ESCAP/WMO Typhoon Committee
Fifty first Session
26 February – 1 March 2019
Guangzhou
China

FOR PARTICIPANTS ONLY
WRD/TC.51/8.2
22 February 2019
ENGLISH ONLY

REPORT ON AMENDMENTS TO THE TYPHOON COMMITTEE OPERATIONAL MANUAL

(submitted by the Rapporteur)

Summary and Purpose of Document**:**

This document presents draft amendments to the Typhoon Committee Operational Manual - Meteorological Component (TOM) proposed by the RSMC Tokyo – Typhoon Center and the Members.

ACTION REQUIRED:
The Committee is invited to review and approve the proposed amendments to the TOM.

APPENDIXES:
A) DRAFT TEXT FOR INCLUSION AT SESSION REPORT
B) UPDATE OF THE TYPHOON COMMITTEE OPERATIONAL MANUAL

APPENDIX A:

DRAFT TEXT FOR INCLUSION IN THE SESSION REPORT

x.x Review of Typhoon Committee Operational Manual (TOM)

1. The Session noted that the Typhoon Committee Operational Manual (TOM) rapporteur requests WMO to publish and upload the 2019 edition of TOM on the Tropical Cyclone Programme (TCP) Website as submitted by the Rapporteur, with the amendments given in Appendix XX.

2. The Committee expressed its appreciation to the rapporteur for update of TOM.

APPENDIX B:

UPDATE OF THE TYPHOON COMMITTEE OPERATIONAL MANUAL

1. The Typhoon Committee Operational Manual - Meteorological Component (TOM) has been reviewed and updated every year since its first issue in 1987. The 2018 edition was completed and posted on the WMO website in March 2018 in accordance with the approval of amendments to the 2017 edition by the Typhoon Committee 50th session (28 February to 3 March 2018, Hanoi, Viet Nam).

2. At the 50th session, the Committee decided that the rapporteur of the RSMC Tokyo – Typhoon Center in Japan Meteorological Agency (JMA) continues arrangements for updating the TOM. In this connection, on 31 October 2018, the rapporteur, Dr. Hisaki Eito of the RSMC Tokyo - Typhoon Center proposed some revisions to the focal points of the meteorological component of the Members and invited them to provide comments for the revision and proposals for updates.

3. Proposed revisions by the RSMC Tokyo – Typhoon Center are attached in Annex 1. The major points of the revisions are given below:

- Transfer of detailed information on satellite operated by the RSMC Tokyo – Typhoon Center from the text to appendices and revision of the format of satellite specification so that satellites operated by other Members can be added in the future (Section 2.4 to Appendix 2-F)
- Transfer of all figures and tables of detailed information on products provided by the RSMC Tokyo – Typhoon Center from the text to appendices (Section 3.1 to Appendix 3-A)
- Revision and update of the information on forecasts, advisories and products provided by the RSMC Tokyo – Typhoon Center (Section 3.2, 4.3, 5.6, Appendix 4-B, 5-D, 5-E)
- Addition of the information on tropical cyclone forecast competency which was approved at the Typhoon Committee 50th session (Chapter 8, Appendix 8-A)
- Simplification of format of radar specification in order to squeeze the data to the minimum required and facilitate the management (Appendix 2-E)
- Proposal of new format for tropical cyclone analysis and forecast procedures of the Members which was deleted in the 2017 edition (Appendix 3-B)

4. As for the simplification of the format of radar specification, a comment was received from a focal point that detailed information on the specification is necessary. In response to the comment, the rapporteur decided not to carry out the revision. No comments were received for the other proposed revisions by 22 February 2019.

5. Proposals for updates and amendments to the revised TOM were submitted by the seven focal points of China; Hong Kong, China; ICAO; Japan; Macao, China; Malaysia and Thailand as attached in Annex 2. The major points of the amendments are given below:

- Update of the information on the buoy observations (Section 2.2, Appendix 2-C)
- Revision of the description related to meteorological services for international aviation (Section 2.5, 4.5, 5.1, Appendix 1-C)

- Revision and update of the information on analyses, forecasts, advisories and products provided by the RSMC Tokyo – Typhoon Center (Section 3.1, 3.2, Appendix 3-A)
- Update of the information on stations which enable enhanced observations (Appendix 2-A, 2-B)
- Update of the information on the radar stations (Appendix 2-D,E)
- Update of the information on the satellite imagery receiving facilities (Appendix 2-G)
- Update of the information on the radio stations (Appendix 4-C)
- Update of the information on the meteorological telecommunication network (Appendix 5-A, B)
- Update of the contact details (Appendix 5-C)
- Update of the list of collection and distribution of information related to tropical cyclones (Appendix 5-E)
- Update of the table of abbreviated headings in the meteorological messages (Appendix 5-F)
- Revision of the information on distribution of monitoring results for regular monitoring at the RSMC Tokyo – Typhoon Center (Appendix 6-B)

Annex 1

Draft Revisions to
the Typhoon Committee Operational Manual – Meteorological Component (TOM)
proposed by the RSMC Tokyo – Typhoon Center

Page	Line	Proposed Revision	Comments
Section 2.4			
9	49	Satellite imagery data and related products are essential for monitoring and analyzing tropical cyclones. RSMC Tokyo – Typhoon Center, operating Himawari-8/9, has been providing their imagery data and related products to the Asia-Oceania region to support their operations on tropical cyclones. Other Members which also operate satellites are expected to provide those data and/or products to the Members. ~~JMA started the operation of its new geostationary meteorological satellite, Himawari-8, at 02:00 UTC on 7 July 2015, replacing the previous satellite MTSAT-2. The agency also launched Himawari-9, which is identical to the Himawari-8 unit, on 2 November 2016. After a period of in-orbit testing, Himawari-9 began serving as back-up to Himawari-8 on 10 March 2017 and will continue in this role until the planned switchover in or around 2022. This dual combination of new-generation satellites will support JMA's stable provision of continuous satellite observation data for the Asia-Oceania region until 2029.~~ ~~The meteorological satellite information obtained by Himawari-8/9 and related products are operated as follows:~~ ~~full disk data are obtained every 10 minutes with 16 observation bands;~~ ~~target area data are obtained every 2.5 minutes;~~ ~~AMV data are derived hourly;~~ ~~Clear Sky Radiance (CSR) data are derived hourly from the full disk data.~~ Detailed information on the satellites operated by Typhoon Committee Members is given in Appendix 2-F.	Transfer of detailed information on satellite operated by the RSMC Tokyo – Typhoon Center to Appendix 2-F so that satellites operated by other Members can be added in the future

Section 3.1			
12	L18	A list of products provided by the RSMC Tokyo - Typhoon Center is given in Appendix 3-A~~Tables 3.1 to 3.4~~.	Transfer of all figures and tables of detailed information on products provided by the RSMC Tokyo – Typhoon Center to Appendix 3-A
Section 3.2			
19	L28	(ii) 24, 48, 72, 96 and 120-hour forecast intensity and wind distribution;	Update of the information on intensity forecast issued by the RSMC Tokyo - Typhoon Center
19	L37	A list of forecast products of the RSMC Tokyo - Typhoon Center, other than alphanumeric form, is shown in Appendix 3-A~~Tables 3.1 to 3.4~~.	Transfer of all figures and tables of detailed information on products provided by the RSMC Tokyo – Typhoon Center to Appendix 3-A
Section 4.3			
20	L39	(iii) 24, 48, 72, 96 and 120-hour forecasts of intensity and wind distribution;	Update of the information on intensity forecast issued by the RSMC Tokyo - Typhoon Center
Section 5.6			
22	L47	(i) analysis and three-day forecast - WTPQ20 RJTD through WTPQ25 RJTD; (ii) prognostic reasoning - WTPQ30 RJTD through WTPQ35 RJTD; (iii) analysis and five-day ~~track~~ forecast - WTPQ50 RJTD through WTPQ55 RJTD; (iv) numerical prediction by global deterministic model - FXPQ20 RJTD through FXPQ25 RJTD; (v) numerical prediction by global ensemble model - FXPQ30 RJTD through FXPQ35 RJTD.	Update of the information on advisories issued by the RSMC Tokyo - Typhoon Center
Chapter 8			
After 26	L1	CHAPTER 8 CAPACITY DEVELOPMENT 8.1 Tropical Cyclone Forecast Competency in the Typhoon Committee Region Tropical Cyclone Forecast Competency in the Typhoon Committee Region is shown in Appendix 8-A. 8.2 Capacity development activities conducted by RSMC Tokyo - Typhoon	Addition of the information on tropical cyclone forecast competency which was approved at the Typhoon Committee 50th session

		Center The RSMC Tokyo - Typhoon Center should carry out capacity development activities in accordance with the Tropical Cyclone Forecast Competency in the Typhoon Committee Region. 8.3 Capacity development activities conducted by Members Members should establish and maintain capacity development strategy and conduct necessary training activities or give opportunities to participate in activities conducted by other centers, to develop, maintain and enhance capacity of staff members for tropical cyclone analysis, forecast and related activities, in accordance with the Tropical Cyclone Forecast Competency in the Typhoon Committee Region.	
Appendix 2-E			
40		To be changed by format of Annex 1-1 * In response to the comment by a focal point, the rapporteur decided not to revise.	Simplification of format of radar specification in order to squeeze the data to the minimum required and facilitate the management
Appendix 2-F			
65		To be replaced by Annex 1-2	Transfer of detailed information on satellite operated by the RSMC Tokyo – Typhoon Center from Section 2.4 and revision of the format of satellite specification so that satellites operated by other Members can be added in the future
Appendix 3-A			
After 70		To be added by Annex 1-3	Transfer of all figures and tables of detailed information on products provided by the RSMC Tokyo – Typhoon Center from Section 3.1
Appendix 3-B			
After Appendix 3-A		To be added in the future by format of Annex 1-4	Proposal of new format for tropical cyclone analysis and forecast procedures of the Members which was deleted in the 2017 edition
Appendix 4-B			
72		To be replaced by Annex 1-4	Update of the examples of

			advisories issued by the RSMC Tokyo - Typhoon Center
Appendix 5-D			
81		To be replaced by Annex 1-5	Update of the information on abbreviated headings for the tropical cyclone warnings issued by the RSMC Tokyo - Typhoon Center
Appendix 5-E			
82		To be replaced by Annex 1-6	Update of the list of collection and distribution of information related to tropical cyclones issued by the RSMC Tokyo – Typhoon Center
Appendix 8-A			
After 100		To be added by Annex 1-7	Addition of the information on tropical cyclone forecast competency which was approved at the Typhoon Committee 50th session

Annex 1-1

APPENDIX 2-E, p.1

TECHNICAL SPECIFICATIONS OF RADARS OF TYPHOON COMMITTEE MEMBERS

Member	Name of Station	Index Number	Location of Station	Detection range (km)	Operation Mode (When tropical cyclone is within range of detection) 1. Hourly 2. 3-hourly 3. Others	Present Status 1.Operational 2.Not operational (for research etc.)
China	Shanghai	58367	31° 02′ N, 121° 57′ E	600	1	1
	Wenzhou	58659	27° 51′ N, 120° 49′ E	600	1	1

Annex 1-2

APPENDIX 2-F

TECHNICAL SPECIFICATIONS OF SATELLITE OPERATED BY TYPHOON COMMITTEE MEMBERS

1. Himawari-8/9 (RSMC Tokyo – Typhoon Center)

(a) Observations

(i) full-disk observations: every 10 minutes
(ii) target area observations: every 2.5 minutes

(b) Products

(i) full disk data: every 10 minutes
(ii) target area data: every 2.5 minutes;
(iii) AMV data: hourly
(iv) Clear Sky Radiance (CSR) data: hourly

(c) Dissemination ways

(i) HimawariCloud (Internet cloud service)
Service via which distributes full-spec imagery derived from the Himawari-series satellites
(https://www.data.jma.go.jp/mscweb/en/himawari89/cloud_service/cloud_service.html)

(ii) HimawariCast (communication satellite dissemination service)
Service which disseminates primary sets of imagery from the Himawari-series satellites via a communication satellite
(https://www.data.jma.go.jp/mscweb/en/himawari89/himawari_cast/himawari_cast.html)

(iii) Internet Service for National Meteorological and Hydrological Services (NMHSs)
[JMA real-time satellite imagery webpage]
https://www.jma.go.jp/en/gms/

[MSC (Meteorological Satellite Center) real-time satellite imagery webpage]
https://www.data.jma.go.jp/mscweb/data/himawari/

[SATAID (Satellite Animation and Interactive Diagnosis) Service]
https://www.wis-jma.go.jp/cms/sataid/

[JDDS (JMA Data Dissemination Service)]
https://www.data.jma.go.jp/mscweb/en/himawari89/JDDS_service/JDDS_service.html

SCHEDULE OF HIMAWARI OBSERVATIONS AND DISSEMINATIONS

1. Observations

Himawari observations are as follows:

(a) full-disk observations are made every 10 minutes;

(b) target area observations are made every 2.5 minutes in addition to the full-disk observations;

2. HimawariCloud (Internet cloud service)

JMA distributes full-spec imagery derived from the Himawari-series satellites via an Internet cloud service, HimawariCloud. See the following webpage for details.
http://www.data.jma.go.jp/mscweb/en/himawari89/cloud_service/cloud_service.html

3. HimawariCast (communication satellite dissemination service)

JMA operates the HimawariCast service which disseminates primary sets of imagery from the Himawari-series satellites via a communication satellite, See the following webpage for details.
http://www.data.jma.go.jp/mscweb/en/himawari89/himawari_cast/himawari_cast.html

4. Internet Service for National Meteorological and Hydrological Services (NMHSs)

Besides the above services, JMA provides satellite imagery through various methods.

