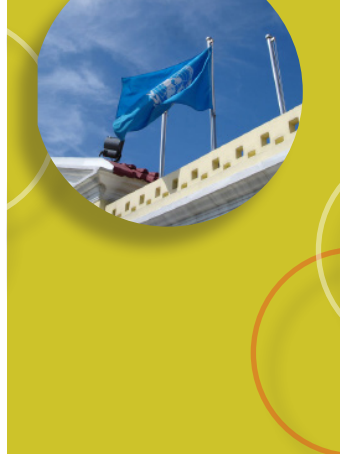


53rd TC
Session



New
Directors



MEMBERS
Activities



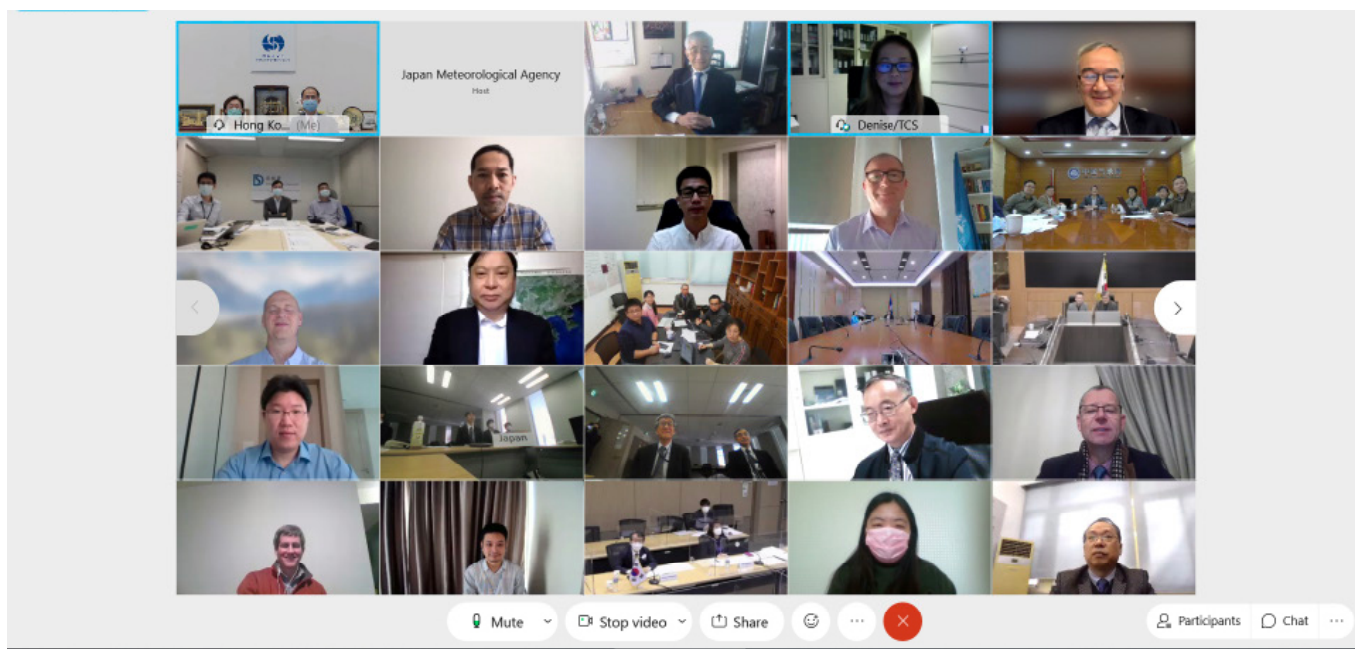
ESCAP/WMO
Typhoon Committee



Issue 42 • Year 2021
Typhoon Committee
Secretariat
Macao, China

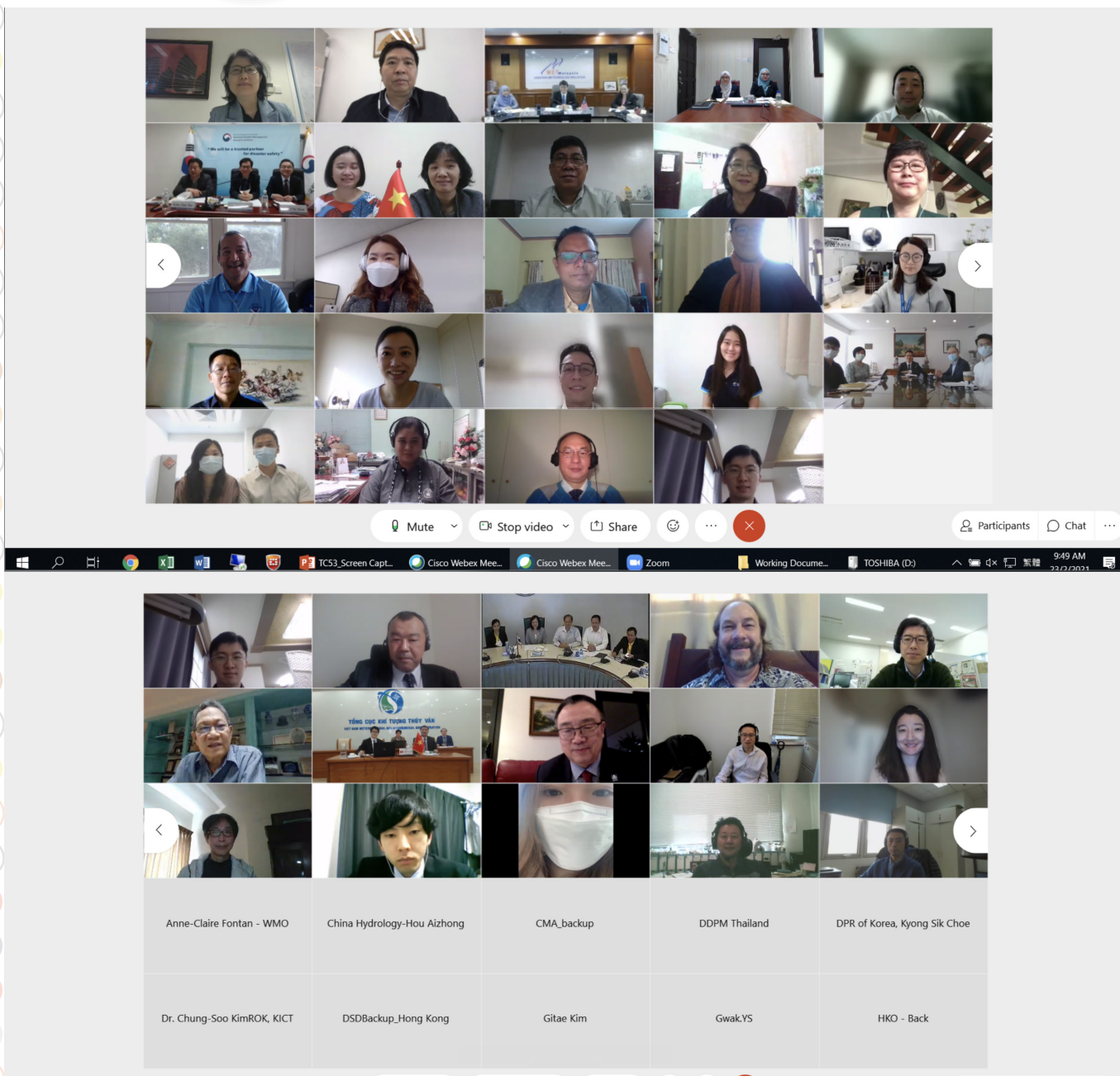
1st newsletter

The Fifty-Third Session of the Typhoon Committee Online • Okinawa, Japan, 23 to 25 February 2021



The Fifty-third Session of the Typhoon Committee held online from 23 to 25 February 2021. The Session is being convened by the Typhoon Committee, under the auspices of the Economic and Social Commission for Asia and the Pacific (ESCAP) and the World Meteorological Organization (WMO), and hosted online by Japan Meteorological Agency (JMA).

Due to the ongoing COVID-19 situation around the world and after approval by TC52 Chair and Vice-Chairperson, at this special online 53rd Annual Session of the Typhoon Committee, the Committee reviewed the progress made in its programme of work in 2020 and plan for activities to be undertaken in 2021 and beyond, together with the support required to implement them. The Session also the cover strategic and



development issues such as the implementation of the Strategic Plan 2017-2021 and the preparation for the update of the Strategic Plan for 2022-2026.

