



## Hong Kong Observatory 2018

### INTRODUCTION

The three main objectives of the Hong Kong Observatory (the Observatory) are:

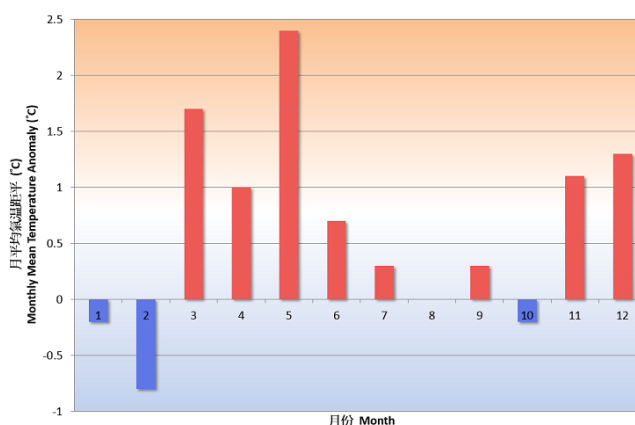
- (1) to provide weather forecasts and warnings to meet the public's demand for weather services, and to provide weather services for aviation and shipping in accordance with international standards;
- (2) to monitor local environmental radiation levels and impacts, and to advise the Government on counter-measures that may be necessary during nuclear emergencies;
- (3) to maintain the Hong Kong time standard and to provide geophysical, oceanographic, astronomical and climatological information and consultative services to the public and business sectors.

During the financial year 2018-19, the department's total expenditure was \$338.2 million and the total revenue was \$123.2 million. By the end of the financial year, there were altogether 311 civil servants, 20 non-civil service contract staff and 28 T-contract staff working in the department.

### The Year's Weather

In 2018, the weather was rather warm. Hong Kong registered an annual mean temperature of 23.9 degrees Celsius, 0.6 degrees above normal and among the third warmest since records began in 1884. The monthly mean temperature of 28.3 degrees and monthly mean minimum temperature of 26.1 degrees recorded at the Hong Kong Observatory headquarters in May were the highest ever on record for May.

The highest temperature recorded at the Observatory in the year was 35.4 degrees on 30 May, the eleventh highest since records began in 1884. There were 26 Hot Nights and 36 Very Hot Days in Hong Kong in 2018, ranking the eighth highest and the third highest on record respectively. For low temperatures, the number of Cold Days in the year was 21 days, which is 3.9 days more than the 1981-2010 normal. The lowest temperature recorded at the Observatory in the year was 6.8 degrees on 1 February.



Monthly mean temperature anomalies in Hong Kong in 2018

Six tropical cyclones affected Hong Kong in the year. Among them, Tropical Cyclone Mangkhut necessitated the issuance of warning signals No 8 or above. During the ferocious strike of Mangkhut on 16 September, the highest tropical cyclone warning, the No. 10 Hurricane Signal, was issued for 10 hours. This is the second longest duration of No. 10 Hurricane Signal in Hong Kong since 1946, just next to the record of 11 hours set by Typhoon York on 16 September 1999. The maximum 60-minute mean wind speeds recorded at Waglan Island and Cheung Chau were 161 km/h and 157 km/h respectively. Both are the second highest record at the corresponding stations, just below the records set by Ellen in 1983. The severe storm surge brought by Mangkhut raised the water level in Hong Kong generally by more than two metres, resulting in record breaking storm surge in many places. The

water level at Quarry Bay of the Victoria Harbour rose to a maximum of 3.88 mCD (metres above Chart Datum) on the afternoon of 16 September, the second highest since instrumental water level measurement started in 1954 and only lower than the record high of 3.96 mCD set by Super Typhoon Wanda in 1962. The destructive winds, severe storm surge and squally heavy rain associated with Mangkhut caused the most serious and extensive damages in Hong Kong in the recent three decades since Ellen in 1983.

