ECONOMIC AND SOCIAL COMMISSION
FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

WRD/TC.42/5.1 Add. 2
26 January 2010

Typhoon Committee
Forty Second Session
25 to 29 January 2010
Singapore

ACTIVITIES OF THE RSMC TOKYO - TYPHOON CENTER IN 2009

(Item 5 of the Provisional Agenda)

Submitted by the RSMC Tokyo - Typhoon Center

Activities of the RSMC Tokyo - Typhoon Center in 2009

1. Provision of RSMC Products

The RSMC Tokyo - Typhoon Center (referred to here below as *the Center*) provides Typhoon Committee (TYC) Members with a range of products related to tropical cyclones in the western North Pacific and the South China Sea through the GTS and the AFTN. Table 1 shows the total numbers of products issued by the Center in 2009. As from 22 April 2009, the Center started the operational five-day tropical cyclone (TC) track forecasts and issued additional RSMC Tropical Cyclone Advisory (WTPQ50-55 RJTD).

2. Track Forecasts

Operational track forecasts for the 22 TCs that reached TS intensity or higher in 2009 were verified against the Center's analysis data. Figure 1 shows the annual mean position errors of 24-hour (from 1982), 48-hour (from 1988), 72-hour (from 1997), 96-hour and 120-hour (from 2009) forecasts. The errors for the year were 122 km (114km in 2008), 216 km (209 km), 312 km (345 km), 415 km and 528 km for 24-, 48-, 72-, 96- and 120-hour forecasts, respectively. The annual mean position errors for 96- and 120-hour forecasts in 2009 were in line with expectations, while those for forecasts of up to 72 hours have not improved in recent years (Table 2). Track forecasts were especially difficult for Lupit (0920), which followed an unusual path. The mean hitting ratios of probability circles* for 24-, 48-, 72-, 96- and 120-hour forecasts were 69% (77% in 2008), 70% (69%), 70% (63%), 76% and 79%, respectively (Table 3).

* Probability circle: a circular area within which a TC is expected to be located with a probability of 70% at each forecast time, indicating the uncertainty of a forecast

3. Intensity Forecasts

Table 4 gives the root mean square errors (RMSEs) of 24-, 48- and 72-hour intensity forecasts for the 22 TCs of 2009. The annual mean RMSEs for central pressure forecasts were 13.1 hPa (13.9 hPa in 2008), 20.1 hPa (20.2 hPa) and 22.6 hPa (20.5 hPa) for 24-, 48- and 72-hour forecasts, respectively, while those of maximum wind speed forecasts for 24-, 48- and 72-hour forecasts were 6.4 m/s (7.3 m/s in 2008), 8.7 m/s (10.1 m/s) and 9.5 m/s (9.4 m/s), respectively. Intensity forecasts were particularly difficult for TCs that developed rapidly, including Nida (0922) (55-hPa development in 24 hours), Parma (0917) (50-hPa development), Choi-wan (0914) (45-hPa development) and Mirinae (0921) (37-hPa development).

4. RSMC Data Serving System

The Center operates the RSMC Data Serving System (RSMC-DSS) to provide TYC Members with NWP products such as GPVs and observational data through the Internet. The RSMC-DSS was being used by nine TYC Members as of the end of 2009. The products and data provided through this system are listed in Table 5.

5. JMA Numerical Typhoon Prediction (NTP) website

Since October 2004, the Center has officially operated a Numerical Typhoon Prediction (NTP) website in cooperation with eight NWP centers: BoM (Australia), MSC (Canada), CMA (China), ECMWF, DWD (Germany), KMA (Republic of Korea), UKMO (UK) and NCEP (US). The NTP website provides predictions of tropical cyclone tracks derived from models of major NWP centers in order to assist the NMHSs of TYC Members in their tropical cyclone forecasting and warning services. The website is available only to registered organizations, including the NMHSs of TYC Members and participating NWP centers. Eleven TYC Members other than Japan had accessed the website as of the end of 2009. The site's main content is as follows:

