



飛行氣象 WEATHER ON WINGS



航空界通訊

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新人事 新氣象

衛翰戈先生於 2003 年 11 月 1 日接替李本澄博士出任助理台長（航空氣象服務）。衛先生於 1981 年加入天文台，他是發展氣象系統的專家，更是深受航空界歡迎的「航空氣象資料發放系統」的策劃人。他並對航空氣象人員充滿信心，期望以科學及專業精神為基礎，進一步發展香港的航空氣象服務。



署理助理台長（航空氣象服務）衛翰戈先生。

Mr. H.G. Wai, Acting Assistant Director (Aviation Weather Services).

New Aviation Weather Chief

Mr. H.G. Wai took over the post of Assistant Director (Aviation Meteorological Services) from Dr. B.Y. Lee from 1 Nov 2003. Mr. H.G. Wai joined the Observatory in 1981. He is an expert in the development of meteorological systems. He was the leading force behind the past development of the much appreciated Aviation Meteorological Information Dissemination System. He is confident that the aviation weather team will continue to develop the aviation weather service of Hong Kong on the basis of science and professionalism.

傑出顧客服務

Outstanding Customer Service



天文台一眾同事與公務員事務局局長王永平(左三)合攝

HKO staff pictured here with Secretary for the Civil Service Mr. W.P. Wong (third left).

天文台的航空氣象服務在 2003 至 04 年度的顧客服務獎勵計劃中，奪取傑出顧客服務隊伍(內部支援)亞軍獎。今年的比賽共有 29 個部門合共 89 個隊伍參加，評選小組根據顧客滿意程度、顧客服務文化及成本效益選出最優秀的隊伍。顧客服務獎勵計劃是公務員事務局為表揚在顧客服務方面表現優秀的政府部門和隊伍而設的，目標是要推廣優質顧客服務文化。在這次比賽中，天文台亦獲市民評為「最佳公眾形象獎」銅獎，充分顯示市民高度評價天文台的專業服務和表現。我們會繼續努力，為香港的航空界提供更優質的服務。

The Observatory won the first runner-up in the 2003-04 Outstanding Customer Service Award competition (internal Support) for the excellent aviation weather services it provides. Eighty-nine teams from twenty-nine departments joined the competition this year. The teams were assessed by their customer satisfaction, customer service culture as well as efficiency and cost-effectiveness. The Customer Service Award Scheme was organized by Civil Service Bureau (CSB) to promote

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台長林超英先生(中)與航空公司及飛機師代表慶祝香港航空天氣聯絡小組成立十週年。(詳情見第三頁)

Director of the Hong Kong Observatory, Mr. C.Y. Lam (middle), celebrated the 10th Anniversary of the Liaison Group on Aviation Weather Service with airline and pilot representatives. (Details on P.3)

(From previous page) quality service in the civil service and to give recognition to departments and teams excelling in customer service. The Observatory also won the Bronze Award for “Best Public Image”. The award is the result of voting by the public and it showed that our professional service and performance were highly appreciated by the public. We will continue our good effort and strive to provide an even better service for the aviation community.

加強版自動站風切變警報系統

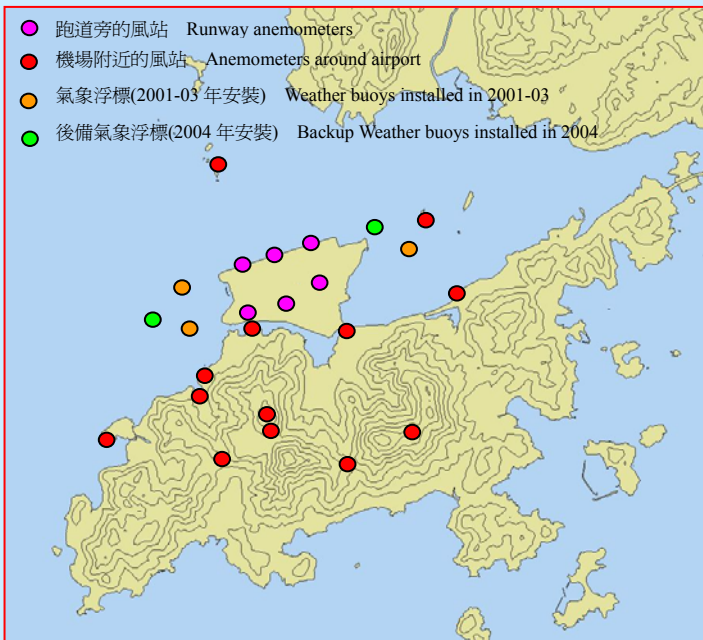
李淑明

天文台利用安裝在兩條跑道上的六個風速表的資料，計算出風切變的強度，自動監測風切變。這套名為「低空風切變系統」(LLWAS)的軟件，主要是輔助機場多普勒天氣雷達，捕捉晴天時所出現的風切變，如由海風引起的風切變。

在過去數年，天文台在機場附近水域，安裝了多個氣象浮標(圖一)，擴大自動站的監測範圍。利用這個擴大的風速表網絡，天文台發展了一套革新的風切變探測方法，名為「加強版自動站風切變警報系統」(AWARE)。它將網絡內各站所測到的風作出比較，來探測跑道上的風切變，而一些與航空風切變無關的小規模的擾動，則會被過濾出來，以減少虛報的情況。

個案研究顯示，相比「低空風切變系統」，新系統有更好的表現。在許多情況下，除了能更早顯示風切變的出現外，它所探測到的風切變強度，與飛機報告的相符。圖二顯示在2004年1月14日下午由海風引起的風切變個案，「加強版自動站風切變警報系統」便能成功在西面進場地區發出時速+15海里的風切變警報，隨後收到飛機的報告，証實探測到的位置和強度與飛機遇上的相符。

有見於這些良好表現，我們已於2004年5月以「加強版自動站風切變警報系統」取代原有的「低空風切變系統」。



圖一：在飛機場及其鄰近地區的風站及氣象浮標。

Figure 1: Anemometers and weather buoys installed at and around the airport.

An enhanced anemometer based windshear detection algorithm

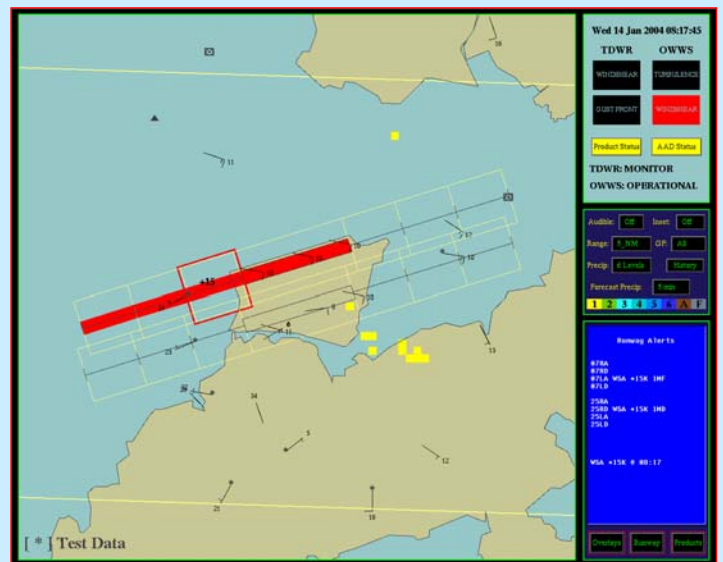
Olivia Lee

The Observatory's automatic windshear detection algorithms make use of wind data from six anemometers along the runways in computing the shear magnitude. The algorithm concerned, known as the Low-Level Wind Shear Alert System (LLWAS), serves to supplement the Terminal Doppler Weather Radar in detecting windshear in fine weather, especially events caused by sea-breezes.