[JMA real-time satellite imagery webpage]
http://www.jma.go.jp/en/gms/

[MSC (Meteorological Satellite Center) real-time satellite imagery webpage]
http://www.data.jma.go.jp/mscweb/data/himawari/

[SATAID (Satellite Animation and Interactive Diagnosis) Service]
http://www.wis-jma.go.jp/cms/sataid/

[JDDS (JMA Data Dissemination Service)]
http://www.data.jma.go.jp/mscweb/en/himawari89/JDDS_service/JDDS_service.html

Annex 1-3

APPENDIX 3-A, p.1

PRODUCTS PROVIDED BY RSMC TOKYO - TYPHOON CENTER

Chart-form products provided by RSMC Tokyo - Typhoon Center for regional purposes

Area	Contents and Level	Forecast hours	Initial time	Availability
A' (Far East)	500hPa (Z, ζ)	Analysis	00, 12UTC	GTS
		24, 36	00, 12UTC	GTS, JMH
	500hPa (T), 700hPa (D)	24, 36	00, 12UTC	GTS, JMH
	700hPa (ω), 850hPa (T, A)	Analysis	00, 12UTC	GTS
		24, 36	00, 12UTC	GTS, JMH
	Surface (P, R, A)	24, 36	00, 12UTC	GTS, JMH
C (East Asia)	300hPa (Z, T, W, A)	Analysis	00UTC	GTS
	500hPa (Z, T, A)	Analysis	00, 12UTC	GTS, JMH
	500hPa (Z, ζ)	48, 72	00, 12UTC	GTS
	700hPa (Z, T, D, A)	Analysis	00, 12UTC	GTS
	700hPa (ω), 850hPa (T, A)	48, 72	12UTC	GTS
	850hPa (Z, T, D, A)	Analysis	00, 12UTC	GTS, JMH
	Surface (P, R)	24, 48, 72	00, 12UTC	GTS, JMH
		96, 120	12UTC	JMH
O (Asia)	500hPa (Z, ζ)	96, 120, 144, 168, 192	12UTC	GTS
	850hPa (T), Surface (P)			
Q (Asia Pacific)	200hPa (Z, T, W), Tropopause (Z)	Analysis	00, 12UTC	GTS
	250hPa (Z, T, W)	Analysis, 24	00, 12UTC	
	500hPa (Z, T, W)	24	00, 12UTC	
D (N.H.)	500hPa (Z, T)	Analysis	12UTC	GTS
W (NW Pacific)	200hPa (streamline)	Analysis, 24, 48	00, 12UTC	GTS
	850hPa (streamline)		00, 12UTC	
C'' (NW Pacific)	Ocean Wave (height, period and direction)	Analysis	00, 12UTC	GTS, JMH
	Ocean Wave (height, period and direction)	12, 24, 48, 72		
	Ocean Wave (height, period, direction and rough sea area)	24		
C	Sea Surface Temperature	Daily analysis	-	JMH
C'2 (Asia Pacific)	Surface (P)	Analysis	00,06,12, 18UTC	GTS, JMH
		24	00, 12UTC	
		48		
	Surface (Typhoon Forecast)	12,24,48,72	00,06,12, 18UTC	
		24,48,72,96, 120		JMH

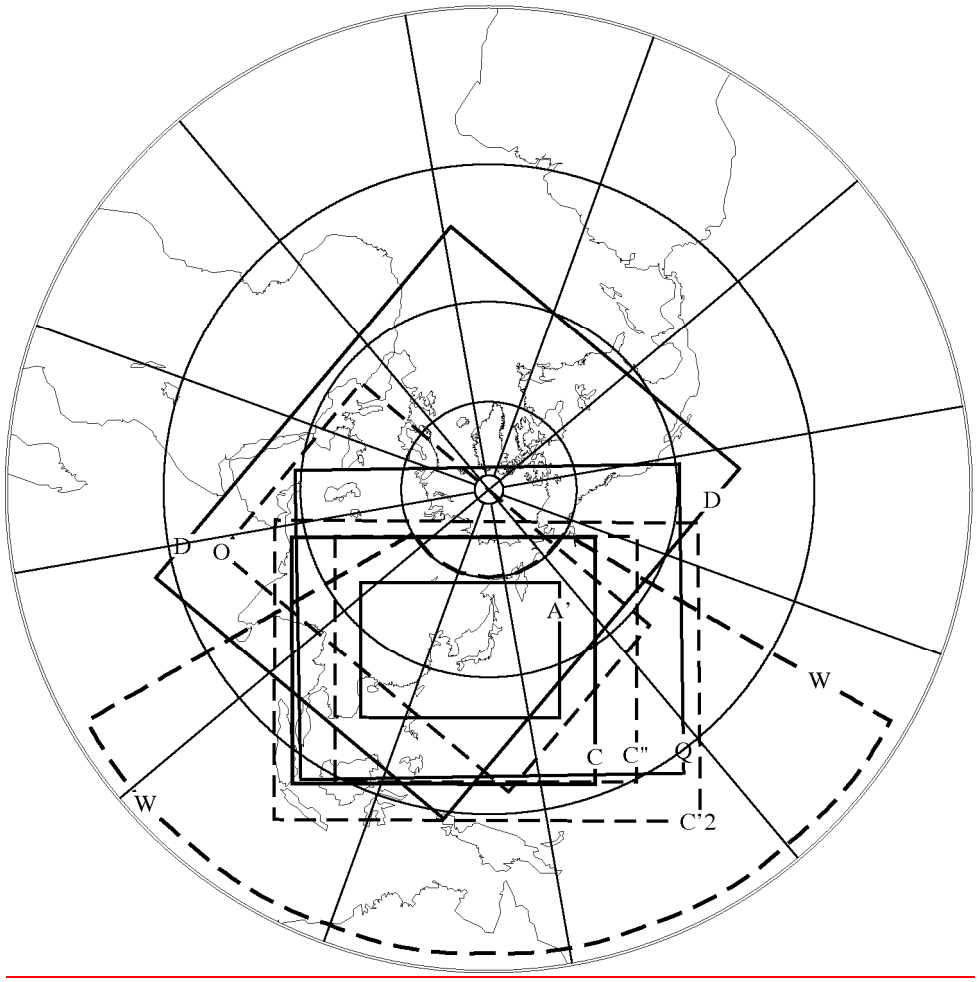
Notes:

(a) Area

A', C, O, Q, D, W,C'' and C'2 are illustrated in Figure 3.1.

(b) Contents

Z: geopotential height	ζ: vorticity	T: temperature
D: dewpoint depression	ω: vertical velocity	W: wind speed by isotach
A: wind arrows	P: sea level pressure	R: rainfall



Output areas for facsimile charts transmitted through GTS and radio facsimile JMH

NWP products (GSM and EPS) provided by RSMC Tokyo - Typhoon Center
(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 for 12UTC initial † 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	Global 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.

List of other products provided by RSMC Tokyo - Typhoon Center
(Available at the Global Information System Center Tokyo server:
http://www.wis-jma.go.jp/cms/)

Data	Contents / frequency (initial time)
Satellite products	High density atmospheric motion vectors (BUFR) Himawari-8 (VIS, IR, WVx3: every hour), 60S-60N, 90E-170W Clear Sky Radiance (CSR) data (BUFR) Himawari-8 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 96-192 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
SATAID service	(a) Satellite imagery (SATAID) Himawari-8 (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/)

List of other products provided by RSMC Tokyo - Typhoon Center
(Available at the Numerical Typhoon Prediction Website:
https://tynwp-web.kishou.go.jp/)

Products	Frequency	Details
Advisories		
Prognostic Reasoning	4 times/day	• RSMC Tokyo Tropical Cyclone Prognostic Reasoning (WTPQ)
RSMC TC Advisory	At least 8 times/day	• RSMC Tokyo – Typhoon Center's TC analysis, track forecast up to 120-hours and intensity forecast up to 72-hours (linked to JMA's website: https://www.jma.go.jp/en/typh/)
Graphical TC Advisory	4 times/day	• Graphical TC Advisory including RSMC Tokyo – Typhoon Center's TC analysis, track and intensity forecast up to 24-hours and horizontal extent of cumulonimbus cloud and cloud top height associated with TCs potentially affecting aviation safety (linked to Tropical Cyclone Advisory Center Tokyo Website: https://www.data.jma.go.jp/fcd/tca/data/index.html)
Operational Remarks		• Advance notice on TC status change from RSMC Tokyo – Typhoon Center
Track Bulletin	4 times/day	• RSMC Tokyo Tropical Cyclone Track Forecast Bulletin - Track forecast by deterministic GSM (FXPQ2X) - Track forecast by GEPS (FXPQ3X)
Observation/Analysis		
TC Analysis	At least 4 times/day	• Results and historical logs of RSMC Tokyo – Typhoon Center's TC analysis conducted using satellite images (Conventional Dvorak analysis and Early-stage Dvorak analysis)
Satellite Microwave Products		• TC snapshot images • Warm-core-based TC intensity estimates • Weighted consensus TC intensity estimates made using Dvorak analysis and satellite microwave warm-core-based intensity estimates
Radar	Every hour	• Radar composite imagery of the Typhoon Committee Regional Radar Network
Weather Maps	4 times/day	• Weather maps for surface analysis, 24- and 48-hour forecast (linked to JMA's website: https://www.jma.go.jp/en/g3/)
Upper-Air Analysis	4 times/day	• Upper-air analysis based on GSM initial field data - Streamlines at 850 and 200 hPa - Vertical wind shear between 200 and 850 hPa - Divergence at 200 hPa - Vorticity at 850 hPa
Ocean Analysis	Once/day	• Sea surface temperature and difference from 24 hours ago • Tropical cyclone heat potential and difference from 24 hours ago
Forecasting/NWP		
TC Track Prediction	4 times/day	• TC track prediction of deterministic NWP models from nine centers (BoM, CMA, CMC, DWD, ECMWF, KMA, NCEP, UKMO and JMA) and a related consensus • TC track prediction of ensemble NWP models from four centers (ECMWF, NCEP, UKMO and JMA)
NWP Weather Maps	Twice/day	• Mean sea level pressure and 500 hPa Geopotential height (up to 72 hours at 00 UTC, up to 168 hours at 12 UTC) of deterministic NWP models from nine centers (BoM, CMA, CMC, DWD, ECMWF, KMA, NCEP, UKMO and JMA)
TC Activity Prediction	Twice/day	• Two- and five-day TC activity prediction maps based on ensemble NWP models from four centers (ECMWF, UKMO, NCEP and JMA) and a related consensus

Storm Surge/Waves		
Storm Surge Forecasts	4 times/day	• Distribution maps of storm surge for RSMC Tokyo – Typhoon Center's TC track forecast and each of five TC track forecasts selected from GEPS ensemble members and maximum storm surge among these six TC track forecasts (up to 72 hours ahead) • Time-series storm surge forecast charts for RSMC Tokyo – Typhoon Center's TC track forecast and each of five TC track forecasts selected from GEPS ensemble members (up to 72 hours ahead)
Wave Height Forecasts	4 times/day	• Distribution maps of ensemble mean wave height, maximum wave height, probability of exceeding various wave heights and ensemble spread based on Wave EPS Model (up to 264 hours ahead) • Time-series charts of ensemble mean wave height with ensemble spread information and probability of exceeding various wave heights based on Wave EPS Model (up to 264 hours ahead)

Annex 1-4

1 Tropical Cyclone Analysis

[Please describe analyzed Tropical Cyclone (TC) parameters and methods used for analysis by filling out the below table.]

Parameter	Time (UTC)	Methods	Other sources
[Please specify analyzed TC parameters (e.g. position, speed, central pressure, maximum sustainable wind)]	*[Please specify analysis time]*	*[Please describe both satellite-based and non satellite-based methods used for analysis of respective parameters (e.g. satellite imagery and radar image for position, Dvorak technique for intensity estimate.).]*	*Although TC analysis including Dvorak technique is still challenging for some Members, analytical results made by other centers, including those by RSMCs, are available via GTS and/or the Internet on a real-time basis. If your Service refers to such products by other centers, please specify them.*

2 Tropical Cyclone Forecasting

[Please describe forecasted Tropical Cyclone (TC) parameters and methods used for forecast by filling out the below table.]

Parameter	Issuance Time (UTC)	Lead Time (hours)	Methods
[Please specify forecast TC parameters (e.g. track, central pressure, maximum sustainable wind, strong wind areas, cyclogenesis).]	*[Please specify issuance time]*	*[Please specify lead time]*	*[Nowadays, operational TC track forecasts are generally based on numerical weather prediction (NWP) guidance. Such NWP guidance products of major numerical centers are available for WMO Members (e.g. JMA provides numerical track guidance of major numerical centers for Western North Pacific to Typhoon Committee Members at JMA's Numerical Typhoon Prediction Website (https://tynwp-web.kishou.go.jp/)). If your Service refers to such numerical track guidance products of other centers, please specify sources and how you use them for your forecasts.* *As for TC Intensity forecasting, t still remains a difficult task, while TC track forecasts have been steadily improved because of advances in NWP guidance. If your Service issues intensity forecasts, please describe how they are produced. If your Service refers to TC intensity forecasts of other centers, please specify them. If you issue any forecasts such as cyclogenesis other than track and intensity, please specify them.]*

3 NWP Models in Operational Use

[Please describe NWP models in operational use at your Service. In the rightmost column, please specify whether your Service runs global/regional models on your own or uses models provided by other centers.]

Model	Domain (square degree)	Resolution (horizontal & vertical)	Initial Time	Forecast Range (hours)	Run by (own/other centers)

Annex 1-5

APPENDIX 4-B, p.1

EXAMPLES OF ADVISORIES ISSUED FROM RSMC TOKYO - TYPHOON CENTER

RSMC Tropical Cyclone Advisory

WTPQ20 RJTD 231200
RSMC TROPICAL CYCLONE ADVISORY
NAME TY 1826 YUTU (1826)
ANALYSIS
PSTN 231200UTC 12.0N 149.6E GOOD
MOVE W 11KT
PRES 965HPA
MXWD 075KT
GUST 105KT
50KT 60NM
30KT 270NM NORTHEAST 210NM SOUTHWEST
FORECAST
24HF 241200UTC 14.4N 146.2E 50NM 70%
MOVE WNW 10KT
PRES 925HPA
MXWD 100KT
GUST 140KT
48HF 251200UTC 16.2N 143.2E 95NM 70%
MOVE WNW 09KT
PRES 915HPA
MXWD 105KT
GUST 150KT
72HF 261200UTC 17.4N 139.8E 130NM 70%
MOVE WNW 09KT
PRES 915HPA
MXWD 105KT
GUST 150KT =
~~WTPQ20 RJTD 271200~~
~~RSMC TROPICAL CYCLONE ADVISORY~~
~~NAME TY 0815 JANGMI (0815)~~
~~ANALYSIS~~
~~PSTN271200UTC 21.3N 124.4E GOOD~~
~~MOVE NW 13KT~~
~~PRES910HPA~~
~~MXWD 115KT~~
~~GUST165KT~~
~~50KT 120NM~~
~~30KT 240NM~~
~~FORECAST~~
~~24HF 281200UTC 24.7N 121.1E 75NM 70%~~
~~MOVE NW 12KT~~
~~PRES950HPA~~
~~MXWD 080KT~~
~~GUST115KT~~
~~48HF 291200UTC 27.3N 121.3E 160NM 70%~~
~~MOVE N 07KT~~
~~PRES980HPA~~
~~MXWD 060KT~~
~~GUST085KT~~
~~72HF 301200UTC 29.3N 124.9E 220NM 70%~~
~~MOVE ENE 09KT~~

~~PRES994HPA~~
~~MXWD 035KT~~
~~GUST050KT =~~

RSMC Guidance for Forecast by Global Model

FXPQ20 RJTD 231200
RSMC GUIDANCE FOR FORECAST
NAME TY 1826 YUTU (1826)
PSTN 231200UTC 12.0N 149.6E
PRES 965HPA
MXWD 75KT
FORECAST BY GLOBAL MODEL
TIME PSTN PRES MXWD
(CHANGE FROM T=0)
T=006 12.8N 149.0E -007HPA +007KT
T=012 13.5N 148.4E -012HPA +015KT
T=018 14.0N 147.5E -016HPA +011KT
T=024 14.5N 146.7E -018HPA +017KT
T=030 15.2N 145.8E -025HPA +023KT
T=036 15.7N 144.9E -025HPA +027KT
T=042 16.2N 144.0E -032HPA +028KT
T=048 16.3N 143.2E -032HPA +031KT
T=054 16.6N 142.4E -037HPA +035KT
T=060 16.7N 141.4E -035HPA +033KT
T=066 16.7N 140.3E -041HPA +033KT