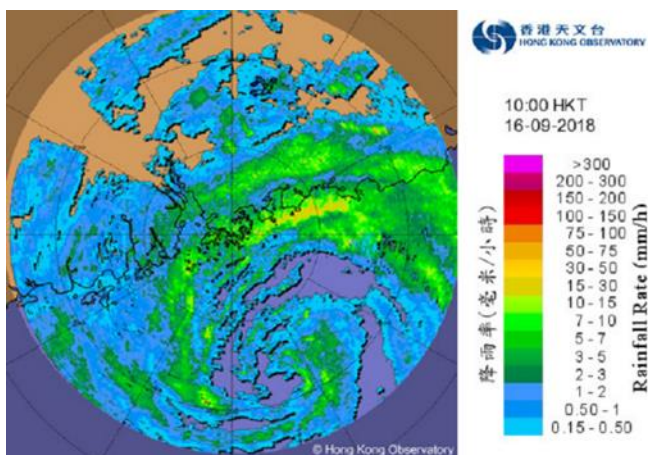
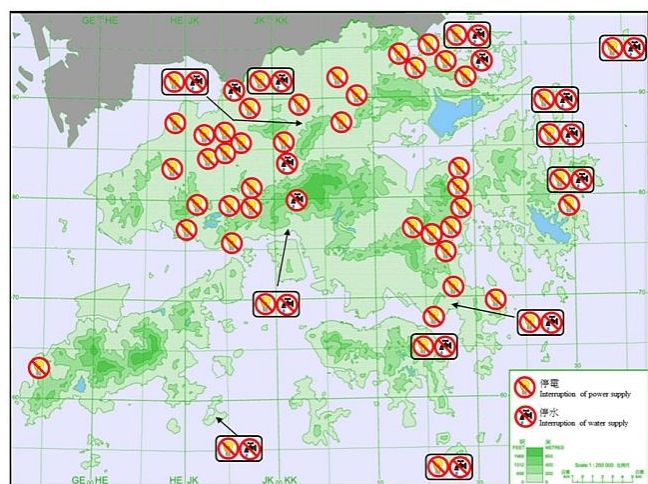
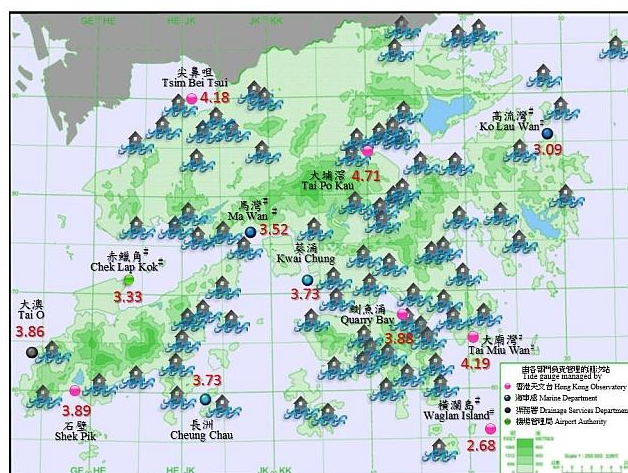


Image of radar echoes at 10:00 a.m. on 16 September 2018, showing the intense spiral rainbands of Mangkhut affecting Hong Kong.



Reports of interruption of power and water supply during the influence of Mangkhut based on news and social media. The incident reports are not exhaustive.



Maximum sea level (metres above Chart Datum) recorded at various tide gauges in Hong Kong and flood reports from government departments, news and social media on 16 September 2018. The flood reports are not exhaustive.

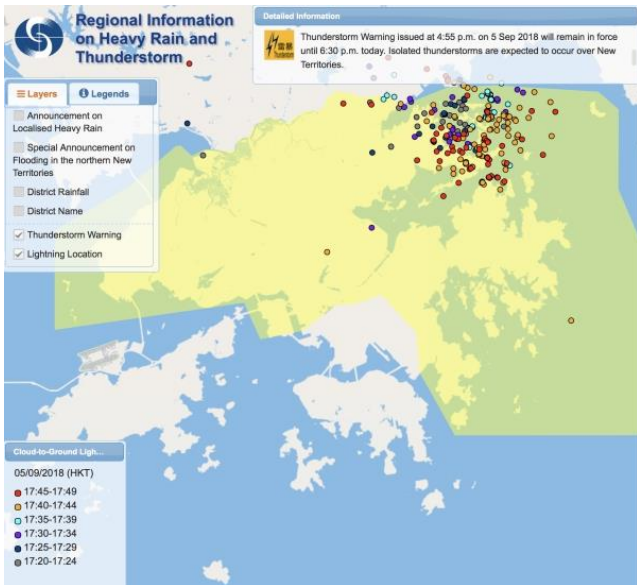
## WEATHER SERVICES

The Observatory provides weather forecasts and warnings to the public, special users, the shipping and aviation communities to reduce loss of life and damage to property, and to minimise disruption to economic and social activities during hazardous weather.