Over the past couple of years, the Observatory implemented a number of weather buoys over the waters surrounding the airport to extend the coverage of the anemometer network (Figure 1). Making use of the data from this extended anemometer network, a new windshear detection algorithm known as the Anemometer-based Windshear Alerting Rules – Enhanced (AWARE) has been developed. It compares winds measured at adjacent anemometers in the network to detect for windshear along the runways. Small-scale wind fluctuations which are not related to windshear affecting aircraft are filtered to lower the chance of nuisance alerts.

Case studies prove that this new algorithm, AWARE, has superior performance over LLWAS. It gives earlier indications of windshear on many occasions and the strength of windshear computed also agrees well with that reported by aircraft flying through the phenomena. Figure 2 shows AWARE successfully provided +15 knot windshear alerts in the sea breeze episode in the afternoon of 14 January 2004 which brought windshear to the western approach corridor of the northern runway. The location and strength of the windshear indicated in the alert were later confirmed by aircraft reports.

In view of the demonstrated performance of AWARE, it replaced LLWAS in May 2004.



圖二：加強版的自動站風切變警報系統探測到的風變。

Figure 2 : Windshear alerts generated by AWARE.

攜手合作

劉心怡

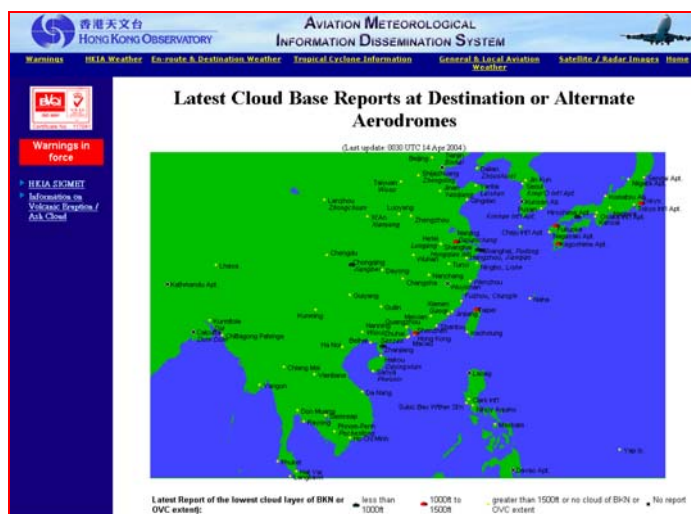
(接封面) 航空天氣聯絡小組自 1993 年成立，對改進本港的航空氣象服務貢獻很大。它提供一個我們和用戶直接跟對話的渠道，讓我們更了解用戶的需要。去年的 11 月 28 日，聯絡小組在機場富豪酒店慶祝成立十週年，當晚不單有現任的聯絡小組的成員參加，更有一些經已離任的成員到場一起慶祝，場面非常高興。希望聯絡小組將來繼續為香港的航空業作出貢獻。

新產品及服務發展

亞洲地區的雲底高度及重要天氣資料

呂永康

雲底高度及重要天氣如雷暴等資料，對飛機的升降非常重要。現在航空公司用戶可以從「航空氣象資料發放系統」(AMIDS)，看到這些在目的地著陸及其鄰近機場的天氣資料，一目了然。資料以圖像形式顯示，如雲底高度的網頁，便以不同符號，代表不同雲底高度。黑色代表雲底高度低於 1000 呎，紅色代表雲底高度介乎 1000 與 1500 呎之間。重要天氣的網頁也是採取同樣風格。航空用戶在評估備用機場的天氣，將更得心應手。



亞洲機場雲底高度一覽。

Global view of cloud base heights of aerodromes in Asia.

機場雷暴警告 – 全新面貌

劉心怡

自從去年引進取消機場雷暴警告機制後，警報的時間明顯更貼近雷暴影響機場的時間。為了方便用戶理解生效時間，進一步提高警告的可用性，今年機場雷暴警告的格式作了一次更新，列明生效時間。此外，每當預報員發出或取消機場雷暴警告，「航空氣象資料發放系統」將自動出現一個提示視窗（見右圖），網頁左旁的導覽列亦會顯示當時的警報狀況。

United we Stand

Sharon Lau

(From the cover page) The Aviation Weather Service Liaison Group has made great contribution to the improvement of our aviation weather service since its establishment in 1993. It provided a vehicle for direct exchange of views between the users and the Hong Kong Observatory, enabling us to better understand user needs. The Liaison Group, including both current and past members, celebrated its 10th Anniversary at Regal Airport Hotel on the night of 28 Nov. 2003.

New products and service development

Cloud Base Height and Significant Weather Information in Asia

Lui Wing Hong

Cloud base heights and significant weather such as thunderstorms are essential information for aircraft landing at or taking off an airport. Airline users can now get these weather information for the destination and neighbouring aerodromes at a glance on the Aviation Meteorological Information Dissemination system (AMIDS). Presented in graphical format, the webpage on cloud base heights illustrates the height of cloud base using symbols. Black cloud represents cloud base height of less than 1000 ft whereas red clouds represents cloud base height of between 1000 ft and 1500 ft. The same style is adopted for the webpage on significant weather. These facilitate airline users in accessing weather conditions of alternate aerodromes.

Aerodrome Thunderstorm Warning – Face-Lift

Sharon Lau

With the introduction of cancellation of aerodrome thunderstorm warning last year, the alignment of alerts period with the thunderstorm episode have significantly improved. To enhance the user-friendliness of our Aerodrome Thunderstorm Warning and to facilitate users in making out the validity period of the warning, the format of the message was revamped to explicitly state the validity period of the warning in the message. When the aerodrome thunderstorm warning is issued or cancelled, a pop-up message will be displayed (see figure below) and the sidebar of the AMIDS will be updated with the latest warning status.

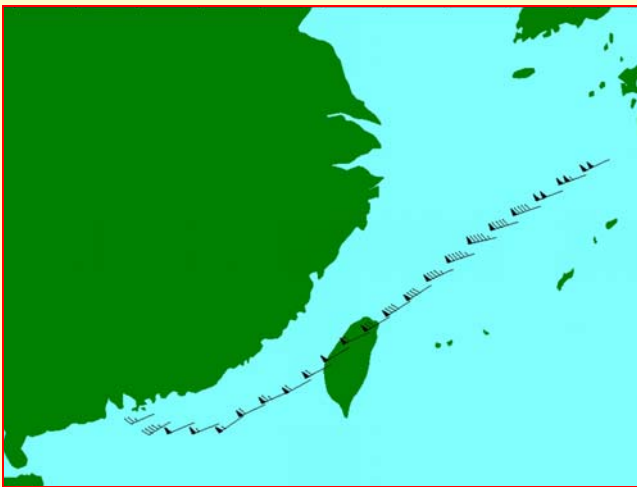


飛機天氣觀測自動化

蘇志權

香港的航空氣象服務踏進了新紀元。自 2004 年 4 月，天文台開始業務接收從商業航機上電腦傳來的自動天氣報告。香港成爲了亞洲第一個氣象服務部門開展飛機自動天氣觀測的計劃，並業務性發送這些天氣報告。

今年，天文台與國泰航空公司及民航處合作，通過電腦與電腦的聯繫，自動接收飛機天氣報告。這種新方法免卻了人手在飛機上發出報告及在地面接收的工序，大大減少工作量及減低人手出錯的機會。相對 1924 年第一次的天氣報告，新的自動化天氣報告的數量較多，所覆蓋的範圍亦較廣。此外，航空天氣預報員可於數分鐘內收到報告，大大提高數據的實用性。



2004 年 4 月 2 日從一班離港航機收到的天氣觀測資。
Weather observations received from an aircraft departing Hong Kong on 2 April 2004.

