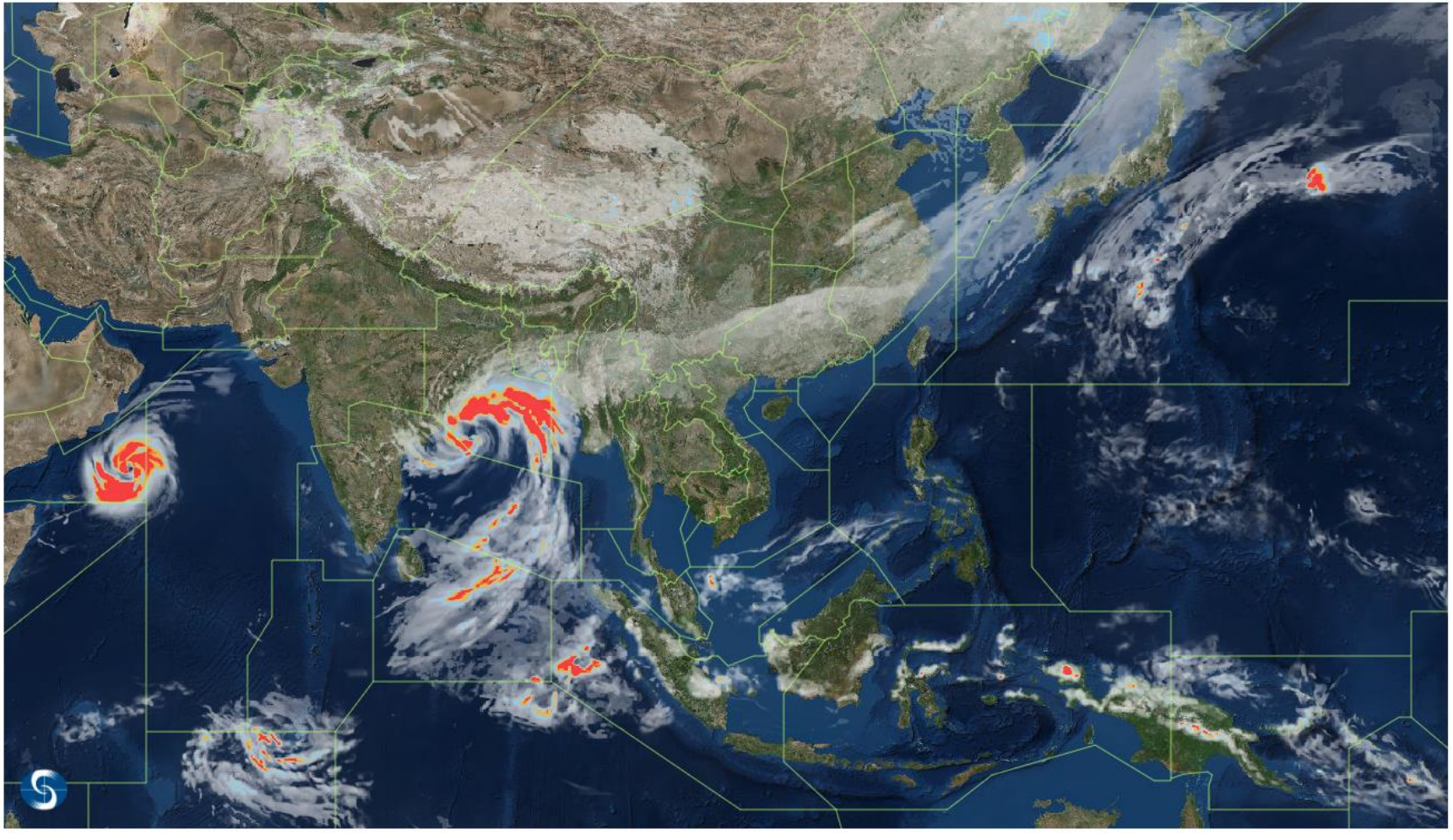
WMO VCP Workshop on MET-ATM Integration

Hong Kong, China
10th October 2018

K.K. Hon
kkhon@hko.gov.hk

香港天文台
HONG KONG OBSERVATORY

NWP for Aviation-Impact Hazard Prediction



Fine-resolution NWP for HKIA, *etc.*

WORLD METEOROLOGICAL ORGANIZATION

AeroMetSci 2017

AERONAUTICAL METEOROLOGY SCIENTIFIC CONFERENCE

Frequent-output sub-kilometric NWP models supporting enhanced runway throughput and performance-based navigation