In 2018-19, the Observatory fulfilled its performance pledge of issuing at least one weather bulletin every hour of the day, disseminating 99% of the bulletins within 10 minutes after each hour, and attained a forecast accuracy (as verified by objective means) of 91%.

Weather information was enhanced in 2018-19 to meet the needs of the public through:

- Launching a new webpage on “Regional Information on Heavy Rain and Thunderstorm”, and display regions affected by the “Announcement on Localised Heavy Rain”, “Special Announcement on Flooding in the northern New Territories” or “Thunderstorm Warning”;

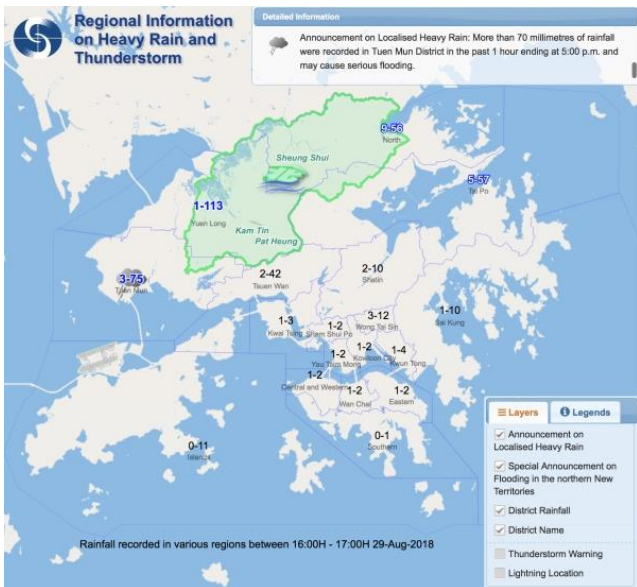


The webpage indicated that the region affected by thunderstorm in New Territories (shaded in yellow). Round dots denote the location of lightning in the past half hour.



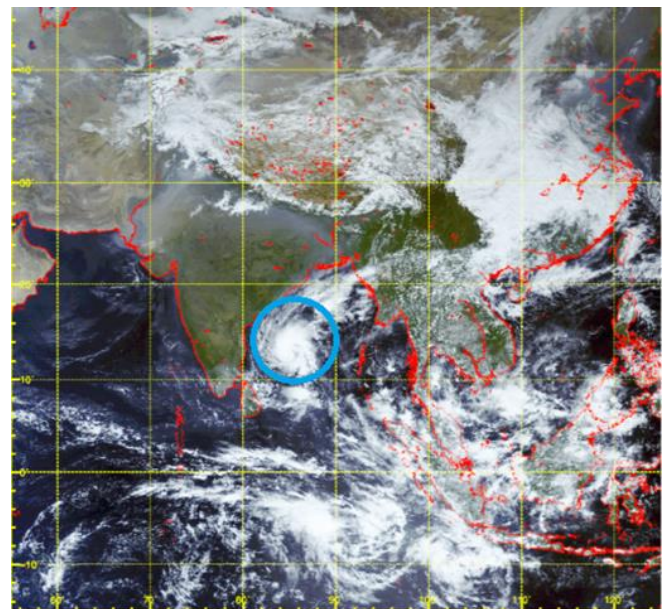
The Observatory has added real-time weather photos captured at the International Commerce Centre in West Kowloon.

- Enriching the weather satellite imagery on the Observatory's website and the "MyObservatory" application with imagery covering the western Asia region and hourly updates;



