

Weather phenomena affecting air traffic management operations

Air Traffic Meteorology Center (ATMetC)
Japan Meteorological Agency

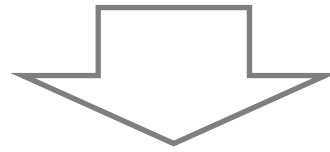
Introduction

- Weather information around the airport and airspace including major air-routes is necessary for ATM.
- Forecasters at ATMetC give briefings on the expected significant weather and the possibility of its impact on air traffic flow.



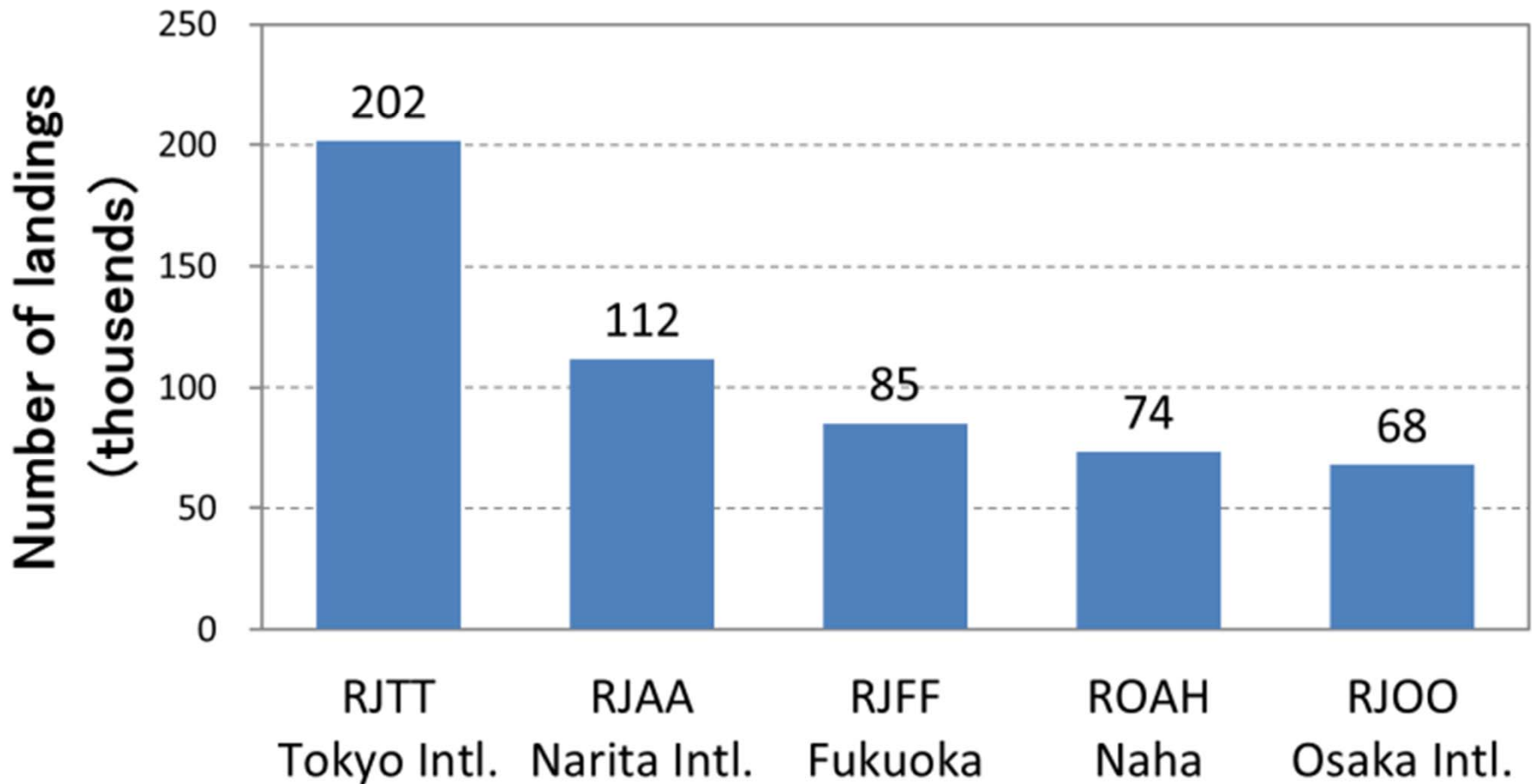
ATM and weather

- Air traffic disorder at a congested airport (major airport) has profound effect on ATM.
- Weather information for at / around such airport is highly important.



