726
V-67	10.31	14:04	11.1	02:00	80-31.0E	08-00.8S	1.07	20.0	23261
V-68	11.1	02:03	11.1	14:00	80-30.1E	08-00.7S	1.07	20.4	23726
V-69	11.1	14:04	11.2	02:00	80-30.6E	08-00.7S	1.07	20.5	23842
V-70	11.2	02:04	11.2	15:03	80-30.0E	07-59.9S	1.16	21.8	23387
V-71	11.2	15:06	11.3	02:00	80-30.7E	08-00.3S	0.98	18.0	22857
V-72	11.3	02:03	11.3	14:00	80-30.8E	07-59.9S	1.07	20.2	23493
V-73	11.3	14:05	11.4	02:00	80-31.2E	08-00.1S	1.07	20.2	23493
V-74	11.4	02:03	11.4	14:00	80-30.8E	08-00.6S	1.07	19.9	23144
V-75	11.4	14:03	11.5	02:00	80-30.9E	08-00.2S	1.07	21.8	25354
V-76	11.5	02:03	11.5	14:00	80-30.9E	07-59.9S	1.06	20.9	24537
V-77	11.5	14:03	11.6	02:00	80-30.9E	07-59.9S	1.07	21.0	24424
V-78	11.6	02:03	11.6	14:00	80-30.4E	07-59.8S	1.07	20.8	24191
V-79	11.6	14:03	11.7	02:00	80-30.5E	07-59.0S	1.07	20.4	23726
V-80	11.7	02:03	11.7	14:00	80-30.3E	07-59.9S	1.07	20.6	23958
V-81	11.7	14:03	11.8	02:00	80-30.7E	08-00.0S	1.07	21.8	25354
V-82	11.8	02:03	11.8	14:01	80-30.8E	07-59.7S	1.07	21.8	25354
V-83	11.8	14:05	11.9	02:00	80-30.7E	08-00.0S	1.07	20.6	23958
V-84	11.9	02:04	11.9	14:00	80-30.3E	08-00.7S	1.07	18.8	21865
V-85	11.9	14:03	11.10	02:01	80-30.1E	08-00.7S	1.07	19.8	23028
V-86	11.10	02:04	11.10	14:00	80-30.1E	08-00.2S	1.07	19.8	23028
V-87	11.10	14:03	11.11	02:00	80.30.8E	07-59.3S	1.07	19.8	23028
V-88	11.11	02:03	11.11	14:12	80.30.5E	07-59.7S	1.09	20.2	23062
V-89	11.11	14:15	11.12	02:00	80-30.7E	07-59.8S	1.05	19.8	23467
V-90	11.12	02:04	11.12	14:00	80-29.2E	08-01.0S	1.06	20.6	24184
V-91	11.12	14:04	11.13	02:00	80-30.0E	07-58.6S	1.07	20.8	24191
V-92	11.13	02:03	11.13	14:00	80-30.5E	07-58.8S	1.08	21.8	25119
V-93	11.13	14:04	11.14	02:00	80-30.1E	07-59.0S	1.08	21.0	24198
V-94	11.14	02:03	11.14	14:00	80-30.2E	07-59.9S	1.08	21.6	24889
V-95	11.14	14:03	11.15	02:00	80-30.9E	08-01.4S	1.07	21.4	24889
V-96	11.15	02:04	11.15	14:00	80-30.3E	08-00.3S	1.08	21.2	24428
V-97	11.15	14:03	11.16	02:00	80-30.6E	08-00.1S	1.07	21.8	25354
V-98	11.16	02:04	11.16	14:00	80-30.8E	07-59.4S	1.07	21.8	25354
V-99	11.16	14:03	11.17	02:01	80-30.5E	08-01.2S	1.07	21.6	25121
V-100	11.17	02:04	11.17	14:00	80-30.8E	08-00.4S	1.07	21.8	25354
V-101	11.17	14:03	11.18	02:00	80-30.7E	08-00.5S	1.07	22.0	25587
V-102	11.18	02:05	11.18	14:00	80-29.5E	08-00.1S	1.06	21.4	25124
V-103	11.18	14:03	11.19	02:00	80-29.6E	08-01.0S	1.07	22.0	25587