1) Predictions of tropical cyclone tracks, in table and chart format, from participating NWP centers together with predictions by the Japan Meteorological Agency (JMA). Ensemble mean prediction with any combination of products is also available.
2) NWP model products, in chart format, from participating NWP centers
3) Results of satellite image analysis (early-stage Dvorak analysis and regular Dvorak analysis)

6. Migration of SAREP and RADOB to BUFR

The Center started disseminating SAREP in BUFR format via the GTS in November 2005 and RADOB in BUFR format in September 2006 in response to the WMO migration plan. As agreed by TYC Members at the 41st session (Chiang Mai, 2009), the Center will stop providing alphanumeric SAREP and RADOB data at the end of 2010. In order to assist SAREP users in their TC monitoring and forecasting, the Center started in June 2009 to post the results of not only regular Dvorak analysis as included in SAREP reports but also those of early-stage Dvorak analysis on the Numerical Typhoon Prediction (NTP) website.

7. Expanded Best Track Data Set for the Western North Pacific and the South China Sea

At the 36th session of the TYC (Kuala Lumpur, 2003), a plan to produce an *Expanded Best Track Data Set for the western North Pacific and the South China Sea* (referred to below as the *EBT*) was approved. In relation to this, the Committee urged TYC Members at the 40th session (Macao, 2007) to send observational and disaster-related data to the Center as soon as possible. As of the end of 2009, 10 TYC Members had provided data to the Center. At the end of 2007, the Center compiled its best track data along with Japan's observational data from 1996 to 2005 in accordance with the updated format reported at the 39th session (Manila, 2006) as an EBT prototype, and sent them to the EBT contacts. In 2008, the Center finished basic screening of the data from 1996 submitted by TYC Members. The results, along with inquiries regarding any questionable information found in observational and disaster-related data submitted by TYC Members, were sent to TYC Members on 9 December 2008. Considering that the EBT is expected to contribute to the disaster-preparedness of TYC Members, those who have not yet provided their data are kindly requested to do so as soon as possible.

8. Regional storm surge watch scheme suitable for the TYC region

Following the recommendation of the WGM at the 41st session of the TYC (Chiang Mai, 2009), the Center distributed a survey in June 2009, and 12 TYC Members had responded as of the end of 2009. The survey's aim is to collect information on the present status of TYC Members in using storm surge models in order to develop future plan for the establishment of a regional storm surge watch scheme suitable for the TYC region. After reviewing the survey responses, the Center plans to provide distribution maps and time-series charts of storm surges. For this purpose, TYC Members are expected to provide the Center with bathymetric data of their surrounding areas together with sea level data from past measurements.

9. Publications

The Center published *Technical Review No. 11* in March 2009 and *Annual Report on the Activities of the RSMC Tokyo - Typhoon Center in 2008* in December 2009. These are also available on the Center's website at http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm.

10. Training

Two forecasters from China and Malaysia visited the Center from 22 to 31 July 2009 to participate in annual on-the-job training for typhoon operations. During the two weeks of training, they experienced the operational procedures of the Center in the analysis and forecasting of tropical cyclones.

11. Implementation Plans

Table 6 shows the implementation plans of the Center for the period from 2009 to 2013. The Center started providing cloud motion wind data for the Northern Hemisphere in BUFR format every three hours in August 2009. In April 2009, it started issuing five-day track forecasts and provided TYC Members with this information in the RSMC Tropical Cyclone Advisory. Ensemble mean data of TEPS track prediction up to 132 hours ahead were also provided through the NTP website and the GTS. In addition, the Center posted the results of early-stage Dvorak analysis and regular Dvorak analysis was posted on NTP website in June 2009 instead of the dissemination of alphanumeric SAREP data, which will be discontinued at the end of 2010. The switchover for the meteorological mission of MTSAT from MTSAT-1R to MTSAT-2 is provisionally scheduled for 1 July 2010. More information is available on the MSC webpage at
http://mscweb.kishou.go.jp/notice/switch_over_e.htm.