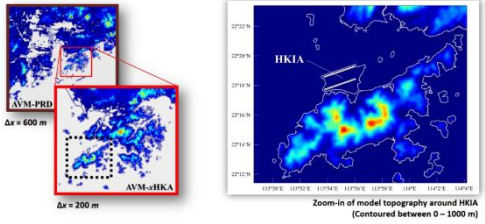
K.K. Hon and P.W. Chan*
Hong Kong Observatory

**kkhon@hko.gov.hk*

6 to 10 November 2017, Météo-France, Toulouse

HKO's Aviation Model (AVM)

- Sub-km implementation of WRF-ARW (v3.7.1) for HKIA
- Hourly-updated up to T+9 (or so)
- Inner (200-*m*) domain recently expanded to whole of HK
- Windshear/turbulence, good ol' winds & temp. forecasts

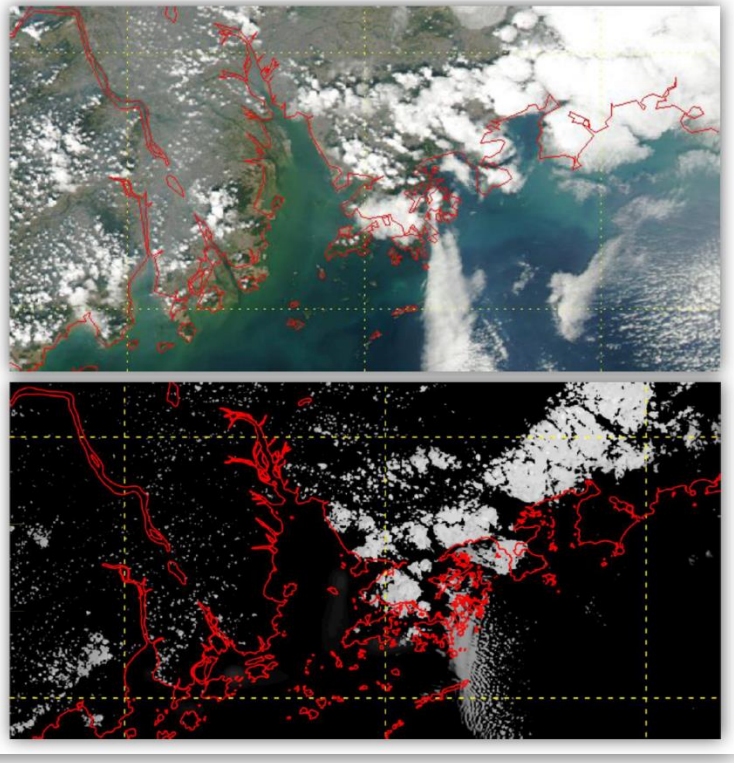


What does 200-*m* res. look like?

***Top*: Cloud distribution over Pearl River Estuary during passage of an E'ly wind front as observed on MODIS (true colour)**

***Bottom*: Simulated cloud imagery (through RTTOV) based on AVM forecast**

(Gridlines at 1-deg lat./lon.)

