Speech by Mr SHUN Chi-ming, Director of the Hong Kong Observatory
23 March 2015

I am glad to meet all of you on the World Meteorological Day today. Before reporting on the latest developments in the Hong Kong Observatory, let me first introduce my Assistant Directors. They are:

1. Dr CHENG Cho-ming, responsible for public weather services
2. Miss LAU Sum-yee, responsible for aviation weather services
3. Mr LAI Sau-tak, responsible for climate and geophysical matters
4. Mr TSUI Kit-chi, responsible for radiation monitoring and instruments

Let's first review the weather during the past year.

The World Meteorological Organization (WMO) has ranked 2014 the hottest year on record since 1880, which is also a consequence of global warming. Locally, the weather in Hong Kong in 2014 was also marked by unusually high temperatures in summer and autumn. The mean temperature from June to November 2014 recorded at the Observatory (27.6 degrees) was the highest for the same period since record began in 1884. Amid the global warming background, high temperature records in Hong Kong may become easier to be broken in the future, with heat waves likely to become more frequent. I would like to remind members of the public to be more aware of the impact of hot weather, and pay attention to the Very Hot Weather Warning and the Hot Weather Special Advisory launched last year for taking the appropriate precautionary measures.

Apart from the trend of getting more hot weather, the chance of occurrence of extreme weather events, including stronger typhoons and more intense rainstorms, will likely increase due to global warming. Whatever happens globally, in terms of climate change, Hong Kong will not be immune from its impact. As such, the Observatory has conducted a series of public educational programmes during the past year to raise public awareness and preparedness on weather and climate change, including the TV documentary on "Meteorology Series IV", public course on weather observations and public seminars, which were all well-received by public. In support of disaster mitigation initiatives, the Observatory has recently produced a short video on the threat of typhoon-related hazards on behalf of the Typhoon Committee in the Asia/Pacific region to facilitate sharing and promotion by Members (Note). The video was also premiered at the Third UN World Conference on Disaster Risk Reduction held in Sendai, Japan during 14-18 March 2015, as well as posted on the websites of the Observatory and Typhoon Committee.

Apart from facilitating international cooperation, the Observatory has also stepped up regional meteorological cooperation. The Observatory and the Guangdong Meteorological Bureau signed a new "Co-operation Agreement in Meteorological Science and Technology" to expand the collaboration between the two sides in meteorological science and technology, including the enhancement of weather observation network, and development of numerical weather prediction technology. In the coming year, we will continue to seek more in-depth collaboration with our counterparts in nearby regions so as to enhance the quality of meteorological services.

On climate change impacts, based on the Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change, the Observatory has completed the studies of the impacts to Hong Kong in terms of extreme temperatures and sea level rise in the 21st century. For extreme temperatures, the number of hot nights and very hot days will increase dramatically in the 21st century while the number of cold days will decrease significantly (Figure 1). I believe that the public could understand fairly well the reason behind these changes. What worries us most is the projected rise in sea level. Under the high greenhouse gas emission scenario, the sea level is expected to rise by a maximum of more than 1 m by the end of this century when compared to the average sea level in the past twenty to thirty years. To be exact, the average for 2081-2100 will be 0.63 to 1.07 m above the average for 1986-2005 (Figure 2). With the elevated sea level, the risk of typhoon-generated storm surges affecting Hong Kong will be enhanced. The video "Chasing Ice" that I have shared with you just now will enable members of the public to see for themselves the rapid melting of glaciers over Greenland – a clear evidence of global warming – and through which people can independently judge whether the so-called "climate change deniers" are right or wrong. I would like to take this opportunity to reiterate: ***Climate change is here and now. We need to take positive actions to combat climate change without any further delay***. Indeed the theme of the World Meteorological Day this year is "Climate Knowledge for Climate Action". The Observatory and our meteorological counterparts around the world are trying our best to promote the scientific facts and climate change knowledge so that the public could obtain the correct understanding of global warming. I would also like to appeal all our media friends to communicate the correct messages of climate change to the public.

Looking ahead, we plan to launch a series of **new services and products**:

In view of the increasing awareness on climate change and extreme weather issues, as well as the importance of using climate information by various sectors of the society to plan for future development, the Observatory has updated the **Climatological Information Services Webpage** (Figure 3) today. The new version provides a one-stop-shop online access to climate data of Hong Kong in the past 130 years, the latest climate news, for example, the latest update on El Nino, and educational resources on climate subjects. With improved user interface and enhanced features, a whole range of climate information and statistics can be readily accessed by public and users in different sectors.

The Observatory also launches today a new version of **Satellite Imagery Webpage** (Figure 4a) which aims at providing better regional and global coverage for the public (Figure 4b), especially the travellers who would like to appreciate the weather conditions of their destinations, through the extended satellite imageries and large-area satellite imageries covering regions around the world. GIS function has also been included to improve user experience and enable users to retrieve more useful information. To heighten public interest of weather phenomena and meteorology, the new webpage also includes a regularly-updated **Satellite Imagery of Interest gallery** (Figure 4c). For example, the fallstreak hole widely reported by members of the public early this year as seen by the satellite is included in the gallery.

For **weather forecast and warning services**, with the advancement in weather prediction technology, the accuracy of forecasts has been improving gradually. Following the launch of the well-received 9-day weather forecast in April 2014, the Observatory extended the “Automatic Regional Weather Forecast” from seven days to nine days late last year. In 2014, the Observatory’s online information service registered more than 72.5 billion page views, another record high. 62% of this figure comes from the popular “MyObservatory” mobile application (i.e. 45.3 billion page views). This year the Observatory will put further effort to enhance the “Automatic Regional Weather Forecast” to consolidate the hourly weather forecasts at different locations in Hong Kong and the Pearl River Delta region for the next nine days, as well as rainfall nowcast in the next two hours, to facilitate one-stop-shop access to the **Hong Kong 9-day Regional Weather Forecast** (Figure 5). Apart from launching a new iPhone version soon, the "MyObservatory" mobile application will also be progressively enhanced with the inclusion of the 9-day regional weather forecasts in the coming year (Figure 6).

