



World Meteorological Organization

Weather • Climate • Water



Global Aviation Trend and Nowcasting/Mesoscale Modelling Requirements

*CM Shun and Sharon Lau
Hong Kong Observatory*

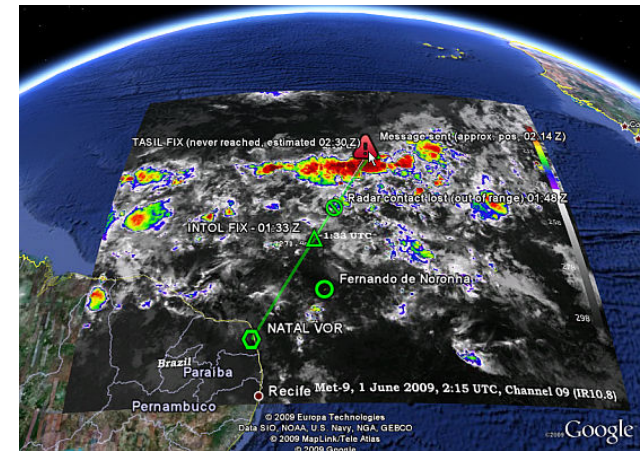
**4th WWRP International Symposium on
Nowcasting and Very-short-range Forecast
Hong Kong, China, 25 July 2016**



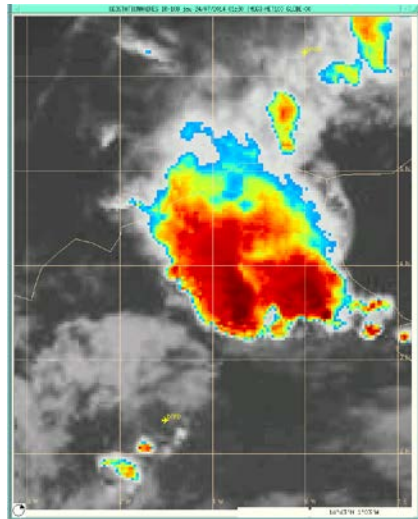
Aviation Accidents & Weather

- Weather is a major contributing factor to **aviation accidents**
- IATA classifies weather as an **“environmental threat”** that induces pilot’s error
- Weather is the **second biggest** threat to flight safety after aircraft malfunction

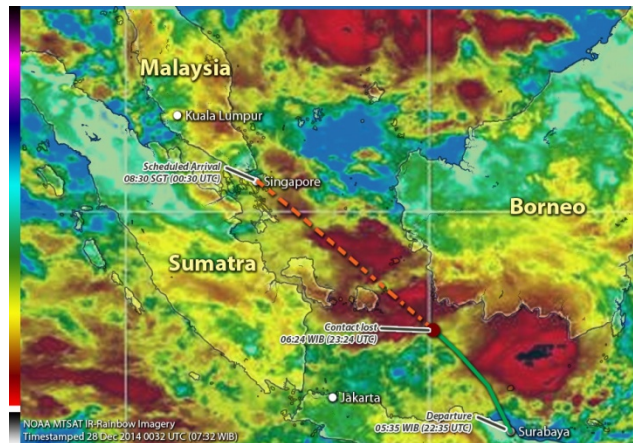
1 June 2009
Air France 447



24 July 2014
Air Algerie 5017



28 December 2014
AirAsia 8501



July 2014
SA Airways 286

SEV CAT





Weather & Airport Operation

More travel chaos expected as Hong Kong Airport Authority battles to clear backlog after rain storm

Chek Lap Kok's ability to function in extreme weather questioned after weekend rainstorms cause thousands of passengers to be stranded

Danny Lee
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PUBLISHED : Sunday, 24 May, 2015, 12:50pm
UPDATED : Monday, 25 May, 2015, 8:07am



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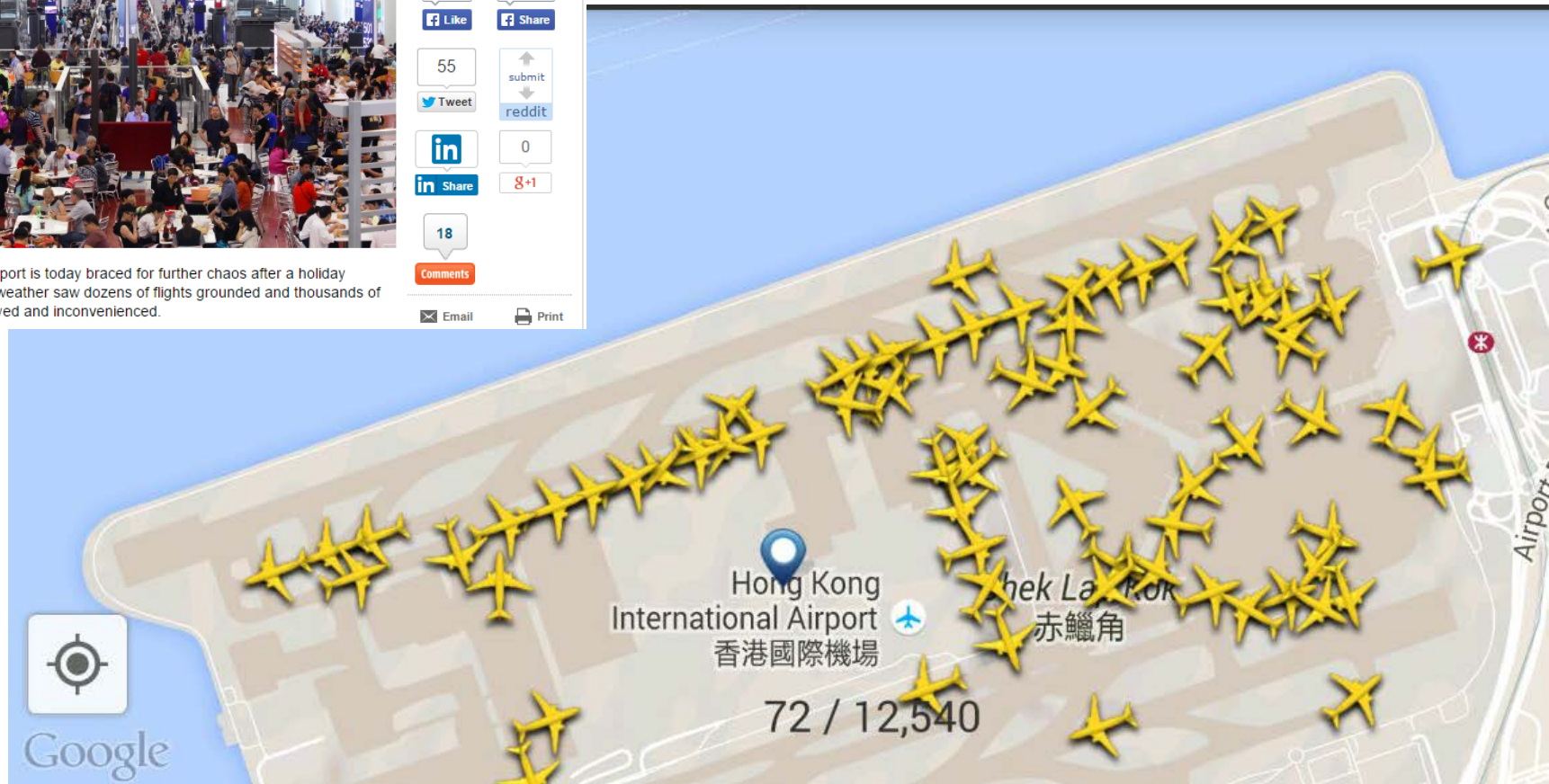
Email Print

