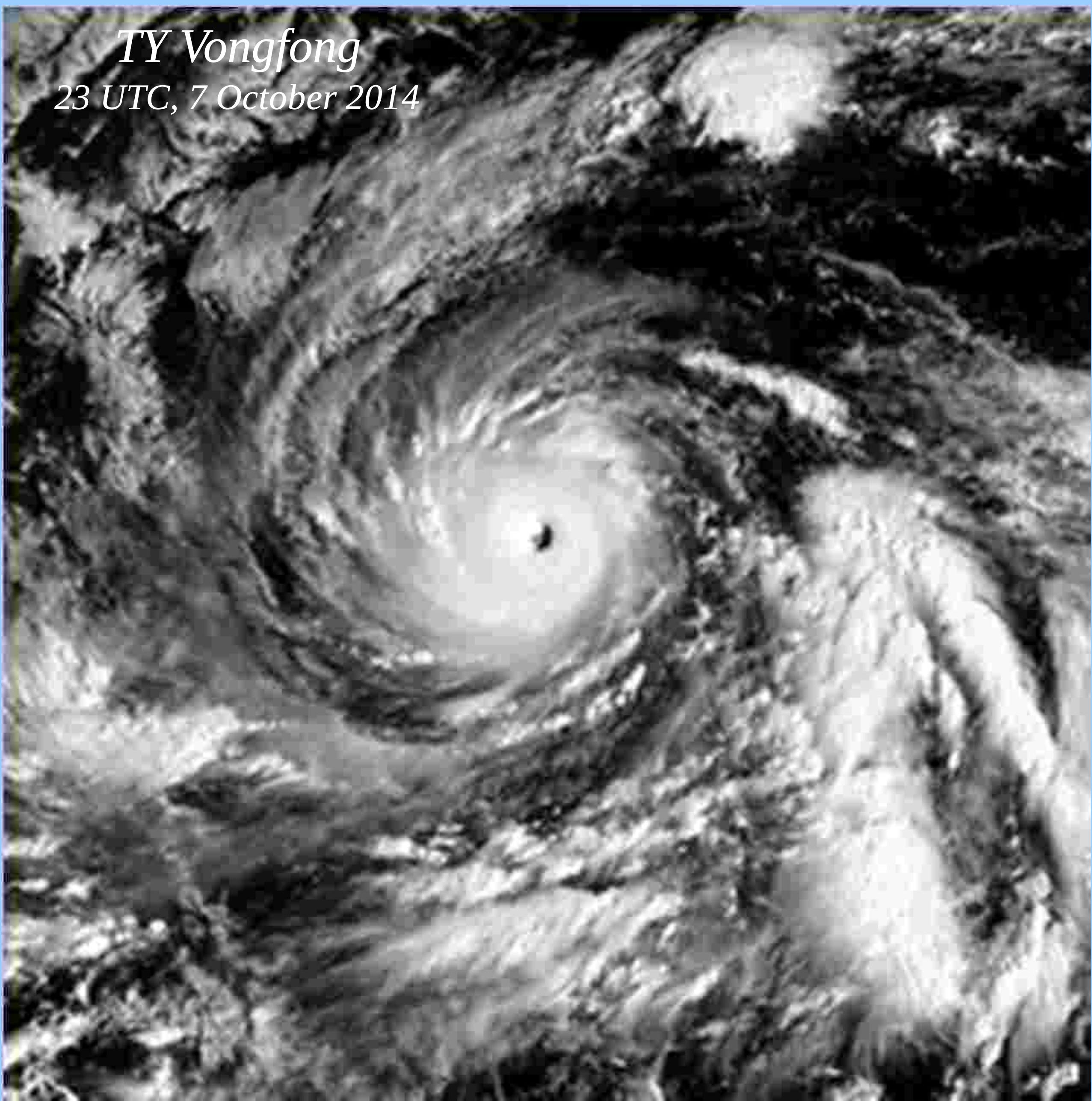
Annual Report
on the Activities of
the RSMC Tokyo - Typhoon Center
2014



Japan Meteorological Agency

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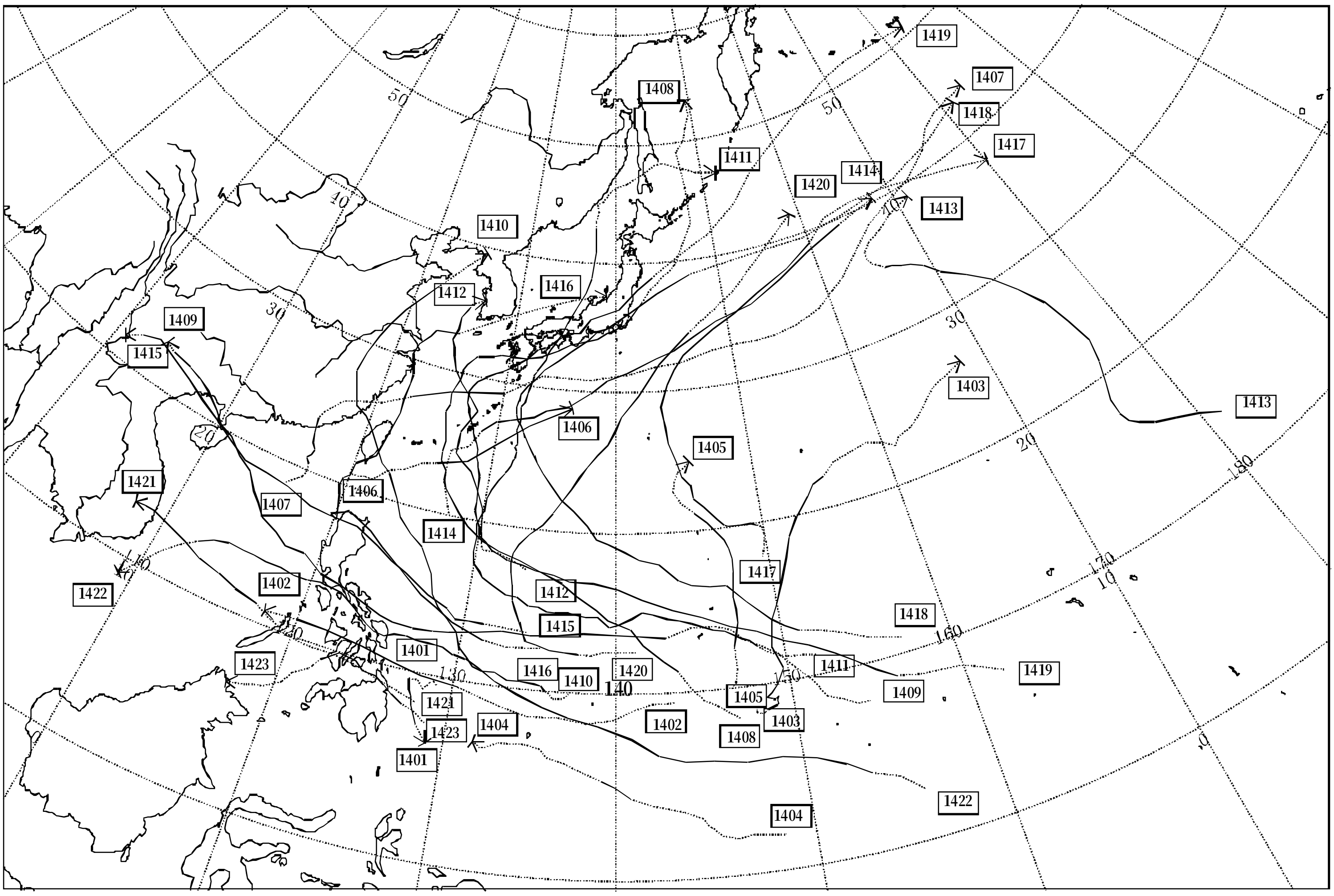

Japan Meteorological Agency

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Introduction

The RSMC Tokyo - Typhoon Center (referred to here as *the Center*) is a Regional Specialized Meteorological Centre (RSMC) that carries out specialized activities in analysis, tracking and forecasting of western North Pacific tropical cyclones (TCs) within the framework of the World Weather Watch (WWW) Programme of the World Meteorological Organization (WMO). The Center was established at the headquarters of the Japan Meteorological Agency (JMA) in July 1989 following a designation by the WMO Executive Council at its 40th session (Geneva, June 1988).

The Center conducts the following operations on a routine basis:

(1) Preparation of information on the formation, movement and development of TCs and associated meteorological phenomena

(2) Preparation of information on synoptic-scale atmospheric situations that affect the behavior of TCs

(3) Provision of the above information to National Meteorological Services (NMSs), and in particular to ESCAP/WMO Typhoon Committee Members, in appropriate formats for operational processing

In addition to the routine services outlined above, the Center distributes a series of reports entitled *Annual Report on the Activities of the RSMC Tokyo - Typhoon Center* as operational references for the NMSs concerned. The reports summarize the activities of the Center and review the TCs of the preceding year.

In this issue covering 2014, Chapter 1 outlines routine operations performed at the Center and its operational products, while Chapter 2 reports on its major activities in 2014. Chapter 3 describes atmospheric and oceanic conditions in the tropics and notes the highlights of TC activity in 2014. In Chapter 4, verification statistics relating to operational forecasts and the results of the Center's numerical weather prediction (NWP) models are presented. Best track data for 2014 TCs are shown in table and chart form in the appendices. All relevant text, tables, charts and appendices are included on the DVD provided with this report.

The DVD contains hourly cloud images of all 2014 TCs of TS intensity or higher within the Center's area of responsibility. Also included is the necessary viewer software, which features various functions for analyzing satellite imagery (such as image animations) and facilitates efficient post-analysis of TCs and their environments. A setup program and a user manual for the software are included on the DVD. Appendix 8 gives an outline of the DVD and instructions on using the software.

Chapter 1

Operations at the RSMC Tokyo - Typhoon Center in 2014

The Center's area of responsibility covers the western North Pacific and the South China Sea (0° – 60°N, 100° – 180°E) including marginal seas and adjacent land areas (Figure 1.1). The Center carries out analysis and forecasting in relation to tropical cyclones (TCs) in the area and also provides the relevant National Meteorological Services (NMSs) with RSMC products via the Global Telecommunication System (GTS), the Aeronautical Fixed Telecommunication Network (AFTN), the Internet and other media.

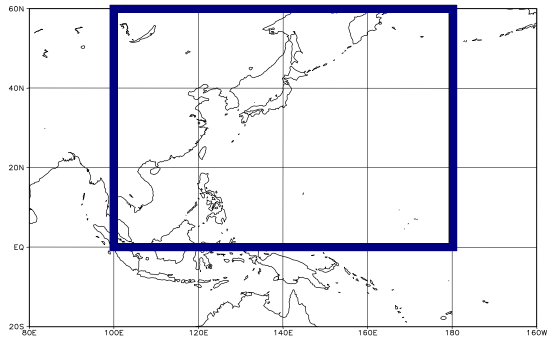


Figure 1.1
Area of responsibility of the RSMC Tokyo - Typhoon Center

1.1 Analysis

TC analysis is performed eight times a day at 00, 03, 06, 09, 12, 15, 18 and 21 UTC, and begins with determination of the TC's center position. Cloud images from the Multi-functional Transport Satellite (MTSAT) are the principal source for this determination, especially for TCs migrating over data-sparse ocean areas. Information on the TC's direction and speed of movement is extracted primarily from six-hourly displacement vectors of the center position.

The central pressure of TCs is determined mainly from the CI number, which is derived from satellite imagery using the Dvorak method. The CI number also gives the maximum sustained wind speed in the vicinity of the center. The radii of circles representing winds with speeds of more than 30 and 50 knots are determined mainly from surface observation, ASCAT observation and low-level cloud motion winds (LCW) derived from cloud motion vectors of satellite images in the vicinity of the TC.

1.2 Forecasts

As a primary basis for TC track forecasts, JMA implements NWP using the Global Spectral Model (GSM) and the Typhoon Ensemble Prediction System (TEPS). The GSM (TL959L100; upgraded on 18 March, 2014) has a horizontal resolution of approximately 20 km and 100 vertical layers, while TEPS (TL479L60; operational as of 11 March 2014) has 25 members with a horizontal resolution of approximately 40 km and 60 vertical layers. Using mainly TEPS, JMA extended its TC track forecast up to five days ahead as of April 2009. Further details and recent model improvements are detailed in Appendix 6. In terms of TC intensity, central pressure and maximum sustained wind speeds are forecast using the results of NWP models and the Dvorak method.

A probability circle shows the range into which the center of a TC is expected to move with 70% probability at each validation time. The radius of the circle is statistically determined according to the speed of TC movement based on the results of recent TC track forecast verification.

1.3 Provision of RSMC Products

The Center prepares and distributes the RSMC bulletins listed below via the GTS and the AFTN when:

- a TC of tropical storm (TS) intensity or higher exists in the Center's area of responsibility
- a TC is expected to reach or exceed TS intensity in the area within 24 hours

RSMC products are continually issued while any TC of TS intensity or higher exists in the Center's area of responsibility. Appendix 5 denotes the code forms of the bulletins.

(1) RSMC Tropical Cyclone Advisory (WTPQ20-25 RJTD: via GTS)

The RSMC Tropical Cyclone Advisory is issued eight times a day after observations made at 00, 03, 06, 09, 12, 15, 18 and 21 UTC, and reports the following elements in analysis, and in 24-, 48- and 72-hour forecasts for TCs:

Analysis	Center position Accuracy of center position determination Direction and speed of movement Central pressure Maximum sustained wind speed (10-minute average) Maximum gust wind speed Radii of wind areas over 50 and 30 knots
24-, 48- and 72-hour forecasts	Center position and radius of probability circle Direction and speed of movement Central pressure Maximum sustained wind speed (10-minute average) Maximum gust wind speed

(2) RSMC Tropical Cyclone Advisory for Five-day Track Forecast (WTPQ50-55 RJTD: via GTS)

The RSMC Tropical Cyclone Advisory for Five-day Track Forecast is issued four times a day after observations made at 00, 06, 12 and 18UTC, and reports the following elements in analysis and in 24-, 48-, 72-, 96- and 120-hour forecasts for TCs:

Analysis	Center position Accuracy of center position determination Direction and speed of movement Central pressure Maximum sustained wind speed (10-minute average) Maximum gust wind speed

	Radii of wind areas over 50 and 30 knots
24-, 48- and 72-hour forecasts	Center position and radius of probability circle Direction and speed of movement Central pressure Maximum sustained wind speed (10-minute average) Maximum gust wind speed
96- and 120-hour forecasts	Center position and radius of probability circle Direction and speed of movement

(3) RSMC Guidance for Forecast (FXPQ20-25 RJTD: via GTS)

The RSMC Guidance for Forecast reports the results of predictions made by the GSM; which is run four times a day with initial analyses at 00, 06, 12 and 18 UTC. The guidance presents six-hourly GSM predictions for TCs up to 84 hours ahead and TEPS mean six-hourly predictions up to 132 hours ahead, and reports the following elements:

NWP prediction (T = 06 to 84 or 132)
Center position
Central pressure*
Maximum sustained wind speed*

** Predictions of these parameters are given as deviations from those at the initial time.*

(4) SAREP (IUCC10 RJTD: via GTS)

The SAREP in BUFR format reports on the results of TC analysis including intensity information (i.e., the CI number) based on the Dvorak method. It is issued 30 minutes to an hour after observations made at 00, 03, 06, 09, 12, 15, 18 and 21 UTC, and reports the following elements:

MTSAT imagery analysis	Center position Accuracy of center position determination Direction and speed of movement Mean diameter of overcast cloud Apparent past 24-hour change in intensity** Dvorak Intensity (CI, T, DT, MET, PT number) ** Cloud pattern type of the DT number** Trend of past 24-hour change** Cloud pattern type of the PT number** Type of the final T-number**

*** Reported only at 00, 06, 12 and 18 UTC*

BUFR/CREX templates for translation into table-driven code forms are provided on the WMO website at http://www.wmo.int/pages/prog/www/WMOCodes.html

(5) RSMC Prognostic Reasoning (WTPQ30-35 RJTD: via GTS)

The RSMC Prognostic Reasoning report provides brief reasoning for TC forecasts, and is issued at 00 and 06 UTC following the issuance of the RSMC Tropical Cyclone Advisory. In the bulletin, general comments on the forecasting method, the synoptic situation of the subtropical ridge, the movement and intensity of the TC as well as relevant remarks are given in plain language.

(6) RSMC Tropical Cyclone Best Track (AXPQ20 RJTD: via GTS)

The RSMC Tropical Cyclone Best Track report provides post-analysis data on TCs of TS intensity or higher. It reports the center position, the central pressure and the maximum sustained wind speed. The best track for each TC is usually finalized one and a half months after the termination of related issuance of the above RSMC bulletins.

(7) Tropical Cyclone Advisory for SIGMET (FKPQ30-35 RJTD: via AFTN)

As a Tropical Cyclone Advisory Centre within the framework of the International Civil Aviation Organization (ICAO), the Center provides Tropical Cyclone Advisory for SIGMET to Meteorological Watch Offices (MWOs) in order to support their preparations of SIGMET information on TCs. These advisories include the following elements in analysis and in 6-, 12-, 18- and 24-hour forecasts***:

**** The 6- and 18-hour forecasts were added on 22 May, 2008.*

Analysis	Center position Direction and speed of movement Central pressure Maximum sustained wind speed (10-minute average)
Forecast	Center position Maximum sustained wind speed (10-minute average)

1.4 RSMC Data Serving System Upgrade to WMO Information System

As designated at the Sixteenth WMO Congress in June 2011, the Center introduced Data Collection or Production Center (DCPC) service under the Global Information System Center (GISC) Tokyo in August 2011. It provides NWP products such as data on predicted fields in grid-point-value (GPV) form and observational values through WIS Data Discovery, Access and Retrieval (DAR) via a new GISC Tokyo server (http://www.wis-jma.go.jp/). GSM products with resolution of 0.5 and 0.25 degrees (surface layer) and JMA SATAID Service (http://www.wis-jma.go.jp/cms/sataid/) are also available from the server through WIS DAR. All products available via the new server are listed in Appendix 7.

1.5 RSMC Tokyo - Typhoon Center Website

The RSMC Tokyo - Typhoon Center Website provides TC advisories on a real-time basis and a wide variety of products including TC analysis archives, technical reviews and annual reports on the Center's activities at http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm .

1.6 Numerical Typhoon Prediction Website

Since 1 October, 2004, JMA has operated the Numerical Typhoon Prediction (NTP) website (https://tynwp-web.kishou.go.jp/). The site provides TC track predictions from eight major NWP centers (BoM (Australia), CMA (China), CMC (Canada), DWD (Germany), ECMWF, KMA (Republic of Korea), NCEP (USA), UKMO (UK) and JMA) to assist the NMSs of Typhoon Committee Members in improving their TC forecasting and warning services. The site includes:

- Table/chart format TC track predictions from the participating NWP centers with several useful functions such as ensemble mean derivation from any combination of predictions
- Weather charts from NWP models of the participating NWP centers (up to 72 hours ahead)
- Results of JMA's operational TC analysis conducted using satellite images (conventional Dvorak analysis and Early-stage Dvorak analysis)
- Storm surge distribution maps for the Typhoon Committee region
- Time series charts of storm surges and tides

Chapter 2

Major Activities of the RSMC Tokyo - Typhoon Center in 2014

2.1 Provision of RSMC Products

The Center provides operational products for tropical cyclone (TC) forecasting to NMSs via the GTS, the AFTN and other networks. Monthly and annual totals of products issued in 2014 are listed in Table 2.1.

Table 2.1 Monthly and annual totals of products issued by the RSMC Tokyo - Typhoon Center in 2014

Product	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
IUCC10	38	17	41	68	3	26	231	144	197	137	73	109	1084
WTPQ20-25	55	27	41	81	3	32	261	145	223	142	80	118	1208
WTPQ30-35	13	7	10	20	1	6	63	36	54	36	19	30	295
WTPQ50-55	4	3	12	26	0	0	83	44	54	48	14	41	329
FXPQ20-25	54	26	40	80	2	28	257	142	218	140	78	116	1181
FKPQ30-35	27	13	20	40	1	14	129	71	109	70	39	58	591
AXPQ20	0	2	1	0	2	1	1	3	3	4	3	1	21

Notes:

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
FXPQ20-25 RJTD	RSMC Guidance for Forecast
FKPQ30-35 RJTD	Tropical Cyclone Advisory for SIGMET
AXPQ20 RJTD	RSMC Tropical Cyclone Best Track

2.2 Publications

In March 2014, the 15th issue of the *RSMC Technical Review* was issued with the following areas of focus:

1. Cloud Grid Information Objective Dvorak Analysis (CLOUD) at the RSMC Tokyo - Typhoon Center

In December 2014, the Center published the *Annual Report on the Activities of the RSMC Tokyo - Typhoon Center in 2013*. Both publications are available on the website.

2.3 Monitoring of Observational Data Availability

The Center carried out regular monitoring of information exchanges for enhanced TC observation in accordance with the standard procedures stipulated in Section 6.2, Chapter 6 of *The Typhoon Committee Operational Manual (TOM) - Meteorological Component (WMO/TD-No. 196)*. Monitoring for the period from 1 November, 2013, to 31 October, 2014, was conducted for two tropical cyclones:

1. TY Rammasun (1409), from 12UTC 14 July to 12UTC 19 July 2014
2. TS Fung-wong (1416), from 12UTC 18 September to 12UTC 23 September 2014

The results were distributed to all Typhoon Committee Members in March 2015, and are also available on the WIS GISC Tokyo server at http://www.wis-jma.go.jp/monitoring/data/monitoring/.

Chapter 3

Summary of the 2014 Typhoon Season

In 2014, 23 TCs of tropical storm (TS) intensity or higher formed over the western North Pacific and the South China Sea. This total is below the 30-year average* frequency of 25.6. Among these 23 TCs, 11 reached typhoon (TY) intensity, 4 reached severe tropical storm (STS) intensity and 8 reached TS intensity (Table 3.1).

Table 3.1 List of tropical cyclones reaching TS intensity or higher in 2014

Tropical Cyclone			Duration (UTC) (TS or higher)					Minimum Central Pressure				Max Wind
								(UTC)	lat (N)	long (E)	(hPa)	(kt)
TS	Lingling	(1401)	180000	Jan	-	200000	Jan	180600	9.7	127.4	1002	35
TS	Kajiki	(1402)	310000	Jan	-	010600	Feb	310000	9.7	130.3	1000	35
TY	Faxai	(1403)	281200	Feb	-	051800	Mar	041200	17.5	151.2	975	65
TS	Peipah	(1404)	050000	Apr	-	051200	Apr	050600	4.8	139.6	998	35
STS	Tapah	(1405)	280000	Apr	-	010000	May	290000	15.6	147.3	985	50
TS	Mitag	(1406)	110000	Jun	-	120000	Jun	110600	24.0	128.1	994	40
TS	Hagibis	(1407)	140000	Jun	-	171200	Jun	140000	20.6	117.0	996	40
TY	Neoguri	(1408)	031800	Jul	-	110000	Jul	061800	19.7	129.1	930	100
TY	Rammasun	(1409)	120600	Jul	-	191800	Jul	180600	20.0	111.2	935	90
TY	Matmo	(1410)	171200	Jul	-	250600	Jul	210000	16.2	127.3	965	70
TY	Halong	(1411)	290000	Jul	-	110000	Aug	021200	14.9	135.1	920	105
STS	Nakri	(1412)	291200	Jul	-	030600	Aug	311800	27.6	128.2	980	55
TY	Genevieve	(1413)	070600	Aug	-	120600	Aug	071800	15.7	177.5	915	110
STS	Fengshen	(1414)	061800	Sep	-	101800	Sep	080600	30.0	137.3	975	60
TY	Kalmaegi	(1415)	120600	Sep	-	171200	Sep	160000	19.7	111.2	960	75
TS	Fung-wong	(1416)	171200	Sep	-	240000	Sep	190600	18.6	120.9	985	45
STS	Kammuri	(1417)	241200	Sep	-	300600	Sep	261200	23.2	145.1	985	50
TY	Phanfone	(1418)	290600	Sep	-	061200	Oct	020600	19.7	138.2	935	95
TY	Vongfong	(1419)	031800	Oct	-	140000	Oct	071800	17.7	133.2	900	115
TY	Nuri	(1420)	310000	Oct	-	061800	Nov	021200	17.2	132.5	910	110
TS	Sinlaku	(1421)	280000	Nov	-	300600	Nov	290000	12.7	111.8	990	45
TY	Hagupit	(1422)	010000	Dec	-	110600	Dec	040600	10.4	132.4	905	115
TS	Jangmi	(1423)	281200	Dec	-	301200	Dec	291800	9.9	124.1	996	40

3.1 Atmospheric and Oceanographic Conditions in the Tropics

Positive anomalies of sea surface temperature (SST) prevailed over the tropics in the western North Pacific all year round. In the South China Sea, although negative SST anomalies were seen early in the year, positive anomalies prevailed for the rest of the year.

Convective activity over the South China Sea and in the vicinity of the Philippines was characterized by intra-seasonal variability with enhanced phases in July and September in contrast to a suppressed phase in August. Especially in July monthly numbers of TC formations were above the 30-year average, whereas monthly numbers of TC formations were below the 30-year average in August. This contributed to below normal number of TC formations in the year (23 in 2014 compared to 25.6 on average*). The monthly and annual frequencies of named TCs forming since 1951 are presented in

Appendix 4.

To highlight atmospheric and oceanographic conditions, charts showing monthly mean SST anomalies for the western North Pacific and the South China Sea, monthly mean streamlines at 850 hPa and 200 hPa and OLR for the months from January to December are included on the DVD provided with this report.

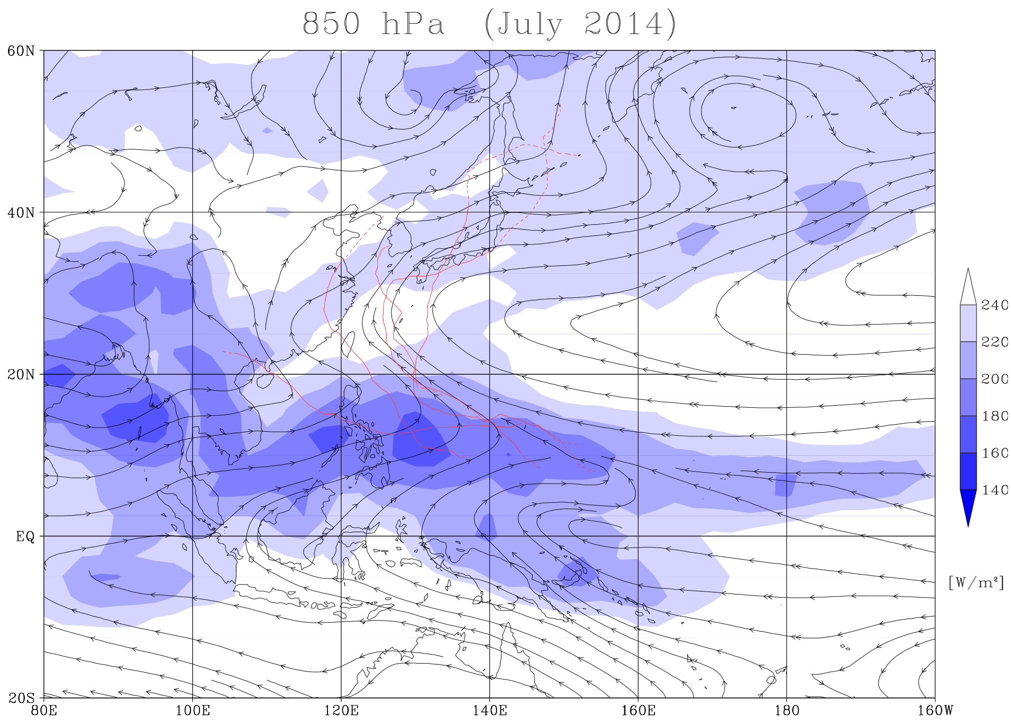


Figure 3.1 Monthly mean streamlines at 850 hPa (lines with arrows) and areas with OLR values of less than 240 W/m^2 (shaded) for July 2014. The tracks of the 5 named TCs that formed in July are superimposed onto the figure.

3.2 Tropical Cyclones in 2014

A total of 23 named TCs formed over the western North Pacific and the South China Sea in 2014. Monthly and 30-year average* TC formation numbers are shown in Figure 3.2, and tracks of the 23 TCs are shown in Figure 3.3. Figure 3.4 shows the genesis points of the 23 TCs (dots) and related frequency distribution for past years (1951 – 2013). The mean genesis point of named 22 TCs forming in 2014 excluding Genevieve (1413) was at 13.1˚N and 139.0˚E, showing a southeastward deviation from the 30-year average* (16.2˚N and 137.4˚E).

The 2014 TC season began with the formation of Lingling (1401) in January, which formed over the sea east of Mindanao Island. Three named TCs hit the continent from June to July and three from September to November. The total of named TCs which hit the continent was 6 during the season. Detailed descriptions of each TC forming in 2014 are included on the DVD provided with this report.

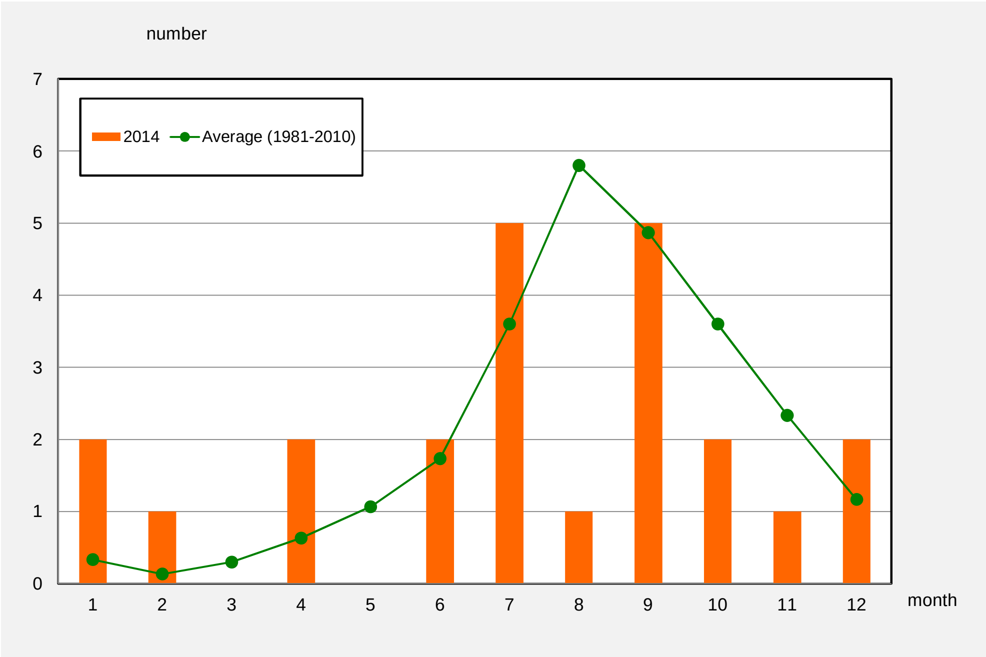


Figure 3.2 Monthly TC formation numbers for 2014 compared to the 30-year average*

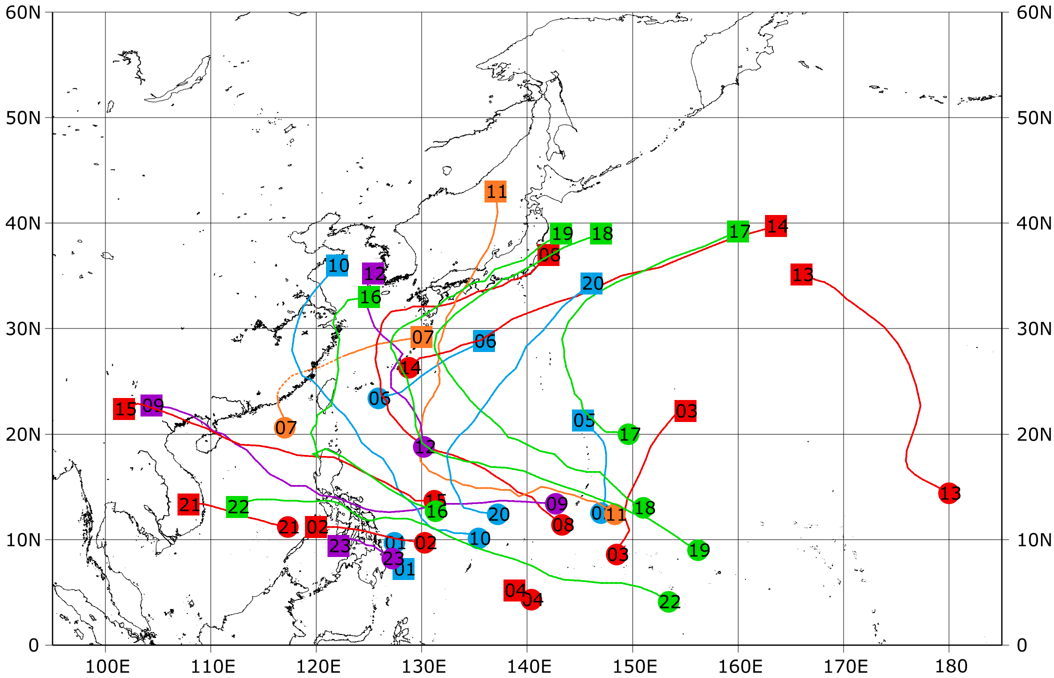


Figure 3.3 Tracks of the 23 named TCs forming in 2014. TC tracks for those with an intensity of TS or higher are shown.

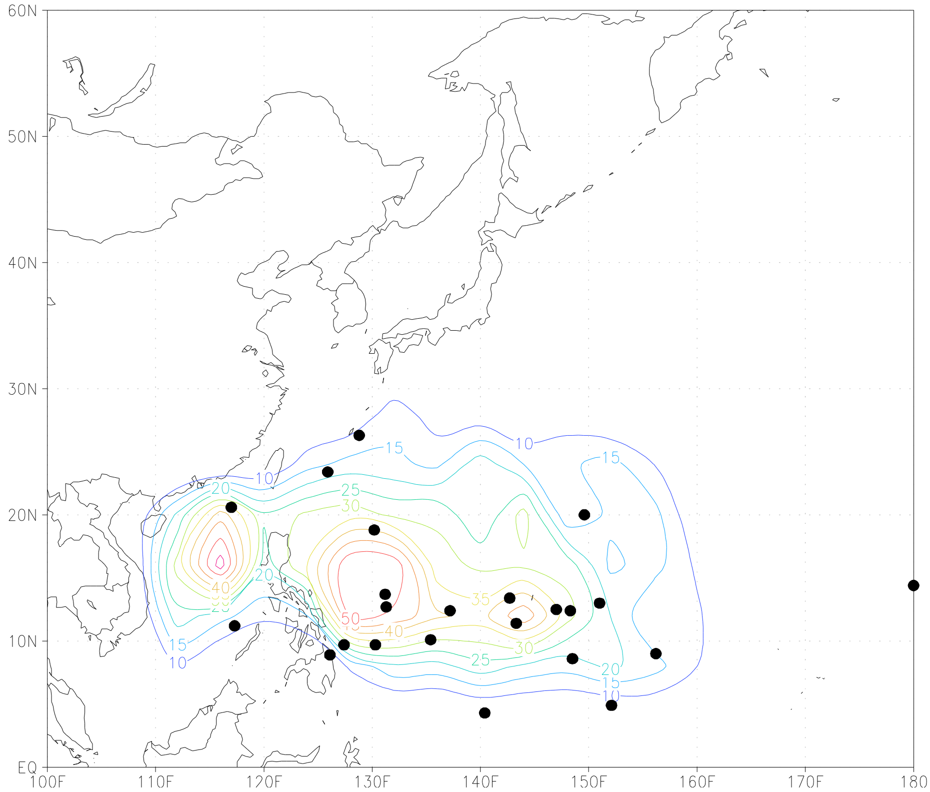


Figure 3.4 Genesis points of the 23 TCs forming in 2014 (dots) and related frequency distribution for 1951 – 2013 (lines)

* *The 30-year average is for the period from 1981 to 2010.*

Chapter 4
Verification of Forecasts in 2014

4.1 Verification of Operational Forecasts

Operational forecasts for the 23 TCs of TS intensity or higher that formed in 2014 were verified using RSMC TC best track data. The verified elements were forecasts of the center position (up to five days ahead), central pressure and maximum sustained wind (up to three days ahead). The position and intensity errors of operational forecasts for each TC forming in 2014 are indicated in Appendix 3.

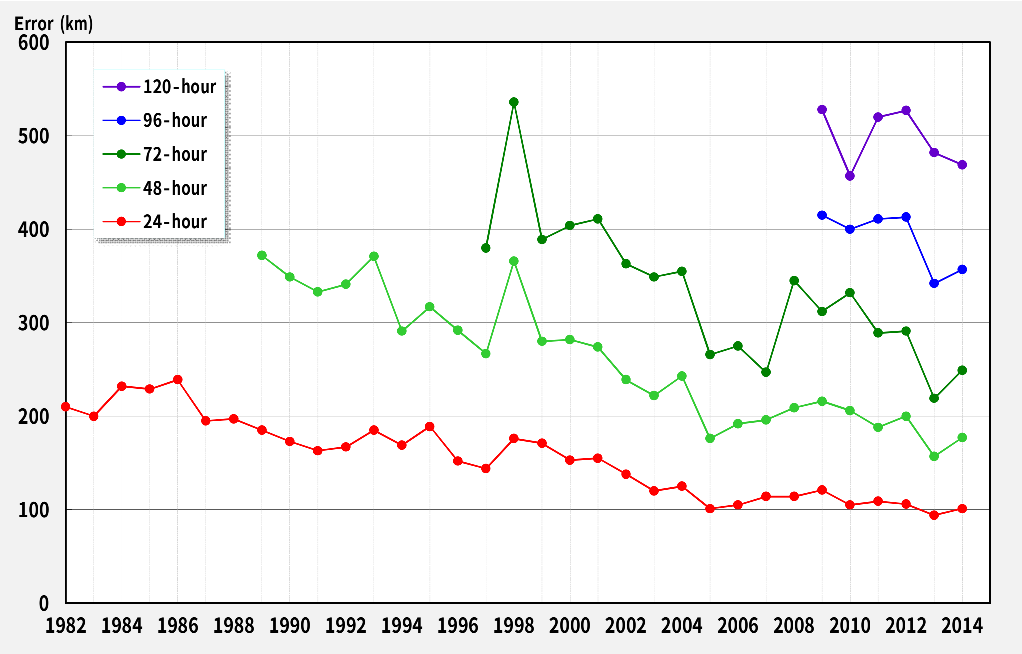


Figure 4.1 Annual mean position errors in 24-, 48-, 72-, 96- and 120-hour operational track forecasts

4.1.1 Center Position

Figure 4.1 shows annual mean errors in center position forecasts covering periods of 24 hours (since 1982), 48 hours (since 1989), 72 hours (since 1997), 96 hours and 120 hours (since 2009). The errors in 2014 were 101, 177, 249, 357 and 469 km for 24-, 48-, 72-, 96- and 120-hour forecasts, respectively.