For **tropical cyclone forecast**, the accuracy of the Observatory’s track forecast has improved in recent years. In particular, the average accuracy of the fifth-day forecast based on objective verification is now around some 400 kilometers, which is comparable to that for the third-day forecast when it was launched in 2003. The Observatory will extend the tropical cyclone forecast track from three days to five days ahead during the coming tropical cyclone season (Figure 7). On the other hand, I would like to emphasize that since the tracks of some tropical cyclones could be rather changeable, the error of the 5-day forecast could be rather large at times. We will highlight to the public about the uncertainties of the forecasts on the webpage providing the extended forecast, and will explain the corresponding information through our TV weather programmes.

To facilitate the public to grasp the weather information more easily, the Observatory will **revamp** the **front page of the Observatory’s website** (Figure 8). The new layout will provide the public with at-a-glance weather information pertaining to different weather scenario, for example, under tropical cyclone or rainstorm situation, the front page will show directly the tropical cyclone forecast track and the rainfall map respectively. Later this year, a new one-stop **Asian Regional Weather Information** (Figure 9) service hub will be launched to integrate various types of weather information on a Geographic Information System (GIS) platform (for example wind and temperature information overlaying on satellite image) for convenient browsing of regional weather information outside Hong Kong to meet the individual needs of members of the public.

For **weather monitoring**, the Observatory continues to adopt state-of-the-art technologies for comprehensive observation. Apart from the on-going effort to enhance the automatic weather station network with more observation sites, including the recent launch of the **Yuen Long Park temperature** as well as upcoming **new webcam weather photos**, a new **Terminal Doppler Weather Radar station at Brothers Point** in Tuen Mun will commence full operations shortly for detecting windshear over the airport and thus assuring aviation safety. At the same time, the Observatory has also completed installing a **new-generation dual-polarisation Doppler weather radar at Tate's Cairn** (Figure 10a) which will start operation in April. With data collection and analysis, it is expected that the capability in detecting hails and

estimating rainfall amount could be enhanced (Figure 10b). The Observatory has also recently enhanced **upper-air monitoring** capability by acquiring a portable upper-air sounding system (Figure 11). The system can be easily deployed to different locations or even on ships for measurement of meteorological parameters through the depth of the atmosphere, thus enhancing the mobility and the application of sounding work.

For **radiation monitoring**, the Observatory has acquired an **enhanced high volume air sampler** and a set of **online gamma spectroscopic analyser system**. They will be put into operation within this year, thus enhancing the capability of emergency radiation monitoring.

To **promote public interest in weather and cloud observations,** and to encourage the public to enjoy our rural areas and appreciate our sky more, the Observatory plans to launch a thematic webpage "**Weather Information for Outdoor Photography**" (Figure 12) this year to encourage and facilitate the public to undertake first-hand weather observations and share their weather photos. Weather information specifically tailored for weather photographers along with weather and cloud photos will be provided through the webpage to facilitate photographers in planning their observation activities, as well as better understanding of the science behind the weather phenomena.

For **public education**, in line with the theme of the World Meteorological Day this year - "Climate Knowledge for Climate Action", the Observatory will carry out a series of public outreach activities to promote weather and climate change knowledge to the public, including:

a) publishing a **pamphlet on the** "**Hong Kong in a Warming World**" to raise public awareness on climate change and its impact on Hong Kong (http://www.weather.gov.hk/climate_change/climate_change_e.pdf). I would like to request the help of media friends to publicize this pamphlet to the public.

b) launching a **mobile version of the "Education Resources" webpage** to facilitate access by mobile users to promote public education on meteorology. Interesting online quiz games (Figure 13) will also be included to heighten public's interest and understanding on meteorology, especially the younger generation (http://m.weather.gov.hk/education/m_edu_e.htm). "Gamification for education" will be our future direction of development of public education and promotion of scientific knowledge;

c) organising "**Weather Observation Competition 2015**" jointly with Ho Koon Nature Education cum Astronomical Centre, the Hong Kong Meteorological Society and the Community Weather Information Network to consolidate students' knowledge on weather observation through creative activities;

d) organising "**Sea Level Measurement Device Design Competition**" jointly with the Faculty of Engineering of the University of Hong Kong and the Hong Kong Meteorological Society to enhance students' awareness on climate change issues (http://i.cs.hku.hk/~sealevel/Index-English.php); and

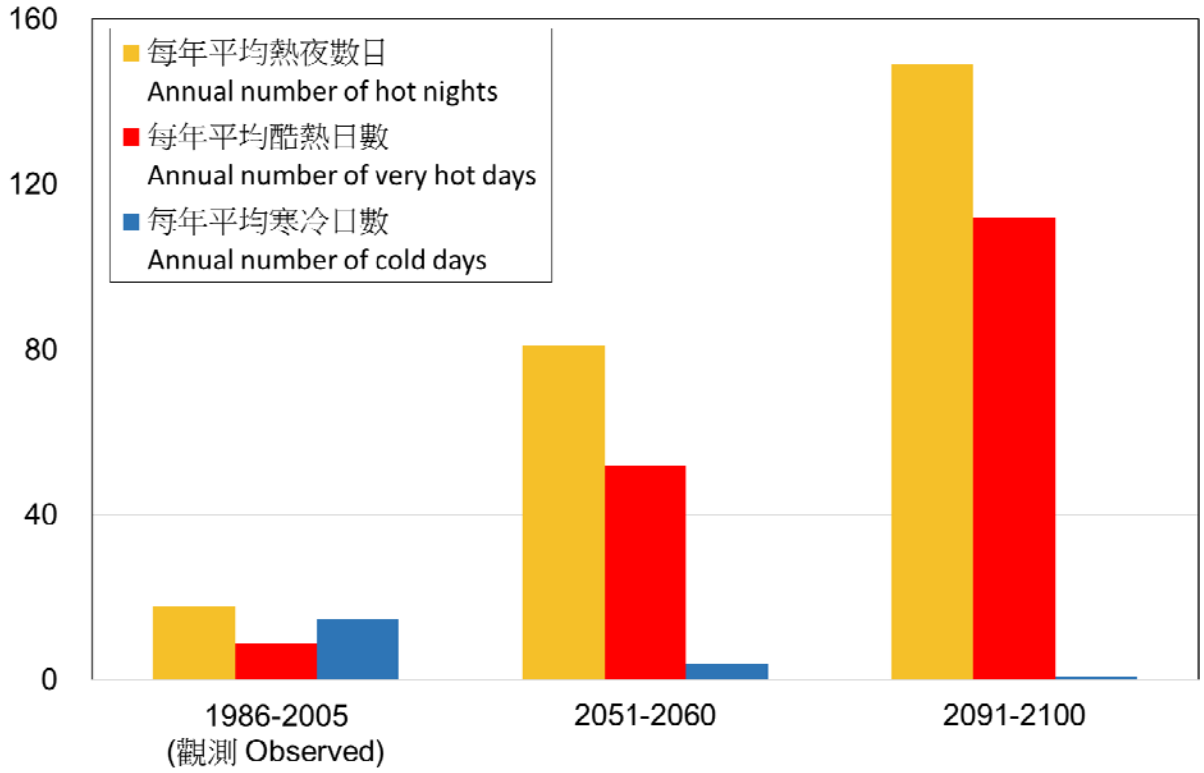
e) organising a **public talk with the theme "Climate Knowledge for Climate Action"** in co-operation with the Hong Kong Institution of Engineering and Technology and China Light and Power Ltd.