Table 1 Monthly and annual total numbers of products issued by the RSMC Tokyo - Typhoon Center in 2009

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TCNA20	0	0	0	0	40	30	17	103	105	170	37	8	510
TCNA21	0	0	0	0	43	32	23	115	118	180	46	8	565
IUCC10	0	0	0	0	83	62	40	218	223	350	83	16	1075
WTPQ20-25	0	0	0	0	89	65	48	232	246	359	96	17	1152
WTPQ30-35	0	0	0	0	22	16	12	57	60	89	23	4	283
WTPQ50-55	0	0	0	0	33	15	3	51	64	124	30	3	323
FXPQ20-25	0	0	0	0	86	64	46	228	236	359	92	16	1127
FKPQ30-35	0	0	0	0	43	32	23	115	118	179	47	8	565
AXPQ20	1	0	0	0	0	2	0	2	2	4	8	3	22

Notes:

TCNA20/21 RJTD	SAREP (TACs)
IUCC10 RJTD	SAREP (BUFR format)
WTPQ20-25 RJTD	RSMC Tropical Cyclone Advisory
WTPQ30-35 RJTD	RSMC Prognostic Reasoning
WTPQ50-55 RJTD	**RSMC Tropical Cyclone Advisory for five-day track forecast (from 2009)**
FXPQ20-25 RJTD	RSMC Guidance for Forecast
FKPQ30-35 RJTD	Tropical Cyclone Advisory for SIGMET
AXPQ20 RJTD	RSMC Tropical Cyclone Best Track

Table 2 Mean position errors of track forecasts for the 22 TCs in 2009

Tropical Cyclone			24-hour Forecast				48-hour Forecast				72-hour Forecast				96-hour Forecast				120-hour Forecast			
			Position Error & Number of Forecast				Position Error & Number of Forecast				Position Error & Number of Forecast				Position Error & Number of Forecast				Position Error & Number of Forecast			
			Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num	EO/EP (%)	Mean (km)	S.D. (km)	Num	EO/EP (%)	Mean (km)	S.D. (km)	Num	EO/EP (%)
TY	KUJIRA	(0901)	119	49	16	57	256	105	11	51	431	155	7	52	737	191	3	48	-	-	0	-
TY	CHAN-HOM	(0902)	189	94	18	92	364	244	14	71	408	251	10	42	585	159	6	54	882	62	2	-
STS	LINFA	(0903)	91	44	12	45	188	55	8	42	356	23	4	40	-	-	0	-	-	-	0	-
TS	NANGKA	(0904)	132	36	10	73	255	32	6	53	456	24	2	-	-	-	0	-	-	-	0	-
TS	SOUDELOR	(0905)	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TY	MOLAVE	(0906)	102	59	8	57	208	68	3	49	-	-	0	-	-	-	0	-	-	-	0	-
TS	GONI	(0907)	137	147	8	62	174	162	3	27	608	608	1	-	-	-	0	-	-	-	0	-
TY	MORAKOT	(0908)	111	66	26	42	192	83	21	31	280	114	16	26	251	170	12	17	339	224	8	23
TS	ETAU	(0909)	141	71	11	37	379	99	6	32	491	30	2	25	-	-	0	-	-	-	0	-
TY	VAMCO	(0910)	121	69	29	51	193	80	25	38	236	107	21	34	328	252	17	31	328	184	13	23
STS	KROVANH	(0911)	152	111	12	24	180	171	8	9	458	282	4	32	-	-	0	-	-	-	0	-
STS	DUJUAN	(0912)	136	83	21	41	219	99	17	29	245	95	13	28	390	196	9	66	572	384	5	53
TS	MUJIGAE	(0913)	273	73	4	121	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TY	CHOI-WAN	(0914)	82	50	27	40	107	86	23	20	128	75	19	16	234	84	15	22	440	138	11	34
TY	KOPPU	(0915)	124	26	3	56	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TY	KETSANA	(0916)	84	36	13	47	106	39	9	26	154	48	5	15	345	-	1	-	-	-	0	-
TY	PARMA	(0917)	121	75	47	66	218	123	42	48	288	167	38	39	394	191	37	33	467	226	34	33
TY	MELOR	(0918)	88	65	30	33	168	121	26	25	232	145	22	21	365	212	18	27	452	113	14	30
TS	NEPARTAK	(0919)	159	142	15	64	265	144	11	44	785	348	7	87	1571	87	3	101	-	-	0	-
TY	LUPIT	(0920)	167	99	42	61	367	286	38	55	575	426	33	50	720	391	29	46	1012	558	25	66
TY	MIRINAE	(0921)	99	43	22	86	174	85	18	63	232	128	14	47	400	208	10	46	667	171	6	73
TY	NIDA	(0922)	75	39	34	51	125	49	30	34	142	60	26	21	138	93	22	13	212	157	18	19
Annual Mean (Total)			122	81	408	52	216	163	319	39	312	260	244	35	415	321	182	34	528	387	136	39

