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Meteorological Services for the Islands District

<u>Purpose</u>

This article introduces the works of the Hong Kong Observatory (HKO) in Islands District and relevant weather services for the district.

Climate of the Islands District

2. The Islands District consists of around twenty offshore islands of various sizes covering widely the southern and southwestern part of Hong Kong waters, including the populated islands like Lantau, Cheung Chau and Lamma. Lantau Island is the largest in size among the others in the district. The Hong Kong International Airport and Tung Chung new town located at its northern part are the most developed zones of the district. In the central part of the Lantau, there is a range of mountains consisting of Nei Lak Shan, Lantau Peak, Sunset Peak, Yi Tung Shan and Lin Fa Shan. Hence, the climate of the Island District is mixed with the characteristics of ocean, urban and high ground with a large regional variation. Affected by oceanic climate, the mean temperature for the islands surrounding Lantau, like Cheung Chau, Ping Chau and Lamma is around 22.7 degrees. It is warmer over the more populated urban region at the northern part of Lantau with the mean temperature of about 24.1 degrees. On the high ground over Lantau, it is relatively cooler with a mean temperature of only around 19.2 degrees. The average annual rainfall amounts at Ngong Ping and Cheung Chau are about 2100 millimetres and 1620 millimetres respectively. About 80% of the annual rainfall is received during the rain season spanning from May to September.

Monitoring Stations in the Islands District

3. The Observatory has established Automatic Weather Stations (AWS) in Waglan Island, Cheung Chau, Chek Lap Kok, Peng Chau, Lantau Island and Lamma Island. In particular, the AWS at Waglan Island and Cheung Chau have a long history.

4. Early in 1952, the Observatory set up weather station at Waglan Island and the Observatory's staff then made hourly weather observations during daytime. In 1964, colleagues of the Marine Department took over the task. In 1989, the Observatory installed an AWS there to make weather observations round-the-clock. In 2007, a visibility meter, two sets of network cameras and a fully redundant backup AWS were installed to strengthen the functions of the AWS at Waglan Island. At present, the Waglan Island AWS collect various meteorological information including wind direction, wind speed, rainfall, air temperature, relative humidity, air pressure, sea surface temperature, visibility, tides and real-time weather photos.

5. The weather station at Cheung Chau was established in 1953 which was then named as the Cheung Chau Aeronautical Meteorological Station. Weather Observatory's observations made by the staff were sent through radio-transmission to the Kai Tak meteorological office. In 1970, the Cheung Chau meteorological station was relocated from the location near the Kwun Yam Wan road to the current site at Cheung Chau peak road west. In 1992, an AWS was installed and weather observations at Cheung Chau were automated. Α weather camera was erected in 2004. In 2009, a wind station was established near the Cheung Chau beach to serve as backup of the Cheung Chau AWS in wind measurements. Currently, meteorological information collected by the Cheung Chau AWS includes wind direction, wind speed, rainfall, air temperature, relative humidity, air pressure and real-time weather photos.

6. To enhance the provision of regional weather information, the Observatory installed weather cameras at Sha Lo Wan and Cheung Chau Tung Wan to provide real-time weather photos there.

7. In 2005, the Observatory installed an AWS at Peng Chau to measure air

temperature, relative humidity, wind speed, wind direction and air pressure. In addition, real-time weather photos overlooking Penny's Bay and Hong Kong Disneyland were provided to enable the public to view the weather conditions there.

8. The Observatory has set up automatic raingauges at Hung Shing Yeh Wan in Lamma Island, Discovery Bay and Ngong Ping in Lantau Island. Moreover, rainfall data were received in real-time from raingauges of the Geotechnical Engineering Office at Po Toi, Picnic Bay in Lamma Island, Peng Chau, Cheung Chau, Mui Wo, Siu Ho Wan, Tung Chung, Tung Chung road, Cheung Sha, Tai O, in Lantau Island as well as the raingauge of the Drainage Services Department at Mui Wo in Lantau Island. The information is used as reference for the issurance of rainstorm and landslip warnings. Furthermore, the data from the above rainguages serves for the analysis of rainfall changes in Hong Kong and for the production of rainfall distribution map which is being displayed the website in of the Observatory (http://www.hko.gov.hk/wxinfo/rainfall/isohyete.shtml).

9. The Observatory has a series of meteorological facilities to support the operation of the Airport Meteorological Office, and monitoring of windshear, turbulence and thunderstorm near the Airport, in order to provide alerts and warnings to pilots and airlines. The meteorological instruments include automatic weather stations, buoy weather stations, the Terminal Doppler Weather Radar, LIDARs, wind profilers. In particulars, real-time meteorological data from the automatic weather stations like Ngong Ping and Ping Chau are made available on the Regional Weather web page that people can have most updated weather information for going countryside and hiking.

10. The Observatory is planning to set up an AWS at Yung Shue Wan in Lamma Isand to provide measurements of wind speed, wind direction and rainfall. The AWS construction work is expected to be completed next year.