The Session was attended by 123 online participants from 13 out of 14 Members of the Typhoon Committee, namely: China; Democratic Republic of Korea (DPRK), Hong Kong, China; Japan; Laos People's Democratic Republic (Laos PDR); Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; United States of America

(USA); and the Socialist Republic of Viet Nam. Representatives of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS).



New Directors

New Director of the Hong Kong Observatory

Dr CHENG Cho Ming was appointed as the Director of the Hong Kong Observatory (HKO) on 15 February 2020. He graduated with a BSc degree in Physics and Mathematics from the University of Hong Kong in 1985 and subsequently obtained a PhD degree in Physics in 1989. He joined the Hong Kong Observatory as a Scientific Officer in the same year and was promoted to a Senior Scientific Officer in 1999. Since the 1990s, Dr Cheng has been involved in a number of disciplines, including weather forecasting, TV weather reporting, weather radar and satellite meteorology, and aerodrome meteorological observing system, etc. In 2011, he was promoted to an Assistant Director taking charge of public weather services and overseeing the development of the Observatory website and mobile app. In 2020, Dr Cheng succeeded as the Director of the Hong Kong Observatory. Over the years, Dr Cheng has participated in various meetings of WMO and ICAO. In 2020, he served as the Chairperson of the 52nd Session of the Typhoon Committee.





TC News from Members

China

Upgraded NWP system empowers global tropical cyclone prediction

On September 1, CMA's independently developed global assimilation forecast system GRAPES_GFS completed upgrading. Using this system, CMA has carried out prediction for the track and gale of hurricane Ida and Nora from August 28 UT.

After the upgrading of GRAPES_GFS, the tropical cyclone forecast scope of World Meteorological Centre (Beijing) is expanded from Northwest Pacific and the South China Sea to the entire world.

The R&D team has developed new vortex initialization technology based on 4Dvar assimilation system, and markedly enhanced the forecasting capability. Besides, the upgraded global model has further boosted track prediction capacity of tropical cyclones.

For users service, the team developed products like global infrared and water vapor cloud image, tropical cyclone track coupled with 120-hour cumulative gale, and tropical cyclone intensity. It has also

rolled out products dedicated to key coastal regions like Northwest Pacific, North Indian Ocean and Northeast Pacific.

In terms of CMA's typhoon forecast operation, the upgraded global model can complement with regional typhoon models. This model can provide more accurate medium and long range track prediction. (Sep.3)

Source: China Meteorological News
Press03-09-2021



Hong Kong, China

1. Typhoon Committee Research Fellowship

Amid the ongoing COVID-19 pandemic, the Hong Kong Observatory offered a Typhoon Committee Research Fellowship remotely for the first time. Ms Lu Xiaojin from the Shanghai Typhoon Institute / CMA commenced the Fellowship research project in January 2021. Her project, titled “Verification of tropical cyclone wind structure forecasts from global NWP models and ensemble prediction system”, aimed at developing verification techniques for TC wind structure forecasts from ECMWF deterministic and 51 ensemble members that have been released to NMHSs since June 2020. The project was conducted smoothly through a number of online meetings and email communication with fruitful contributions from Ms Lu. The study findings and verification results were being reviewed for preparing a report to the Tropical Cyclone Research and Review.

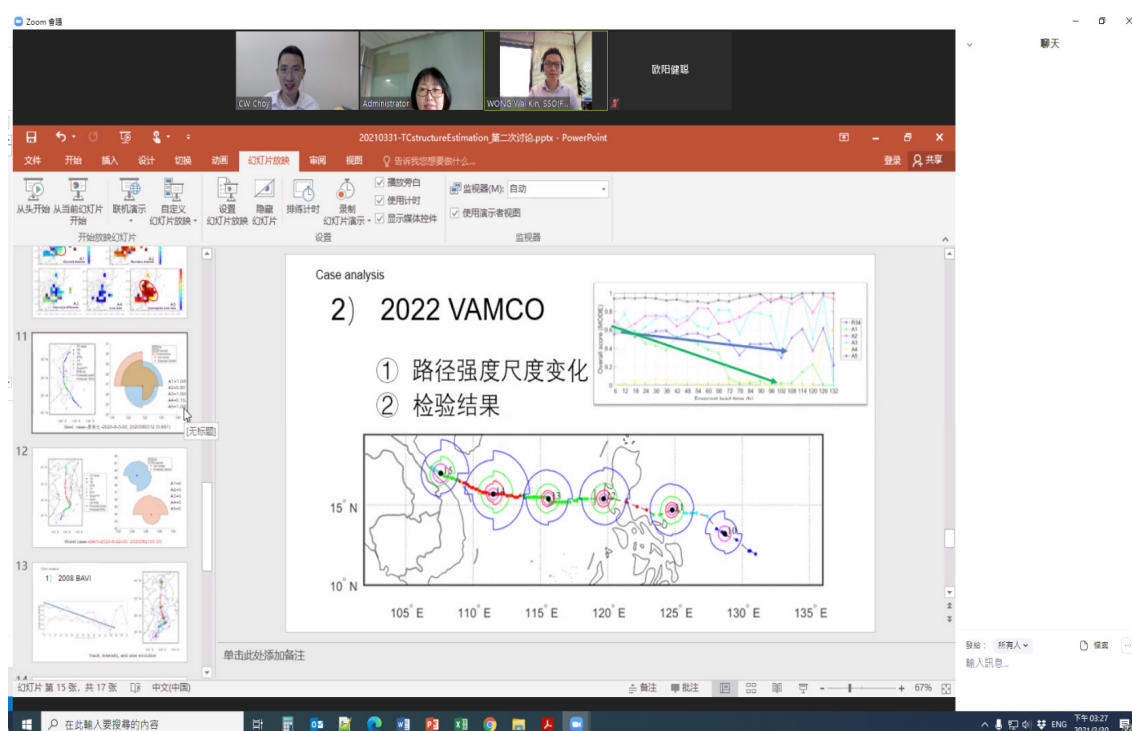


Figure 1 Ms Lu Xiaojin (second from the left) discussed with HKO colleagues through online meeting

2. “2016-2020 Top 10 Mind-boggling Weather and Climate Events Selection” Online Polling Campaign (D4)

In recent years, extreme weather conditions such as super typhoons, torrential rain, intense cold surges and scorching high temperatures affected Hong Kong and various parts of the world. Melting ice in polar regions and rising sea levels led to widespread concern over issues related to climate change across the world. Extreme weather events caused severe damages and even loss of life. The Hong Kong Observatory organised an online public polling activity “2016-2020 Top 10 Mind-boggling Weather and Climate Events Selection” (<https://eforms.weather.gov.hk/selection/vote-ended.fm>) in early 2021 to arouse public’s attention to high-impact weather and climate events in Hong Kong and around the world over the past 5 years, with a view to enhancing their understanding on climate change and its impacts on human lives.



Figure 2 “2016-2020 Top 10 Mind-boggling Weather and Climate Events Selection” online public polling website banner (<https://eforms.weather.gov.hk/selection/vote-ended.fm>).



This activity had attracted over 5,000 votes. The top 5 weather and climates events with the highest number of votes in each of the “Hong Kong” and “Worldwide” categories are as follows:



“Hong Kong” Category



Super Typhoon Mangkhut slammed Hong Kong with record-breaking storm surge


4731 votes



Intense cold surge brought freezing weather to Hong Kong

3552 votes





First-ever Black Rainstorm Warning in October

2869 votes



2020: Record-breaking numbers of very hot days and hot nights


2724 votes

“Worldwide” Category:



Destructive wildfires ravaged Australia and California

4242 votes



Greenland lost a record amount of ice in 2019

3705 votes



Temperature in a Siberian town soared to 38 degrees in 2020

3022 votes



Widespread drought in Africa caused severe food shortage

2851 votes



The five-year average of 2016–2020 is the warmest on record

2752 votes

3. New Gauging Stations in Coastal Areas of Hong Kong

Based on situation during the passage of severe/super typhoons in recent years, HKO, in collaboration with Drainage Services Department (DSD), jointly spent efforts to install new gauging stations in coastal areas of Hong Kong to monitor the flooding hazards brought by storm surge and overtopping wave.