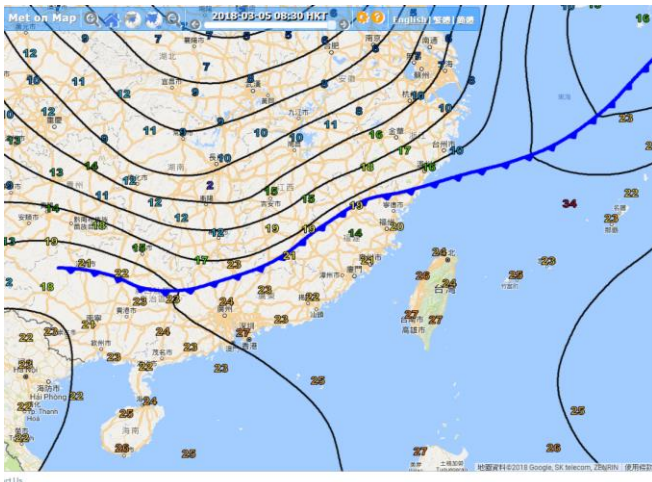
The webpage displayed that Tuen Mun was under the influence of localised heavy rain (indicated by the grey rainy icon). There was also risk of flood at Sheung Shui, Kam Tin and Pat Heung (green text in italic bold face) owing to heavy rain.

- Enhancing the regional weather information service on the Observatory website, providing temperature information from Clear Water Bay, weather photo captured in West Kowloon and high resolution weather photos at some locations;



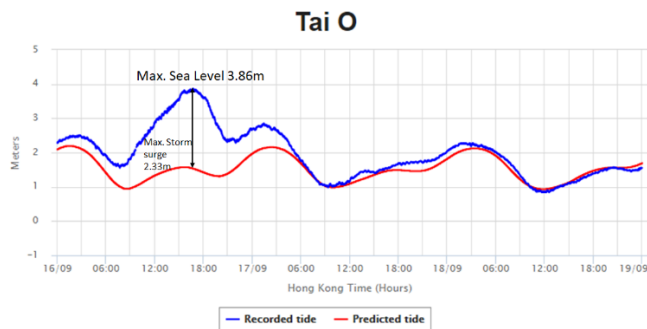
The true colour image captured by FY4A satellite at 2:00 p.m. (Hong Kong Time) on 14 November 2018. The blue circle shows the circulation of tropical cyclone Gaja

- Enriching the "Met on Map" service, a one-stop service hub powered by a Geographic Information System platform, with more weather observations including wind speed and direction, air temperature and visibility from airports around the globe; and



Total number of observing stations has increased by 30% in the enhanced “Met on Map”.

- Enhancing the tidal information service on the Observatory’s website by adding real-time tide data collected at Tai O.



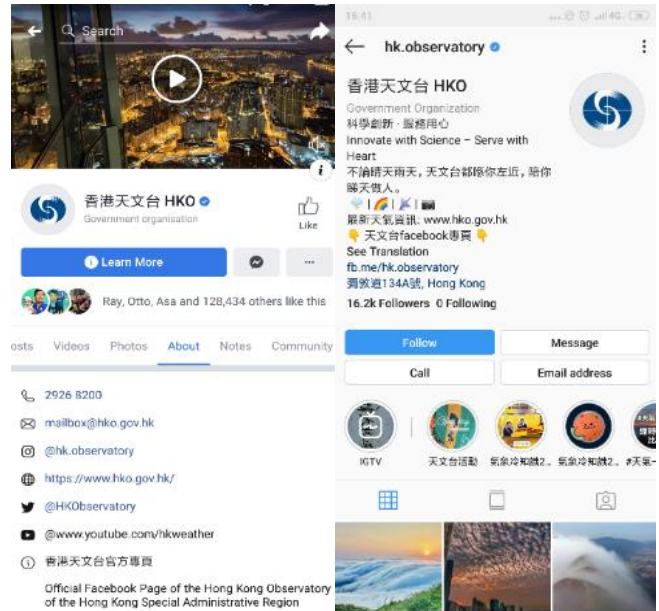
Variation of tide levels at Tai O Tide Station between 16-19 September 2018 during the passage of Mangkhut.

In 2018, total number of page views of the Observatory’s website and mobile weather application “MyObservatory” reached the 146 billion mark and its YouTube channel accumulated around 6 million views. Users can receive weather warnings and news on Facebook, Twitter, Weibo and WeChat. PC users can install the “Weather Wizard” desktop application to obtain the latest weather information. A personalised website that allows users to customise the information they receive is also available. The Dial-a-Weather service (187 8200) handled a total of 7.5 million calls during the year.

Professional meteorologists of the Observatory produced and hosted television weather programmes for broadcast through major television channels in the morning and evening. The broadcast of weather program and a weekly educational feature “Cool Met Stuff” continued on television, YouTube and the “MyObservatory”

mobile application.

The Observatory launched “香港天文台 HKO” Facebook page and “hk.observatory” Instagram platform in March 2018. As at the end of the year, recorded followers are over 120,000 and 12,000 respectively.