現時天文台每天接收到約 300 個由往來香港及世界各地的航機發出的自動天氣報告。當中包括了飛機航道上的風向、風速及溫度資料。在數據稀少的南中國海，這些天氣報告爲我們提供了極珍貴的天氣資料，對天氣預測很有幫助。

天文台這項工作，是世界氣象組織內「飛機氣象資料下傳」(Aircraft Meteorological Data Relay, AMDAR) 計劃的一環。這計劃旨在推動飛機作高空天氣觀測，從而提高航空安全與效率。服務其他航空樞紐的氣象中心亦有透過其夥伴航空公司接收自動天氣報告。天文台得到國泰航空公司及民航處的支持，現成爲此國際計劃的一分子，爲全球的協作作出貢獻。

天文台計劃進一步推動此計劃，獲取更多飛機天氣觀測，從而提供更可靠及更有效的航空天氣服務。

Automation aircraft weather observations

So Chi Kuen

The aviation weather services in Hong Kong enter a new era as the Observatory starts operational reception of automatic weather reports made by computers onboard commercial aircraft in April 2004. The Observatory is the first weather service in Asia to launch an automatic aircraft weather observation programme and to distribute such weather reports worldwide operationally.

Through the collaboration among the Observatory, Cathay Pacific Airways and the Civil Aviation Department, aircraft weather reports are now automatically received by the Observatory via computer-to-computer links. This new means obviates the need for manual on-board transmission and ground reception of reports, greatly reducing the workload and the possibility of human errors. As compared with the first weather reports in 1924, the new automatic ones are more in number and cover a much wider geographical area. In addition, the weather reports are delivered to the Aviation Weather Forecaster within minutes instead of weeks after the measurements are made.



天文台與國泰航空公司及民航處合作接收自 B-747 商業航機的天氣報告。

The Observatory, in collaboration with Cathay Pacific Airways and Civil Aviation Department, receives automatic weather observations from a B-747 commercial aircraft.

At present, the Observatory receives about 300 automatic weather observations daily directly from aircraft travelling between Hong Kong and other airports around the world. These contain information on wind direction, wind speed and temperature along the aircraft flight path. The weather reports provide the much needed weather information over the data-sparse South China Sea, and contribute to the improvement of weather forecasts.

Besides the Observatory, meteorological centres serving other aviation hubs are also receiving automatic aircraft reports through partnership of major airlines under a World Meteorological Organization programme called AMDAR (Aircraft Meteorological Data Relay), which aims to enhance aviation safety and efficiency through promoting upper-air weather observations using aircraft. The Observatory with the support of Cathay Pacific Airways and the Civil Aviation Department now becomes a member of this international community making contributions to this global effort.

The Observatory plans to further develop the programme to obtain more aircraft weather observations in the future and be able to provide even more reliable and effective aviation weather services.

出門前 看天氣

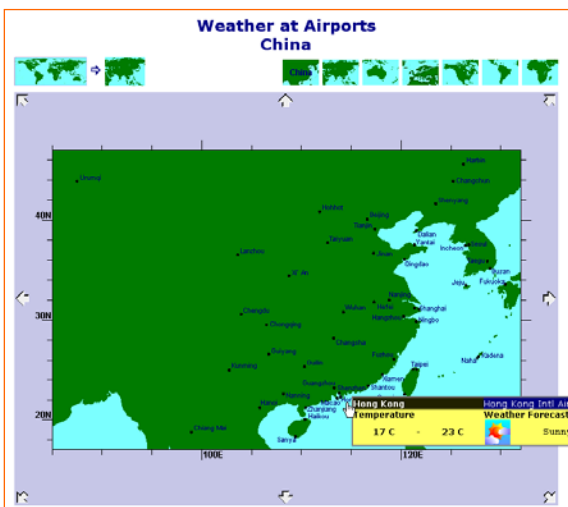
呂永康

天文台爲了加強網上天氣服務，增設了一個新網頁提供超過一千個機場的天氣資料。這網頁對機師和旅遊人士尤爲有用。現在你可以在前往機場之前，上網查看目的地機場及其他機場的天氣資料。

新的網頁提供了各地機場的天氣預測、最低及最高溫度等資料。這些資料是來自會定期發佈天氣報告和預測的國際機場的官方天氣資訊。

在 2002 年年底，天文台推出了「世界城市天氣」網頁，包含了八百多個城市的天氣資料。現推出的「機場天氣報告」網頁加進了超過一千個機場的天氣資料，使網上內容更豐富。歡迎瀏覽「機場天氣報告」網頁，網址是：

<http://www.weather.gov.hk/aviat/airportwx/>。



Look before you leave

Lui Wing Hong

Weather for over 1000 airports worldwide are now available at the Observatory's webpage. This is part of the Observatory's effort to enhance its weather services on the Internet. You can now check the weather of the destination and other aerodromes before you leave for the airport. The web page should be of particular use to pilots and travellers wishing to get hold of the weather before departure.

The new webpage provides such information as the forecast weather, the minimum and the maximum temperatures for airports. They are based on the official weather information received from international airports that issue weather reports and forecasts regularly.

In late 2002, the Observatory launched a webpage on World Weather Information. It contains weather information for over 800 cities around the world. Now added to the list is the weather information for more than 1000 airports worldwide from the webpage on World Airport Weather. Do come and visit the 'World Airport Weather' website at:

<http://www.weather.gov.hk/aviat/airportwx/>

世界機場天氣網頁。

World Airport Weather website

業務使用新風切變警報用詞

陳世倜

經過一年的試用，新的風切變術語於 2004 年 4 月 1 日正式投入業務使用。使用新的用詞後，航空交通管制員傳遞給飛機師的風切變及微下擊暴流預警，不再包含位置資料(即跑道或離跑道兩端 1 海里、2 海里或 3 海里的地方)。除了比較簡單外，新的用詞亦避免當系統監測到進場或離場航道上出現超過一個風切變發生時，機師錯誤理解預警的風切變位置的情況。

國際航空公司飛行人員協會 (IFALPA)、國際航空運輸協會 (IATA)、香港的主要航空公司及香港航空交通管制協會對實施新用詞皆表示支持。以下是一些新用詞的預警例句的中文譯本：

- 「警告。在最後進場區有微下擊暴流；風速減少達 30 海里/小時。」
- 「警告。在離場區有風切變；風速增加達 25 海里/小時。」
- 「警告。在最後進場區有猛烈湍流及顯著風切變。」
- 「警告。在離場區有中度湍流及顯著風切變。」

New Windshear Alerting Phraseology Put into Use

S.T. Chan

New windshear alerting language has been put into operational use since 1 April 2004 after a year's trial. Under the new phraseology, the windshear and microburst alerts passed by ATC no longer include the reference to specific location (i.e. 1 NM, 2 NM, 3 NM or runway). Apart from its simplicity, the new phraseology avoids possible misinterpretation of the alert message in respect of the location of windshear detected when more than one event occurs over a particular approach or departure corridor.