Chek Lap Kok airport is today braced for further chaos after a holiday weekend of wild weather saw dozens of flights grounded and thousands of passengers delayed and inconvenienced.

Increasing **vulnerability** of operations to weather

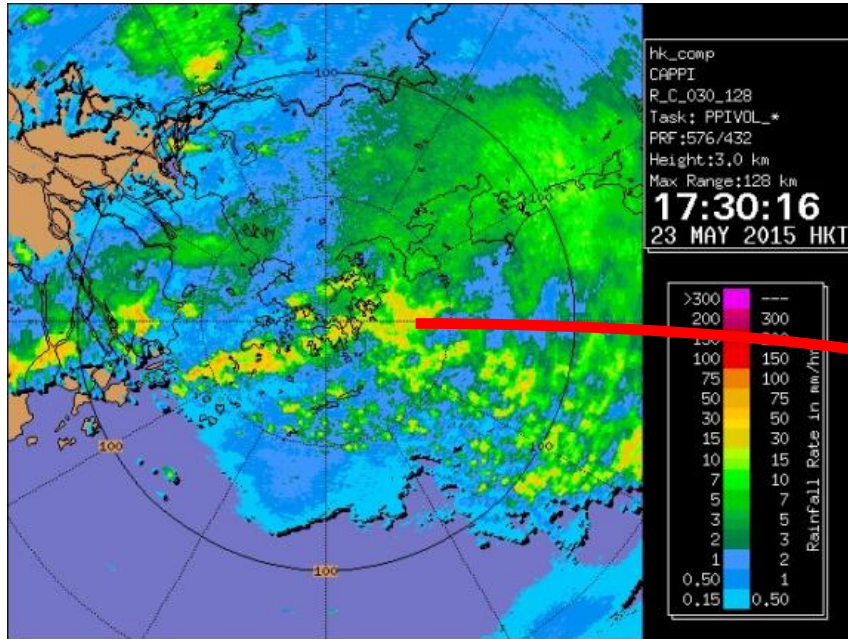
23 May 2015: 25 cancellations, 694 delayed and five diverted

24 May 2015: 29 cancellations and 614 delays





Weather & Airport Operation





User requirements

Industry needs and expectations

BETTER

Quality

Access

Utilization

OF WEATHER
INFORMATION

- Need to provide information fit to support user's decisions
- Seamless services, global harmonization
- Efficiency



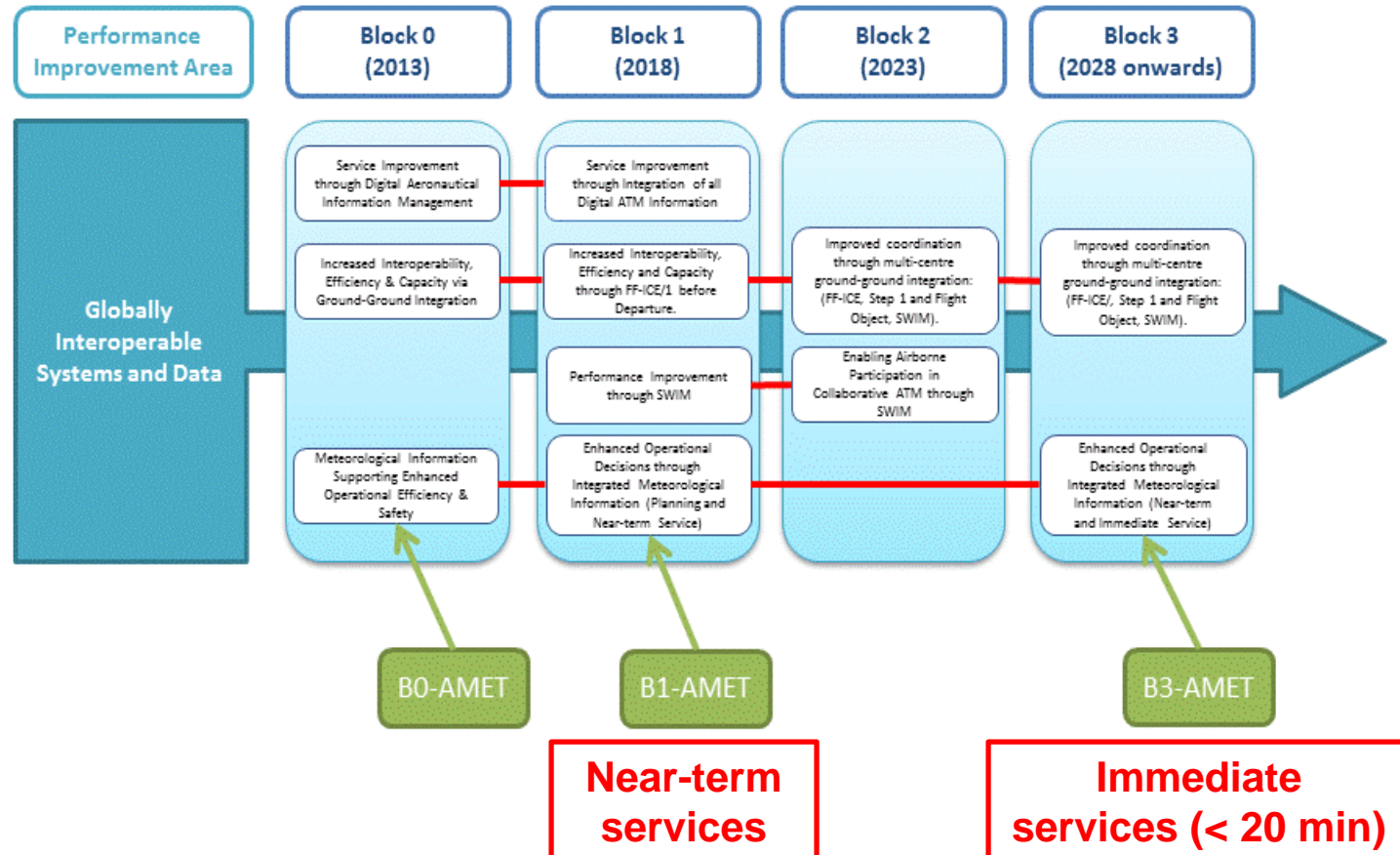
- Future development of MET service fully aligned and integrated into the future ATM system as part of the **Global Air Navigation Plan (GANP)**
- MET developments part of the **Aviation System Block Upgrades (ASBU)** methodology and timeline