“香港天文台 HKO” Facebook page and “hk.observatory” Instagram platform

In 2018, a total of 64 government bureaux, departments and related organisations subscribed to the services of the Observatory through the Government Weather Information Server (GOWISE). Specialised weather services were also provided to utility companies, public transport operators, engineering contractors and information providers on a cost-recovery basis. A total of 106 clients subscribed to the Observatory’s specialised services in 2018, generating a revenue of about \$0.7 million.

The Observatory maintains a close surveillance of the weather at and around the Hong Kong International Airport (HKIA) and provides the aviation community with the weather information needed for its operations. In 2018–19, a wake vortex study for landing and departing aircraft at the HKIA commenced as a joint undertaking of the Airport Authority Hong Kong (AAHK) and HKO.

Local, Regional and International Collaborations

The Observatory established the following local, regional and international collaborations in 2018-19:

- Signing a Memorandum of Understanding (MoU) with World Meteorological Organization (WMO), supporting WMO's initiative in establishing the Global Multi-hazard Alert System (GMAS);



The Director of the Observatory, Mr Shun Chi-ming (left), signed a Memorandum of Understanding with the Secretary-General of the World Meteorological Organization, Professor Petteri Taalas (right), to further strengthen meteorological co-operation.

- Co-operating with China Meteorological Administration, the WMO Global Multi-hazard Alert System for Asia (GMAS-A) was launched during the Second China-ASEAN Meteorological Forum;



The Director of the Observatory, Mr Shun Chi-ming, attended the Second China-ASEAN Meteorological Forum held in Nanning and delivered a keynote presentation on the launch of the World Meteorological Organization Global Multi-hazard Alert System for Asia (GMAS-A), jointly developed by the Observatory and the China Meteorological Administration.

- The Observatory was designated as a Regional Specialized Meteorological Centre (RSMC) for Nowcasting for the Asian region in June this year, and commenced operation after the launch ceremony officiated by Secretary-General of the WMO;



The Director of the Observatory, Mr Shun Chi-ming (right), and the Secretary-General of the World Meteorological Organization, Professor Petteri Taalas (left), officiate at the opening ceremony of the Regional Specialized Meteorological Centre for Nowcasting

- The Asian Aviation Meteorological Centre (AAMC), jointly established by the Observatory, the Civil Aviation Administration of China (CAAC) and the China Meteorological Administration (CMA), commenced operation in July, providing en-route hazardous weather information of the region and improving aviation safety and efficiency;



The Asian Aviation Meteorological Centre (AAMC), jointly established by the Observatory, the Civil Aviation Administration of China (CAAC) and the China Meteorological Administration (CMA), commenced operation.

- The Observatory was also designated by WMO as a Testbed for Doppler Light Detection and Ranging (LIDAR) systems for aviation application, to promote collaboration between National Meteorological and Hydrological Services (NMHSs) in testing, development and standardization of meteorological instruments;
- The Observatory attended the Symposium on Meteorological Development Plan for Guangdong-Hong Kong-Macao Greater Bay Area and discussed with CMA and Macao Meteorological and Geophysical Bureau (SMG) in

detail how to take forward the initiatives in the "Meteorological Development Plan";



The Director of the Observatory, Mr Shun Chi-ming (fifth right), and the Administrator of the China Meteorological Administration (CMA), Ms Liu Ya-ming (sixth left), attended the Senior Management Meeting between CMA and the Observatory.

- At the invitation of the WMO, the Observatory, first sent an officer to visit the United Nations (UN) Headquarters to assist in developing WMO's new support services for the UN Operations and Crisis Centre (UNOCC) and the UN Secretary-General's Office.