Notes: S.D. means standard deviation of operational forecast errors.

Num. means numbers of forecasts.

EO/EP indicates the ratio of EO (mean position error of operational forecasts) to EP (mean position error of forecasts by the persistency forecast).

.

Table 3 Mean hitting ratios (%) and radii (km) of 70% probability circles issued for track forecasts for the 22 TCs in 2009

Tropical Cyclone			24-hour Forecast			48-hour Forecast			72-hour Forecast			96-hour Forecast			120-hour Forecast		
			Ratio (%)	Num.	Radius (km)	Ratio (%)	Num.	Radius (km)	Ratio (%)	Num.	Radius (km)	Ratio (%)	Num.	Radius (km)	Ratio (%)	Num.	Radius (km)
TY	KUJIRA	(0901)	88	16	162	64	11	327	57	7	455	33	3	519	-	0	-
TY	CHAN-HOM	(0902)	39	18	158	57	14	290	60	10	408	33	6	445	0	2	556
STS	LINFA	(0903)	92	12	158	100	8	294	100	4	408	-	0	-	-	0	-
TS	NANGKA	(0904)	60	10	135	0	6	204	0	2	296	-	0	-	-	0	-
TS	SOUDELOR	(0905)	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-
TY	MOLAVE	(0906)	75	8	149	67	3	241	-	0	-	-	0	-	-	0	-
TS	GONI	(0907)	62	8	137	33	3	204	0	1	296	-	0	-	-	0	-
TY	MORAKOT	(0908)	69	26	142	62	21	216	56	16	296	92	12	476	88	8	643
TS	ETAU	(0909)	64	11	163	33	6	327	0	2	408	-	0	-	-	0	-
TY	VAMCO	(0910)	66	29	144	72	25	252	81	21	353	82	17	566	100	13	752
STS	KROVANH	(0911)	58	12	146	75	8	292	50	4	426	-	0	-	-	0	-
STS	DUJUAN	(0912)	71	21	165	82	17	322	100	13	433	89	9	650	100	5	926
TS	MUJIGAE	(0913)	0	4	130	-	0	-	-	0	-	-	0	-	-	0	-
TY	CHOI-WAN	(0914)	89	27	139	87	23	246	100	19	349	100	15	516	91	11	676
TY	KOPPU	(0915)	33	3	130	-	0	-	-	0	-	-	0	-	-	0	-
TY	KETSANA	(0916)	85	13	132	100	9	204	100	5	296	100	1	519	-	0	-
TY	PARMA	(0917)	60	47	139	64	42	240	63	38	342	73	37	485	88	34	652
TY	MELOR	(0918)	77	30	140	85	26	259	86	22	384	89	18	498	100	14	645
TS	NEPARTAK	(0919)	67	15	148	55	11	288	14	7	400	0	3	788	-	0	-
TY	LUPIT	(0920)	52	42	147	37	38	248	27	33	345	41	29	532	28	25	640
TY	MIRINAE	(0921)	82	22	142	83	18	266	93	14	394	90	10	544	67	6	757
TY	NIDA	(0922)	88	34	135	100	30	221	100	26	329	100	22	635	100	18	819
Annual Mean (Total)			69	408	145	70	319	256	70	244	360	76	182	537	79	136	695

Notes: Num. means numbers of forecasts.