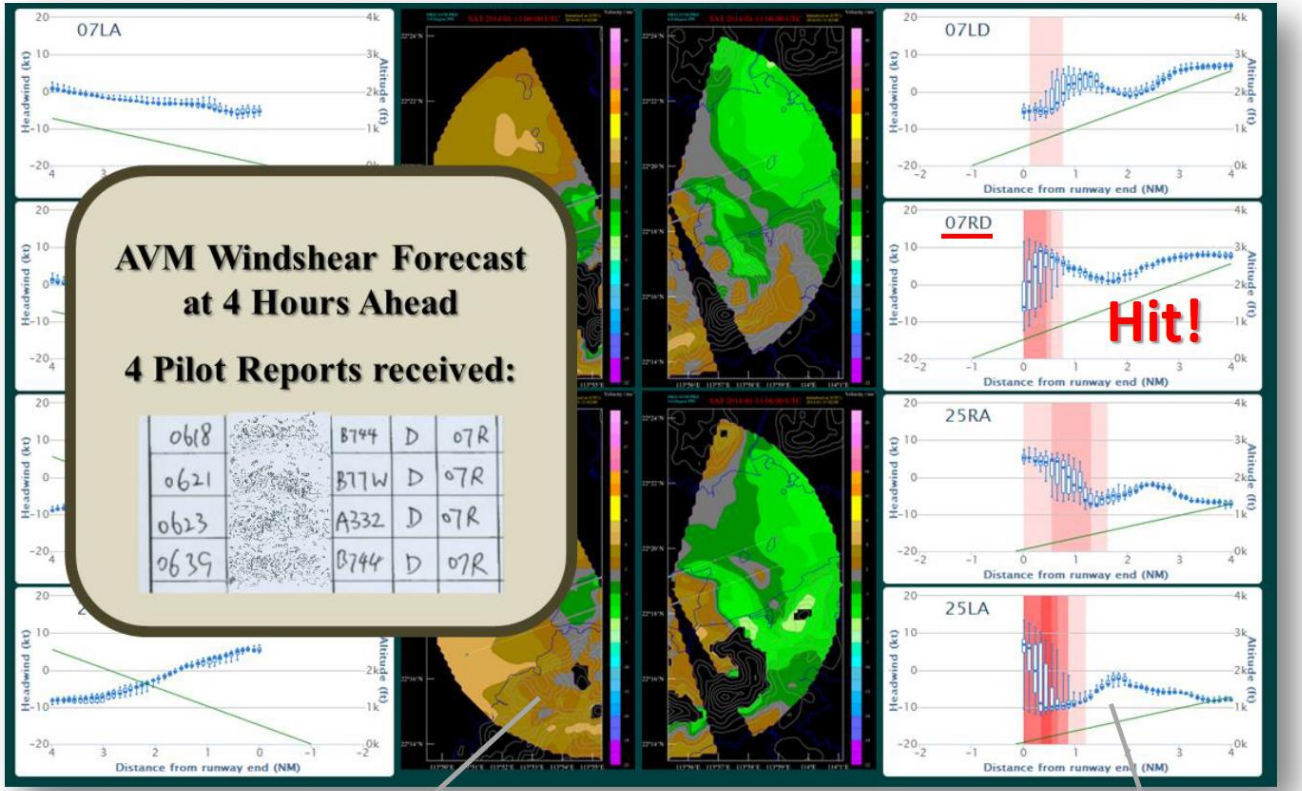


Hon (2017):