- ASBUs – a systems engineering modernization strategy – a series of modules across 4 performance improvement areas and 4 time blocks

National Projects:

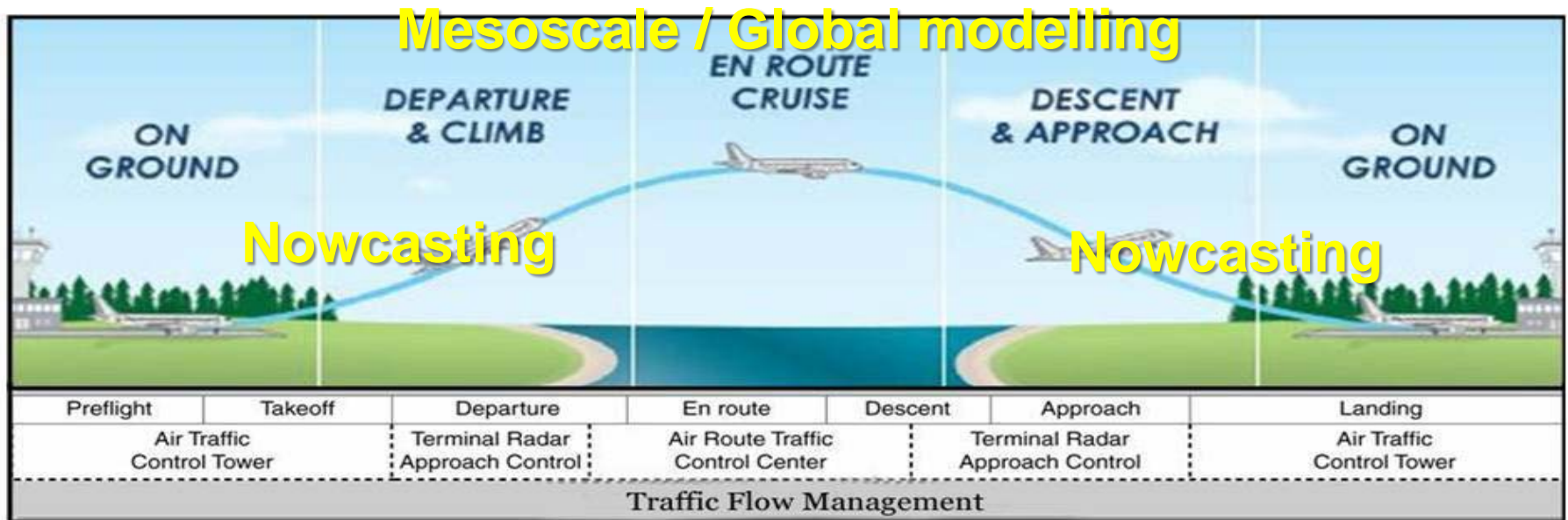
- ❑ *SESAR – Europe*
- ❑ *NextGen – USA*
- ❑ *CARATS – Japan*
- ❑ *SIRIUS – Brazil*
- ❑ *China*
- ❑ *Canada*
- ❑ *Etc.*





Trajectory-based operation (TBO)

- Seamless MET information, not bounded by FIR
- Trajectory-based operation; gate-to-gate info



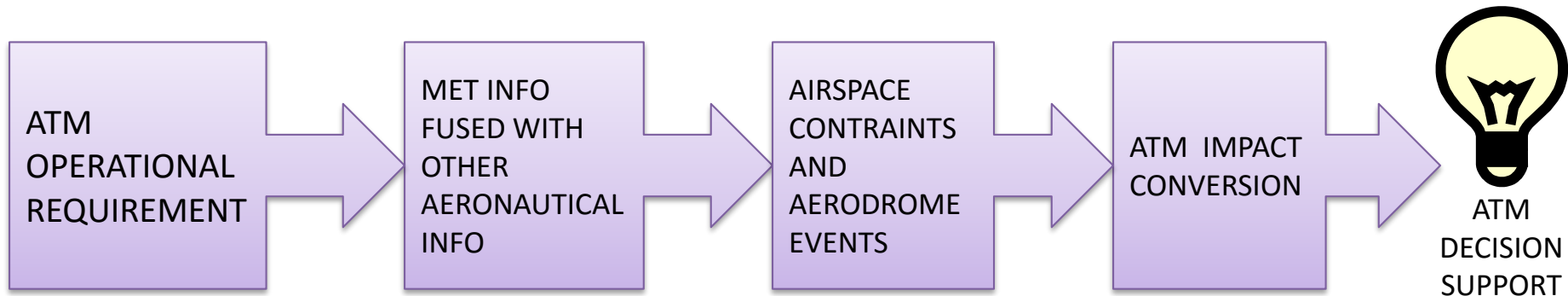
To be provided by local Services
 Meteorological Service information for the Terminal Area (MSTA)