Table 4 Root mean square errors (RMSEs) of intensity forecasts for the 22 TCs in 2009

Tropical Cyclone			24-hour Forecast			48-hour Forecast			72-hour Forecast		
			Central pressure (hPa)	Maximum sustained wind (m/s)	Num.	Central pressure (hPa)	Maximum sustained wind (m/s)	Num.	Central pressure (hPa)	Maximum sustained wind (hPa)	Num.
TY	KUJIRA	(0901)	15.3	6.3	16	16.7	6.3	11	22.6	11.2	7
TY	CHAN-HOM	(0902)	7.2	3.1	18	8.9	4.5	14	10.4	5.6	10
STS	LINFA	(0903)	5.3	3.0	12	9.5	4.8	8	8.7	5.3	4
TS	NANGKA	(0904)	4.1	3.2	10	7.7	5.8	6	4.5	3.6	2
TS	SOUDELOR	(0905)	-	-	0	-	-	0	-	-	0
TY	MOLAVE	(0906)	10.2	14.6	8	6.6	5.6	3	-	-	0
TS	GONI	(0907)	4.0	11.1	8	2.0	1.5	3	4.0	18.0	1
TY	MORAKOT	(0908)	11.2	6.3	26	15.0	8.4	21	13.6	4.6	16
TS	ETAU	(0909)	4.8	4.3	11	5.1	5.1	6	2.0	5.1	2
TY	VAMCO	(0910)	12.4	6.1	29	18.4	9.1	25	15.9	8.4	21
STS	KROVANH	(0911)	6.3	2.8	12	5.5	2.9	8	6.8	2.9	4
STS	DUJUAN	(0912)	4.0	2.2	21	9.2	4.8	17	12.0	6.2	13
TS	MUJIGAE	(0913)	2.4	1.3	4	-	-	0	-	-	0
TY	CHOI-WAN	(0914)	17.1	7.4	27	29.2	11.0	23	34.6	12.0	19
TY	KOPPU	(0915)	9.1	6.6	3	-	-	0	-	-	0
TY	KETSANA	(0916)	6.0	4.0	13	8.5	4.5	9	12.8	6.1	5
TY	PARMA	(0917)	18.7	8.2	47	26.8	12.5	42	28.0	12.9	38
TY	MELOR	(0918)	16.5	6.6	30	18.6	8.0	26	19.0	8.3	22
TS	NEPARTAK	(0919)	6.1	2.9	15	8.3	3.5	11	10.0	4.1	7
TY	LUPIT	(0920)	10.6	4.4	42	18.1	7.3	38	20.7	7.4	33
TY	MIRINAE	(0921)	16.2	6.3	22	24.0	9.0	18	33.5	13.1	14
TY	NIDA	(0922)	18.3	8.6	34	28.8	11.7	30	25.9	10.5	26
Annual Mean (Total)			13.1	6.4	408	20.1	8.7	319	22.6	9.5	244

Notes: Num. means numbers of forecasts.

Table 5 List of GPV products and data provided with the RSMC Data Serving System (as of the end of November)