I understand that many of you are interested about what is in store for us in terms of the **Weather Outlook for this year** (Figure 14), which I will try to answer now. For 2015, after considering the latest status of El Nino and various objective data and criteria, we expect the **annual rainfall to be normal to below-normal** and the **number of tropical cyclones coming within 500 km of Hong Kong to be near normal, i.e. between four and seven**, with the **first tropical cyclone in the season expected to come in June or later.** As the rainy season approaches, I would also like to remind the public to remain vigilant against the threat of inclement weather. Last year, thunderstorms brought casualties. Apart from lightning strikes, strong wind gusts associated thunderstorms (called "Shi Hu Feng" by the local community) had also blown down scaffoldings and damaged properties from time to time. Furthermore, people being swept away by swells induced by far-away tropical cyclones were not uncommon in Hong Kong. To raise public awareness, two new **Announcements in the Public Interest** (API) will be launched later this year on "thunderstorms" and "tropical cyclone swells" (Figure 15).

Lastly, I would like to request your help in publicizing the **Observatory's Open Day** on the afternoon of March 28 and the day of March 29, when the Observatory headquarters and exhibits will be opened to the public. All are welcome. (http://www.hko.gov.hk/openday/2015/indexe.htm).

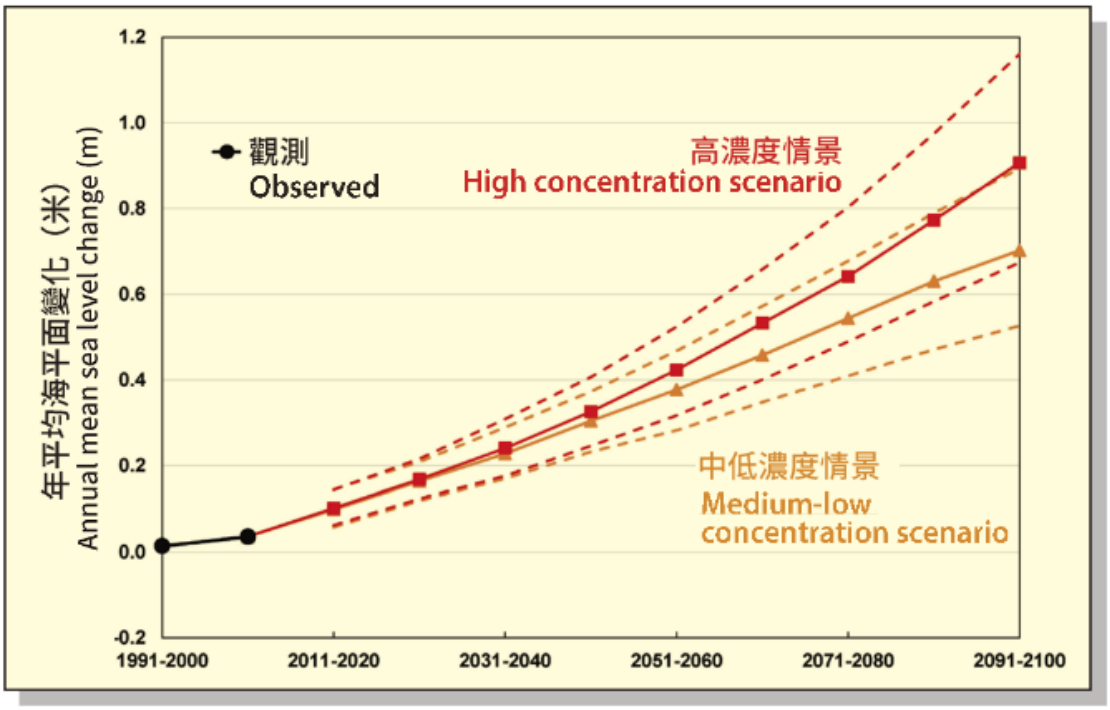
Let me stop here. If you have questions, my Assistant Directors and I will try our best to answer them. Thank you!

Note: The short video produced by the Observatory on the threats of typhoon-related hazards can be viewed at (available only in English) : https://www.youtube.com/watch?v=7v5f8GW_Mnc.



圖一：在高溫室氣體濃度情景下，香港年平均熱夜數目、酷熱日數和寒冷日數的未來推算。

Figure 1: Projected annual number of hot nights, very hot days and cold days in Hong Kong under the high greenhouse gas concentration scenario.



2081 至2100年的20年平均海平面高度變化 (米) The change of rise in mean sea level for 2081-2100 (m)	
中低濃度情景 Medium-Low concentration scenario	高濃度情景 High concentration scenario
0.67 [0.50 - 0.84]	0.84 [0.63 - 1.07]

圖二：21 世紀香港海平面推算

在高（紅色）和中低（橙色）溫室氣體濃度情景下香港及鄰近水域的平均海平面高度變化（相對於 1986-2005 年平均）的未來推算（實線是平均值，虛線是推算結果的可能範圍）。歷史觀測以黑線表示。

