International Civil Aviation Organization

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Discussion Topic 2: Meteorological impacts on ATM and MET information required for Air Traffic Flow Management

METEOROLOGICAL ELEMENTS THAT AFFECT AIR TRAFFIC MANAGEMENT

(Presented by Japan)

SUMMARY

Japan Meteorological Agency (JMA) established the Air Traffic Meteorology Center (ATMetC) and began its operation in Oct. 2005 for the purpose of supporting Air Traffic Management Center (ATMC) of the Japan Civil Aviation Bureau (JCAB). This paper introduces the ATMetC's services about meteorological elements that affect to Air Traffic Management (ATM).

1. INTRODUCTION

1.1 The air traffic control is affected by weather condition. Therefore, the Japan Meteorological Agency (JMA) established the Air Traffic Meteorology Center (ATMetC), which provides all kinds of meteorological information of the air space and key airports for the purpose of supporting the Air Traffic Management Center (ATMC) of the Japan Civil Aviation Bureau (JCAB). ATMetC provides various observation data (including the report and analysis products) for ATMC through "ATMet Information Sharing system".

1.2 ATMC officers can get the real time weather information, such as weather radar, satellite images, etc., on the ATMet Information Sharing system, and they use these observation data with meteorological briefing for the air traffic management.

1.3 Meteorological observation data which affect air traffic control are as follows. Very high cloud top along the airway causes the deviation of aircrafts from the original route, and the heavy precipitation around the aerodrome exhaust officers and pilots. Wind shear , especially microburst, sometimes interrupt landing and takeoff. Unexpected runway change caused by sudden wind variation disturbs the landing and take-off, and causes overcrowd of the control area.

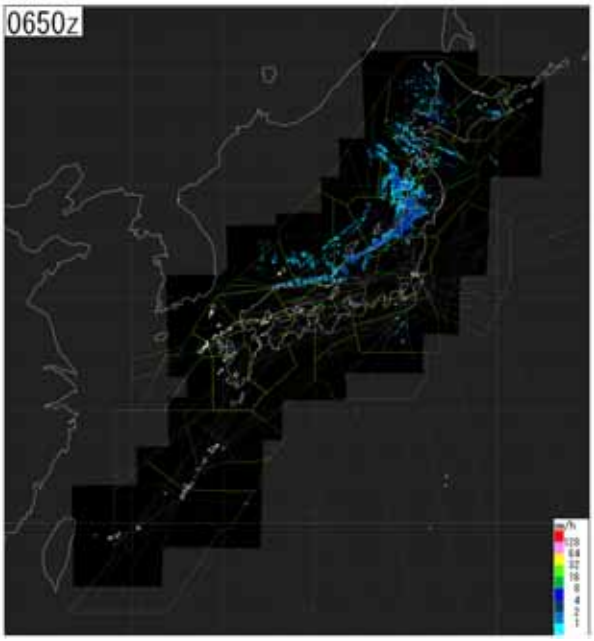

Figure 2 Meteorological radar echo

2. METEOROLOGICAL RADAR

2.1 ATMetC provides the meteorological radar information. JMA‘s network of 20 C-band radars (with a wavelength of 5.6cm) covers most of Japan’s territory and observes echo intensity and distribution. Detection range of each radar is about radius of 500km, and radar data are digitized to produce special composite maps (rainfall intensity and echo height) every five minutes for the purpose of monitoring precipitation throughout the country.

2.2 At ATMC, these composite maps are piled up with other maps, such as SIGnificant METeorological information (SIGMET), LIghtning DEtection Network (LIDEN) data, airways, radio equipments, and so on. In addition, JMA has the plan to make and distribute the unique products, such as the cross section of the echo intensity which are superposed the model wind data, for the ATMC and ATMet. Officers watch the weather variation, especially echo movement and height, to estimate the deviation rate for the adequate air traffic capacity.

3. TERMINAL DOPPLER WEATHER RADAR AND LIDAR

3.1 Wind shear is the hazardous phenomenon to aircraft during takeoff and landing. JMA operates the Terminal Doppler Weather Radar (TDWR) to detect the wind shear at nine airports. TDWR system can see three-dimensional precipitation and wind fields. The observation range of TDWR is radius of 120 km, and TDWR has the capability to detect the microburst within a 20 km radius every 1.2 minutes and the shear line within a 60km radius every 6 minutes.

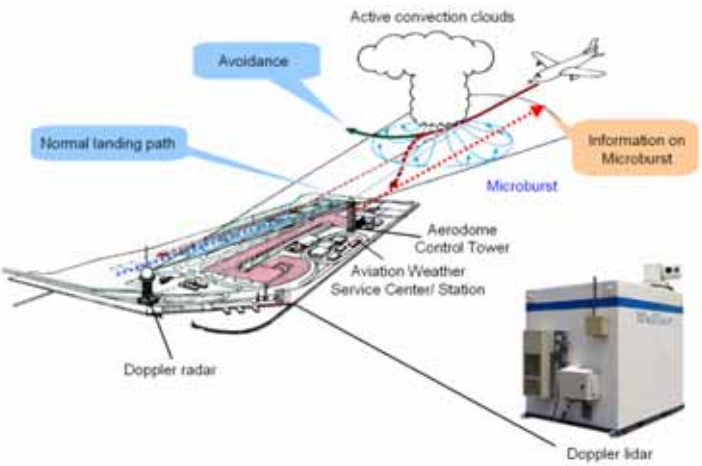

Figure3 Doppler radar and Doppler lidar for airport weather observation

3.2 When there is no precipitation, three-dimensional wind fields are observed using Doppler LIDARs (Light Detection and Ranging) at two airports (Tokyo and Narita). Detection range of a LIDAR is about radius of 10 km.

3.3 Once the wind shear is detected near the aerodrome by TDWR or LIDAR and MBA/WSA （Micro Burst Alert/Wind Shear Alert） announced, the officer has to rapidly adjust the air traffic flow around the aerodrome with unexpected runway change or go-around of the aircraft.

4. METAR/SPECI and real time observation data

4.1 METAR and SPECI of 14 domestic major airports and telegrams which include the keywords concerned with significant weather are indicated on the display. Observation data are picked up from the latest weather report and indicated along with hourly forecast. This information assists the officers to judge the weather condition of the aerodrome and to perform comparison with the forecast consistently.

4.2 Observation data such as surface wind, precipitation and snow intensity which is automatically collected and processed from the equipments at each airport are indicated on the display. These data are updated every 6 seconds and assist the officers to decide the capacity of the air traffic flow and management depending on the real-time weather condition.

5. SATELLITE OBSERVATION

5.1 Satellite observation provides a wealth of information, such as data on cloud height and distribution, upper-air wind, and sea surface temperature distribution. Currently, the Multi-functional Transport Satellite (MTSAT-2) launched in 2006 is in operation since July 2010. Satellite imageries (infrared, water vapor and visible) are indicated piled up with maps of SIGMET, LIDEN, airways, etc.. Satellite cloud information chart, which includes cloud top height automatically classified, is also used for air traffic management. Satellite observation data is used instead of meteorological radar data over the areas where the radar observation cannot cover.

6. SUMMARY

6.1 The most important matters to use observation data for the use of air traffic management are real-time updating and good visibility. Various observation data are piled up with other maps such as air route, into one image, officers can use these data very usefully. So, the observation information systems shall be constructed on these points. Besides, for more suitable air traffic management, varieties of meteorological elements should be investigated continuously.

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