Model	GSM	GSM	GSM
Area and resolution	Whole globe, 1.25° × 1.25°	20°S–60°N, 60°E–160°W 1.25° × 1.25°	Whole globe, 2.5° × 2.5°
Levels and elements	10 hPa: Z, U, V, T 20 hPa: Z, U, V, T 30 hPa: Z, U, V, T 50 hPa: Z, U, V, T 70 hPa: Z, U, V, T 100 hPa: Z, U, V, T 150 hPa: Z, U, V, T 200 hPa: Z, U, V, T, ψ, χ 250 hPa: Z, U, V, T 300 hPa: Z, U, V, T, H, ω 400 hPa: Z, U, V, T, H, ω 500 hPa: Z, U, V, T, H, ω, ζ 600 hPa: Z, U, V, T, H, ω 700 hPa: Z, U, V, T, H, ω 850 hPa: Z, U, V, T, H, ω, ψ, χ 925 hPa: Z, U, V, T, H, ω 1000 hPa: Z, U, V, T, H, ω Surface: P, U, V, T, H, R†	10 hPa: Z, U, V, T 20 hPa: Z, U, V, T 30 hPa: Z, U, V, T 50 hPa: Z, U, V, T 70 hPa: Z, U, V, T 100 hPa: Z, U, V, T 150 hPa: Z, U, V, T 200 hPa: Z§, U§, V§, T§, ψ, χ 250 hPa: Z, U, V, T 300 hPa: Z, U, V, T, D 400 hPa: Z, U, V, T, D 500 hPa: Z§, U§, V§, T§, D§, ζ 700 hPa: Z§, U§, V§, T§, D§, ω 850 hPa: Z§, U§, V§, T§, D§, ω, ψ, χ 925 hPa: Z, U, V, T, D, ω 1000 hPa: Z, U, V, T, D Surface: P¶, U¶, V¶, T¶, D¶, R¶	10 hPa: Z*, U*, V*, T* 20 hPa: Z*, U*, V*, T* 30 hPa: Z°, U°, V°, T° 50 hPa: Z°, U°, V°, T° 70 hPa: Z°, U°, V°, T° 100 hPa: Z°, U°, V°, T° 150 hPa: Z*, U*, V*, T* 200 hPa: Z, U, V, T 250 hPa: Z°, U°, V°, T° 300 hPa: Z, U, V, T, D*‡ 400 hPa: Z*, U*, V*, T*, D*‡ 500 hPa: Z, U, V, T, D*‡ 700 hPa: Z, U, V, T, D 850 hPa: Z, U, V, T, D 1000 hPa: Z, U*, V*, T*, D*‡ Surface: P, U, V, T, D‡, R†
Forecast hours	0– 84 (every 6 hours) and 96–192 (every 12 hours) † Except analysis	0–84 (every 6 hours) § 96–192 (every 24 hours) are also available for 12 UTC Initial time. ¶ 0–192 (every 6 hours)	0– 72 (every 24 hours); 96–192 (every 24 hours) are also available for 12 UTC Initial time. ° 0–120 for 12 UTC † Except analysis * Analysis only
Initial times	00, 06, 12, 18 UTC	00, 06, 12, 18 UTC	00, 12UTC ‡ 00 UTC only

Model	GSM	Mid-range EPS
Area and resolution	20°S–60°N, 80°E–200°E 2.5° × 2.5°	Whole globe, 2.5° × 2.5°
Levels and elements	100 hPa: Z, U, V, T 150 hPa: Z, U, V, T 200 hPa: Z, U, V, T 250 hPa: Z, U, V, T 300 hPa: Z, U, V, T 500 hPa: Z, U, V, T, D, ζ 700 hPa: Z, U, V, T, D, ω 850 hPa: Z, U, V, T, D, ω Surface: P, U, V, T, D, R	250 hPa: μU, σU, μV, σV 500 hPa: μZ, σZ 850 hPa: μU, σU, μV, σV, μT, σT 1000 hPa: μZ, σZ Surface: μP, σP
Forecast hours	0–36 (every 6 hours), 48, 60 and 72	0–192 (every 12 hours)
Initial times	00, 12 UTC	12 UTC

Notes: Z: geopotential height U: eastward wind V: northward wind
T: temperature D: dewpoint depression H: relative humidity
ω: vertical velocity ζ: vorticity ψ: stream function
χ: velocity potential P: sea level pressure R: rainfall

The prefixes μ and σ represent the average and standard deviation of ensemble prediction results respectively.
The symbols °, *, ¶, §, ‡ and † indicate limitations on forecast hours or initial time as shown in the notes.