Figure 2: Sea level projection of Hong Kong climate for the 21st century

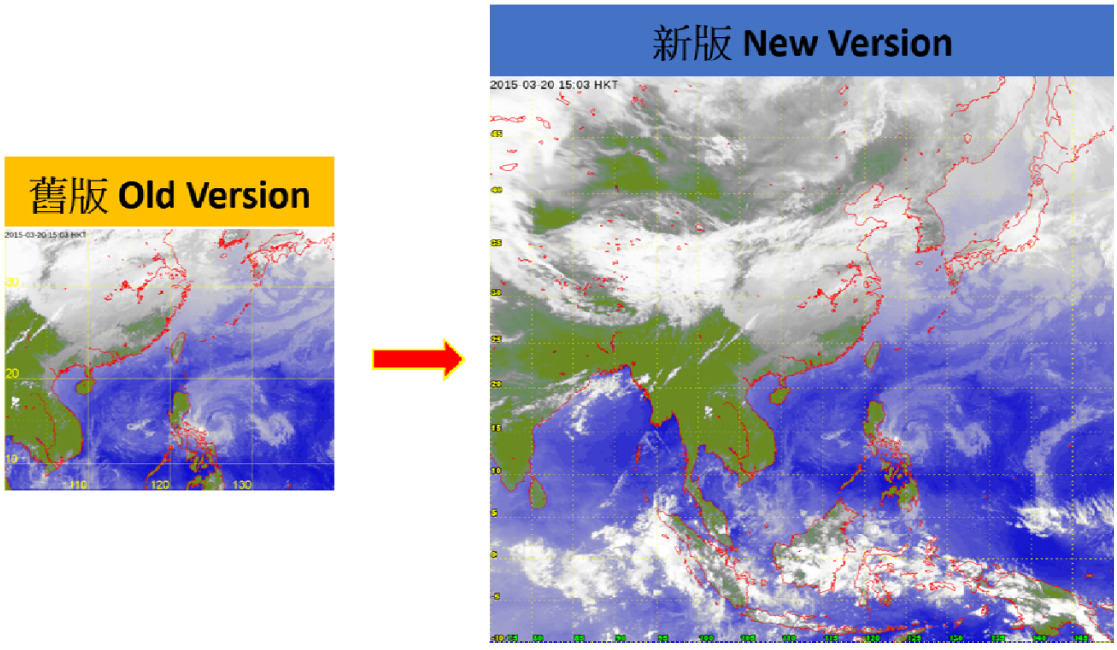
Projected changes in the mean sea level in Hong Kong and its adjacent waters relative to the average of 1986-2005 under the high (red) and medium-low (orange) greenhouse gas concentration scenarios (solid line plots the mean value while dashed lines show the likely range of projection results). Historical observations are shown in black.

圖三：「氣候資訊服務」網頁新版本

(http://www.hko.gov.hk/cis/climat_c.htm)

Figure 3: New version of climatological information services webpage

(http://www.hko.gov.hk/cis/climat_e.htm)

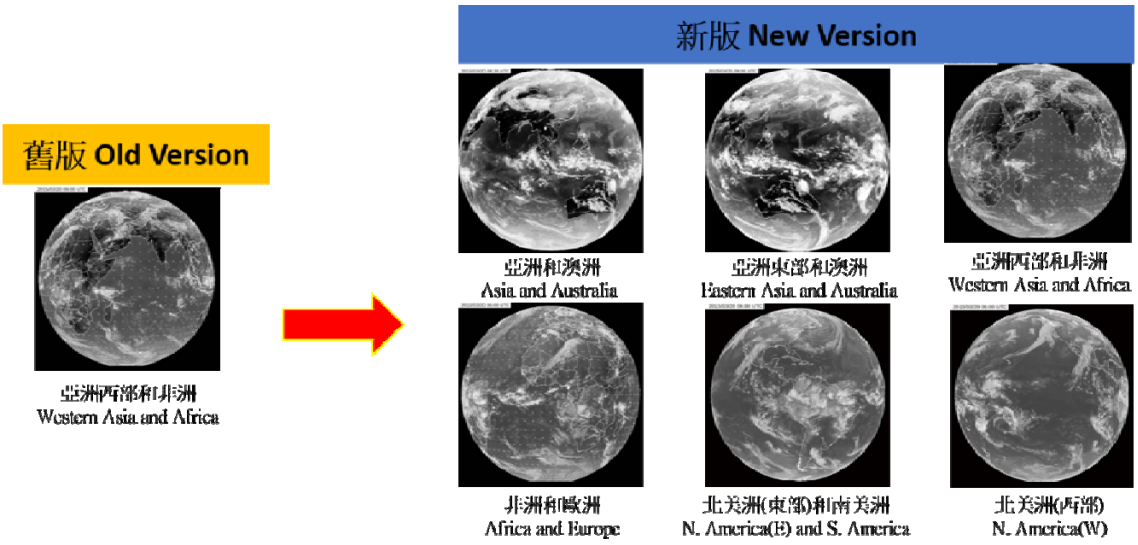


圖四 a：新版衛星圖像網頁－覆蓋範圍更大

(http://www.hko.gov.hk/wxinfo/intersat/satellite/satc_uc.htm)

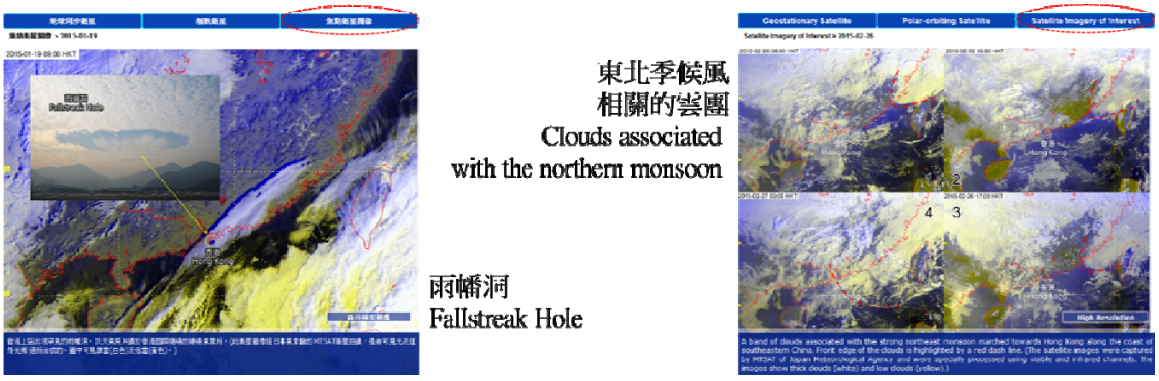
Figure 4a: New Version of Satellite Webpage – Larger Coverage