Mainly supported by global Aviation Weather Forecast Centre (AWFC)

To be provided by local Services
 Meteorological Service information for the Terminal Area (MSTA)



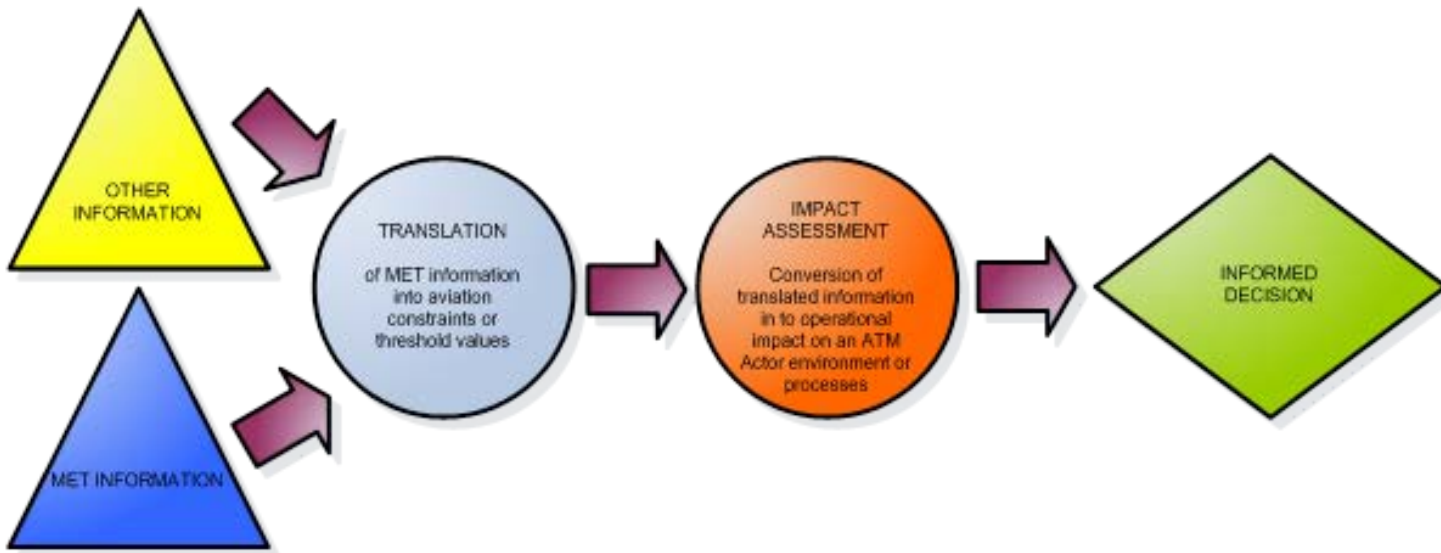
MET-ATM integration



- System-Wide Information Management (SWIM)
- “Product” centric → “Data” centric (Big Data concept)
- Collaborative, knowledge-based, decision making
- Impact-based and probabilistic
- Regional/global service delivery



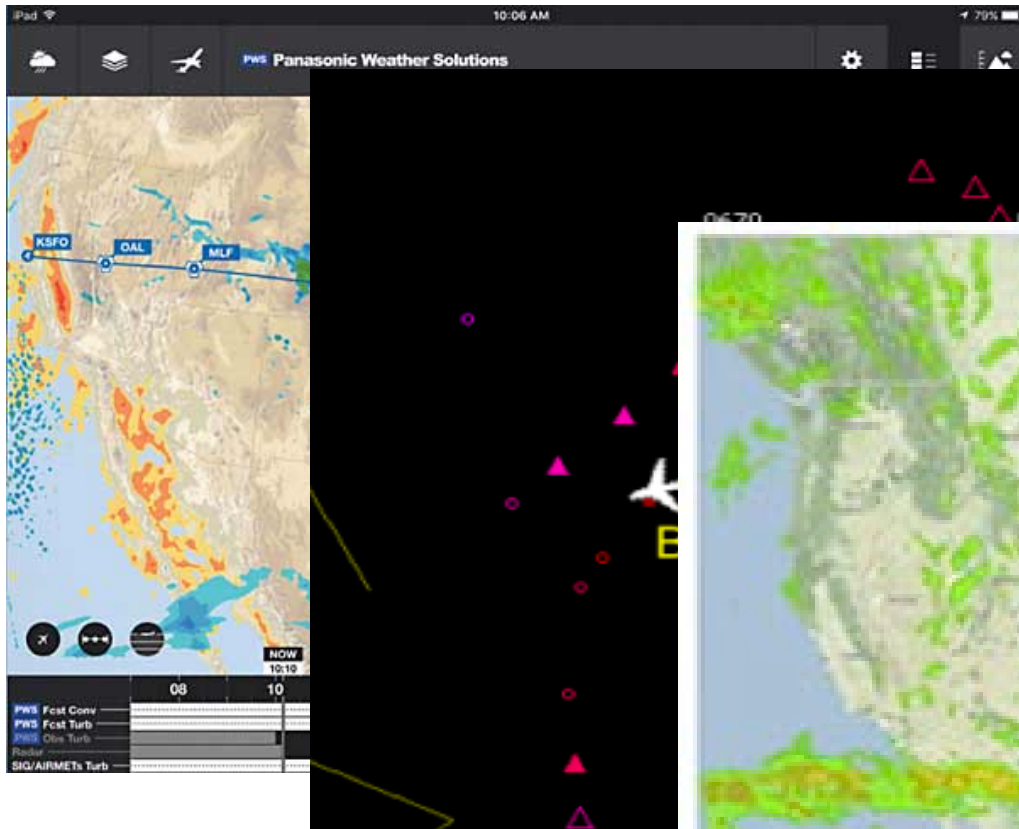
MET-ATM integration



- **Partnership with ATM to research translation of weather into aviation impact**
- **Various integration levels – finally an informed decision**