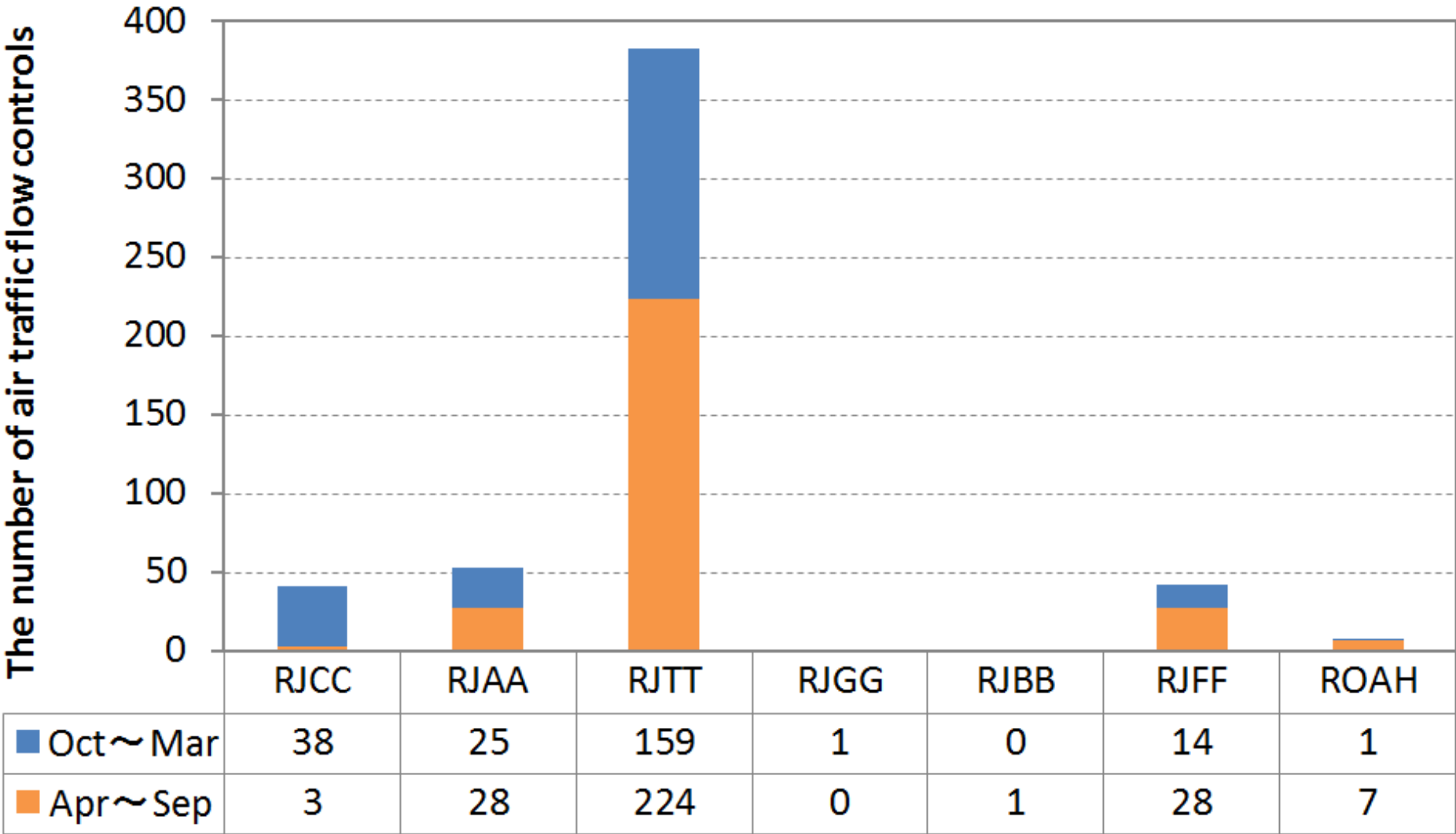
What weather phenomena affect ATM at congested airports ?