Some coastal areas in Hong Kong are vulnerable to seawater flooding caused by extreme storm surges and/or huge overtopping waves. To tackle this challenge, DSD has installed new gauging stations at 18 locations in coastal areas, for example Tai O and Lei Yue Mun (which are low-lying areas subject to threat of storm surge) and Heng Fa Chuen and Tseung Kwan O (which are coastal areas subject to the attack by overtopping wave). The new gauging stations comprise water level sensors, staff gauge and camera for real-time flood monitoring especially during adverse weather conditions. These measures are automatically collected at the sites and continuously transmitted to DSD's Emergency Control Centre by telemetry. Also, those measurement at designated locations are displayed in online monitoring platform and mobile app, namely Hydrometric Information System (HIS), so as to facilitate resources deployment in case the flood water at a particular location reaching the respective trigger level. It also enables early deployment of DSD's emergency teams to the flooding locations for carrying out flood alleviation work and provides supplementary information for HKO's daily operation and long-term tidal monitoring.

Taking the example of Tropical Cyclone HIGOS (2020), with the new gauging stations at Heng Fa Chuen, Tai O and Lei Yue Mun, more real time water level and site images were collected during the passage of HIGOS. With these real-time hydrometric data, the duty officers in Emergency Control Centre of DSD could quickly analyze the flooding situation and coordinate emergency services to minimize flooding impacts.



Figure 3 New gauging station at Lei Yue Mun

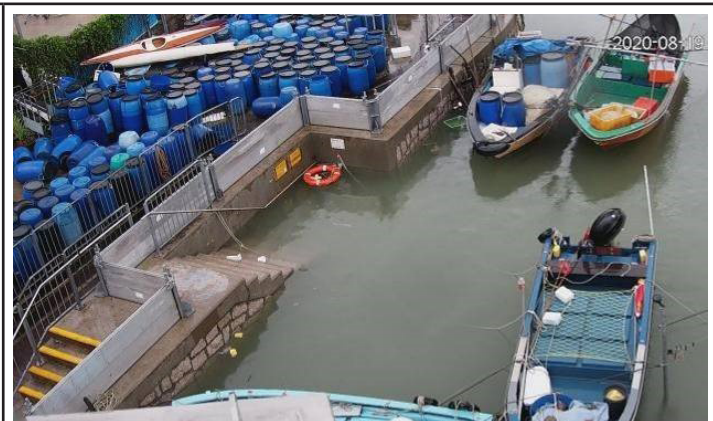


Figure 4 Real-time image during storm surge period of Typhoon HIGOS at Tai O in August 2020.

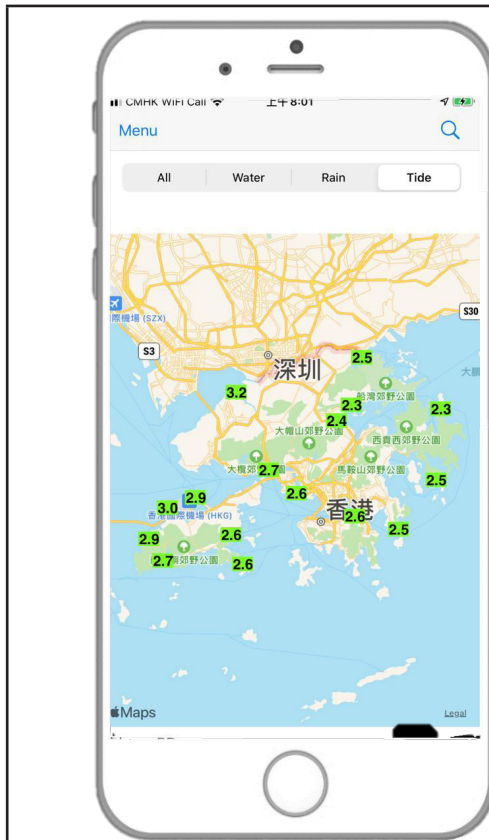


Figure 5 Real-time water level display in Hydrometric Information System (HIS) mobile apps during storm surge period of Typhoon HIGOS in August 2020.

Water Level Graph - D72

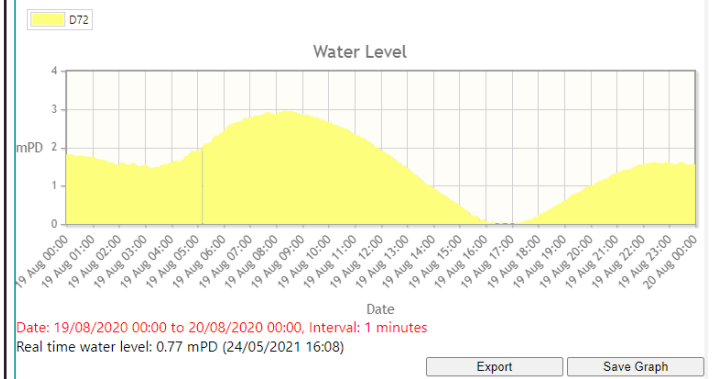


Figure 6 Water level graph display in Hydrometric Information System (HIS) mobile app for Tai O during storm surge period of Typhoon HIGOS in August 2020.

4. Automatic sea state and mean sea-level pressure forecasts available on “Earth Weather”

The Observatory further enhanced the “Earth Weather” website (<https://maps.weather.gov.hk/wxviewer/index.html?lang=en>) with the addition of automatic sea state forecasts, including prediction of waves and swells in the next 96 hours. Direction of waves and swells are displayed in animation, while their heights and the peak wave periods are shown using colour layers. The products will help people engaged in maritime operations and water sports in the South China Sea and western North Pacific better appreciate changes in the sea state. Furthermore, forecasts of mean sea-level pressure have also been added to “Earth Weather” for users to take note of large-scale weather systems in the next 9 days.