V-104	11.19	02:03	11.19	14:00	80-29.9E	07-59.5S	1.07	22.2	25819
V-105	11.19	14:03	11.20	02:00	80-30.7E	08-01.2S	1.07	21.0	24424

V-106	11.20	02:03	11.20	14:07	80-30.4E	08-00.3S	1.08	21.2	24428
V-107	11.20	14:10	11.21	02:00	80-31.2E	08-00.0S	1.06	20.2	23715
V-108	11.21	02:04	11.21	14:00	80-30.1E	08-00.1S	1.08	19.8	22815
V-109	11.21	14:03	11.22	02:00	80-30.5E	07-59.8S	1.08	20.8	23967
V-110	11.22	02:03	11.22	14:00	80-29.8E	08-01.0S	1.08	20.6	23737
V-111	11.22	14:04	11.23	02:00	80-30.6E	08-01.3S	1.07	20.0	23261
V-112	11.23	02:04	11.23	14:00	80-30.4E	08-00.7S	1.07	20.4	23726
V-113	11.23	14:08	11.24	02:00	80-30.7E	08-00.8S	1.07	21.8	25354
V-114	11.24	02:04	11.24	14:00	80-29.6E	08-00.7S	1.07	21.6	25121
V-115	11.24	14:02	11.25	02:00	80-28.7E	08-00.9S	1.07	21.2	24656
V-116	11.25	02:03	11.25	14:55	80-30.0E	07-59.9S	1.14	22.4	24452
V-117	11.25	14:58	11.26	02:00	80-30.9E	07-59.5S	0.98	19.8	25143
V-118	11.26	02:04	11.26	14:00	80-30.6E	08-00.1S	1.06	21.8	25593
V-119	11.26	14:02	11.27	02:02	80-30.4E	08-00.8S	1.07	21.6	25121
V-120	11.27	02:05	11.27	14:00	80-30.1E	08-00.1S	1.07	22.0	25587
V-121	11.27	14:02	11.28	02:00	80-30.2E	08-00.3S	1.08	23.0	26502
V-122	11.28	02:03	11.28	14:00	79-29.0E	06-48.3S	1.07	21.8	25354
V-123	11.28	14:02	11.29	02:15	78-06.0E	05-05.3S	1.09	23.6	26944
V-124	11.29	02:18	11.29	14:00	78-05.9E	05-04.9S	1.05	21.8	25837
V-125	11.29	14:03	11.30	02:00	79-04.0E	02-29.7S	1.07	21.4	24889
V-126	11.30	02:02	11.30	14:00	80-00.8E	00-00.3N	1.07	22.4	26052
V-127	11.30	14:01	12.1	02:00	80-28.2E	01-47.8N	1.09	21.6	24661

Table 5.27-2 Summary of precipitation sampling for isotope analysis.

	Date	Time (UT)	Lon	Lat	Date	Time (UT)	Lon	Lat	Rain (mm)	R/S
R-1	9.25	11:55	91-46.2E	04-04.2N	9.29	07:46	78-06.6E	05-06.6S	13.2	R
R-2	9.29	07:46	78-06.6E	05-06.6S	9.29	17:06	79-12.6E	06-26.8S	0.2	R
R-3	9.29	17:07	79-12.7E	06-26.9S	9.30	08:01	80-31.8E	07-59.2S	1.3	R
R-4	9.30	08:01	80-31.8E	07-59.2S	9/0	21:00	80-29.8E	08-00.0S	3.1	R
R-5	9.30	21:00	80-29.8E	08-00.0S	10.01	13:20	80-29.1E	08-00.0S	59.5	R
R-6	10.01	13:20	80-29.1E	07-59.5S	10.02	07:45	80-30.4E	08-00.2S	1.8	R
R-7	10.02	07:49	80-30.4E	08-00.2S	10.05	00:30	80-30.0E	07-59.8S	69.5	R
R-8	10.05	00:30	80-30.0E	07-59.8S	10.05	03:36	80-29.7E	07-59.7S	5.2	R