New Modes of Service Delivery



TAMDAR Point

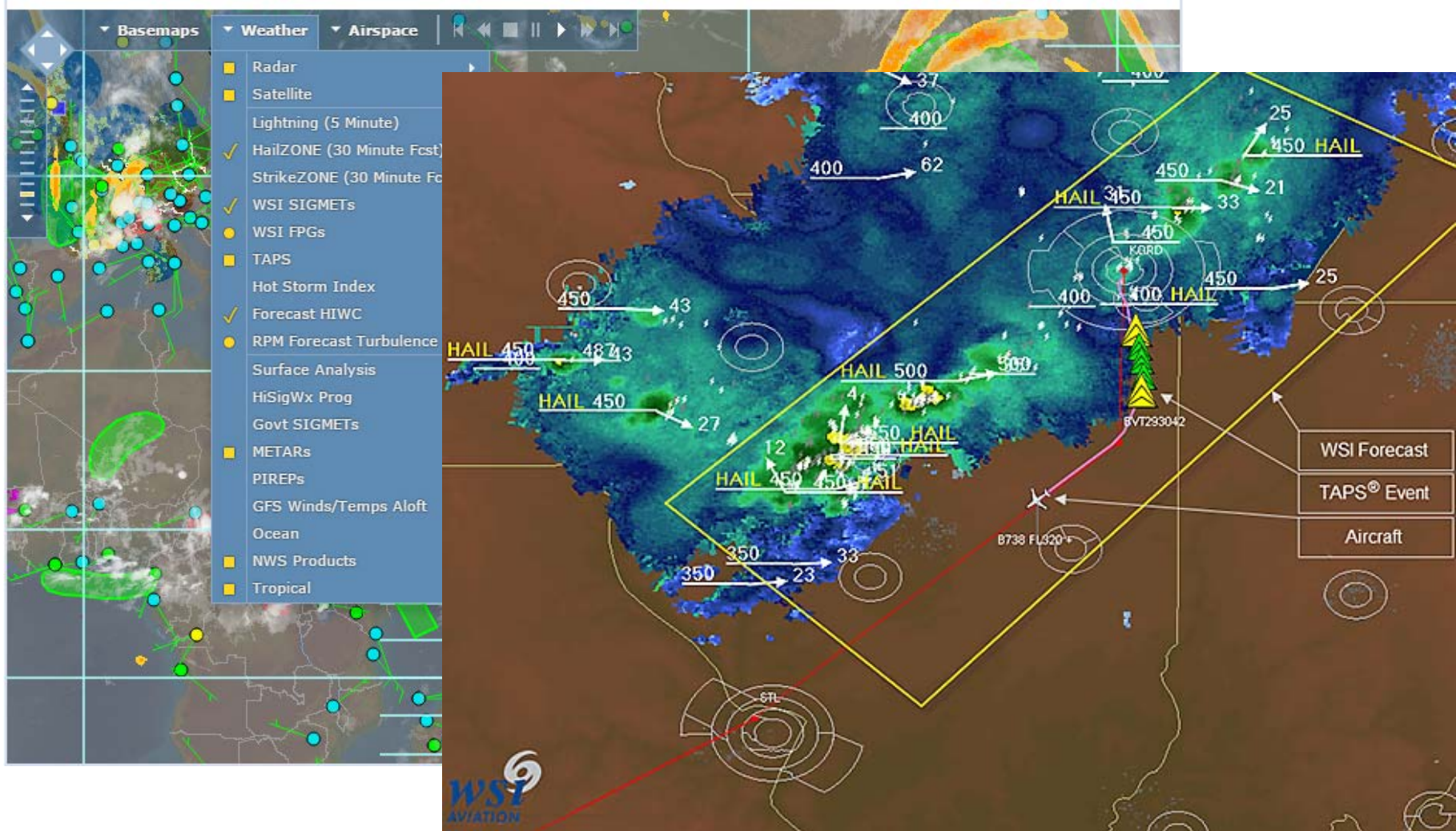
- Trajectory based
- High-impact weather
- Obs + NWP (value add on top of global models)



EDR-based turbulence forecast
(Schneider Electric)



New Modes of Service Delivery



TAPS turbulence observation (WSI)

MET Service Developments

ATM Categorized Impact of weather Element prediction

Issued at: 1930UTC 20 May 2015
ATMeTC Tokyo Metropolitan Area TEAM, JMA

Sector/Time(UTC)	19					20					21					22					23					00									
	30	40	50	0	10	20	30	40	50	0	10	20	30	40	50	0	10	20	30	40	50	0	10	20	30	40	50	0	10	20	30	40	50		
T02	CR					CONV																													
T02_W_NW Conv																																			
T02_W_NE Conv																																			
T02_W_SW Conv																																			
T02_W_SE Conv																																			

The screenshot shows a Japanese weather service interface. On the left, there is a grid of weather elements categorized by time and sector. The main area displays a radar map of Japan with various weather elements overlaid. The interface includes navigation buttons and a search function.

Japan

The screenshot shows the METEO FRANCE website. The main content is a forecast for CDG on Tuesday, 26/01/10. The forecast includes a table of weather elements and a radar map of France.

Element	17h	18h	19h
CDG	45	15	45
CEILING	NC		
VISIBILITY			
FOG			
FREEZING FOG			
THUNDERSTORMS			
HEAVY RAIN			
RAIN & SNOW			
SNOW			
BLACK ICE			
COLD TEMPS			
WARM TEMPS			
WIND GUSTS			
CROSS WIND			
GUSTS	-4	-4	-4
AVERAGE	-4	-4	-4
CROSS WIND	4	4	4
AVERAGE	4	4	4
GUSTS	45	15	45
AVERAGE	45	15	45

China

The screenshot shows the INSITE website. The main content is a forecast for CDG on Tuesday, 26/01/10. The forecast includes a table of weather elements and a radar map of the USA.