The details of errors for each TC forming in 2014 are summarized in Table 4.1. The forecasts for Kammuri (1417), which moved from east of the Mariana Islands to southeast of the Ogasawara Islands, were characterized by large errors. The 96- and 120-hour forecasts for Fung-wong (1416) and Nuri(1420), which recurved around Japan, also showed large errors, while forecasts for Rammasun(1409) and Hagupit (1422) exhibited relatively small errors.

The position errors were also compared with those determined using the persistency (PER) method*. The ratios of EO (i.e., the position errors of operational forecasts) to EP (the position errors of PER method forecasts) as percentages are also shown in Table 4.1. An EO/EP value smaller/greater than 100% indicates that the operational forecast was better/worse than the PER method forecast. The annual mean EO/EP ratios for 24-, 48-, 72-, 96- and 120-hour forecasts in 2014 were 43% (41% in 2013), 34% (31%), 30% (30%), 30% (41%) and 30% (42%), respectively. Figure 4.2 shows a histogram of 24-hour forecast position errors. About 79% (86% in 2013) of 24-hour forecasts, 87% (91%) of 48-hour forecasts, 90% (93%) of 72-hour forecasts, 82% (84%) of 96-hour forecasts and 74% (74%) of 120-hour forecasts had errors of less than 150, 300, 450, 500 and 600 km, respectively.

** The PER method is based on the assumption that a TC holds the same movement throughout the forecast period, and linear extrapolation for the latest 12-hour track of the TC is applied to create TC track forecasts. Position errors with the PER method are used to evaluate the relative performance of operational forecasts and model predictions.*

Table 4.1 Mean position errors of 24-, 48-, 72-, 96- and 120-hour operational forecasts for each TC forming in 2014. S.D., EO, EP, and EO/EP represent the standard deviation of operational forecast position error, the operational forecast position error, the position error with the PER method and the ratio of EO to EP, respectively.

Tropical Cyclone			24-hour Forecast				48-hour Forecast				72-hour Forecast				96-hour Forecast				120-hour 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 (%)
TS	Lingling	(1401)	134	20	4	222	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TS	Kajiki	(1402)	262	0	1	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TY	Faxai	(1403)	119	47	17	52	142	50	13	23	137	36	9	12	162	67	5	14	191	0	1	-
TS	Peipah	(1404)	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
STS	Tapah	(1405)	149	54	8	97	303	102	4	48	-	-	0	-	-	-	0	-	-	-	0	-
TS	Mitag	(1406)	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
TS	Hagibis	(1407)	62	16	3	53	349	0	1	51	688	0	1	-	-	-	0	-	-	-	0	-
TY	Neoguri	(1408)	100	60	25	35	184	121	20	29	230	119	16	22	303	112	12	20	358	119	8	23
TY	Rammasun	(1409)	118	63	26	74	180	102	22	44	198	114	18	28	286	135	14	25	213	99	10	13
TY	Matmo	(1410)	117	121	27	37	210	152	23	33	256	110	18	29	339	83	14	28	554	162	10	32
TY	Halong	(1411)	89	42	48	59	168	82	44	50	250	144	39	47	385	219	35	49	528	280	31	47
STS	Nakri	(1412)	129	98	15	33	200	169	11	31	189	98	6	20	346	5	2	45	-	-	0	-
TY	Genevieve	(1413)	118	34	16	29	223	49	12	22	201	79	8	13	149	99	4	4	-	-	0	-
STS	Fengshen	(1414)	78	46	11	45	102	62	6	17	258	23	2	24	-	-	0	-	-	-	0	-
TY	Kalmaegi	(1415)	86	56	17	45	182	86	13	37	372	93	9	42	492	107	5	32	794	0	1	-
TS	Fung-wong	(1416)	126	69	22	38	182	111	18	23	227	110	13	18	520	168	9	25	1077	260	5	54
STS	Kammuri	(1417)	148	56	19	45	302	140	15	43	553	277	11	50	971	355	7	56	1399	165	3	73
TY	Phanfone	(1418)	77	54	25	25	149	88	21	27	246	120	17	29	352	126	13	27	524	115	9	33
TY	Vongfong	(1419)	72	38	37	33	174	74	33	37	276	110	29	34	334	96	25	26	329	112	21	18
TY	Nuri	(1420)	76	36	23	49	122	54	19	30	263	133	14	31	521	113	10	37	891	141	6	38
TS	Sinlaku	(1421)	97	22	5	42	62	0	1	-	-	-	0	-	-	-	0	-	-	-	0	-
TY	Hagupit	(1422)	85	54	37	48	138	81	33	35	155	55	28	26	161	56	24	18	209	80	20	16
TS	Jangmi	(1423)	110	23	4	55	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-
Annual Mean (Total)			101	65	390	43	177	108	309	34	249	151	238	30	357	221	179	30	469	315	125	30

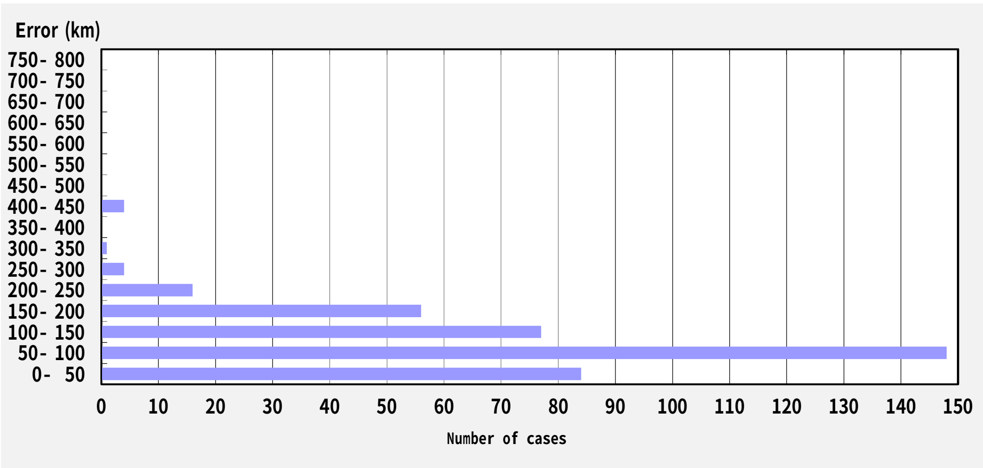


Figure 4.2 Histogram of 24-hour forecast position errors in 2014
(Histograms for 48-, 72-, 96- and 120-hour forecasts are included on the DVD provided with this report).

Table 4.2 presents the mean hitting ratios and radii of 70% probability circles* provided in operational forecasts for each TC forming in 2014. The term *hitting ratio* here is used to describe the ratio of the number of 70% probability circles within which the actual TC center fell to the total number of circles. The annual mean radius of circles provided in 24-hour position forecasts was 145 km (140 km in 2013), and their hitting ratio was 78% (82%). The corresponding values for 48-hour forecasts were 251 km (243 km in 2013) and 78% (82%), those for 72-hour forecasts were 360 km (351 km in 2013) and 76% (84%), those for 96-hour forecasts were 480 km (483 km in 2013) and 79% (81%), and those for 120-hour forecasts were 602 km (630 km in 2013) and 70% (75%).

Table 4.2 Mean hitting ratios (%) and radii (km) of 70% probability circles provided in 24-, 48-, 72-, 96- and 120-hour operational forecasts for each TC forming in 2014

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)
TS	Lingling	(1401)	75	4	157	-	0	-	-	0	-	-	0	-	-	0	-
TS	Kajiki	(1402)	0	1	139	-	0	-	-	0	-	-	0	-	-	0	-
TY	Faxai	(1403)	82	17	156	100	13	299	100	9	426	100	5	519	100	1	695
TS	Peipah	(1404)	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-
STS	Tapah	(1405)	50	8	130	0	4	204	-	0	-	-	0	-	-	0	-
TS	Mitag	(1406)	-	0	-	-	0	-	-	0	-	-	0	-	-	0	-
TS	Hagibis	(1407)	100	3	179	0	1	296	0	1	407	-	0	-	-	0	-
TY	Neoguri	(1408)	84	25	149	85	20	281	88	16	422	100	12	540	100	8	695
TY	Rammasun	(1409)	69	26	137	77	22	247	89	18	368	93	14	519	100	10	695
TY	Matmo	(1410)	78	27	141	65	23	237	61	18	337	100	14	577	60	10	708
TY	Halong	(1411)	88	48	144	77	44	244	62	39	346	60	35	434	55	31	553
STS	Nakri	(1412)	60	15	141	64	11	237	83	6	395	100	2	482	-	0	-
TY	Genevieve	(1413)	75	16	140	75	12	245	100	8	370	100	4	551	-	0	-
STS	Fengshen	(1414)	82	11	163	100	6	333	100	2	463	-	0	-	-	0	-
TY	Kalmaegi	(1415)	82	17	137	69	13	246	67	9	368	80	5	519	0	1	695
TS	Fung-wong	(1416)	55	22	152	67	18	268	92	13	433	100	9	698	20	5	926
STS	Kammuri	(1417)	47	19	140	33	15	240	27	11	332	14	7	487	0	3	602
TY	Phanfone	(1418)	80	25	147	90	21	247	82	17	332	69	13	473	56	9	578
TY	Vongfong	(1419)	92	37	143	79	33	227	62	29	331	76	25	406	90	21	536
TY	Nuri	(1420)	100	23	160	100	19	304	86	14	407	40	10	519	0	6	695
TS	Sinlaku	(1421)	100	5	135	100	1	204	-	0	-	-	0	-	-	0	-
TY	Hagupit	(1422)	78	37	139	94	33	228	100	28	313	100	24	389	100	20	507
TS	Jangmi	(1423)	75	4	176	-	0	-	-	0	-	-	0	-	-	0	-
Annual Mean (Total)			78	390	145	78	309	251	76	238	360	79	179	480	70	125	602

* Probability circle: a circular range in which a TC is expected to be located with a probability of 70% at each forecast time

4.1.2 Central Pressure and Maximum Wind Speed

Table 4.3 gives the root mean square errors (RMSEs) of 24-, 48- and 72-hour operational central pressure forecasts for each TC forming in 2014. RMSE data for maximum wind speed forecasts are included on the DVD provided with this report. The annual mean RMSEs of central pressure and maximum wind speed for 24-hour forecasts were 14.4 hPa (13.6 hPa in 2013) and 6.1 m/s (6.4 m/s). For 48-hour forecasts, the corresponding values were 21.0 hPa (21.4 hPa in 2013) and 8.9 m/s (9.4 m/s), while those for 72-hour forecasts were 23.8 hPa (23.7 hPa in 2013) and 10.4 m/s (10.4 m/s).

Table 4.3 Mean intensity errors of 24-, 48- and 72-hour operational central pressure forecasts for each TC forming in 2014

Tropical Cyclone			24-hour Forecast			48-hour Forecast			72-hour Forecast		
			Error (hPa)	RMSE (hPa)	Num.	Error (hPa)	RMSE (hPa)	Num.	Error (hPa)	RMSE (hPa)	Num.
TS	Lingling	(1401)	-1.5	1.7	4	-	-	0	-	-	0
TS	Kajiki	(1402)	-10.0	10.0	1	-	-	0	-	-	0
TY	Faxai	(1403)	-0.2	3.9	17	-0.1	4.4	13	-0.6	3.7	9
TS	Peipah	(1404)	-	-	0	-	-	0	-	-	0
STS	Tapah	(1405)	0.0	13.4	8	1.8	7.5	4	-	-	0
TS	Mitag	(1406)	-	-	0	-	-	0	-	-	0
TS	Hagibis	(1407)	-4.0	4.3	3	0.0	0.0	1	4.0	4.0	1
TY	Neoguri	(1408)	-6.6	17.8	25	-15.0	23.9	20	-15.9	19.7	16
TY	Rammasun	(1409)	5.0	11.2	26	8.6	14.2	22	12.2	19.9	18
TY	Matmo	(1410)	-5.0	11.5	27	-9.6	16.4	23	-17.1	23.9	18
TY	Halong	(1411)	-0.2	17.2	48	-1.0	20.0	44	0.6	20.0	39
STS	Nakri	(1412)	1.6	2.8	15	2.7	4.3	11	1.7	5.8	6
TY	Genevieve	(1413)	-8.5	19.5	16	-10.5	18.7	12	-12.0	15.1	8
STS	Fengshen	(1414)	-0.1	6.9	11	-7.5	8.4	6	-7.5	7.9	2
TY	Kalmaegi	(1415)	-1.1	6.7	17	-4.0	8.3	13	-7.7	15.8	9
TS	Fung-wong	(1416)	-3.1	4.2	22	-5.1	5.6	18	-14.3	15.4	13
STS	Kammuri	(1417)	0.8	4.0	19	-2.7	6.3	15	-7.7	8.4	11
TY	Phanfone	(1418)	1.8	11.8	25	4.0	15.5	21	3.5	15.6	17
TY	Vongfong	(1419)	-3.0	19.2	37	-1.4	26.0	33	4.1	25.1	29
TY	Nuri	(1420)	10.3	22.6	23	20.3	35.8	19	14.3	32.4	14
TS	Sinlaku	(1421)	2.0	3.9	5	-2.0	2.0	1	-	-	0
TY	Hagupit	(1422)	-0.3	18.7	37	-0.3	33.5	33	-6.4	42.3	28
TS	Jangmi	(1423)	0.5	1.7	4	-	-	0	-	-	0
Annual Mean (Total)			-0.6	14.4	390	-0.9	21.0	309	-2.3	23.8	238

Figure 4.3 shows a histogram of maximum wind speed errors for 24-hour forecasts. Approximately 54% (54% in 2013) of 24-hour forecasts had errors of less than ±3.75 m/s, with figures of ±6.25 m/s for 62% (59%) of 48-hour forecasts and ±6.25 m/s for 50% (49%) of 72-hour forecasts.

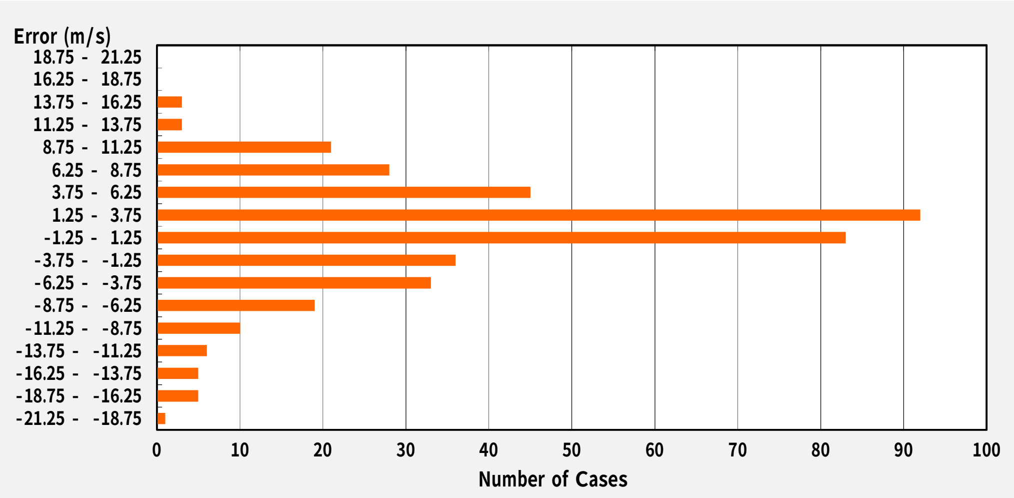


Figure 4.3 Histogram of 24-hour forecast maximum wind speed errors in 2014 (Histograms for 48-, 72-, 96- and 120-hour forecasts are included on the DVD provided with this report).

4.2 Verification of Numerical Models (GSM, TEPS)

The Global Spectral Model (GSM) and the Typhoon Ensemble Prediction System (TEPS) provide primary information for use by JMA forecasters in making operational TC track and intensity forecasts. The details of GSM and TEPS and information on recent related improvements are given in Appendix 6. GSM and TEPS predictions were verified with RSMC TC best track data and predictions using the persistency (PER) method. All TC forecast verifications were conducted for both systems.

4.2.1 GSM Prediction

1) Center Position

GSM annual mean position errors observed since 1997 are presented in Figure 4.4. In 2014, the annual mean errors for 30-, 54- and 78-hour* predictions were 124 km (124 km in 2013), 212 km (201 km) and 312 km (293 km), respectively. The mean position errors of 18-, 30-, 42-, 54-, 66- and 78-hour predictions for each TC are given in Table 4.4.

** 30-, 54- and 78-hour GSM predictions are used as primary information by forecasters creating 24-, 48- and 72-hour operational forecasts, respectively.*

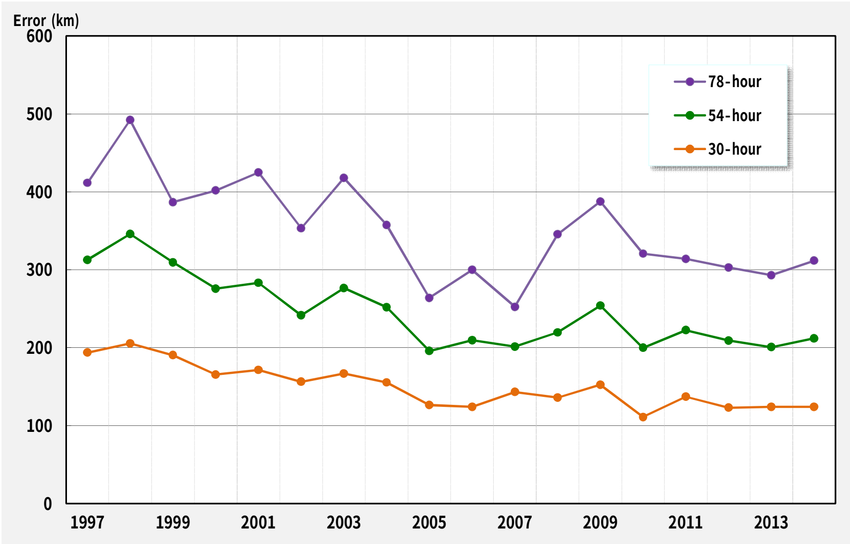


Figure 4.4　GSM annual mean position errors since 1997

Tropical Cyclone			T=18		T=30		T=42		T=54		T=66		T=78	
TS	LINGLING	(1401)	146.5	(10)	384.9	(4)	538.8	(4)	402.3	(1)	855.4	(1)	-	(-)
TS	KAJIKI	(1402)	144.8	(11)	186.7	(9)	243.6	(7)	339.3	(5)	442.0	(3)	641.0	(1)
TY	FAXAI	(1403)	111.6	(23)	120.3	(21)	110.2	(19)	104.6	(17)	111.9	(15)	135.0	(13)
TS	PEIPAH	(1404)	110.5	(17)	146.3	(15)	174.9	(13)	195.2	(11)	189.6	(9)	238.4	(7)
STS	TAPAH	(1405)	164.9	(12)	253.8	(10)	350.4	(8)	443.6	(6)	565.3	(4)	689.6	(2)
TS	MITAG	(1406)	179.0	(3)	212.8	(1)	-	(-)	-	(-)	-	(-)	-	(-)
TS	HAGIBIS	(1407)	34.9	(9)	67.7	(7)	53.0	(5)	95.4	(3)	149.5	(1)	-	(-)
TY	NEOGURI	(1408)	69.3	(27)	111.7	(26)	172.3	(24)	237.3	(22)	276.5	(20)	321.0	(18)
TY	RAMMASUN	(1409)	95.7	(33)	141.5	(30)	207.4	(28)	259.3	(26)	294.4	(24)	332.8	(21)
TY	MATMO	(1410)	142.4	(32)	210.6	(30)	274.4	(28)	342.4	(26)	389.3	(24)	448.6	(22)
TY	HALONG	(1411)	67.4	(49)	106.8	(47)	144.5	(45)	188.0	(43)	221.9	(41)	251.0	(39)
STS	NAKRI	(1412)	73.2	(21)	84.0	(19)	110.8	(17)	149.9	(15)	212.1	(13)	274.3	(11)
TY	GENEVIEVE	(1413)	48.9	(17)	88.8	(15)	139.0	(13)	177.8	(11)	196.3	(9)	264.3	(7)
STS	FENGSHEN	(1414)	98.5	(14)	143.3	(12)	188.8	(10)	216.1	(8)	296.1	(6)	465.7	(4)
TY	KALMAEGI	(1415)	52.8	(18)	107.1	(16)	170.2	(14)	251.4	(13)	346.6	(11)	419.9	(9)
TS	FUNG-WONG	(1416)	65.0	(24)	91.7	(22)	119.9	(20)	152.2	(18)	160.1	(16)	185.0	(14)
STS	KAMMURI	(1417)	134.8	(23)	166.9	(21)	225.7	(19)	337.1	(17)	453.4	(15)	603.0	(13)
TY	PHANFONE	(1418)	72.6	(27)	81.6	(25)	95.7	(23)	142.6	(21)	204.2	(19)	236.4	(17)
TY	VONGFONG	(1419)	57.0	(41)	92.9	(39)	143.4	(37)	215.9	(35)	286.2	(33)	347.0	(31)
TY	NURI	(1420)	61.3	(25)	94.0	(23)	117.0	(21)	158.3	(19)	253.2	(17)	373.2	(15)
TS	SINLAKU	(1421)	56.5	(13)	64.0	(9)	83.5	(7)	129.8	(5)	159.1	(3)	241.1	(1)
TY	HAGUPIT	(1422)	79.0	(39)	119.7	(37)	147.6	(35)	169.5	(33)	187.1	(31)	205.3	(29)
TS	JANGMI	(1423)	99.5	(11)	126.0	(9)	173.9	(7)	168.5	(4)	177.3	(2)	-	(-)
Annual Mean (Total)			86.8	(499)	124.2	(447)	165.8	(404)	211.9	(359)	261.0	(317)	311.6	(274)

Table 4.4　GSM mean position errors (km) for each TC forming in 2014. The number of samples is given in parentheses.

Table 4.5 shows relative GSM performance compared with results obtained using the PER method. In this comparison, TCs were classified into the three life stages of before, during and after recurvature. The definition of the stages is based on the direction of movement of each TC at individual prediction times. The table indicates that GSM results outperformed those of the PER method throughout the forecast period beyond 18 hours from the initial time, and that the ratios of error reduction for the GSM compared to the PER method were about 47% (45% in 2013), 56% (55%), 61% (63%) and 64% (63%) for 18-, 30-, 54- and 78-hour predictions, respectively.

About 73% (70% in 2013) of 30-hour predictions had errors of less than 150 km, while 77% (83%) of 54-hour predictions had errors of less than 300 km, and 77% (80%) of 78-hour predictions had errors of less than 450 km. Histograms showing the position errors of 30-, 54- and 78-hour predictions are included on the DVD provided with this report.

Table 4.5 Mean position errors (km) of GSM and PER method predictions for the 31 TCs forming in 2014 in the stages before, during and after recurvature. The number of samples is given in parentheses. IMPROV is the ratio of error reductions in GSM results to those observed using the PER method.

TIME	MODEL	Before	During	After	All
T=18	GSM	96.1 (271)	71.2 (112)	80.2 (116)	86.8 (499)
	PER	148.1 (271)	161.0 (112)	198.6 (116)	162.8 (499)
	IMPROV	35.1 %	55.7 %	59.6 %	46.7 %
T=30	GSM	139.2 (235)	99.0 (106)	115.9 (106)	124.2 (447)
	PER	252.6 (235)	279.3 (106)	339.6 (106)	279.6 (447)
	IMPROV	44.9 %	64.6 %	65.9 %	55.6 %
T=42	GSM	190.4 (208)	128.4 (96)	150.7 (100)	165.8 (404)
	PER	365.8 (208)	403.1 (96)	520.6 (100)	413.0 (404)
	IMPROV	47.9 %	68.2 %	71.1 %	59.8 %
T=54	GSM	237.7 (176)	170.2 (88)	202.6 (95)	211.9 (359)
	PER	475.5 (176)	564.3 (88)	670.0 (95)	548.7 (359)
	IMPROV	50.0 %	69.8 %	69.8 %	61.4 %
T=66	GSM	287.0 (145)	207.2 (80)	267.0 (92)	261.0 (317)
	PER	590.8 (145)	743.5 (80)	822.0 (92)	696.4 (317)
	IMPROV	51.4 %	72.1 %	67.5 %	62.5 %
T=78	GSM	337.0 (118)	269.3 (70)	311.2 (86)	311.6 (274)
	PER	683.4 (118)	920.8 (70)	1033.7 (86)	854.0 (274)
	IMPROV	50.7 %	70.8 %	69.9 %	63.5 %

2) Central Pressure and Maximum Wind Speed

The mean errors of 30-, 54- and 78-hour GSM central pressure predictions in 2014 were +13.1 hPa (+14.2 hPa in 2013), +13.1 hPa (+16.9 hPa) and +12.6 hPa (+18.5 hPa), respectively. Their root mean square errors (RMSEs) were 23.9 hPa (23.8 hPa in 2013) for 30-hour predictions, 25.7 hPa (28.6 hPa) for 54-hour predictions and 26.5 hPa (31.9 hPa) for 78-hour predictions. The biases for 30-, 54- and 78-hour maximum wind speed predictions were -8.0 m/s (-9.1 m/s in 2013) with a RMSE of 12.2 m/s (12.7 m/s), -7.8 m/s (-9.8 m/s) with a RMSE of 13.2 m/s (14.8 m/s) and -7.1 m/s (-9.9 m/s) with a RMSE of 13.5 m/s (16.1 m/s), respectively.

Figure 4.5 shows histograms of central pressure errors and maximum wind speed errors in 30-hour GSM predictions. It can be seen that the GSM has a small positive bias for central pressure prediction (left) and tends to underestimate the wind speed of TCs (right). This underestimation occurs because the model's current horizontal resolution (about 20 km) is not fine enough to produce the TC core structure, especially when the TC is intense and small.

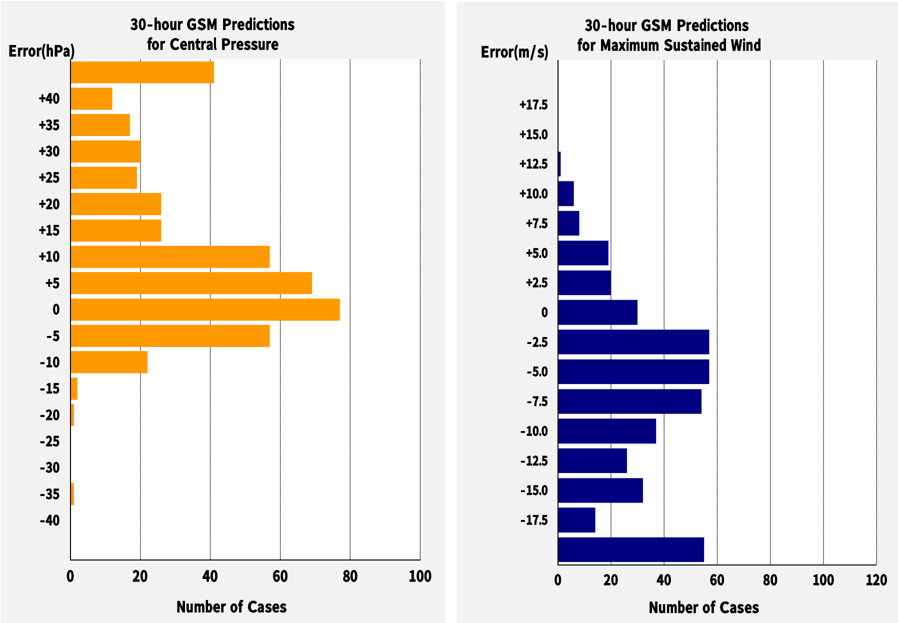


Figure 4.5 Error distribution of GSM 30-hour intensity predictions in 2014.
The figure on the left shows error distribution for central pressure, while the one on the right shows that for maximum wind speed (the error distributions of 54- and 78-hour predictions are included on the DVD provided with this report).

4.2.2 TEPS Prediction

1) Ensemble mean center position

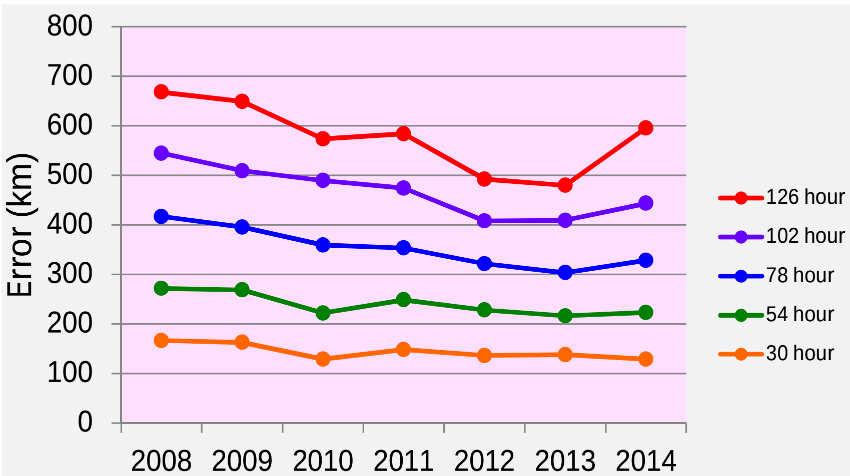


Figure 4.6 TEPS annual mean position errors since 2008

TEPS annual mean position errors observed since 2008 are presented in Figure 4.6. In 2014, the mean position errors of TEPS ensemble mean forecasts for 30-, 54-, 78-, 102- and 126-hour predictions for each TC are given in Table 4.6. The annual means of ensemble mean position errors for 30-, 54-, 78-, 102- and 126-hour predictions were 129 km (124 km with the GSM), 223 km (212 km), 328 km (312 km), 443 km and 595 km, respectively.

Table 4.6 Mean position errors (km) of TEPS ensemble mean forecasts for each TC forming in 2014. The number of samples is given in parentheses.

Tropical Cyclone			T=30		T=54		T=78		T=102		T=126	
TS	LINGLING	(1401)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
TS	KAJIKI	(1402)	213.4	(9)	413.6	(5)	684.9	(1)	-	(-)	-	(-)
TY	FAXAI	(1403)	122.4	(21)	89.8	(17)	104.2	(13)	128.1	(9)	296.8	(5)
TS	PEIPAH	(1404)	154.4	(15)	232.5	(11)	322.8	(7)	364.3	(3)	-	(-)
STS	TAPAH	(1405)	210.6	(10)	352.1	(6)	529.4	(2)	-	(-)	-	(-)
TS	MITAG	(1406)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)
TS	HAGIBIS	(1407)	51.6	(6)	65.1	(1)	-	(-)	-	(-)	-	(-)
TY	NEOGURI	(1408)	111.1	(27)	215.2	(23)	311.2	(19)	368.9	(15)	459.0	(11)
TY	RAMMASUN	(1409)	165.0	(30)	305.6	(26)	409.5	(23)	519.1	(19)	649.4	(15)
TY	MATMO	(1410)	222.1	(30)	342.1	(26)	433.6	(22)	490.5	(18)	586.4	(14)
TY	HALONG	(1411)	119.8	(47)	205.7	(43)	292.3	(39)	429.5	(35)	553.7	(31)
STS	NAKRI	(1412)	79.2	(19)	134.9	(15)	246.7	(11)	379.9	(7)	627.6	(3)
TY	GENEVIEVE	(1413)	116.8	(15)	222.8	(11)	241.2	(7)	145.4	(3)	-	(-)
STS	FENGSHEN	(1414)	138.9	(10)	197.4	(6)	318.3	(2)	-	(-)	-	(-)
TY	KALMAEGI	(1415)	132.9	(16)	282.5	(12)	455.8	(9)	614.6	(5)	844.9	(1)
TS	FUNG-WONG	(1416)	108.5	(22)	189.0	(18)	284.4	(14)	560.3	(10)	1081.1	(6)
STS	KAMMURI	(1417)	159.9	(21)	307.9	(17)	564.5	(13)	946.0	(9)	1539.5	(5)
TY	PHANFONE	(1418)	82.5	(25)	150.1	(21)	201.5	(17)	258.4	(13)	365.3	(9)
TY	VONGFONG	(1419)	91.1	(39)	205.6	(35)	319.4	(31)	384.7	(27)	381.8	(23)
TY	NURI	(1420)	85.0	(23)	173.0	(19)	420.1	(15)	641.4	(11)	1055.0	(7)
TS	SINLAKU	(1421)	78.1	(10)	159.4	(6)	240.7	(1)	-	(-)	-	(-)
TY	HAGUPIT	(1422)	131.1	(37)	203.0	(33)	273.5	(29)	382.7	(25)	548.3	(21)
TS	JANGMI	(1423)	154.2	(9)	209.9	(5)	222.7	(1)	-	(-)	-	(-)
All Mean (Total)			128.3	(441)	221.9	(356)	326.5	(276)	440.9	(209)	592.9	(151)

2) Spread-skill relationship

Although position errors of TEPS ensemble mean forecasts were larger than those of the GSM in short-range forecasts, TEPS provides useful information on the reliability of TC track forecasts with its ensemble spread. The ensemble spread was calculated using forecast data from April to December 2014 in order to keep consistency of verification data because the major TEPS upgrade in March 2014 caused a change in the spread-skill relationship. Figure 4.6 shows the relationship between 6-hourly cumulative ensemble spreads in TC position forecasts and ensemble mean forecast position errors in 126-hour prediction. In an ideal EPS with a large number of samples, a significant position error is observed when the ensemble spread is large.

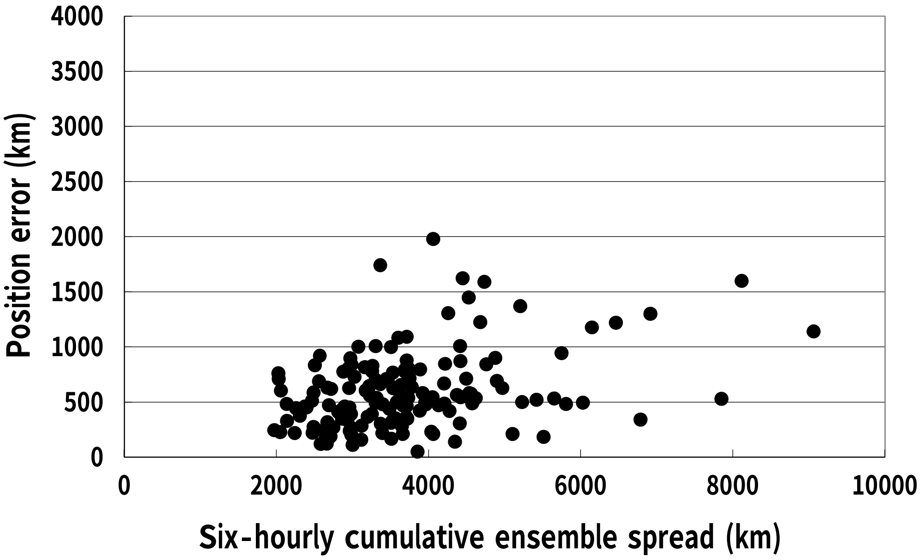


Figure 4.6 Relationship between six-hourly cumulative ensemble spread in TC position forecasts (km) and ensemble mean forecast position errors (km) in 126-hour predictions from April to December in 2014.

To add reliability information to TC track forecasts, JMA has introduced a reliability index in which the categories A, B and C represent the highest, middle and lowest levels of reliability, respectively. The index is based on the six-hourly cumulative ensemble spread at each forecast time. The category levels were set from the results of the pre-operational running of TEPS so that the category frequencies are 40%, 40% and 20%, respectively. Table 4.7 shows ensemble mean forecast errors classified with the reliability index. Theoretically, mean position errors with reliability level A should be smaller than those with levels B and C throughout the forecast times with a sufficient number of samples in an ideal EPS. However, the A shows larger position errors compared to B and C. To improve the accuracy of forecasts, TEPS needs to be improved to give the better reliability information on the TC track forecast.

Table 4.7 Ensemble mean forecast position errors (km) from April to December in 2014 classified with six-hourly cumulative ensemble spread at each forecast time. The number of samples is given in parentheses.

Time	Reliability Index					
	A		B		C	
T=30	111.2	(192)	130.8	(210)	214.8	(32)
T=54	215.4	(166)	224.1	(160)	285.7	(31)
T=78	304.5	(131)	339.3	(129)	458.6	(22)
T=102	413.0	(108)	478.0	(89)	564.2	(17)
T=126	515.4	(103)	681.6	(47)	1042.1	(7)

Appendices

RSMC Tropical Cyclone Best Track Data in 2014

Appendix 1

Lingling (1401)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jan.	15/00	9.6	129.2	1006	-	-	TD
	15/06	9.6	129.2	1004	-	-	TD
	15/12	9.7	129.0	1008	-	-	TD
	15/18	9.8	128.9	1006	-	-	TD
	16/00	9.8	128.8	1008	-	0.5	TD
	16/06	9.7	128.6	1004	-	1.0	TD
	16/12	9.5	128.5	1004	-	1.0	TD
	16/18	9.3	128.3	1004	-	1.5	TD
	17/00	9.3	128.3	1004	-	1.5	TD
	17/06	9.7	127.9	1002	-	1.5	TD
	17/12	9.7	127.4	1006	-	1.5	TD
	17/18	9.7	127.4	1006	-	1.5	TD
	18/00	9.7	127.4	1004	35	2.0	TS
	18/06	9.7	127.4	1002	35	2.0	TS
	18/12	9.7	127.4	1004	35	2.0	TS
	18/18	9.4	127.4	1004	35	2.0	TS
	19/00	9.2	127.5	1006	35	2.0	TS
	19/06	9.0	127.5	1004	35	2.0	TS
	19/12	8.7	127.7	1006	35	1.5	TS
	19/18	8.2	127.8	1006	35	1.5	TS
	20/00	7.2	128.3	1008	-	1.5	TD
	20/06	6.3	129.0	1004	-	-	TD
	20/12						Dissip.

Kajiki (1402)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jan.	29/00	9.5	143.1	1004	-	0.0	TD
	29/06	9.5	141.8	1002	-	0.0	TD
	29/12	9.2	140.7	1004	-	0.0	TD
	29/18	8.6	139.4	1002	-	0.0	TD
	30/00	8.4	137.9	1004	-	0.0	TD
	30/06	8.6	136.3	1004	-	0.5	TD
	30/12	8.6	134.5	1004	-	1.0	TD
	30/18	9.0	132.8	1002	-	1.5	TD
	31/00	9.7	130.3	1000	35	2.0	TS
	31/06	10.0	128.0	1000	35	2.5	TS
	31/12	10.4	126.2	1000	35	2.5	TS
	31/18	10.9	124.2	1002	35	2.0	TS
Feb.	01/00	11.2	121.9	1002	35	1.5	TS
	01/06	11.2	120.0	1004	-	1.0	TD
	01/12	11.0	118.0	1008	-	0.5	TD
	01/18						Dissip.