11. Cheung Chau Seismograph Station, located inside Cheung Chau Meteorological Station, commenced operation in 1979. Keung Shan Seismograph Station, located at Lantau Country Park Keung Shan Management Centre, commenced operation in 1997. The Hong Kong Seismograph

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Network has full coverage of Hong Kong and monitors earthquakes in the territory.

12. Since 1979, there were altogether six locally felt earth tremors with epicentres located within the territory of Hong Kong. Apart from one event at Maipo, all other five earthquakes occurred over the sea east of Lantau Island with two in 1982 and three in 1995. The highest magnitude was Magnitude 3.1, and all their intensity were lower than V(5). Such minor earthquakes did not cause any damages to buildings.

13. Shek Pik tide gauge station started operation in 1998, providing real-time sea level data for the western waters of Hong Kong, including the seas near Lantau. The data is useful to monitoring of storm surges and tsunamis and studies on long-term sea level change in Hong Kong.

14. To promote deeper appreciation of weather information among the communities and to strength cooperation with them, the Observatory, in collaborative effort with the Department of Applied Physics of the Hong Kong Polytechnic University, established a "Community Weather Information Network" (Co-WIN). Co-WIN spans a total of 92 members (up to 17 Nov There are two members in the Islands District: 2010) over Hong Kong. Cheung Chau Sacred Heart School and Tung Chung Catholic School. Co-WIN (http://weather.ap.polyu.edu.hk/index.php) provides additional information of weather and UV index from communities. This helps the residents to better understand the weather situation in their vicinity. The Observatory appreciates the assistance from the District Council for the promotion of Co-WIN, so that there will be more community stations joining us and to provide extensive weather information for the community members and even to people all over Hong Kong.

15. In order to determine whether the operation of the Guangdong Daya Bay Nuclear Power Station will affect the environmental radiation levels in Hong Kong, the Observatory implements the Environmental Radiation Monitoring Programme. Under the programme, a thermoluminescent dosimeter (TLD) network has been established to measure ambient gamma doses accumulated over a long period. The network comprises 27 monitoring points over the territory, with one located at Cheung Chau Meteorological Station. Another component of the programme is to carry out radioactivity measurements of food and environmental samples collected from various parts of the territory. These samples include seabed sediment collected at Picnic Bay and Western Anchorage, seafood samples collected near Cheung Chau and land soil samples collected at Tung Chung, Shek Pik Reservoir, Cheung Chau, Lamma Island, Peng Chau, Silvermine Bay and Tai O.

Enhanced tropical cyclone track webpage

16. The Observatory launched a tropical cyclone track information webpage based on a geographic information platform in July. Users can display tropical cyclone positions and tracks over a detailed map. They can also zoom in or out the map, pan to their area of interest, and view detailed information of the tropical cyclone, including its latitude, longitude, classification and maximum sustained wind. Multiple tropical cyclones can also be displayed on the same map.

Early Storm Surge Alert System for Tai O

17. Tai O was severely flooded due to the combined effect of storm surge and spring tide during the passage of Typhoon Hagupit in September 2008. Since 2009, the Hong Kong Observatory has been operating an early storm surge alert system for alerting Tai O residents and relevant government departments to an imminent threat of serious flooding caused by storm surge. This would enable the residents to take necessary precautions and seek refuge in a safe location as well as the government to mobilize her resources for evacuation and relief efforts. HKO would issue early alerts of possible storm surge affecting Tai O, aiming at a few hours ahead, to key government official as well as to the community representatives using the Short Message Service (SMS). The early alert system proved to be very effective during the passage of Typhoon Koppu in September 2009 by providing alert for villagers to take early and suitable precautionary measures.

"Wind Forecast for Water Sport Activities" Webpage

18. Launched early this year, the webpage provides computer-generated weather forecasts at ten hotspots of water sports in Hong Kong for reference by the members of the public. With the new service, people stand a better chance of finding suitable locations for their water sports. Following the operation of a new generation of computer models at the Observatory, the period of the hotspot weather forecast is lengthened from one to three days.

UV Index Information Service

19. There are many outdoor facilities in the Islands District. Workers or people engaging in outdoor activities can make use of the Observatory's UV index and its forecasting services to assess the intensity of UV radiation and take appropriate protective measures. Relevant UV information is made available to the public through the radio, TV and the Observatory's website.

Location-specific Lightning Alert Service

20. The Location-specific Lightning Alert Service provided by the Observatory can help the public assess the risk of lightning at their locations. People can select their location of interest as well as a maximum of three alert circles of different sizes in the Observatory's Location-specific Lightning Alert webpage. Alert messages will be automatically generated when lightning is detected within the specified ranges. The District Council and other organizations in the district can make use of this service when organizing outdoor activities, especially during the rain season.