The International Federation of Air Line Pilots' Associations (IFALPA), International Air Transport Association (IATA), major airlines operating in Hong Kong and the Hong Kong Air Traffic Control Association have given their support to the implementation of this new phraseology. The followings are examples of alerts under the new phraseology:

- “Caution microburst minus 30 kt on final approach”
- “Caution windshear plus 25 kt on departure”
- “Caution severe turbulence and significant windshear on final approach”
- “Caution moderate turbulence and significant windshear on departure”

雷達圖像廊

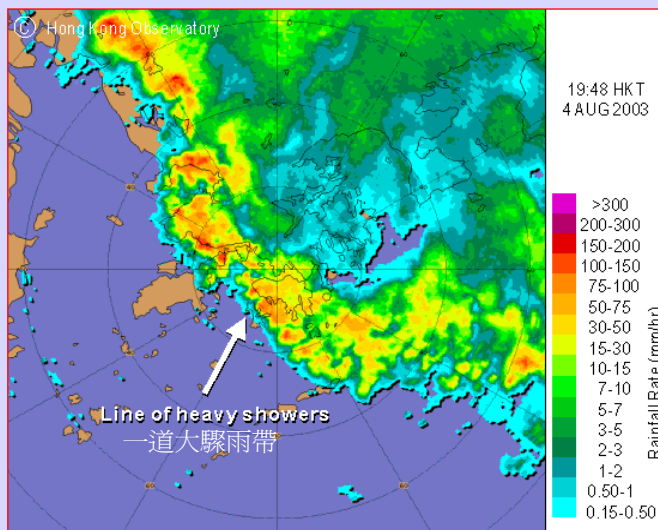
何家亮

繼去年在天文台公眾網頁上推出了帶有雨量資料的實時雷達圖像後，我們在今年初再推出了另一個與雷達有關的資訊網頁 - 雷達圖像廊。網址為：

http://www.weather.gov.hk/wxinfo/radars/radar_gallery/index_c.htm

雷達圖像廊收藏了天文台在不同年代採用的雷達及其所捕捉到的一些惡劣天氣現象的圖片。你可看到包括熱帶氣旋、暴雨和典型的季節性天氣如局部地區驟雨及冬季的降雨等在雷達圖上的面貌。當中還有一些圖像描述了曾在機場上出現的惡劣天氣，例如 2002 年出現的龍捲風和冬季雷暴，以及 2003 年的颶鋒(見下圖)，相信都能令大家較了解這些天氣過程。

圖像廊亦搜羅了一些記載着溫黛、愛倫以及其他猛烈颱風襲港時的雷達圖像，這或能勾起大家在十號風球高懸時的回憶。此外，一些在特別的大氣狀態下或由於雷達本身的運作特性所引致的「假」降雨現象，都包括在圖像廊內，希望藉此能幫助大家正確解讀雷達圖像。



氣象浮標下水

陳柏緯

今年 1 月初，天文台再有兩個新氣象浮標下水，設置在機場附近水域(位置見右圖 WB4 及 WB5)。現時在赤鱗角機場附近，共安裝了 5 個氣象浮標。

自 2001 年天文台首度安裝氣象浮標以來，這些浮標一直提供非常有用的氣象觀測，讓預報員能及時發出由海風及由大嶼山的地形引致的風切變警報。

新的氣象浮標，除了作為後備以外，WB5 更把西面的地面觀測監測範圍擴展至 2 海里，對監測海風甚有裨益。2004 年 3 月 15 日發生的風切變便是一個好例子。約在下午 1 時，一道由海風引起的切變線(圖中紅色點線)出現於 WB5 及 WB1 之間，隨後一架由西面降落北跑道的航機報告遇到強度達時速+15 海里的風切變。

Radar Image Gallery

Paul K.L. Ho

Following the launch of real-time radar pictures with rainfall information on the Observatory's website last year, another radar-related webpage - 'Radar Image Gallery', was launched early this year. The website is:

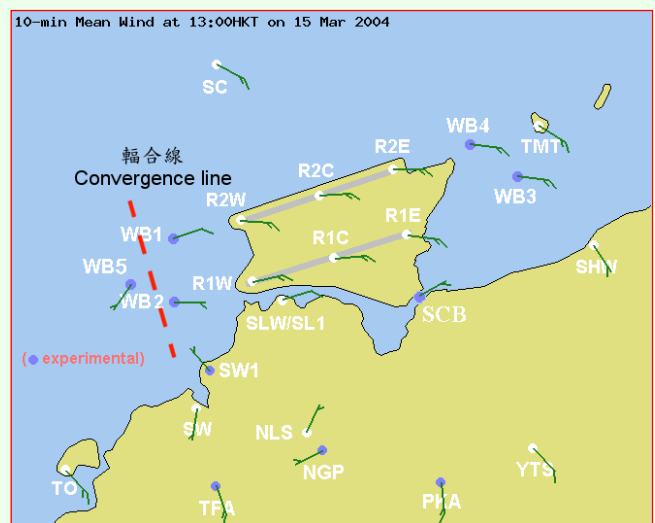
http://www.weather.gov.hk/wxinfo/radars/radar-gallery/index_e.htm

The gallery keeps a host of pictures of different generations of weather radars used by the Observatory and the severe weather phenomena captured by these radar. You can see different weather episodes appearing on the radar pictures including tropical cyclones, rainstorms as well as typical local seasonal weather phenomena like isolated showers and winter rain. There are also images showing some remarkable weather events affecting airport in the past such as a tornado and winter thunderstorms in 2002 as well as a gust front in 2003 (picture below). The images may help you to have a better understanding of those weather events.

The gallery also collects pictures that may recall your memories of the days when the Hurricane Signal No. 10 was hoisted under the attack of Wanda, Ellen and other intense typhoons. Images depicting artifacts caused by special weather conditions or the way the radar is operated are also included to help readers interpreting the radar pictures properly.

雷達圖像顯示在一個夏季的晚上，一道呈東南 -- 西北走向的大驟雨帶正覆蓋著香港。

Radar image showing a southeast-northwest oriented line of heavy showers over Hong Kong in a summer's evening.



一道由海風引起的切變線出現於 WB5 及 WB1 之間，隨後一架由西面降落北跑道的航機報告遇到強度達時速+15 海里的風切變。

A shear line due to sea breeze appeared between WB5 and WB1. Soon after, an aircraft reported +15 knot windshear on arrival from the west using northern runway.

More Weather Buoys Launched

P.W. Chan

Two new weather buoys were successfully deployed by the Observatory in waters off the Hong Kong International Airport in early January 2004 (see the left hand side figure for location WB4 and WB5). There are now a total of five weather buoys operating around Chek Lap Kok.

Since weather buoys were first deployed in 2001, they have provided useful meteorological observations and were instrumental in enabling forecaster to issue timely alerts of

windshear events arising from sea breeze and airflow disturbances relating to the Lantau's terrain.

Apart from serving as backup for existing buoys, the new buoy, WB5, further extended the coverage of surface observation over the western approach to around 2 nautical mile from touch down. This westward extension is useful in the monitoring of windshear due to sea breeze. For example, at around 1 p.m. 15 March 2004, a shear line due to sea breeze (red dotted line) first appeared between WB5 and WB1. Soon after, an aircraft reported +15 knot windshear on arrival from the west using northern runway.