Faxai (1403)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Feb.	27/12	8.7	147.8	1004	-	1.5	TD
	27/18	8.6	147.8	1002	-	1.5	TD
	28/00	8.5	148.0	1004	-	1.5	TD
	28/06	8.5	148.3	1002	-	1.5	TD
	28/12	8.6	148.5	1000	35	2.0	TS
	28/18	8.8	149.0	1000	35	2.0	TS
Mar.	01/00	8.9	149.1	998	35	2.0	TS
	01/06	9.1	149.1	996	35	2.0	TS
	01/12	9.3	149.2	994	40	2.5	TS
	01/18	9.2	149.0	994	40	2.5	TS
	02/00	9.2	148.8	994	40	3.0	TS
	02/06	9.3	148.5	994	40	3.0	TS
	02/12	9.5	148.8	994	40	3.0	TS
	02/18	10.0	149.2	992	40	3.0	TS
	03/00	10.9	149.7	990	45	3.5	TS
	03/06	12.2	149.2	985	50	3.5	STS
	03/12	12.9	149.3	985	50	3.5	STS
	03/18	13.9	149.5	980	55	4.0	STS
	04/00	14.7	149.9	980	55	4.0	STS
	04/06	16.1	150.6	980	60	4.0	STS
	04/12	17.5	151.2	975	65	4.0	TY
	04/18	18.8	151.7	975	65	4.5	TY
	05/00	20.0	152.5	980	60	4.5	STS
	05/06	21.2	153.5	985	50	4.5	STS
	05/12	21.9	154.1	990	45	4.0	TS
	05/18	22.2	155.0	994	-	3.5	L
	06/00	23.0	156.0	998	-	3.0	L
	06/06	23.3	157.3	996	-	-	L
	06/12	23.6	158.8	1000	-	-	L
	06/18	23.2	160.1	1000	-	-	L
	07/00	22.7	160.8	1004	-	-	L
	07/06	23.2	161.3	1004	-	-	L
	07/12	23.5	162.3	1004	-	-	L
	07/18	24.1	163.3	1004	-	-	L
	08/00	25.4	165.1	1006	-	-	L
	08/06	26.2	168.0	1008	-	-	L
	08/12						Dissip.

Peipah (1404)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Apr.	02/18	1.8	148.4	1004	-	1.0	TD
	03/00	1.9	147.8	1006	-	1.0	TD
	03/06	2.0	146.8	1002	-	2.0	TD
	03/12	1.9	146.0	1004	-	2.0	TD
	03/18	2.1	145.2	1002	-	2.0	TD
	04/00	2.6	144.6	1004	-	2.0	TD
	04/06	3.1	144.2	1002	-	2.0	TD
	04/12	3.5	143.3	1004	-	2.0	TD
	04/18	3.9	141.7	1002	-	2.0	TD
	05/00	4.3	140.4	1000	35	2.5	TS
	05/06	4.8	139.6	998	35	2.5	TS
	05/12	5.2	138.8	1002	-	2.5	TD
	05/18	5.6	137.9	1004	-	2.5	TD
	06/00	6.1	136.8	1006	-	2.5	TD
	06/06	6.4	135.8	1004	-	2.0	TD
	06/12	6.8	135.3	1006	-	2.0	TD
	06/18	7.0	134.5	1004	-	2.0	TD
	07/00	6.9	133.0	1004	-	2.0	TD
	07/06	6.6	132.3	1002	-	2.0	TD
	07/12	6.5	132.0	1004	-	2.0	TD
	07/18	6.7	131.9	1002	-	2.0	TD
	08/00	6.8	131.6	1006	-	2.0	TD
	08/06					2.0	Dissip.

Tapah (1405)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Apr.	27/00	10.1	146.5	1008	-	1.5	TD
	27/06	10.4	146.8	1006	-	1.5	TD
	27/12	11.2	147.0	1006	-	1.5	TD
	27/18	11.8	147.0	1004	-	2.0	TD
	28/00	12.5	147.0	1002	35	2.0	TS
	28/06	13.2	147.2	998	35	2.5	TS
	28/12	14.0	147.4	994	40	3.0	TS
	28/18	14.8	147.4	990	45	3.5	TS
	29/00	15.6	147.3	985	50	4.0	STS
	29/06	16.5	147.4	985	50	4.0	STS
	29/12	17.2	147.5	985	50	4.0	STS
	29/18	18.0	147.5	985	50	4.0	STS
	30/00	18.7	147.4	985	50	4.0	STS
	30/06	19.3	147.2	990	45	4.0	TS
	30/12	19.8	146.8	996	40	4.0	TS
	30/18	20.5	146.1	1002	35	3.5	TS
May	01/00	21.3	145.3	1006	-	3.0	TD
	01/06	22.0	144.4	1008	-	2.5	TD
	01/12	22.8	143.8	1008	-	-	TD
	01/18	23.5	144.0	1008	-	-	TD
	02/00	24.1	144.2	1010	-	-	TD
	02/06	24.9	145.2	1012	-	-	TD
	02/12						Dissip.

Mitag (1406)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jun.	09/00	21.0	120.0	1000	-	0.5	TD
	09/06	21.0	120.7	1000	-	0.5	TD
	09/12	21.1	121.1	1000	-	1.0	TD
	09/18	21.1	121.6	998	-	1.0	TD
	10/00	21.4	122.0	998	-	1.0	TD
	10/06	22.0	122.6	998	-	1.0	TD
	10/12	22.4	123.7	998	-	1.0	TD
	10/18	23.1	124.8	998	-	1.0	TD
	11/00	23.4	125.9	996	35	1.5	TS
	11/06	24.0	128.1	994	40	2.0	TS
	11/12	25.6	130.1	994	40	2.0	TS
	11/18	27.2	132.5	994	40	2.0	TS
	12/00	28.8	135.9	994	-	2.0	L
	12/06						Dissip.

Hagibis (1407)

	Date/Time (UTC)	Center position Lat (N)	Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jun.	13/00	18.8	116.0	998	-	0.0	TD
	13/06	19.4	116.7	998	-	0.0	TD
	13/12	19.6	116.9	998	-	0.5	TD
	13/18	20.1	117.1	998	-	1.0	TD
	14/00	20.6	117.0	996	35	1.0	TS
	14/06	20.9	116.7	996	35	1.5	TS
	14/12	21.2	116.9	996	35	2.0	TS
	14/18	21.6	116.9	996	35	2.5	TS
	15/00	22.0	116.7	996	35	2.5	TS
	15/06	22.7	116.4	996	35	2.5	TS
	15/12	23.0	116.4	996	35	2.5	TS
	15/18	23.7	116.3	998	-	2.0	TD
	16/00	24.3	116.5	1000	-	2.0	TD
	16/06	25.5	117.6	1000	-	2.0	TD
	16/12	25.9	118.7	1000	-	1.5	TD
	16/18	26.4	120.5	1000	-	1.5	TD
	17/00	27.4	122.6	998	40	1.5	TS
	17/06	28.5	125.7	996	40	2.0	TS
	17/12	29.2	130.0	1000	-	2.0	TD
	17/18	31.0	133.0	996	-	2.0	L
	18/00	31.0	137.2	996	-	-	L
	18/06	31.4	140.7	994	-	-	L
	18/12	31.9	142.9	994	-	-	L
	18/18	32.2	145.2	990	-	-	L
	19/00	32.8	148.0	990	-	-	L
	19/06	33.0	150.5	988	-	-	L
	19/12	32.9	152.3	992	-	-	L
	19/18	33.0	154.1	994	-	-	L
	20/00	33.4	156.3	996	-	-	L
	20/06	34.1	158.7	1000	-	-	L
	20/12	35.0	160.4	1002	-	-	L
	20/18	35.7	161.8	1004	-	-	L
	21/00	36.7	163.2	1004	-	-	L
	21/06	37.7	164.8	1004	-	-	L
	21/12	38.7	166.4	1006	-	-	L
	21/18	39.6	169.3	1008	-	-	L
	22/00	40.4	172.2	1006	-	-	L
	22/06	41.6	175.2	1004	-	-	L
	22/12	42.9	177.0	1004	-	-	L
	22/18	43.6	178.9	1004	-	-	L
	23/00	43.8	183.2	1004	-	-	Out

Neoguri (1408)

Date/Time (UTC)		Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jul.	02/12	8.4	146.8	1006	-	0.5	TD
	02/18	8.9	146.0	1004	-	0.0	TD
	03/00	9.2	145.6	1004	-	1.0	TD
	03/06	9.6	144.8	1004	-	2.0	TD
	03/12	10.4	144.1	1002	-	2.0	TD
	03/18	11.4	143.3	1000	35	2.0	TS
	04/00	12.0	142.6	996	40	2.5	TS
	04/06	13.0	141.3	990	45	3.0	TS
	04/12	14.0	140.5	975	65	4.0	TY
	04/18	14.5	139.1	970	70	4.0	TY
	05/00	15.2	138.3	965	75	4.5	TY
	05/06	16.0	137.0	955	80	5.5	TY
	05/12	16.7	136.0	945	85	5.5	TY
	05/18	17.4	134.5	945	85	5.5	TY
	06/00	18.0	133.0	935	95	6.0	TY
	06/06	18.4	131.5	935	95	6.0	TY
	06/12	18.9	130.3	935	95	6.0	TY
	06/18	19.7	129.1	930	100	6.0	TY
	07/00	20.4	128.3	930	100	6.0	TY
	07/06	21.6	127.3	935	95	6.0	TY
	07/09	21.9	127.0	940	90	-	TY
	07/12	22.3	126.8	940	90	6.0	TY
	07/15	23.1	126.7	940	90	-	TY
	07/18	23.7	126.2	940	90	5.5	TY
	07/21	24.3	126.1	940	90	-	TY
	08/00	25.0	126.1	940	90	5.5	TY
	08/03	25.8	125.9	940	90	-	TY
	08/06	26.5	125.7	945	85	5.5	TY
	08/09	27.1	125.6	945	85	-	TY
	08/12	27.7	125.7	945	85	5.5	TY
	08/15	28.4	125.7	950	80	-	TY
	08/18	28.9	125.8	955	75	5.5	TY
	08/21	29.7	126.1	960	70	-	TY
	09/00	30.4	126.2	965	70	5.0	TY
	09/03	30.8	126.4	965	65	-	TY
	09/06	31.4	126.9	970	60	4.5	STS
	09/09	31.6	127.1	970	55	-	STS
	09/12	31.7	127.6	970	55	4.0	STS
	09/15	31.8	128.5	975	50	-	STS
	09/18	32.1	129.2	975	50	3.5	STS
	09/21	32.1	130.0	980	50	-	STS
	10/00	32.1	131.5	985	50	3.0	STS
	10/03	32.4	132.9	985	50	-	STS
	10/06	33.0	134.3	985	50	2.5	STS
	10/09	33.5	135.3	985	50	-	STS
	10/12	33.8	136.8	990	50	2.0	STS
	10/15	34.1	137.7	990	45	-	TS
	10/17	34.6	138.5	990	45	-	TS
	10/18	34.7	139.1	990	45	1.5	TS
	10/19	34.9	139.5	990	45	-	TS
	10/21	35.3	140.4	990	45	-	TS
	11/00	37.0	142.0	990	-	1.5	L
	11/06	38.0	142.9	990	-	-	L
	11/12	39.8	145.5	992	-	-	L
	11/18	43.2	147.8	992	-	-	L
	12/00	46.2	147.7	992	-	-	L
	12/06	49.3	147.2	992	-	-	L
	12/12	50.2	148.4	994	-	-	L
	12/18	51.2	148.8	994	-	-	L
	13/00	52.4	149.5	996	-	-	L
	13/06	53.7	149.5	996	-	-	L
	13/12						Dissip.

Rammasun (1409)

Date/Time (UTC)		Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jul.	09/06	8.0	154.3	1006	-	-	TD
	09/12	8.0	153.6	1008	-	0.0	TD
	09/18	8.4	152.8	1006	-	0.5	TD
	10/00	8.8	152.0	1008	-	1.0	TD
	10/06	9.8	151.4	1006	-	1.0	TD
	10/12	10.8	150.4	1008	-	1.5	TD
	10/18	11.8	149.5	1006	-	1.5	TD
	11/00	12.3	148.8	1006	-	1.5	TD
	11/06	13.0	147.5	1006	-	1.5	TD
	11/12	13.6	146.8	1008	-	1.5	TD
	11/18	13.9	145.9	1008	-	1.5	TD
	12/00	13.9	144.3	1006	-	1.5	TD
	12/06	13.4	142.7	1004	35	2.0	TS
	12/12	13.5	141.1	1002	35	2.5	TS
	12/18	13.6	139.7	1000	35	2.5	TS
	13/00	13.7	137.5	998	40	2.5	TS
	13/06	13.5	135.9	998	40	2.5	TS
	13/12	13.4	134.2	994	40	2.5	TS
	13/18	13.4	132.4	990	45	3.0	TS
	14/00	13.1	130.6	985	50	3.5	STS
	14/06	12.8	129.2	980	55	4.0	STS
	14/12	12.7	128.2	975	55	4.0	STS
	14/18	12.6	126.9	965	65	4.5	TY
	15/00	12.7	125.6	960	70	5.0	TY
	15/06	12.9	124.7	950	80	5.5	TY
	15/12	13.4	123.4	945	85	6.0	TY
	15/18	14.0	121.9	945	85	6.0	TY
	16/00	14.2	120.4	960	70	5.0	TY
	16/06	15.1	119.0	965	65	4.5	TY
	16/12	15.1	117.6	970	60	4.0	STS
	16/18	15.6	116.8	970	60	4.0	STS
	17/00	16.2	115.6	960	65	5.0	TY
	17/06	16.9	114.9	960	65	5.0	TY
	17/12	17.5	114.3	955	70	5.0	TY
	17/18	18.5	113.4	945	80	5.5	TY
	18/00	19.1	112.3	940	85	6.0	TY
	18/06	20.0	111.2	935	90	6.5	TY
	18/12	20.3	110.2	940	90	6.5	TY
	18/18	21.0	109.4	955	70	6.5	TY
	19/00	21.8	108.1	965	50	6.0	STS
	19/06	22.2	107.0	980	40	5.0	TS
	19/12	22.5	106.1	990	35	5.0	TS
	19/18	22.7	104.4	996	-	4.5	TD
	20/00	23.0	103.6	998	-	4.0	TD
	20/06						Dissip.

Matmo (1410)

Date/Time (UTC)		Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jul.	16/06	10.0	136.8	1006	-	1.0	TD
	16/12	9.8	136.6	1008	-	1.0	TD
	16/18	9.7	136.2	1006	-	1.5	TD
	17/00	9.7	135.9	1006	-	1.5	TD
	17/06	10.0	135.6	1006	-	1.5	TD
	17/12	10.1	135.4	1004	35	2.0	TS
	17/18	10.4	135.1	1000	40	2.5	TS
	18/00	10.5	134.8	1000	40	3.0	TS
	18/06	10.6	133.9	996	45	3.0	TS
	18/12	10.6	133.1	996	45	3.0	TS
	18/18	10.9	132.3	990	50	3.5	STS
	19/00	10.9	131.5	985	55	3.5	STS
	19/06	11.1	130.9	980	60	4.0	STS
	19/12	11.5	130.5	980	60	4.0	STS
	19/18	12.0	130.0	980	60	4.0	STS
	20/00	12.9	129.6	980	60	4.0	STS
	20/06	13.6	128.9	980	60	4.0	STS
	20/12	14.2	128.2	980	60	4.0	STS
	20/18	14.9	127.7	975	65	5.0	TY
	21/00	16.2	127.3	965	70	5.0	TY
	21/06	17.7	126.3	965	70	5.0	TY
	21/12	18.3	125.3	965	70	5.0	TY
	21/18	19.2	124.3	965	70	5.0	TY
	22/00	20.4	123.7	965	70	5.0	TY
	22/06	21.8	122.7	965	70	5.0	TY
	22/12	22.4	122.0	965	70	5.0	TY
	22/18	23.6	120.9	975	60	5.0	STS
	23/00	24.5	120.2	985	50	4.0	STS
	23/06	25.1	119.6	985	50	3.5	STS
	23/12	25.5	118.7	985	45	3.0	TS
	23/18	26.6	118.2	990	40	2.5	TS
	24/00	27.9	117.7	992	35	2.0	TS
	24/06	29.4	117.9	992	35	1.5	TS
	24/12	30.8	118.3	992	35	1.0	TS
	24/18	32.1	118.8	992	35	1.0	TS
	25/00	33.4	119.7	992	35	0.5	TS
	25/06	36.0	122.0	994	-	0.5	L
	25/12	37.3	123.2	994	-	-	L
	25/18	38.3	124.2	996	-	-	L
	26/00	39.6	125.8	1000	-	-	L
	26/06						Dissip.

Halong (1411)

Date/Time (UTC)		Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jul.	27/18	11.3	151.8	1006	-	0.5	TD
	28/00	11.4	151.0	1008	-	1.0	TD
	28/06	11.5	150.3	1006	-	1.0	TD
	28/12	11.7	149.6	1008	-	1.0	TD
	28/18	12.0	148.9	1008	-	1.5	TD
	29/00	12.4	148.3	1002	35	1.5	TS
	29/06	12.8	147.9	998	35	2.0	TS
	29/12	13.0	147.5	992	45	2.5	TS
	29/18	13.6	146.5	992	45	2.5	TS
	30/00	13.7	145.7	992	45	2.5	TS
	30/06	14.2	144.5	992	45	2.5	TS
	30/12	14.4	143.6	992	45	2.5	TS
	30/18	14.6	142.9	992	45	2.5	TS
	31/00	14.9	142.0	990	45	2.5	TS
	31/06	15.0	141.3	990	45	2.5	TS
	31/12	14.6	140.6	990	45	3.0	TS
	31/18	14.3	139.8	985	50	3.5	STS
Aug.	01/00	14.1	139.2	975	55	3.5	STS
	01/06	14.7	138.4	975	55	3.5	STS
	01/12	14.7	137.7	970	60	4.0	STS
	01/18	14.8	137.0	960	75	5.0	TY
	02/00	14.9	136.5	945	80	5.5	TY
	02/06	14.9	135.7	930	95	6.0	TY
	02/12	14.9	135.1	920	105	6.5	TY
	02/18	15.1	134.6	920	105	6.5	TY
	03/00	15.2	133.9	920	105	6.5	TY
	03/06	15.6	133.1	920	105	6.5	TY
	03/12	15.7	132.3	925	100	6.5	TY
	03/18	16.2	131.4	930	95	6.5	TY
	04/00	16.5	130.7	930	95	6.0	TY
	04/06	16.9	130.4	935	90	5.5	TY
	04/12	17.4	129.9	940	85	5.5	TY
	04/18	18.1	129.8	950	80	5.5	TY
	05/00	19.1	129.8	955	75	5.0	TY
	05/06	20.0	129.7	955	75	5.0	TY
	05/12	20.8	130.0	950	75	5.0	TY
	05/18	21.7	130.1	950	75	4.5	TY
	06/00	22.4	130.3	945	80	4.5	TY
	06/06	23.1	130.7	945	80	5.0	TY
	06/12	23.6	131.1	940	85	5.0	TY
	06/15	23.9	131.2	940	85	-	TY
	06/18	24.2	131.4	940	85	5.0	TY
	06/21	24.6	131.6	945	80	-	TY
	07/00	24.8	131.7	945	80	5.0	TY
	07/03	25.3	131.7	945	80	-	TY
	07/06	25.6	131.6	945	80	5.0	TY
	07/09	25.8	131.7	945	80	-	TY
	07/12	26.1	131.7	945	80	5.0	TY
	07/15	26.4	131.6	945	80	-	TY
	07/18	26.7	131.5	945	80	5.0	TY
	07/21	27.0	131.6	945	80	-	TY
	08/00	27.2	131.6	950	75	5.0	TY
	08/03	27.6	131.7	950	75	-	TY
	08/06	28.2	131.6	950	75	5.0	TY
	08/09	28.5	131.6	950	75	-	TY
	08/12	28.7	131.7	955	75	4.5	TY
	08/15	28.9	131.8	955	75	-	TY
	08/18	29.5	132.0	955	75	4.0	TY
	08/21	29.9	132.1	955	75	-	TY
	09/00	30.4	132.3	955	75	4.0	TY
	09/03	30.9	132.3	955	75	-	TY
	09/06	31.3	132.5	960	70	4.0	TY
	09/09	31.7	132.8	960	70	-	TY
	09/12	32.2	133.1	960	70	4.0	TY
	09/15	32.6	133.2	960	70	-	TY
	09/18	33.0	133.4	960	70	4.0	TY
	09/21	33.5	133.8	965	70	-	TY
	10/00	34.2	134.3	970	65	3.5	TY
	10/01	34.5	134.5	975	65	-	TY
	10/03	35.2	134.9	975	65	-	TY
	10/06	36.4	135.5	975	60	3.0	STS
	10/09	37.6	136.3	975	60	-	STS
	10/12	38.9	136.8	975	55	2.5	STS
	10/18	41.0	137.2	975	55	2.0	STS
	11/00	43.0	137.0	972	-	1.5	L
	11/06	43.5	137.0	976	-	-	L
	11/12	44.3	137.3	982	-	-	L
	11/18	45.0	137.0	986	-	-	L
	12/00	45.3	137.7	990	-	-	L
	12/06	46.1	138.6	994	-	-	L
	12/12	46.5	139.5	998	-	-	L
	12/18	46.8	140.6	998	-	-	L
	13/00	47.6	142.7	998	-	-	L
	13/06	48.3	144.3	1000	-	-	L
	13/12	48.4	145.1	1004	-	-	L
	13/18	48.2	146.1	1004	-	-	L
	14/00	47.9	147.2	1006	-	-	L
	14/06	47.7	148.3	1006	-	-	L
	14/12	47.3	149.3	1008	-	-	L
	14/18	47.2	150.5	1008	-	-	L
	15/00	47.0	151.9	1008	-	-	L
	15/06						Dissip.

Nakri (1412)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Jul.	28/06	17.4	133.6	998	-	0.0	TD
	28/12	17.9	132.7	998	-	0.0	TD
	28/18	18.1	131.9	998	-	0.0	TD
	29/00	18.3	131.2	996	-	1.5	TD
	29/06	18.3	130.4	996	-	1.5	TD
	29/12	18.8	130.2	994	35	1.5	TS
	29/18	19.4	130.1	994	35	1.5	TS
	30/00	21.0	129.9	994	35	1.5	TS
	30/06	22.3	129.2	992	35	1.5	TS
	30/12	23.3	128.5	990	40	1.5	TS
	30/18	23.9	127.7	990	40	1.5	TS
	31/00	24.4	127.1	990	40	1.5	TS
	31/06	25.3	127.1	985	40	1.5	TS
	31/12	25.9	127.1	985	45	1.5	TS
	31/18	27.6	128.2	980	50	1.5	STS
Aug.	01/00	28.5	127.3	980	55	2.0	STS
	01/06	29.3	126.3	980	55	2.0	STS
	01/12	30.2	125.5	980	55	2.0	STS
	01/18	31.3	125.1	980	50	2.0	STS
	02/00	31.9	124.9	980	50	2.0	STS
	02/06	32.4	124.6	980	50	2.0	STS
	02/12	33.3	124.9	980	45	2.0	TS
	02/18	34.2	124.9	985	40	2.0	TS
	03/00	34.9	125.3	990	35	2.0	TS
	03/06	35.2	125.4	992	-	2.0	TD
	03/12	35.5	125.6	994	-	1.5	TD
	03/18	35.7	126.1	996	-	1.5	TD
	04/00	35.9	126.7	998	-	-	TD
	04/06						Dissip.

Genevieve (1413)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Aug.	07/00	13.6	181.2	950	90	5.5	Out
	07/06	14.4	180.0	925	100	6.5	TY
	07/12	15.1	178.7	925	100	6.5	TY
	07/18	15.7	177.5	915	110	7.0	TY
	08/00	16.2	176.7	915	110	7.0	TY
	08/06	16.8	176.1	915	110	7.0	TY
	08/12	17.5	175.9	925	100	6.0	TY
	08/18	18.5	176.0	925	100	6.0	TY
	09/00	19.6	176.4	930	100	6.0	TY
	09/06	21.1	176.9	935	95	6.0	TY
	09/12	22.7	177.3	940	90	6.0	TY
	09/18	24.5	176.9	945	85	5.5	TY
	10/00	26.6	176.2	950	85	5.5	TY
	10/06	28.5	175.2	955	80	5.0	TY
	10/12	30.2	173.8	965	70	4.5	TY
	10/18	31.5	172.1	975	60	4.0	STS
	11/00	32.8	170.3	985	50	3.5	STS
	11/06	33.8	169.2	990	45	3.0	TS
	11/12	34.4	168.2	994	40	3.0	TS
	11/18	34.6	167.4	998	35	2.5	TS
	12/00	34.9	166.7	1004	35	2.0	TS
	12/06	35.1	166.0	1008	-	2.0	TD
	12/12	35.4	165.5	1010	-	-	TD
	12/18	35.7	164.9	1012	-	-	TD
	13/00	36.3	164.7	1012	-	-	TD
	13/06	36.8	164.8	1012	-	-	TD
	13/12	37.4	165.6	1012	-	-	TD
	13/18	37.9	167.0	1012	-	-	TD
	14/00	38.6	168.7	1012	-	-	TD
	14/06	39.1	171.3	1012	-	-	TD
	14/12						Dissip.

Fengshen (1414)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Sep.	05/12	20.3	127.6	1004	-	0.5	TD
	05/18	22.2	126.8	1004	-	1.0	TD
	06/00	23.6	126.6	1004	-	1.0	TD
	06/06	24.5	126.7	1004	-	1.0	TD
	06/12	25.0	127.9	1002	-	1.5	TD
	06/18	26.3	128.8	998	35	2.0	TS
	07/00	27.2	129.8	996	35	2.0	TS
	07/06	27.4	130.9	994	40	2.5	TS
	07/12	27.9	132.8	992	45	3.0	TS
	07/18	28.4	133.7	985	50	3.5	STS
	08/00	28.9	135.6	980	55	3.5	STS
	08/06	30.0	137.3	975	60	3.5	STS
	08/12	30.9	138.6	975	60	3.5	STS
	08/18	31.6	140.4	975	60	3.5	STS
	09/00	32.6	143.1	975	60	3.5	STS
	09/06	33.1	144.8	975	60	3.5	STS
	09/12	34.0	146.8	980	55	3.0	STS
	09/18	35.0	148.9	980	55	2.5	STS
	10/00	35.8	152.6	985	50	2.5	STS
	10/06	37.2	156.0	985	50	2.5	STS
	10/12	38.5	159.3	990	45	2.5	TS
	10/18	39.7	163.6	990	-	-	L
	11/00	40.5	168.0	992	-	-	L
	11/06						Dissip.

Kalmaegi (1415)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Sep.	11/18	13.5	134.0	1004	-	0.5	TD
	12/00	13.7	132.2	1004	-	1.0	TD
	12/06	13.7	131.2	1000	35	2.0	TS
	12/12	13.7	130.2	996	40	2.5	TS
	12/18	13.7	129.4	990	45	2.5	TS
	13/00	14.2	128.8	985	50	3.0	STS
	13/06	14.9	127.4	980	55	3.5	STS
	13/12	15.4	126.6	975	60	3.5	STS
	13/18	15.8	125.7	970	65	4.0	TY
	14/00	16.4	124.5	970	65	4.0	TY
	14/06	17.0	123.4	970	65	4.5	TY
	14/12	17.8	121.7	970	65	4.5	TY
	14/18	17.9	119.6	975	60	3.5	STS
	15/00	18.0	118.2	970	65	4.0	TY
	15/06	18.6	116.3	970	65	4.0	TY
	15/12	18.9	114.6	965	70	4.5	TY
	15/18	19.0	112.8	965	70	4.5	TY
	16/00	19.7	111.2	960	75	4.5	TY
	16/06	20.5	109.7	960	75	4.5	TY
	16/12	21.1	108.0	970	65	4.0	TY
	16/18	21.8	106.4	980	55	3.5	STS
	17/00	22.4	104.7	985	50	3.0	STS
	17/06	22.9	103.1	994	40	2.5	TS
	17/12	22.4	101.8	998	-	2.0	TD
	17/18	21.6	100.8	1002	-	-	TD
	18/00						Dissip.

Fung-wong (1416)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Sep.	17/00	12.6	135.0	1002	-	0.5	TD
	17/06	12.5	132.8	1002	-	1.0	TD
	17/12	12.7	131.3	1000	35	1.5	TS
	17/18	13.5	129.2	1000	35	1.5	TS
	18/00	14.2	128.0	998	40	2.0	TS
	18/06	14.8	126.9	996	40	2.5	TS
	18/12	16.0	125.2	994	40	2.5	TS
	18/18	17.0	123.7	990	45	2.5	TS
	19/00	17.8	122.6	990	45	3.0	TS
	19/06	18.6	120.9	985	45	3.0	TS
	19/12	18.1	119.7	985	45	3.0	TS
	19/18	17.8	120.2	985	45	3.5	TS
	20/00	19.4	119.8	985	45	3.5	TS
	20/06	20.1	119.5	985	45	3.5	TS
	20/12	20.6	119.7	985	45	3.0	TS
	20/18	20.9	120.0	985	45	3.0	TS
	21/00	21.8	120.1	985	45	3.0	TS
	21/06	22.7	121.4	985	45	3.0	TS
	21/12	24.3	121.8	990	45	3.0	TS
	21/18	26.1	122.1	990	45	3.0	TS
	22/00	27.2	122.0	990	40	2.5	TS
	22/06	28.3	122.1	990	40	2.5	TS
	22/12	29.0	122.2	992	40	2.5	TS
	22/18	29.8	121.9	996	35	2.5	TS
	23/00	30.5	121.6	998	35	2.0	TS
	23/06	31.3	121.8	998	35	1.5	TS
	23/12	32.1	122.6	998	35	1.5	TS
	23/18	32.7	123.0	998	35	1.0	TS
	24/00	33.0	125.0	1002	-	1.0	L
	24/06	34.3	127.7	1002	-	-	L
	24/12	36.0	131.6	1002	-	-	L
	24/18	37.0	135.0	1000	-	-	L
	25/00	37.5	138.5	1002	-	-	L
	25/06						Dissip.

Kammuri (1417)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Sep.	23/12	17.9	149.6	1004	-	0.0	TD
	23/18	18.6	149.9	1002	-	1.5	TD
	24/00	19.3	150.0	1002	-	2.0	TD
	24/06	19.8	149.9	1000	-	2.0	TD
	24/12	20.0	149.6	998	35	2.0	TS
	24/18	20.1	149.2	994	40	2.0	TS
	25/00	20.2	148.4	994	40	2.0	TS
	25/06	20.2	147.5	992	40	2.5	TS
	25/12	20.3	147.3	992	40	2.5	TS
	25/18	20.8	146.8	992	40	3.0	TS
	26/00	21.6	146.0	992	40	3.0	TS
	26/06	22.3	145.3	990	45	3.5	TS
	26/12	23.2	145.1	985	50	3.5	STS
	26/18	23.8	144.5	985	50	3.5	STS
	27/00	25.0	144.2	985	50	3.5	STS
	27/06	26.3	143.7	985	50	3.5	STS
	27/12	27.4	143.5	985	45	3.0	TS
	27/18	28.0	143.5	985	45	3.0	TS
	28/00	29.0	143.3	985	45	3.0	TS
	28/06	30.6	143.9	985	45	2.5	TS
	28/12	31.6	144.7	985	45	2.5	TS
	28/18	32.7	145.6	985	45	2.5	TS
	29/00	33.4	146.7	985	45	2.0	TS
	29/06	34.4	148.5	985	45	2.0	TS
	29/12	35.4	150.9	985	45	2.0	TS
	29/18	36.6	153.4	985	45	2.0	TS
	30/00	37.8	156.8	985	45	1.5	TS
	30/06	39.2	160.0	986	-	-	L
	30/12	40.6	162.3	986	-	-	L
	30/18	41.0	165.5	988	-	-	L
Oct.	01/00	40.8	169.6	988	-	-	L
	01/06	39.9	173.6	992	-	-	L
	01/12	39.1	176.7	996	-	-	L
	01/18	37.8	180.1	996	-	-	Out

Phanfone (1418)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Sep.	28/06	11.0	157.1	1004	-	1.0	TD
	28/12	11.6	155.1	1004	-	1.0	TD
	28/18	12.2	153.8	1002	-	1.5	TD
	29/00	12.7	152.2	1000	-	1.5	TD
	29/06	13.0	151.0	998	35	2.0	TS
	29/12	13.4	150.3	994	40	2.0	TS
	29/18	13.9	149.5	990	45	2.0	TS
	30/00	15.2	148.1	990	45	2.0	TS
	30/06	16.4	146.9	990	45	2.5	TS
	30/12	16.4	145.8	985	50	3.0	STS
	30/18	16.6	144.7	980	55	3.5	STS
Oct.	01/00	16.9	143.8	970	60	4.0	STS
	01/06	18.1	142.6	965	65	4.0	TY
	01/12	18.4	141.2	955	75	4.5	TY
	01/18	18.9	140.2	950	80	5.0	TY
	02/00	19.5	139.0	940	90	5.5	TY
	02/06	19.7	138.2	935	95	5.5	TY
	02/12	20.6	137.5	935	95	5.5	TY
	02/18	21.5	136.5	935	95	5.5	TY
	03/00	22.3	135.5	935	95	5.0	TY
	03/06	23.2	134.6	935	95	5.0	TY
	03/12	24.0	134.0	935	95	5.0	TY
	03/18	24.7	133.4	935	95	5.5	TY
	03/21	25.1	133.1	935	95	5.5	TY
	04/00	25.4	132.9	935	95	5.5	TY
	04/03	25.9	132.5	935	95	-	TY
	04/06	26.3	132.3	935	95	5.5	TY
	04/09	26.7	132.1	935	95	-	TY
	04/12	27.1	131.8	935	95	5.5	TY
	04/15	27.5	131.5	935	95	-	TY
	04/18	27.9	131.3	940	90	5.0	TY
	04/21	28.4	131.2	940	90	-	TY
	05/00	28.9	131.3	945	85	5.0	TY
	05/03	29.5	131.4	945	85	-	TY
	05/06	30.1	131.9	945	85	5.0	TY
	05/09	30.7	132.5	945	85	-	TY
	05/12	31.4	133.2	950	80	5.0	TY
	05/15	32.2	134.3	950	80	-	TY
	05/18	33.0	135.4	955	75	5.0	TY
	05/21	34.0	136.9	960	70	-	TY
	05/23	34.7	137.7	965	65	-	TY
	06/00	34.9	138.5	965	65	4.5	TY
	06/03	36.1	140.7	970	65	-	TY
	06/06	37.7	143.5	975	60	4.0	STS
	06/12	39.0	147.0	982	-	3.5	L
	06/18	39.7	153.7	984	-	-	L
	07/00	39.8	159.4	984	-	-	L
	07/06	40.3	164.7	978	-	-	L
	07/12	41.0	170.7	972	-	-	L
	07/18	42.0	176.5	964	-	-	L
	08/00	43.2	181.3	960	-	-	Out

Vongfong (1419)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Oct.	02/12	7.3	162.1	1006	-	0.5	TD
	02/18	8.0	160.8	1004	-	1.0	TD
	03/00	8.4	159.9	1004	-	1.0	TD
	03/06	8.5	158.7	1004	-	1.5	TD
	03/12	8.7	157.5	1004	-	2.0	TD
	03/18	9.0	156.2	1000	35	2.0	TS
	04/00	9.6	155.1	996	40	2.5	TS
	04/06	10.4	154.0	990	45	3.0	TS
	04/12	11.1	152.9	985	50	3.5	STS
	04/18	12.0	151.5	980	55	4.0	STS
	05/00	12.5	150.0	975	60	4.5	STS
	05/06	13.3	148.5	975	60	4.5	STS
	05/12	13.8	146.9	975	60	4.5	STS
	05/18	14.5	145.1	975	60	4.5	STS
	06/00	15.1	143.3	975	60	4.5	STS
	06/06	15.8	141.3	975	60	4.5	STS
	06/12	16.5	139.7	975	60	4.5	STS
	06/18	16.8	138.1	965	70	5.0	TY
	07/00	16.9	136.5	950	80	5.5	TY
	07/06	17.3	135.4	935	90	6.5	TY
	07/12	17.4	134.2	915	105	7.0	TY
	07/18	17.7	133.2	900	115	7.5	TY
	08/00	17.9	132.2	900	115	7.5	TY
	08/06	18.2	131.5	900	115	7.5	TY
	08/12	18.4	131.0	900	115	7.5	TY
	08/18	18.8	130.5	905	110	7.0	TY
	09/00	19.2	130.0	905	110	7.0	TY
	09/06	19.7	129.9	915	105	6.0	TY
	09/12	20.2	129.6	925	100	6.0	TY
	09/18	20.8	129.4	925	100	6.0	TY
	10/00	21.4	129.4	925	100	6.0	TY
	10/06	22.2	129.3	925	100	6.0	TY
	10/12	23.1	129.2	935	95	5.5	TY
	10/18	23.8	129.0	940	90	5.5	TY
	10/21	24.1	128.9	940	90	-	TY
	11/00	24.4	128.8	940	90	5.5	TY
	11/03	24.9	128.7	945	85	-	TY
	11/06	25.3	128.6	945	85	5.0	TY
	11/09	25.6	128.4	945	85	-	TY
	11/12	26.1	128.1	945	85	5.0	TY
	11/15	26.4	128.0	950	80	-	TY
	11/18	26.9	127.7	950	80	4.5	TY
	11/21	27.4	127.5	950	80	-	TY
	12/00	27.7	127.4	965	70	4.0	TY
	12/03	28.1	127.1	965	70	-	TY
	12/06	28.8	127.1	970	65	3.5	TY
	12/09	29.3	127.3	970	65	-	TY
	12/12	29.7	127.6	970	65	3.5	TY
	12/15	30.2	128.2	970	65	-	TY
	12/18	30.6	129.0	970	65	3.5	TY
	12/21	30.9	129.6	970	65	-	TY
	12/23	31.1	130.0	970	65	-	TY
	13/00	31.3	130.3	975	60	3.0	STS
	13/03	32.2	131.6	975	60	-	STS
	13/05	32.9	132.4	975	60	-	STS
	13/06	33.1	133.0	975	60	3.0	STS
	13/09	33.9	134.2	980	55	-	STS
	13/10	34.2	134.6	980	55	-	STS
	13/11	34.4	135.1	985	50	-	STS
	13/12	34.5	136.0	985	50	2.5	STS
	13/15	35.6	136.9	985	50	-	STS
	13/18	36.5	139.7	985	50	2.5	STS
	13/21	38.0	141.5	980	55	-	STS
	14/00	39.0	143.2	980	-	2.0	L
	14/06	40.5	146.0	980	-	-	L
	14/12	42.0	149.4	980	-	-	L
	14/18	44.1	153.1	980	-	-	L
	15/00	46.5	156.2	980	-	-	L
	15/06	48.4	160.4	980	-	-	L
	15/12	49.9	164.5	980	-	-	L
	15/18	51.2	169.3	980	-	-	L
	16/00	51.7	173.4	980	-	-	L
	16/06	51.5	177.8	980	-	-	L
	16/12	51.0	183.0	980	-	-	Out

Nuri (1420)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Oct.	30/00	12.6	140.9	1004	-	0.5	TD
	30/06	12.6	139.7	1004	-	0.5	TD
	30/12	12.6	138.8	1004	-	0.5	TD
	30/18	12.4	138.0	1002	-	1.0	TD
	31/00	12.4	137.2	1000	35	1.5	TS
	31/06	12.5	136.4	1000	35	2.0	TS
	31/12	12.6	135.5	998	35	2.5	TS
	31/18	12.9	134.6	992	40	3.0	TS
Nov.	01/00	13.0	134.0	980	55	3.5	STS
	01/06	13.5	133.7	975	55	4.0	STS
	01/12	14.1	133.5	965	65	4.5	TY
	01/18	14.8	133.1	955	75	5.0	TY
	02/00	15.4	132.8	940	85	6.0	TY
	02/06	16.3	132.7	930	95	6.5	TY
	02/12	17.2	132.5	910	110	7.0	TY
	02/18	17.8	132.4	910	110	7.0	TY
	03/00	18.4	132.5	910	110	7.0	TY
	03/06	19.0	132.9	910	110	7.0	TY
	03/12	19.8	133.5	915	105	7.0	TY
	03/18	20.5	134.3	920	105	7.0	TY
	04/00	21.3	135.0	925	100	6.5	TY
	04/06	22.1	135.5	930	95	6.5	TY
	04/12	23.0	136.2	935	90	5.5	TY
	04/18	23.9	136.8	940	85	5.5	TY
	05/00	24.6	137.3	945	80	5.0	TY
	05/06	25.5	138.1	950	75	4.5	TY
	05/12	26.2	138.9	960	70	4.5	TY
	05/18	27.2	139.4	970	60	4.0	STS
	06/00	28.3	139.9	975	60	3.5	STS
	06/06	29.8	141.5	975	60	3.5	STS
	06/12	32.1	143.4	980	60	3.0	STS
	06/18	34.3	146.1	980	-	2.5	L
	07/00	37.0	151.0	984	-	2.0	L
	07/06	42.0	159.0	976	-	-	L
	07/12						Dissip.