Top 5 at Japanese airports ranked by annual number of landings(2013)



Tokyo Intl. Airport (RJTT) is one of the most congested airports in Japan. Circumstances of RJTT has a significant effect on ATM.

The number of air traffic flow controls due to significant weather (April 2013 – March 2015)



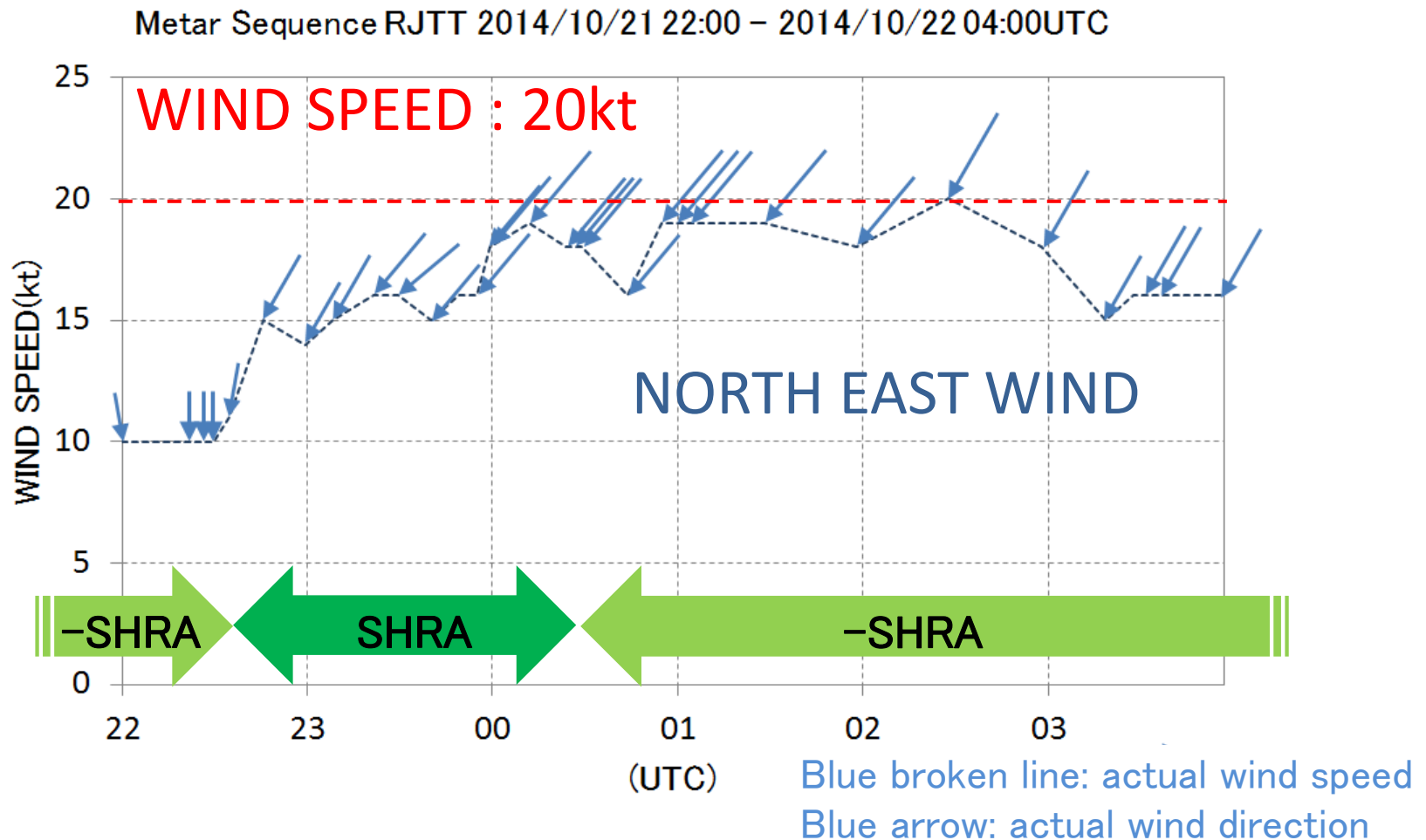
The number of air traffic flow controls at RJTT classified by the causes (weather phenomena)