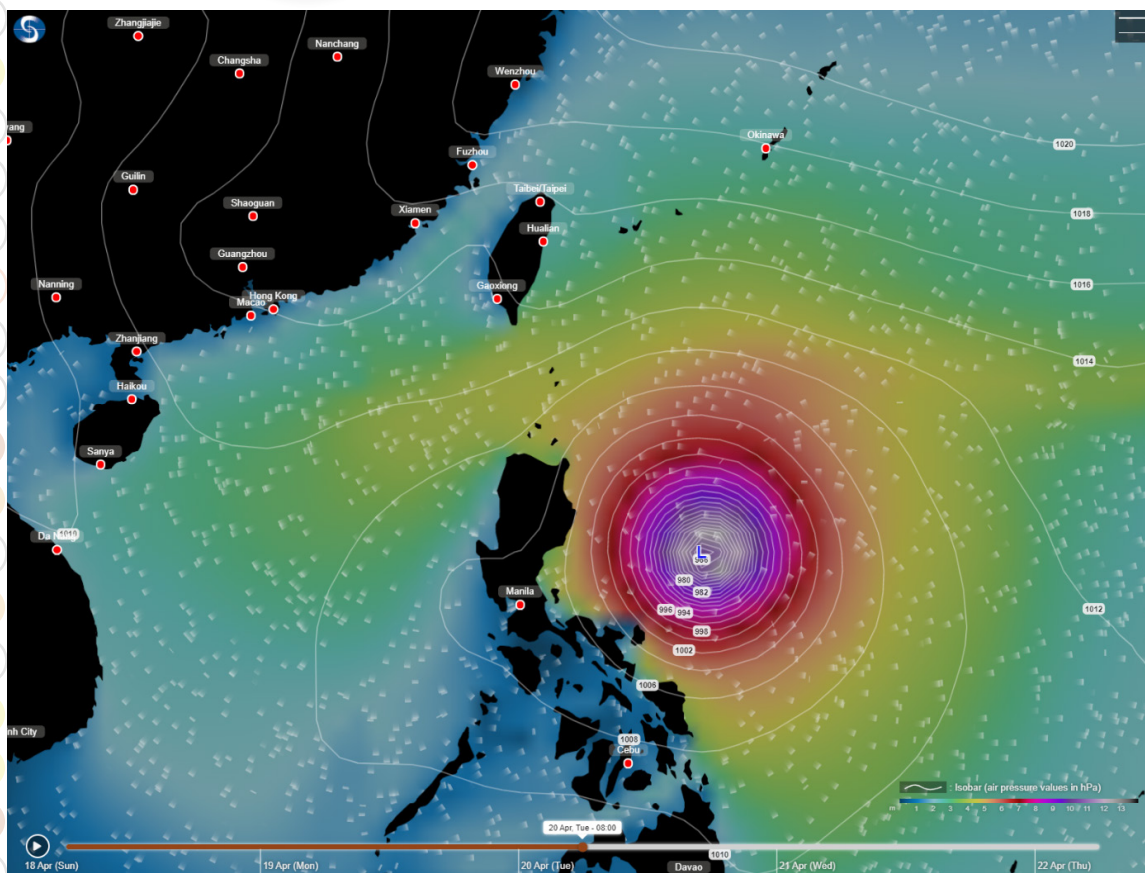


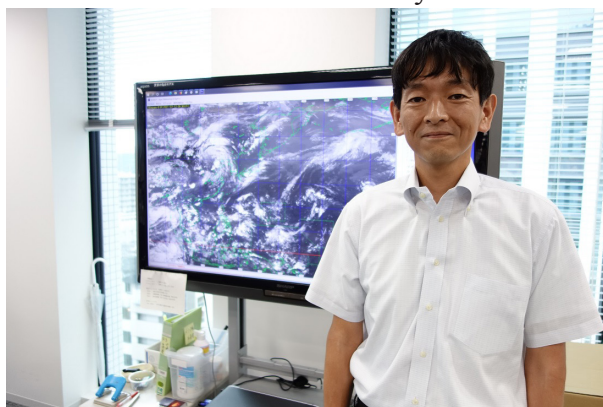
Figure 7 Example of mean sea-level pressure forecast and automatic sea state forecast with significant wave height in the vicinity of Super Typhoon SURIGAE (2102) in April 2021



Japan

1 HOSOMI Takuya Appointed as Tokyo Typhoon Center Head

HOSOMI Takuya replaced TANAKA Nobuyuki as head of the Tokyo Typhoon Center at the Japan Meteorological Agency (JMA) on 1 April, 2021. Mr. Hosomi graduated from the Meteorological College and started his career at JMA in 1995. After working at the Fukushima Meteorological Office, he served as a technical official at the Numerical Prediction Division and the RSMC Tokyo – Typhoon Center. He then worked at the Office of International Affairs as Senior Coordinator for International Cooperation from 2013 to 2017, and devoted himself to bilateral technical cooperation and Typhoon Committee matters. He previously served as the Head of Information and Data Services and the Head of the Office of Data Accessibility.



HOSOMI Takuya, Head of the Tokyo Typhoon Center

2 The 53rd session of the Typhoon Committee

Japan hosted the 53rd Typhoon Committee session from 23 to 25 February 2021 online due to the COVID-19 pandemic. HASEGAWA Naoyuki, the Director-General of the Japan Meteorological Agency, was appointed as the Chairperson of the Committee, along with Ms. Outhone PHETLUANGSY, Director-General of Department of Meteorology and Hydrology (DMH), Ministry of Natural Resources and Environment of Lao PDR as the Vice-Chairperson.

Mr. Hasegawa highlighted the Committee's dedication to strengthening social science approaches based on an understanding of risk perception, human behavior and public impacts, in addition to traditional natural scientific approaches, as part of the core message within the Tokyo Statement adopted at the High-level Dialogues on Tropical Cyclones held in October 2019. To this end, he welcomed all efforts and progress in this direction, and expressed a keen sense of anticipation for working with Members over the course of the year toward greater public disaster resilience.

Mr. Hasegawa chaired the first day of the session, with Atmosphere and Ocean Department Director-General OBAYASHI Masanori chairing the rest of the event. The agenda covered the approval of Working Group recommendations, preparation for updating of the Strategic Plan 2022 – 2026, and discussions on the way forward for a collaborative research center hosted by China. Despite time limitations and the online nature of the interaction medium, the session saw productive discussions among Typhoon Committee Members.



(Left) HASEGAWA Naoyuki, Director-General of the Japan Meteorological Agency
(Right) OBAYASHI Masanori, Director-General of the Atmosphere and Ocean Department



Delegates from the Japan Meteorological Agency



3 Publications released by the RSMC Tokyo – Typhoon Center

3.1 Annual Report on the Activities of the RSMC Tokyo – Typhoon Center 2019

The Annual Report on the Activities of the RSMC Tokyo – Typhoon Center 2019 was released in December 2020. The publication outlines the operations of the Center, reports on its major activities in 2019, summarizes the 2019 typhoon season and presents verification of operational forecasts, numerical models and other products. Major 2019 activities reported include, Typhoon Committee Attachment Training course, extension of the tropical cyclone intensity forecasts up to 120 hours ahead, revision of probability circle radii for tropical cyclone track forecasts with multiple ensembles and set up of an enhanced communication service on a trial basis are newly added in the report. In addition, verification of storm surge prediction based on both deterministic and multi-scenario prediction is introduced, and best-track data for 2019 tropical cyclones are provided in table and chart forms as appendices. The publication is available on the RSMC Tokyo – Typhoon Center website at <https://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/annualreport.html>.

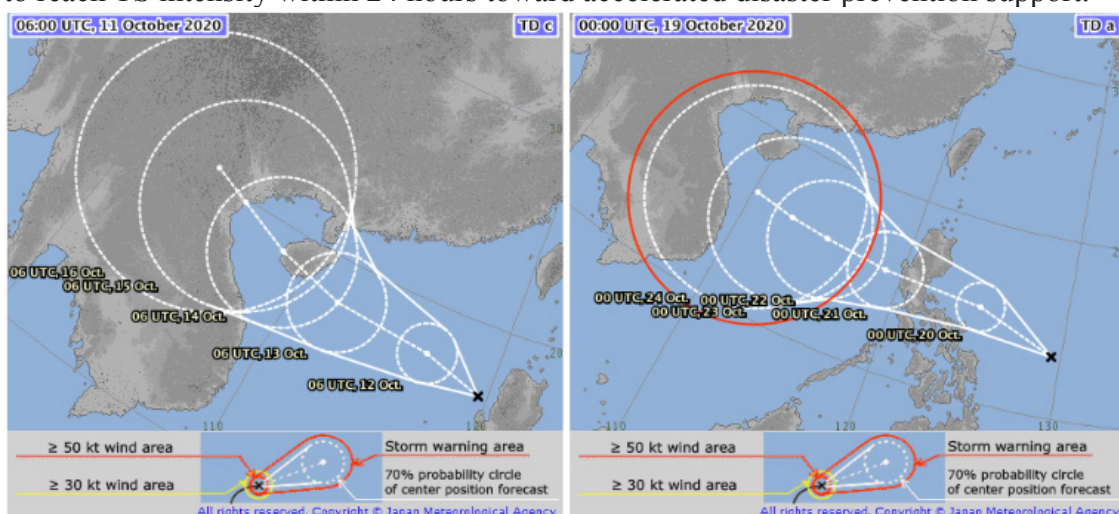
3.2 RSMC Technical Review No. 23

RSMC Technical Review No. 23, published in April 2021, includes upgrades to JMA's operational NWP high-resolution global models. This publication is available on the RSMC Tokyo - Typhoon Center website at <https://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/techrev.htm>

4 Technical Developments

4.1 Commencement of five-day forecasts for TDs expected to reach TS intensity within 24 hours

On 9 September 2020, RSMC Tokyo began to provide five-day forecasts for TDs expected to reach TS intensity within 24 hours toward accelerated disaster prevention support.



Forecasts for the TDs that developed into T2016 Nangka (left) and T2017 Saudel (right)

4.2 Enhancement of NTP website

4.2.1 TIFS Monitor (TC intensity guidance)

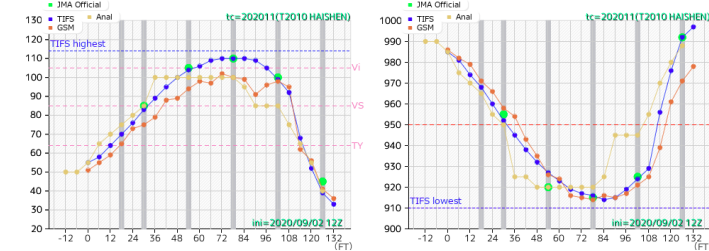
In 2020, RSMC Tokyo began providing tropical cyclone intensity forecast guidance products, including TIFS (the Typhoon Intensity Forecasting scheme based on SHIPS) data created from the Statistical Hurricane Intensity Prediction Scheme (SHIPS).