Sinlaku (1421)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Nov.	26/00	8.4	128.0	1002	-	0.5	TD
	26/06	8.9	126.8	1002	-	1.5	TD
	26/12	9.3	125.3	1002	-	2.0	TD
	26/18	9.7	124.0	1000	-	1.5	TD
	27/00	9.9	122.6	1002	-	1.5	TD
	27/06	9.9	121.4	1002	-	1.5	TD
	27/12	10.0	120.3	1004	-	1.5	TD
	27/18	10.6	118.5	1004	-	1.5	TD
	28/00	11.2	117.3	1000	35	2.0	TS
	28/06	11.5	115.8	996	40	2.5	TS
	28/12	11.9	114.5	992	45	3.0	TS
	28/18	12.2	113.1	992	45	3.0	TS
	29/00	12.7	111.8	990	45	3.5	TS
	29/06	13.0	110.7	992	45	3.5	TS
	29/12	13.2	110.0	992	45	3.5	TS
	29/18	13.4	109.2	992	45	3.0	TS
	30/00	13.4	108.6	998	35	2.5	TS
	30/06	13.3	107.9	1002	-	2.0	TD
	30/12						Dissip.

Hagupit (1422)

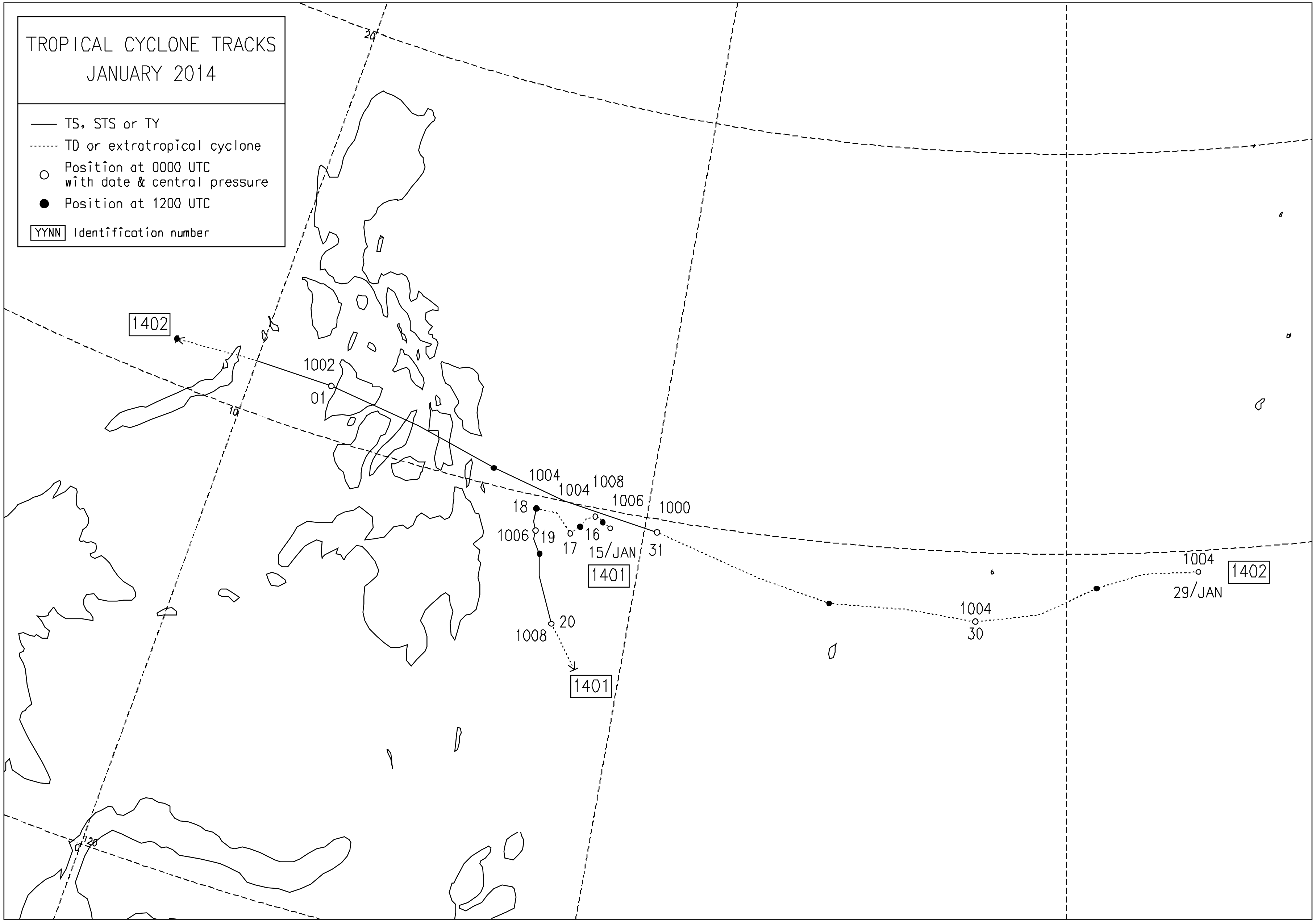
Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Nov.	30/12	2.6	156.0	1006	-	0.5	TD
	30/18	3.6	154.8	1004	-	1.0	TD
Dec.	01/00	4.1	153.4	1000	35	1.5	TS
	01/06	4.9	152.2	998	35	2.0	TS
	01/12	5.5	150.7	994	40	2.5	TS
	01/18	5.9	148.9	990	45	3.0	TS
	02/00	5.9	146.9	985	50	3.5	STS
	02/06	6.1	145.1	980	55	4.0	STS
	02/12	6.2	143.5	975	60	4.5	STS
	02/18	6.6	142.1	965	70	5.0	TY
	03/00	7.5	140.5	955	75	5.0	TY
	03/06	8.2	138.6	950	80	5.0	TY
	03/12	8.7	136.8	945	85	5.5	TY
	03/18	9.2	135.3	935	95	6.0	TY
	04/00	9.8	133.8	915	105	7.0	TY
	04/06	10.4	132.4	905	115	7.5	TY
	04/12	11.0	131.3	905	115	7.5	TY
	04/18	11.4	130.4	905	115	7.5	TY
	05/00	11.6	129.7	910	110	7.5	TY
	05/06	11.9	129.0	910	110	7.5	TY
	05/12	12.0	128.5	910	110	7.5	TY
	05/18	12.0	128.0	925	100	6.5	TY
	06/00	12.0	127.3	935	95	6.0	TY
	06/06	12.1	126.6	935	95	6.0	TY
	06/12	12.0	125.9	945	90	5.5	TY
	06/18	11.8	125.3	945	90	5.5	TY
	07/00	11.9	124.6	955	85	5.0	TY
	07/06	12.2	124.1	955	85	4.5	TY
	07/12	12.5	123.6	965	75	4.0	TY
	07/18	12.8	123.1	975	65	3.5	TY
	08/00	13.2	122.6	980	60	3.0	STS
	08/06	13.5	122.0	985	55	3.0	STS
	08/12	13.7	121.2	990	45	2.5	TS
	08/18	13.7	121.0	990	40	2.5	TS
	09/00	13.7	120.6	994	35	2.0	TS
	09/06	13.6	119.7	994	35	2.5	TS
	09/12	13.6	118.9	990	40	3.0	TS
	09/18	13.7	117.9	990	40	3.0	TS
	10/00	13.7	116.9	990	40	3.0	TS
	10/06	13.8	116.0	990	40	3.0	TS
	10/12	13.8	115.3	990	40	3.0	TS
	10/18	13.8	114.3	990	40	3.0	TS
	11/00	13.6	113.4	996	35	2.5	TS
	11/06	13.1	112.5	1002	-	2.5	TD
	11/12	12.4	111.6	1004	-	2.5	TD
	11/18	11.6	110.8	1006	-	-	TD
	12/00	10.3	110.0	1008	-	-	TD
	12/06	9.2	109.2	1008	-	-	TD
	12/12						Dissip.

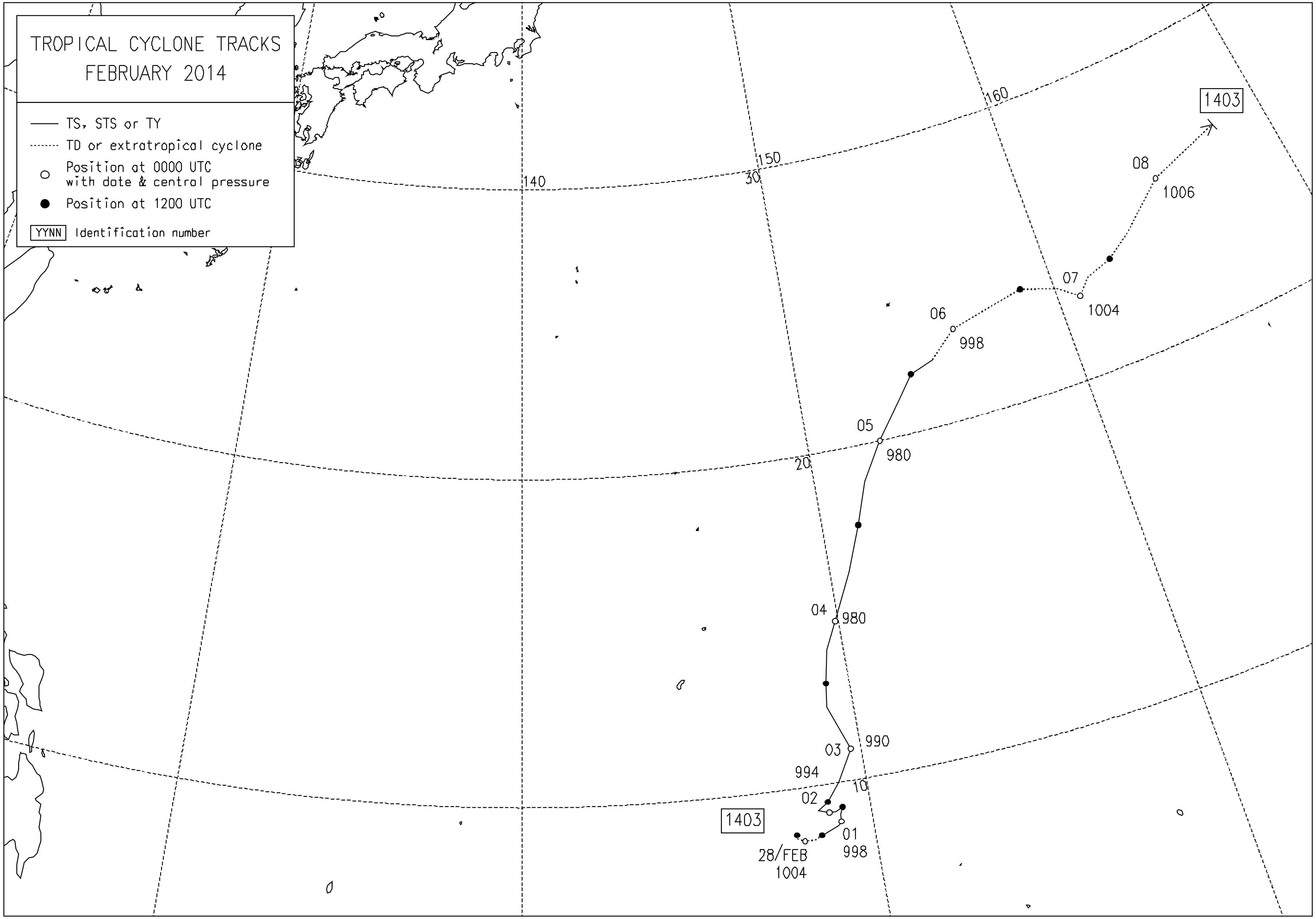
Jangmi (1423)

Month	Date/Time (UTC)	Center position Lat (N)	Center position Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
Dec.	28/00	7.4	128.7	1006	-	1.0	TD
	28/06	7.9	128.0	1002	-	1.5	TD
	28/12	8.2	127.2	1000	35	2.0	TS
	28/18	8.6	126.6	998	35	2.0	TS
	29/00	9.0	126.0	1000	35	2.5	TS
	29/06	9.4	125.4	998	35	2.0	TS
	29/12	9.5	124.7	998	35	2.5	TS
	29/18	9.9	124.1	996	40	2.0	TS
	30/00	10.1	123.0	998	35	1.5	TS
	30/06	9.6	122.4	1000	35	1.0	TS
	30/12	9.4	122.1	1002	-	0.5	TD
	30/18	9.0	121.8	1002	-	0.5	TD
	31/00	8.7	121.6	1004	-	0.5	TD
	31/06	8.2	120.8	1002	-	0.5	TD
	31/12	7.5	120.4	1004	-	-	TD
	31/18	6.9	119.5	1004	-	-	TD
Jan.	01/00	6.8	119.0	1006	-	-	TD
	01/06	6.6	118.5	1004	-	-	TD
	01/12	6.4	117.5	1006	-	-	TD
	01/18						Dissip.

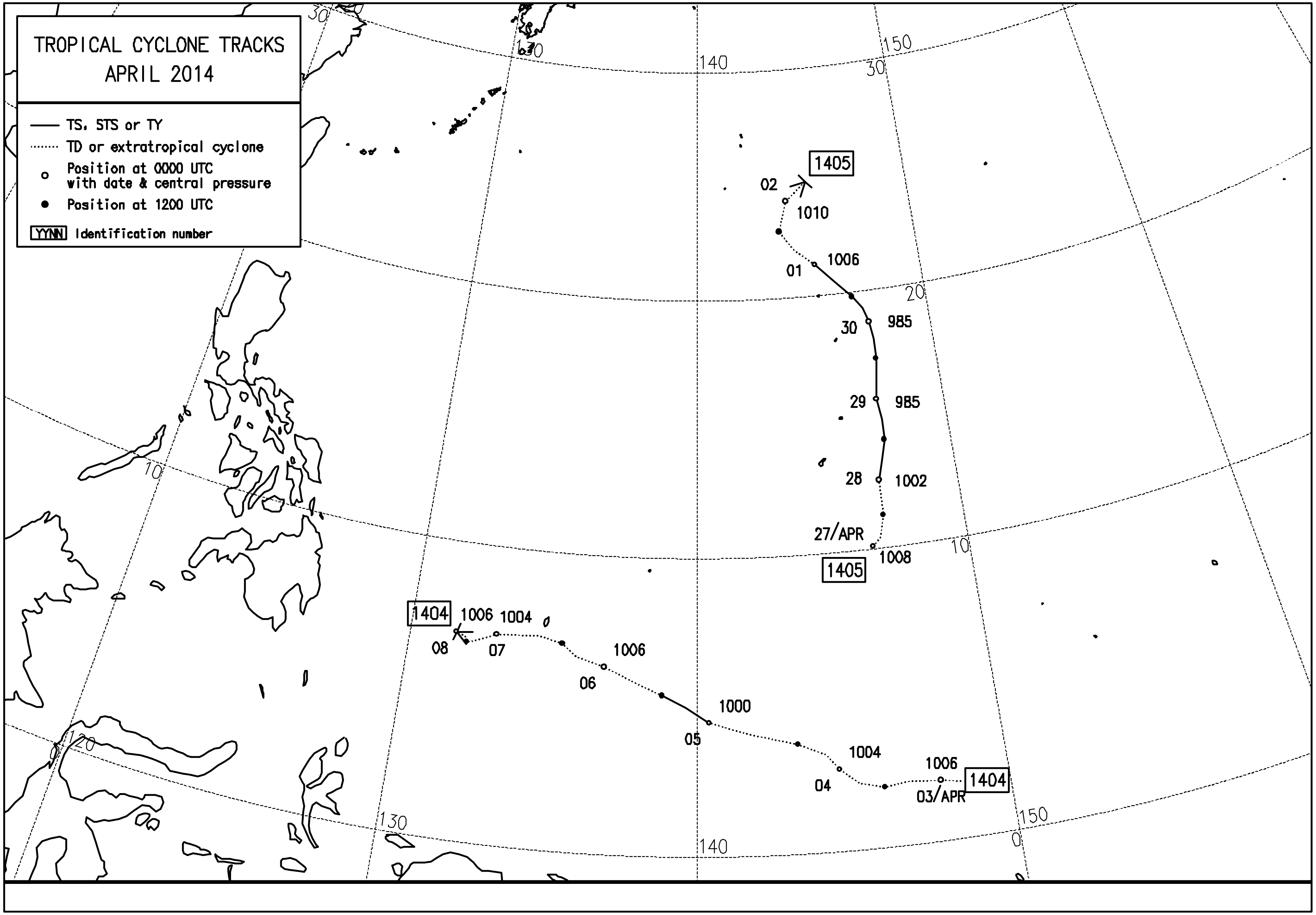
Appendix 2

Monthly Tracks of Tropical Cyclones in 2014

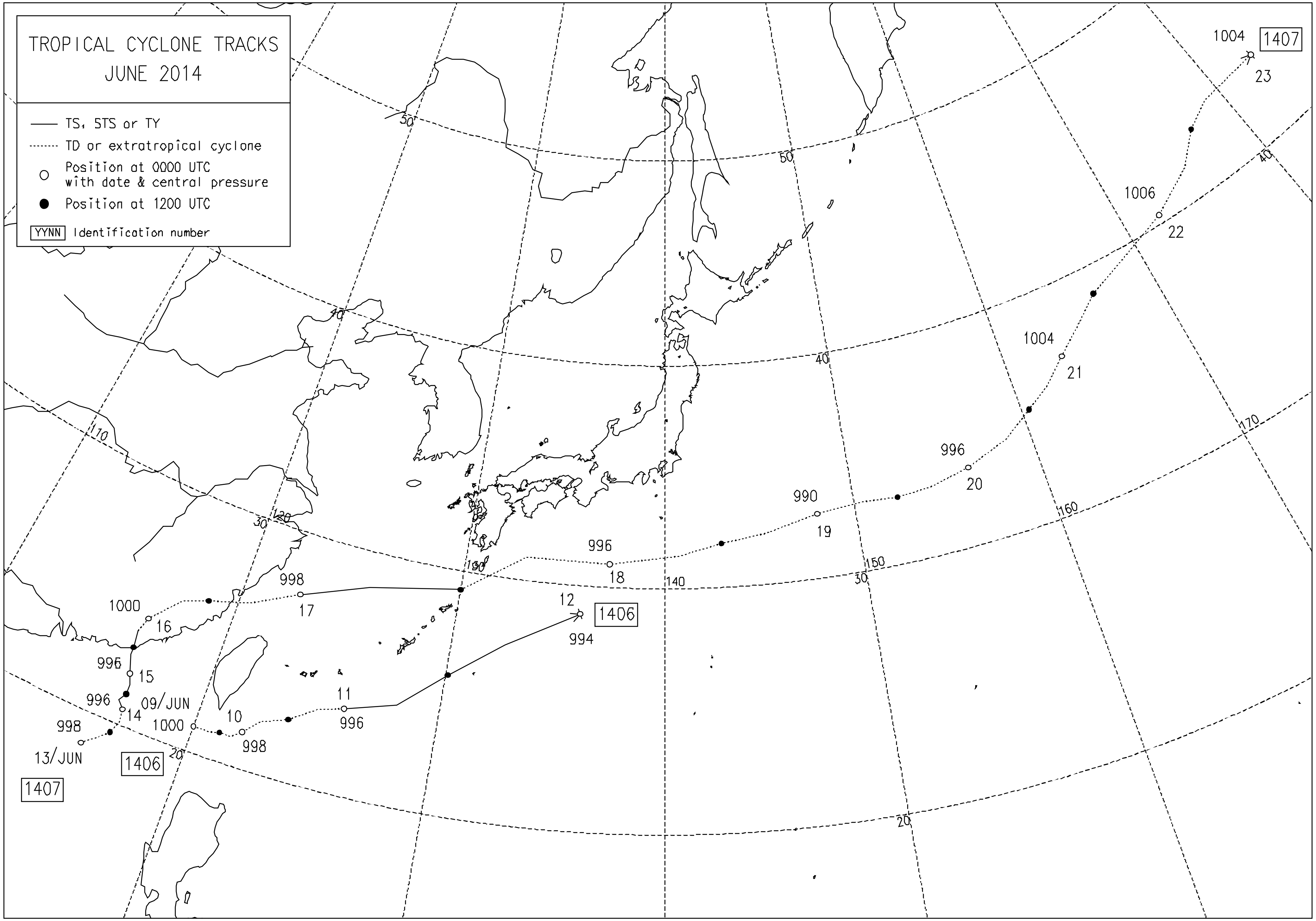

TROPICAL CYCLONE TRACKS
JANUARY 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC
with date & central pressure
Position at 1200 UTC
YYNN Identification number
1402
1002
01
1004
1004
1008
1006
1000
18
1006
19
17
16
15/JAN
31
1401
20
1008
1401
1004
1402
29/JAN
1004
30

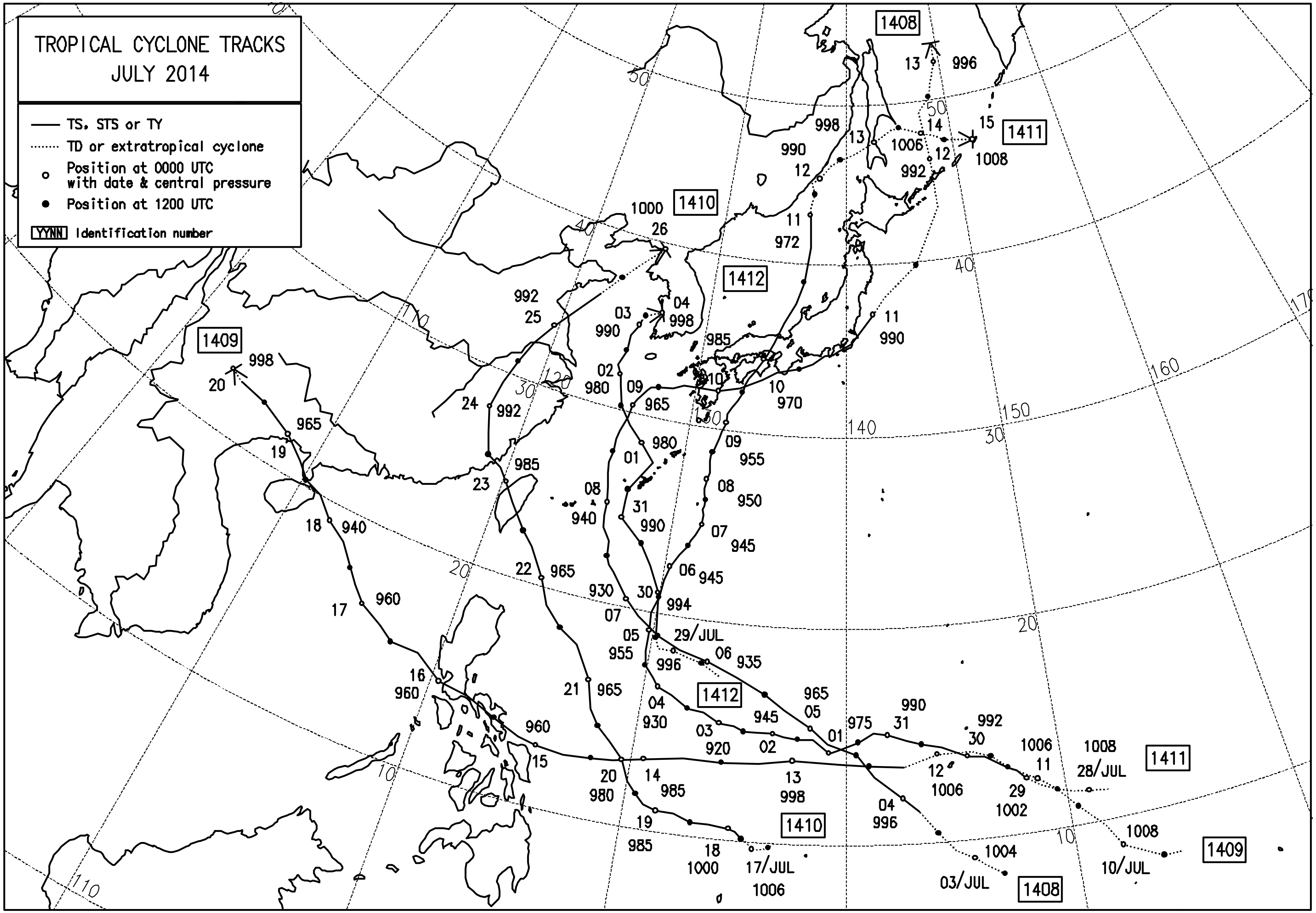


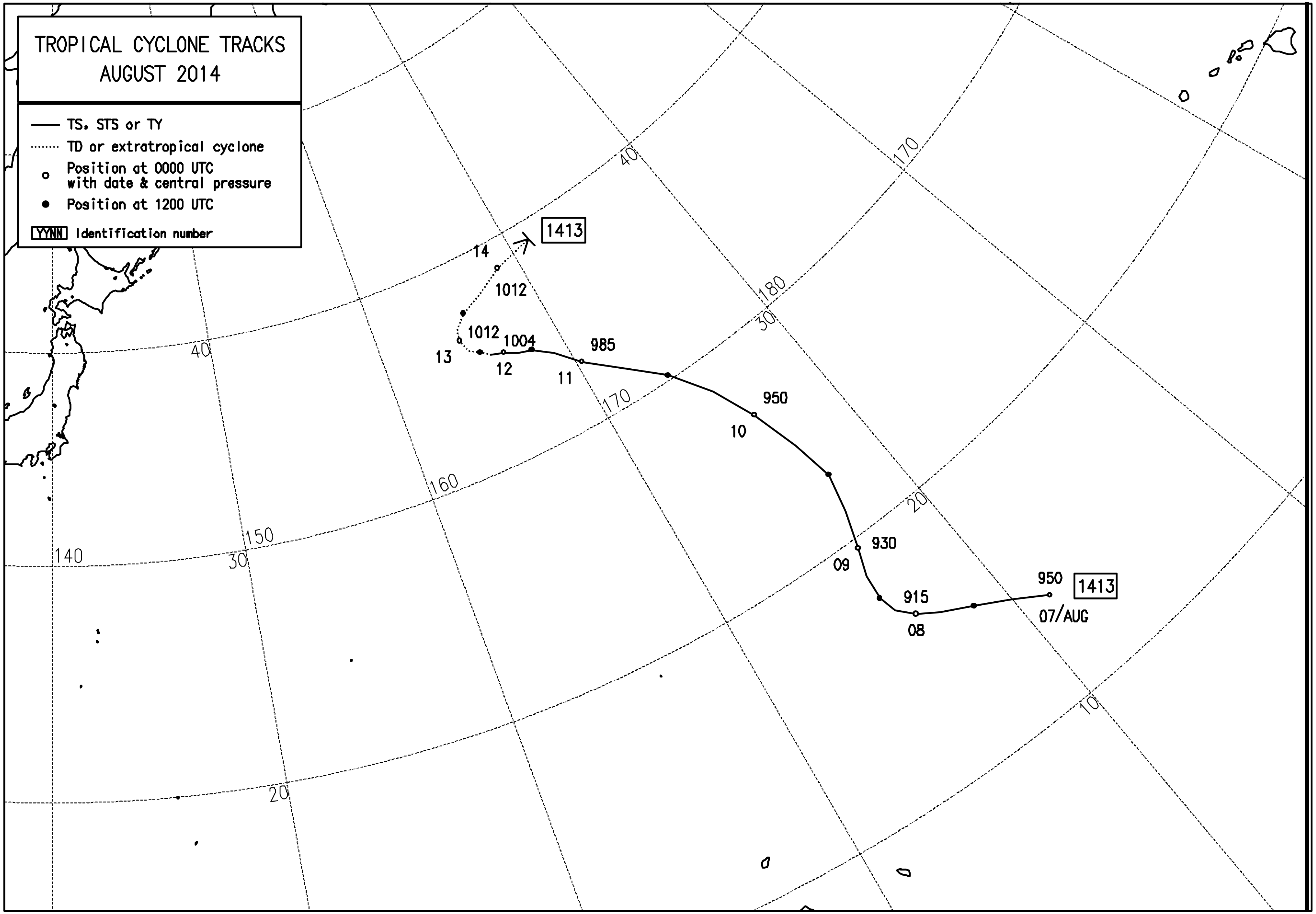
TROPICAL CYCLONE TRACKS
FEBRUARY 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC
with date & central pressure
Position at 1200 UTC
YYNN Identification number
140
150
160
30
20
10
1403
28/FEB
1004
01
998
02
994
03
990
04
980
05
980
06
998
07
1004
08
1006
1403

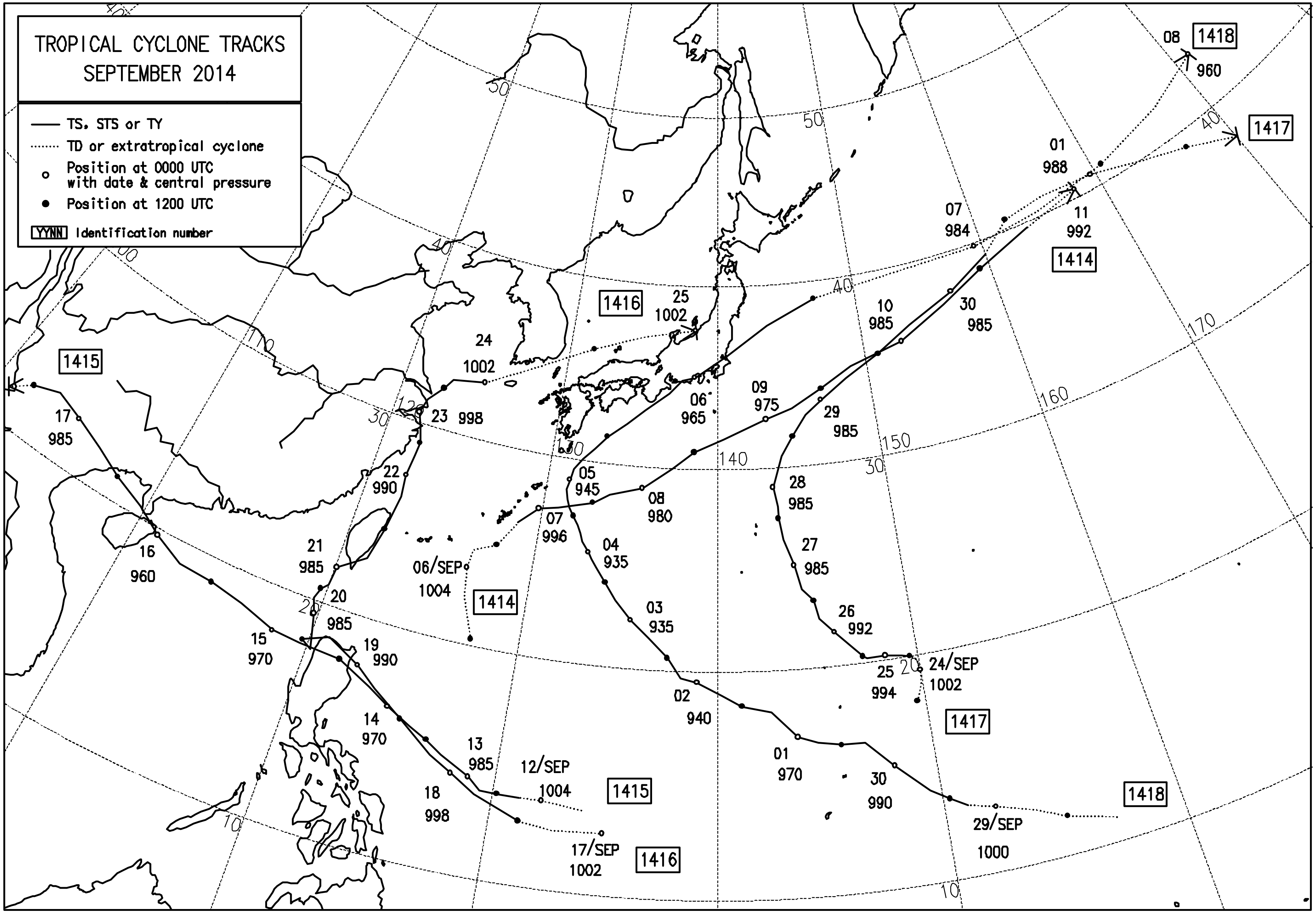


TROPICAL CYCLONE TRACKS
APRIL 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC with date & central pressure
Position at 1200 UTC
YYNN Identification number
1405
02
1010
1006
01
985
30
29
985
28
1002
27/APR
1008
1405
1404
1006
1004
08
07
1006
06
1000
05
1004
04
1006
1404
03/APR
10
20
30
120
130
140
150

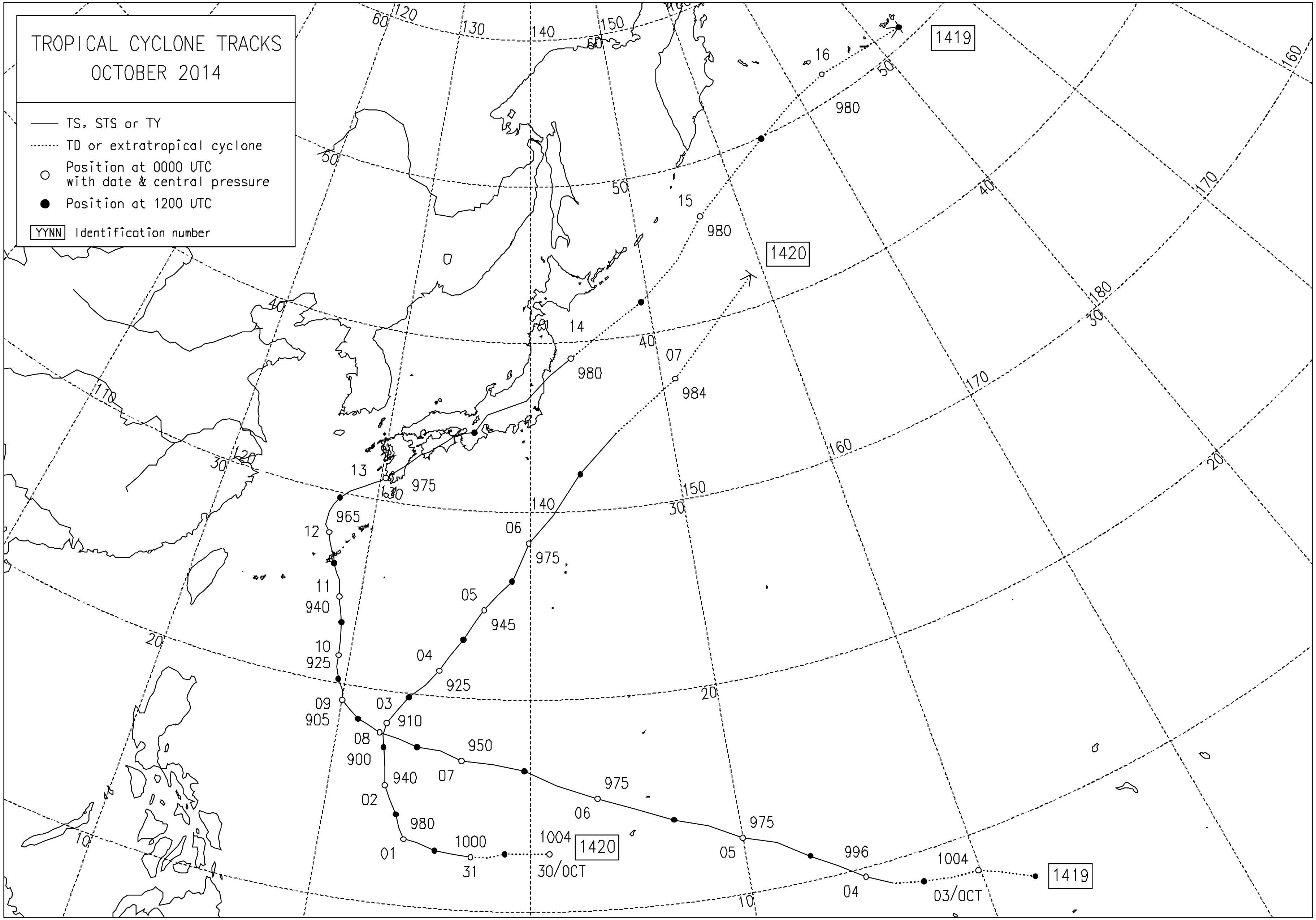

TROPICAL CYCLONE TRACKS
JUNE 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC
with date & central pressure
Position at 1200 UTC
YYNN Identification number
1406
09/JUN
10
1000
998
11
996
12
994
1407
13/JUN
998
14
996
15
996
16
1000
17
998
18
996
19
990
20
996
21
1004
22
1006
23
1004