Cause		Cold Season (Oct – Mar)	Warm Season (Apr – Sep)	Sum
TS	TS-OHD	4	23	27
	Around the airport	6	28	34
CB	Within the Approach Control Area	29	80	109
	Microburst Alert	2	0	2
	Around the Approach Control Area	42	57	99
Wind	Strong Crosswind	40	29	69
	Strong Low Level Wind	23	6	29
	Vertical Wind Shear (Wind change on approach course)	6	4	10
Snow	Snowfall	5	0	5
	Snow Removal	2	0	2
Others		0	1	1
Sum		159	228	387

In this presentation, four cases of air traffic flow control at RJTT due to significant weather are shown.

1. Strong crosswinds (22 October 2014)
2. CBs within the approach control area (13 September 2014)
3. CBs in the airspace around the approach control area (1 September 2014)
4. Vertical wind change around RJTT (21 April 2013)

Case 1. Strong crosswinds



1. Rain showers were observed and the conditions of runways became “WET”. After that, light rain showers continued.
2. North east wind (about 20kt) continued blowing under raining.



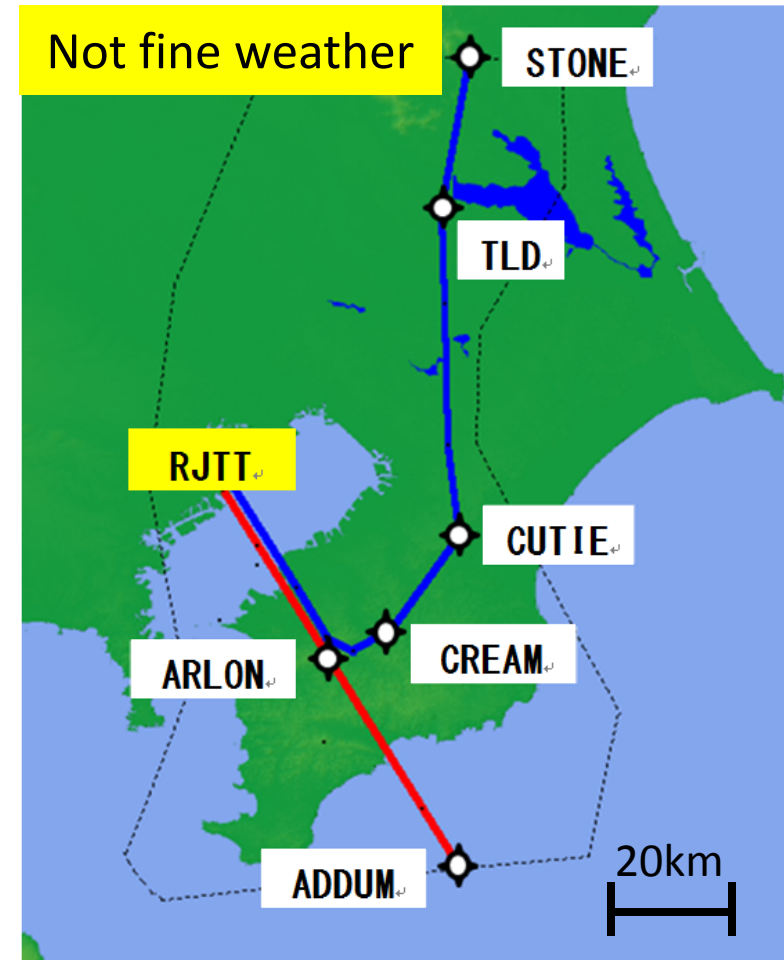
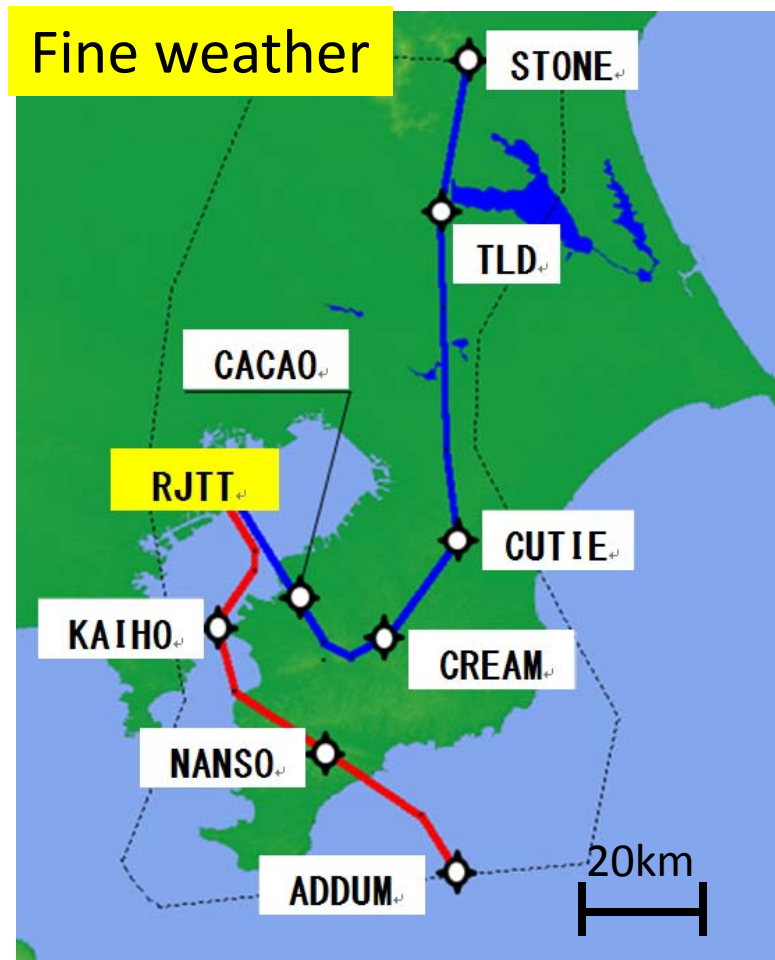
Arrival
RWY34L&34R

Departure
RWY05&34R

Examples of cross wind speed limits for major aircraft types		
Condition of Runway	Wind speed limit (kt)	
	Airline A Aircraft-Type- I	Airline B Aircraft-Type- II
DRY	33	25
WET (GROOVED)	25	25
WET (NON-GROOVED)	20	20
WATER	10	10