Simulated satellite imagery at sub-*km* resolution by the Hong Kong Observatory

Weather, accepted, DOI:10.1002/wea.3100

Prediction of Low-level Windshear

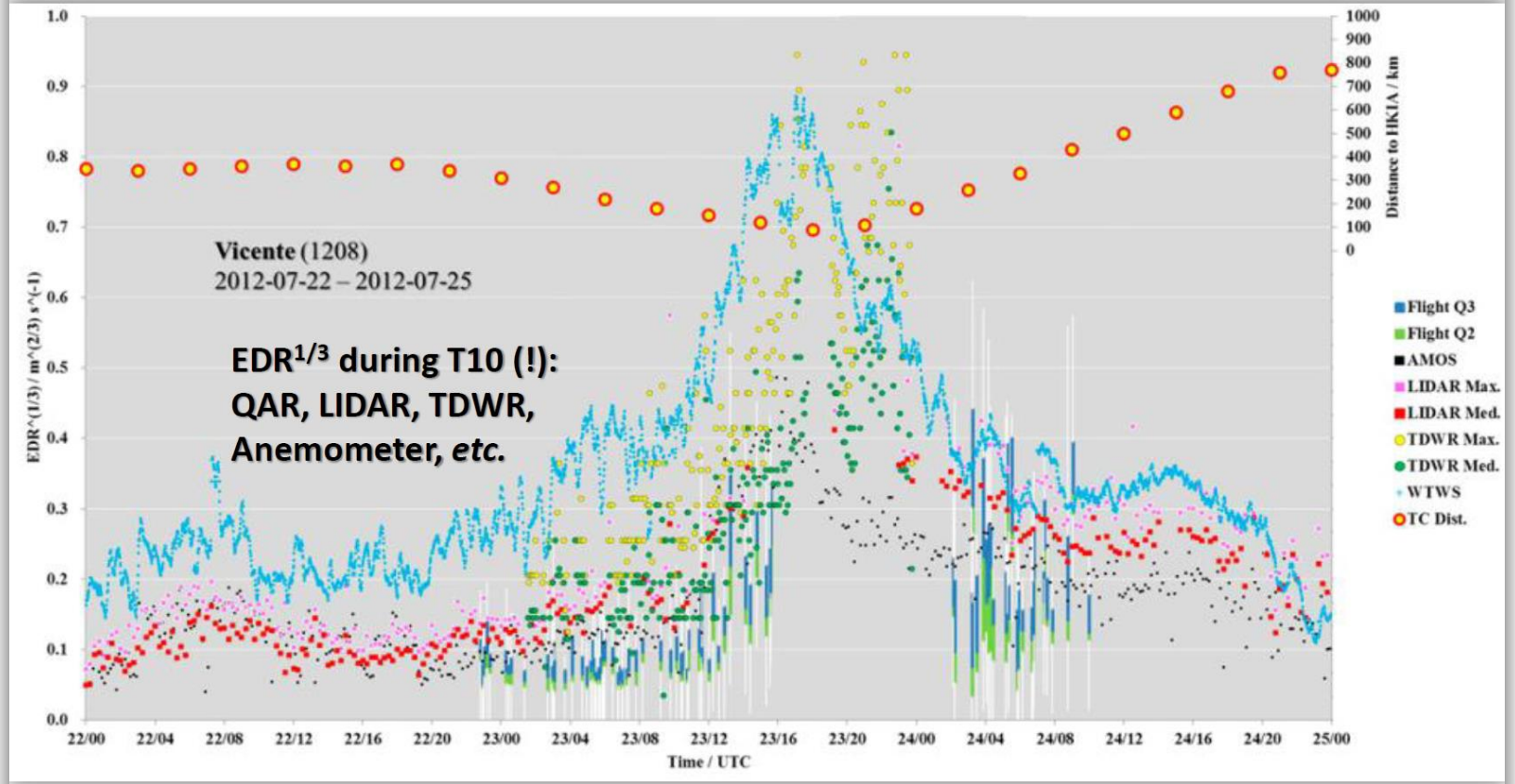


Simulated LIDAR PPI of Doppler velocities @ 3-/6-deg elevation

Predicted headwind changes along 8 x arrival/departure glide-paths

(Note only 1 combination can be in use at a time – e.g. 07LA/07RD)

The Problem with $EDR^{1/3}$…



Hon and Chan (2014):
Terrain-Induced Turbulence Intensity during Tropical Cyclone Passage as Determined from Airborne, Ground-Based, and Remote Sensing Sources.
J. Atmos. Oceanic Technol., **31**, 2373–2391.