T=072 16.8N 139.0E -039HPA +037KT
T=078 16.9N 137.7E -041HPA +035KT
T=084 16.9N 136.2E -040HPA +033KT
T=090 17.0N 135.0E -045HPA +036KT
T=096 17.0N 133.9E -043HPA +038KT
T=102 17.0N 132.8E -045HPA +038KT
T=108 16.8N 131.8E -047HPA +038KT
T=114 16.6N 130.9E -053HPA +041KT
T=120 16.5N 130.1E -054HPA +042KT
T=126 16.4N 129.2E -055HPA +042KT
T=132 16.4N 128.5E -051HPA +038KT=
~~D20080927152930~~
~~FXPQ20 RJTD 271200~~
~~RSMC GUIDANCE FOR FORECAST~~
~~NAME TY 0815 JANGMI (0815)~~
~~PSTN 271200UTC 21.3N 124.4E~~
~~PRES 910HPA~~
~~MXWD 115KT~~
~~FORECAST BY GLOBAL MODEL~~
~~TIME PSTN PRES MXWD~~
~~(CHANGE FROM T=0)~~
~~T=06 22.0N 124.0E -002HPA +001KT~~
~~T=12 23.0N 123.4E 000HPA +004KT~~
~~T=18 24.5N 122.7E -003HPA +013KT~~
~~T=24 25.0N 121.3E +009HPA -005KT~~
~~:~~

~~T=72 29.5N 125.8E +040HPA -039KT~~
~~T=78 29.5N 127.6E +039HPA -040KT~~
~~T=84 29.7N 129.7E +039HPA -039KT~~
~~T=90 ///// ///// ////// /////=~~

RSMC Guidance for Forecast by Global Ensemble Prediction Model

FXPQ30 RJTD 231200
RSMC GUIDANCE FOR FORECAST
NAME TY 1826 YUTU (1826)
PSTN 231200UTC 12.0N 149.6E
PRES 965HPA
MXWD 75KT
FORECAST BY GLOBAL ENSEMBLE PREDICTION SYSTEM
TIME PSTN PRES MXWD
(CHANGE FROM T=0)
T=006 12.7N 149.1E -002HPA +001KT
T=012 13.2N 148.3E -001HPA +004KT
T=018 13.8N 147.6E -005HPA +004KT
T=024 14.3N 146.7E -005HPA +006KT
T=030 14.9N 145.9E -009HPA +009KT
T=036 15.4N 145.0E -009HPA +010KT
T=042 15.8N 144.2E -013HPA +010KT
T=048 16.1N 143.5E -012HPA +011KT
T=054 16.3N 142.7E -015HPA +012KT
T=060 16.5N 141.9E -014HPA +013KT
T=066 16.7N 141.0E -018HPA +017KT
T=072 16.9N 139.8E -017HPA +018KT
T=078 17.2N 138.6E -020HPA +018KT
T=084 17.4N 137.3E -020HPA +021KT
T=090 17.7N 136.0E -024HPA +021KT
T=096 17.8N 134.9E -023HPA +021KT
T=102 17.9N 133.9E -027HPA +023KT
T=108 17.9N 132.9E -026HPA +026KT
T=114 18.0N 132.1E -031HPA +028KT
T=120 17.9N 131.3E -031HPA +030KT
T=126 17.9N 130.6E -034HPA +030KT
T=132 18.0N 129.9E -033HPA +030KT=

APPENDIX 4-B, p.3

RSMC Prognostic Reasoning

WTPQ30 RJTD 231200
RSMC TROPICAL CYCLONE PROGNOSTIC REASONING
REASONING NO.10 FOR TY 1826 YUTU (1826)
1.GENERAL COMMENTS
TY YUTU IS LOCATED AT 12.0N, 149.6E. INFORMATION ON THE CURRENT POSITION IS BASED ON ANIMATED MSI. POSITIONAL ACCURACY IS GOOD. THE SYSTEM IS IN A FAVORABLE ENVIRONMENT FOR DEVELOPMENT UNDER THE INFLUENCE OF

HIGH SSTS, HIGH TCHP AND WEAK VWS. THIS HAS CAUSED THE SYSTEM TO DEVELOP OVER THE LAST SIX HOURS. HOWEVER, THE INFLUENCE OF DRY AIR IS UNFAVORABLE FOR SYSTEM DEVELOPMENT. INFORMATION ON CURRENT INTENSITY IS BASED ON DVORAK INTENSITY ANALYSES.
2.SYNOPTIC SITUATION
THE SYSTEM IS MOVING WESTWARD ALONG THE SOUTHERN PERIPHERY OF A MID-LEVEL SUB-TROPICAL HIGH. ANIMATED MSI SHOWS THE APPEARANCE OF AN EYE. WATER VAPOR IMAGERY SHOWS DRY AIR IN THE DIRECTION OF THE MOVEMENT. DMSP-F18/SSMIS 89 GHZ MICROWAVE IMAGERY SHOWS THE SYSTEM HAS A BAND WITH CURVATURE INDICATING THE CSC.
3.TRACK FORECAST
THE SYSTEM WILL MOVE NORTHWESTWARD ALONG THE PERIPHERY OF A MID-LEVEL SUB-TROPICAL HIGH UNTIL FT12. THE SYSTEM WILL THEN MOVE WEST-NORTHWESTWARD ALONG THE PERIPHERY OF A MID-LEVEL SUB-TROPICAL HIGH UNTIL FT120. THE JMA TRACK FORECAST IS BASED ON GSM PREDICTIONS, AND REFERENCE TO OTHER NWP MODELS. JMA TRACK FORECAST CONFIDENCE IS FAIR UNTIL FT48 BUT LOW THEREAFTER DUE TO SIGNIFICANT DIFFERENCES AMONG NUMERICAL MODEL OUTPUTS.
4.INTENSITY FORECAST
THE SYSTEM WILL DEVELOP UNTIL FT48 DUE TO THE INFLUENCE OF INTERACTION WITH HIGH SSTS, HIGH TCHP, WEAK VWS AND GOOD UPPER LEVEL OUTFLOW. THE SYSTEM WILL THEN MAINTAIN ITS INTENSITY UNTIL FT72 DUE TO THE INFLUENCE OF INTERACTION WITH HIGH SSTS, HIGH TCHP AND DRY AIR. THE JMA INTENSITY FORECAST IS BASED ON GUIDANCE DATA. =
~~WTPQ30 RJTD 250600~~
~~RSMC TROPICAL CYCLONE PROGNOSTIC REASONING~~
~~REASONING NO. 4 FOR STS 0815 JANGMI (0815)~~
~~1.GENERAL COMMENTS~~
~~REASONING OF PROGNOSIS THIS TIME IS SIMILAR TO PREVIOUS ONE.~~
~~POSITION FORECAST IS MsAINLY BASED ON NWP AND PERSISTENCY.~~
~~2.SYNOPTIC SITUATION~~
~~NOTHING PARTICULAR TO EXPLAIN.~~
~~3.MOTION FORECAST~~
~~POSITION ACCURACY AT 250600 UTC IS FAIR.~~
~~STS WILL DECELERATE FOR THE NEXT 24 HOURS.~~
~~STS WILL MOVE NORTHWEST FOR THE NEXT 48 HOURS THEN MOVE GRADUALLY TO WEST-NORTHWEST.~~
~~4.INTENSITY FORECAST~~
~~STS WILL BE GRADED UP TO TY WITHIN 24 HOURS.~~
~~STS WILL DEVELOP BECAUSE SPIRAL CLOUD BANDS HAVE BECOME WELL ORGANIZED AND CYCLONE WILL STAY IN HIGH SST AR EA.~~
~~FI-NUMBER WILL BE 4.5 AFTER 24 HOURS.=~~

RSMC Tropical Cyclone Advisory for Five-day ~~Track~~ Forecast

WTPQ50 RJTD 231200
RSMC TROPICAL CYCLONE ADVISORY
NAME TY 1826 YUTU (1826)
ANALYSIS
PSTN 231200UTC 12.0N 149.6E GOOD
MOVE W 11KT
PRES 965HPA
MXWD 075KT
GUST 105KT
50KT 60NM
30KT 270NM NORTHEAST 210NM SOUTHWEST
FORECAST
24HF 241200UTC 14.4N 146.2E 50NM 70%

MOVE WNW 10KT
PRES 925HPA
MXWD 100KT
GUST 140KT
48HF 251200UTC 16.2N 143.2E 95NM 70%
MOVE WNW 09KT
PRES 915HPA
MXWD 105KT

GUST 150KT
72HF 261200UTC 17.4N 139.8E 130NM 70%
MOVE WNW 09KT
PRES 915HPA
MXWD 105KT
GUST 150KT
96HF 271200UTC 18.7N 135.6E 240NM 70%
MOVE WNW 11KT
PRES 935HPA
MXWD 95KT
GUST 135KT
120HF 281200UTC 19.6N 132.6E 375NM 70%
MOVE WNW 07KT
PRES 935HPA
MXWD 90KT
GUST 130KT =
~~WTPQ50 RJTD 190000~~
~~RSMC TROPICAL CYCLONE ADVISORY~~
~~NAME TY 0910 VAMCO (0910) UPGRADED FROM STS ANALYSIS~~
~~PSTN 190000UTC 17.3N 157.5E GOOD~~
~~MOVE E SLOWLY~~
~~PRES 970HPA~~
~~MXWD 065KT~~
~~GUST 095KT~~
~~50KT 40NM~~
~~30KT 180NM NORTHEAST 120NM SOUTHWEST~~
~~FORECAST~~
~~24HF 200000UTC 18.0N 156.9E 70NM 70%~~
~~MOVE ALMOST STATIONARY~~
~~PRES 960HPA~~
~~MXWD 075KT~~
~~GUST 105KT~~
~~48HF 210000UTC 18.7N 156.5E 110NM 70%~~
~~MOVE ALMOST STATIONARY~~
~~PRES 950HPA~~
~~MXWD 080KT~~
~~GUST 115KT~~
~~72HF 220000UTC 21.2N 155.9E 160NM 70%~~
~~MOVE N 06KT~~
~~PRES 950HPA~~
~~MXWD 080KT~~
~~GUST 115KT~~
~~96HF 230000UTC 24.5N 154.4E 240NM 70%~~
~~MOVE NNW 09KT~~
~~120HF 240000UTC 29.2N 153.5E 375NM 70%~~
~~MOVE N 12KT =~~

Annex 1-6

APPENDIX 5-D

ABBREAVIATED HEADINGS FOR THE TROPICAL CYCLONE WARNINGS

Member	Abbreviated WMO Communication Headings
Cambodia	
China	WTPQ20 BABJ
Democratic People's Republic of Korea	
Hong Kong, China	WTPQ20 VHHH, WTSS20 VHHH
Japan	WTPQ20 - 25 RJTD, ~~WTPQ21 RJTD, WTPQ22 RJTD, WTPQ23 RJTD, WTPQ24 RJTD, WTPQ25 RJTD~~ WTPQ50 - 55 RJTD
Lao People's Democratic Republic	
Macao, China	For domestic dissemination only and WTMU40 VMMC
Malaysia	For domestic dissemination only
Philippines	WTPH20 RPMM, WTPH21 RPMM
Republic of Korea	WTKO20 RKSL
Singapore	WTSR20 WSSS
Thailand	WTTH20 VTBB
USA	WTPQ31 - 35 PGUM
Viet Nam	WTVS20 VNNN

Annex 1-7

APPENDIX 5-E, p.3

Type of Data	Heading		Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
			*										
Satellite	TPPN10	PGTW			TD	TD			BB	BB	BB	BB	
guidance	TPPN10	PGUA	*		TD	TD			BB	BB	BB	BB	
	TPPA1	RJTY	*	TD	TD	TD	TD		BB	BB	BB	BB	
	TPPA1	RODN	*	TD	TD	TD	TD		BB	BB	BB	BB	
	IUCC10	RJTD	O	TD	TD	TD	TD	TD		BB	BB	BB	
	IUCC01	VHHH	HH	HH	HH	O							
	IUCC02	VHHH	HH	HH	HH	O							
	IUCC03	VHHH	HH	HH	HH	O							
	IUCC04	VHHH	HH	HH	HH	O							
Tropical	FXPQ01	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
Cyclone	FXPQ02	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
Forecast	FXPQ03	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXPQ20	VHHH	HH	HH	BJ	O	TD	TD	BB	BB	BB	BB	HH
	FXPQ21	VHHH	HH	HH		O							
	FXPQ20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ22	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ23	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ24	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ25	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ29	VTBB			O								
	FXPQ30	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ31	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ32	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ33	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ34	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ35	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPH20	RPMM	MM	TD	TD	TD	O	TD	BB	BB	BB	BB	
	FXSS01	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS02	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS03	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS20	VHHH	HH	HH	BJ	O	TD	TD	BB	BB	BB	BB	HH
	FXSS21	VHHH	HH	HH		O							

Type of Data	Heading		Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Warning	WDPN31	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WDPN32	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WHCI28	BCGZ			BJ	BJ			BJ	BB	BB	BB	
	WHCI40	BABJ	BJ	O	BJ	BJ			BJ	BB	BB	BB	
	WSPH	RPMM	*	TD	TD	TD	O	TD	BB	BB	BB	BB	
	WTMU40	VMMC	BJ	MC	BJ	BJ			BB	BB	BB	BB	O
	WTPN21	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPN31	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPN32	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPH20	RPMM	MM	TD	TD	TD	O		BB		BB	BB	
	WTPH21	RPMM			TD		O		BB		BB	BB	
	WTPQ20	VHHH	HH	HH	BJ	O		TD	BB	BB	BB	BB	HH
	WTSS20	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	WTTH20	VTBB	BB	TD	O	TD			BB	BB	BB	BB	
	WTVS20	VNNN			NN	BJ			O	BB	BB	BB	
	WTPQ20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ22	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ23	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ24	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ25	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTKO20	RKSL	SL	TD	TD	TD		O	BB	BB	BB	BB	
Prognostic Reasoning	WTPQ30	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ31	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ32	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ33	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ34	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ35	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
Five-day ~~track~~ forecast	WTPQ50	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ51	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ52	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ53	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ54	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	WTPQ55	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
Others Best track	AXPQ20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	

Annex 1-8

APPENDIX 8-A, p.1

TROPICAL CYCLONE FORECAST COMPETENCY IN THE TYPHOON COMMITTEE REGION

Category 1

This competency unit is relevant to dedicated or specialized TC forecasters working in a TC office at an unsupervised level. It includes:

- analyzing broad-scale environment and determine TC position, intensity and structure;
- forecasting TC track, intensity and structure;
- determining potential TC-related hazards;
- formulating and issuing TC-related warning products;
- communicating relevant TC information to internal and external stakeholders.

Category 2

This competency unit is relevant to general forecasters who provide a range of TC forecast services based on information from the 'parent' RSMC or other agencies, and/or available data. It includes:

- accessing, interpreting, and adapting TC analysis and forecast;
- determining potential TC-related hazards;
- formulating and issuing TC-related warning products;
- communicating relevant TC information to internal and external stakeholders.