"MyObservatory" Location-specific Weather Service

21. The Observatory launched "MyObservatory", a location-specific weather service in March 2010. By making use of positioning software to

estimate the user's location, this new service provides the latest weather information of nearby weather stations through webpage, personal digital assistance (PDA), and iPhone. The information includes temperature, relative humidity, rainfall, wind direction, wind speed and weather photo. Residents in Islands District can acquire latest weather information in the district by using the new service. The page views to the "MyObservatory" exceed 100 million since its launch.

"Digital Weather Forecast" webpage

22. Although Hong Kong is small, temperatures and winds can vary over different regions. The Observatory launched a "Digital Weather Forecast" webpage in March, providing weather forecast in fine spatial and temporal details. The webpage shows hourly changes in temperature, wind direction and speed for the next day, at a resolution of 10 kilometres over Hong Kong and the neighbouring Pearl River Estuary region. People in the Islands District can make use of this webpage to appreciate the change in temperatures and winds over the region.

"Rainfall Nowcast for the Pearl River Delta Region" Webpage

23. The Observatory launched the "Rainfall Nowcast for the Pearl River Delta Region" webpage in late 2008. It displays the computer-generated evolution within the next two hours about the forecast rainfall distribution over the Pearl River Delta region, including Hong Kong. The webpage was revamped in June this year. The new webpage features a four-dimensional (4D) space-time map of the globe with user-selectable geographical information content. Advanced users may also download the forecast information of interest for direct use. Members of Islands District may make reference to the forecast rainfall maps before they decide on their travel plan.

"Computer Forecast Weather Map" Webpage

24. The "Computer Forecast Weather Map" displays computer-simulated evolution of weather patterns over East Asia and the western North Pacific. Since September this year, the update frequency of the predictions has been increased from twice per day to four times per day. The products include weather, temperature, mean sea level pressure, relative humidity and winds. These enhancements are made possible through the operation of a new generation of numerical weather prediction models at HKO. The highest resolution of weather models previously run by the Observatory was 20 km. The new suite of models offers a resolution down to 2 km, providing more details on weather systems affecting the territory.

Beta Version of Greater Pearl River Delta Weather Warning Webpage

25. With the rapid development of the Greater Pearl River Delta, people (including those who work or go to school crossing the boarders) are traveling more frequently in the region. To provide weather warning information for people on the move in this region, HKO worked together with the Guangdong Meteorological Bureau and the Macao Meteorological and Geophysical Bureau to develop a portal webpage displaying real-time weather warnings in 11 cities of the Greater Pearl River Delta region. This portal webpage also provides a guide to the weather warning signals for the cities in the region.

Weather Video on YouTube

26. The Observatory produces and uploads short videos about the weather to the YouTube website every week. The videos also explain weather systems affecting Hong Kong and relevant meteorological knowledge.

Future Version of World Weather Information Service Website

27. The Observatory launched the future version of the World Weather

Information Service (WWIS) in April, providing official weather forecasts for cities around the world, under the auspices of the World Meteorological Developed by the Observatory, the brand-new future version Organization. gives Internet users more intuitive and flexible access to the latest official weather forecasts from 124 countries and territories around the world. It features a versatile 'fly-over' function to any part of the world. Users can obtain the latest weather forecast for any of the 1,300 cities worldwide by a simple click. People can visit this website to readily acquire weather information for planning of travel or duty visits. The website was showcased in the MeteoWorld Pavilion at the Shanghai World Expo 2010. The total page visits of the WWIS future and existing versions exceed 100 million so far this year.

HKO Delivers Weather News on Twitter

28. The Observatory launched a trial service on Twitter (http://twitter.com) in September to deliver the latest weather warnings and HKO news. Follow HKO's account, "HKObservatory", to stay connected with us and be informed of the latest weather news.

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Annex

Operation procedures of Early Storm Surge Alert System for Tai O

- 1. During the passage of a tropical cyclone, when the Hong Kong Observatory (HKO) forecast the sea level at Tai O will reach or exceed 3.3 mCD in the next five hours, SMS message will be sent to Tai O resident representatives and relevant government departments. Upon issuance of the storm surge alerts for Tai O by HKO, all relevant departments should mobilize their resources and deploy them to Tai O as appropriate according to instructions set out in the operation manual.
- 2. When the seawater level reaches 3.0 mCD after the SMS storm surge alert has been issued by HKO, Drainage Services Department (DSD) will alert relevant parties to take responsive actions by autodialing system via telephone messages or SMS message (to government parties only).
- 3. When the seawater has subsided, it is important that emergency relief assistance should be offered at once to those victims who have been affected by the flood. When the monitored seawater level falls below 3.0 mCD, DSD will alert relevant parties to take respective actions by autodialing system via telephone messages or SMS messages (to government parties only).
- 4. The details of the alert system are set out in the OPERATION MANUAL EARLY ALERTING SYSTEM, EMERGENCY RELIEF AND SERVICES FOR SERIOUS FLOODING IN TAI O maintained by the IsDO of HAD.