Aviation Applications of Doppler LIDARs

https://www.hko.gov.hk/hkonews/A2/news-20181008e.htm

10 Oct 2018 (Wed) | 24.6°C 95% (13:30) Personalised | App | Mobile | 繁體 | 简体

香港天文台 HONG KONG OBSERVATORY

The Government of the Hong Kong Special Administrative Region

Innovate with Science, Serve with Heart

New York 26°C 20°C

Home | What's new | About us | HKO Side Lights | Our Services | Visitors Figures | Press releases | Weather Note (Chinese) | Weather Warning | Local Weather Observations | Weather Forecast | Weather Monitoring Imagery | Computer Forecast Products | MyObservatory | Met on Map | Tropical Cyclones | Aviation Weather Services | Marine Meteorological

Weather | Climate | Community | Learning | News | e-Services | Follow Us

HKO Side Lights

< Back

Hong Kong Observatory (HKO) is designated as a Testbed for Doppler LIDAR by World Meteorological Organization (WMO)

Monday, 8th October 2018

[Mobile Version]

HKO is designated by WMO as a Testbed for Doppler Light Detection and Ranging (LIDAR) systems for aviation application. HKO is the world-first in the use of LIDAR for operational windshear detection back in 2002. The LIDAR Windshear Alerting System received the Hong Kong ICT Grand Award back in 2009. Currently seven Doppler LIDARs, including two long-range and five short-range LIDARs are installed at the Hong Kong International Airport for detection of windshear, building wake and wake turbulence from aircraft. The designation by WMO as a Testbed for Doppler LIDAR for aviation application is a further recognition from the meteorological community of HKO's technological advancement in the use of Doppler LIDAR to gain better knowledge on windshear and turbulence which is critical for aviation safety.

CIMO Testbeds are established to promote collaboration between CIMO and relevant National Meteorological and Hydrological Services (NMHSs) in testing, development and standardization of meteorological instruments and systems performance for the benefit of all WMO Members. Right now there are only seven Testbeds as designated by WMO in the whole world.

Partnership with Hong Kong Airport Authority

Hong Kong Observatory
The Government of the Hong Kong Special Administrative Region
Innovate with Science, Serve with Heart

GovHK香港政府一站通 | 繁體版 | 简体版

SEARCH Enter search keyword(s) | SITE MAP

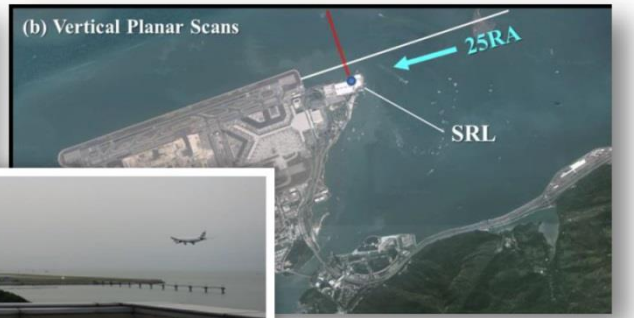
- Home
- What's new
- About us
- HKO Side Lights
- Our Services
- Visitors Figures
- Press releases
- Today's Weather Warnings
- Local Weather Observations
- Weather Forecast
- Weather Monitoring

Print Version | PDF Version

First Wake Vortex Measurements at the Hong Kong International Airport

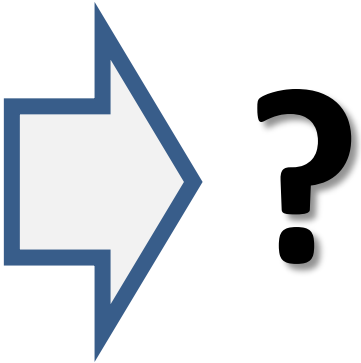
The Observatory has always been keen in applying the latest technology in advancing aviation meteorological service. Over the past few summers, a rented unit of short-range LIDAR (SRL) – a higher-resolution, more agile counterpart to the long-range LIDARs currently used in the alerting of low-level windshear – has been installed on the rooftop of the AsiaWorld-Expo to study the properties of building-induced windshear and turbulence at corridor 25RA. This was achieved by performing rapid near-horizontal planar scans, up to 3 times per minute, over the region spanned by the last 1 to 2 nautical miles before touch-down (Fig. 1a).