TIFS (Typhoon Intensity Forecast scheme based on SHIPS) Monitor

[Click here to see explanatory remarks](#)

TC Number: 202011(T2010 HAISHEN) Select forecast model:
☒ TIFS ☐ LGEM ☒ GSM ☐ MSM ☐ HWRF
☐ Multi-model ave. (composed of ☒ TIFS ☐ LGEM ☐ GSM ☐ HWRF)
☒ Analysis ☒ JMA official ☐ Best Track (if available)
 1- to 10-min wind speed conversion for HWRF ☒ Koba's table ☐ Multiplied by 0.93

[Text format analysis](#) [Text format forecast](#) [Environmental conditions along the forecast track](#)



Max. Wind(KT) Peak wind 110KT at 2020/09/05/12/UTC (FT=72)

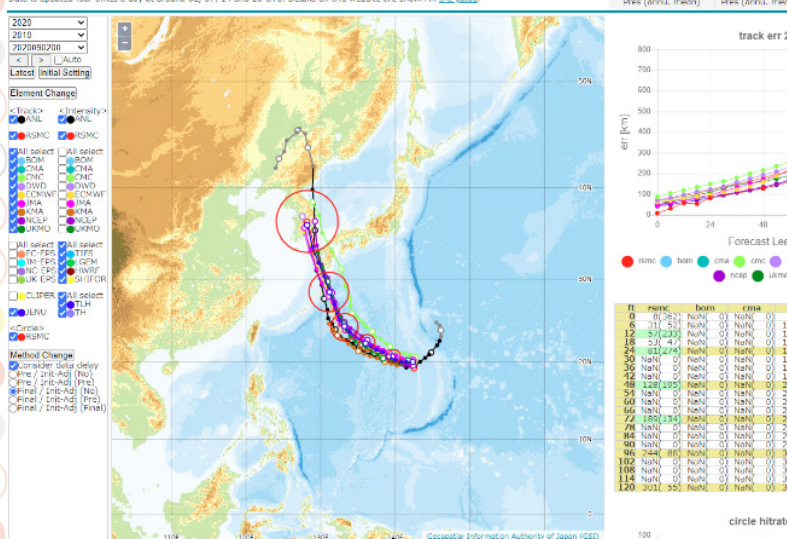
Valid for	FT	Anal	GSM	TIFS	HWRF	LGEM	Favorable factors	Unfavorable factors	Central
2020090212	0	55	51	55	67				202009
2020090218	6	65	55	58	66	58	Vertical shear: 1.8 Diff btw MPI and V0max: 1.8	P0min: -1.3 Diff btw MPI and V0max squared: -1.1 :-1.1	202009

4.2.2 Real-time verification results

RSMC Tokyo shares internal real-time verification results with Members via the NTP website under “Verification” on the “Numerical TC Prediction” global menu. Content includes RSMC Tokyo official forecasts, prediction results from global models already on the site, and results from certain intensity guidance schemes for prediction of tracks and intensities (central pressure and maximum wind speed), along with a usage guide.

Tropical Cyclone Verification Website

This website shows verification results of RSMC Tokyo's official forecasts as well as NWP model and guidance predictions. Data is updated four times a day at around 04, 07, 14 and 20 UTC. Details on this website are shown in [this guide](#).





4.2.3 TC activity prediction with increased accuracy

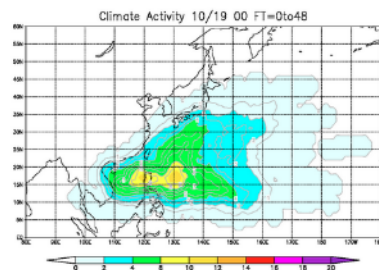
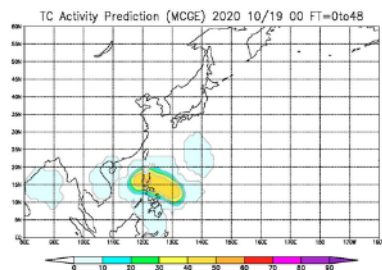
RSMC Tokyo provides two- and five-day Tropical Cyclone Activity Prediction Maps covering its area of responsibility based on ensembles from ECMWF, NCEP, UKMO and JMA, along with a grand ensemble for these four centers. The maps display potential tropical cyclone activity in terms of the percentage of ensemble members in which TC-like vortices are represented within 300 km of a certain location during the relevant forecast time. In 2020, RSMC Tokyo conducted parameter tuning with cumulative data and improved accuracy, and began provision of improved maps. Maps based on climatological normal values (1989 – 2018) were also added for reference.

Tropical Cyclone Activity Prediction

Forecast target:
☒ 0-2 days
☐ 0-2 days
☐ 0-5 days

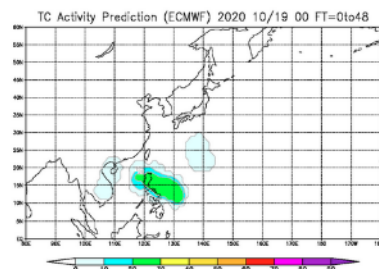
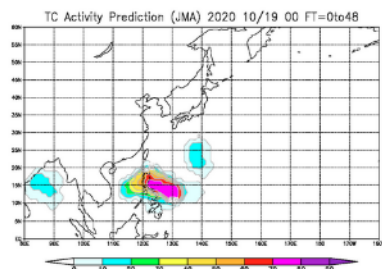
Multi-Center grand ensemble(MCGE)

Climatological Activity



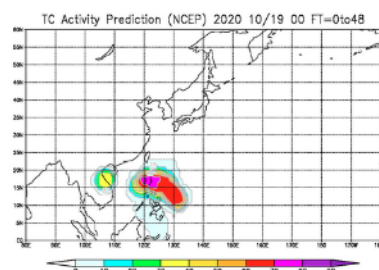
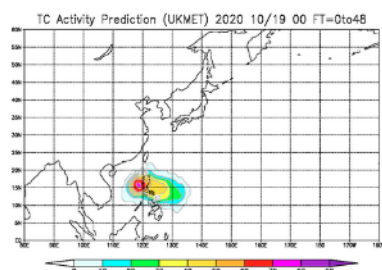
JMA

ECMWF



UKMET

NCEP



4.2.4 Additional points for time-series charts representing ocean wave prediction

Five points were added to time-series charts representing ocean wave prediction based on a Malaysia Meteorological Department request.

4.2.5 Introduction of NOAA-20 data to microwave TC intensity estimation

To further support TC intensity estimation, RSMC Tokyo added a TC central pressure estimate based on satellite microwave observation data from the Advanced Technology Microwave Sounder (ATMS) on the NOAA-20 polar-orbiting satellite to time-series charts.

4.2.6 Tropical cyclone advisories for SIGMET in graphical format

In August 2015, as an ICAO TCAC, RSMC Tokyo started providing graphical tropical cyclone advisories (hereinafter referred to as TCG) according to MODEL TCG in Appendix 1 of ICAO Annex 3. In March 2016, it started providing the graphical tropical cyclone advisories using a new Himawari product identifying Cb associated with tropical cyclones potentially affecting aviation safety. TCG is being provided through the website where the specifications and text format advisories are also available (<http://www.data.jma.go.jp/fcd/tca/data/index.html>). This website is linked to the NTP website. Also, TCG is sent to WAFCs, so that they are transmitted through WIFS and Secure SADIS FTP. WMO AHLs of the bulletin are PZXE (01-06) RJTD.

TCG is issued, together with text advisories, when 1) a tropical cyclone with Tropical Storm (TS) intensity or higher exists in the area of responsibility of RSMC Tokyo, or 2) a tropical cyclone is expected to reach TS intensity in the area within 24 hours. In the second case, gale force wind area is not to be presented in TCG.

In November 2020, TCAC Tokyo began providing tropical cyclone advisory messages with full ICAO SARP compliance, including the following amendments:

- Annex 3, Amendment 78, Appendix 2, para. 5.1.3: Dissemination of tropical cyclone advisory information in IWXXM GML format in addition to the dissemination of this advisory information in abbreviated plain language;

- Annex 3, Amendments 78 and 79, Table A2-2: Changes to the elements “Advisory number” (mandatory) and “Observed position of the centre” (mandatory) and addition of the elements “Status indicator” (conditional) and “Observed CB cloud” (optional); and

- Annex 3, Amendment 79, Table A2-2: Addition of the element “Changes in intensity” (mandatory)

Sharing of messages in IWXXM 3.0 format on the TCAC Tokyo website began on 5 November 2020.