Case 2. CBs in the approach control area

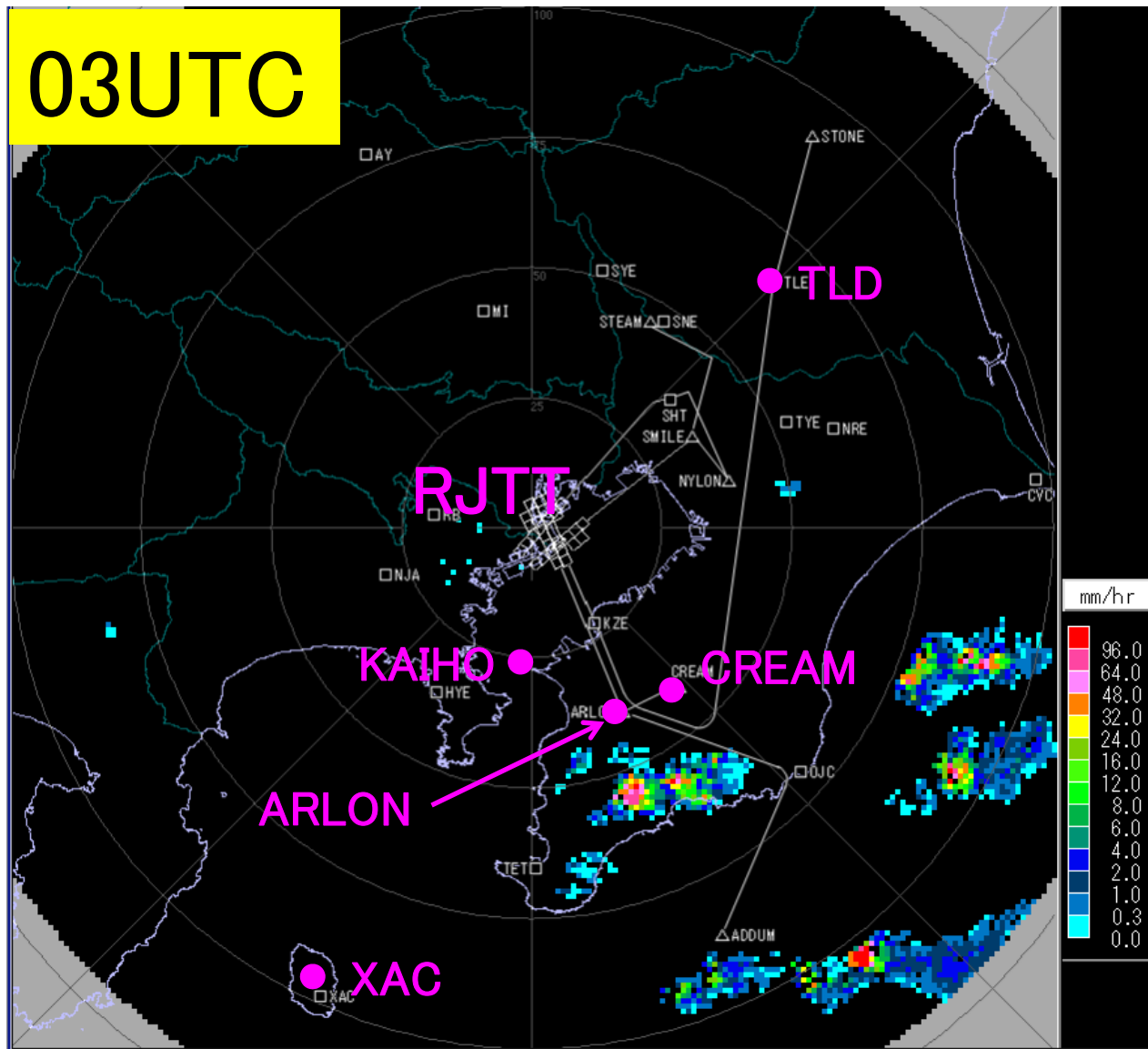
Examples of usual approach routes for RJTT (north wind operation)



Red solid line: the route for aircraft approaching from south (RJTTTS)