機場天氣觀測

波狀雲與風切變

岑智明

以下的全景照片，是 2004 年 4 月 14 日下午 3 時 30 分在香港國際機場面向大嶼山拍攝。圖中可見波狀雲從大嶼山的山頂伸延出海，及至機場東面的起飛航道。這些雲相信是由於東風吹過大嶼山，產生波動，空氣抬升後冷卻，空氣中的水份凝結成水點而形成的。在拍攝這張照片後的一小時內，有兩班離港航機報告遇上風切變。我們將繼續進行科學研究，以便進一步了解風切變與大嶼山的波狀雲之間的關係。

2004 年 4 月 14 日赤鱸角上空的波狀雲 (照片: 岑智明攝)
Wave clouds as observed at Chek Lap Kok on 14 April 2004
(Photo: C.M. Shun)



重要天氣

颱風伊布都過境時的猛烈湍流

陳世僑

2003 年 7 月 24 日颱風伊布都過境時，一共有 31 班航機在香港國際機場報告遇上湍流。其中有 15 班更是中度至猛烈湍流，是香港國際機場在 1998 年啓用以來，最多猛烈湍流報告的一天。跟風切變一樣，猛烈湍流可以引致飛機短暫時間失控，所以湍流可以影響飛機安全。

下頁所示的圖像是激光雷達在當天早上所探測到的風場，當時從西面降落的航機報告遇上猛烈湍流。圖中可見一些小尺度、不規則、長約數百米的擾動，正影響機場及大嶼山北面的鄰近地區，顯示猛烈湍流的存在。

除了湍流，天文台在當日亦收到 66 個機師的風切變報告。得到天文台發出及時的警報，各起飛及降落的機師均一早作好準備。雖然當日共有超過 30 班航機在第一次降落時，因為風切變或湍流而須要覆飛，但各航機均能安全起飛及降落。

Weather observations at the airport

Wave Clouds and Windshear

CM Shun

The following panoramic photograph was taken at around 3:30 p.m. on 14 April 2004 at the Hong Kong International Airport towards Lantau Island. Wave clouds were seen above the hilltops of Lantau Island with some appearing to extend to the sea area crossing the eastern departure corridors of the airport. These clouds are believed to be formed by wave motions in the easterly airflow over and to the lee of Lantau, where moisture in the air condenses into water droplets as a result of the upward motion. In the hour following the time of the photograph, two departing aircraft reported windshear. Ongoing scientific studies are being conducted to better understand the relationship between reported windshear events and wave clouds generated over Lantau.

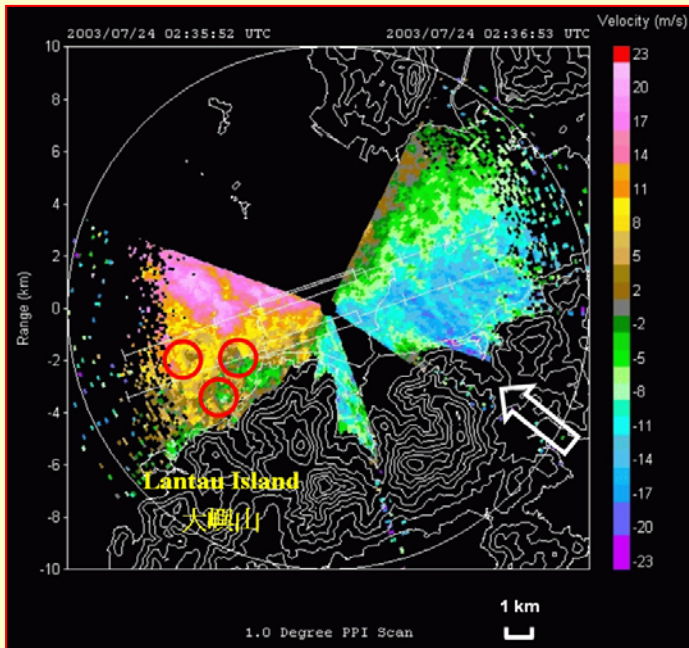
Severe weather

Severe Turbulence during the Passage of Typhoon Imbudo

S.T. Chan

During the passage of Typhoon Imbudo on 24 July 2003, a total of 31 aircraft reported encounters with turbulence at the Hong Kong International Airport. Of these, 15 were moderate to severe turbulence reports. It was a single day with the largest number of severe turbulence reports since airport opening in 1998. Just like windshear, turbulence can affect flight safety as the pilot may experience a momentary loss of control of the aircraft in severe turbulence.

The figure over the next page shows the wind pattern revealed by the Doppler Light Detection And Ranging (LIDAR) System that morning when an aircraft on approach from the west reported severe turbulence. As shown in the figure, there were small-scale, irregularly-arranged wind disturbances with a length scale of several hundred metres affecting the airport and its surrounding areas to the north of Lantau, indicating the presence of severe turbulence.



Apart from the turbulence reports, the Observatory also received 66 reports of significant windshear from pilots on the same day. With timely alerts issued by the Observatory, the pilots landing and taking off were all prepared. Throughout the day, more than 30 flights conducted go-arounds on first approach owing to the windshear and turbulence. All aircraft landed and took off safely that day.

2003年7月24日颱風伊布都過境時激光雷達探測到小尺度的擾動（見紅色圓圈）。白色箭嘴所指為背景風的風向。

Small-scale wind disturbances (marked in red circles) revealed by the LIDAR during the passage of Typhoon Imbudo on 24 July 2003. The white arrow indicates the background wind direction.

捉貓 - 捕捉晴空湍流

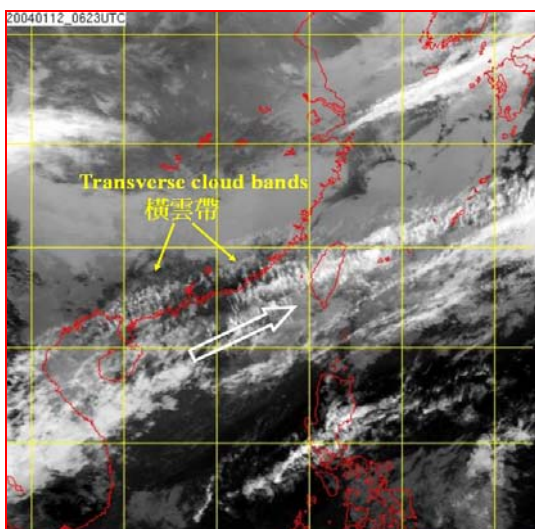
李鄰安

湍流的成因，除了對流及因強風如熱帶氣旋吹過山脈而引起外（見上文），還有在 20,000 呎（若 6 公里）或更高的高空中發生的，稱為晴空湍流（英文簡寫 CAT「貓」）。

這種湍流，名副其實不是由對流產生。晴空湍流通常產生於急流（即狹窄的強風帶）或強垂直風切變的區域。在香港重要氣象情報區內發生的晴空湍流，大部份都是在冬季如 12 月、1 月、2 月等時間發生。幸宜，在香港重要氣象情報區內發生的晴空湍流，很少到達猛烈程度，每個冬天平均只有一個猛烈晴空湍流。

雖然晴空湍流不是由對流產生，當大氣有足夠水份形成雲時，衛星圖像有時亦可給我們一些啓示。其中一個線索便是衛星圖像中出現橫雲帶。

橫雲帶是一些清晰的卷雲，其走向與高空的風向差不多成一直角。最強的晴空湍流發生時所伴隨的橫雲帶通常是較闊及厚，較易在衛星圖像中察覺。這些雲帶發生在急流下面強垂直或水平方向風切變區。2004 年 1 月 12 日，衛星圖像觀測到橫雲帶穿越香港重要氣象情報區，該天有 4 班航機報告遇上晴空湍流，其中一班更達到猛烈程度。



Clear-air Turbulence Detection

L.O. Li

Apart from turbulence due to convection and strong winds across mountains such as those accompanying the passage of tropical cyclones (see previous article), there is another kind of turbulence – clear air turbulence (CAT) which occurs at high altitudes of 20,000 feet (around 6 kilometres) or above

As the name implies, this kind of turbulence is not caused by convection. CAT can often develop near jet stream (i.e. narrow bands of strong winds) and regions of strong vertical shear. A majority of the CAT events over the Hong Kong SIGMET area were reported in the winter months of December, January and February. Luckily most of them did not reach severe intensity. On average, there is around 1 severe CAT report each winter.