Analyze broad-scale environment and determine TC position, intensity and structure (for Category 1)		
Description A range of observational information is analysed to interpret the synoptic scale environment, the position, intensity and structure of the tropical circulation		
Performance criteria		analyzes the synoptic scale environment to assess the likely influence on the disturbance in a range of situations
		determines TC centre location and current movement in accordance with standard operating procedures in a range of situations
		determines TC intensity in accordance with standard operating procedures in a range of situations
		determines TC structure in accordance with standard operating procedures in a range of situations
Back-ground	**Know-ledge**	standard operating procedures for TC analysis
		basic TC climatology and general impacts of ENSO on TC behaviors
		capabilities and limitations of different observational data types
		TC structure dynamics and conceptual models
		synoptic scale factors that affect the tropical cyclone intensity including shear, ocean temperatures, upper-level flow, stability, landfall, vorticity and low to mid-level moisture
		strengths and limitations of intensity analysis methods including Dvorak technique and other ones, such as ADT, CLOUD, AMSU intensity estimation, and SATCON.
	Skills	uses data viewing software and other applications in the forecast process
		interprets observations, weather radar and satellite derived information such as scatterometry and cloud drift winds
		interprets satellite imagery including water vapor, visible, infra-red, and microwave for TC analysis
		uses Dvorak technique for TC centre location and intensity estimation.
		estimates the intensity from a number of inputs
		interprets wind shear from shear analyses and prognoses
		assesses the environment for motion and intensity changes
		interprets NWP guidance material

Forecast TC track, intensity and structure (for Category 1)		
Description A range of information including numerical weather prediction NWP and objective aids in addition to an understanding of conceptual synoptic forecast approaches are used to forecast the track, intensity and structure in warning products that are issued in accordance with documented procedures.		
Performance criteria		interprets NWP-predicted synoptic scale environment to assess the likely influence on the disturbance in a range of situations
		determines TC forecast track in accordance with standard operating procedures in a range of situations
		determines TC forecast intensity in accordance with standard operating procedures in a range of situations
		determines TC forecast structure in accordance with standard operating procedures and timelines in a range of situations
Back-ground	**Know-ledge**	standard operating procedures for TC forecasts
		relative strengths and limitations of NWP in predicting cyclone movement, structure and intensity
		basic concept of rapid intensification/weakening, landfall process, and extra tropical transition
		verification results of official TC forecasts and NWP guidance
		basic theory of TC ensemble forecasts
		synoptic factors that affect TC genesis, motion, intensity, and structure
		track forecasting techniques including consensus and ensemble forecasts
		intensity forecasting methods
	Skills	evaluates model predictions against observed conditions to assess the most likely forecast environment for motion and intensity changes
		evaluates TC genesis potential using observations and NWP guidance including ensembles
		interprets NWP guidance material including ensemble output to determine forecast uncertainty
		uses software systems to determine forecast parameters

Access, interpret, and adapt TC analysis and forecast (for Category 2)		
Description Guidance products from RSMC and other agencies are appropriately interpreted and assessed. Technical information including satellite and other observational information are interpreted taking into consideration the guidance products		
Performance criteria		evaluates and adapt TC analysis and forecast based on information from RSMCs or other TC forecast agencies, and/or available data
		interprets technical forecast guidance in order to assess impact potential upon forecast region of responsibility
		interprets observational and satellite information appropriately
Back-ground	**Know-ledge**	standard operating procedures for TC analysis and forecasts
		capabilities and limitations of different observational data types
		TC structure dynamics and conceptual models
		synoptic scale factors that affect the tropical cyclone intensity including shear, ocean temperatures, upper-level flow, stability, landfall, vorticity and low to mid-level moisture
		relative strengths and limitations of NWP in predicting cyclone movement, structure and intensity
		synoptic factors that affect TC genesis, motion, intensity, and structure
		track forecasting techniques including consensus and ensemble forecasts
		intensity forecasting methods
		strengths and limitations of Dvorak technique, and other intensity analysis guidance, such as ADT, CLOUD, AMSU intensity estimation, and SATCON
	Skills	uses data viewing software and other applications in the forecast process
		interprets observations, weather radar, satellite and satellite derived information at a general level
		assesses the environment for impact on the TC at a general level
		interprets NWP guidance material
		interprets official TC forecast products from official agencies

Determine potential TC-related hazards (for Category 1 &2)		
Description Potential TC-related hazards such as high winds, rainfall, waves and storm surge are determined, taking also into consideration mesoscale weather phenomena, for key locations according to appropriate thresholds and including estimates of uncertainty.		
Performance criteria		forecasts extent of cyclonic winds (e.g. gales, storm force) and onset times for key locations using available guidance in a range of situations.
		forecasts rainfall using available guidance in a range of situations and liaise with relevant organizations to determine potential flooding and landslide.
		forecasts waves in accordance with standard operating procedures.
		forecasts storm tide potential considering various TC forecast scenarios and confidence levels (worst case, most likely, alternate TC forecast scenario).
Back-ground	**Know-ledge**	standard operating procedures for TC-related hazards including wave and storm surge associated with tropical cyclones.
		potential TC-related hazards in a range of synoptic and mesoscale situations
		basic theory of wave and storm surge
	Skills	interprets guidance material of NWP and/or other Centres such as RSMCs.
		assesses rainfall potential using probabilistic rainfall guidance, such as eTRaP and consensus model guidance (OCF, PME).
		determines onset, duration, coverage and associated uncertainties of weather phenomena
		interprets TC storm surge forecast guidance

Formulate and issue TC-related warning products (for Category 1 &2)		
Description Forecast production systems are used to produce and disseminate a range of TC-related waning products according to operating procedures.		
Performance criteria		liaises effectively with internal staff in the development of TC forecast scenarios and impact on other services.
		formulates TC-related warning products, in consideration of potential impacts, in accordance with standard operating procedures in a range of situations.
		determines the appropriate key messages for general and technical audiences in a range of situations.
		issues the range of TC-related warning products in accordance with standard operating procedures and timelines in a range of situations.
Back-ground	**Know-ledge**	standard operating procedures for warning issuance and contingency plans of relevant DRR authorities such as local governments.
		local characteristics of potential impacts of tropical cyclones
		level of threat posed by storm tide
		user needs and significant impact thresholds
		product styles and standards
	Skills	uses appropriate software to determine range of potential impacts and produce warning products
		communicates with colleagues to formulate warning products
		compiles products and key messages for different audiences
		converts technical concepts into concise and easy to understand language

Communicate relevant TC information to internal and external stakeholders (for Category 1 &2)		
Description Forecasters are required to communicate information to internal and external users appropriate to their needs.		
Performance criteria		logically structures briefings and presentations to contain relevant, timely, and understandable information
		delivers briefings, presentations and interviews to suit the intended audience explaining technical information in concise, clear and easy to understand language
		communicate with related internal and external parties, such as DRR emergency managers, RSMCs, other TC forecast centres and weather services in neighboring areas
		responds to requests for information appropriately
Back-ground	**Know-ledge**	principles of effective communication, including presentation and interviews
		presentation and meeting formats and requirements
		legislation, regulations, policies, procedures and guidelines relating to workplace communication in the public sector such as privacy, confidentiality, freedom of information
	Skills	compiles products and key messages for different audiences

		converts technical concepts into concise and easy to understand language
		facilitates and engages in communication exchanges
		uses equipment for presentations

Annex 2

Draft Amendments to
the Typhoon Committee Operational Manual – Meteorological Component (TOM)
proposed by the Members

Page	Line	Proposed Amendment	Comments
Section 2.2			
9	L23	All reports are coded in the BUFR code (FM-94) with drifting buoys Template (TM315009) ~~the BUOY code (FM18)~~, and immediately put onto the GTS.	Update of the information on the code of drifting ocean data buoys by Japan
Section 2.5			
10	L26	States within the ICAO Asia and Pacific Regions exchange r~~R~~eports from aircraft in flight prepared in conformity with ICAO requirements for meteorological reporting (known as air-reports or AIREPs) ~~in the Typhoon Committee Members areas are collected and exchanged~~ in accord~~ing to~~ance with the Regional OPMET Bulletin Exchange (ROBEX) scheme[3].	Revision of the description related to meteorological services for international aviation to go along with ICAO Annex 3 etc.
10	Footnote	[3] The ICAO Asia Pacific Region ROBEX Handbook describes the ROBEX scheme ~~is the method to exchange operational aeronautical meteorological (OPMET) information. The scheme~~, which consists of a number of Regional OPMET Centres (ROCs) ~~ROBEX collecting and disseminating centres (ROBEX centres)~~, R~~r~~egional OPMET D~~d~~ata B~~b~~anks (RODBs), and I~~i~~nter-regional OPMET G~~g~~ateways (IROGs) to deliver to the aviation users the required OPMET information in the form of predefined bulletins.	Revision of the description related to meteorological service for international aviation to go along with ICAO Annex 3 etc.
Section 3.1			
11	L35	Analysis of sea~~-~~ surface temperature combining satellite data and in-situ measurements should be prepared every ~~five~~ day~~s~~.	Update of the information on analysis of sea-surface temperature prepared by the RSMC Tokyo - Typhoon Center
Section 3.2			
12	L19	Furthermore, the RSMC Tokyo - Typhoon Center should prepare a 24-hour ocean wave forecast ~~once~~twice a day for the western North Pacific.	Update of the information on 24-hour ocean wave forecast prepared by the RSMC Tokyo - Typhoon Center
Section 4.4			
14	L6	The pre-assigned forecast areas of Typhoon Committee Members were agreed upon by Regional Associations II and V (Res. 17 (IV-RA II; WMO-181, 1966) and Res.10 (IV-RA V; WMO-187, 1966)).	Addition of detailed information on the resolutions

Section 4.5			
14	L18	Tropical cyclone SIGMET~~Warnings~~ and advisory information~~advisories~~ for international aviation In accordance with the International Civil Aviation Organization (ICAO) Annex 3 - Meteorological Service for International Air Navigation/WMO No. 49 Technical Regulations, ~~—~~Volume II: Meteorological Service for International Air Navigation (WMO-No. 49 Vol. 2), SIGMET is information~~tropical cyclone warnings, required for the international air navigation, are~~ issued by a (designated) meteorological watch office~~s~~ (MWO) ~~as SIGMET messages. SIGMET messages give a concise description in abbreviated plain language~~ concerning the occurrence ~~and/~~or expected occurrence of specified en-route weather and other phenomena in the atmosphere~~,~~ (including tropical cyclone) ~~which~~that may affect the safety of aircraft operations~~,~~ and of the development of those phenomena in time and space. Each designated MWO is required to maintain continuous watch over meteorological conditions affecting flight operations within ~~provides information for~~ one or more designated ~~specified~~ flight information regions (FIRs) and prepare, supply and disseminate SIGMET information (including for tropical cyclone as necessary) relating to its designated area of responsibility~~or upper information regions (UIRs)~~. The ~~boundaries of the FIRs/UIRs are defined in~~ ICAO Asia and Pacific Regions Air Navigation Plan ~~– Asia and Pacific Region~~ (Doc 9673) describes the FIRs in the Asia and Pacific Regions and lists the designated MWOs and the requirements for the issuance of SIGMET information (including for tropical cyclone). ~~The content and order of elements in a~~ SIGMET ~~message~~ information (for tropical cyclone) shall be prepared, formatted and disseminated in accordance with ICAO Annex 3/WMO-No. 49 Vol. 2. The data type designator to be used in the WMO abbreviated heading of such messages shall be T1T2 = WC (WMO-No. 386, Manual on GTS refers).	Revision of the description related to meteorological services for international aviation to go along with ICAO Annex 3 etc.

		In accordance with ICAO Annex 3/WMO-No. 49 Vol. 2 and the ICAO Asia and Pacific Regions Air Navigation Plan, ~~T~~the designated Tropical Cyclone Advisory Centre (TCAC) Tokyo shall: a) monitor the development of tropical cyclones in its area of responsibility~~, as determined in the ICAO Air Navigation Plan - Asia and Pacific Region (Doc 9673) and~~ ; b) issue advisory information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre, in abbreviated plain language to: 1) ~~. The tropical cyclone advisories shall be disseminated to the~~ MWOs ~~by TCAC Tokyo~~ in its area of responsibility~~. In addition, the tropical cyclone advisories shall be disseminated to~~; 2) other TCACs~~,~~ whose areas of responsibility may be affected~~, to the~~; and 3) World Area Forecast Centres (WAFCs) [London and Washington], and international OPMET data-banks; and c) issue updated advisory information to MWOs for each tropical cyclone, as necessary, but at least every six hours. The ~~format of the~~ tropical cyclone ~~advisories~~ advisory information shall be prepared, formatted and disseminated in accordance with the technical specifications and detailed criteria in ICAO Annex 3/WMO-No. 49 Vol. 2. The data type designator to be used in the WMO abbreviated heading of such messages shall be T1T2 = FK (WMO-No. 386, Manual on GTS, refers). ~~TCAC Tokyo shall issue updated advisory information for its area of responsibility, for each tropical cyclone, as necessary, but at least every six hours.~~	
Section 5.1			
15	After L10	*Note: With respect to meteorological service for international air navigation (as described in sections 2.5 and 4.5), the*	Addition of the description related to meteorological services

		telecommunications facilities used for the exchange of operational meteorological information should be the aeronautical fixed service (AFS)[6].	for international aviation to go along with ICAO Annex 3 etc.
15	Footnote	[6] The AFS is comprised of a number of systems and applications that are used for ground-ground (i.e. point-to-point and/or point-to-multipoint) communications in the international aeronautical telecommunication service. In accordance with the ROBEX scheme, the (AFS) systems used to disseminate SIGMET/tropical cyclone advisory information and air-reports include the aeronautical fixed telecommunications network (AFTN) and the air traffic services message handling system (AMHS).	Addition of the description related to meteorological services for international aviation to go along with ICAO Annex 3 etc.
Appendix 1-C			
26		To be replaced by Annex 2-1	Revision of list of acronyms related to meteorological services for international aviation to go along with ICAO Annex 3 etc.
Appendix 2-A			
29		To be replaced by Annex 2-2	Addition of stations which enable enhanced surface observation in Thailand
Appendix 2-B			
31		To be replaced by Annex 2-3	Addition of stations which enable enhanced upper-air observation in Thailand
Appendix 2-C			
32		To be replaced by Annex 2-4	Update of the information on the code of drifting ocean data buoys by Japan
Appendix 2-D			
33		To be replaced by Annex 2-5	Update of the distribution of the radar stations in Malaysia and Thailand
Appendix 2-E			
52		To be replaced by Annex 2-6	Update of the information on radar stations in Malaysia and Thailand
Appendix 2-G			
60		To be replaced by Annex 2-7	Update of the information on satellite imagery receiving facilities at Hong Kong, China; and Singapore
Appendix 3-A			
65		To be replaced by Annex 2-8	Revision and update of the information on

			products provided by the RSMC Tokyo – Typhoon Center
Appendix 4-A			
72		To be replaced by Annex 2-9	Addition of the information on classifications of tropical cyclones in Macao, China
Appendix 4-C			
77		To be replaced by Annex 2-10	Update of the information on the radio stations in Malaysia
Appendix 5-A			
78		To be replaced by Annex 2-11	Deletion of the inter-regional circuit between Bangkok and Offenbach
Appendix 5-B			
79		To be replaced by Annex 2-12	Update of present operational status of the meteorological telecommunication network related to Japan; Macao, China; and Thailand
Appendix 5-C			
81		To be replaced by Annex 2-13	Update of the contact details of China; Macao, China; Malaysia; and Thailand
Appendix 5-E			
86		To be replaced by Annex 2-14	Update of the list of collection and distribution of information related to tropical cyclones by Hong Kong
Appendix 5-F			
90		To be replaced by Annex 2-15	Update of the table of abbreviated headings in the meteorological messages by ICAO; Hong Kong, China; and Japan
Appendix 6-B			
92	L35	The monitoring results should be distributed once a year by RSMC Tokyo - Typhoon Center to Typhoon Committee Secretariat and its Members by the end of March every year. A copy will be forwarded to WMO Secretariat. Members can also retrieve the data from the Internet server of JMA (https://www.wis-jma.go.jp/monitoring/data/monitoring/) by using HTTPS.	Revision of the information on distribution of monitoring results for regular monitoring at the RSMC Tokyo – Typhoon Center