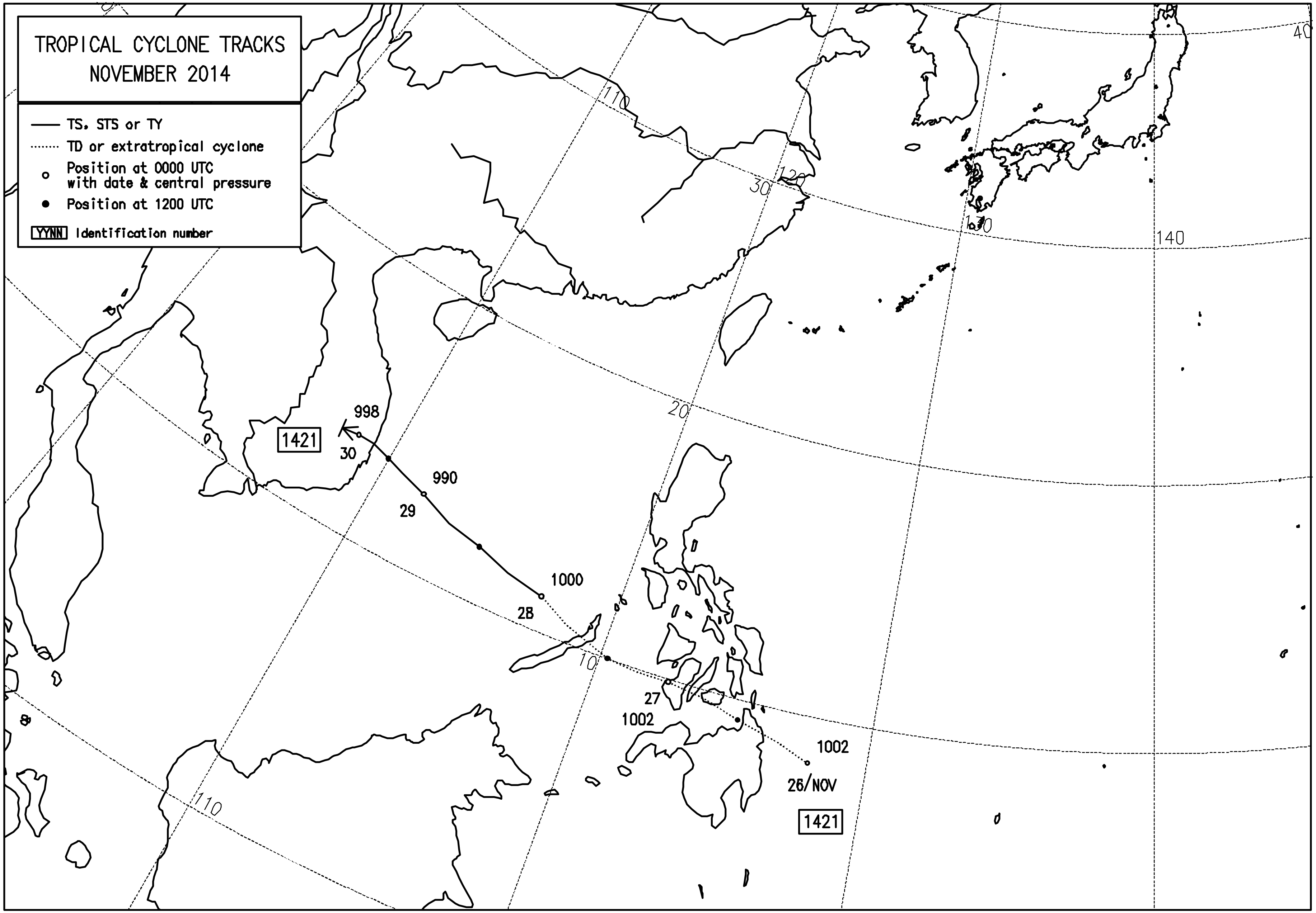

TROPICAL CYCLONE TRACKS
JULY 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC with date & central pressure
Position at 1200 UTC
YYNN Identification number
1408
1409
1410
1411
1412
03/JUL
10/JUL
17/JUL
28/JUL
29/JUL

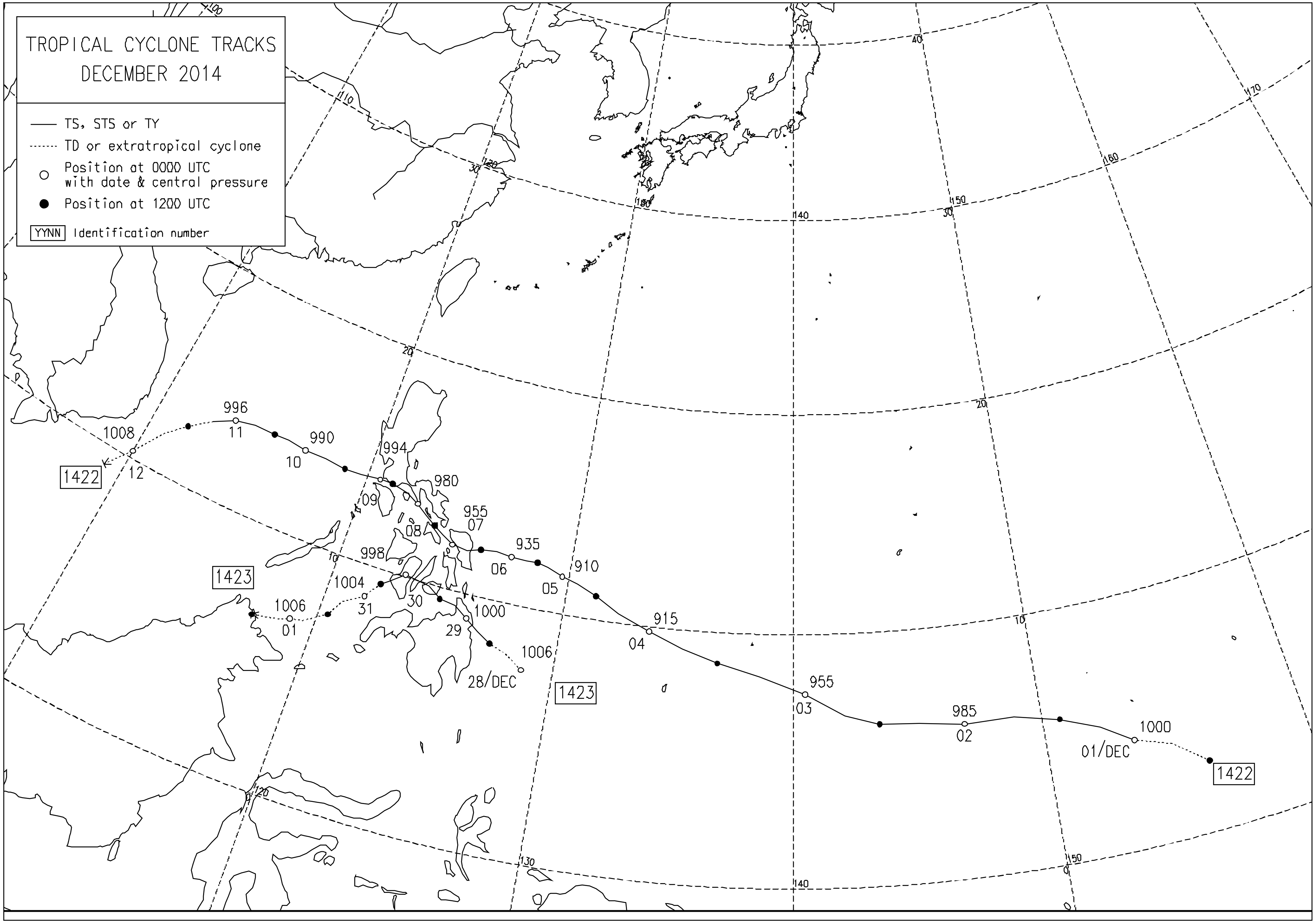

TROPICAL CYCLONE TRACKS
AUGUST 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC with date & central pressure
Position at 1200 UTC
YYNN Identification number
1413
14
1012
1012
1004
985
13
12
11
950
10
930
09
915
08
950
1413
07/AUG
40
30
20
10
140
150
160
170
180



TROPICAL CYCLONE TRACKS
SEPTEMBER 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC with date & central pressure
Position at 1200 UTC
YYNN Identification number
1414
06/SEP 1004
07 996
08 980
09 975
10 985
11 992
1415
12/SEP 1004
13 985
14 970
15 970
16 960
17 985
1416
17/SEP 1002
18 998
19 990
20 985
21 985
22 990
23 998
24 1002
25 1002
1417
24/SEP 1002
25 994
26 992
27 985
28 985
29 985
30 985
01 988
1418
29/SEP 1000
30 990
01 970
02 940
03 935
04 935
05 945
06 965
07 984
08 960
10
20
30
40
50
110
120
130
140
150
160
170


TROPICAL CYCLONE TRACKS
OCTOBER 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC
with date & central pressure
Position at 1200 UTC
YYNN Identification number
1419
1420
03/OCT
30/OCT


TROPICAL CYCLONE TRACKS
NOVEMBER 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC
with date & central pressure
Position at 1200 UTC
YYNN Identification number
1421
998
30
990
29
1000
28
27
1002
1002
26/NOV
1421
110
120
130
140
40
30
20
10
110



TROPICAL CYCLONE TRACKS
DECEMBER 2014
TS, STS or TY
TD or extratropical cyclone
Position at 0000 UTC with date & central pressure
Position at 1200 UTC
YYNN Identification number
1422
1423
01/DEC
28/DEC

Appendix 3

Errors of Track and Intensity Forecasts for Each Tropical Cyclone in 2014

TS Lingling (1401)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Jan.	18/00	25	118					-2			0		
	18/06	11	113					-2			0		
	18/12	0	141					-2			0		
	18/18	0	164					0			-10		
	19/00	0											
	19/06	0											
	19/12	35											
	19/18	0											
	mean	9	134	--	--	--	--	-1	--	--	-2	--	--
	sample	8	4	0	0	0	0	4	0	0	4	0	0

TS Kajiki (1402)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Jan.	31/00	71	262					-10			10		
	31/06	112											
	31/12	80											
	31/18	11											
Feb.	01/00	101											
	mean	75	262	--	--	--	--	-10	--	--	10	--	--
	sample	5	1	0	0	0	0	1	0	0	1	0	0

TY Faxai (1403)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Feb.	28/12	35	74	197	141	60	191	-2	-9	-5	5	10	5
	28/18	11	121	196	140	156		-2	-7	0	5	10	0
Mar.	01/00	35	177	150	97	192		-2	-5	0	5	5	0
	01/06	55	217	114	70	265		-4	0	0	5	0	-5
	01/12	65	188	89	108	137		-4	0	5	5	0	-10
	01/18	71	99	24	182			-2	5	5	5	-5	-10
	02/00	35	110	131	169			-5	0	0	5	0	-5
	02/06	33	105	122	162			0	0	-5	0	-5	5
	02/12	22	157	161	167			0	5	-5	0	-10	5
	02/18	62	68	134				5	5		-5	-10	
	03/00	55	39	118				0	5		0	-10	
	03/06	0	139	208				0	0		-5	0	
	03/12	34	148	197				10	0		-15	0	
	03/18	31	138					5			-10		
	04/00	0	95					0			-5		
	04/06	44	76					-5			5		
	04/12	0	70					2			0		
	04/18	0											
	05/00	64											
	05/06	15											
	05/12	83											
	mean	36	119	142	137	162	191	0	0	-1	0	-1	-2
	sample	21	17	13	9	5	1	17	13	9	17	13	9

TS Peipah (1404)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Apr.	05/00	56											
	05/06	33											
	mean	44	--	--	--	--	--	--	--	--	--	--	--
	sample	2	0	0	0	0	0	0	0	0	0	0	0

STS Tapah (1405)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Apr.	28/00	102	267	459				13	11		-15	-10	
	28/06	11	183	330				13	6		-15	-5	
	28/12	22	96	218				13	-2		-10	5	
	28/18	21	110	206				9	-8		-5	10	
	29/00	0	148					0			5		
	29/06	11	164					-10			15		
	29/12	25	126					-16			20		
	29/18	0	94					-22			20		
	30/00	24											
	30/06	0											
	30/12	47											
	30/18	109											
	mean	31	149	303	--	--	--	0	2	--	2	0	--
	sample	12	8	4	0	0	0	8	4	0	8	4	0

TS Mitag (1406)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Jun.	11/00	0											
	11/06	20											
	11/12	0											
	11/18	0											
	mean	5	--	--	--	--	--	--	--	--	--	--	--
	sample	4	0	0	0	0	0	0	0	0	0	0	0

TS Hagibis (1407)

Date/Time	(UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Jun.	14/00	46	43					-2			0		
	14/06	10	82		688			-6		4	10		-15
	14/12	35	62					-4			5		
	14/18	57											
	15/00	10		349					0			-15	
	15/06	33											
	15/12	46											
	15/18												
	16/00												
	16/06												
	16/12												
	16/18												
	17/00	46											
	17/06	0											
	mean	31	62	349	688	--	--	-4	0	4	5	-15	-15
	sample	9	3	1	1	0	0	3	1	1	3	1	1

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
TY Neoguri (1408)												
Jul. 03/18	124	238					30			-35		
04/00	65	124	258	297	313	337	15	30	15	-20	-25	-15
04/06	0	55	190	210	430	512	20	20	5	-20	-20	-10
04/12	0	43	191	229	405	389	15	5	-10	-10	-10	0
04/18	0	74	190	193	333	204	10	10	-10	-10	-15	0
05/00	0	72	94	129	299	154	10	0	-15	-10	-10	0
05/06	0	96	124	146	301	345	0	-10	-20	-5	-5	5
05/12	0	95	98	186	131	425	-5	-20	-25	-5	5	10
05/18	0	95	92	159	69	494	0	-20	-20	-10	5	10
06/00	0	64	84	147	194		-10	-30	-25	0	15	20
06/06	0	38	97	88	343		-15	-35	-30	5	20	30
06/12	0	22	104	161	370		-25	-35	-25	10	20	30
06/18	0	41	103	176	447		-30	-30	-25	15	20	30
07/00	0	70	146	188			-30	-35	-25	15	25	20
07/06	0	89	128	379			-35	-35	-20	20	30	20
07/12	10	78	115	478			-30	-25	-15	15	30	10
07/18	0	24	137	504			-15	-20	-10	10	25	10
08/00	0	102	170				-15	-25		10	25	
08/06	0	131	403				-15	-20		15	20	
08/12	0	88	473				-15	-15		20	10	
08/18	0	160	477				-5	-10		15	10	
09/00	22	212					-10			10		
09/06	29	243					-5			5		
09/12	0	150					-5			0		
09/18	0	85					0			0		
10/00	0											
10/06	0											
10/12	0											
10/18	0											
mean	9	100	184	230	303	358	-7	-15	-16	2	9	11
sample	29	25	20	16	12	8	25	20	16	25	20	16

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
TY Rammasun (1409)												
Jul. 12/06	0	152	376	351	434	375	-6	-5	5	10	10	0
12/12	0	187	368	412	560	239	-4	-5	5	10	15	0
12/18	0	271	416	448	462	70	0	5	5	5	5	0
13/00	0	196	264	320	412	294	5	15	-5	0	-5	10
13/06	22	163	210	238	243	195	5	20	0	0	-10	10
13/12	0	129	155	285	158	95	10	25	15	0	-15	-5
13/18	0	123	124	223	81	81	10	10	15	0	-5	-5
14/00	16	80	63	144	107	221	15	15	25	-5	-5	-10
14/06	16	64	151	111	167	242	15	10	15	-10	-5	-5
14/12	0	43	232	108	256	319	20	5	20	-15	0	-10
14/18	22	134	278	118	301		25	5	30	-15	0	-20
15/00	0	162	198	62	258		15	15	35	-5	-5	-25
15/06	0	216	144	124	312		5	15	40	5	-5	-30
15/12	0	237	100	97	259		5	15	30	5	0	-20
15/18	0	135	77	94			0	20	15	10	-5	0
16/00	0	68	90	156			-5	10	0	15	0	20
16/06	11	81	61	123			-5	15	-15	15	-5	30
16/12	0	105	74	157			-5	20	-15	15	-15	25
16/18	11	81	79				15	15		-5	-5	
17/00	11	64	172				10	0		0	25	
17/06	0	56	167				15	-15		-5	35	
17/12	0	49	151				15	-20		-10	30	
17/18	0	46					0			10		
18/00	0	68					-10			30		
18/06	0	95					-15			30		
18/12	0	63					-5			15		
18/18	0											
19/00	0											
19/06	25											
19/12	62											
mean	6	118	180	198	286	213	5	9	12	4	2	-2
sample	30	26	22	18	14	10	26	22	18	26	22	18

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
TY Matmo (1410)												
Jul. 17/12	11	313	542				4	16		-10	-20	
17/18	44	408	581	473	388	564	4	0	-5	-5	-5	0
18/00	47	437	486	369	345	565	9	0	5	-10	-5	-5
18/06	90	401	409	237	262	382	12	0	5	-15	-5	-5
18/12	44	159	175	33	164	373	12	5	10	-15	-5	-5
18/18	22	167	192	73	313	596	-5	-10	-25	5	10	20
19/00	70	70	68	100	239	345	-10	-10	-25	10	10	20
19/06	101	109	239	308	356	587	-20	-15	-25	15	15	20
19/12	59	40	124	258	365	741	-20	-15	-25	15	15	20
19/18	0	99	230	391	490	891	-15	-15	-35	10	15	30
20/00	55	48	133	304	300	494	-5	-15	-45	5	15	40
20/06	67	90	231	310	407		0	-10	-40	0	10	35
20/12	49	39	135	137	362		0	-10	-25	0	5	30
20/18	31	44	225	228	457		-10	-30	-30	5	25	35
21/00	55	107	270	305	301		-10	-40	-32	5	35	40
21/06	22	70	165	253			-10	-30	-12	5	25	15
21/12	22	21	161	234			-15	-30	-7	10	30	10
21/18	22	83	92	259			-25	-15	-2	20	20	5
22/00	0	80	119	326			-20	-7	6	20	10	-10
22/06	0	20	24				-20	-2		20	5	
22/12	0	83	67				0	4		5	0	
22/18	0	46	29				0	4		5	-10	
23/00	11	70	124				0	4		5	-10	
23/06	0	22					2			0		
23/12	10	29					2			-10		
23/18	30	38					2			-10		
24/00	0	80					2			-10		
24/06	33											
24/12	0											
24/18	0											
25/00	0											
mean	29	117	210	256	339	554	-5	-10	-17	3	8	16
sample	31	27	23	18	14	10	27	23	18	27	23	18

Date/Time		Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
	(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
TY Halong (1411)													
Jul.	29/00	11	85	79				-2	-5		0	10	
	29/06	34	89	131	193	423	675	-2	-15	-20	5	20	25
	29/12	0	92	157	352	609	846	-12	-25	-15	15	30	20
	29/18	0	44	186	401	616	883	-12	-20	-5	15	25	5
	30/00	15	94	194	351	625	921	-10	-10	15	15	20	-5
	30/06	15	24	162	348	579	851	-15	-10	30	20	20	-20
	30/12	31	55	194	391	666	873	-15	-10	35	20	15	-20
	30/18	35	109	225	386	727	866	-10	0	35	15	0	-20
	31/00	0	168	266	420	768	810	5	20	40	5	-5	-30
	31/06	22	125	294	423	692	736	5	35	40	5	-20	-30
	31/12	68	154	304	480	666	559	10	45	35	0	-30	-25
	31/18	49	155	320	534	669	519	15	40	30	-10	-30	-20
Aug.	01/00	34	188	311	524	484	361	30	40	30	-15	-30	-20
	01/06	11	154	294	478	446	395	45	40	15	-30	-30	-5
	01/12	22	136	319	468	288	298	50	35	10	-35	-25	0
	01/18	15	111	304	344	222	351	40	20	-10	-30	-15	5
	02/00	0	117	278	211	151	289	30	10	-20	-25	-10	10
	02/06	0	93	186	127	33	224	15	-5	-25	-15	0	15
	02/12	0	88	158	114	57	275	0	-15	-25	0	15	25
	02/18	0	118	148	137	67	237	-5	-25	-25	5	20	25
	03/00	0	118	115	129	180	384	-5	-30	-20	5	25	20
	03/06	0	78	85	46	152	279	-20	-40	-30	15	30	25
	03/12	0	75	102	70	182	209	-25	-30	-20	20	25	15
	03/18	0	57	59	130	177	201	-30	-25	-15	20	25	15
	04/00	0	49	78	183	181	176	-25	-15	-15	20	15	15
	04/06	0	79	106	171	141	152	-25	-15	-10	20	15	5
	04/12	0	57	72	142	175	348	-10	-5	0	15	5	5
	04/18	0	53	30	83	200	360	-15	-5	0	15	5	5
	05/00	0	69	42	99	265	510	-5	-5	-5	10	10	10
	05/06	0	24	106	167	343	763	0	0	-5	5	5	10
	05/12	0	52	134	239	442	1021	5	0	-10	0	5	10
	05/18	0	112	161	263	466	1002	5	0	-5	0	5	5
	06/00	0	142	181	305	439		10	5	0	0	5	5
	06/06	0	92	162	291	610		10	5	-5	0	5	10
	06/12	0	91	122	131	348		10	0	0	0	5	5
	06/18	15	61	118	134	385		10	0	5	-5	0	0
	07/00	0	30	97	142			5	0	0	0	0	0
	07/06	11	29	70	125			5	-5	-5	0	5	5
	07/12	22	11	104	113			-10	-15	0	0	5	5
	07/18	22	31	189	93			-10	5	-5	0	-5	5
	08/00	15	62	133				-10	0		0	-5	
	08/06	0	58	153				-10	-5		5	0	
	08/12	10	80	235				-5	-5		0	5	
	08/18	22	57	229				-5	-5		-5	5	
	09/00	11	145					-5			-5		
	09/06	0	120					-10			0		
	09/12	19	122					0			0		
	09/18	9	134					-5			5		
	10/00	0											
	10/06	21											
	10/12	0											
	10/18	24											
	mean	11	89	168	250	385	528	0	-1	1	2	4	3
	sample	52	48	44	39	35	31	48	44	39	48	44	39

Date/Time		Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
	(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
STS Nakri (1412)													
Jul.	29/12	92	406	533				4	0		-5	0	
	29/18	109	282	489	395	351		0	5	5	0	-5	-5
	30/00	172	157	318	175	341		0	5	5	0	-10	-5
	30/06	126	151	266	130			5	5	5	0	-10	-5
	30/12	60	69	102	83			5	5	5	-5	-10	0
	30/18	90	159	138	178			5	5	0	-5	-5	5
	31/00	0	157	78	173			0	0	-10	-10	-5	10
	31/06	0	109	15				0	5		-10	-10	
	31/12	0	19	71				0	5		-10	-5	
	31/18	63	92	100				0	0		0	5	
Aug.	01/00	0	72	92				0	-5		5	15	
	01/06	48	82					0			5		
	01/12	0	24					5			5		
	01/18	0	51					0			5		
	02/00	22	99					0			10		
	02/06	56											
	02/12	37											
	02/18	0											
	03/00	30											
	mean	48	129	200	189	346	--	2	3	2	-1	-4	0
	sample	19	15	11	6	2	0	15	11	6	15	11	6

Date/Time		Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
	(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
TY Genevieve (1413)													
Aug.	07/06	0	140	301	356	261		30	15	0	-5	5	15
	07/12	0	113	277	304	229		20	10	-5	5	10	20
	07/18	0	69	213	189	85		25	15	0	0	5	10
	08/00	0	95	188	129	21		0	0	-10	5	5	20
	08/06	0	125	221	200			-10	-10	-15	10	15	25
	08/12	0	195	200	143			-10	-20	-19	5	20	30
	08/18	0	162	109	137			-15	-25	-23	10	25	35
	09/00	10	122	178	148			-15	-25	-24	5	25	20
	09/06	0	128	244				-15	-25		5	25	
	09/12	22	160	259				-15	-19		10	20	
	09/18	15	116	247				-15	-18		15	20	
	10/00	11	117	237				-25	-24		25	20	
	10/06	0	86					-25			25		
	10/12	0	94					-29			30		
	10/18	0	78					-23			25		
	11/00	0	80					-14			5		
	11/06	0											
	11/12	0											
	11/18	0											
	12/00	11											
	mean	3	118	223	201	149	--	-8	-10	-12	11	16	22
	sample	20	16	12	8	4	0	16	12	8	16	12	8

STS Fengshen (1414)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Sep. 06/18	0	45					9			-10		
07/00	0	72	169	236			10	0	-5	-10	0	5
07/06	0	89	135	281			10	-5	-10	-10	5	10
07/12	37	67	81				5	-10		-5	10	
07/18	33	33	35				0	-10		0	10	
08/00	51	50	18				-5	-10		5	10	
08/06	31	22	174				-5	-10		5	10	
08/12	0	67					-10			10		
08/18	0	86					-5			5		
09/00	78	164					-5			5		
09/06	0	168					-5			5		
09/12	0											
09/18	0											
10/00	0											
10/06	22											
mean	17	78	102	258	--	--	0	-7	-7	0	8	8
sample	15	11	6	2	0	0	11	6	2	11	6	2

TY Kalmaegi (1415)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Sep. 12/06	43	15	180	530	690	794	10	10	10	-10	-10	-10
12/12	0	34	201	328	512		10	0	0	-10	0	0
12/18	0	49	291	337	428		10	-5	0	-10	5	0
13/00	22	102	317	381	444		5	5	5	-5	-5	-5
13/06	44	11	149	252	388		0	0	5	0	0	-5
13/12	95	125	198	259			-10	-5	-15	10	5	10
13/18	22	202	263	324			-10	-5	-20	10	5	20
14/00	0	172	272	432			0	-5	-25	0	0	25
14/06	0	169	201	500			-5	-5	-29	5	0	30
14/12	0	71	106				-5	-15		5	10	
14/18	56	100	100				-5	-20		5	20	
15/00	22	80	41				-5	-5		0	0	
15/06	39	25	49				-5	-2		0	5	
15/12	21	38					-10			10		
15/18	0	84					0			0		
16/00	70	54					0			0		
16/06	0	125					2			-5		
16/12	0											
16/18	31											
17/00	0											
17/06	56											
mean	25	86	182	372	492	794	-1	-4	-8	0	3	7
sample	21	17	13	9	5	1	17	13	9	17	13	9

TS Fung-wong (1416)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Sep. 17/12	99	169	408				0	0		-5	5	
17/18	133	169	208	385	700	1298	0	-5	-15	0	10	20
18/00	153	219	214	452	740	1336	0	-5	-15	0	10	20
18/06	60	185	208	340	729	1175	0	-5	-15	5	10	20
18/12	180	213	192	227	553	934	0	-5	-20	5	10	20
18/18	110	90	183	221	504	640	0	-10	-25	5	15	25
19/00	22	145	391	290	473		0	0	-20	5	5	25
19/06	44	218	368	278	424		-5	-5	-20	10	10	25
19/12	70	192	206	162	292		-5	-5	-7	10	5	10
19/18	113	189	82	102	266		-10	-10	-11	10	5	10
20/00	33	188	45	109			-5	-5	-13	5	5	10
20/06	0	185	44	123			0	-5	-13	0	5	10
20/12	0	111	81	137			-5	-7	-8	0	5	5
20/18	22	105	165	132			-5	-6	-4	0	5	0
21/00	47	112	142				-5	-6		5	5	
21/06	10	77	163				-5	-4		5	0	
21/12	15	31	155				-2	-4		5	0	
21/18	11	15	15				-6	-4		10	0	
22/00	0	38					-6			5		
22/06	0	15					-4			5		
22/12	19	56					-4			5		
22/18	0	48					-2			0		
23/00	10											
23/06	0											
23/12	67											
23/18	0											
mean	47	126	182	227	520	1077	-3	-5	-14	4	6	15
sample	26	22	18	13	9	5	22	18	13	22	18	13

STS Kammuri (1417)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Sep. 24/12	46	231	136	124	497	1193	4	5	0	0	-5	5
24/18	91	232	153	146	645	1407	-2	0	-5	5	0	10
25/00	90	174	84	191	761	1598	-2	0	-5	5	0	10
25/06	33	93	148	425	919		0	-5	-10	0	0	10
25/12	0	53	234	529	1094		5	-5	-10	-5	5	10
25/18	61	91	256	669	1280		0	-5	-10	0	5	10
26/00	66	56	199	685	1598		0	-5	-10	0	5	10
26/06	103	137	324	783			0	-10	-10	0	10	10
26/12	51	104	323	773			0	-10	-10	5	10	10
26/18	30	122	447	900			-5	-10	-10	5	10	10
27/00	0	81	374	855			-10	-10	-5	10	10	5
27/06	0	176	513				0	0		0	0	
27/12	0	184	526				0	5		0	-5	
27/18	37	231	484				0	5		0	-5	
28/00	0	152	334				5	5		-5	-5	
28/06	0	183					5			-5		
28/12	0	161					5			-5		
28/18	37	157					5			-5		
29/00	30	201					5			-5		
29/06	0											
29/12	0											
29/18	46											
30/00	138											
mean	37	148	302	553	971	1399	1	-3	-8	0	2	9
sample	23	19	15	11	7	3	19	15	11	19	15	11

TY Phanfone (1418)

Date/Time (UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Sep. 29/06	0	189	172	283	400	499	-5	10	30	5	-5	-25
29/12	31	185	314	357	474	612	0	15	25	0	-10	-20
29/18	46	190	352	399	482	644	0	15	25	0	-10	-20
30/00	75	149	100	114	308	497	10	25	15	-5	-25	-15
30/06	0	55	77	163	278	360	15	30	15	-10	-30	-15
30/12	32	55	84	190	212	325	25	30	15	-20	-30	-15
30/18	0	109	157	216	259	577	20	20	10	-15	-25	-10
Oct. 01/00	0	124	175	234	202	513	20	15	5	-15	-15	-10
01/06	0	31	102	164	139	688	25	15	5	-20	-15	-10
01/12	0	73	108	214	365		15	10	0	-15	-10	-5
01/18	0	83	124	238	571		10	0	-5	-10	-5	0
02/00	0	39	63	136	392		-5	-5	-10	0	0	5
02/06	0	59	73	195	496		-15	-10	-15	5	5	10
02/12	0	30	45	83			-10	-5	-10	5	0	10
02/18	0	39	74	236			-10	-10	-10	5	5	10
03/00	0	15	63	377			-5	-10	-15	0	5	15
03/06	23	35	104	582			-5	-10	-20	0	5	20
03/12	0	135	255				0	-10		0	10	
03/18	0	63	244				-5	-15		5	15	
04/00	10	22	164				-5	-10		10	10	
04/06	0	68	285				-5	-15		10	10	
04/12	0	38					-5			5		
04/18	0	9					-5			5		
05/00	0	38					-5			5		
05/06	0	91					-10			10		
05/12	0											
05/18	0											
06/00	0											
06/06	0											

TY Vongfong (1419)

Date/Time (UTC)	Center Position (km) T=00	=24	=48	=72	=96	=120	Central Pressure (hPa) T=24	=48	=72	Max. Wind (kt) T=24	=48	=72
Oct. 03/18	0	109	251	459	500	337	10	5	0	-10	-5	0
04/00	0	105	266	434	393	221	15	5	15	-15	-5	-10
04/06	0	84	266	376	387	339	10	0	25	-10	0	-15
04/12	59	152	323	418	468	456	10	0	40	-10	0	-30
04/18	33	152	320	397	415	364	-10	-10	45	10	5	-30
05/00	11	78	214	206	220	223	-15	0	40	15	0	-30
05/06	40	116	159	202	234	357	-15	15	40	15	-10	-30
05/12	22	159	227	277	377	429	-15	35	40	15	-20	-25
05/18	43	112	117	190	312	407	-5	50	35	5	-30	-20
06/00	0	32	48	131	220	335	10	50	35	-5	-30	-20
06/06	21	54	49	130	221	392	25	50	25	-15	-30	-15
06/12	33	21	75	183	266	488	45	50	15	-30	-30	-10
06/18	0	31	110	203	306	487	50	40	15	-35	-25	-15
07/00	0	25	119	155	345	453	35	25	5	-25	-20	-10
07/06	0	53	107	187	362	425	25	10	0	-20	-10	-5
07/12	0	42	140	268	390	328	5	-15	-15	-5	5	5
07/18	0	54	166	296	406	211	-5	-15	-15	5	5	5
08/00	0	81	155	294	404	191	-5	-15	-10	5	5	5
08/06	0	81	168	322	383	194	-15	-15	-15	10	5	10
08/12	0	100	187	330	349	112	-20	-20	-5	10	10	0
08/18	0	96	204	357	211	161	-20	-20	-5	10	10	5
09/00	0	47	173	298	119		-10	-15	-20	5	5	15
09/06	0	85	192	303	219		-5	-15	-25	0	10	20
09/12	0	93	215	210	360		-10	-10	-25	0	5	20
09/18	0	88	165	136	487		-15	-15	-20	5	10	15
10/00	0	71	142	89			-10	-30	-25	5	20	20
10/06	0	23	83	231			-15	-30	-20	5	20	20
10/12	0	30	135	415			-10	-30	-30	5	20	30
10/18	0	24	121	521			-15	-30	-25	10	20	25
11/00	0	30	88				-30	-25		20	20	
11/06	0	39	201				-30	-25		20	20	
11/12	32	44	199				-25	-25		20	25	
11/18	11	89	344				-10	-20		5	15	
12/00	22	38					-10			10		
12/06	0	93					-5			5		
12/12	0	101					-15			15		
12/18	19	44					-10			10		
13/00	0											
13/06	0											
13/12	0											
13/18	0											
mean	8	72	174	276	334	329	-3	-1	4	2	1	-2
sample	41	37	33	29	25	21	37	33	29	37	33	29

TY Nuri (1420)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Oct. 31/00	11	113	146				16	50		-15	-40	
31/06	0	49	39	103	356	762	17	55	65	-10	-45	-50
31/12	33	101	33	94	359	723	20	65	55	-15	-50	-40
31/18	31	102	69	128	434	801	25	60	45	-20	-45	-35
Nov. 01/00	16	118	123	221	497	917	35	60	40	-25	-45	-30
01/06	47	150	149	289	579	1053	45	60	35	-35	-45	-25
01/12	15	79	108	220	521	1091	55	45	25	-40	-30	-15
01/18	22	15	74	177	539		50	30	10	-35	-25	-5
02/00	0	61	137	249	568		30	10	5	-25	-10	0
02/06	0	25	89	264	613		10	10	10	-10	-10	0
02/12	0	25	59	219	747		-5	-10	-20	0	5	15
02/18	0	74	142	356			-5	-10	-25	-5	5	20
03/00	0	76	159	308			-5	-5	-20	-5	5	15
03/06	0	93	248	441			-5	-5	-15	0	10	10
03/12	0	64	228	609			-5	-10	-10	5	10	5
03/18	0	24	123				-10	-15		10	15	
04/00	0	32	118				-5	-10		5	10	
04/06	0	74	146				-5	5		5	-5	
04/12	0	83	134				0	0		5	-5	
04/18	0	63					-5			10		
05/00	0	94					-5			5		
05/06	11	135					-5			5		
05/12	22	91					-5			0		
05/18	10											
06/00	11											
06/06	59											
06/12	102											
mean	14	76	122	263	521	891	10	20	14	-8	-16	-10
sample	27	23	19	14	10	6	23	19	14	23	19	14

TS Sinlaku (1421)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Nov. 28/00	56	110	62				6	-2		-5	5	
28/06	31	97					0			0		
28/12	59	103					-2			0		
28/18	0	55					0			0		
29/00	0	119					6			-10		
29/06	25											
29/12	22											
29/18	0											
30/00	0											
mean	21	97	62	--	--	--	2	-2	--	-3	5	--
sample	9	5	1	0	0	0	5	1	0	5	1	0

TY Hagupit (1422)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Dec. 01/00	46	233	496				15	43		-15	-35	
01/06	11	188	276	343	252	163	18	46	89	-20	-40	-75
01/12	11	157	177	183	225	204	17	40	70	-15	-35	-55
01/18	46	94	136	149	162	331	27	50	70	-25	-45	-55
02/00	33	67	129	101	137	221	35	70	65	-30	-55	-50
02/06	16	63	86	175	178	203	20	55	45	-15	-45	-35
02/12	11	40	70	145	165	292	15	50	40	-10	-40	-30
02/18	0	25	101	175	144	285	20	40	25	-20	-35	-20
03/00	11	44	80	159	144	303	20	20	5	-20	-20	-10
03/06	0	40	111	133	167	316	30	20	5	-30	-20	-10
03/12	0	57	134	162	228	292	25	25	0	-25	-20	-5
03/18	0	79	140	170	247	290	25	10	0	-20	-10	-5
04/00	0	89	122	130	236	234	-5	-30	-45	0	15	20
04/06	0	89	113	140	240	213	-10	-30	-45	10	20	25
04/12	0	74	84	90	163	107	-5	-40	-50	5	25	30
04/18	0	68	86	130	153	161	-20	-30	-55	15	15	35
05/00	16	31	34	132	93	93	-5	-15	-30	0	5	20
05/06	0	39	90	140	62	144	-15	-20	-35	5	5	25
05/12	0	39	80	130	60	86	-25	-30	-45	15	15	40
05/18	11	25	114	181	135	144	-20	-40	-45	10	25	45
06/00	16	0	125	173	109	90	-25	-40	-44	10	30	50
06/06	0	55	151	118	89		-25	-40	-39	10	30	45
06/12	0	66	132	118	101		-20	-35	-35	10	35	40
06/18	11	79	157	114	181		-30	-35	-45	20	40	45
07/00	0	86	112	76	196		-25	-29	-25	20	40	35
07/06	0	64	54	100			-25	-29	-20	20	40	30
07/12	0	46	97	168			-20	-20	-15	20	25	20
07/18	11	83	153	234			-15	-15	-10	20	20	15
08/00	24	152	176	277			-4	-5	-11	10	10	15
08/06	22	140	197				-9	-5		15	10	
08/12	0	155	238				0	2		5	5	
08/18	24	117	197				2	4		5	0	
09/00	15	63	109				6	2		0	0	
09/06	54	65					8			-5		
09/12	34	62					6			0		
09/18	22	182					6			0		
10/00	15	203					-4			15		
10/06	0											
10/12	0											
10/18	86											
11/00	97											
mean	16	85	138	155	161	209	0	0	-6	0	0	7
sample	41	37	33	28	24	20	37	33	28	37	33	28

TS Jangmi (1423)

Date/Time	Center Position (km)						Central Pressure (hPa)			Max. Wind (kt)		
(UTC)	T=00	=24	=48	=72	=96	=120	T=24	=48	=72	T=24	=48	=72
Dec. 28/12	40	95					2			0		
28/18	33	130					2			-5		
29/00	16	134					0			0		
29/06	22	80					-2			0		
29/12	25											
29/18	40											
30/00	0											
30/06	110											
mean	36	110	--	--	--	--	1	--	--	-1	--	--
sample	8	4	0	0	0	0	4	0	0	4	0	0

Appendix 4

Monthly and Annual Frequencies of Tropical Cyclones

Monthly and annual frequencies of tropical cyclones that attained TS intensity or higher in the western North Pacific and the South China Sea for 1951 - 2014

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1951		1	1	2	1	1	3	3	2	4	1	2	21
1952						3	3	5	3	6	3	4	27
1953		1			1	2	1	6	3	5	3	1	23
1954			1		1		1	5	5	4	3	1	21
1955	1	1	1	1		2	7	6	4	3	1	1	28
1956			1	2		1	2	5	6	1	4	1	23
1957	2			1	1	1	1	4	5	4	3		22
1958	1			1	1	4	7	5	5	3	2	2	31
1959		1	1	1			2	5	5	4	2	2	23
1960				1	1	3	3	10	3	4	1	1	27
1961	1		1		2	3	4	6	6	4	1	1	29
1962		1		1	2		5	8	4	5	3	1	30
1963				1		4	4	3	5	4		3	24
1964					2	2	7	5	6	5	6	1	34
1965	2	1	1	1	2	3	5	6	7	2	2		32
1966				1	2	1	4	10	9	5	2	1	35
1967		1	2	1	1	1	7	9	9	4	3	1	39
1968				1	1	1	3	8	3	5	5		27
1969	1		1	1			3	4	3	3	2	1	19
1970		1				2	3	6	5	5	4		26
1971	1		1	3	4	2	8	5	6	4	2		36
1972	1				1	3	7	5	4	5	3	2	31
1973							7	5	2	4	3		21
1974	1		1	1	1	4	4	5	5	4	4	2	32
1975	1						2	4	5	5	3	1	21
1976	1	1		2	2	2	4	4	5	1	1	2	25
1977			1			1	3	3	5	5	1	2	21
1978	1			1		3	4	8	5	4	4		30
1979	1		1	1	2		4	2	6	3	2	2	24
1980				1	4	1	4	2	6	4	1	1	24
1981			1	2		3	4	8	4	2	3	2	29
1982			3		1	3	3	5	5	3	1	1	25
1983						1	3	5	2	5	5	2	23
1984						2	5	5	4	7	3	1	27
1985	2				1	3	1	8	5	4	1	2	27
1986		1		1	2	2	4	4	3	5	4	3	29
1987	1			1		2	4	4	6	2	2	1	23
1988	1				1	3	2	8	8	5	2	1	31
1989	1			1	2	2	7	5	6	4	3	1	32
1990	1			1	1	3	4	6	4	4	4	1	29
1991			2	1	1	1	4	5	6	3	6		29
1992	1	1				2	4	8	5	7	3		31
1993			1			1	4	7	6	4	2	3	28
1994				1	1	2	7	9	8	6		2	36
1995				1		1	2	6	5	6	1	1	23
1996		1		1	2		6	5	6	2	2	1	26
1997				2	3	3	4	6	4	3	2	1	28
1998							1	3	5	2	3	2	16
1999				2		1	4	6	6	2	1		22
2000					2		5	6	5	2	2	1	23
2001					1	2	5	6	5	3	1	3	26
2002	1	1			1	3	5	6	4	2	2	1	26
2003	1			1	2	2	2	5	3	3	2		21
2004				1	2	5	2	8	3	3	3	2	29
2005	1		1	1	1		5	5	5	2	2		23
2006					1	2	2	7	3	4	2	2	23
2007				1	1		3	4	5	6	4		24
2008				1	4	1	2	4	4	2	3	1	22
2009					2	2	2	5	7	3	1		22
2010			1				2	5	4	2			14
2011					2	3	4	3	7	1		1	21
2012			1		1	4	4	5	3	5	1	1	25
2013	1	1				4	3	6	8	6	2		31
2014	2	1		2		2	5	1	5	2	1	2	23
Normal 1981-2010	0.3	0.1	0.3	0.6	1.1	1.7	3.6	5.8	4.9	3.6	2.3	1.2	25.6

Appendix 5

Code Forms of RSMC Products

(1) RSMC Tropical Cyclone Advisory (WTPQ20-25 RJTD)

WTPQ i i RJTD YYGGgg
RSMC TROPICAL CYCLONE ADVISORY
NAME class ty-No. name (common-No.)
ANALYSIS
PSTN YYGGgg UTC LaLa.La N LoLoLo.Lo E (or W) confidence
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT
50KT RdRdRd NM (or 50KT RdRdRd NM octant RdRdRd NM octant)
30KT RdRdRd NM (or 30KT RdRdRd NM octant RdRdRd NM octant)
FORECAST
24HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT
Ft1Ft1HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
GUST VgVgVg KT
MXWD VmVmVm KT
Ft2Ft2HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT =

Notes:

a. Underlined parts are fixed.

b. Abbreviations

PSTN	:	Position
MOVE	:	Movement
PRES	:	Pressure
MXWD	:	Maximum wind
HF	:	Hour forecast

c. Symbolic letters

i i	:	'20', '21', '22', '23', '24' or '25'
YYGGgg	:	Time of observation submitting the data for analysis in UTC
class	:	Intensity classification of the tropical cyclone 'TY', 'STS', 'TS' or 'TD'
ty-No.	:	Domestic identification number of the tropical cyclone adopted in Japan given in four digits (same as the international identification number)
name	:	Name assigned to the tropical cyclone from the name list prepared by the Typhoon Committee
common-No.	:	International identification number of the tropical cyclones given in four digits
LaLa.La	:	Latitude of the center position in "ANALYSIS" part
LoLoLo.Lo	:	Longitude of the center position in "ANALYSIS" part
confidence	:	Confidence of the center position. 'GOOD', 'FAIR' or 'POOR'
direction	:	Direction of movement given in 16 azimuthal direction such as 'N', 'NNE', 'NE' and 'ENE'
SpSpSp	:	Speed of movement
PPPP	:	Central pressure

VmVmVm	:	Maximum sustained wind
VgVgVg	:	Maximum gust wind
RdRdRd	:	Radii of 30knots and 50knots wind
octant	:	Eccentric distribution of wind given in 8 azimuthal direction such as 'NORTH', 'NORTHEAST' and 'EAST'
Ft1Ft1	:	48 (00, 06, 12 and 18 UTC) or 45 (03, 09, 15 and 21 UTC)
Ft2Ft2	:	72 (00, 06, 12 and 18 UTC) or 69 (03, 09, 15 and 21 UTC)
$YYGGgg_F$	:	Time in UTC on which the forecast is valid
$LaLa.La_F$	:	Latitude of the center of 70% probability circle in "FORECAST" part
$LoLoLo.Lo_F$	:	Longitude of the center of 70% probability circle in "FORECAST" part
FrFrFr	:	Radius of 70% probability circle

d. MOVE is optionally described as 'ALMOST STATIONARY' or '(direction) SLOWLY', depending on the speed of movement.