Element	17h	18h	19h
CDG	45	15	45
CEILING	NC		
VISIBILITY			
FOG			
FREEZING FOG			
THUNDERSTORMS			
HEAVY RAIN			
RAIN & SNOW			
SNOW			
BLACK ICE			
COLD TEMPS			
WARM TEMPS			
WIND GUSTS			
CROSS WIND			
GUSTS	-4	-4	-4
AVERAGE	-4	-4	-4
CROSS WIND	4	4	4
AVERAGE	4	4	4
GUSTS	45	15	45
AVERAGE	45	15	45

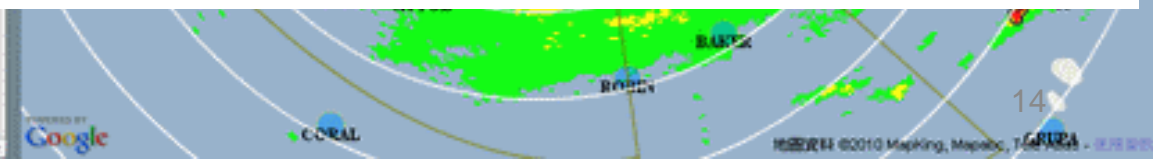
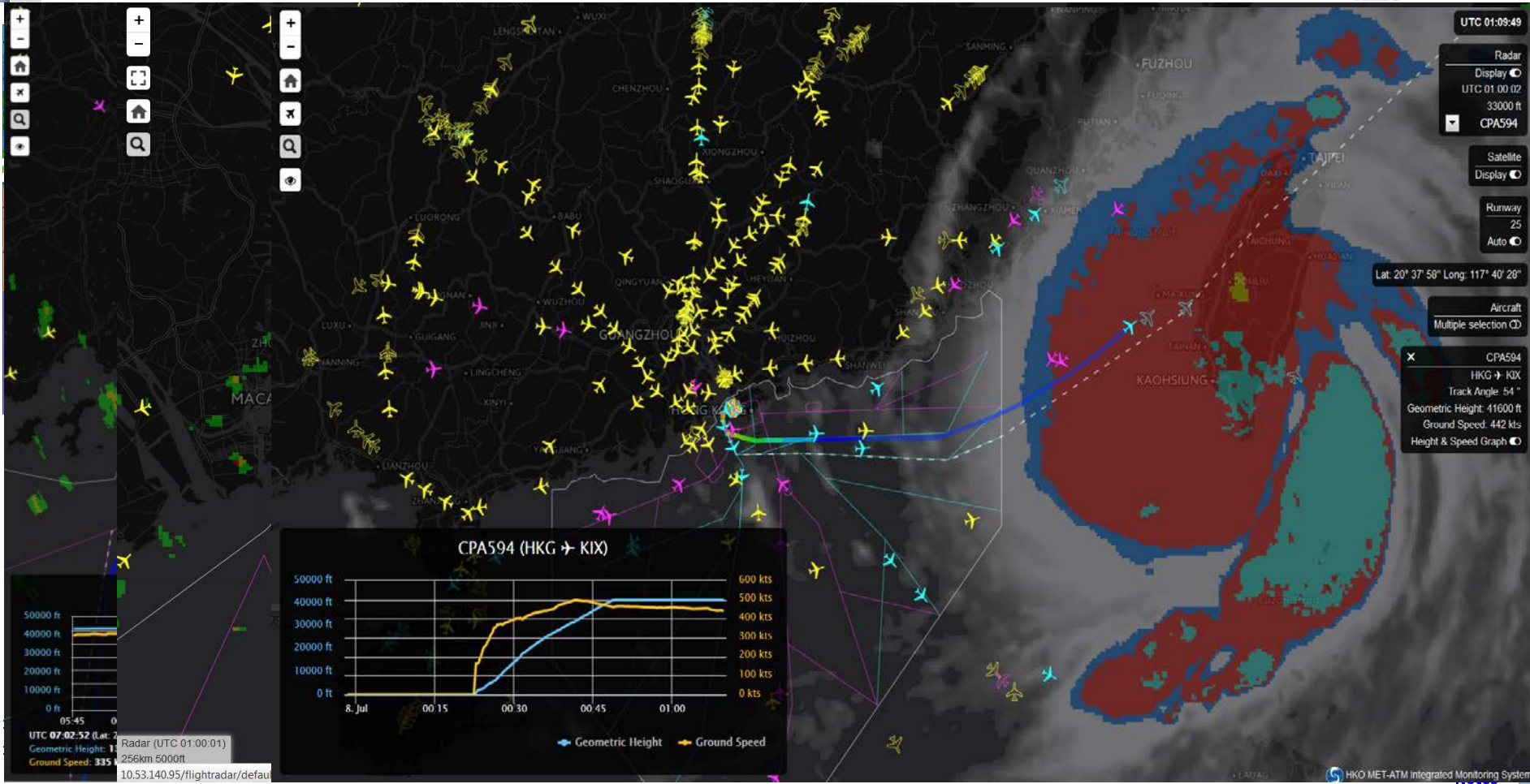
France

The screenshot shows a radar map of the USA with various weather elements overlaid. The map is color-coded to show different weather conditions across the country.