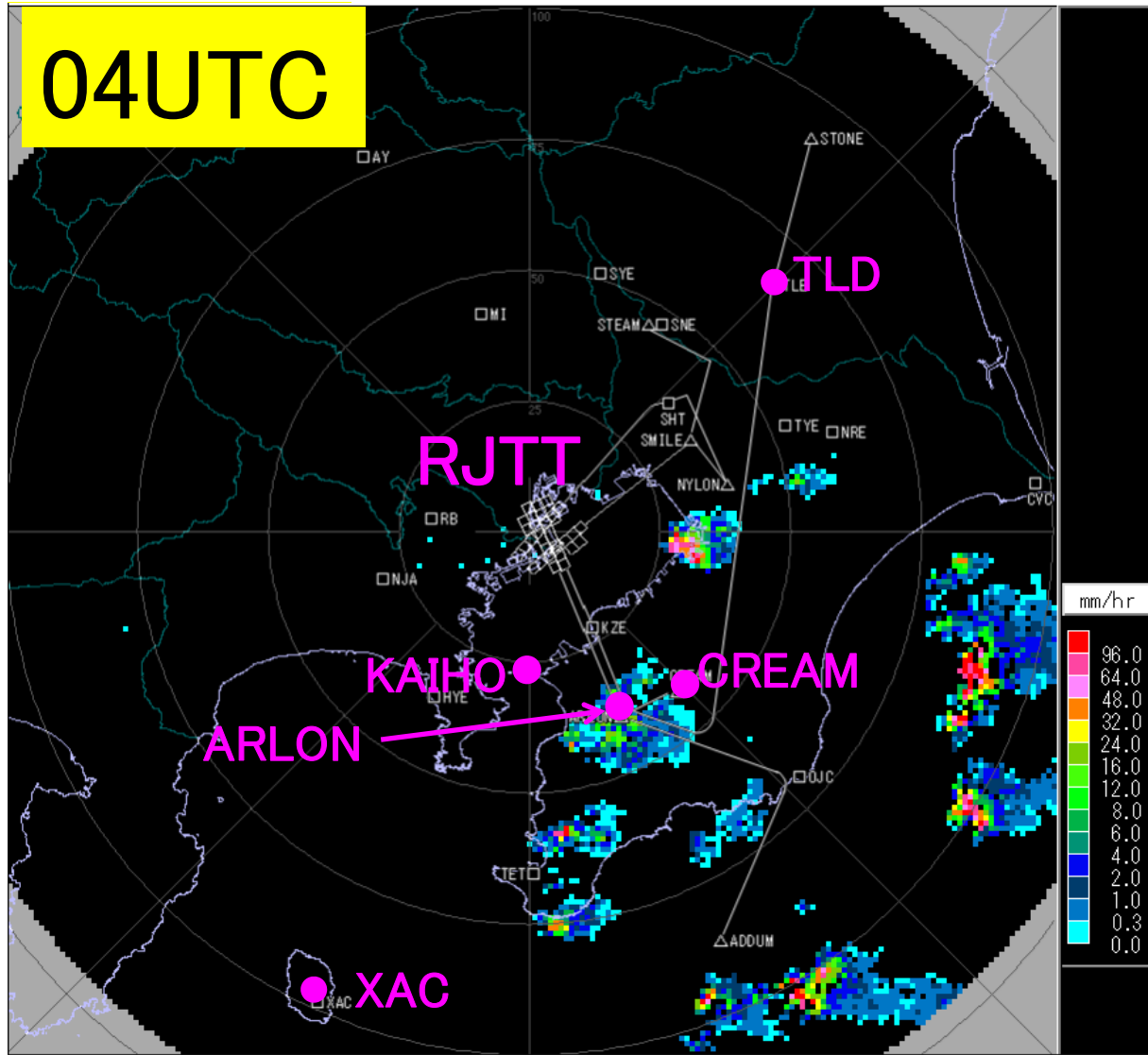
Blue solid line: the route for aircraft approaching from north (RJTTN)