5 Enhanced communication

RSMC Tokyo maintains its own dedicated platform via which Committee Members can post inquiries and comments on tropical cyclone analysis and forecasts, with commencement of Advance Notice provision in 2020. The first 18 months of trial basis operation saw active discussions and hundreds of accesses during the 2020 typhoon season, highlighting the platform’s core role in maintaining communication among Members and RSMC Tokyo. Based on this success, the trial phase transitioned to full-fledged operation to further enhance related interaction in May 2021.



6 20th Typhoon Committee Attachment Training course at the RSMC Tokyo – Typhoon Center

The 20th ESCAP/WMO Typhoon Committee Attachment Training course was held online from 9 to 11 March 2021.

The Regional Specialized Meteorological Centre (RSMC) Tokyo – Typhoon Center has run annual ESCAP/WMO Typhoon Committee Attachment Training courses since 2001 with the support of the WMO Tropical Cyclone Programme and the Typhoon Committee in order to enhance the tropical cyclone (TC) analysis and forecasting capacity of Committee Members. Amid the COVID-19 pandemic, the 2021 course was held virtually with 44 attendees from the seven Typhoon Committee Members (Hong Kong China, Macao China, Malaysia, the Philippines, the Republic of Korea, Singapore and Thailand). RSMC New Delhi senior forecaster Ms. Sunitha Devi attended as an invited presenter, and two researchers from the Japan Meteorological Agency (JMA) Meteorological Research Institutes joined the attendees' presentation session.

At the opening session, OBAYASHI Masanori (Director-General of the Atmosphere and Ocean Department at JMA) highlighted the main purpose of the training, that is to provide a solid understanding of monitoring, analysis and forecasting for tropical cyclones based on RSMC Tokyo products, and to raise awareness of up-to-date public weather services and information design based on the concept of the 10-year Vision to Protect Life and Property from Tropical Cyclones as delineated in the Tokyo Statement from the High-level Dialogues on Tropical Cyclones held in Tokyo, Japan in October 2019. The training course also addressed the promotion of information sharing on recent tropical cyclone activities conducted by contributing services.

The online course saw active discussions between presenters and attendees, with more than 50 questions and comments made during the three-day event regarding RSMC-Tokyo operational services and products and technical aspects of tropical cyclones. TANAKA Nobuyuki, former Head of the Tokyo Typhoon Center, gave a presentation on best practices in Japan and JMA disaster risk mitigation measures. Attendee presentations included case studies on TCs affecting individual areas, highlighting the characteristics of such phenomena and how neighboring Meteorological Services implement TC-related services.

During the closing session, Mr. Cyrille Honoré (Director of the DRR and Public Services Branch within the WMO Services Department) highlighted how current climate changes mandate the development and maintenance of competency in typhoon monitoring, forecasting and warning services. Training was also highlighted as a key element in the WMO strategy for long-term capacity and personnel development to reflect and leverage progress in sciences and technology to better address public need. Against such a background, RSMC-Tokyo is committed to playing vital roles in improving competence and skills of forecasters, thus the capacities of Meteorological Services in the Typhoon Committee region via training to meet various regional needs, from basic application to state-of-the-art tropical cyclone forecasting and monitoring techniques and methodologies. It is expected that the annual training will serve to help save lives and mitigate the impacts of hazardous conditions relating to tropical cyclones in the region.

ESCAP/WMO Typhoon Committee RSMC-Tokyo attachment online training course 2021 (March 9 - 11)



Attendees and Tokyo Typhoon Center staff (11 March, 2021)



Republic of Korea

KMA/NTC's improved Tropical Depression (TD) forecast information

Last year the Korea Meteorological Administration/National Typhoon Center (KMA/NTC) extended the forecast period for Tropical Depression (TD) up to 5 days. Since this year's typhoon season (starting from mid-May 2021), it has started providing additional information about TD forecasts — strong winds and storm radius. As a result, the KMA/NTC's TD forecast information now offers the track, intensity and radius of the area with wind speed of 15m/s and 25m/s in the coming 5 days from the TD stage. The improved TD information has been applied and provided since May 26, 2021. This is expected to help respond to the effects of typhoons at the early stage.

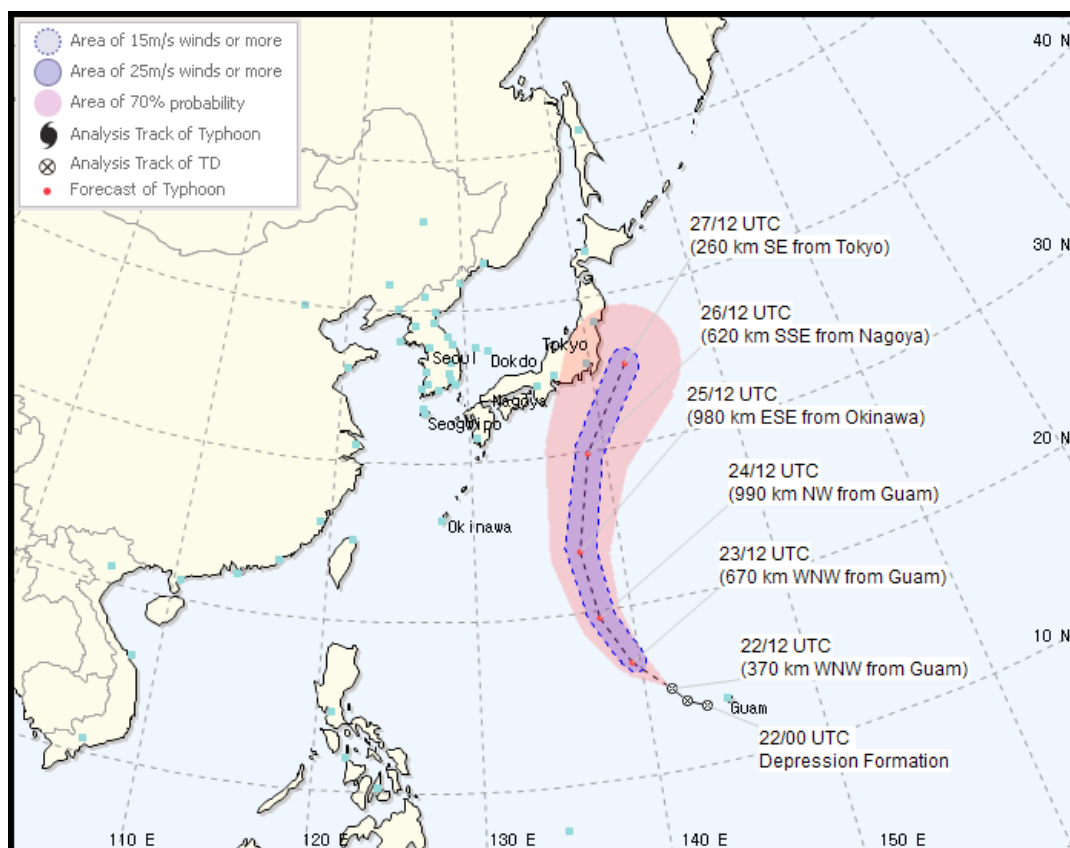


Fig. 1 KMA/NTC Tropical Depression (TD) forecast information at 12 UTC on June 22, 2021

KMA/NIMS Atmospheric Research Aircraft is in the Air

Tae-Young, Goo, Sueng-Pil Jung, Ji-Hyoung Kim, Min-Seong Kim, Kwang-Jae Lee, Myoung-Hun Kang, Jihwi Yang and Chulkyu Lee.