Annex 2-1

APPENDIX 1-C, p.1

LIST OF ACRONYMS USED IN THE OPERATIONAL MANUAL - METEOROLOGICAL COMPONENT –

AFTN	Aeronautical Fixed Telecommunication Network
AIREP	Air~~craft En-route R~~-report
AMeDAS	Automated Meteorological Data Acquisition System
AMV	Atmospheric Motion Vector
APT	Automatic Picture Transmission
ASCAT	Advanced SCATterometer
ASDAR	Aircraft to Satellite Data Relay
BOM	Bureau of Meteorology
BUFR	Binary Universal Form for the Representation of meteorological data
BUOY	Report of a buoy operation
CAPPI	Constant Altitude Plan Position Indicator
CMA	China Meteorological Administration
CMC	Canadian Meteorological Centre
CSR	Clear Sky Radiance
DDN	DataDirect Networks
DWD	Deutscher Wetterdienst
ECMWF	European Centre for Medium-Range Weather Forecasts
EPS	Ensemble Prediction System
ESCAP	Economic and Social Commission for Asia and the Pacific
FAX	Facsimile
FTP	File Transfer Protocol
GEPS	Global EPS
GMS	Geostationary Meteorological Satellite
GNSS	Global Navigation Satellite System
GRIB	General regularly distributed information in binary form
GSM	Global Spectral Model
GTS	Global Telecommunication System
HKO	Hong Kong Observatory
HRPT	High Resolution Picture Transmission
ICAO	International Civil Aviation Organization
IR	Infrared
JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
JCSAT	Japan Communications Satellite
JMA	Japan Meteorological Agency
JTWC	Joint Typhoon Warning Centerr~~e~~
KMA	Korea Meteorological Administration
META~~E~~R	Aerodrome/aviation routine meteorological report
MPLS	Multi-Protocol Label Switching
MSTP	Multiple Spanning Tree Protocol
MTI	Moving Target Indicator
MTSAT	Multi-functional Transport Satellite
MWO	Meteorological Watch Office
NCEP	National Centers for Environmental Prediction
NESDIS	National Environmental Satellite, Data and Information Service
NMC	National Meteorological Centre
NMHS	National Meteorological and Hydrological Service
NMS	National Meteorological Service
NOAA	National Oceanic and Atmospheric Administration

NWP	Numerical Weather Prediction
OPMET	Operational Meteorological information~~Data~~
PILOT	Upper-wind report from a fixed land station
PNG	Portable Network Graphics
PWV	Precipitable Water Vapour
R/A	Radar/raingauge-Analyzed precipitation
RADOB	Report of ground radar weather observations
RO	Radio Occultation
ROBEX	Regional OPMET Bulletin Exchange
RSMC	Regional Specialized Meteorological Centre
RTH	Regional Telecommunication Hub
S.VISSR	Stretched VISSR
SAREP	Report of synoptic interpretation of cloud data obtained by a meteorological satellite
SATAID	SATellite Animation and Interactive Diagnosis
SATEM	Report of satellite remote upper-air soundings of pressure, temperature and humidity
SATOB	Report of satellite observations of wind, surface temperature, cloud, humidity and radiation
SHIP	Report of surface observation from a sea station
SST	Sea Surface Temperature
SYNOP	Report of surface observation from a fixed land station
TAC	Traditional Alphanumeric Code Form
TBB	Temperature Black Body
TC	Typhoon Committee
TCAC	Tropical Cyclone Advisory Centre
TCP	Tropical Cyclone Programme
TCP/IP	Transmission Control Protocol / Internet Protocol
TCS	Typhoon Committee Secretariat
TDCF	Table-Driven Code Form
TEMP	Upper-level pressure, temperature, humidity and wind report from a fixed land station
TOPEX	Typhoon Operational Experiment
TS	Tropical Storm
UKMO	United Kingdom Met Office
UNDP	United Nations Development Programme
UTC	Universal Time Coordinated
VIS	Visible
VISSR	Visible and Infrared Spin Scan Radiometer
VPN	Virtual Private Network
WMO	World Meteorological Organization
WV	Water Vapour

Annex 2-2

APPENDIX 2-A, p.2

Philippines

(98): 132, 133, 135, 222, 232, 233, 324, 325, 328, 329,
330, 333, 336, 425, 427, 428, 429, 430, 431, 432,
434, 435, 437, 440, 444, 446, 447, 526, 531, 536,
538, 543, 546, 548, 550, 555, 558, 618, 630, 637,
642, 644, 646, 648, 653, 741, 746, 747, 748, 751,
752, 753, 755, 836, 851

Republic of Korea

(47): 090, 093, 095, 098, 099, 100, 101, 102, 105, 106,
108, 112, 114, 115, 119, 121, 127, 129, 130, 131,
133, 135, 136, 137, 138, 140, 143, 146, 152, 155,
156, 159, 162, 165, 168, 169, 170, 172, 174, 175,
177, 184, 185, 188, 189, 192 201, 202, 203, 211,
212, 214, 216, 217, 221, 226, 232, 235, 236, 243,
244, 245, 247, 248, 251, 252, 253, 254, 255, 257,
258, 259, 260, 261, 262, 263, 264, 266, 268, 271,
272, 273, 276, 277, 278, 279, 281, 283, 284, 285,
288, 289, 294, 295

Thailand

(48): 300, 302, 303, 304, 307, 310, 315, 324, 325, 327,
328, 329, 330, 331, 333, 334, 350, 351, 352, 353,
354, 355, 356, 357, 358, 360, 372, 373, 374, 375,
376, 377, 378, 379, 380, 381, 382, 383, 384, 385,
386, 387, 390, 400, 401, 402, 403, 404, 405, 407,
408, 409, 410, 413, 415, 416, 417, 418, 419, 420,
421, 425, 426, 427, 429, 430, 431, 432, 433, 434,
435, 436, 437, 438, 439, 440, 450, 451, 453, 455,
456, 458, 459, 460, 461, 462, 464, 465, 474, 475,
477, 478, 479, 480, 481, 500, 501, 517, 520, 532,
550, 551, 552, 554, 555, 556, 557, 560, 561, 563,
564, 565, 566, 567, 568, 569, 570, 571, 574, 580,
581, 583

USA

(91): 203, 212, 258, 317, 324, 334, 339, 348, 353, 356,
366, 367, 369, 371, 376, 378, 408, 413, 425, 434

Viet Nam

(48): 820, 826, 839, 845, 848, 855, 870, 877, 900, 914,
917, 918, 920

Note: Name, latitude, longitude and elevation of these stations are included in Weather Reporting, Volume A - Observing Stations (WMO Publication No. 9).

Annex 2-3

APPENDIX 2-B, p.2

Thailand

(48): 327, ~~354,~~ 378, 381, 407, 431, 453, 480, 500, 551, 565, 568

USA

(91): 212, 334, 348, 366, 376, 408, 413

Viet Nam

(48): 820, 855, 900

Note: Name, latitude, longitude and elevation of these stations are included in Weather Reporting, Volume A - Observing Stations (WMO Publication No. 9).

Annex 2-4

APPENDIX 2-C

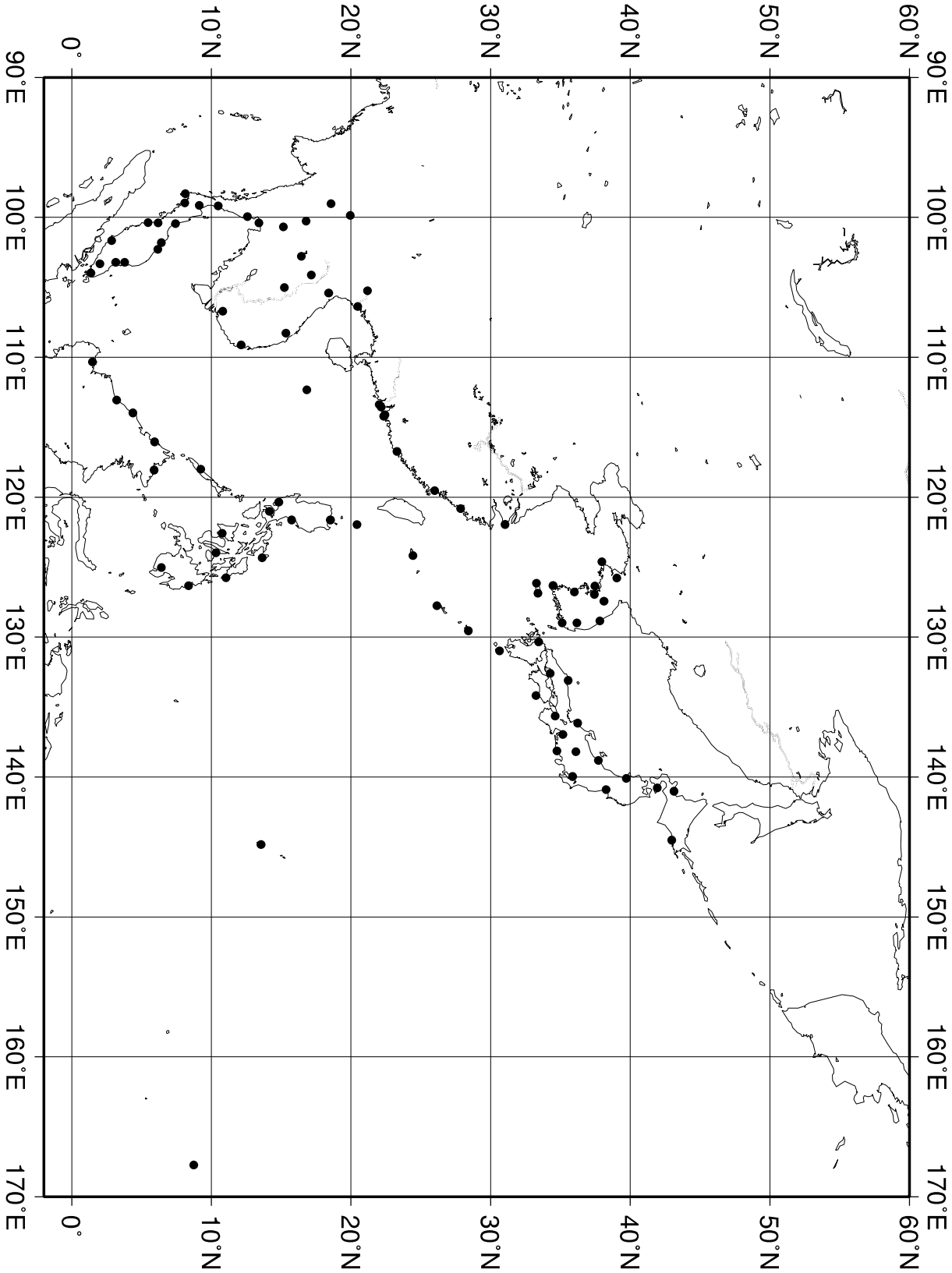
LIST OF BUOY OBSERVATIONS BY TYPHOON COMMITTEE MEMBERS

Member	Area	Observation Elements	Frequency	Heading in the BUFR code (FM 94)
Hong Kong, China	South China Sea	Air pressure and sea surface temperature	Every hour during tropical cyclone seasons	IOBC01 VHHH for buoys operated solely by Hong Kong, China IOBX02 KWBC for buoys operated under the Barometer Upgrade Scheme of the Global Drifter Programme of Data Buoy Cooperation Panel of JCOMM~~.~~
Japan	Western North Pacific	Air pressure, sea surface temperature, significant wave height and period	Every 3 hours (Every hour when waves are higher than thresholds set beforehand)	IOBC11 RJTD~~SSVB01-19 RJTD~~

Annex 2-5

APPENDIX 2-D

DISTRIBUTION OF THE RADAR STATIONS OF TYPHOON COMMITTEE MEMBERS



Annex 2-6
APPENDIX 2-E, p.9

Name of the Member **Malaysia - 1**

NAME OF STATION		Alor Star	Kota Bharu	Kuala Lumpur (Sepang)	Kuala Lumpur (Subang)	Kluang
SPECIFICATIONS						
Index number		48603	48615	48650	48647	48672
Location of station		6° 11´ N 100° 24´ E	6° 10´ N 102° 17´ E	2° 51´ N 101° 40´ E	3° 097´ N 103° 13´ E	2° 01´ N 103° 19´E
Antenna elevation	m	3324	33	1225	11732	1313
Wave length	cm	10	10	10	10	10
Peak power of transmitter	kW	650	650	750	650	650
Pulse length	μ s	0.8 and 2	2	1 and 3	0.8 and 2	0.8 and 2
Sensitivity minimum of receiver	dBm	-110 (.8 μs) -113 (2 μs)	-113	-110 (.8 μs) -115 (3 μs)	-113	-110 (.8 μs) -113 (2 μs)
Beam width (Width of over -3dB antenna gain of maximum)	deg	2	2	1	12	2
Detection range	km	3400	3400	400	3400	3400
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		12	12	12	12	12
DATA PROCESSING						
MTI processing 1.Yes, 2.No		2	2	2	2	2
Doppler processing 1.Yes, 2.No		12	12	1	12	12
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		3 (every 10 mins)	3 (every 10 mins)	3 (every 105 mins)	3 (every 510 mins)	3 (every 10 mins)
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1 (from May 2005)	1 (from 2005)	1 (upgrade in 2016)	1 (upgrade in 2015)	1 (from Apr 2005)

APPENDIX 2-E, p.10

Name of the Member **Malaysia - 2**

NAME OF STATION		Kuantan	Butterworth	Kuching	Bintulu	Miri
SPECIFICATIONS						
Index number		48657	48602	96413	96441	96449
Location of station		3° 47´ N 103° 13´ E	5° 28´ N 100° 23´ E	1° 29´ N 110° 20´ E	3° 13´ N 113° 04´ E	4° 23´ N 113° 59´ E
Antenna elevation	m	532	320	757	1751	120
Wave length	cm	10	10	5	5	10
Peak power of transmitter	kW	650	50650	2250	250	540
Pulse length	μ s	0.8 and 2	0.8 and 2	0.8 and 2	0.8 and 2	0.8 and 2
Sensitivity minimum of receiver	dBm	-113	-113	-113	-113	-113
Beam width (Width of over -3dB antenna gain of maximum)	deg	2	2	21.6	21.6	2
Detection range	km	3400	3400	30250	30250	300
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		12	12	12	12	1
DATA PROCESSING						
MTI processing 1.Yes, 2.No		2	2	2	2	2
Doppler processing 1.Yes, 2.No		12	12	12	12	1
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		3 (every 10 mins)	3 (every 10 mins)	3 (every 10 mins)	3 (every 10 mins)	3 (every 10 mins)
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1 (from 1996)	1 (from 1985)	1 (from 2000)	1 (from 2001)	1 (from 2010)