(http://www.hko.gov.hk/wxinfo/intersat/satellite/sate.htm)



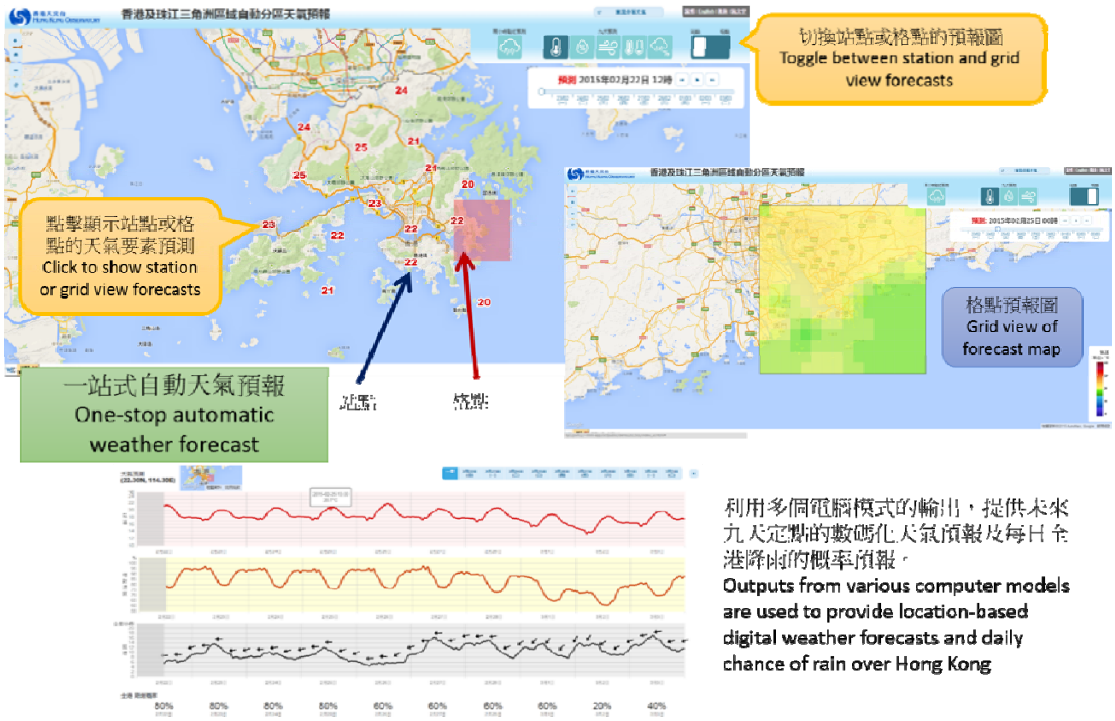
圖四 b：新版衛星圖像網頁 – 更多全球衛星圖像

Figure 4b: New Version of Satellite Webpage – More Global Satellite Imageries



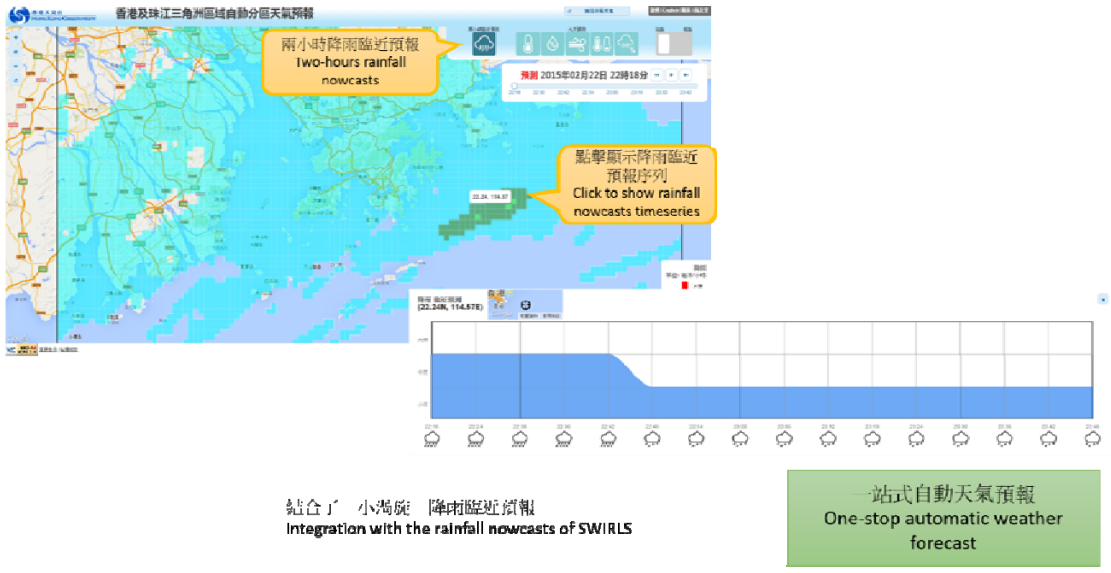
圖四 c：新版衛星圖像網頁 – 焦點衛星圖像

Figure 4c: New Version of Satellite Webpage – Satellite Imagery of Interest