http://www.hko.gov.hk/aviat/outreach/32nd/wakevortex.htm



"Building effect" scans (PPI every 20 – 30 *s*)

Prelim. wake vortex scans (RHI every 5 *s* or so)



World Meteorological Organization

COMMISSION FOR AERONAUTICAL METEOROLOGY

Sixteenth Session

Exeter, UK, 24 to 27 July 2018

CAeM-16/INF. 6.3(1)

Submitted by:
President of CAeM

23.VII.2018

OPPORTUNITIES FOR FURTHER ADVANCEMENT OF AVIATION WEATHER SERVICES

Abstract

In response to the Global Air Navigation Plan (GANP) and the associated Aviation System Block Upgrade (ASBU) methodology promulgated by the International Civil Aviation Organization (ICAO), new initiatives to fast-track science into applications and services to meet the increasing demand from users have been taken forward by aeronautical meteorological services and providers around the world. This information paper gives a brief summary of the identified opportunities for further advancement of aviation weather services from the perspective of an NMHS supporting a busy aviation hub.

New Developments for Supporting Terminal Area

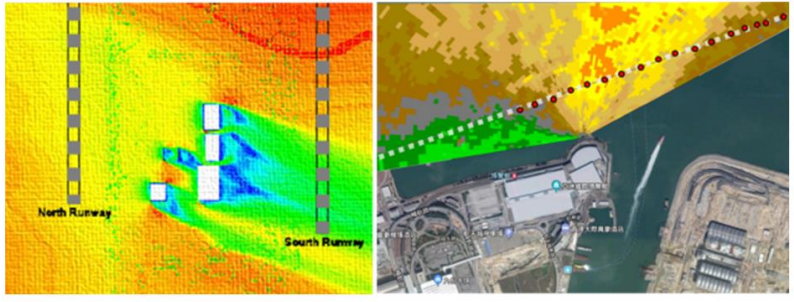


Figure 4 Assessing the impact of new constructions at the Hong Kong International Airport (HKIA) using CFD simulations (left); and (right) detection of building-induced turbulence using rapid-scanning SRL.

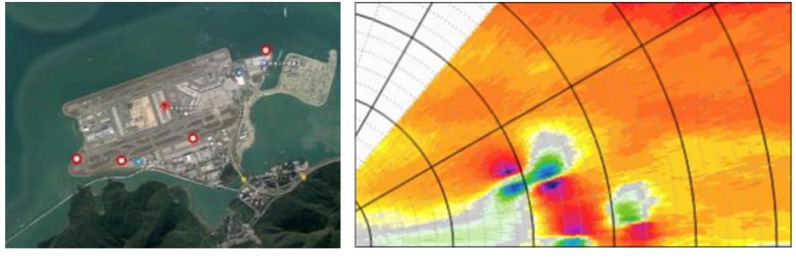


Figure 5 Four SRLs (red circle) placed at a strategic location for monitoring wake turbulence from arrival and departure flights (left); and complex wake vortices observed by the SRL (right).