Example:

```
WTPQ20 RJTD 150000
RSMC TROPICAL CYCLONE ADVISORY
NAME    STS 0320 NEPARTAK (0320)
ANALYSIS
PSTN    150000UTC 12.6N 117.8E FAIR
MOVE    WNW 13KT
PRES    980HPA
MXWD    055KT
GUST    080KT
50KT    40NM
30KT    240NM NORTHEAST 160NM SOUTHWEST
FORECAST
24HF    160000UTC 14.7N 113.7E 110NM 70%
MOVE    WNW 11KT
PRES    965HPA
MXWD    070KT
GUST    100KT
48HF    170000UTC 16.0N 111.0E 170NM 70%
MOVE    WNW 07KT
PRES    970HPA
MXWD    065KT
GUST    095KT
72HF    180000UTC 19.5N 110.0E 250NM 70%
MOVE    NNW 09KT
PRES    985HPA
MXWD    050KT
GUST    070KT =
```

(2) RSMC Tropical Cyclone Advisory for Five-day Track Forecast (WTPQ50-55 RJTD)

WTPQ i i RJTD YYGGgg
RSMC TROPICAL CYCLONE ADVISORY
NAME class ty-No. name (common-No.)
ANALYSIS
PSTN YYGGgg UTC LaLa.La N LoLoLo.Lo E (or W) confidence
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT
50KT RdRdRd NM (or 50KT RdRdRd NM octant RdRdRd NM octant)
30KT RdRdRd NM (or 30KT RdRdRd NM octant RdRdRd NM octant)
FORECAST
24HF $YYGGgg_F$ UTC $LaLa.La_F$ N $LoLoLo.Lo_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT
48HF $YYGGgg_F$ UTC $LaLa.La_F$ N $LoLoLo.Lo_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
GUST VgVgVg KT
MXWD VmVmVm KT

72HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
PRES PPPP HPA
MXWD VmVmVm KT
GUST VgVgVg KT
96HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT
120HF YYGGgg$_F$ UTC LaLa.La$_F$ N LoLoLo.Lo$_F$ E (or W) FrFrFr NM 70%
MOVE direction SpSpSp KT=

Notes:

a. Underlined parts are fixed.

b. Abbreviations and symbolic letters are the same as those used in RSMC Tropical Cyclone Advisory (WTPQ20-25 RJTD).

Example:

```
WTPQ50 RJTD 060000
RSMC TROPICAL CYCLONE ADVISORY
NAME    TY 0908 MORAKOT (0908)
ANALYSIS
PSTN    060000UTC 23.4N 128.3E FAIR
MOVE    WNW 09KT
PRES    960HPA
MXWD    075KT
GUST    105KT
50KT    80NM
30KT    350NM SOUTH 300NM NORTH
FORECAST
24HF    070000UTC 24.0N 123.9E 70NM 70%
MOVE    W 10KT
PRES    925HPA
MXWD    090KT
GUST    130KT
48HF    080000UTC 25.3N 121.8E 110NM 70%
MOVE    WNW 06KT
PRES    950HPA
MXWD    080KT
GUST    115KT
72HF    090000UTC 26.5N 119.7E 160NM 70%
MOVE    WNW 06KT
PRES    970HPA
MXWD    065KT
GUST    095KT
96HF    100000UTC 28.0N 118.8E 240NM 70%
MOVE    NNW SLOWLY
120HF 110000UTC 29.6N 118.2E 375NM 70%
MOVE    NNW SLOWLY =
```

(3) RSMC Guidance for Forecast (FXPQ20-25 RJTD)

FXPQ i i RJTD YYGGgg
RSMC GUIDANCE FOR FORECAST
NAME class ty-No. name (common-No.)
PSTN YYGGgg UTC LaLa.La N LoLoLo.Lo E (or W)
PRES PPPP HPA
MXWD WWW KT
FORECAST BY GLOBAL MODEL

TIME	PSTN	PRES	MXWD
		(CHANGE FROM T=0)	

T=06 LaLa.La N LoLoLo.Lo E (or W) appp HPA awww KT
T=12 LaLa.La N LoLoLo.Lo E (or W) appp HPA awww KT
T=18 LaLa.La N LoLoLo.Lo E (or W) appp HPA awww KT
:
T=84 LaLa.La N LoLoLo.Lo E (or W) appp HPA awww KT=

Notes:

a. Underlined parts are fixed.

b. Symbolic letters

i i	:	'20', '21', '22', '23', '24' or '25'
YYGGgg	:	Initial time of the model in UTC
class	:	Intensity classification of the tropical cyclone 'T', 'STS', 'TS' or 'TD'
PPPP	:	Central pressure in hPa
WWW	:	Maximum wind speed in knots
a	:	Sign of ppp and www (+, - or blank)
ppp	:	Absolute value of change in central pressure from T=0, in hPa
www	:	Absolute value of change in maximum wind speed from T=0, in knots

Example:

```
FXPQ20 RJTD 180600
RSMC GUIDANCE FOR FORECAST
NAME TY 0001DAMREY (0001)
PSTN 180000UTC 15.2N 126.3E
PRES    905HPA
MXWD    105KT
FORECAST BY GLOBAL MODEL
TIME        PSTN        PRES        MXWD
                    (CHANGE FROM T=0)
T=06 15.4N 125.8E +018HPA -008KT
T=12 15.5N 125.6E +011HPA -011KT
T=18 15.8N 125.7E +027HPA -028KT
                  :
                  :
T=84 20.7N 128.8E +021HPA -022KT=
```

(4) RSMC Prognostic Reasoning (WTPQ30-35 RJTD)

Example:

```
WTPQ30 RJTD 180000

RSMC TROPICAL CYCLONE PROGNOSTIC REASONING
REASONING NO. 9 FOR TY 0001 DAMREY (0001)
        1.GENERAL COMMENTS
REASONING OF PROGNOSIS THIS TIME IS SIMILAR TO PREVIOUS ONE.
POSITION FORECAST IS MAINLY BASED ON NWP AND PERSISTENCY.
        2.SYNOPTIC SITUATION
SUBTROPICAL RIDGE WILL NOT CHANGE ITS LOCATION AND STRENGTH FOR THE NEXT 24 HOURS.
        3.MOTION FORECAST
POSITION ACCURACY AT 180000 UTC IS GOOD.
TY WILL DECELERATE FOR THE NEXT 12 HOURS.
TY WILL RECURVE WITHIN 60 HOURS FROM 180000 UTC.
TY WILL MOVE WEST FOR THE NEXT 12 HOURS THEN MOVE GRADUALLY TO WEST-NORTHWEST.
        4.INTENSITY FORECAST
TY WILL KEEP PRESENT INTENSITY FOR NEXT 24 HOURS.
FI-NUMBER WILL BE 7.0 AFTER 24 HOURS.=
```

(5) Tropical Cyclone Advisory for SIGMET (FKPQ30-35 RJTD)

FKPQ i i RJTD YYGGgg
TC ADVISORY

DTG:	yyyymmdd/time Z
TCAC:	TOKYO
TC:	name
NR:	number
PSN:	N LaLa.LaLa E LoLoLo.LoLo
MOV:	direction SpSpSp KT
C:	PPPP HPA
MAX WIND:	WWW KT

FCST PSN +6HR:	YY/GGgg Z NLaLa.LaLa ELoLoLo.LoLo*
FCST MAX WIND +6HR:	WWW KT*
FCST PSN +12HR:	YY/GGgg Z NLaLa.LaLa ELoLoLo.LoLo
FCST MAX WIND +12HR:	WWW KT
FCST PSN +18HR:	YY/GGgg Z NLaLa.LaLa ELoLoLo.LoLo*
FCST MAX WIND +18HR:	YY/GGgg Z NLaLa.LaLa ELoLoLo.LoLo*
FCST PSN +24HR:	YY/GGgg Z N LaLa.LaLa E LoLoLo.LoLo
FCST MAX WIND +24HR:	WWW KT
RMK:	NIL =
NXT MSG:	yyyymmdd/time Z

* 6 hour and 18 hour forecasts are added from 22 May 2008.

Notes:

a. Underlined parts are fixed.

b. Abbreviations

DTG	:	Date and time
TCAC	:	Tropical Cyclone Advisory Centre
TC	:	Tropical Cyclone
NR	:	Number
PSN	:	Position
MOV	:	Movement
C	:	Central pressure
MAX WIND	:	Maximum wind
FCST	:	Forecast
RMK	:	Remarks
NXT MSG	:	Next message

c. Symbolic letters

i i	:	'30', '31', '32', '33', '34' or '35'
YYGGgg	:	Date(YY), hour(GG) and minute(gg) in UTC (Using “Z”)
yyyymmdd/time	:	Year(yyyy), month(mm), date(dd), hour and minute (time) in UTC (Using “Z”)
name	:	Name assigned to the tropical cyclone by RSMC Tokyo-Typhoon Center
Number	:	Advisory number (starting with “01” for each cyclone)
LaLa.LaLa	:	Latitude of the center position
LoLoLo.LoLo	:	Longitude of the center position
direction	:	Direction of movement given in 16 azimuthal direction such as 'N', 'NNE', 'NE' and 'ENE'
SpSpSp	:	Speed of movement. “SLW” for less than 3 kt “STNR” for less than 1 kt.
PPPP	:	Central pressure
WWW	:	Maximum sustained wind

Example:

FKPQ30 RJTD 271200
TC ADVISORY

DTG:	20080927/1200Z
TCAC:	TOKYO
TC:	JANGMI
NR:	15
PSN:	N2120 E12425
MOV:	NW 13KT
C:	910HPA
MAX WIND:	115KT
FCST PSN +6HR:	27/1800Z N2200 E12330
FCST MAX WIND +6HR:	115KT
FCST PSN +12HR:	28/0000Z N2240 E12250
FCST MAX WIND +12HR:	115KT
FCST PSN +18HR:	28/0600Z N2340 E12205
FCST MAX WIND +18HR:	95KT
FCST PSN +24HR:	28/1200Z N2440 E12105
FCST MAX WIND +24HR:	80KT
RMK:	NIL
NXT MSG:	20080927/1800Z =

(6) RSMC Tropical Cyclone Best Track (AXPQ20 RJTD)

AXPQ20 RJTD YYGGgg
RSMC TROPICAL CYCLONE BEST TRACK
NAME ty-No. name (common-No.)
PERIOD FROM MMMDDTTUTC TO MMMDDTTUTC
DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT
DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT
:
:
DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT DDTT LaLa.LaN LoLoLo.LoE PPPHPA WWWKT
REMARKS[1)]
TD FORMATION AT MMMDDTTUTC
FROM TD TO TS AT MMMDDTTUTC
:
:
DISSIPATION AT MMMDDTTUTC=

Notes:

a. Underlined parts are fixed.

b. [1)] REMARKS is given optionally.

c. Symbolic letters

MMM	:	Month in UTC given such as 'JAN' and 'FEB'
DD	:	Date in UTC
TT	:	Hour in UTC
PPP	:	Central pressure
WWW	:	Maximum wind speed

Example:

```
AXPQ20 RJTD 020600

RSMC TROPICAL CYCLONE BEST TRACK
NAME 0001 DAMREY (0001)
PERIOD FROM OCT1300UTC TO OCT2618UTC
1300 10.8N 155.5E 1008HPA   //KT   1306 10.9N 153.6E 1006HPA   //KT
1312 11.1N 151.5E 1004HPA   //KT   1318 11.5N 149.8E 1002HPA   //KT
1400 11.9N 148.5E 1000HPA   //KT   1406 12.0N 146.8E  998HPA   35KT
                      :
                      :
1712 14.6N 129.5E  905HPA 105KT   1718 14.7N 128.3E  905HPA 105KT
                      :
                      :
2612 32.6N 154.0E 1000HPA   //KT   2618 33.8N 157.4E 1010HPA   //KT
REMARKS
TD    FORMATION      AT OCT1300UTC
FROM  TD   TO  TS    AT OCT1406UTC
FROM  TS   TO  STS   AT OCT1512UTC
FROM  STS  TO  TY    AT OCT1600UTC
FROM  TY   TO  STS   AT OCT2100UTC
FROM  STS  TO  TS    AT OCT2112UTC
FROM  TS   TO  L     AT OCT2506UTC
DISSIPATION          AT OCT2700UTC=
```

Appendix 6

Specifications of JMA NWP (GSM, TEPS)

The Global Spectral Model (GSM) and the Typhoon Ensemble Prediction System (TEPS) are used in JMA as a primary basis for TC forecasts. GSM (TL959L100) has about 20 km horizontal resolution and 100 vertical layers. Details on the GSM are found in Yonehara et. al. (2014). TEPS (TL479L60) has 25 members with approximately 40 km horizontal resolution and 60 vertical layers. Details on the TEPS are found in Kyouda and Higaki (2015). A singular vector (SV) method is employed for the initial perturbation setup. The stochastic physics scheme (Buizza et al. 1999) is also introduced in consideration of model uncertainties associated with physical parameterizations. The general specifications of GSM and TEPS are summarized in Table 6.1.

Table 6.1 Specifications of GSM and TEPS

NWP Model	GSM (Global Spectral Model), TL959L100	TEPS (Typhoon Ensemble Prediction System), TL479L60
Resolution	20 km, 100 layers (Top: 0.01hPa)	40 km, 60 layers (Top: 0.1hPa)
Area	Global	Global
Method for initial value	Global Data Assimilation System (4DVAR) Outer resolution: TL959L100 Inner resolution: TL319L100 Window: Init-3h to Init + 3h	Unperturbed condition: Truncated GSM initial condition Initial perturbation: SV-based perturbation Ensemble size: 25 (24 perturbed members and 1 control member) SV target areas: Northwestern Pacific (20°N -60°N, 100 °E -180°) and vicinities of up to 3 TCs in the Typhoon Center's area of responsibility (e.g. Figure 6.1)
Forecast time (and initials)	84h (00, 06, 18 UTC) 264h (12 UTC)	132h (00, 06, 12, 18 UTC)
Operational as from	18 March 2014	11 March 2014 (de facto from T1404)

[Recent upgrades on GSM and the Global Data Assimilation System and TEPS]

GSM:

- Increase in the number of vertical layers from 60 to 100 with a topmost level raised from 0.1hPa to 0.01hPa, and revision of several physical processes such as boundary layer, radiation, non-orographic gravity wave and deep convection. (March 2014).

Global Data Assimilation System:

- The assimilation of Metop-A/IASI, Metop-B/IASI, and Aqua/AIRS data were started

(September 2014).

- The assimilation of AMSU-A channel 14 and ground-based GNSS-ZTD (Zenith Total Delay) data were started, and the GNSS RO assimilation was revised from refractivity assimilation up to 30 km AMSL to bending angle assimilation up to 60 km AMSL (March 2014).

TEPS:

- Enhancement for the horizontal resolution of the EPS model from TL319 to TL479 (March 2014)
- Revision of physical processes of the EPS model such as stratocumulus and radiation (March 2014)
- Increase of ensemble size from 11 to 25 (March 2014)

TEPS is an ensemble prediction system used mainly for TC track forecasts up to five days ahead. Two SV calculations are introduced into the system to efficiently capture the uncertainty of TC track forecasts. One produces SVs with a spatial target area fixed on the Northwestern Pacific (20°N -60°N, 100 °E -180°), and the other produces SVs whose spatial target area can be moved within a 750-km radius of a predicted TC's position in one-day forecasting. Up to three movable areas can be configured for different TCs at one initial time. If more than three TCs are present in the area of responsibility, three are selected in the order of concern as prioritized by the RSMC Tokyo – Typhoon Center. Figure 6.1 shows an example of SV spatial target areas. At this initial time, there were three TCs in the area. Figure 6.2 shows an example of TEPS forecast tracks for PHANFONE (TY1418). In this case, the forecasted TC track of the control member showed that the typhoon would hit both Nansei Islands (southwestern islands off Kyushu) and Kyushu (southernmost of the four main islands of Japan). In addition, ensemble TC tracks suggested that there would be widespread probabilities of not only typhoon hitting but also typhoon passing by off the Pacific. As a result, some TC tracks were close to the best track during the period..

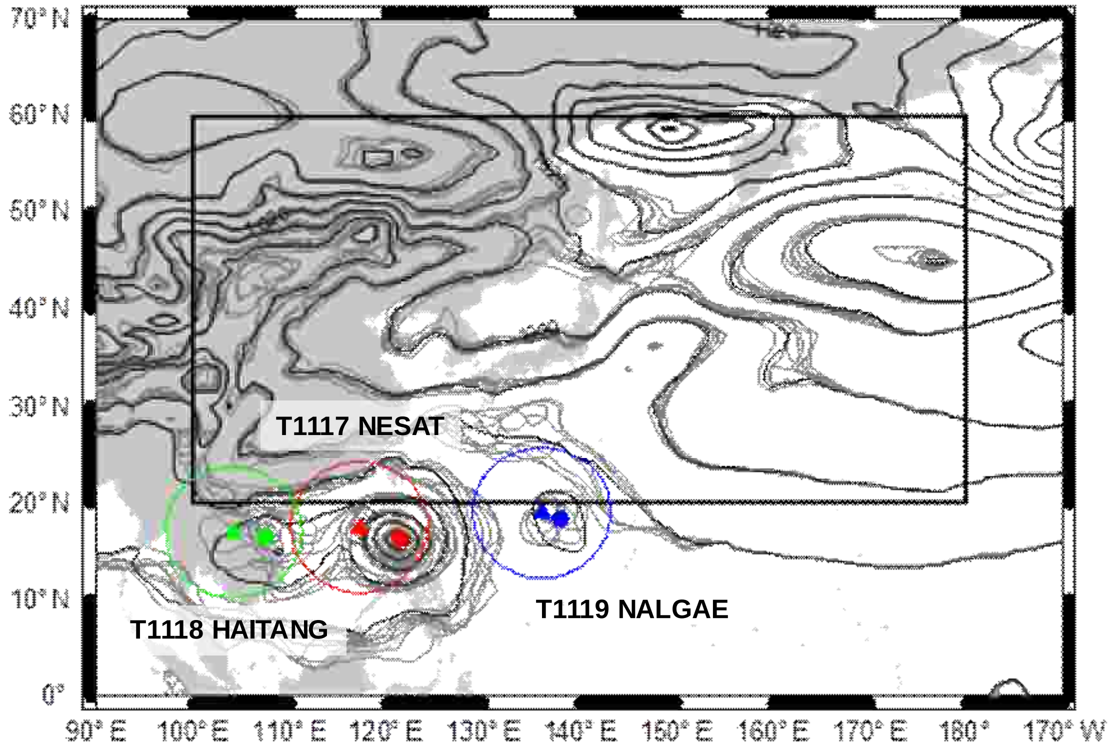


Figure 6.1 Example of SV spatial target areas of TEPS (Initial time: 00UTC 27 September 2011). The large thick rectangle shows the fixed area and the circles show the three movable areas which are set around a predicted TC's position. Filled circles and triangles show TCs' central positions at the initial time and in one-day forecasting, respectively. Gray contours show the initial sea level pressure of each member.

[References]

Buizza, R., M. Miller, and T. N. Palmer, 1999: Stochastic representation of model uncertainties in the ECMWF Ensemble Prediction System. Quart. J. Roy. Meteor. Soc., 125, 2887–2908.

Kyouda, M. and M. Higaki, 2015: Upgrade of JMA's Typhoon Ensemble Prediction System, RSMC Tokyo-Typhoon Center Technical Review, 17-1, p.13.
http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/techrev/text17-1.pdf

Yonehara, H., M. Ujiie, T. Kanehama, R. Sekiguchi and Y. Hayashi, 2014: Upgrade of JMA's Operational NWP Global Model, CAS/JSC WGNE Res. Activ. Atmos. Oceanic Modell., 44, 06.19-06.20.

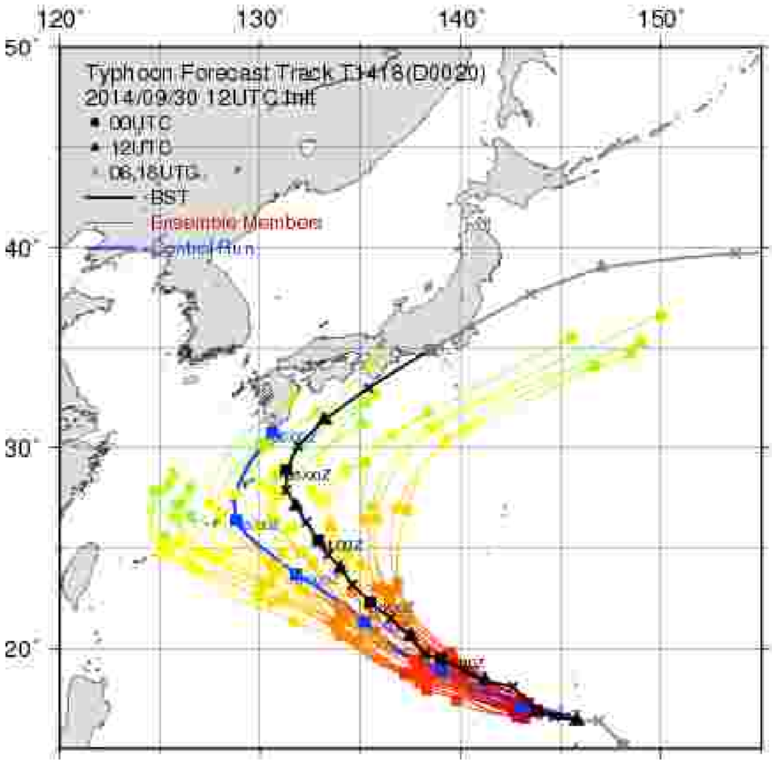


Figure 6.2 Example of TEPS forecast track (Initial time: 12UTC 30 September 2014). Black and blue lines denote TC best track and forecast track of control member respectively. Red, dark orange, orange, yellow and green lines show TC forecast tracks of all perturbed members up to 48, 72, 96, 120 and 132 hours, respectively.

NWP products (GSM and EPS) provided on WIS GISC Tokyo server

(Available at http://www.wis-jma.go.jp/cms/)

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) for 12UTC initial ¶ 90–192 (every 6 hours) for 12UTC initial	0–72 every 24 hours and 96–192 every 24 hours for 12UTC ° 0–120 for 12UTC † Except analysis * Analysis only
Initial times	00, 06, 12, 18UTC	00, 06, 12, 18UTC	00UTC and 12UTC ‡ 00UTC only

Model	One-week EPS
Area and resolution	Whole globe, 2.5°×2.5°
Levels and elements	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	0–192 every 12 hours
Initial times	00, 12UTC

Model	GSM	GSM
Area and resolution	5S-90N and 30E-165W, Whole globe 0.25° × 0.25°	5S-90N and 30E-165W, Whole globe 0.5° × 0.5°
Levels and elements	Surface: U, V, T, H, P, Ps, R, Cla, Clh, Clm, Cll	10 hPa: Z, U, V, T, H, ω 20 hPa: Z, U, V, T, H, ω 30 hPa: Z, U, V, T, H, ω 50 hPa: Z, U, V, T, H, ω 70 hPa: Z, U, V, T, H, ω 100 hPa: Z, U, V, T, H, ω 150 hPa: Z, U, V, T, H, ω 200 hPa: Z, U, V, T, H, ω, ψ, χ 250 hPa: Z, U, V, T, H, ω 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 800 hPa: Z, U, V, T, H, ω 850 hPa: Z, U, V, T, H, ω, ψ, χ 900 hPa: Z, U, V, T, H, ω 925 hPa: Z, U, V, T, H, ω 950 hPa: Z, U, V, T, H, ω 975 hPa: Z, U, V, T, H, ω 1000 hPa: Z, U, V, T, H, ω Surface: U, V, T, H, P, Ps, R, Cla, Clh, Clm, Cll
Forecast hours	0– 84 (every 3 hours) 90– 264 (every 6 hours) are available for 12 UTC Initial	0– 84 (every 3 hours) 90– 264 (every 6 hours) are available for 12 UTC Initial
Initial times	00, 06, 12, 18 UTC	00, 06, 12, 18 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 Ps: pressure
R: rainfall Cla: total cloudiness Clh: cloudiness (upper layer)
Clm: cloudiness (middle layer) Cll: cloudiness (lower layer)

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 tables.

Other products on WIS GISC Tokyo server

(Available at http://www.wis-jma.go.jp/cms/)

Data	Contents / frequency (initial time)
Satellite products	High density atmospheric motion vectors (BUFR) (a) MTSAT-2 (VIS, IR, WV), 60S-60N, 90E-170W VIS: every hour (00-09, 21-23 UTC), IR and WV: every hour (b) METEOSAT-7 (VIS, IR, WV) VIS: every 1.5 hours between 0130 and 1500 UTC IR and WV: every 1.5 hours Clear Sky Radiance (CSR) data (BUFR) MTSAT-2 (IR, WV) radiances and brightness temperatures averaged over cloud-free pixels: every hour
Tropical cyclone Information	Tropical cyclone related information (BUFR) • tropical cyclone analysis data (00, 06, 12 and 18 UTC)
Wave data	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 96-264 every 12 hours (12 UTC)
Observational data	(a) Surface data (TAC/TDCF) SYNOP, SHIP, BUOY: Mostly 4 times a day (b) Upper-air data (TAC/TDCF) TEMP (parts A-D), PILOT (parts A-D): Mostly twice a day
Storm surge	Storm surge model for Asian area • storm surge distribution (map image) • time series charts (at requested locations) The plotted values are storm surges, predicted water levels, astronomical tides, surface winds, and sea level pressures. Forecast hours: 0–72 every 3 hours (00, 06 12, and 18UTC) Only in the case of a tropical cyclone being in the forecast time (Available at https://tynwp-web.kishou.go.jp/)
SATAID service	(a) Satellite imagery (SATAID) MTSAT (b) Observation data (SATAID) SYNOP, SHIP, METAR, TEMP (A, B) and ASCAT sea-surface wind (c) NWP products (SATAID) GSM (Available at http://www.wis-jma.go.jp/cms/sataid/)

Appendix 8

User’s Guide to the DVD

Preface

This DVD contains all the texts, tables and charts of the RSMC Annual Report 2014 along with satellite images of the tropical cyclones that attained TS intensity or higher in the western North Pacific and the South China Sea in 2014. This document is a brief user's guide on how to use the DVD, which was mastered in ISO-9660 format.

Directory and File layout

```
[Root]
|------Readme.txt (brief explanation of the DVD)
|------TopMenu.exe (start menu setup program)
|------SATAIDmanual.pdf (user manual for the satellite image viewer)
|------Annual_Report
            |---Text (text of Annual Report 2014 in PDF)
            |---Figure (figures in PDF)
            |---Table (tables in PDF)
            |---Appendix (appendices for MS Word, Excel and PDF)
|------Programs
            |---Gmslpd
                    |--Gmslpd.exe (viewer; tropical cyclone version in English)
                    |--Gsetup.exe (setup program)
|------Satellite_Image_Data
            |---T1401 (hourly satellite image data)
            |---T1402 (hourly satellite image data)
                          :
            |---T1423 (hourly satellite image data)
|------Andata
            |--Besttrack
                    |--E_BST_2014.txt (best track data for 2014)
                    |--E_BST_201401.txt (best track data for TCs generated in January 2014)
                                   :
                    |--E_BST_201412.txt (best track data for TCs generated in December 2014)
```

How to use the DVD

A start menu will be launched if you enter the DVD or click TopMenu.exe file. The start menu includes buttons marked Annual Report 2014, MTSAT Satellite Image, About DVD and Close, as well as File List Box for introductory documents. Click the button or the file name of the content you wish to see and follow the instructions on the display.

Hardware/OS requirements for using the DVD:

Hardware	:	PC/AT compatible
OS	:	Microsoft Windows ver. 3.1 or later

< Annual Report 2014 >

Annual Report 2014 is provided in two formats as PDF files and MS Word/Excel files.

- PDF files:

Click the *Annual Report 2014* button to open the text in PDF. If you cannot open it, download Adobe Reader from Adobe’s website (http://www.adobe.com/). Adobe Reader (or Adobe Acrobat) is required to view PDF files.

- MS Word/Excel files:

The original figures and tables prepared with Microsoft Word or Excel are contained in the Annual Report folder of the DVD.

< MTSAT Satellite Image >

- Installation of the program for displaying satellite images

Click the *MTSAT Satellite Image* button to run the setup program (Gsetup.exe) for the satellite image viewer. Follow the instructions, and the satellite image viewer *Gmslpd.exe* will be installed onto the computer’s hard disk. A list of the tropical cyclones occurring in 2014 is displayed in the selection window of the satellite images for tropical cyclones.

- Displaying satellite images

Choose and click a tropical cyclone from the list to see hourly satellite images of it. You can also display the track of the tropical cyclone superimposed onto the satellite image and measure its intensity using the Dvorak method.

- User manual for the viewer

Besides the above features, the viewer has many other useful functions. See the User Manual (SATAIDmanual.pdf) for further details on its use.

- Explanation of satellite image data

Period : From the TD formation to the time of dissipation

Images	: Infrared images (00 to 23 UTC) Visible images (00 to 09 and 21 to 23 UTC)
Range	: 40 degrees in both latitude and longitude (The image window moves to follow the track of the tropical cyclone so that its center remains in the middle of the window.)
Time interval	: Hourly
Resolution	: 0.05 degrees in both latitude and longitude
Compression of file	: Compressed using the *compress.exe* command of Microsoft Windows

< About DVD >

Click the *About DVD* button to open the *Readme.txt* file.

< Close >

Click the *Close* button to close the start menu window.

< File list box >

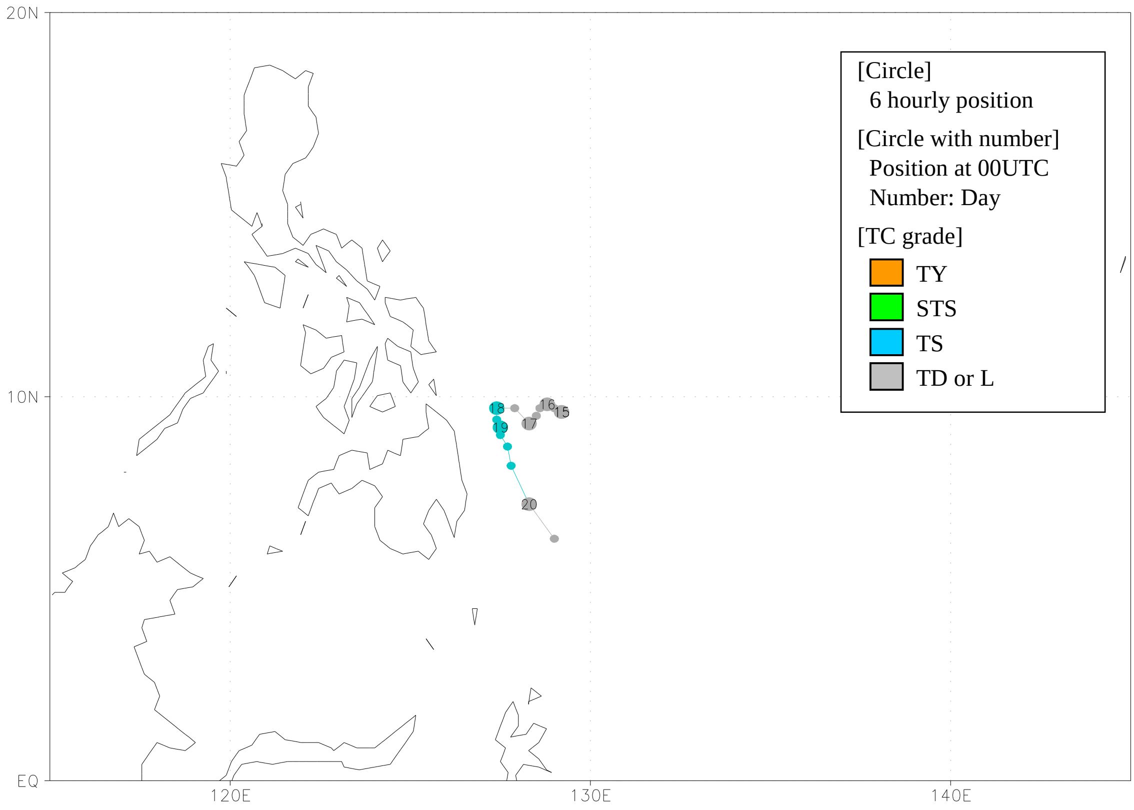
Document files can be opened from the file list box in the start menu window. Choose a file and click the *Open* button, or simply double-click the file name.