APPENDIX 2-E, p.11

Name of the Member **Malaysia - 3**

NAME OF STATION		Kota Kinabalu	Sandakan			
SPECIFICATIONS						
Index number		96471	96491			
Location of station		5° 56´ N 116° 03´E	5° 54´ N 118° 04´ E			
Antenna elevation	m	27	28			
Wave length	cm	5	5			
Peak power of transmitter	kW	2150	250			
Pulse length	μ s	0.8 and 2	0.8 and 2			
Sensitivity minimum of receiver	dBm	-113	-113			
Beam width (Width of over -3dB antenna gain of maximum)	deg	21.6	21.6			
Detection range	km	30250	30250			
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2	2			
DATA PROCESSING						
MTI processing 1.Yes, 2.No		2	2			
Doppler processing 1.Yes, 2.No		12	12			
Display 1.Digital, 2.Analog		1	1			
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		3 (every 10 mins)	3 (every 10 mins)			
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1 (from 2000)	1 (from 2001)			

APPENDIX 2-E, p.19

Name of the Member **Thailand - 1**

NAME OF STATION		Chiang Rai	Lamphun	Sakol Nakon	Phitsanulok	Khon Khaen
SPECIFICATIONS	Unit					
Index number		48303	48329	48356	48378	48381
Location of station		19° 575´ N 99° 520´ E	18° 34´ N 99° 02´ E	17° 09´ N 104° 078´ E	16° 476´ N 100° 16´ E	16° 27´ N 102° 47´ E
Antenna elevation	m	440	337	198	56	215
Wave length	cm	5	5	5	5	5
Peak power of transmitter	kW	300	300	300	300	300
Pulse length	μ s	0.8&2	0.8&2	0.8&2	0.8&2	0.8&2
Sensitivity minimum of receiver	dBm	-110	-110	-110	-110	-106
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.0	1.0	1.0	1.0	1.0
Detection range	km	240	240	240	240	240
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		1, 2, 3	1, 2	1, 2, 3	1, 2, 3	1, 2, 3
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		1	1	1	1	1
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1, 3	1, 3	1, 3	1, 3	1, 3
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

APPENDIX 2-E, p.20

Name of the Member **Thailand - 2**

NAME OF STATION		Chainat	Ubo~~l~~n Ratchathani	Samut Songkram	Hua Hin	Chumporn
SPECIFICATIONS	Unit					
Index number		48402	48407	4843802	48475	48517
Location of station		15° 09′ N 100° 41′ E	15° 14′ N 105° 01′ E	13° 24′ N 100° 2401′ E	12° 35′ N 99° 57′ E	10° 29′ N 99° 11′ E
Antenna elevation	m	45	155	29	30	28
Wave length	cm	5	5	5	10	5
Peak power of transmitter	kW	300	300	300	500	300
Pulse length	μ s	0.8&2	0.8&2	0.812	0.8&2	0.8&2
Sensitivity minimum of receiver	dBm	-110	-108	-110	-106	-1105
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.0	1.0	1.0	2.1	1.0
Detection range	km	240	240	240	240	240
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		1, 2	1, 2, 3	1, 2, 3	1, 2, 3	1, 2, 3
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		1	1	1	1	1
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1, 3	1, 3	1, 3	1, 3	1, 3
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

APPENDIX 2-E, p.21

Name of the Member **Thailand - 3**

NAME OF STATION		Surat Thani	Krabi	Phuket	Sathing Pra (Songkla)	Narathiwat
SPECIFICATIONS	Unit					
Index number		48551	48563	48565	48568	48583
Location of station		9° 08′ N 99° 09′ E	8° 06′ N 98° 58′ E	8° 08′ N 989° 19′ E	7° 26′ N 100° 27′ E	6° 25′ N 101° 49′ E
Antenna elevation	m	33	51	281	30	29
Wave length	cm	5	5	5	5	5
Peak power of transmitter	kW	300	300	300	300	300
Pulse length	μ s	0.8&2	0.852	0.852	0.8&2	0.5&1
Sensitivity minimum of receiver	dBm	-110	-106	-106	-115	-110
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.0	1.0	1.0	1.0	1.0
Detection range	km	240	240	240	240	120
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		1, 2, 3	1, 2	1, 2, 3	1, 2, 3	1, 2, 3
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		1	1	1	1	1
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1, 3	1, 3	1, 3	1, 3	1, 3
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

APPENDIX 2-E, p.22

Name of the Member **Thailand - 4**

NAME OF STATION		Trang	Sathing Pra (Songkla)	Narathiwat		
SPECIFICATIONS	Unit					
Index number		48567	48568	48583		
Location of station		7° 31′ N 99° 37′ E	7° 26′ N 100° 27′ E	6° 25′ N 101° 49′ E		
Antenna elevation	m	40	30	29		
Wave length	cm	3	5	5		
Peak power of transmitter	kW	200	300	300		
Pulse length	μ s	0.5&1	0.8&2	0.5&1		
Sensitivity minimum of receiver	dBm	-90	-115	-110		
Beam width (Width of over -3dB antenna gain of maximum)	deg	2	1.0	1.0		
Detection range	km	120	240	120		
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2, 3	2, 3	2, 3		
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1		
Doppler processing 1.Yes, 2.No		1	1	1		
Display 1.Digital, 2.Analog		1	1	1		
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1, 3	1, 3	1, 3		
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1		

Annex 2-7

APPENDIX 2-G, p.1

SATELLITE IMAGERY RECEIVING FACILITIES AT TYPHOON COMMITTEE MEMBERS

Member	Station		Himawari 1. Himawari Cloud 2. Himawari Cast	NOAA 1. HRPT 2. APT	Meteosat 1. P-DUS
Cambodia			1, 2		
China	Beijing Shanghai Shenyan Guangzhou Cheng-chou Cheng-tu Lan-chou Kunming Changsha Nanjing Harbin	(39.9°N, 116.4°E) (31.1°N, 121.4°E) (41.8°N, 123.6°E) (23.1°N, 113.3°E) (34.7°N, 113.7°E) (31.2°N, 114.0°E) (36.1°N, 103.9°E) (25.0°N, 102.7°E) (28.2°N, 113.1°E) (32.0°N, 118.8°E) (45.8°N, 126.8°E)	1	1, 2 2	
Democratic People's Republic of Korea	Pyongyang	(39.0°N, 125.8°E)		1	
Hong Kong, China*	Kowloon	(22.3°N, 114.2°E)	1, 2	1	
Japan	Minamitorishima	(24.3°N, 154.0°E)	2		
Lao People's Democratic Republic			2		
Macao, China*	Macao	(22.2°N, 113.5°E)	1, 2	1	
Malaysia	Petaling Jaya	(3.1°N, 101.7°E)	1, 2	1	
Philippines	Quezon City Cagayan de Oro City Pasay City Cebu	(14.7°N, 121.0°E) (8.5°N, 124.6°E) (14.5°N, 121.0°E) (10.3°N, 124.0°E)	1, 2	1	

*Hong Kong, China receives AQUA (MODIS), SNPP (CrIs, VIIRS, ATMS), FY-2 (S-VISSR), and TERRA (MODIS), METOP-A and METOP-B (AMSU-A, AVHRR, HIRS, MHS).

* Macao, China receives FY-2D, FY-2E (S-VISSR) Stretched VISSR.

Member	Station		Himawari 1. Himawari Cloud 2. Himawari Cast	NOAA 1. HRPT 2. APT	Meteosat 1. P-DUS
Republic of Korea*	Seoul Incheon Int. Airport Munsan Seosan Pusan Pusan Kimhae Air Kwangju Taejon Kangnung Cheju Taegu Taegu/Air Traffic Chonju Chongju Ullung-Do Mokpo Chunchon Masan Tongyong Inchon Huksando Suwon Sokcho Pohang Kunsan Baengnyeong-do	(37.6°N, 127.0°E) (37.3°N, 126.3°E) (37.9°N, 126.8°E) (36.8°N, 126.5°E) (35.1°N, 129.0°E) (35.2°N, 126.9°E) (35.2°N, 126.9°E) (36.4°N, 127.4°E) (37.5°N, 130.9°E) (33.5°N, 126.5°E) (35.9°N, 128.6°E) (35.9°N, 128.7°E) (35.8°N, 127.2°E) (36.6°N, 127.4°E) (37.5°N, 130.9°E) (34.8°N, 126.4°E) (37.9°N, 127.7°E) (35.2°N, 128.6°E) (34.9°N, 128.4°E) (37.5°N, 126.6°E) (34.7°N, 125.5°E) (37.3°N, 127.0°E) (38.3°N, 128.6°E) (36.0°N, 129.4°E) (36.0°N, 126.7°E) (37.9°N, 124.6°E)	1	1 1	 1
Singapore*	Changi Airport	(1.4°N, 104.0°E)	1, 2	1	1
Thailand	Bangkok	(13.7°N, 100.6°E)	1, 2	1	
USA	Guam	(13.4°N, 144.6°E)	1	1	
Viet Nam	Hanoi Ho Chi Ming City	(21.0°N, 105.5°E) (10.5°N, 106.4°E)	1, 2	2 2	

* Republic of Korea receives AQUA (MODIS, AIRS, AMSU, AMSR-E), FY-1 (CHRPT) and TERRA (MODIS).
* Singapore receives AQUA (MODIS), FY2B (S-VISSR), FY-1 (CHRPT) and TERRA (MODIS).

Annex 2-8

APPENDIX 3-A, p.1

PRODUCTS PROVIDED BY RSMC TOKYO - TYPHOON CENTER

Chart-form products provided by RSMC Tokyo - Typhoon Center for regional purposes

Area	Contents and Level	Forecast hours	Initial time	Availability
A' (Far East)	500hPa (Z, ζ)	Analysis	00, 12UTC	GTS
		24, 36	00, 12UTC	GTS, JMH
	500hPa (T), 700hPa (D)	24, 36	00, 12UTC	GTS, JMH
	700hPa (ω), 850hPa (T, A)	Analysis	00, 12UTC	GTS
		24, 36	00, 12UTC	GTS, JMH
	Surface (P, R, A)	24, 36	00, 12UTC	GTS, JMH
C (East Asia)	300hPa (Z, T, W, A)	Analysis	00UTC	GTS
	500hPa (Z, T, A)	Analysis	00, 12UTC	GTS, JMH
	500hPa (Z, ζ)	48, 72	00, 12UTC	GTS
	700hPa (Z, T, D, A)	Analysis	00, 12UTC	GTS
	700hPa (ω), 850hPa (T, A)	48, 72	12UTC	GTS
	850hPa (Z, T, D, A)	Analysis	00, 12UTC	GTS, JMH
	Surface (P, R)	24~~, 48, 72~~	00, 12UTC	GTS~~, JMH~~
		48, 72	00, 12UTC	GTS, JMH
		96, 120	12UTC	GTS, JMH
O (Asia)	500hPa (Z, ζ)	96, 120, 144, 168, 192	12UTC	GTS
	850hPa (T), Surface (P)			
Q (Asia Pacific)	200hPa (Z, T, W), Tropopause (Z)	Analysis	00, 12UTC	GTS
	250hPa (Z, T, W)	Analysis, 24	00, 12UTC	
	500hPa (Z, T, W)	24	00, 12UTC	
D (N.H.)	500hPa (Z, T)	Analysis	12UTC	GTS
W (NW Pacific)	200hPa (streamline)	Analysis, 24, 48	00, 12UTC	GTS
	850hPa (streamline)		00, 12UTC	
X (Japan)	Ocean Wave (J, M, G and observation plots)	Analysis	00, 12UTC	GTS, JMH
	Ocean Wave (J, M, G, rough sea area and observation plots)	24		
C'' (NW Pacific)	Ocean Wave (J, M, G~~height, period and direction~~)	Analysis, 12, 24, 48, 72	00, 12UTC	GTS, JMH
	Ocean Wave (J, M, G~~height, period, direction~~ and rough sea area)	24		
C''2 (NW Pacific)	Sea Surface Temperature	Daily analysis	-	GTS, JMH
C'2 (Asia Pacific)	Surface (P)	Analysis	00,06,12, 18UTC	GTS, JMH
		24	00, 12UTC	
		48		
	Surface (Typhoon Forecast)	12,24,48,72	00,06,12, 18UTC	
		24,48,72,96, 120		JMH

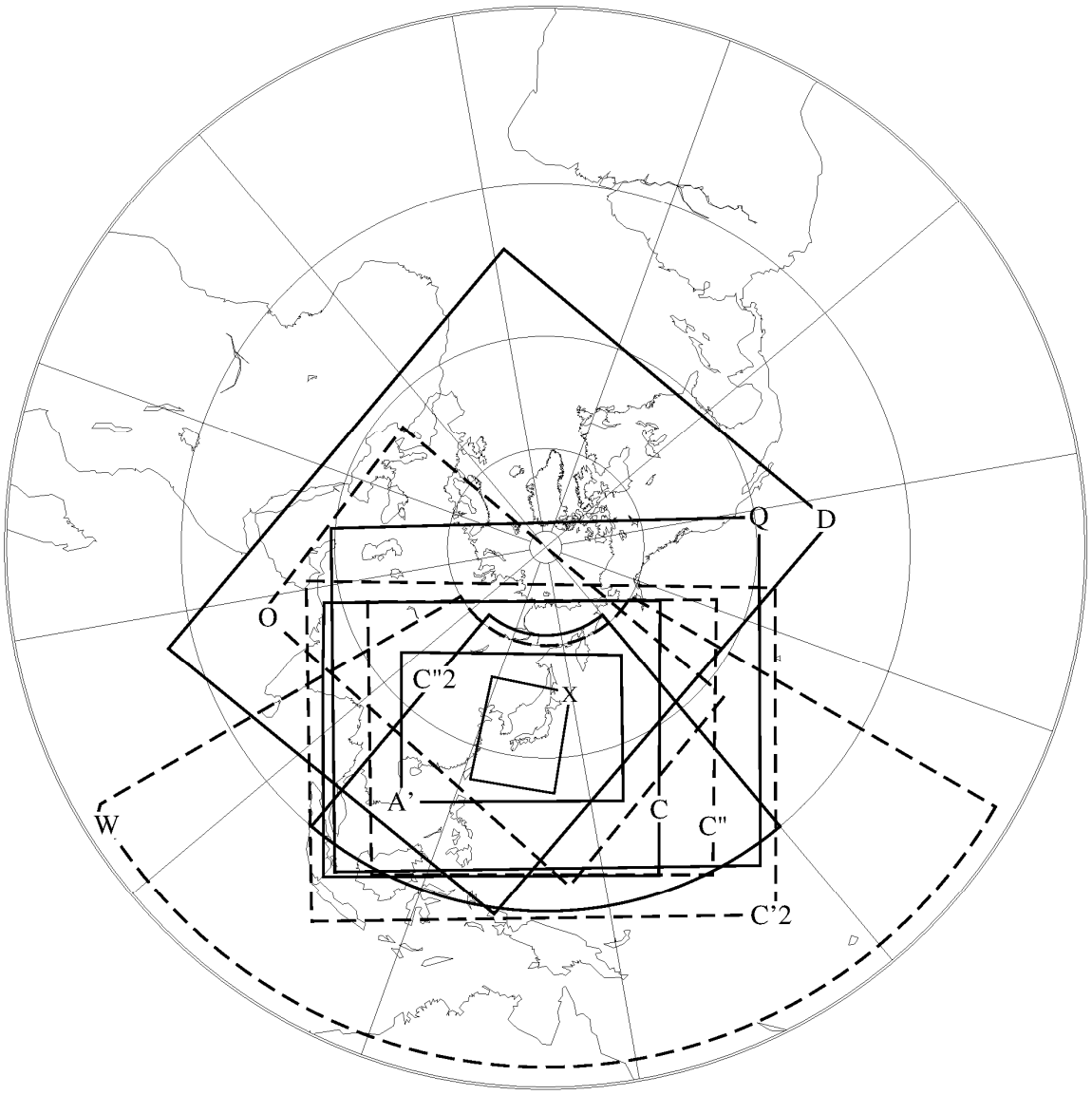
Notes:

(a) Area

A', C, O, Q, D, W, X, C'', C''2 and C'2 are illustrated in ~~F~~figure of the next page~~3-1~~.