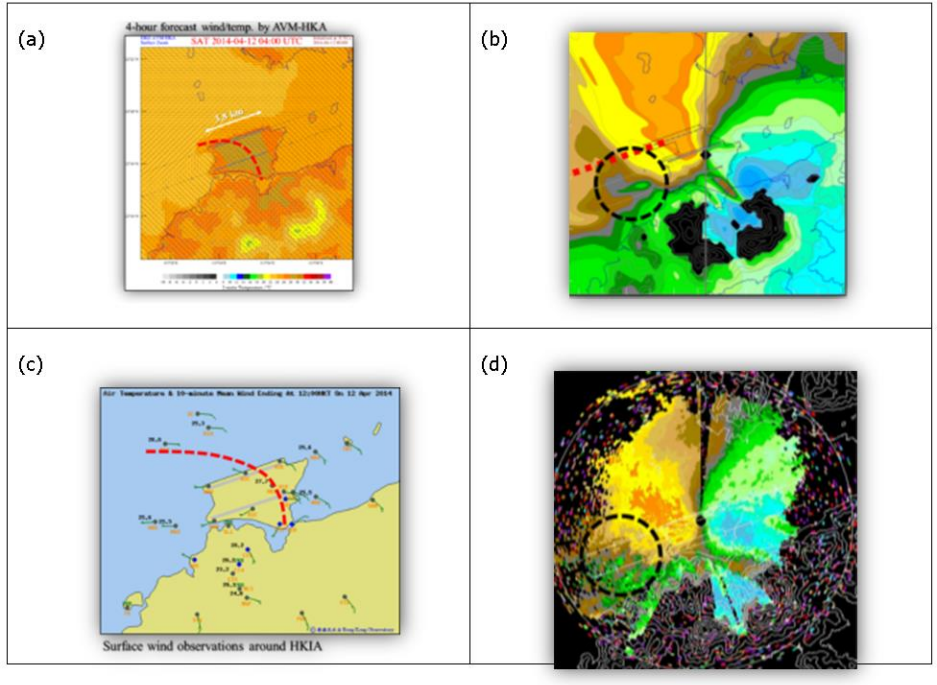


Figure 6 (a) 4-hour simulation of sea breeze by sub-kilometre scale aviation model; (b) simulated LIDAR based on the 4-hour AVM forecast; (c) and (d) are respectively the actual aerodrome and LIDAR observations.

Uncertainty / Confidence / Alternative Scenarios [?]

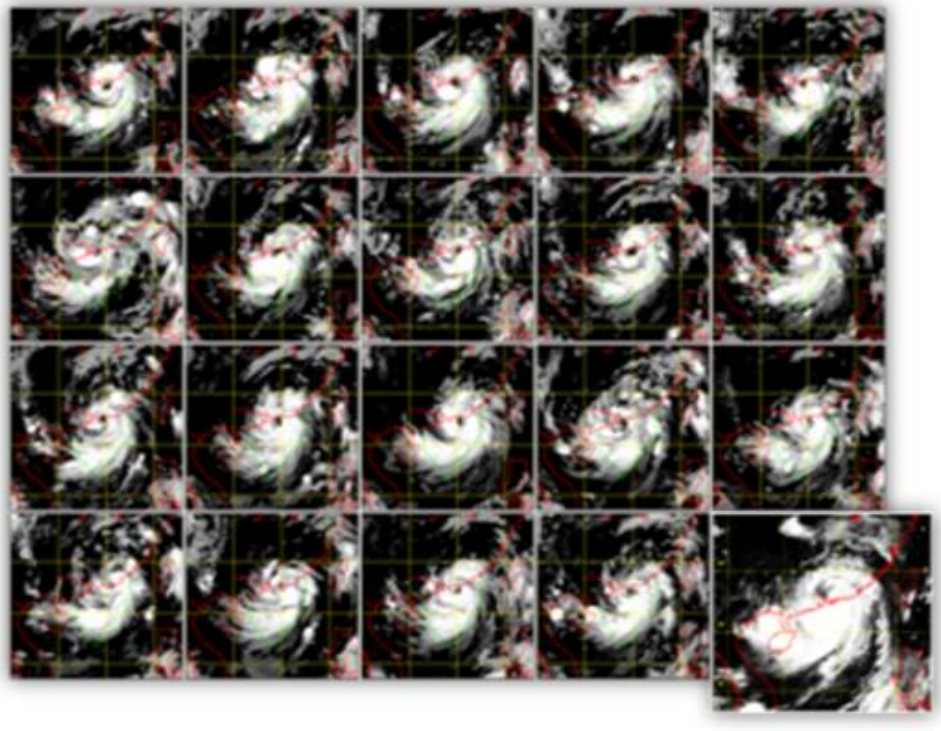


Figure 7 Mesoscale EPS simulation of Typhoon Nida. The picture at the lower right corner is the corresponding actual satellite image.

Thank you !

kkhon@hko.gov.hk

香港天文台
HONG KONG OBSERVATORY