For further information, please contact:

RSMC Tokyo - Typhoon Center
Forecast Division
Forecast Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku, Tokyo 100-8122, Japan
FAX: +81-3-3211-8303
E-mail: rsmc-tokyo@met.kishou.go.jp

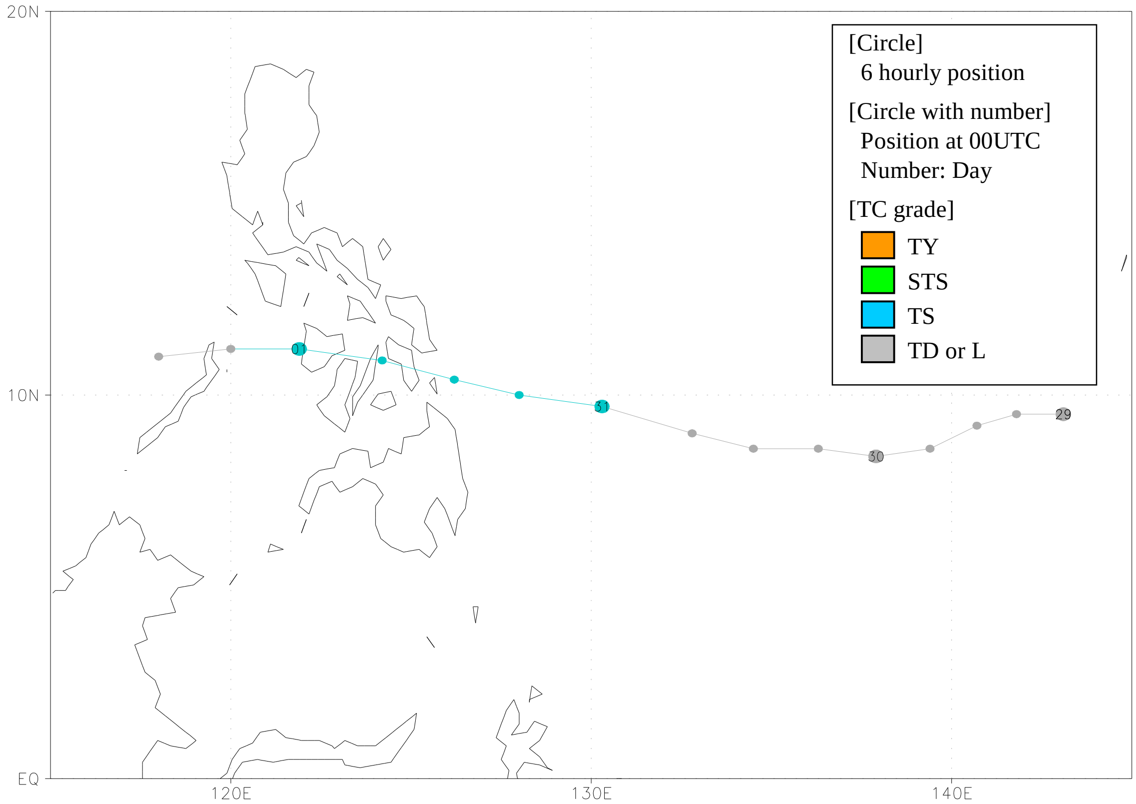
LINGLING (1401)

LINGLING formed as a tropical depression (TD) over the sea east of Mindanao Island at 00 UTC on 15 January 2014 and slowly moved westward. While LINGLING remained almost stationary over the same waters from 12 UTC on 17 January to 12 UTC on 18 January, it was upgraded to tropical storm (TS) intensity at 00 UTC on 18 January and reached its peak intensity with maximum sustained winds of 35 kt and a central pressure of 1002 hPa six hours later. Moving southward, LINGLING weakened to TD intensity at 00 UTC on 20 January and dissipated southeast of Mindanao Island 12 hours later.



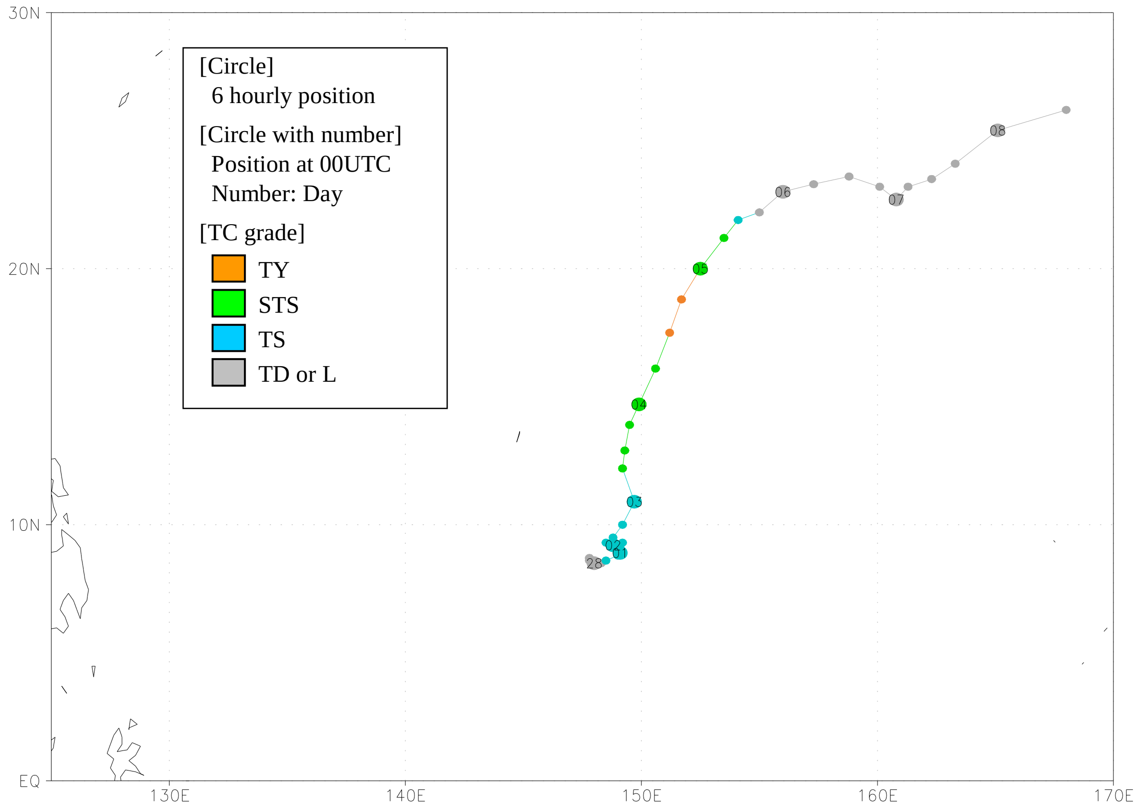
KAJIKI (1402)

KAJIKI formed as a tropical depression (TD) around the Caroline Islands at 00 UTC on 29 January 2014. Moving westward, it was upgraded to tropical storm (TS) intensity east of the Philippines at 00 UTC on 31 January when it reached its peak intensity with maximum sustained winds of 35 kt and a central pressure of 1000 hPa. After crossing the central part of the Philippines with TS intensity, KAJIKI weakened to TD intensity over the northern part of the Sulu Sea at 06 UTC the next day and dissipated west of Palawan Island 12 hours later.



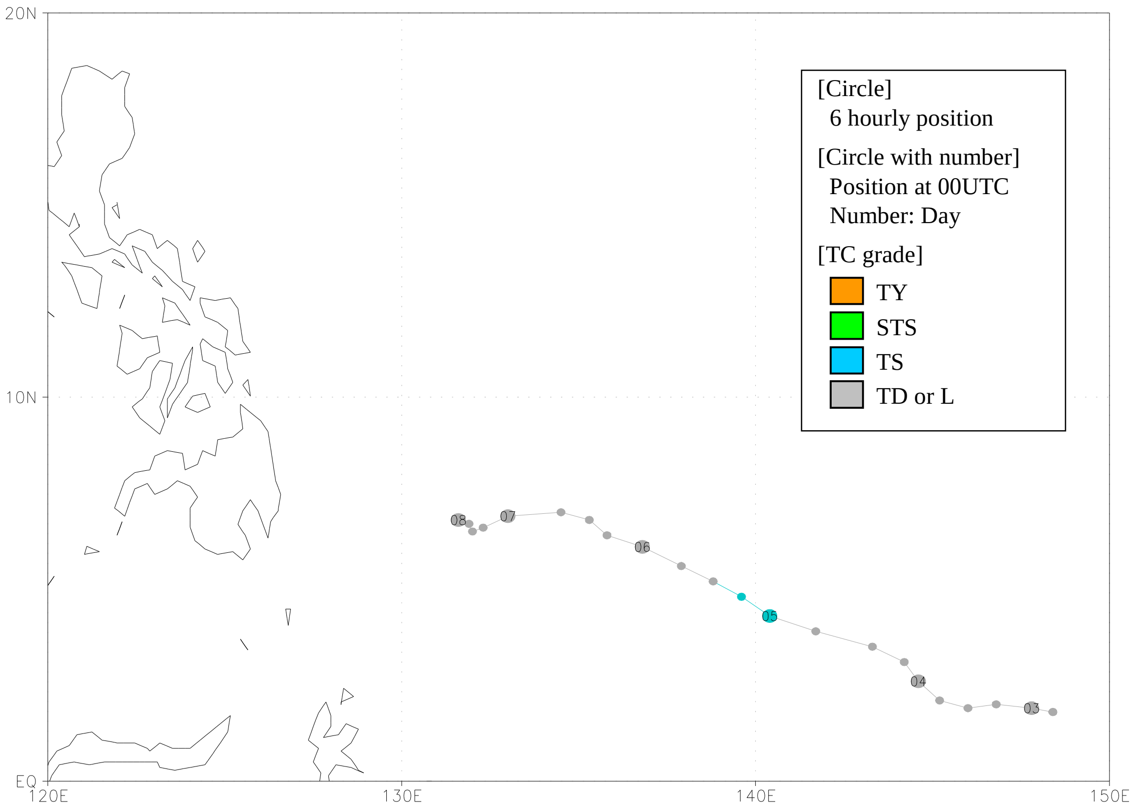
FAXAI (1403)

FAXAI formed as a tropical depression (TD) southeast of the Mariana Islands at 12 UTC on 27 February 2014. Remaining almost stationary, it was upgraded to tropical storm (TS) intensity over the same waters at 12 UTC the next day. After remaining almost stationary, FAXAI accelerated north-northeastward on 2 March. It was upgraded to typhoon (TY) intensity and reached its peak intensity with maximum sustained winds of 65 kt and a central pressure of 975 hPa east of the islands at 12 UTC on 4 March. Turning gradually eastward, FAXAI transformed into an extratropical cyclone south of Minamitorishima Island at 18 UTC on 5 March and dissipated north of Wake Island at 12 UTC on 8 March.



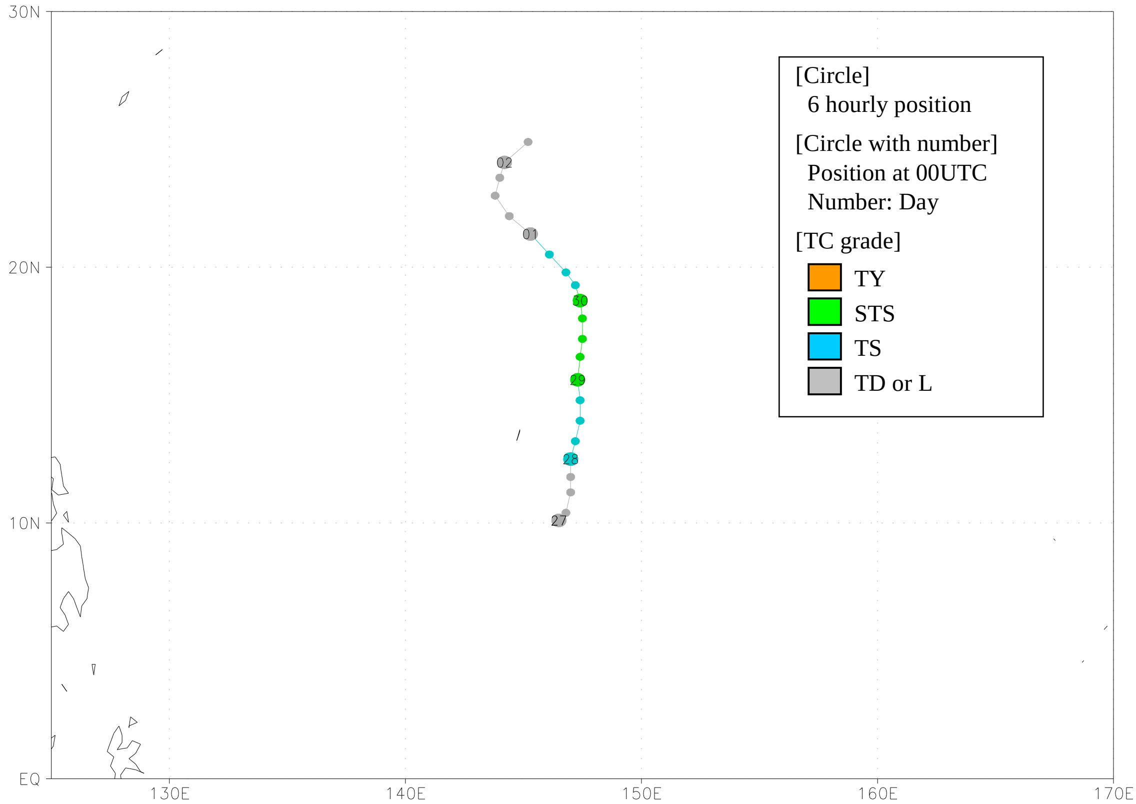
PEIPAH (1404)

PEIPAH formed as a tropical depression (TD) southwest of the Chuuk Islands at 18 UTC on 2 April 2014 and moved westward. Turning west-northwestward, it was upgraded to tropical storm (TS) intensity south of the Yap Islands at 00 UTC on 5 April. PEIPAH reached its peak intensity with maximum sustained winds of 35 kt and a central pressure of 998 hPa over the same waters six hours later. Keeping its west-northwestward track, it weakened to TD intensity at 12 UTC the same day and dissipated west of the Palau Islands at 06 UTC on 8 April.



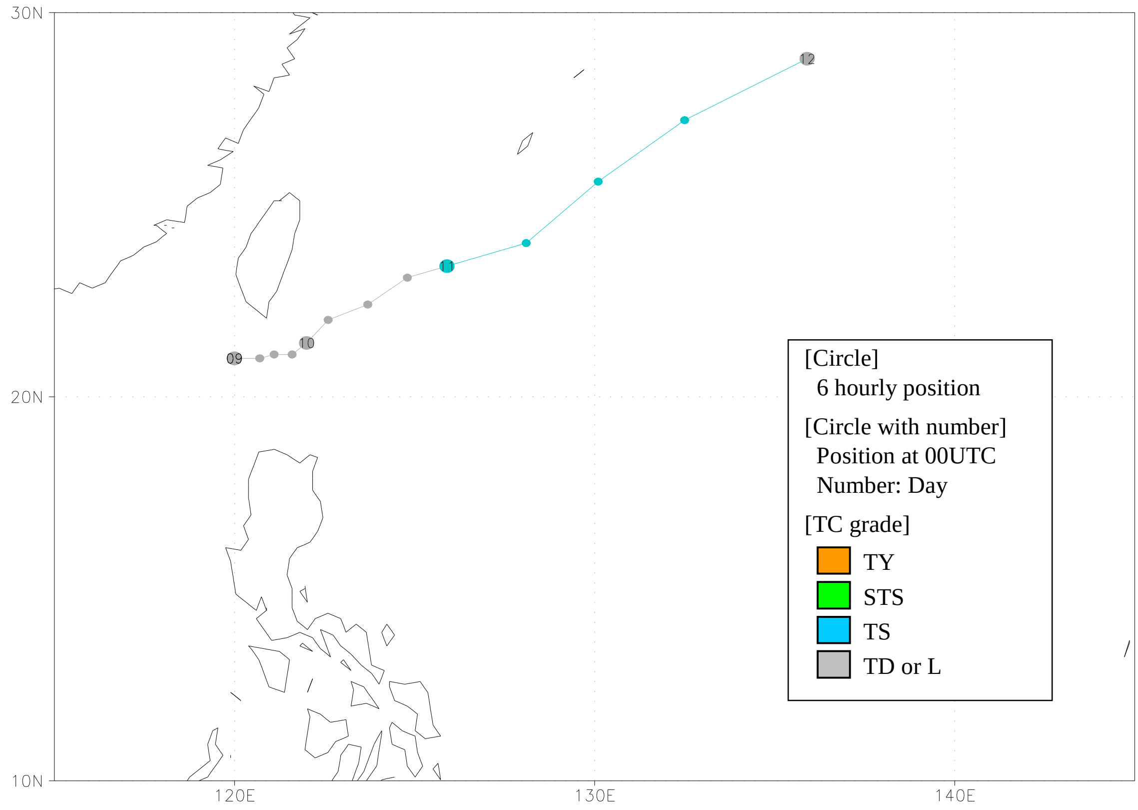
TAPAH (1405)

TAPAH formed as a tropical depression (TD) over the sea south of Saipan Island at 00 UTC on 27 April 2014 and moved northward. It was upgraded to tropical storm (TS) intensity at 00 UTC the next day southeast of the island. Continuing northward, TAPAH was upgraded to severe tropical storm (STS) intensity and reached its peak intensity with maximum sustained winds of 50 kt and a central pressure of 985 hPa east of the island at 00 UTC on 29 April. Turning northwestward, TAPAH weakened to TD intensity at 00 UTC on 1 May, and dissipated southeast of Chichijima Island at 12 UTC the next day.



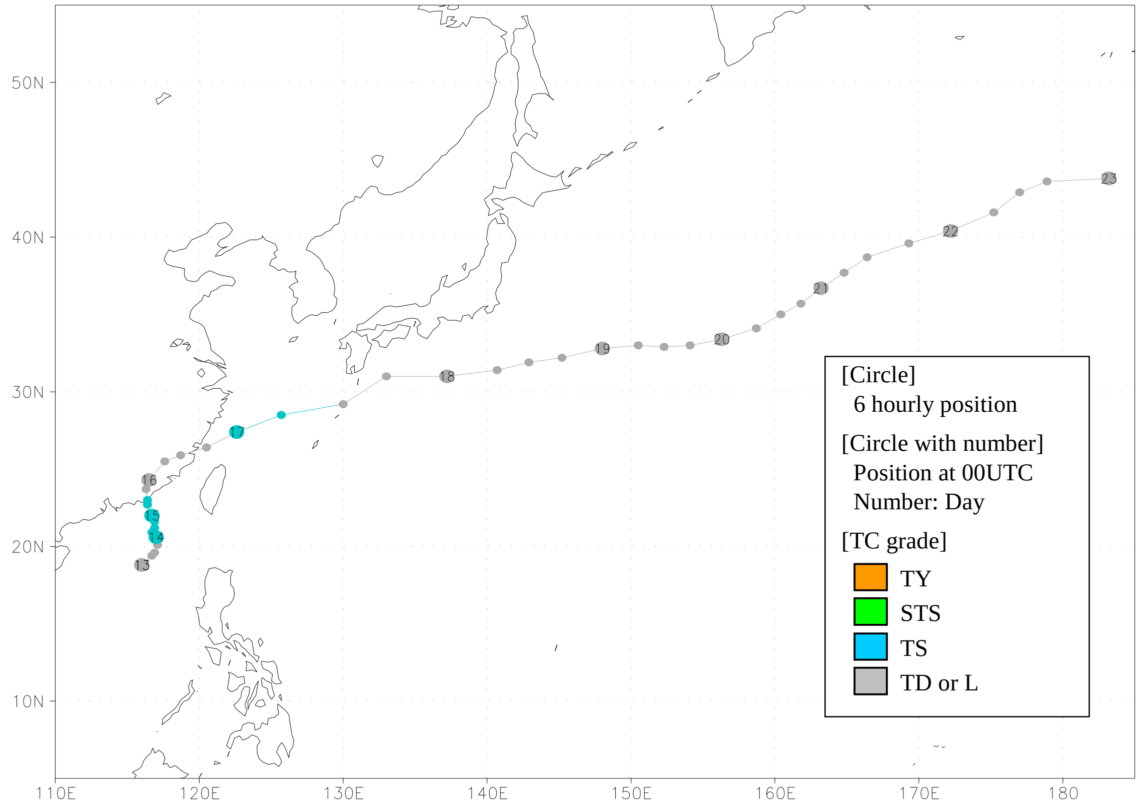
MITAG (1406)

MITAG formed as a tropical depression (TD) over the sea south of Taiwan Island at 00 UTC on 9 June 2014 and moved eastward and then east-northeastward. It was upgraded to tropical storm (TS) intensity at 00 UTC on 11 June south of Okinawa Island, and reached its peak intensity with maximum sustained winds of 40 kt and a central pressure of 994 hPa over the same waters at 06 UTC that day. Moving northeastward, MITAG transformed into an extratropical cyclone south of Honshu Island at 00 UTC on the next day, and dissipated six hours later.



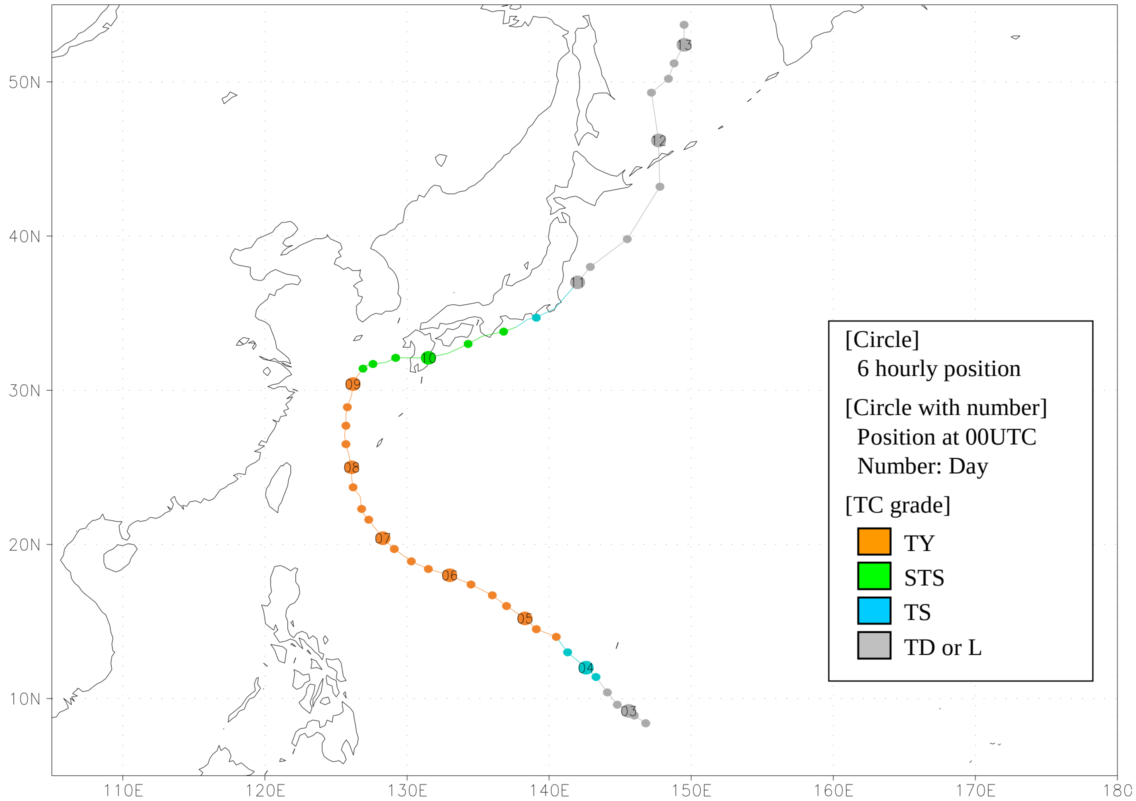
HAGIBIS (1407)

HAGIBIS formed as a tropical depression (TD) over the sea southwest of Taiwan Island at 00 UTC on 13 June 2014. Moving northeastward and then turning northward, it was upgraded to tropical storm (TS) intensity and reached its first peak intensity with maximum sustained winds of 35 kt and a central pressure of 996 hPa over the same waters at 00 UTC the next day. Keeping its northward track and intensity, HAGIBIS hit South China and then weakened to TD intensity there at 18 UTC on 15 June. Turning northeastward the next day and then entering the East China Sea, it was re-upgraded to TS intensity there at 00 UTC on 17 June. HAGIBIS reached its second peak intensity with maximum sustained winds of 40 kt and a central pressure of 996 hPa northwest of Okinawa Island at 06 UTC on 17 June and then weakened to TD intensity north of Amami Oshima Island six hours later. HAGIBIS transformed into an extratropical cyclone south of Shikoku Island at 18 UTC the same day and moved eastward. It gradually turned northeastward and continued northeastward until it crossed longitude 180 degrees east before 00 UTC on 23 June.



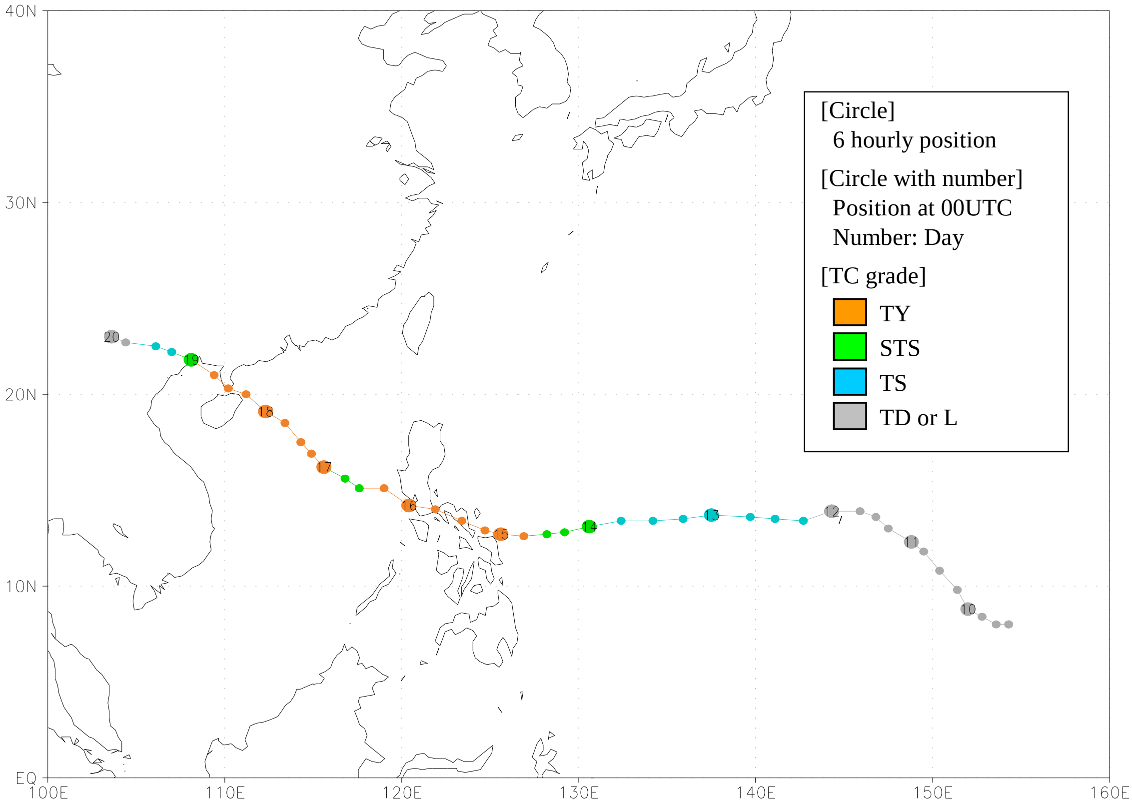
NEOGURI (1408)

NEOGURI formed as a tropical depression (TD) south of the Mariana Islands at 12 UTC on 2 July 2014. Moving northwestward, it was upgraded to tropical storm (TS) intensity over the same waters at 18 UTC on 3 July. NEOGURI developed rapidly and was upgraded to typhoon (TY) intensity west of the islands at 12 UTC the next day. Keeping its northwestward track, it reached its peak intensity with maximum sustained winds of 100 kt and a central pressure of 930 hPa at 18 UTC on 6 July. Gradually turning northward, it moved between Miyako Island and Kumejima Island with TY intensity early on 8 July. Turning eastward, NEOGURI made landfall on around Akune City, Kagoshima Prefecture with severe tropical storm (STS) intensity before 22 UTC on 9 July. Moving eastward, it landed on the southern part of Wakayama Prefecture with STS intensity around 0930 UTC the next day. NEOGURI passed through the southern part of the Izu Peninsula, Shizuoka Prefecture with TS intensity around 1730 UTC on 10 July and then landed on around Futtsu City, Chiba Prefecture with TS intensity before 20 UTC the same day. Gradually turning northward, it transformed into extratropical cyclone at 00 UTC on 11 July and dissipated over the Sea of Okhotsk at 12 UTC on 13 July.



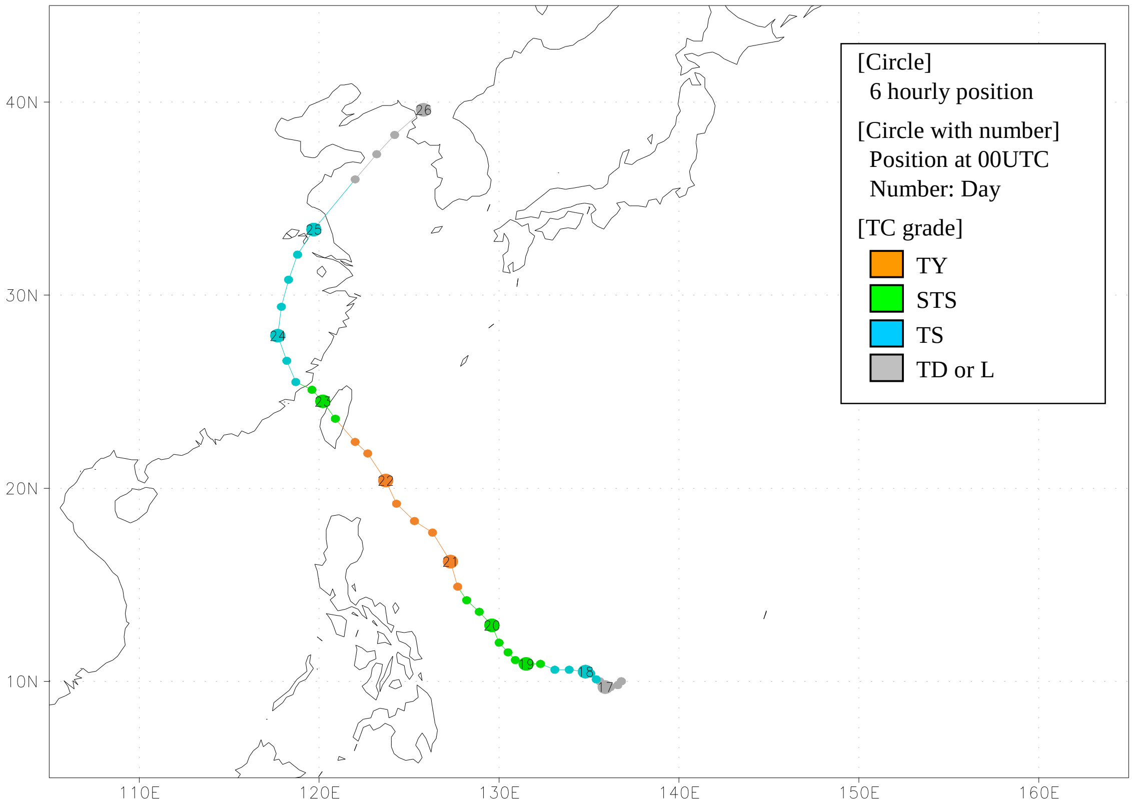
RAMMASUN (1409)

RAMMASUN formed as a tropical depression (TD) over the sea east of the Chuuk Islands at 06 UTC on 9 July 2014. Moving northwestward, it was upgraded to tropical storm (TS) intensity west of Guam Island at 06 UTC on 12 July. Moving westward, RAMMASUN was upgraded to typhoon (TY) intensity east of the Philippines at 18 UTC on 14 July. Moving west-northwestward, it crossed the Philippines with TY intensity the next day and entered the South China Sea. RAMMASUN reached its peak intensity with maximum sustained winds of 90 kt and a central pressure of 935 hPa northeast of Hainan Island at 06 UTC on 18 July. After hitting the southern part of China, it was downgraded to severe tropical storm (STS) intensity at 00 UTC on 19 July. RAMMASUN weakened to TD intensity over the southern part of China at 18 UTC the same day and dissipated 12 hours later.



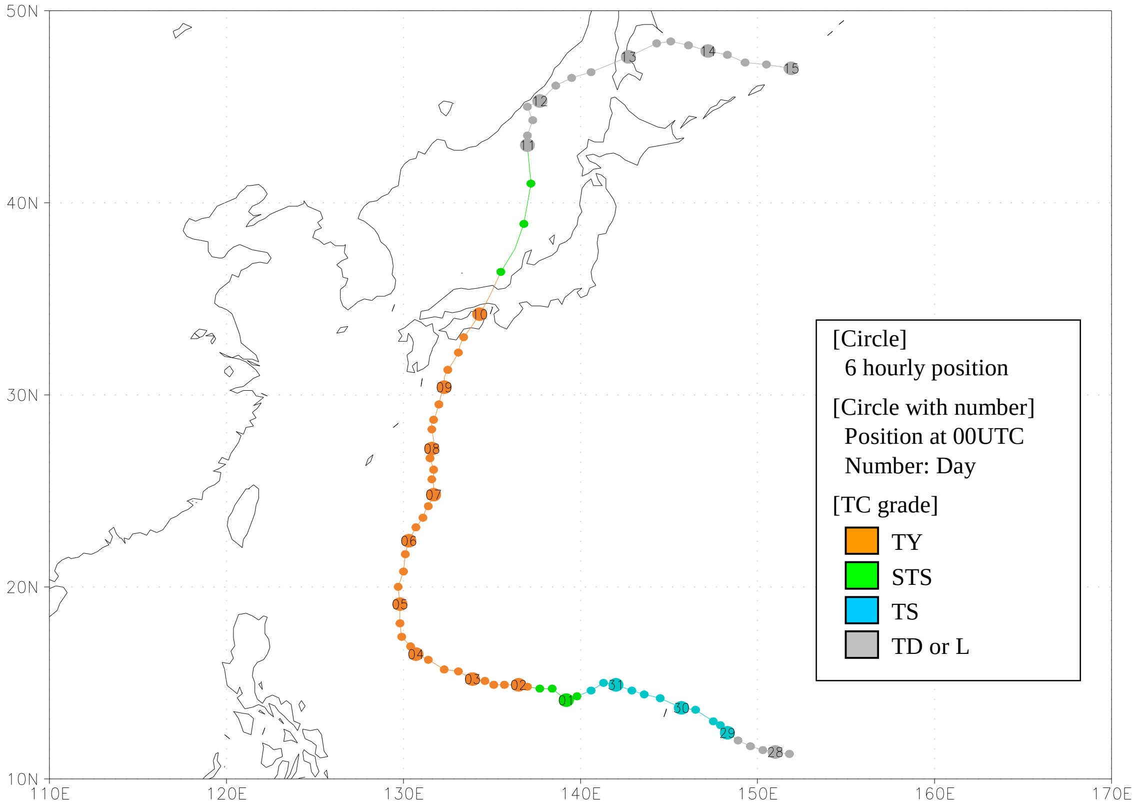
MATMO (1410)

MATMO formed as a tropical depression (TD) over the sea northeast of the Palau Islands at 06 UTC on 16 July 2014. Moving westward, it was upgraded to tropical storm (TS) intensity over the same waters at 12 UTC the next day. Turning northwestward, MATMO was upgraded to typhoon (TY) intensity east of the Philippines at 18 UTC on 20 July and reached its peak intensity with maximum sustained winds of 70 kt and a central pressure of 965 hPa six hour later. After crossing Taiwan Island with TY intensity on 22 July, it was downgraded to TS intensity over the coast of southeastern China at 12 UTC the next day. After turning north-northeastward, MATMO transformed into an extratropical cyclone over the Yellow Sea at 06 UTC on 25 July and dissipated over the northern part of the Korean Peninsula 24 hours later.



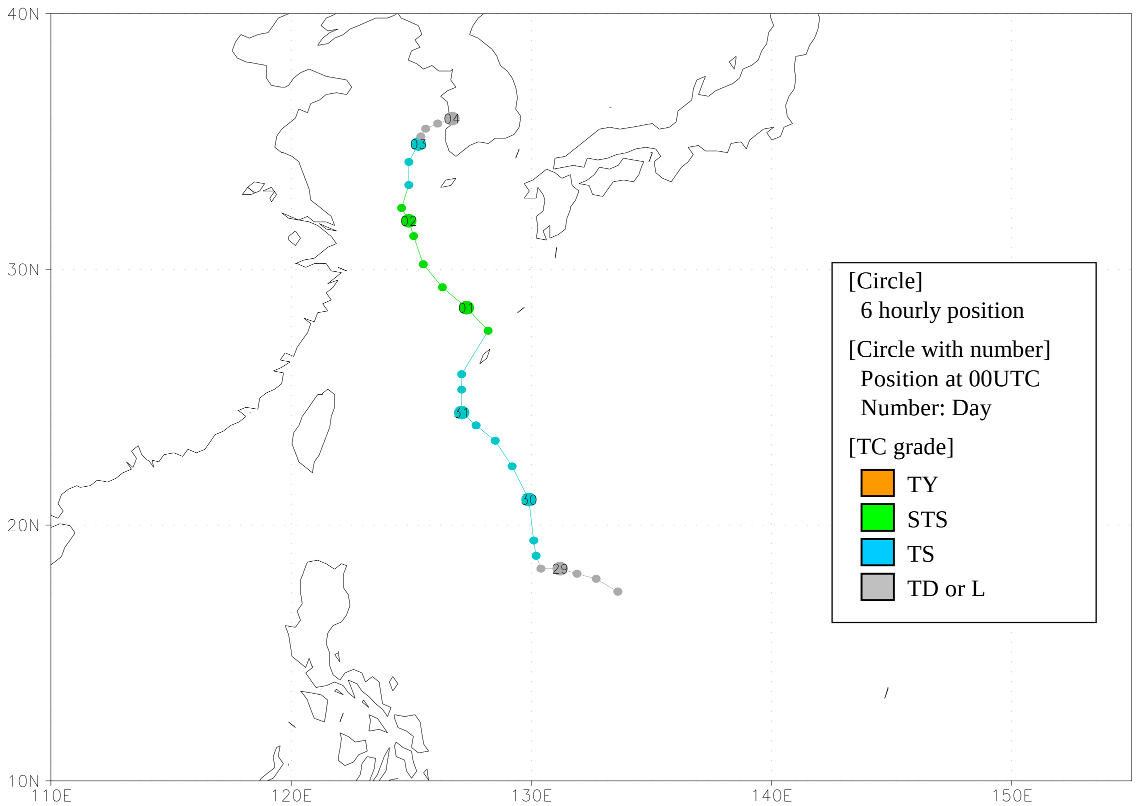
HALONG (1411)

HALONG formed as a tropical depression (TD) over the sea north of Chuuk Islands at 18 UTC on 27 July 2014, and then moved northwestward. It was upgraded to tropical storm (TS) intensity east of Guam Island at 00 UTC on 29 July. After turning westward on 31 July, HALONG was upgraded to typhoon (TY) intensity over the sea north of the Yap Islands at 18 UTC on 1 August. HALONG reached its peak intensity with maximum sustained winds of 105 kt and a central pressure of 920 hPa over the same waters at 12 UTC the next day. After turning northward on 4 August, it moved east of Minamidaitojima Island on 7 August. Turning northeastward the next day, HALONG made landfall around Aki City in Kochi Prefecture with TY intensity after 21 UTC on 9 August and then it made landfall again around Himeji City in Hyogo Prefecture with TY intensity before 02 UTC the next day. After crossing the Kinki region, HALONG entered the Sea of Japan and was downgraded to severe tropical storm (STS) intensity at 06 UTC on 10 August. Moving northward, HALONG transformed into an extratropical cyclone over the same waters at 00 UTC on 11 August. Turning eastward the next day, it crossed Sakhalin Island and dissipated around the Chishima Islands at 06 UTC on 15 August.