(b) Contents

Z: geopotential height	ζ: vorticity	T: temperature
D: dewpoint depression	ω: vertical velocity	W: wind speed by isotach
A: wind arrows	P: sea level pressure	R: rainfall
J: wave height	M: wave period	G: arrow for prevailing wave direction



Output areas for facsimile charts transmitted through GTS and radio facsimile JMH

NWP products (GSM and EPS) provided by RSMC Tokyo - Typhoon Center
(Available at https://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 for 12UTC initial † 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	Global 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.

List of other products provided by RSMC Tokyo - Typhoon Center
(Available at the Global Information System Center Tokyo server:
https://www.wis-jma.go.jp/cms/)

Data	Contents / frequency (initial time)
Satellite products	High density atmospheric motion vectors (BUFR) Himawari-8 (VIS, IR, WVx3: every hour), 60S-60N, 90E-170W Clear Sky Radiance (CSR) data (BUFR) Himawari-8 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 96-192 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
SATAID service	(a) Satellite imagery (SATAID) Himawari-8 (b) Observation data (SATAID) SYNOP, SHIP, METAR, TEMP (A, B) and ASCAT sea- surface wind (c) NWP products (SATAID) GSM (Available at https://www.wis-jma.go.jp/cms/sataid/)

List of other products provided by RSMC Tokyo - Typhoon Center
(Available at the Numerical Typhoon Prediction Website:
https://tynwp-web.kishou.go.jp/)

Products	Frequency	Details
Advisories		
Prognostic Reasoning	4 times/day	• RSMC Tokyo Tropical Cyclone Prognostic Reasoning (WTPQ)
RSMC TC Advisory	At least 8 times/day	• RSMC Tokyo – Typhoon Center's TC analysis, track forecast up to 120-hours and intensity forecast up to 72-hours (linked to JMA's website: https://www.jma.go.jp/en/typh/)
Graphical TC Advisory	4 times/day	• Graphical TC Advisory including RSMC Tokyo – Typhoon Center's TC analysis, track and intensity forecast up to 24-hours and horizontal extent of cumulonimbus cloud and cloud top height associated with TCs potentially affecting aviation safety (linked to Tropical Cyclone Advisory Center Tokyo Website: https://www.data.jma.go.jp/fcd/tca/data/index.html)
Operational Remarks		• Advance notice on TC status change from RSMC Tokyo – Typhoon Center
Track Bulletin	4 times/day	• RSMC Tokyo Tropical Cyclone Track Forecast Bulletin - Track forecast by deterministic GSM (FXPQ2X) - Track forecast by GEPS (FXPQ3X)
Observation/Analysis		
TC Analysis	At least 4 times/day	• Results and historical logs of RSMC Tokyo – Typhoon Center's TC analysis conducted using satellite images (Conventional Dvorak analysis and Early-stage Dvorak analysis)
Satellite Microwave Products		• TC snapshot images • Warm-core-based TC intensity estimates • Weighted consensus TC intensity estimates made using Dvorak analysis and satellite microwave warm-core-based intensity estimates
Radar	Every hour	• Radar composite imagery of the Typhoon Committee Regional Radar Network
Weather Maps	4 times/day	• Weather maps for surface analysis, 24- and 48-hour forecast (linked to JMA's website: https://www.jma.go.jp/en/g3/)
Upper-Air Analysis	4 times/day	• Upper-air analysis based on GSM initial field data - Streamlines at 850 and 200 hPa - Vertical wind shear between 200 and 850 hPa - Divergence at 200 hPa - Vorticity at 850 hPa
Ocean Analysis	Once/day	• Sea surface temperature and difference from 24 hours ago • Tropical cyclone heat potential and difference from 24 hours ago
Forecasting/NWP		
TC Track Prediction	4 times/day	• TC track prediction of deterministic NWP models from nine centers (BoM, CMA, CMC, DWD, ECMWF, KMA, NCEP, UKMO and JMA) and a related consensus • TC track prediction of ensemble NWP models from four centers (ECMWF, NCEP, UKMO and JMA)
NWP Weather Maps	Twice/day	• Mean sea level pressure and 500 hPa Geopotential height (up to 72 hours at 00 UTC, up to 168 hours at 12 UTC) of deterministic NWP models from nine centers (BoM, CMA, CMC, DWD, ECMWF, KMA, NCEP, UKMO and JMA)
TC Activity Prediction	Twice/day	• Two- and five-day TC activity prediction maps based on ensemble NWP models from four centers (ECMWF, UKMO, NCEP and JMA) and a related consensus

Storm Surge/Waves		
Storm Surge Forecasts	4 times/day	• Distribution maps of storm surge for RSMC Tokyo – Typhoon Center's TC track forecast and each of five TC track forecasts selected from GEPS ensemble members and maximum storm surge among these six TC track forecasts (up to 72 hours ahead) • Time-series storm surge forecast charts for RSMC Tokyo – Typhoon Center's TC track forecast and each of five TC track forecasts selected from GEPS ensemble members (up to 72 hours ahead)
Ocean Wave ~~Height~~ Forecasts	Twice~~4 times~~/day	• Distribution maps of ensemble mean ~~wave height~~, maximum ~~wave height~~, probability of exceeding various ~~wave height~~thresholds and ensemble spread of wave height and period based on Wave Ensemble System (WENS)~~EPS Model~~ (up to 264 hours ahead) • Time-series of box-and-whisker ~~chart~~plots of ~~ensemble mean~~ wave height and period,~~with ensemble spread information~~ and probability of exceeding various thresholds of wave height~~s~~ and period based on ~~Wave EPS Model~~WENS (up to 264 hours ahead)

Annex 2-9

APPENDIX 4-A

CLASSIFICATIONS OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC INTERNALLY USED BY MEMBERS

Maximum sustained winds (knots)	≤33	34 - 47	48 - 63	≥ 64		
Typhoon Committee (10 min)	Tropical Depression (TD)	Tropical Storm (TS)	Severe Tropical Storm (STS)	Typhoon (TY)		
China (2 min)	TD	TS	STS	64 - 80 TY	81 - 99 Severe Typhoon (STY)	≥ 100 Super Typhoon (Super TY)
Hong Kong, China (10 min)	TD	TS	STS	64 - 80 TY	81 - 99 Severe Typhoon (ST)	≥ 100 Super Typhoon (Super T)
Japan (10 min)	TD	TS	STS	64 - 84 TY	85 - 104 Very Strong TY	≥ 105 Violent TY
Macao, China (10 min)	TD	TS	STS	64 - 80 TY	81 - 99 Severe Typhoon (ST)	≥ 100 Super Typhoon (Super T)
U.S. (1 min)	TD	TS		64 - 129 TY		≥ 130 Super TY

Annex 2-10

APPENDIX 4-C

STATIONS BROADCASTING CYCLONE WARNINGS FOR SHIPS ON THE HIGH SEAS

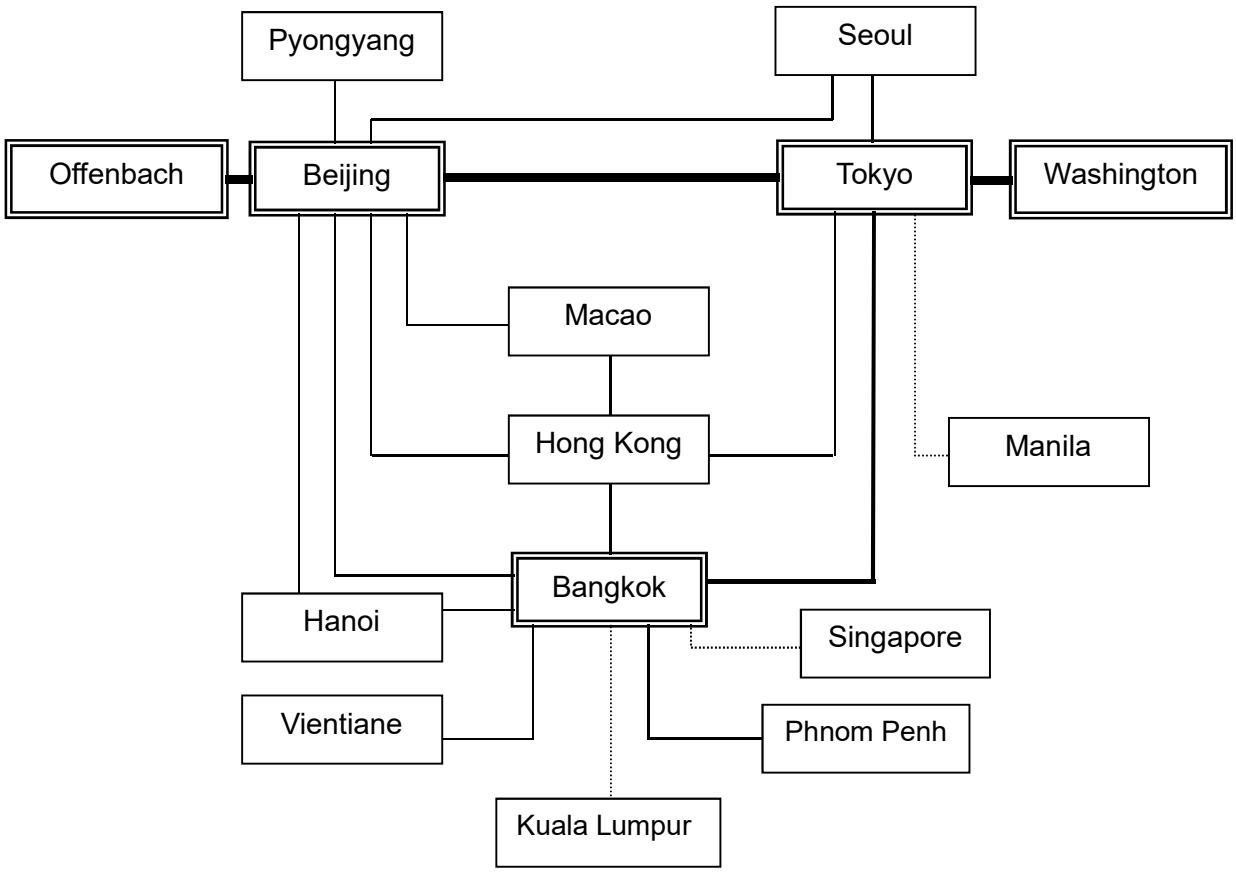
Station		Call sign of coastal radio station	Area covered
Member	Station		
China	Shanghai	XSG	Bohai Sea, Huanghai Sea, Donghai Sea, Shanghai Port, Taiwan Straits and sea around Taiwan province
	Tianjin	XSZ	North and Central Huanghai Sea and Bohai Sea
	Guangzhou	XSQ	Taiwan Straits, Bashi Channel, Nanhai Sea and Beibu Wan Gulf
Hong Kong, China	Hong Kong	Broadcast via NAVTEX on 518 kHz*	Waters inside the boundary line: 30N 105E to 30N 125E to 10N 125E, to 10N 105E, to 30N 105E
Japan	Hokkaido	JNL	Hokkaido area
	Shiogama	JNN	Sendai area
	Yokohama	JGC	Tokyo area
	Nagoya	JNT	Nagoya area
	Kobe	JGD	Kobe area
	Hiroshima	JNE	Hiroshima area
	Niigata	JNV	Niigata area
	Maizuru	JNC	Maizuru area
	Moji	JNR	Fukuoka area
	Kagoshima	JNJ	Kagoshima area
	Okinawa	JNB	Okinawa area
Malaysia	Klang~~Port Penang~~ Labuan Kuching~~Miri~~	SSB 5~~LY 3010~~ SSB 16~~OA 3010~~ SSB 5~~OE 3010~~	Strait of Malacca~~*~~ South China Sea~~*~~ South China Sea~~*~~ ~~*within 300nm from station~~
Philippines	Manila	DZR, DZG, DSP, DZD, DZF, DFH, DZO, DZN, DZS	Pacific waters inside the boundary line: 25N 120E to 25N 135E, to 5N 135E, to 5N 115E, to 15N 115E, to 21N 120E, to 20N 120E
	San Miguel	NPO	North Pacific waters east of 160E; Philippine Sea, Japan Sea, Yellow Sea, East China Sea, South China Sea
Republic of Korea	Seoul	HLL	East Sea, Yellow Sea, Jeju, Chusan, Nagasaki, and Kagoshima areas
Thailand	Bangkok	HSA	Gulf of Thailand, West coast of Southern Thailand, Strait of Malacca and South China Sea
U.S.A.	Honolulu, Hawaii	KMV-99	Pacific Ocean
Viet Nam	Dannang	XVT 1-2	Basco Gulf, Blendong Sea and Gulf of Thailand
	Halphong	XVG 5, 9	*ditto*
	Ho Chi Minh Ville	XVS 1, 3, 8	*ditto*
	Nha Trang	XVN 1, 2	*ditto*

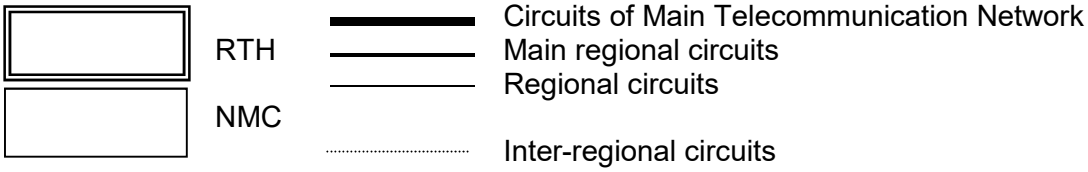
*Coast station VRX closed on 1 October 2006.