Although CAT is not caused by convection, where the atmosphere is sufficiently moist for clouds to form, the satellite picture may offer some clue to its occurrence. One of the indications is the presence of transverse cloud bands.

Transverse cloud bands are well-defined cirrus bands oriented nearly perpendicular to the upper winds. The most intense turbulence is related to wide, thick bands easily seen in the satellite imagery. The bands occur in the presence of strong vertical and horizontal wind shears below the jet. On 12 January 2004, the satellite imagery depicted a transverse cloud bands running across the Hong Kong SIGMET area. On that day, four aircrafts reported encountering CAT, one of which reached severe intensity.

2004年1月12日下午7時的 GOES-9 衛星圖像。橫雲帶內的個別雲帶為西北東南走向，跟白色箭嘴所指的高空風風向差不多成一直角。

GOES-9 satellite imagery at 7 p.m. 12 January 2004 depicting transverse cloud bands with lines of northwest-southeast clouds that were oriented nearly perpendicular to the upper wind direction as indicated by white arrow.

氣象資料上傳的要求

鄭楚明

天文台在今年 2 月 1 日至 3 月 15 日期間進行了一次問卷調查，收集機師對氣象資料上傳的要求。天文台共收回 66 份問卷，以下是調查結果的概要：

- (甲) 大部份機師皆滿意現時天文台提供的氣象資料及服務；
- (乙) 機師希望氣象資料如機場天氣、風切變及湍流預警和危險天氣警告等等能於一小時或以內更新。對於高空風及溫度預測和重要天氣預測，更新時間則可長一些，約一至六小時；
- (丙) 基於機師表示的優先次序，首五項最希望上傳至駕駛艙的氣象資料或服務為：
 - (一) 風切變及湍流預警；
 - (二) 雷達影像；
 - (三) 衛星影像；
 - (四) 跑道天氣觀測；
 - (五) 機場天氣預報/著陸預報。

在眾多希望上傳至駕駛艙的氣象資料當中，風切變及湍流預警的優先次序最高。現時，機師是可透過民航處約每半小時更新一次的「數據化自動航站情報」，收到有關香港國際機場的風切變及湍流預警。機師亦可通過與航空交通管制員的對話而獲得風切變及湍流預警的情報。預料未來風切變及湍流預警的產品將可較頻密的自動直接上傳至駕駛艙，讓機師隨時得知最新的風切變及湍流情況。

上述問卷調查的結果相當有用，將會用作發展香港的氣象產品上傳的發展計劃。天文台正研究上傳氣象資料至駕駛艙，以滿足航空界未來在「衛星通訊、導航及監察/航空交通管理系統」之下在氣象資料方面的需要。



Requirements on Meteorological Information Uplink

C.M.Cheng

To solicit views from the pilots in respect of their requirements on the uplinking of meteorological information to cockpit, the Observatory conducted a survey from 1 February to 15 March 2004. A total of 66 returns were received from pilots. A brief summary of the survey results is presented below:

- (a) Most pilots considered that the existing meteorological products and services provided by the Observatory are acceptable to them;
- (b) Pilots considered it desirable to have information on aerodrome weather, windshear and turbulence alerts, and SIGMET updated frequently at intervals of 1 hour or less. As to wind/temperature forecast and SIGWX forecast, the desirable update frequency are longer, i.e. at intervals of 1 to 6 hours; and
- (c) Based on the priority indicated by pilots, the first five most needed meteorological information/products for uplinking to the cockpit are:
 - (i) Windshear and turbulence alerts;
 - (ii) Radar images;
 - (iii) Satellite images;
 - (iv) Runway weather observations;
 - (v) TAF/Landing Forecast.

Windshear and turbulence alerts are amongst the most needed meteorological information for uplink to the cockpit. At present, alerts of windshear and turbulence for the Hong Kong International Airport are made available to the pilots through the Digital-Automatic Terminal Information Services (D-ATIS) of the Civil Aviation Department at about half-hourly intervals and are also verbally communicated to the pilots by the air traffic controllers. It is envisaged that future product on windshear and turbulence could be provided directly to the cockpit at frequent intervals by automatic means to enable pilots to readily get access to the latest windshear and turbulence situation.

The above survey results are very useful and will be utilized to formulate a development strategy for meteorological uplink products in Hong Kong. To meet the future meteorological information need of the aviation under the CNS/ATM systems, Observatory is studying the uplinking of weather information to the cockpit.

機師與天文台職員，對上傳至駕駛艙的氣象資料交換了意見。

Pilot exchanged ideas with staff of the Observatory on the meteorological information for uplinking to the cockpit.

科普講座 - 「天氣與消閒飛行運動」

蔡本良

天文台在 2003 年 12 月及 2004 年 2 月份，分別舉行了兩次「天氣與消閒飛行運動」的科普講座，約有 100 名愛好該等運動的人士參加，分享消閒飛行運動的經驗。

特邀演講者包括香港遙控滑翔飛行協會及香港滑翔傘協會的代表，他們向參加者介紹無線電遙控滑翔飛行及滑翔傘的基本理論及技術。在講座中，我亦介紹了新近推出的「飛行運動天氣資料」網頁 http://www.weather.gov.hk/aviat/soaring_c/ 及其他相關網頁。



香港滑翔傘協會的 Steve Yancey 先生和聽眾交換飛行心得。

Mr. Steve Yancey of the Hong Kong Paragliding Association shared their flying experience with the audience.

Popular Science Lectures on “Weather and Recreational Aviation Sports”

BL Choy

Two sessions of popular science lectures on “Weather and Recreational Aviation Sports” were held in December 2003 and February 2004 for those interested in aviation sports activities. About a hundred enthusiasts attended the lectures to share the experience of recreational flying in Hong Kong.

In the lectures, guest speakers from the Hong Kong Radio Control Soaring Society and the Hong Kong Paragliding Association introduced to the participants the basic principles and skills of radio-controlled gliding and paragliding. In these occasions, I also presented the newly launched “Weather Information for Aviation Sports” webpage (<http://www.weather.gov.hk/aviat/soaring/>) and other webpages with weather information relevant to these activities.



香港遙控滑翔飛行協會的陳祥發先生示範飛行技巧。

Mr. Stanley Chan of the Hong Kong Radio Control Soaring Society.

航空交通管制協會

蘇志權

今年 3 月，國際航空交通管制員協會的年會在香港舉行，天文台參與該會議中的技術展覽，藉此與世界各地的航空交通管制員交流如何為航空界提供優質天氣服務。



IFATCA Conference 2004

So Chi Kuen

The Observatory participated in the technical exhibition of the annual conference of the International Federation of Air Traffic Controllers' Associations (IFATCA), which was held in Hong Kong in March 2004. This offered a good opportunity for the Observatory to exchange views with air traffic controllers from around the world on providing quality weather services for the aviation community.