USA

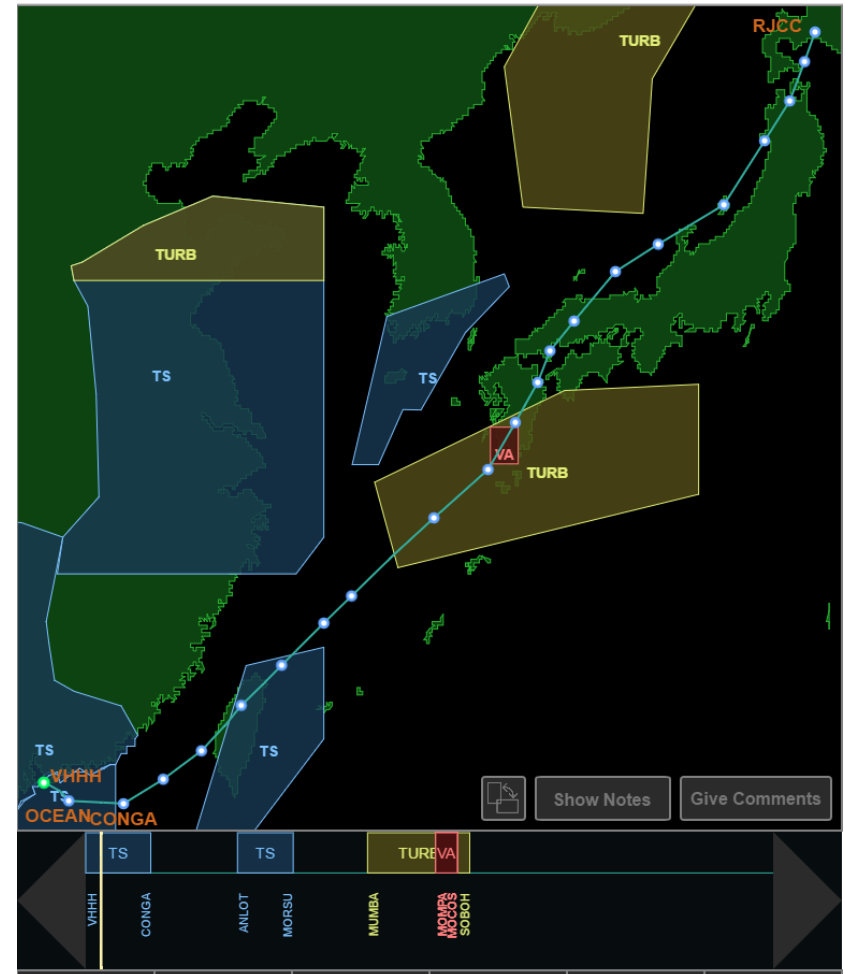
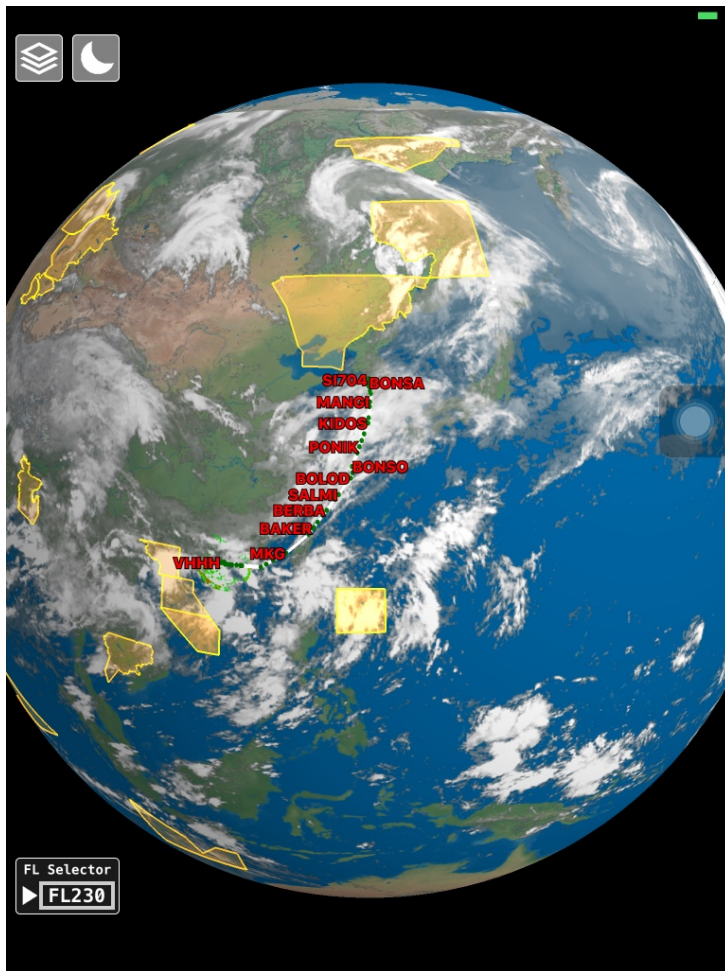