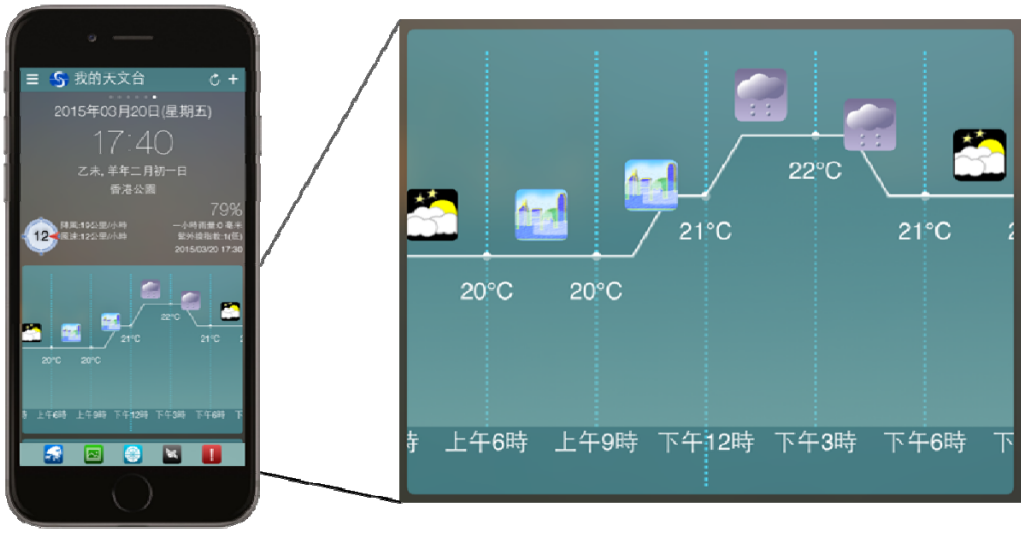
圖五 a：九天自動分區天氣預報

Figure 5a: 9-day Automatic Weather Forecast



圖五 b：未來兩小時的臨近降雨預報

Figure 5b: Rainfall nowcast in the next two hours



圖六：「我的天文台」－加入九天分區天氣預報

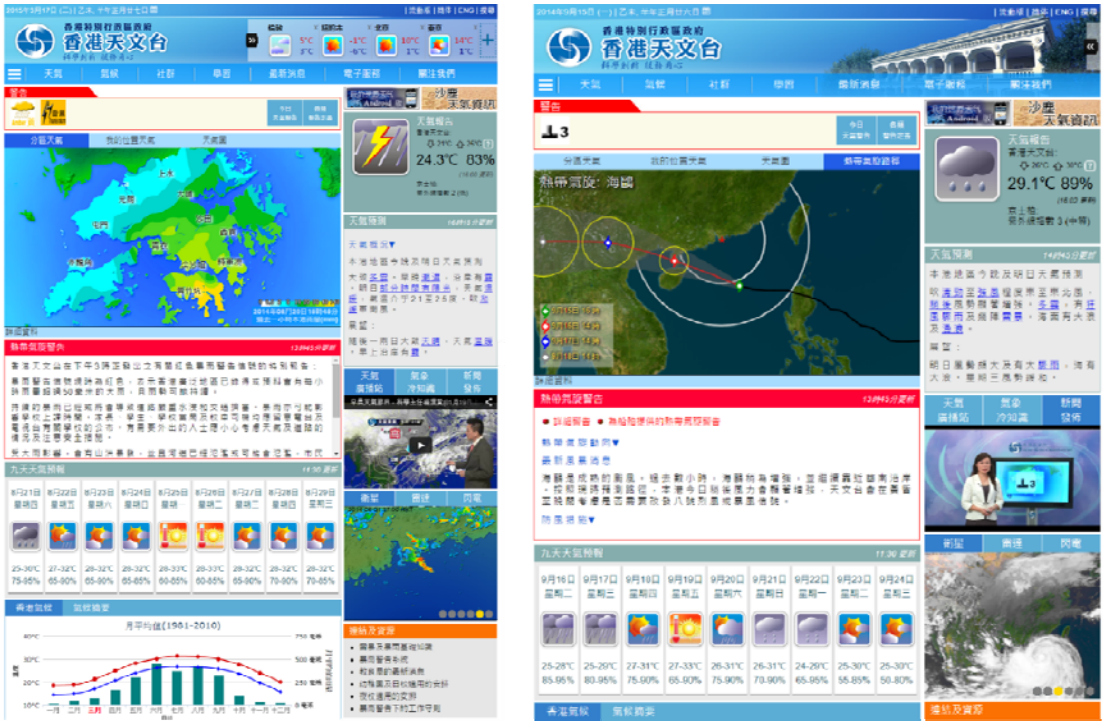
Figure 6: MyObservatory – Inclusion of 9-day regional weather forecast