Contact Information:

Member: Republic of Korea

Name of contact for this item: Tae-Young, Goo

Telephone: +82-64-780-6681

Email: gooty@korea.kr

Convergence Meteorological Research Department,
National Institute of Meteorological Sciences, Korea Meteorological Administration

The National Institute of Meteorological Sciences (NIMS) of the Korea Meteorological Administration (KMA) has been operating the KMA/NIMS Atmospheric Research Aircraft (NARA) since November 2017. NARA is a twin-turboprop aircraft (King air 350HW, Beechcraft) and more details of its specifications are shown in Table 1. Fundamentally, NARA was designed to collect observations on various weather phenomena. Twenty-five types of weather observation instruments are employed to carry out four airborne campaigns such as severe weather observation, aerosol and greenhouse gas measurement, and cloud seeding for precipitation enhancement. The total annual flight time is about 400 hours over the Korean Peninsula. The flight time for severe weather observation is about 100 hours per year and 3.5-4.5 hours are usually spent for a flight. The aircraft has made 82 trips for severe weather events since 2018. Annually 200 to 300 dropsondes were used for severe weather observation.

For data sparse areas, NARA plays a key role in capturing the features of severe weather events such as typhoon, heavy rainfall and snowfall. In particular, dropsonde observation can provide significant vertical structures of the atmosphere depending upon pressure, temperature, relative humidity, and wind speed and wind direction. Fig. 1 shows the comparison of temperature profiles between dropsonde and radiosonde launched on 23 June 2021 from a weather vessel operated by NIMS. Two profiles show considerable consistence.

Fig. 2a shows a radar composite image with dropsonde observations at around 0600 UTC on 1 September 2020, which was one day before the 9th typhoon “MAYSACK” landed on the Korean peninsula. Fig. 2b describes a skew T – log P diagram at dropsonde points expressed as “▲”. Profiles of T, Td, wind speed and direction are illustrated. Red lines indicate observations. Blue and pink lines are 48-hour forecasts from global (GDAPS) and local (LDAPS) numerical weather prediction models in the KMA, respectively. Predicted profiles show a significant difference from those of dropsonde. Dropsonde data were assimilated into the local numerical weather prediction model. As a result, there were approximately 10% improvements (threat score: 11%, POD: 6%, FAR: 12%) with regard to a 12-hour precipitation forecast for typhoon. Additionally, NARA is participating in an international aircraft campaign called “Prediction of Rainfall Extremes Campaign In the

Pacific (PRECIP)", in collaboration with several research institutes in the U.S., Taiwan, Japan and Korea. Due to the COVID-19 pandemic, the PRECIP is postponed to 2022.

From the summer of 2021, NARA started to observe the vertical structure at the boundary (defined ~5880 gpm at 500 hPa here) of North Pacific maritime Tropical (mT) as shown in Fig. 3. We expect that the observation on the edge of mT will contribute to improving the understanding of physical characteristics between stationary front and mT, which result in intensively heavy rainfall in northeast Asia during the monsoon season.

Although airborne measurements from NARA have approximately 3-year records only, they have led to a significant improvement in the prediction model by filling the gap data. In particular, simultaneous aircraft measurements in a variety of weather phenomena have a considerable advantage. In addition, regular aircraft observations for targeted weather events on a yearly basis is remarkably an operational strategy, compared with other common aircraft observations that are intensively conducted for a restricted period.

Table 1. Specifications of KMA/NIMS Atmospheric Research Aircraft

Model	King Air 350HW (Beechcraft Inc)
Engine category	Twin turbo-prop
Size (Length/Weight/Height)	14.22 m / 17.65 m / 4.37 m
Maximum takeoff payload	16,500 lbs (7,425 kg)
Maximum altitude	35,000 ft (10.7 km)
Maximum speed	230 KIAS (425 km/h)
Range	1,550 nm (2,871 km)
Maximum mission flight	5.5 hours
Crews onboard	5 (2 pilots, 1 scientist, 2 operators)

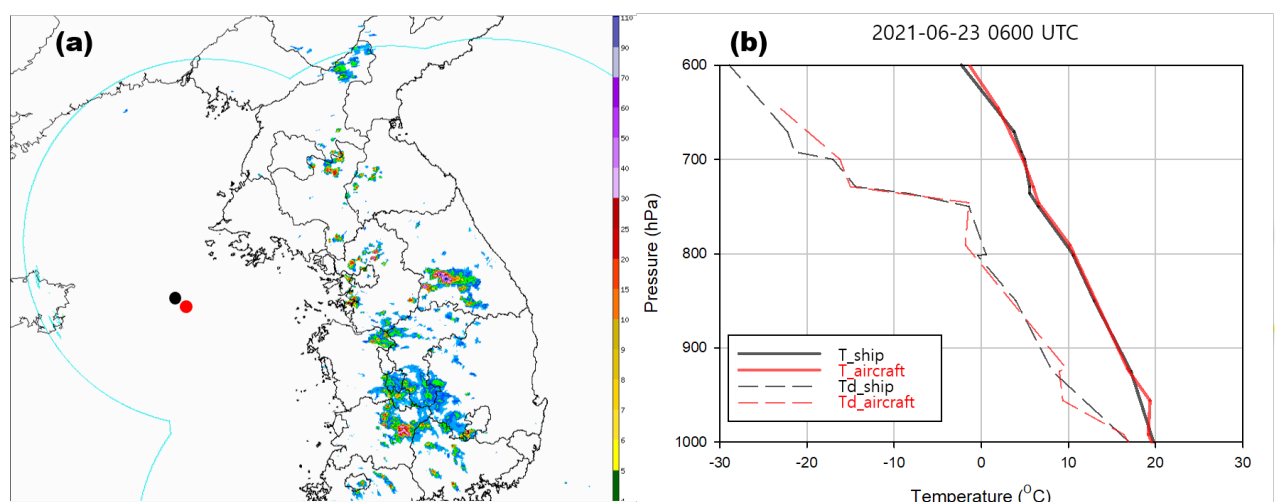


Fig. 1. Comparison between dropsonde from aircraft and radiosonde from ship on 23 Jun. 2021: (a) Observation points of dropsonde (red) and radiosonde (black); (b) Profiles of T and Td observed from aircraft and ship

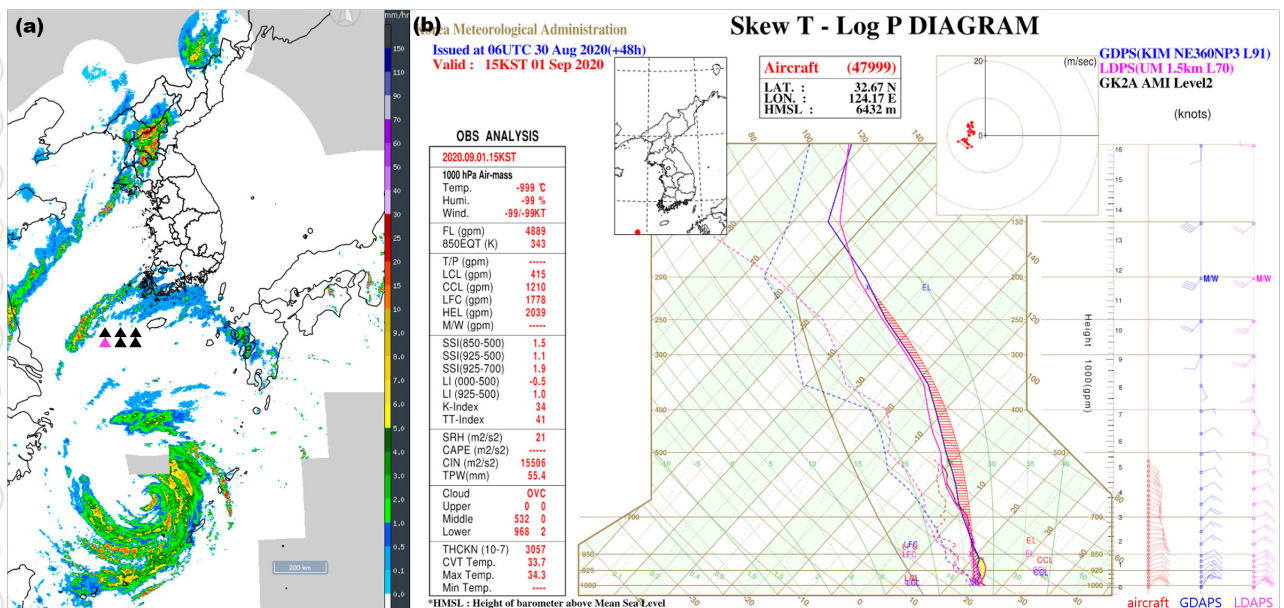


Fig. 2. Comparison between dropsonde observation and model estimations when the 9th Typhoon “MAYSAK” was approaching to the Korean peninsula on 1 Sep. 2020: (a) Radar composite image with dropsonde observation points marked as “□”, (b) Skew T – log P diagram observed at “□”, and Solid (dashed) lines indicating T (Td). Red lines are observations from dropsonde at around 0600 UTC on 1 Sep. 2020 and blue and pink lines are a 48-hour forecast from global (GDAPS) and local (LDAPS) models, respectively.