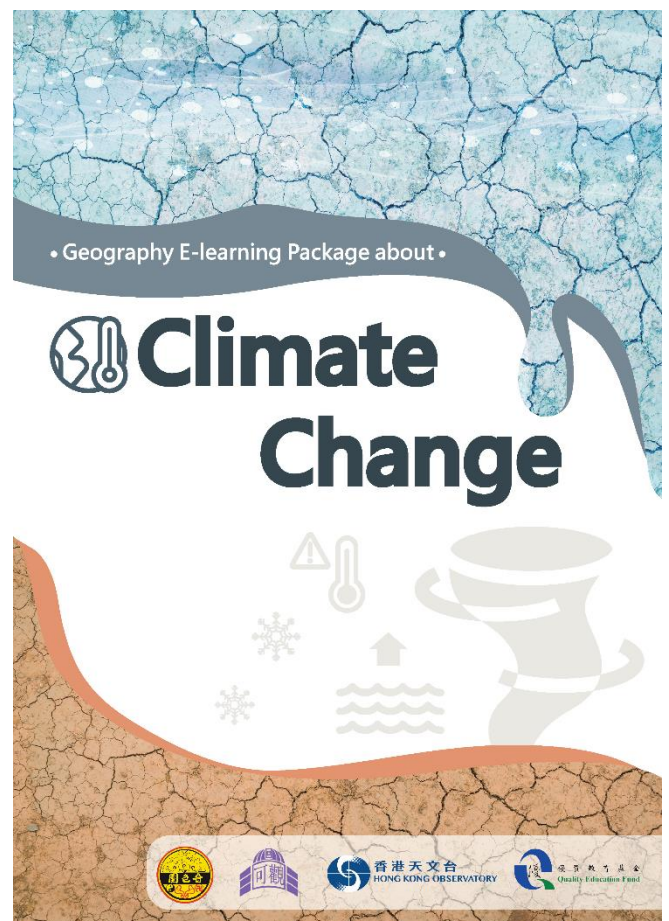
### Public Education

The Observatory promotes awareness of hazardous weather and the impacts of climate change and radiation. In 2018, the Observatory continued to produce a weekly educational series, Cool Met Stuff, for public broadcast on televisions, YouTube, the Observatory's Facebook page and the MyObservatory. Just before Severe Typhoon Mangkhut hitting Hong Kong in September, a special series of Cool Met Stuff on typhoon hazards was broadcasted with the aim of urging members of the public to take necessary precautions in reducing possible losses. A special series of Cool Met Stuff was also produced after the passage of Mangkhut in recording the storm surges and associated damages brought to various areas of Hong Kong.



"Cool Met Stuff" – "Special Series for Mangkhut"

During the year, the Observatory further developed the microclimate stations and provided support to the multi-function smart lamppost project to promote smart city development. In collaboration with the Ho Koon Nature Education cum Astronomical Centre, a curriculum-based climate change education package was compiled for secondary schools. The Observatory joined hands with the Agriculture, Fisheries and Conservation Department to produce an album on "Climate Change and Biodiversity in Hong Kong" to promote awareness and actions to combat climate change and conserve biodiversity.

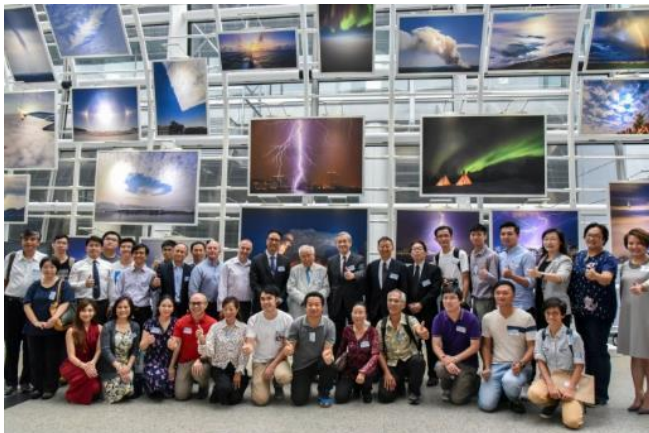


The cover of "Geography E-learning Package about Climate Change"



The cover of "Climate Change and Biodiversity in Hong Kong"

In 2018, the Observatory organized a “Cloud-sourcing: In Touch with Weather from Land, Sea and Air” photo and video exhibition at the Hong Kong International Airport to enhance public awareness and understanding of changes in the weather, thereby bringing people closer to nature.



A group photo of guests and award winners in front of the “Cloud-sourcing: In Touch with Weather from Land, Sea and Air” Photo and Video Exhibition

In 2018-19, the Observatory organized a “1-Minute Weather” Time-lapse Video Competition with support from Facebook, to encourage the public in taking time-lapse weather videos and sharing the videos with family and friends, so as to enhance public understanding of weather and climate change.