名稱: 熱帶風暴 巴威
日期: 2015 年 3 月 17 日
位置: 北緯 15.2 度, 東經 136.4 度
中心附近最高持續風速: 每小時 65 公里

香港時間: 08 時

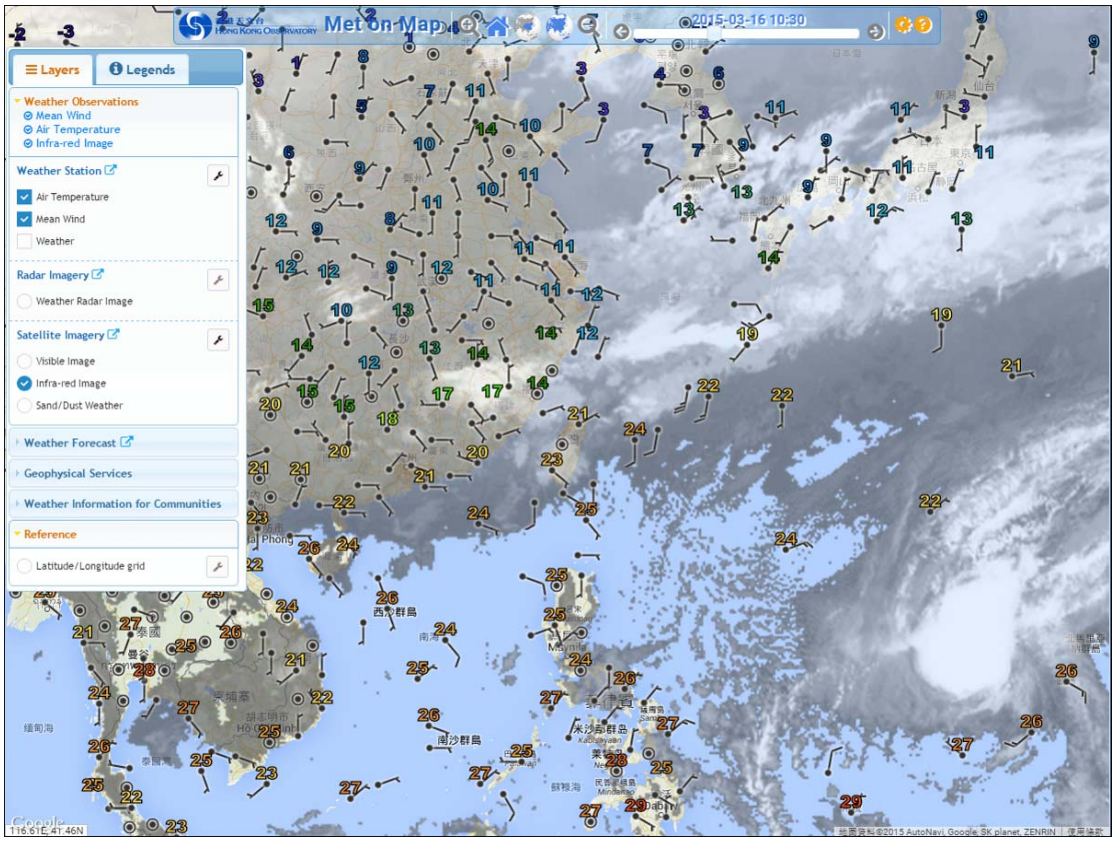
圖七：五天熱帶氣旋路徑資訊

Figure 7: Tropical Cyclone 5-day Track Information



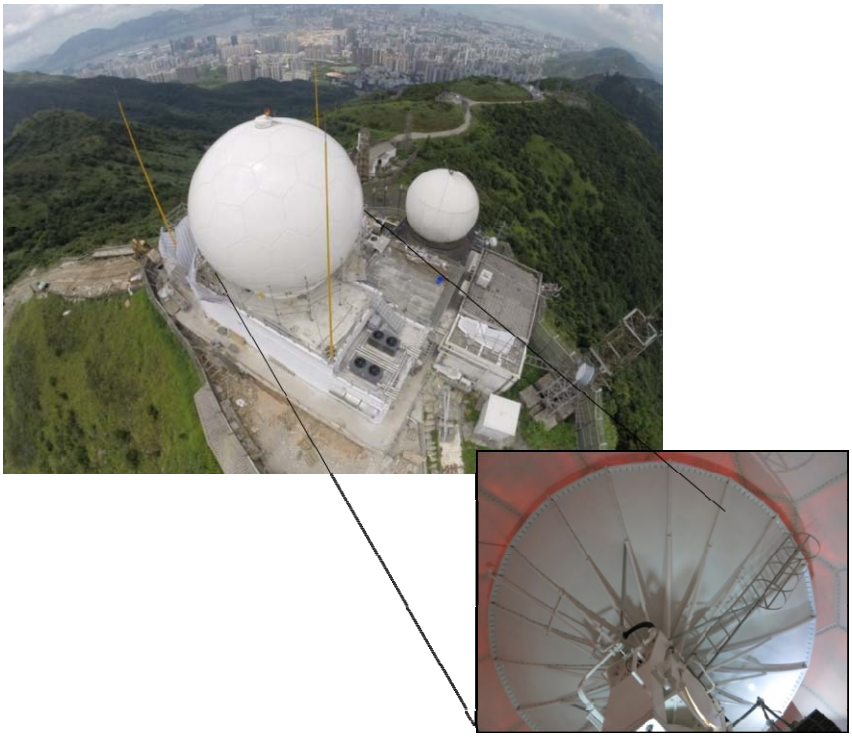
圖八：「天文台網站首頁」新面貌

Figure 8: Revamp front page of the Observatory's website



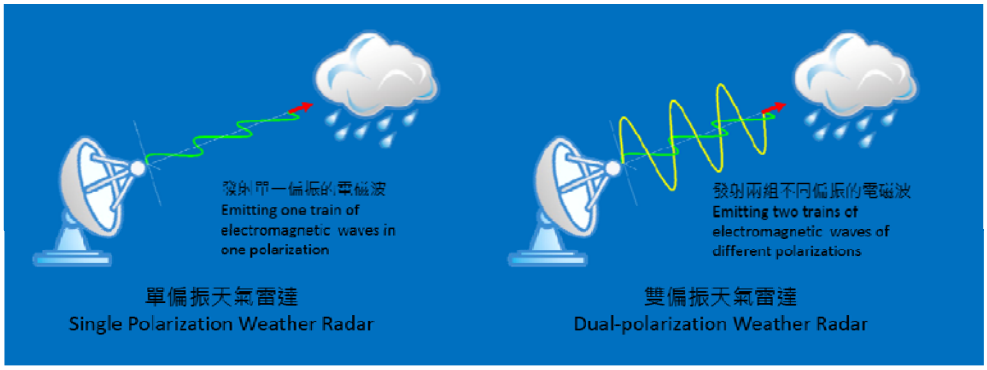
圖九：地理信息系統綜合亞洲區域的天氣資訊

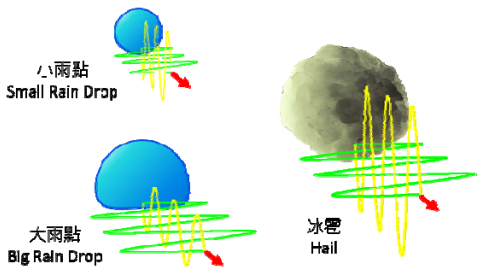
Figure 9: Asian Regional Weather Information Service hub on GIS