R-9	10.05	03:36	80-29.7E	07-59.7S	10.08	05:57	80-30.1E	08-00.0S	1.0	R
R-10	10.08	05:58	80-30.1E	08-00.0S	10.08	08:06	80-31.1E	07-59.8S	4.3	R
R-11	10.08	08:09	80-30.9E	07-59.9S	10.09	04:09	80-30.3E	07-59.8S	4.2	R
R-12	10.09	04:13	80-30.4E	07-59.8S	10.10	00:24	80-29.9E	07-59.8S	2.1	R
R-13	10.10	00:25	80-29.9E	07-59.8S	10.10	16:42	80-29.0E	08-01.3S	16.6	R
R-14	10.10	16:42	80-29.0E	08-01.3S	10.25	03:34	80-30.0E	02-57.0S	9.3	R
R-15	10.29	00:05	79-52.7E	02-13.8N	10.29	13:06	80-11.5E	00-44.5S	32.5	R
R-16	10.29	13:06	80-11.5E	00-44.5S	10.30	00:29	80-28.4E	03-26.4S	32.3	R
R-17	10.30	00:29	80-29.4E	03-26.4S	10.31	00:31	80-29.7E	07-59.9S	13.1	R
R-18	10.31	00:31	80-29.7E	07-54.9S	11.03	14:10	80-30.3E	07-59.6S	0.3	R
R-19	11.03	14:10	80-30.3E	07-59.6S	11.04	00:10	80-30.2E	07-59.8S	2.4	R
R-20	11.04	00:10	80-30.2E	07-59.8S	11.07	11:02	80-31.1E	08-00.3S	0.3	R
R-21	11.07	11:07	80-31.0E	08-00.2S	11.11	10:52	80-31.2E	07-59.6S	1.6	R
R-22	11.11	10:57	80-31.3E	07-59.3S	11.14	00:19	80-29.8E	07-59.9S	1.4	R
R-23	11.14	00:19	80-29.8E	07-59.9S	11.15	03:12	80-29.8E	07-59.8S	1.3	R
R-24	11.15	03:18	80-29.8E	07-59.8S	11.16	00:18	80-29.9E	08-00.1S	0.5	R
R-25	11.16	00:18	80-29.9E	08-00.1S	11.17	02:31	80-30.1E	08-00.1S	0.9	R
R-26	11.17	02:32	80-30.0E	08-00.1S	11.18	00:21	80-29.8E	08-00.1S	1.0	R
R-27	11.19	00:21	80-29.8E	08-00.1S	11.20	00:18	80-30.0E	08-00.2S	4.9	R
R-28	11.20	00:18	80-30.0E	08-00.2S	11.25	00:20	80-30.0E	08-00.2S	10.7	R
R-29	11.25	00:20	80-30.0E	08-00.2S	11.26	00:23	80-30.0E	07-59.9S	13.3	R
R-30	11.26	00:23	80-30.0E	07-59.9S	11.27	12:38	80-29.7E	07-59.8S	8.0	R
R-31	11.27	12:38	80-29.7E	07-59.8S	11.29	00:25	78-08.5E	05-08.9S	28.2	R
R-32	11.29	00:25	78-08.5E	05-08.9S	11.30	00:20	78-55.4E	02-52.8S	3.9	R

Table 5.27-3 Summary of sea surface water sampling for isotope analysis

Sampling No.	Date	Time (UTC)	Position	
			LON	LAT
MR11-07 O- 1	9.26	06:05	88-22.0E	01-43.2E
MR11-07 O- 2	9.27	07:01	84-23.4E	01-12.6S
MR11-07 O- 3	9.28	07:04	80-38.9E	03-52.3S
MR11-07 O- 4	9.29	07:20	78-05.9E	05-05.3S
MR11-07 O- 5	9.30	07:23	80-30.7E	07-59.0S
MR11-07 O- 6	10.1	07:10	80-29.8E	07-59.4S
MR11-07 O- 7	10.2	07:00	80-30.1E	07-59.8S
MR11-07 O- 8	10.3	07:02	80-30.1E	08-00.2S
MR11-07 O- 9	10.4	06:59	80-30.4E	08-00.2S
MR11-07 O- 10	10.5	07:02	80-29.6E	07-59.9S
MR11-07 O- 11	10.6	07:05	80-29.7E	08-00.3S