岑智明先生(中)及呂永康先生(左)與國際航空交通管制協會的參加者交流心得。

Messrs. C.M. Shun (middle) and W.H. Lui (left) of the Observatory exchanging views with a participant of the IFATCA conference.

繼續努力

今年的航空氣象服務調查經已在 3 月底舉行。這個調查的目的之一是要滿足 ISO 的要求，並藉此收集航空公司的需要，以改善我們的服務。今年的調查共收回 23 份問卷，對我們提供的產品及服務，整體結果是 98% 均獲評為滿意或以上。航空公司就天文台如何進一步改善服務提出了寶貴意見，我們非常感謝你們這些意見並正跟進這些事項。

航空氣象小常識問答題 (答案見 15 頁)

1. 以下那一個季節出現地形引致的風切變機會最高？
 - a. 春天
 - b. 夏天
 - c. 秋天
 - d. 冬天
2. 雷擊時空氣會被加熱到
 - a. 20,000°C
 - b. 25,000°C
 - c. 30,000°C
 - d. 35,000°C
3. 根據積冰的特性，選出以下相配的冰種類：
 - i. 純淨冰
 - ii. 霧凇冰
 - iii. 混合冰
 - a. 發生於溫度 -10°C 至 -15°C 之間
 - b. 產生於大範圍的過冷水滴的地方
 - c. 通常在層雲中遇上

會議及探訪



「航空氣象委員會」管理層成員偷得浮生半日閒，與東道主 (Herbert Puempel 博士，前左) 慶祝銀婚紀念。

Members of the CAeM management group taking a break to join their host (Dr. Herbert Puempel, first from the left, front row) to celebrate his silver anniversary.

Strive to be better

The annual survey on the aviation weather services provided by the Observatory was conducted in late March. This is part of our commitment to ISO requirements and to better understand the needs of the airlines so that we could improve our services. We received 23 returns from the airlines. In respect of products and services provided by HKO, overall 98% were considered as satisfactory or better. The airlines also provided valuable comments and suggestions. We thank them for their suggestions and are following them up.

Quiz on aviation weather (See page 15 for answers)

1. The peak season for occurrence of terrain-induced windshear is
 - a. spring
 - b. Summer
 - c. Autumn
 - d. Winter
2. During lightning stroke, the air will be heated to
 - a. 20,000°C
 - b. 25,000°C
 - c. 30,000°C
 - d. 35,000°C
3. Match the following types of icing with its characteristic :
 - i. Clear ice
 - ii. Rime ice
 - iii. Mixed ice
 - a. Occurs in temperatures between -10°C and -15°C
 - b. Develops in an area of large supercooled water droplets
 - c. Normally is encountered in stratiform clouds

Meetings and visits

國際事務

劉心怡

機場氣象所主管劉心怡女士於 2004 年 4 月 5 日至 9 日在奧地利參與第一次「航空氣象委員會」管理層會議，這委員會是「世界氣象組織」下面八個技術委員會之一。這次會議的主要議程包括檢討各專家小組的進程、未來培訓方向及「航空氣象委員會」的未來大計。

Contribution to international arena

Sharon Lau

Ms. Sharon Lau, officer-in-charge of the Airport Meteorological Office (AMO), attended the first Management Group meeting of the Commission for Aeronautical Meteorology (CAeM). This commission is one of the eight commissions under the World Meteorological Organization (WMO). A range of topics were discussed at the meeting including progress of the various expert teams, future training efforts and the long term plan of the commission.

航空交通管理主管探訪天文台

應天文台邀請，署理助理民航處處長(航空交通管理) 譚禮漢先生及他的同事，在 2004 年 4 月 7 日探訪天文台總部，在如何進一步為航空交通管理部門提供更好的天氣服務及兩部門之間協調方面，交換意見。



Head of Air Traffic Management Visited the Observatory

Invited by the Observatory, Mr. Anthony Tam, Acting Assistant Director-General (Air Traffic Management) of the Civil Aviation Department (CAD) and his colleagues visited the Observatory Headquarters on 7 May 2004. Ideas on further enhancing the provision of weather services to air traffic management and coordination between the two services were exchanged.

民航處航空交通管理同事到訪。

Colleagues from Air Traffic Management of Civil Aviation Department visited the Observatory.

與美國國家海洋大氣局的合作

蔡本良

美國國家海洋大氣局環境技術實驗室的三位專家，於 2004 年 3 月 8 日至 3 月 20 日到訪香港天文台。這是繼 2003 年 2 月首度來港後再度訪港。在今年的訪問中，三位專家與天文台分享他們利用激光雷達分析風切變個案的心得。他們亦與天文台交換意見，探討範圍包括利用激光雷達自動化探測風切變的方法及天文台未來在香港國際機場的激光雷達應用。

Collaboration with NOAA

BL Choy

A second visit to the Observatory was made by three scientists from the Environmental Technology Laboratory (ETL) of the U.S. National Oceanic and Atmospheric and Administration (NOAA) during 8-20 March 2004. This was a follow-up to the first visit in February 2003. During the visit this year, the scientists shared with the Observatory their analysis of LIDAR (Light Detection and Ranging) data for a number of windshear cases. There was also an exchange of ideas on the Observatory's in-house developed automatic LIDAR-based windshear detection algorithms and concepts for further development of the Observatory's LIDAR system for the Hong Kong International Airport.



美國國家海洋大氣局環境技術實驗室的專家(前排右起) Dr. Robert Banta, Ms Lisa Darby and Dr. Michael Hardesty 合攝。

Scientists from ETL of NOAA (front row, from right to left): Dr. Robert Banta, Ms Lisa Darby and Dr. Michael Hardesty.

哈爾濱航空氣象服務研討會

陳柏緯

2003年12月，天文台參加了中國民用航空管理局在哈爾濱舉行的研討會。該會共有約70人從中國各地到來參加，發表文章32份。我在該研討會上發表了一篇有關在香港國際機場使用多普勒激光雷達的報告。該研討會提供了一個非常好的機會，讓我們和國內的航空天氣服務的同行交換經驗。



Aviation Meteorological Services Seminar in Harbin

P.W. Chan

In December 2003, the Observatory took part in the above seminar organized by the Civil Aviation Administration of China (CAAC) in Harbin. There were about 70 participants from all over China and 32 papers were presented. I presented a report on the application of a Doppler LIDAR at the Hong Kong International Airport. The seminar provided a good opportunity to share experience with the mainland experts in aviation weather services.

陳柏緯先生在哈爾濱航空氣象服務研討會上演說。

Mr. P.W. Chan presenting at the Aviation Meteorological Services in Harbin.

香港天文台在2004年3月31日舉行了兩場風切變及湍流警報簡報會，第一場是為航空公司代表及飛機師而設，而另一場則是為航空交通管制員。圖為岑智明先生與參加者討論時攝。

The Observatory delivered 2 briefings on windshear and turbulence on 31 March 2004. The first briefing was for airline representatives and pilots and the second one for air traffic control (ATC) personnel. Mr. C.M. Shun was pictured here exchanging views with the participants.



中國氣象局的專家團在2004年4月中旬訪問天文台，並參觀了機場氣象所、激光雷達及沙洲自動站。

A delegation of experts from China Meteorological Administration visited the Observatory's Airport Meteorological Office, LIDAR and Sha Chau Automatic Weather Station in mid-April 2004.