Annex 2-11

APPENDIX 5-A

METEOROLOGICAL TELECOMMUNICATION NETWORK FOR THE TYPHOON COMMITTEE





Annex 2-12
APPENDIX 5-B, p.1

PRESENT OPERATIONAL STATUS
OF THE METEOROLOGICAL TELECOMMUNICATION NETWORK
FOR THE TYPHOON COMMITTEE REGION

1. Main Telecommunication Network	Present Operational Status
Beijing - Tokyo	Cable (MPLS), ~~TCP/IP~~WMO FTP Beijing 16 Mbps/Tokyo 10 Mbps
Beijing - Offenbach	Cable (MPLS), TCP/IP Beijing 16 Mbps/Offenbach 50 Mbps
Washington - Tokyo	Cable (MPLS), TCP/IP Washington 50 Mbps/Tokyo 10 Mbps
2. Main regional circuit	
Tokyo - Bangkok	Cable (MPLS), TCP/IP Tokyo ~~2~~6 Mbps/Bangkok 128 kbps
3. Regional circuits	
Bangkok - Beijing	64 kbps leased line CMACast (Satellite broadcast)
Bangkok - Hanoi	64 kbps leased line, FTP protocol
Bangkok – Hong Kong	Internet, FTP protocol
Bangkok - Phnom Penh	Internet (VPN), TCP/IP
Bangkok - Vientiane	Cable (DDN), 64 kbps, FTP protocol and Internet, FTP protocol
Beijing - Hanoi	64 kbps leased line, CMACast (Satellite broadcast)
Beijing - Hong Kong	Cable (MSTP), 4 Mbps TCP/IP CMACast (Satellite broadcast)
Beijing - Macao	20Mbps leased line CMACast (Satellite broadcast)
Beijing - Pyongyang	64 kbps leased line,; CMACast (Satellite broadcast)
Beijing - Seoul	Cable (MPLS), TCP/IP Beijing 16 Mbps/Seoul 4 Mbps
Beijing - Vientiane	CMACast (Satellite broadcast)

Hong Kong - Macao	Internet (VPN) and Mobile leased line
Tokyo - Hong Kong	Cable (MPLS), TCP/IP Tokyo ~~2~~6 Mbps/Hong Kong 1 Mbps
Tokyo - Seoul	Cable (MPLS), ~~TCP/IP~~WMO FTP Tokyo 10 Mbps/Seoul 4 Mbps

4. Inter-regional circuits

Bangkok - Kuala Lumpur	Cable (MPLS), TCP/IP 64 kbps
Bangkok - Singapore	Cable (MPLS), TCP/IP 64 kbps
~~Bangkok - Offenbach~~	~~Internet, FTP protocol~~
Tokyo - Manila	Cable (MPLS), TCP/IP Tokyo ~~2~~6 Mbps/Manila 64 kbps

5. RTH radio broadcast

Bangkok	1 FAX
Tokyo	1 FAX

6. Satellite broadcast

Operated by China: Asiasat-4 (122.2°E)	Operational observations, warnings, NWP products, satellite image and fax distribution
Operated by Japan: HimawariCast (JCSAT-2, 154°E)	Operational satellite image, NWP products, in-situ observation data and ASCAT ocean surface wind data distribution

7. Internet Cloud Service

Operated by Japan: HimawariCloud	Operational satellite image in full resolutions and bands

Annex 2-13

APPENDIX 5-C, p.1

LIST OF ADDRESSES, TELEX/CABLE AND TELEPHONE NUMBERS OF THE TROPICAL CYCLONE WARNING CENTERS IN THE REGION

Centre numbers	Mailing address	Telex/cable, Telephone, fax
Cambodia		
Attn. Mr Ly Chana Deputy Director Department of Agricultural Hydraulics and Hydrometeorology	Norodom Boulevard	Tel.: (+855) 15 913081 Fax: (+855) 23 26345
Attn. Mr Hun Kim Hak Chief of Cambodian National	Pochentong	Tel/Fax:(+855) 23 66193 66192 NMC 66191 Airport
China		
National Meteorological Center ~~5809~~3198 China Meteorological Adm. (Director: ~~Bi Baogui~~Wang Jianjie) ~~2956~~2909	No. 46 Zhongguancun Nandajie, Beijing 100081	Tel.: (+86) (10) 5899 Cable: 2894 Fax: (+86) (10) 6217 E-mail:~~bibg~~wangjj@cma.gov.cn
Democratic People's Republic of Korea		
Mr Ko Sang Bok Director Central Forecast Research Insitute State Hydrometeorological Adm.	Oesong-dong Central District	Telex: 38022 TCT KP Tel.: (+850) (2) 321 4539 Fax: (+850) (2) 381 4410
Hong Kong, China		
Central Forecasting Office Hong Kong Observatory (Attn. Mr. L.S. Lee)	134A Nathan Road Tsim Sha Tsui Kowloon Hong Kong, China	Tel.: (+852) 2926 8371 (Office hours) (+852) 2368 1944 (24 hours) Fax: (+852) 2311 9448 (24 hours) E-mail: lslee@hko.gov.hk
Japan		
Forecast Division Forecast Department Japan Meteorological Agency (Director: Y. Kajihara)	1-3-4 Otemachi Chiyoda-ku Tokyo 100-8122	Telex: 2228080 METTOKJ (24 hours) Tel.: (+81) (3)3211 8303 (00 - 09 UTC on weekdays) (+81) (3) 3211 7617 (24 hours)

Lao People's Democratic Republic

Ministry of Agriculture and Forestry, Department of VIENTIANE Meteorology and Hydrology	P.O. Box 811 Vientiane	Telex: 4306 ONU VTELS Cable: UNDEVPRO

Macao, China

Meteorological and Geophysical Bureau (Acting Director: ~~Tam Vai Man~~Tang Iu Man)	P.O. Box 93 Macao, China meteo@smg.gov.mo	Tel.: (+853) 88986173 Fax: (+853) 28850773 E-mail:

Malaysia

Malaysian Meteorological ~~Dep.~~ Department (National Weather~~Central Forecast Office,~~ & Geophysics Operation Centre) (Director: ~~Mr. Saw Bun Liong~~Dr. Mohd. Hisham)	Jalan Sultan (+60) (3) 7967 8119 Selangor Malaysia	Tel.: (+60) (3) 7967 8118~~6~~ 46667 Petaling Jaya Fax: (+60) (3) 7955 0964 E-mail: hisham~~cfo~~@met.gov.my

Philippines

Esperanza O. Cayanan Ph.D. Weather Services Chief Weather Division, PAGASA	WFFC Bldg., BIR Road, Diliman, Quezon City 1100	Telex: 66682 WXMLA PN Tel.: (+63) (2) 922 1996 Cable: 66682 WX MLA Fax: (+63) (2) 922 5287 (24 hours)

T C S

Secretary: Yu Jixin	Avenida de 5 de Outubro Coloane, Macau	Tel: (853) 8 8010531 Fax: (853) 8 8010530 E-mail: yujx@typhooncommittee.org

Republic of Korea

National Typhoon Center Korea Meteorological Administration (Director: Deok Hwan JEONG) 2 Seoseongro 810-gil, Namwon-eup, Seogwipo, Jeju, 63614, Republic of Korea		Tel.: (+82) (70) 7850-6351 Fax: (+82) (64) 805-0368

Thailand

Thai Meteorological Department (Director-General: Dr. Phuwieng Prakhammintara~~Mr. Wanchai Sakudomchai~~)	4353 Sukhumvit Road Bangna, Bangkok 10260	Tel.: (+66) (2) 39866 98756325 Fax: (+66) (2) 3989 98754020 E-mail: tmd_inter@tmd.go.th
Weather Forecast Division~~Bureau~~ Thai Meteorological Department (Director: Dr. Sugunyanee Yavinchan)	4353 Sukhumvit Road Bangna, Bangkok 10260	Tel&Fax: (+66) (2) 399 4001 E-mail: sugunyanee@hotmail.com
Telecommunications Division~~and Information~~ Thai Meteorological Department~~Technology Bureau~~ (~~Acting~~ Director: Mr. Sumreang Monkong~~Wirat Woranut~~)	4353 Sukhumvit Road Bangna, Bangkok 10260	Tel.: (+66) (2) 399 4555 Fax: (+66) (2) 398 9861 E-mail: tmd_inter@tmd.go.th

USA

National Weather Service (Genevieve Miller, Meteorologist in charge)	3232 Hueneme Road Barrigada Guam 96913	Tel.: (+1-671) 472 0944 Fax: (+1-671) 472 7405
RSMC Honolulu (Director: Raymond Tanabe)	2525 Correa Road Suite 250 Honolulu, HI 96822	Tel.: (+1-808) 973-5272 Fax: (+1-808) 973-5271

Viet Nam

Forecast Division Forecast Department Hydro-Meteorological Service (Director: Nguyan Cong Thanh)	4 Dan Thai Than Hanoi	Tel.: (+84) (4) 264020 Fax: (+84) (4) 254278

Annex 2-14

APPENDIX 5-E, p.2

Type of Data	Heading		Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Enhanced	UKTH01	VTBB	BB	TD	O	TD		TD	BB	BB	BB	BB	
Upper-air	ULTH01	VTBB	BB	TD	O	TD		TD	BB	BB	BB	BB	
observation	UETH01	VTBB	BB	TD	O	TD		TD	BB	BB	BB	BB	
	USVS01	VNNN	BB	TD	NN	TD	TD	TD	O	BB	BB	BB	
	UKVS01	VNNN	BB	TD	NN	TD		TD	O	BB	BB	BB	
	ULVS01	VNNN	BB	TD	NN	TD	TD	TD	O	BB	BB	BB	
	UEVS01	VNNN	BB	TD	NN	TD	TD	TD	O	BB	BB	BB	
	URPA10	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	URPA11	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	URPA12	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	URPA14	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	URPN10	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	UZPA13	PGTW	*	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	UZPN13	KNHC	*		TD	TD		TD	BB	BB	BB	BB	
	UZPN13	KWBC	*	TD	TD	TD		TD	BB	BB	BB	BB	
	UZPN13	PGTW	*	TD	TD	TD		TD	BB	BB	BB	BB	
	IUDC01	VHHH	HH	HH	HH	O							
	IUDC02	VHHH	HH	HH	HH	O							
	IUDC03	VHHH	HH	HH	HH	O							
	IUDC04	VHHH	HH	HH	HH	O							
	IUDC05	VHHH	HH	HH	HH	O							
	IUDC06	VHHH	HH	HH	HH	O							
	IUDC07	VHHH	HH	HH	HH	O							
	IUDC08	VHHH	HH	HH	HH	O							
	IUDC09	VHHH	HH	HH	HH	O							
	IUDC10	VHHH	HH	HH	HH	O							
Enhanced	SNVB20	VTBB			O				BB	BB	BB	BB	
ship	SNVB20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
observation	SNVD20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVE20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVX20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVB21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVD21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVE21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVX21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	SNVX20	RPMM	MM	TD	TD	TD	O	TD	BB		BB	BB	
	SNVX20	VHHH	HH	HH	BJ	O	TD	TD	BB	BB	BB	BB	HH
	SNVX20	VNNN	BB	TD	NN	TD		TD	O	BB	BB	BB	
Enhanced	SBCI30	BABJ	BJ	O	BJ	TD	TD	TD	BJ	BB	BB	BB	
radar	SCCI30	BABJ		O	BJ	BJ			BB	BB	BB	BB	
observation	SBCI60	BCGZ		O	BJ				BJ	BB	BB	BB	
Continued to the next page	SCCI60	BCGZ	HH	O	BJ				BB	BB	BB	BB	
	SBHK20	VHHH	HH	HH	BJ	O	TD		BB	BB	BB	BB	HH

Type of Data	Heading		Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Enhanced	ISBC01	VHHH	HH	HH	HH	O	TD	TD		BB	BB	BB	
radar	ISBC01	RJTD	O	TD	TD	TD	TD	TD		BB	BB	BB	
observation	SDKO20	RKSL						O					
	SDMS20	WMKK	BB	TD	KK	TD			BB	O	BB	BB	
	SDPH20	RPMM	MM	TD	TD			TD	BB		BB	BB	
	SDTH20	VTBB	BB	TD	O	TD			BB	BB	BB	BB	
	SDVS20	VNNN	BB	TD	NN	TD	TD		O	BB	BB	BB	
			*										
Satellite	TPPN10	PGTW			TD	TD			BB	BB	BB	BB	
guidance	TPPN10	PGUA	*		TD	TD			BB	BB	BB	BB	
	TPPA1	RJTY	*	TD	TD	TD	TD		BB	BB	BB	BB	
	TPPA1	RODN	*	TD	TD	TD	TD		BB	BB	BB	BB	
	IUCC10	RJTD	O	TD	TD	TD	TD	TD		BB	BB	BB	
	IUCC01	VHHH	HH	HH	HH	O							
	IUCC02	VHHH	HH	HH	HH	O							
	IUCC03	VHHH	HH	HH	HH	O							
	IUCC04	VHHH	HH	HH	HH	O							
Tropical	FXPQ01	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
Cyclone	FXPQ02	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
Forecast	FXPQ03	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXPQ20	VHHH	HH	HH	BJ	O	TD	TD	BB	BB	BB	BB	HH
	FXPQ21	VHHH	HH	HH		O							
	FXPQ20	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ21	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ22	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ23	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ24	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ25	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ29	VTBB			O								
	FXPQ30	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ31	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ32	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ33	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ34	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPQ35	RJTD	O	TD	TD	TD	TD	TD	BB	BB	BB	BB	
	FXPH20	RPMM	MM	TD	TD	TD	O	TD	BB	BB	BB	BB	
	FXSS01	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS02	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS03	VHHH	HH	HH	BJ	O			BB	BB	BB	BB	HH
	FXSS20	VHHH	HH	HH	BJ	O	TD	TD	BB	BB	BB	BB	HH
	FXSS21	VHHH	HH	HH		O							

Annex 2-15

APPENDIX 5-F

TABLE of Abbreviated headings (TTAAii CCCC)

TT	Data designator
FK	Tropical cyclone advisories
FX	Miscellaneous forecasts
SB	Radar reports PART A
SC	Radar reports PART B
SD	Radar reports (PART A and PART B)
SN	Synoptic reports (non-standard hours)
TP	Satellite guidance
UA	Aircraft reports (AIREP)
UE	Upper-level observation, PART D
UK	Upper-level observation, PART B
UL	Upper-level observation, PART C
US	Upper-level observation, PART A
WD	Prognostic reasoning for typhoon
WH	Marine/Coastal flood warnings
WO	Other warnings
WC	Tropical cyclone (SIGMET)
WT	Tropical cyclone warnings
WW	Warning and weather summary

TABLE of Abbreviated Headings
(TTAAii CCCC) for BUFR

TTAAii CCCC	Data type
ISBC01 RJTD	Radar reports
ISBC01 VHHH	Radar reports
IUCC01-04 VHHH	SAREP reports
IUCC10 RJTD	SAREP reports
IUDC01-10 VHHH	Dropsonde reports

AA	Geographic designator
CI	China
HK	Hong Kong, China
JP	Japan
KO	Republic of Korea
KP	Cambodia
LA	Lao People's Democratic Republic
MS	Malaysia
MU	Macao, China
PA	Pacific area
PH	Philippines
PN	North Pacific area
PQ	Western North Pacific
PW	Western Pacific area
SS	South China Sea area
TH	Thailand
VS	Viet Nam

CCCC	Location indicator
BABJ	Beijing
BCGZ	Guangzhou
KWBC	Washington
PGFWA	Guam (Fleet- Weather- Central)
PGTW	Guam (JTWC)
PGUM	Guam (Agana)
RJTD	Tokyo
RJTY	Yokota
RKSL	Seoul
RKSO	Osan
RODN	Okinawa / Kadena AB
RPMK	Clark AB
RPMM	Manila / Intl.
VDPP	Phnom Penh
VHHH	Hong Kong
VLIV	Vientiane
VMMC	Macao
VNNN	Hanoi
VTBB	Bangkok
WMKK	Kuala Lumpur