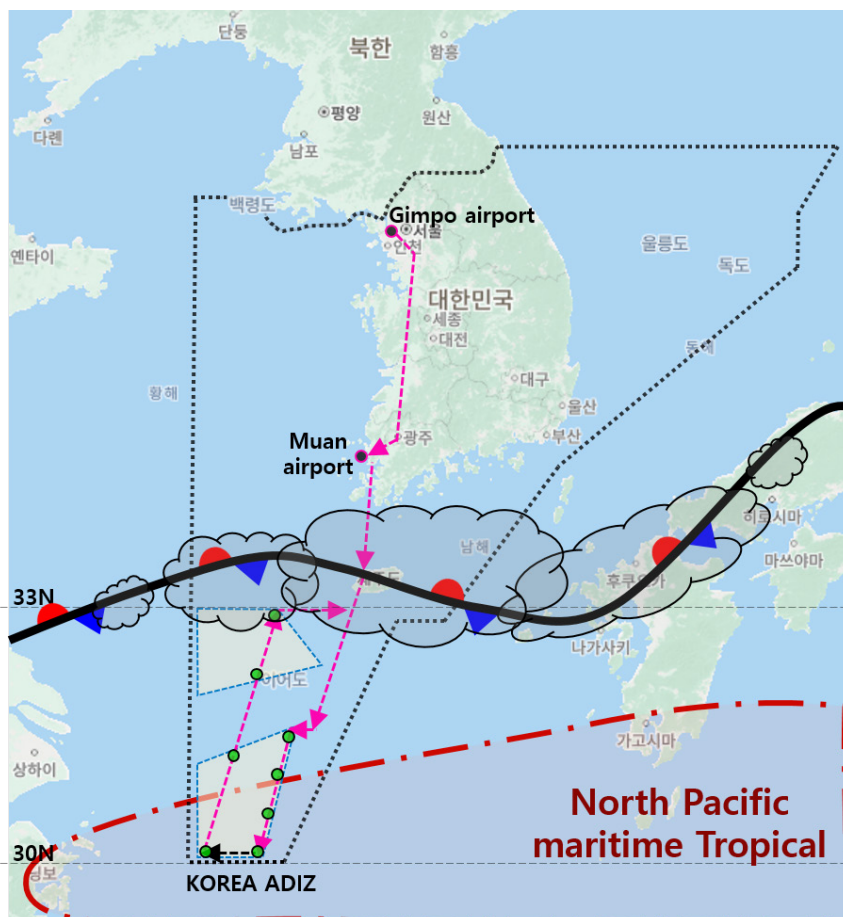


Fig. 3. Schematic diagram of the plan for aircraft observation on the boundary of North Pacific maritime Tropical (dashed-dot). Green circles indicate dropsonde observation points. Blue dashed zones are areas available only to dropsonde from NARA.



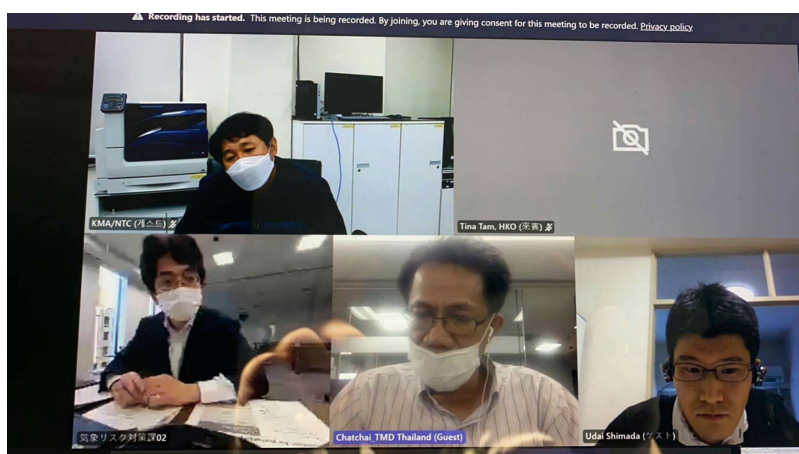
Thailand

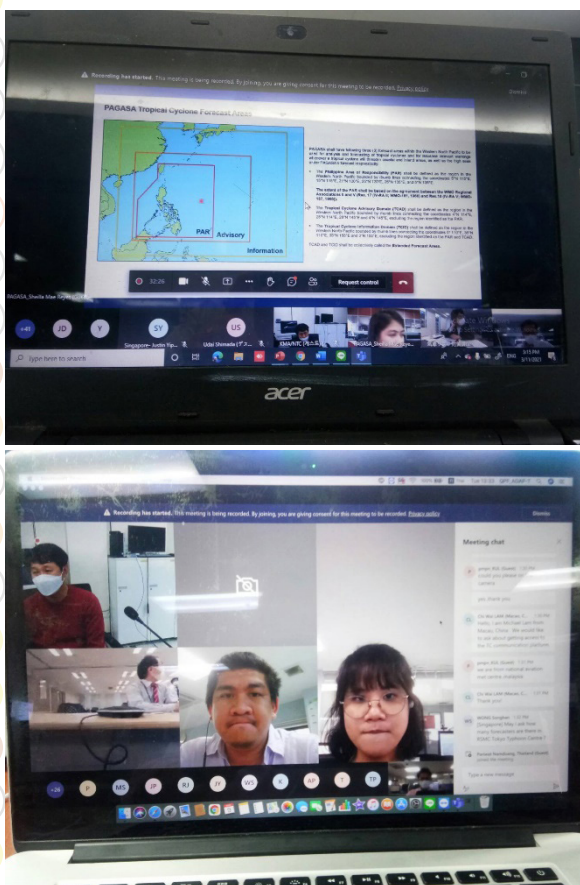
Material from TMD for inclusion in the TC Newsletter 2021

A number of TMD Meteorologists attending RSMC Tokyo Attachment Training 2021

Eighteen participants from regional and headquarters of Thai Meteorological Department (TMD) had participated in the RSMC Tokyo Attachment Training for Forecasters 2021, which was organized by RSMC Tokyo with generous support from the Japan Meteorological Agency (JMA). Due to the outbreak of COVID-19 pandemic worldwide, the training was held online from 9 to 11 March 2021.

One of our attendees gave a presentation on Tropical Cyclone related services and activities in Thailand. All of participants had learned and improve their skills, techniques including resources on tropical cyclones. These enhance and strengthen their knowledge and comprehension of tropical storm forecasting and warning. Furthermore, the training could help the attendees to build network, cooperation and exchange techniques for tropical cyclones forecasting and warning at the regional level.



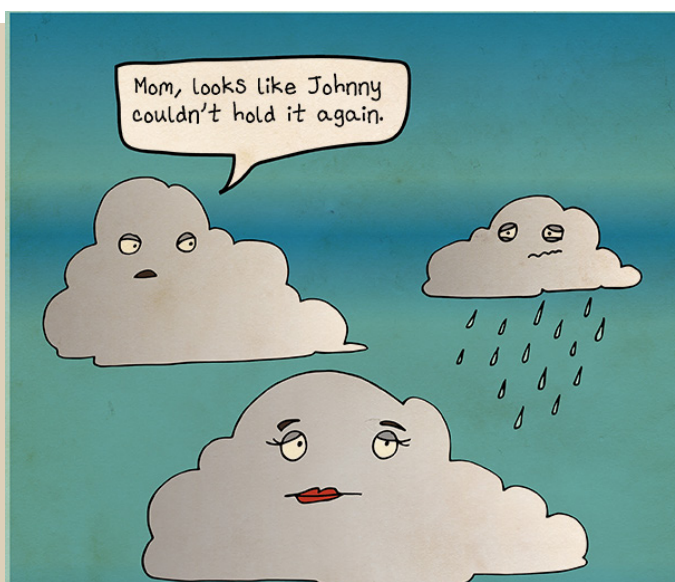


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Humour Corner