圖十 a：大老山雙偏振多普勒天氣雷達

Figure 10a: Tate's Cairn Dual-Polarization Doppler Weather Radar



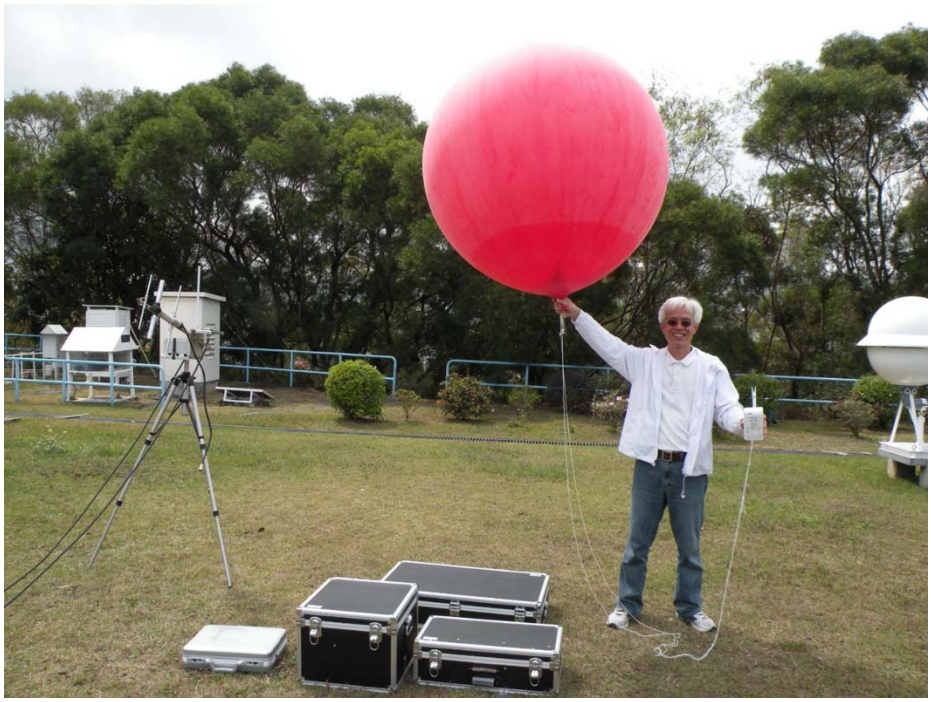


天空中不同形狀、大小及狀態的物體（如大雨點、小雨點、冰晶、冰雹、表面呈水態的雪、飛鳥等），反射垂直和水平偏振的電磁波時會產生不同特性的回波。透過分析這些回波，可有效探測冰雹及降水種類。

Objects of various shapes, sizes and states in air (such as big rain drops, small rain drops, ice crystals, hails, wet snow and birds) respond differently to electromagnetic waves of vertical and horizontal polarizations giving rise to echoes of various characteristics. Analyzing these radar echoes can help detect hails and classify precipitation types.

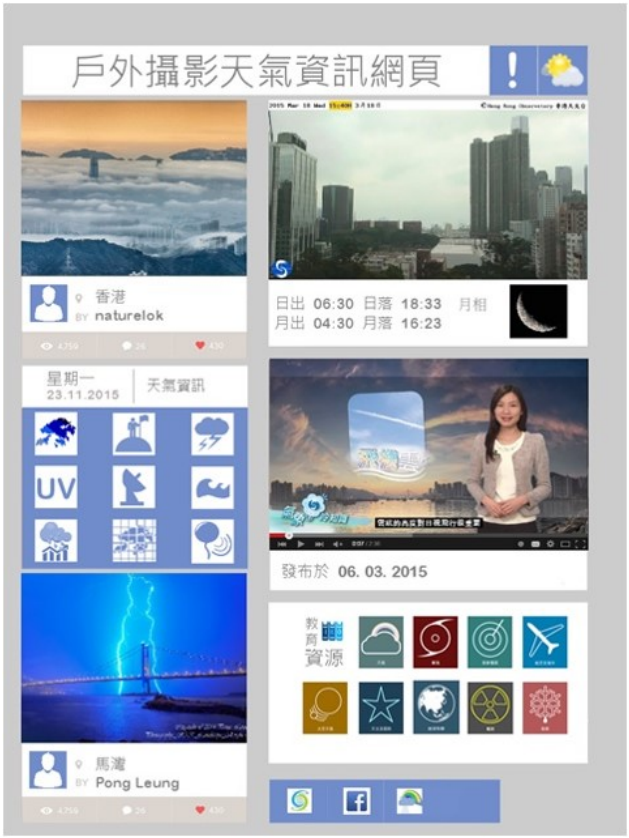
圖十 b：雙偏振多普勒天氣雷達

Figure 10b: Dual-polarization Doppler Weather Radar



圖十一：便攜式高空探測系統

Figure 11: Portable Upper-Air Sounding System

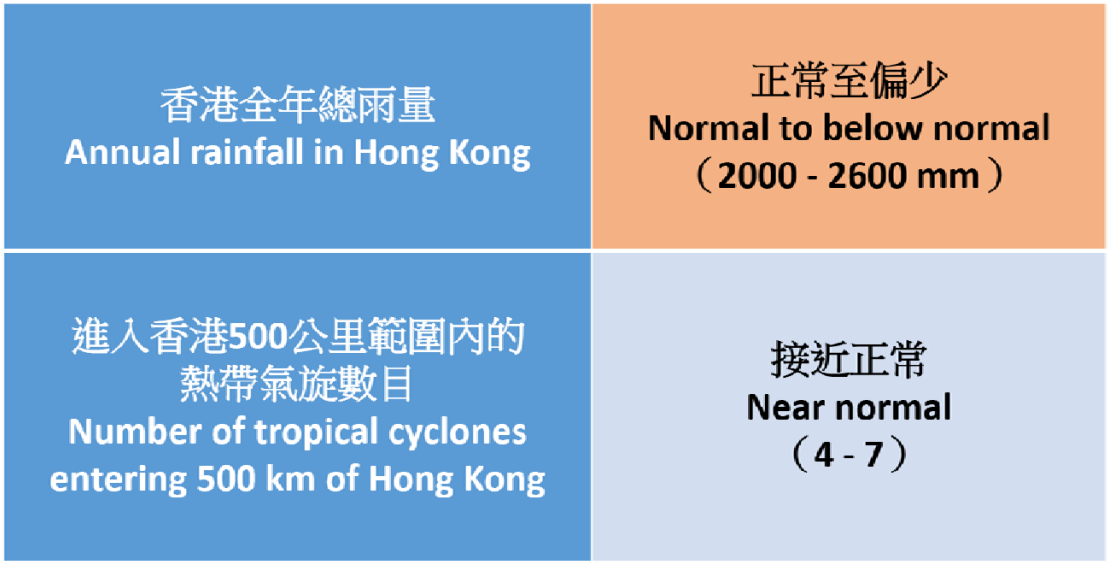


圖十二：戶外攝影天氣資訊網頁

Figure 12: Weather information for Outdoor Photography Webpage

圖十三：教育資源流動版網頁附問答遊戲

Figure 13: Mobile version of Educational Resources Webpage with Quiz Games



圖十四：2015 年全年展望

(http://www.hko.gov.hk/wxinfo/season/anlfc.htm)

Figure 14: Outlook for 2015

(http://www.hko.gov.hk/wxinfo/season/anlf.htm)

圖十五 a：電視宣傳短片 – 雷暴的威脅

Figure 15a: API on "Thunderstorms"

圖十五 b：電視宣傳短片 – 熱帶氣旋湧浪的威脅

Figure 15b: API on "Tropical Cyclone Swells"