The Director of the Hong Kong Observatory (HKO), Mr Shun Chi-ming (left), and the Head of Public Policy for Hong Kong and Taiwan of Facebook, Mr George Chen, officiate at the launch ceremony of the “1-Minute Weather” Time-lapse Video Competition organised by the HKO and supported by Facebook.

## RADIATION MONITORING AND ASSESSMENT

The Observatory monitors ambient radiation levels in Hong Kong and conducts radiological measurements on air, soil, water and food samples. In the event of a nuclear emergency, the Observatory will notify and advise government departments on the possible consequences in Hong Kong and recommend protective actions. Relevant information on radiation levels and the latest developments will be provided to the public. The Observatory organises training and exercises on radiation monitoring for other government departments involved in the contingency plan for nuclear emergencies in Hong Kong. The work involves:

- Operating a network of radiation monitoring stations, an aerial radiation monitoring system, two radiological survey vehicles, a radiation laboratory and an emergency radiation data management system;
- Keeping abreast of the latest development on the methodology for nuclear accident consequence assessment; and
- Planning and participating in exercise and drills in response to nuclear emergencies.

In 2018-19, all radiation monitoring and assessment work in this programme was carried out satisfactorily. All equipment was maintained in a

state of readiness. The radiation laboratory and the ambient gamma radiation level measurement service successfully received the latest ISO 9001:2015 certification. Inter-comparisons between Hong Kong and Guangdong on radiological measurements continued. The Observatory continued to conduct exercises, drills and training on radiation monitoring and assessment. Implementation of new radiation monitoring and assessment facilities, in particular the replacement alpha spectrometry system at the radiation laboratory, high pressure ionization chambers of the Radiation Monitoring Network and the automatic gamma spectrometry system at Ping Chau were in steady progress. In-house produced video clips on radiation and nuclear emergency preparedness were shown on “Cool Met Stuff” channel on the Observatory’s website, the “MyObservatory” mobile application and Youtube. The Observatory also conducted outreach activities such as public and school talks, exhibitions and visits to radiation monitoring facilities to promote public education.

## **TIME STANDARD, GEOPHYSICAL AND CLIMATE SERVICES**

The Observatory maintains the Hong Kong time standard, provides time signals for the public and contributes to the International Bureau of Weights and Measures for the determination of the universal standard time. It provides geophysical, oceanographic, astronomical and climatological information to meet the requirements for planning, engineering design and environmental impact assessments. It monitors earthquakes and the sea level and releases related information to the public, including the operation of the tsunami warning system. It also keeps abreast of research and development on international issues such as global climate change and advises the public and government departments on the likely implications.

Initiatives undertaken in 2018-19 included:

- Providing meteorological data and scientific support to studies conducted by relevant government bureau/ departments on the mitigation, adaptation and resilience-building measures required for combating climate change and its impacts including extreme weather events;

- Conducting school talks on climate change, providing educational videos, and publishing articles and latest research findings of global climate on HKO’s webpage to promote public understanding and awareness of climate change and its impacts;
- Collaborating with the Ho Koon Nature Education cum Astronomical Centre to produce a curriculum-based climate change education package for secondary schools;
- Collaborating with the Agriculture, Fisheries and Conservation Department to produce a book for public education on combating climate change and conserving biodiversity;
- Strengthening the resilience of the tide stations through additional sensors and enhanced facilities;
- Participating in the Pacific-wide Tsunami Exercise “PacWave18” organised by the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization;
- Enhancing the reliability of time measurement through participation in the calibration programme under the auspices of International Bureau of Weights and Measures (BIPM);
- Enhancing the mobile webpage on “Astronomy & Calendar” to provide an interactive diagram of sun path and information of moon phases; and
- Conducting a joint webcast of the total lunar eclipse on 28 July 2018 with the Hong Kong Space Museum, the Ho Koon Nature Education cum Astronomical Centre, the Po Leung Kuk Ngan Po Ling College and the Hong Kong Sheng Kung Hui Solar Tower, attracting about 70 000 page views .

## **PUBLIC OPINION SURVEY**

In the public opinion survey conducted in 2018, the public considered that on average 78% of the weather forecasts issued by the Observatory were accurate, and gave an average score of 7.7 (out of 10) to its overall service.