MR11-07 O- 12	10.7	07:01	80-30.0E	08-00.2S
MR11-07 O- 13	10.8	07:03	80-30.2E	07-59.7S
MR11-07 O- 14	10.9	07:00	80-29.5E	08-00.0S
MR11-07 O- 15	10.10	07:00	80-29.7E	08-00.1S
MR11-07 O- 16	10.11	07:02	80-30.1E	07-59.9S
MR11-07 O- 17	10.12	07:00	80-29.9E	07-59.9S
MR11-07 O- 18	10.13	16:39	80-29.7E	08-00.6S
MR11-07 O- 19	10.14	07:00	80-29.7E	08-00.1S
MR11-07 O- 20	10.15	07:30	80-30.6E	08-00.1S
MR11-07 O- 21	10.16	07:00	80-29.9E	07-59.9S
MR11-07 O- 22	10.17	07:00	80-29.9E	08-00.1S
MR11-07 O- 23	10.18	07:20	80-30.1E	08-00.3S
MR11-07 O- 24	10.19	07:03	80-29.7E	08-00.0S
MR11-07 O- 25	10.20	07:02	80-31.8E	07-59.7S
MR11-07 O- 26	10.21	07:00	80-30.7E	07-59.8S
MR11-07 O- 27	10.22	07:00	80-29.8E	07-59.8S
MR11-07 O- 28	10.23	07:00	80-29.9E	07-59.9S
MR11-07 O- 29	10.24	07:00	80-29.7E	07-58.4S
MR11-07 O- 30	10.25	07:01	80-30.0E	02-07.0N
MR11-07 O- 31	10.29	07:00	80-01.3E	00-40.7N
MR11-07 O- 32	10.30	07:00	80-30.0E	04-50.2S
MR11-07 O- 33	10.31	07:00	80-29.9E	08-00.0S
MR11-07 O- 34	11.1	07:02	80-29.9E	07-59.7S
MR11-07 O- 35	11.2	07:00	80-29.9E	07-59.8S
MR11-07 O- 36	11.3	07:00	80-29.9E	08-00.0S
MR11-07 O- 37	11.4	07:00	80-30.0E	07-59.8S
MR11-07 O- 38	11.5	07:00	80-30.2E	07-59.6S
MR11-07 O- 39	11.6	07:00	80-30.0E	07-59.8S
MR11-07 O- 40	11.7	07:00	80-30.0E	07-59.8S
MR11-07 O- 41	11.8	07:00	80-29.8E	07-59.8S
MR11-07 O- 42	11.9	07:00	80-29.8E	07-59.8S
MR11-07 O- 43	11.10	07:00	80-29.7E	07-59.8S
MR11-07 O- 44	11.11	07:03	80-29.6E	07-59.8S
MR11-07 O- 45	11.12	07:00	80-29.4E	08-00.0S
MR11-07 O- 46	11.13	07:00	80-29.7E	07-59.7S
MR11-07 O- 47	11.14	07:00	80-29.5E	07-59.7S
MR11-07 O- 48	11.15	07:00	80-29.7E	08-00.2S
MR11-07 O- 49	11.16	07:00	80-29.5E	07-59.8S
MR11-07 O- 50	11.17	07:01	80-29.8E	08-00.1S
MR11-07 O- 51	11.18	07:00	80-29.2E	08-00.0S
MR11-07 O- 52	11.19	07:00	80-29.5E	08-00.3S
MR11-07 O- 53	11.20	07:00	80-30.1E	07-59.9S
MR11-07 O- 54	11.21	07:00	80-29.7E	07-59.6S
MR11-07 O- 55	11.22	07:01	80-29.7E	07-59.8S
MR11-07 O- 56	11.23	07:01	80-29.7E	07-59.9S
MR11-07 O- 57	11.24	07:00	80-29.8E	07-59.8S
MR11-07 O- 58	11.25	07:00	80-29.7E	07-59.9S
MR11-07 O- 59	11.26	07:00	80-29.6E	08-00.0S
MR11-07 O- 60	11.27	07:00	80-29.8E	08-00.0S
MR11-07 O- 61	11.28	07:00	80-29.4E	08-00.0S
MR11-07 O- 62	11.29	07:00	78-06.1E	05-07.7S
MR11-07 O- 63	11.30	07:00	79-30.3E	01-19.8S