日本之旅

康志遠

雖然過往我曾多次去日本，但今年 2 月卻是我第一次以航空天氣預報員的身份訪問日本。在兩天的訪問中，我和日本氣象廳的同行分享我們在天氣預報，特別是風切變方面的經驗。此外，我亦向日本的同行了解他們爲了增進與客戶之間的聯繫，在羽田機場設立航空氣象服務中心的計劃。我亦值此機會，參觀日航的飛行操作控制中心，了解日航如何使用日本氣象廳提供的天氣資料。



Japan Visit

C.Y. Hong

Though I have visited Japan many times, it was the first time I visited Japan as an Aviation Weather Forecaster on duty this February. During the two-day visit, I shared with colleagues of Japan Meteorological Agency (JMA) our experience on weather forecasting, in particular windshear alerting. I also learnt about JMA's plan to foster closer liaison with its users through the establishment of an Aviation Weather Service Center in Haneda Airport. I also had the opportunity to visit the Japan Airlines (JAL) Flight Operation Control Center to understand how JAL utilizes the information received from JMA.

高級學術主任康志遠先生與日本氣象廳的同行攝於羽田機場。

Mr. C.Y. Hong, Senior Experimental Officer, pictured here with JMA colleagues at Haneda Airport.

總學術主任李聯安先生爲澳門理工學院氣象學高等專科學位課程的學員介紹機場氣象所運作。

Mr. L.O. Li, Chief Experimental Officer, introduced the operation of the Airport Meteorological Office to students of Higher Diploma in Meteorology, Macau Polytechnic Institute at the Airport Meteorological Office.



當值預報員岑富祥先生正向政府飛行服務隊及海上緊急事故及海上救援中心的代表介紹機場氣象所天氣預報工具。

Mr. F.C. Shum, duty Forecaster, introducing forecasting tools to visitors from the Government Flying Service and Marine Emergency and Maritime Rescue Co-ordination Centre (MRCC).



人與事

Staff matters



科學主任吳炳榮先生向傳媒介紹透過天文台「個人數碼助理」網站：

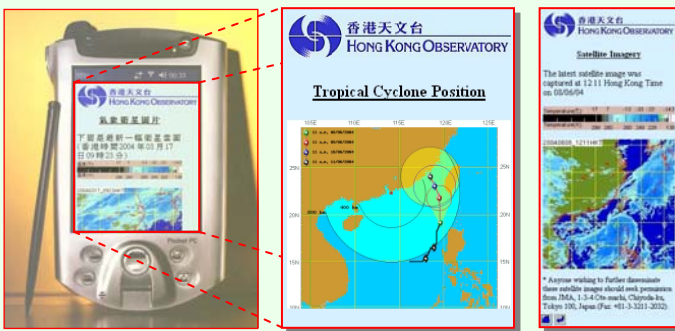
<http://pda.weather.gov.hk> 或 <http://pda.hko.gov.hk>

查閱最新的天氣警告、報告及預測等，市民亦可於該網站看到最新的衛星圖像、雷達圖像、天氣圖、雨量分佈圖以及香港各分區天氣的資料

Mr. P.W. Ng, Scientific Officer, demonstrated to the media the use of the Observatory's Personal Digital Assistant (PDA) website:

<http://pda.weather.gov.hk> or <http://pda.hko.gov.hk>

to obtain the latest weather warnings, weather reports and forecasts. The public can also view the latest satellite and radar imageries, weather charts, rainfall maps and regional weather information from the website.



新力軍

龍達文

航空氣象科最近加入了三位新的研究助理，我是其中之一。在3月初，我們參觀了機場氣象所和跑道旁的儀器，以了解天文台提供的服務。

New support

T.M. Lung

I am one of the three Research Assistants who have newly joined the Aviation Weather Services Branch. In early March, we paid a visit to the Airport Meteorological Office and the field sites along the runways to familiarize ourselves with the services provided by the Observatory.



航空氣象科同事在迎接猴年來臨的聯歡會中比賽寫揮春。

In celebrating the arrival of the Year of the Monkey, colleagues of the Aviation Weather Services Branch competed in Chinese phrase for 'luck'.



與學術界再度合作

岑智明

天文台高級科學主任岑智明先生得到香港大學的委任，在今年七月一日成為榮譽副教授。與天文台同事李炳華和黃偉健，將會在二零零五年初向大學本科生教授大氣物理課程。岑智明表示：「能夠得到委任及可以與香港大學合作向大學本科生推廣有關大氣的課題，我們感到十分榮幸。除了基本物理理論，我希望可以向他們介紹氣象的日常應用，包括天氣預測和特別課題如航空天氣等等。」

這次的委任是多年前與香港大學合作的延續。在八零年代和九零年代初，林超英先生〔現任天文台台長〕及楊繼興先生〔現任天文台助理台長〕教授了類似的課程。林先生和楊先生桃李滿門，多位天文台的同事，包括岑先生，都是他們的學生。



Further Collaboration with Academics

CM Shun

Mr. C.M. Shun, Senior Scientific Officer of the Hong Kong Observatory, will be appointed as Honorary Assistant Professor of the University of Hong Kong with effect from 1 July 2004. Together with his colleagues, Dr. P.W. Li and Mr. W.K. Wong, they will deliver an undergraduate course on atmospheric physics in early 2005. "It is indeed an honour for us to receive such an appointment and to collaborate with the University of Hong Kong to promote studies of the atmosphere among undergraduates," Mr. Shun said, "and I hope that apart from the basic physical theories, we could also introduce to them real-life applications of meteorology, including weather forecasting and specialized topics such as aviation weather."

This appointment is a sequel to an earlier collaboration with the University of Hong Kong many years back. Indeed in the 80's and early 90's, Messrs. C.Y. Lam (now Director of the Hong Kong Observatory) and K.H. Yeung (now Assistant Director of the Hong Kong Observatory) delivered similar courses. A number of the Observatory's staff, including Mr. Shun, were their students at the time.

岑智明先生在二零零四年六月十七日在亞太區民航當局飛行標準研討會上講解風切變及湍流。

Mr. C.M. Shun lecturing on windshear and turbulence in the Flight Standards Seminar for Asia-Pacific Region Civil Aviation Authorities on 17 June 2004.

電話及傳真號碼

Telephone and Fax Numbers

查詢飛行文件 Enquiry on flight documents	(852) 2910 6922	
機場氣象所主管 Officer-in-charge AMO	(852) 2910 6300	(852) 2922 5805
機場氣象所當值預報員 Duty Forecaster AMO	(852) 2910 6920	(852) 2922 5806
傳真 Fax	(852) 2910 0080	
打電話問天氣 Dial-a-Weather	(852) 187 8200 (廣東話 Cantonese)	
	(852) 187 8202 (普通話 Putonghua)	
	(852) 187 8066 (英文 English)	
查詢資料電話系統 Telephone Information Enquiry System	(852) 2926 1133	

香港天文台網頁

Hong Kong Observatory Home Page

<http://www.weather.gov.hk/>

<http://www.hko.gov.hk/>

航空天氣服務網頁

Web Page for Aviation Weather Services

<http://www.weather.gov.hk/aviation>

<http://www.hko.gov.hk/aviation>

是期編輯 李聯安

Editor this issue L.O. Li

香港天文台：香港九龍彌敦道 134A

Hong Kong Observatory : 134A Nathan Road, Kowloon, Hong Kong

電郵 Email : mailbox@hko.gov.hk