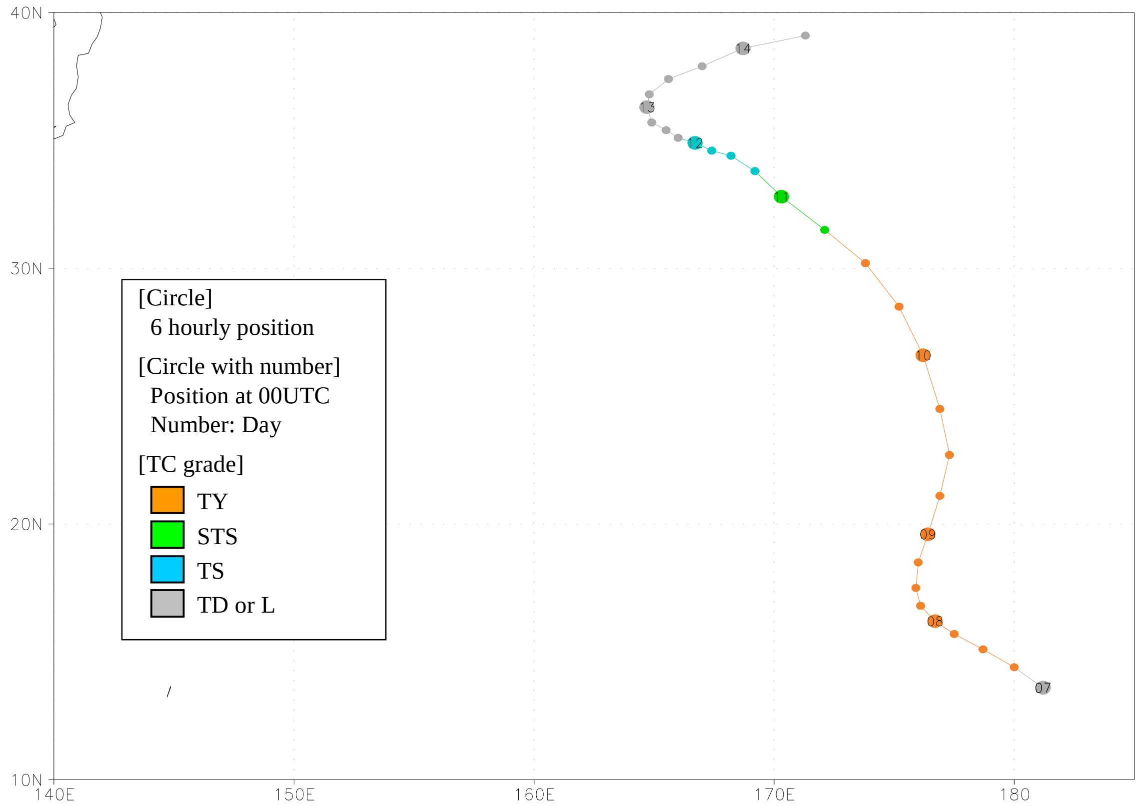
NAKRI (1412)

NAKRI formed as a tropical depression (TD) east of the Philippines at 06 UTC on 28 July 2014 and moved westward. Turning northward, it was upgraded to tropical storm (TS) intensity over the same waters at 12 UTC the next day. Gradually turning northwestward on 30 July, NAKRI turned northeastward the next day and moved into the East China Sea. It was upgraded to severe tropical storm (STS) intensity over the same waters at 18 UTC on 31 July. Turning northwestward again, NAKRI reached its peak intensity with maximum sustained winds of 55 kt and a central pressure of 980 hPa north of Okinawa Island six hours later. Decelerating northeastward on 2 August, it was downgraded to TS intensity west of Jeju Island at 12 UTC the same day. NAKRI weakened to TD intensity over the Yellow Sea at 06 UTC on 3 August and dissipated over the Korean Peninsula at 06 UTC the next day.



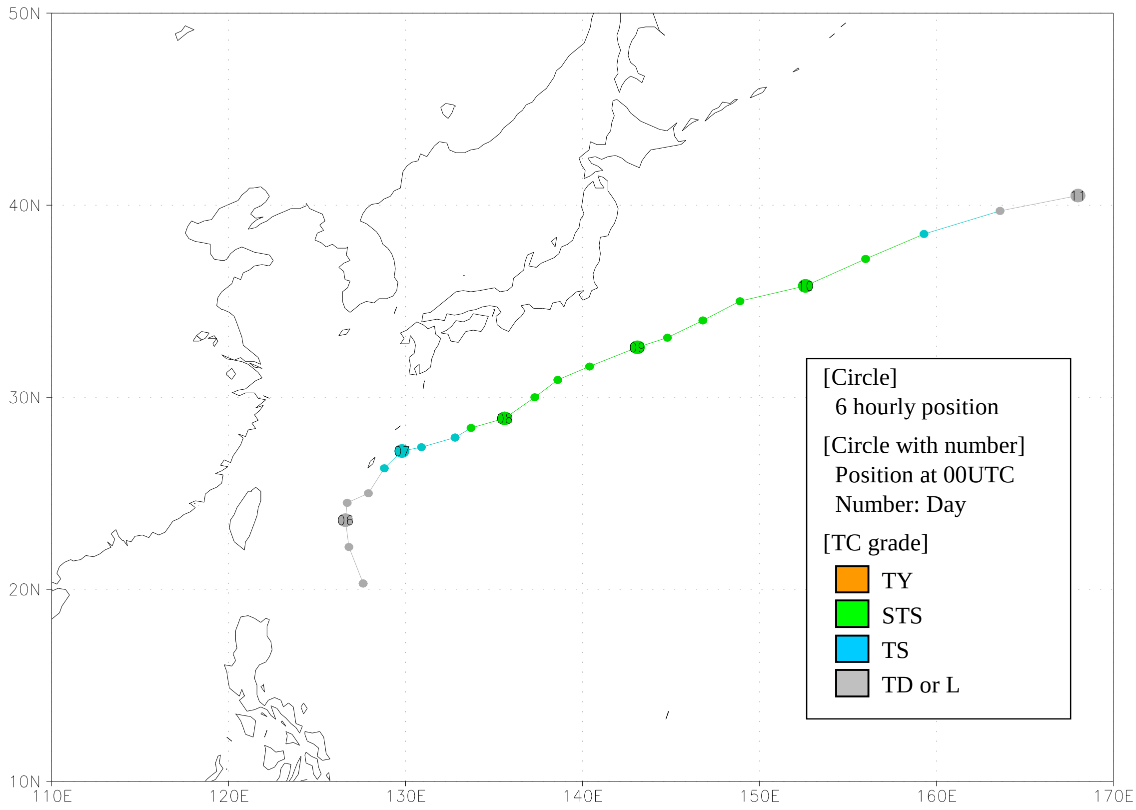
GENEVIEVE (1413)

GENEVIEVE moved northwestward and crossed longitude 180 degrees east with typhoon (TY) intensity over the sea east of the Marshall Islands before 06 UTC on 07 August 2014. Moving northwestward, it reached its peak intensity with maximum sustained winds of 110 kt and a central pressure of 915 hPa over the same waters at 18 UTC the same day. Turning northward then northwestward, GENEVIEVE was downgraded to severe tropical storm (STS) intensity northwest of the Midway Islands at 18 UTC on 10 August. Moving northwestward, it weakened to tropical depression (TD) intensity over the sea far east of Japan at 06 UTC on 12 August. Turning northeastward on 13 August, GENEVIEVE was dissipated south of the Aleutian Islands at 12 UTC the next day.



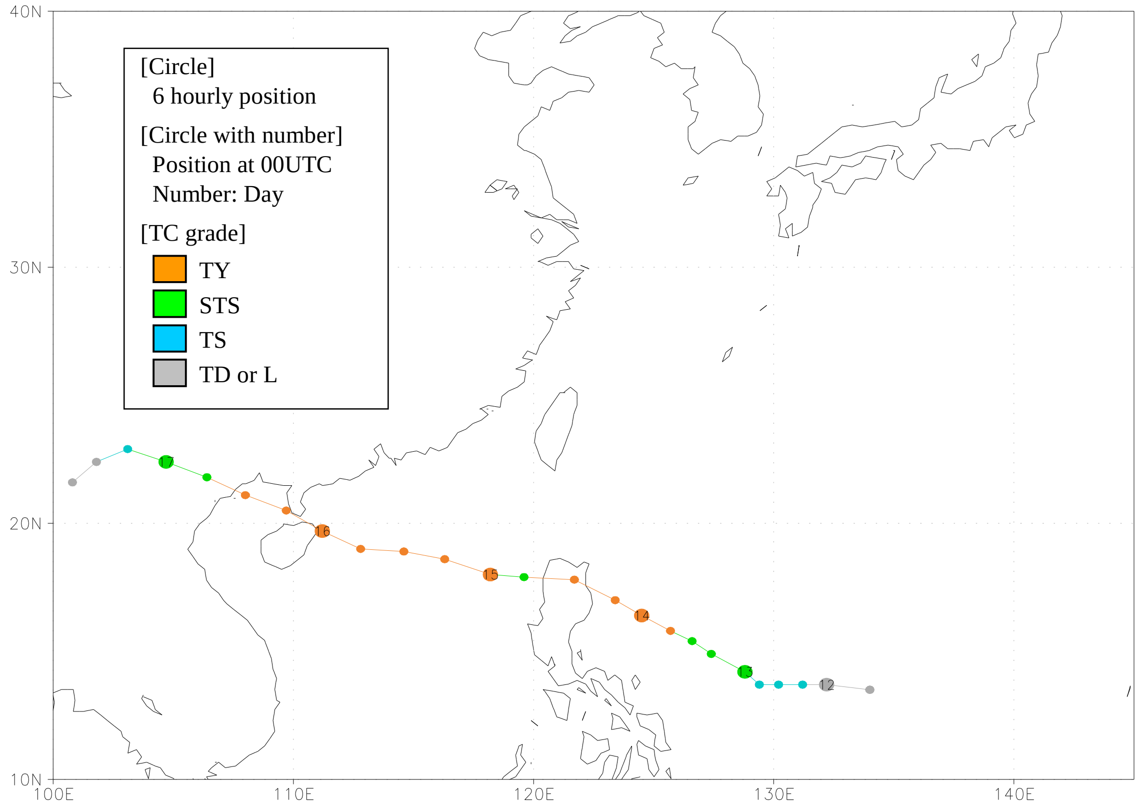
FENGSHEN (1414)

FENGSHEN formed as a tropical depression (TD) south of Okinawa Island at 12 UTC on 5 September 2014 and moved northward. Turning northeastward, it was upgraded to tropical storm (TS) intensity east of the island at 18 UTC the next day. Keeping its northeastward track, FENGSHEN reached its peak intensity with maximum sustained winds of 60 kt and a central pressure of 975 hPa over the sea south of Honshu Island at 06 UTC on 8 September. Accelerating northeastward, it transformed into an extratropical cyclone far east of Japan at 18 UTC on 10 September and dissipated 12 hours later.



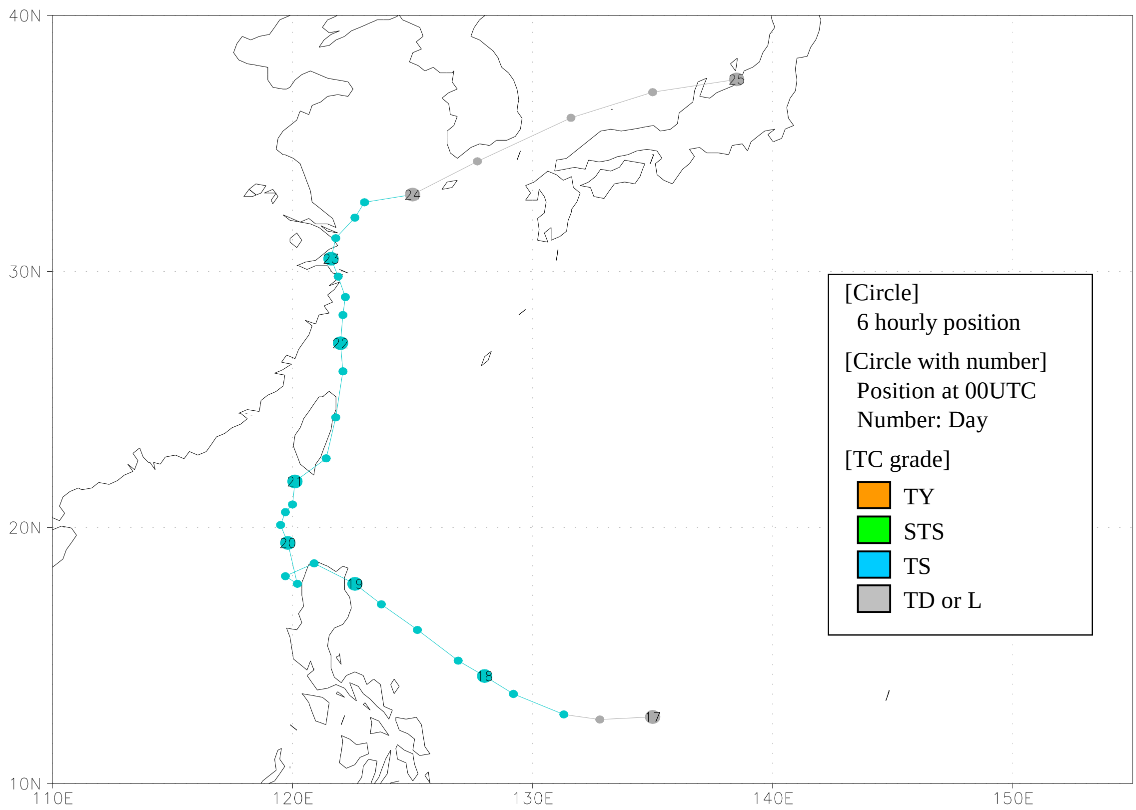
KALMAEGI (1415)

KALMAEGI formed as a tropical depression (TD) over the sea east of the Philippines at 18 UTC on 11 September 2014. Moving westward, it was upgraded to tropical storm (TS) intensity over the same waters 12 hours later. Turning northwestward, KALMAEGI was upgraded to typhoon (TY) intensity east of Luzon Island at 18 UTC on 13 September. After crossing the island and moving westward over the South China Sea, it reached its peak intensity with maximum sustained winds of 75 kt and a central pressure of 960 hPa near Hainan Island at 00 UTC on 16 September. After hitting the northern part of Viet Nam with TY intensity that day, it was downgraded to TS intensity over the southwestern part of China at 06 UTC the next day. After turning southwestward, KALMAEGI weakened to TD intensity near the border between China and Laos six hours later and dissipated over the same region at 00 UTC on 18 September.



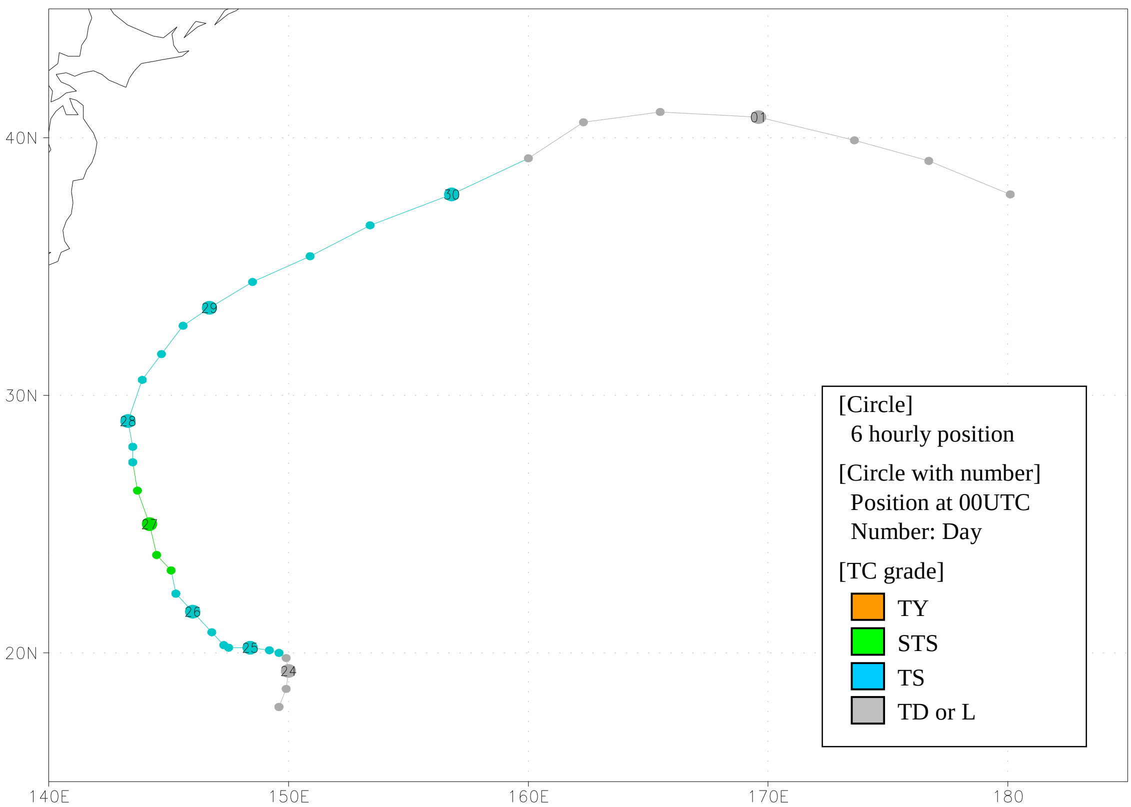
FUNG-WONG (1416)

FUNG-WONG formed as a tropical depression (TD) over the sea east of the Philippines at 00 UTC on 17 September 2014 and moved westward. Gradually turning northwestward, it was upgraded to tropical storm (TS) intensity over the same waters at 12 UTC the same day. Keeping its northwestward track, FUNG-WONG hit the northern part of Luzon Island with TS intensity early on 19 September. It reached its peak intensity with maximum sustained winds of 45 kt and a central pressure of 985 hPa over the Luzon Strait at 06 UTC the same day. FUNG-WONG turned in a counterclockwise direction to circle west of Luzon Island and then moved northward.
It moved along the eastern coast of Taiwan Island and entered the East China Sea late on 21 September. Hitting the eastern part of China and turning eastward on 23 September, FUNG-WONG transformed into an extratropical cyclone west of Jeju Island at 00 UTC on 24 September. After entering the Sea of Japan, FUNG-WONG dissipated over Honshu Island at 06 UTC the next day.



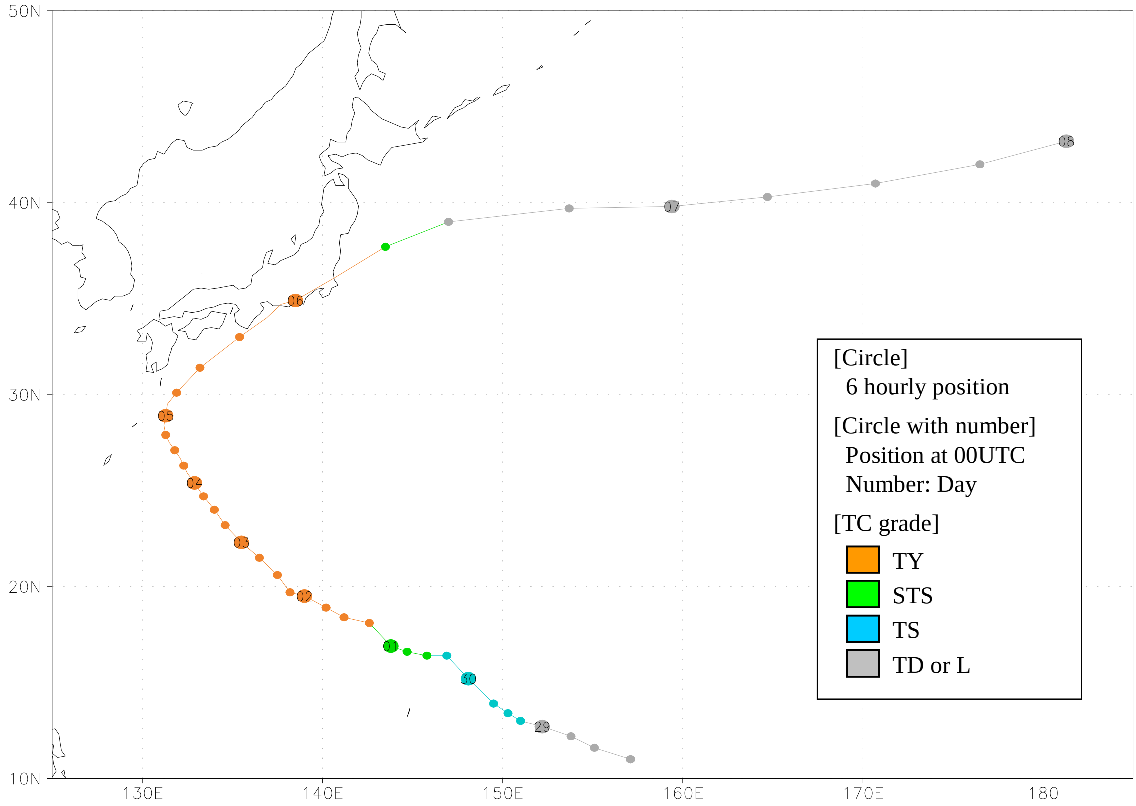
KAMMURI (1417)

KAMMURI formed as a tropical depression (TD) east of the Mariana Islands at 12 UTC on 23 September 2014 and moved northward. Turning westward, it was upgraded to tropical storm (TS) intensity over the same waters at 12 UTC the next day. Turning northwestward on 25 September, KAMMURI reached its peak intensity with maximum sustained winds of 50 kt and a central pressure of 985 hPa southeast of the Ogasawara Islands at 12 UTC the next day. After moving northward east of the islands on 27 September, it accelerated northeastward the next day. After transforming into an extratropical cyclone far east of Japan at 06 UTC on 30 September, KAMMURI moved eastward and crossed longitude 180 degrees east late the next day.



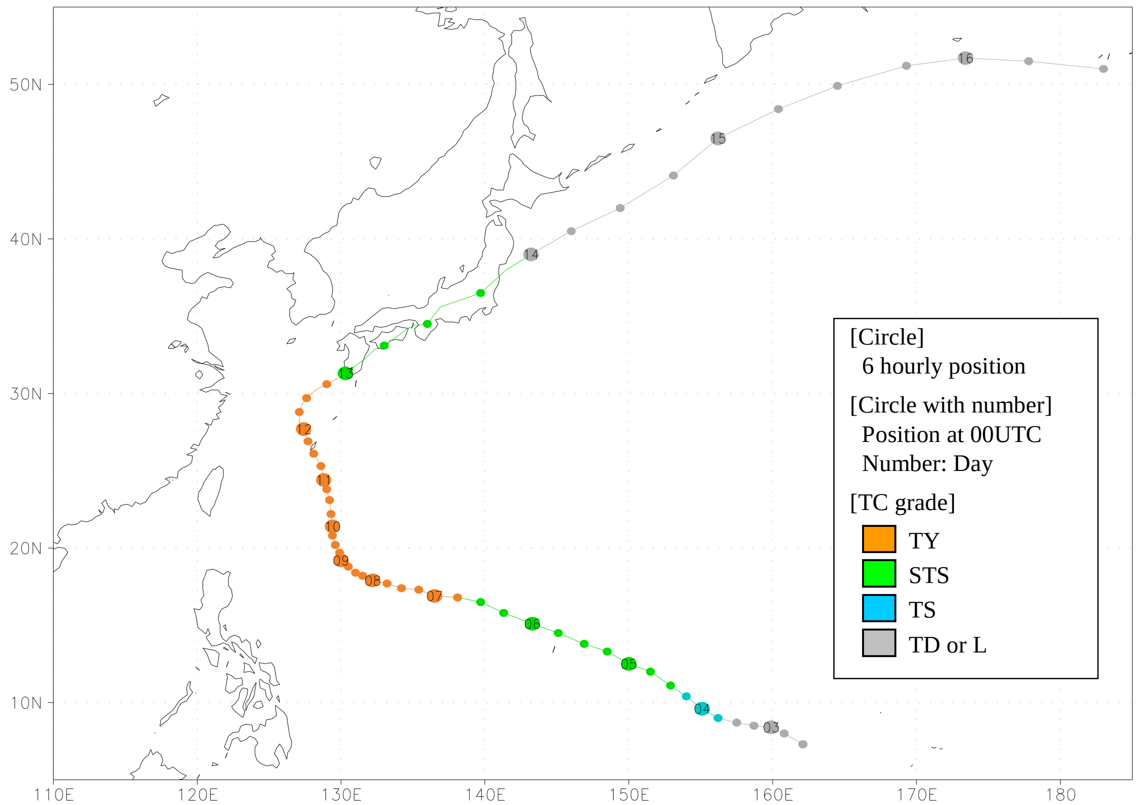
PHANFONE (1418)

PHANFONE formed as a tropical depression (TD) over the sea northwest of the Chuuk Islands at 06 UTC on 28 September 2014 and moved northwestward. It was upgraded to tropical storm (TS) intensity east of Guam Island at 06 UTC the next day. Keeping its northwestward track, PHANFONE was upgraded to typhoon (TY) intensity over the sea west of the Mariana Islands at 06 UTC on 1 October. It reached its peak intensity with maximum sustained winds of 95 kt and a central pressure of 935 hPa east of Okinotorishima Island at 06 UTC the next day. Continuing northwestward east of Minamidaitojima Island on 4 October, PHANFONE turned sharply northeastward and accelerated on 5 October. Keeping its TY intensity, it made landfall on around Hamamatsu City in Shizuoka Prefecture around 23 UTC the same day and made landfall again on around Numazu City in Shizuoka Prefecture around 0030 UTC on 6 October. After crossing the Kanto region, PHANFONE was downgraded to severe tropical storm (STS) intensity east of Japan at 06 UTC the same day. Turning eastward, PHANFONE transformed into an extratropical cyclone over the same waters six hours later. Continuing eastward, it crossed longitude 180 degrees east over the sea south of the Aleutian Islands before 00 UTC on 8 October.



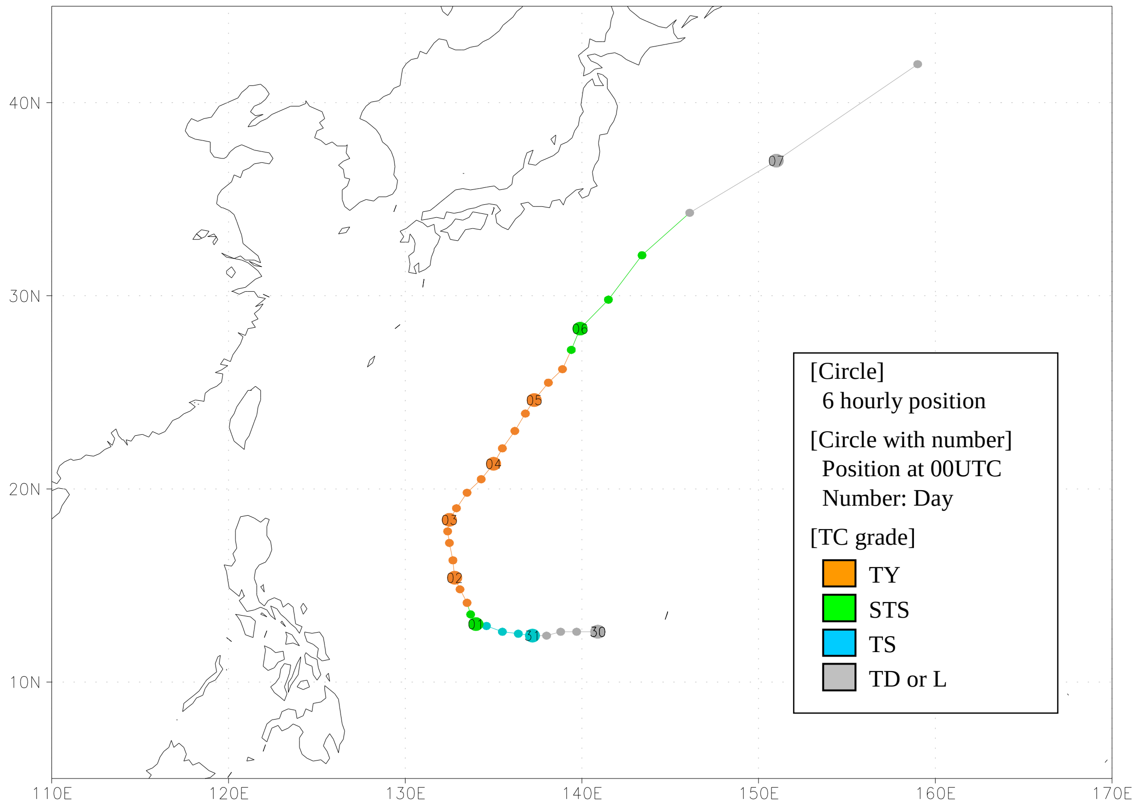
VONGFONG (1419)

VONGFONG formed as a tropical depression (TD) over the sea west of the Marshall Islands at 12 UTC on 2 October 2014. Moving northwestward, it was upgraded to tropical storm (TS) intensity northwest of Pohnpei Island at 18 UTC the next day. Keeping its northwestward track, VONGFONG was upgraded to typhoon (TY) intensity west of the Mariana Islands at 18 UTC on 6 October. It developed rapidly and reached its peak intensity with maximum sustained winds of 115 kt and a central pressure of 900 hPa east of the Philippines 24 hours later. After turning north-northwestward, VONGFONG passed around Okinawa Island with TY intensity around 1530UTC on 11 October. Turning northeastward over the East China Sea, it made landfall on around Makurazaki City, Kagoshima Prefecture around 2330 UTC the next day shortly before being downgraded to severe tropical storm (STS) intensity. VONGFONG made landfall again on around Sukumo City, Kochi Prefecture with STS intensity around 0530 UTC on 13 October. Accelerating northeastward, it passed around Awajishima Island with STS intensity around 1030UTC that day and made landfall again on around Izumisano City, Osaka Prefecture with STS intensity after 11 UTC that day. Keeping its northeastward track, VONGFONG transformed into an extratropical cyclone off the eastern coast of the northern part of Honshu Island 00 UTC on 14 October and crossed longitude 180 degrees east near the Aleutian Islands before 12 UTC on 16 October.



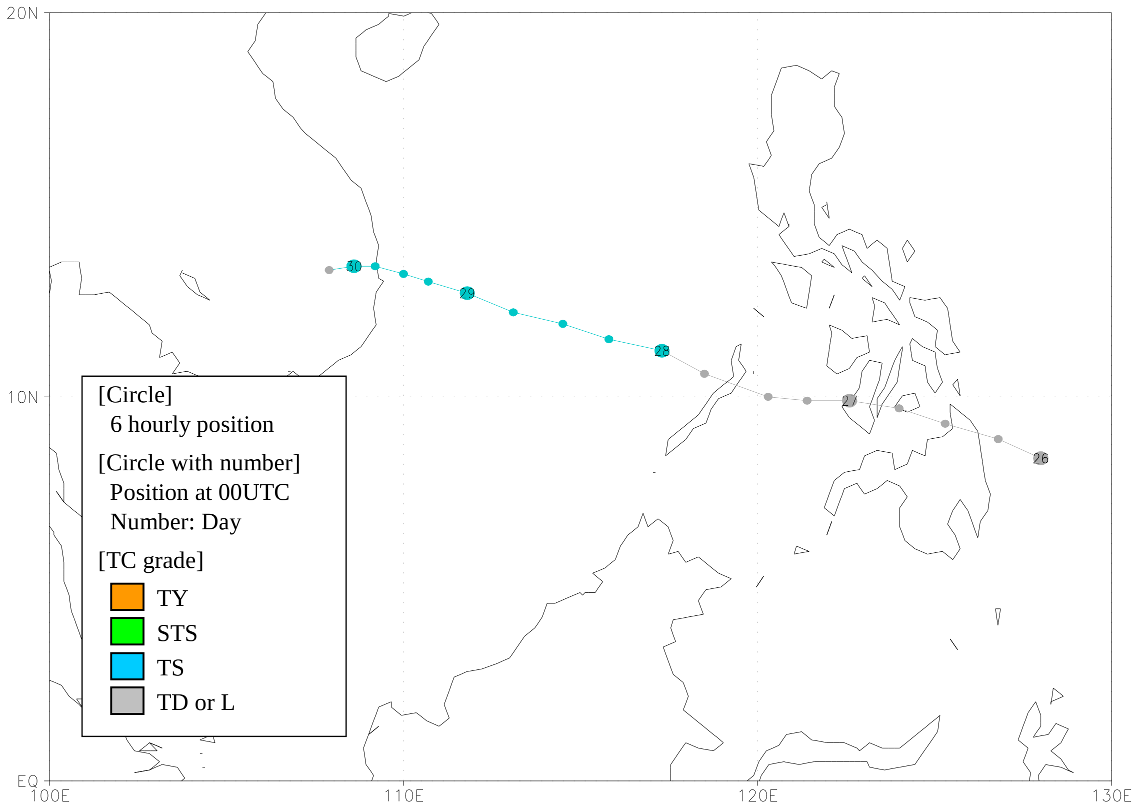
NURI (1420)

NURI formed as a tropical depression (TD) over the sea west of Guam Island at 00 UTC on 30 October 2014 and moved westward. Keeping its westward track, it was upgraded to tropical storm (TS) intensity over the same waters at 00 UTC the next day. Gradually turning north-northwestward, NURI was upgraded to typhoon (TY) intensity over the sea east of the Philippines at 12 UTC on 1 November. Keeping its north-northwestward track, it reached its peak intensity with maximum sustained winds of 110 kt and a central pressure of 910 hPa over the same waters at 12 UTC the next day and then turned northeastward. NURI was downgraded to severe tropical storm (STS) intensity west of the Ogasawara Islands at 18 UTC on 5 November. Accelerating northeastward, it transformed into an extratropical cyclone east of Japan at 18 UTC on 6 November and dissipated southeast of the Chishima Islands at 12 UTC the next day.



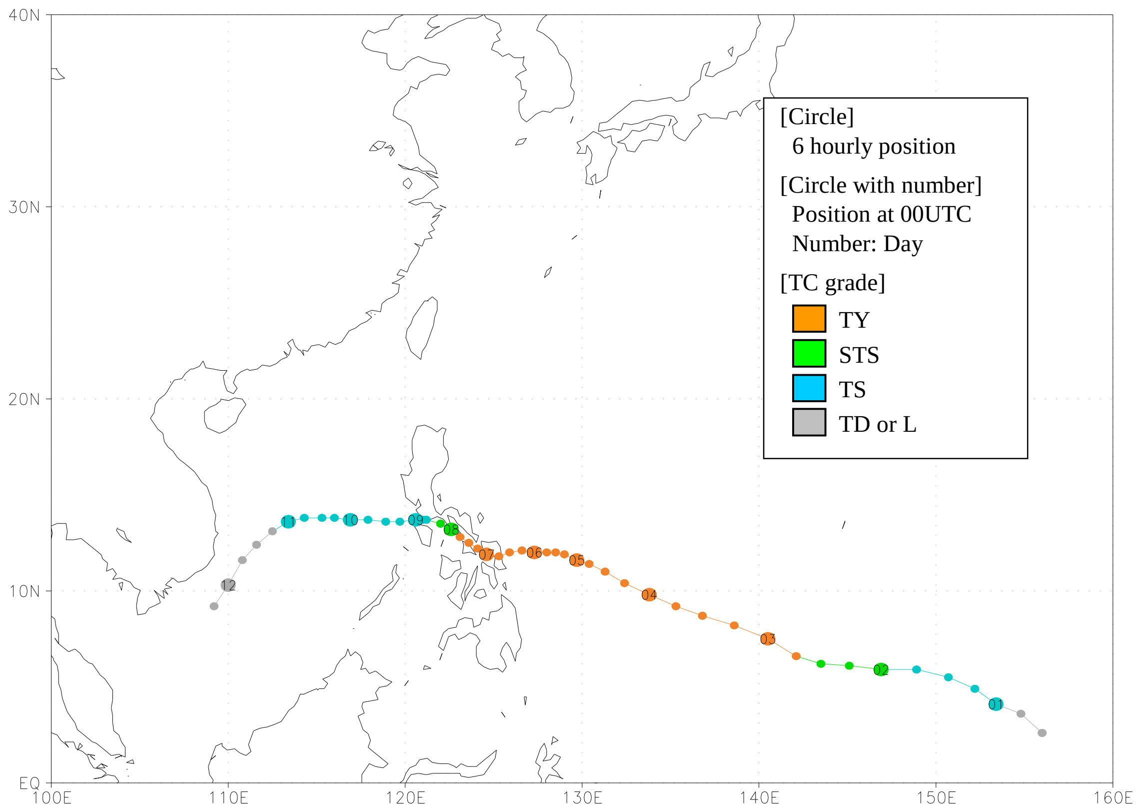
SINLAKU (1421)

SINLAKU formed as a tropical depression (TD) east of Mindanao Island at 00 UTC on 26 November 2014 and moved west-northwestward. After crossing the Philippines, it was upgraded to tropical storm (TS) intensity over the South China Sea at 00 UTC on 28 November. Continuing west-northwestward, SINLAKU reached its peak intensity with maximum sustained winds of 45 kt and a central pressure of 990 hPa over the same waters at 00 UTC the next day. After hitting Viet Nam late on 29 November, it weakened to TD intensity over Viet Nam at 06 UTC the next day and dissipated six hours later.



HAGUPIT (1422)

HAGUPIT formed as a tropical depression (TD) over the sea south of the Chuuk Islands at 12 UTC on 30 November 2014. Moving westward, it was upgraded to tropical storm (TS) intensity over the same waters at 00 UTC the next day. Keeping its westward track, HAGUPIT was upgraded to typhoon (TY) intensity southeast of the Yap Islands at 18 UTC on 2 December. It rapidly developed and reached its peak intensity with maximum sustained winds of 115 kt and a central pressure of 905 hPa east of the Philippines at 06 UTC on 4 December. Moving west-northwestward, HAGUPIT was downgraded to severe tropical storm (STS) intensity at 00 UTC on 8 December while crossing the Philippines. HAGUPIT entered the South China Sea with TS intensity the next day and weakened to TD intensity over the same waters at 06 UTC on 11 December. Turning gradually southwestward, HAGUPIT dissipated southeast of Viet Nam at 12 UTC on 12 December.



JANGMI (1423)

JANGMI formed as a tropical depression (TD) over the sea east of Mindanao Island at 00 UTC on 28 December 2014. Moving northwestward, it was upgraded to tropical storm (TS) intensity over the same waters 12 hours later. Keeping its northwestward track, JANGMI reached its peak intensity with maximum sustained winds of 40 kt and a central pressure of 996 hPa at 18 UTC on 29 December while crossing the Philippines. After turning southwestward, it weakened to TD intensity over the Sulu Sea 18 hours later. Keeping its southwestward track, JANGMI hit the eastern part of Malaysia just before 12 UTC on 1 January 2015 and dissipated over the same area at 18 UTC the same day.