MET Service Development





MET Service Development



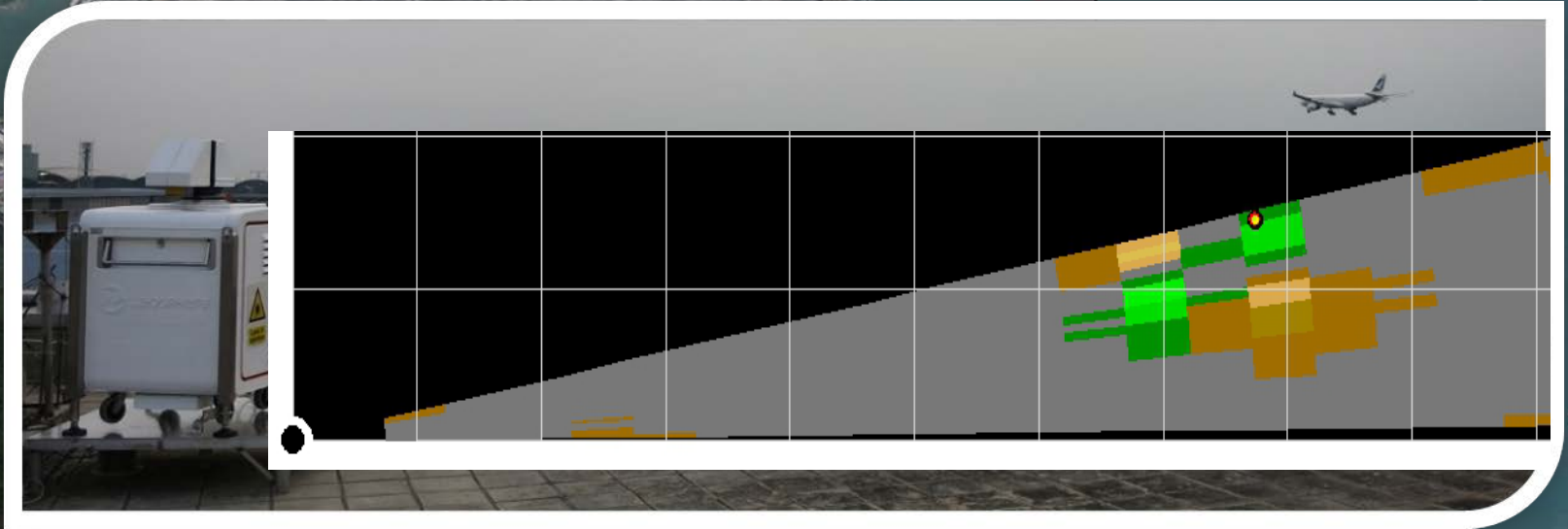
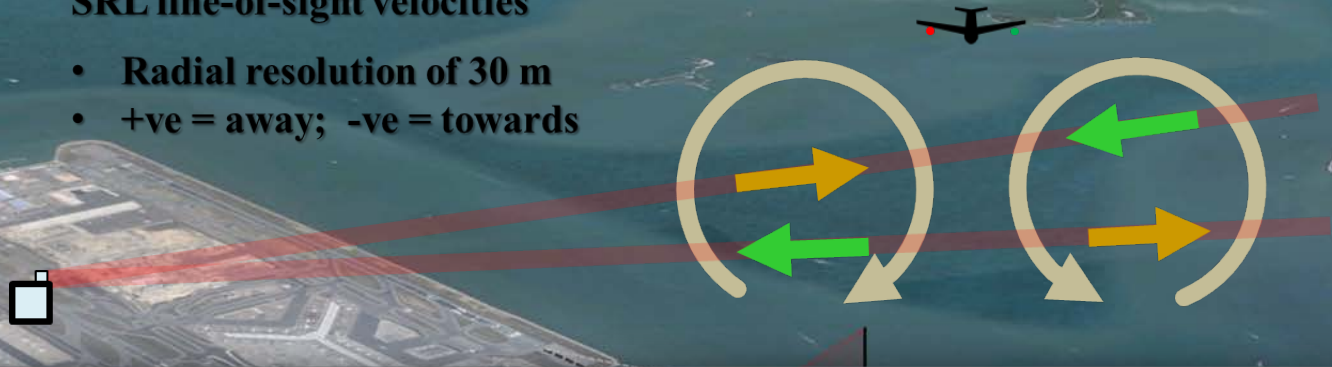
- Electronic Flight Bag App (prototype)
- Seamless HMI (website → mobile → EFB)



MET Service Development

SRL line-of-sight velocities

- Radial resolution of 30 m
- +ve = away; -ve = towards

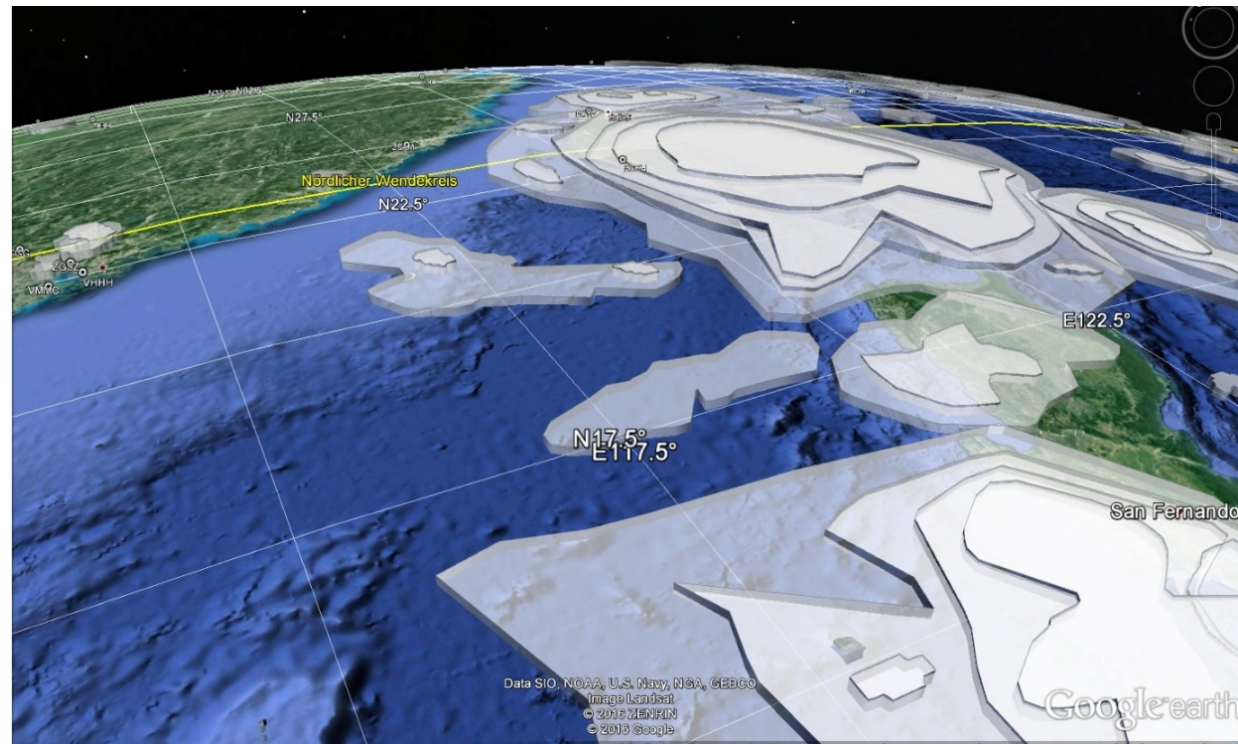


- Wake vortex detection by Short-range LIDAR (SRL)



WMO Science Conference

- Aim: To engage aviation user communities to objectively assess the current and emerging MET capabilities to support ATM
- Planned to be held in early-2017, venue/date being worked out



- Paradigm shift poses serious **challenges** to Meteorological Services
- High **competitive** environment
- Need to be **swift** to demonstrate MET capabilities, esp nowcasting & VSR forecasting, for users, **on top of global models**
- Translate research into **applications**
- **Engage the users**
- Turn challenges to **opportunities**
- **Deliver only the best!**



Thank You!