Table 5 (continued)

Data	Satellite products	Tropical cyclone Information	Wave data	Observational data
Contents/ Frequency (initial time)	High density atmospheric motion vectors (BUFR) (a) MTSAT-1R (VIS, IR, WV) • 0-60N, 90E-170W: 00, 03, 06, 09, 12, 15, 18 and 21 UTC • 60S-0, 90E-170W: 00, 06, 12 and 18 UTC (b) METEOSAT-7 (VIS, IR, WV) VIS: every 1.5hours between 01:30 and 15:00 UTC IR, WV: every 1.5hours	Tropical cyclone related information (BUFR) • tropical cyclone analysis data 00, 06, 12 and 18 UTC	Global Wave Model (GRIB2) • significant wave height • prevailing wave period • wave direction Forecast hours: 0–84 every 6 hours (00, 06 and 18UTC) 0–84 every 6 hours and 96-192 every 12 hours (12 UTC)	(a) Surface data (SYNOP, SHIP, BUOY) Mostly 4 times a day (b) Upper-air data (TEMP, parts A-D) (PILOT, parts A-D) Mostly twice a day

Table 6 Implementation Plans of the RSMC Tokyo - Typhoon Center (2009-2013)

PRODUCT	2009	2010	2011	2012	2013	REMARKS
Satellite Observation						
MTSAT HRIT	———	———	———	———	———	All observed cloud images (full or half-disk)
MTSAT LRIT	———	———	———	———	———	24 times/day (full-disk) 24 times/day (polar-stereo East Asia)
Cloud motion wind (BUFR)		———	———	———	———	8 times/day (Northern Hemisphere) 4 times/day (Sorthern Hemisphere)
						MTSAT-1R to be replaced by MTSAT-2 in mid 2010
Analysis						
RSMC Tropical Cyclone Advisory	———	———	———	———	———	8 times/day
SAREP (for tropical cyclones, TACs)	·····	·····				8 times/day Position of cloud sytem center, etc.
SAREP (for tropical cyclones, BUFR)	———	———	———	———	———	4 times/day Dvorak intensity
Numerical Typhoon Website **satellite image analysis for tropical cyclones**		———	———	———	———	4 times/day early stage Dvorak analysis & regular Dvorak analysis
Sea Surface Temperature Objective analysis pressure pattern, etc	———	———	———	———	———	
Forecast						
RSMC Tropical Cyclone Advisory	———	———	———	———	———	4 times/day up to 72 hrs ahead **(120 hrs from 2009)** 8 times/day up to 24 hrs ahead
RSMC Prognostic Reasoning	———	———	———	———	———	2 times/day
RSMC Guidance for Forecast	———	———	———	———	———	4 times/day up to 84 hrs ahead (GSM) **4 times/day up to 132 hrs ahead (TEPS) (from 2009)**
NWP products pressure pattern, etc	———	———	———	———	———	
Numerical Typhoon Prediction Website tracks and prediction fields, etc	———	———	———	———	———	mostly updated 2 times/day **4 times/day up to 132 hrs ahead (TEPS) (from 2009)**
Storm surge						
Preliminary survey and prepartion	———	———	———			
Storm surge distirbution map			———	———	———	**map area to be expanded gradually**
Storm surge time series chart				———	———	**on trial basis from 2012**
Others						
RSMC Tropical Cyclone Best Track	———	———	———	———	———	
Annual Report	———	———	———	———	———	Publication
Technical Review	·····	·····	·····	·····	·····	Publication (as necessary)

SUPPORTING ACTIVITY	2009	2010	2011	2012	2013	REMARKS
Data archive	———	———	———	———	———	
Monitoring of data exchange	———	———	———	———	———	
Dissemination of products	———	———	———	———	———	RSMC Data Serving System

Figure 1 Annual mean position errors of track forecasts

Vertical axis: position error (km), Horizontal axis: year