## AWARDS WON BY THE OBSERVATORY

The Observatory won a number of awards in 2018-19:

- In 2018, the Observatory has successfully been conferred the renewal of winning the Manpower Developer (MD) Award, demonstrating its outstanding achievements in five areas, namely, "Leading a Learning Culture", "Resources Planning", "Training and Development System", "Performance Management", and "Corporate Social Responsibility in Manpower Development";



Certificate of Manpower Developer awarded to the Observatory

- The Hong Kong Awards for Environmental Excellence (HKAEE) is led by the Environmental Campaign Committee alongside the Environmental Protection Department and in conjunction with a number of organizations. It aims to encourage organizations to implement environmental management, to measure organizations' performance on their commitment to environmental management, and to recognize organizations with excellence performance on environmental management. The Observatory has been awarded the Certificate of Merit for the sixth time in the HKAEE 2017 under the Public Services Sector, which recognizes its contributions to environmental protection;



The Hong Kong Awards for Environmental Excellence

- The Observatory has won the Social Capital Builder Logo Awards 2018 (the Awards) organized by the Community Investment and Inclusion Fund of the Labour and Welfare Bureau. The Awards aim to commend organisations for their contribution to the development in the six core social capital dimensions, including "Social Networks", "Mutual-help and Reciprocity", "Trust and Solidarity", "Social Participation", "Social Cohesion and Inclusion" and "Information and Communication".



Social Capital Builder Logo Awards 2018

## OUTLOOK

The Observatory will continue to enhance its services in the following aspects:

### Weather Services

- Continue to provide weather forecasts, regional weather services and extended weather outlook, and conduct research and enhance forecasting and warning services on high-impact weather;
- Strengthen efforts in public communication of high-impact weather, outreach and public educational activities to enhance public awareness of and preparedness for natural disasters and impact of climate change;
- Enhance the provision of forecast tracks of tropical cyclones over the western North Pacific;
- Continue to promote the use and continuous improvement of “MyFlightWx” in collaboration with airlines to provide the latest inflight weather information to flight crew electronically;
- Continue to take forward the implementation of meteorological facilities in support of the Three-Runway System project;
- Continue to implement urban-scale weather monitoring (including the implementation of microclimate stations), provide support to the Innovation and Technology Bureau’s pilot Multi-functional Smart Lampposts scheme, and develop forecasting products in support of initiatives under the Smart City Blueprint;
- Continue to develop nowcasting products on high-impact weather for local and regional applications;
- Conduct a meteorological study for Government Flying Service’s new Forward Base at Kai Tak;
- Continue to enhance marine meteorological observations and the provision of weather information to the marine community;
- Continue to develop social media services for enhancing communication to the public of weather information, forecasts and warnings, by means including timelapse video competition on such platforms to promote appreciation of weather and sharing of weather videos;
- Continue to enrich the content of the “MyObservatory” mobile application;
- Continue to enhance the “Met on Map” service with more weather and geophysical information;
- Continue to enhance the automatic weather station network for the provision of more weather information;
- Develop a website to provide weather information services for the Guangdong-Hong Kong-Macao Greater Bay Area in collaboration with meteorological authorities of Guangdong and Macao; and
- Develop automatic forecast products for major cities and airports around the world.

### Radiation Monitoring and Assessment

- Implement the agreed arrangements between Hong Kong and Guangdong on radiation monitoring and assessment;
- Conduct drills and exercises on emergency response in conjunction with other government departments as well as the relevant Guangdong counterparts;
- Organise training on radiation monitoring and assessment;
- Take forward the enhancement of radiation monitoring and assessment facilities; and
- Further promote public education on radiation by launching an e-book on radiation and revamping the “Radiation Monitoring, Assessment and Protection” webpage.

### Time Standard, Geophysical and Climate Services

- Undertake and support monitoring and assessment of earthquake, tsunami risk and sea level in the region;
- Continue to strengthen the resilience of the tide stations to better cope with extreme sea level conditions;
- Monitor and study climate change issues, provide relevant government bureau / departments with latest information and assessment of climate change and its impacts to support their studies, and develop new methodology for the projection of likely impacts on Hong Kong;
- Upgrade relevant hardware of the timing system to meet the growing demand for HKO's Internet time service;
- Engage various stakeholders in promoting the effective use of climate information and in developing climate-related services in support of the emerging needs of different sectors and government bureaux/departments; and
- Support outreach activities to promote the understanding of the mitigation, adaptation and resilience-building measures required in combating climate change impacts.