13 September 2014

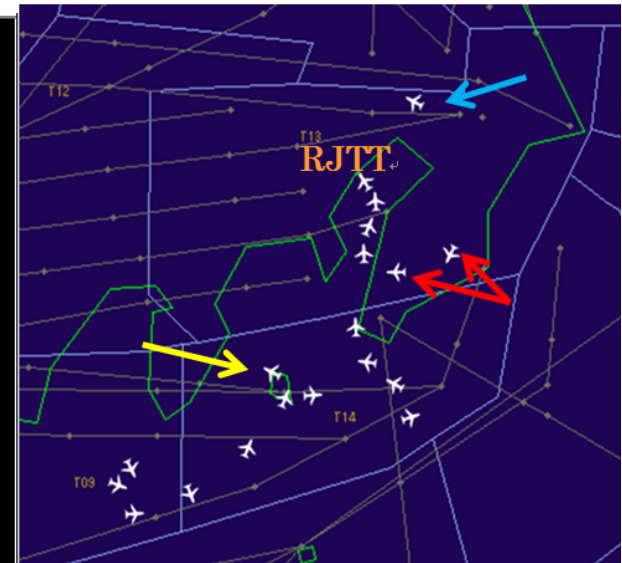


Doppler radar echo intensity at RJTT

13 September 2014



Doppler radar echo intensity at RJTT

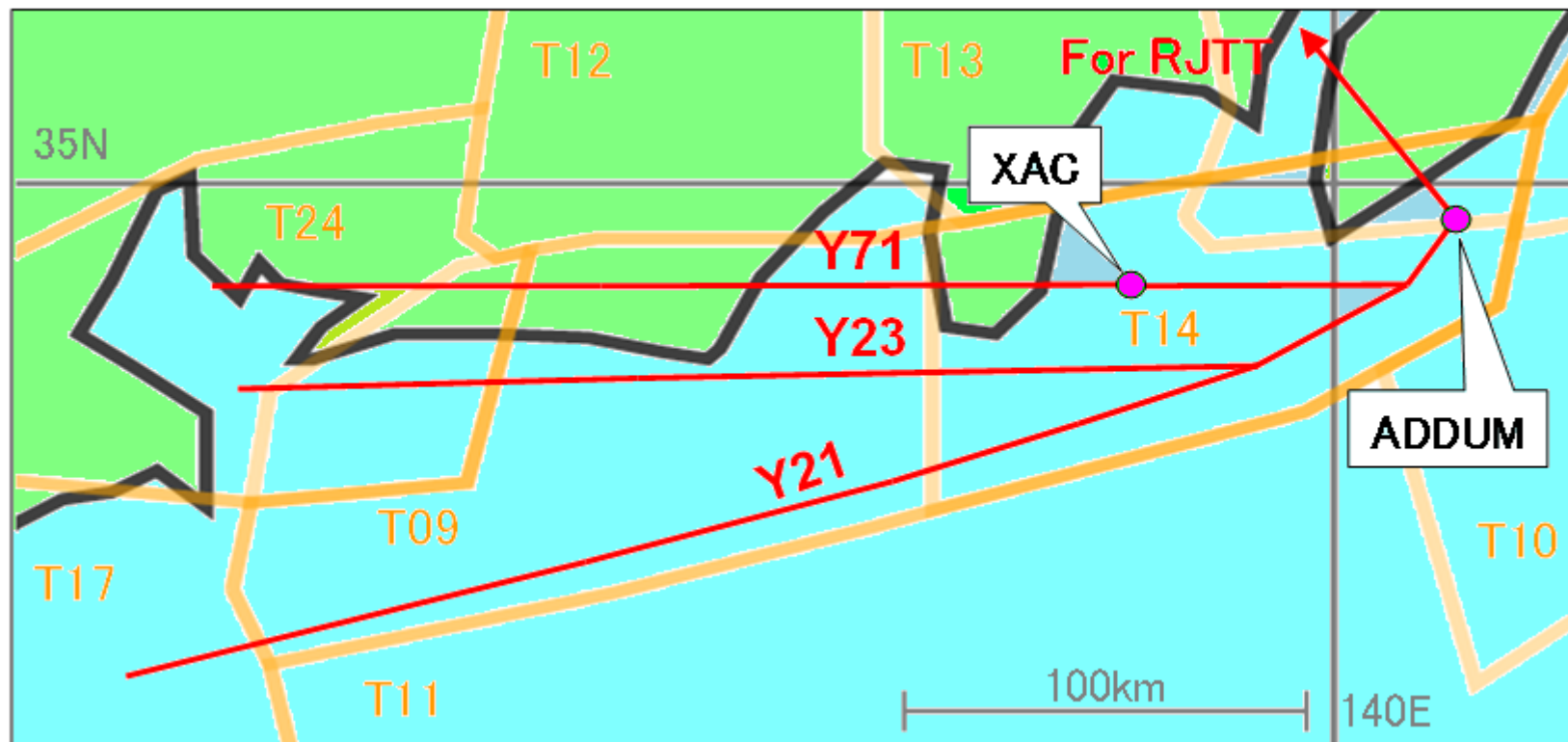


the aircrafts at 04UTC

- Aircrafts headed to KAIHO to avoid CBs (red arrows)
- Holding occurred over XAC (indicated by yellow arrow) and TLD (blue arrow)

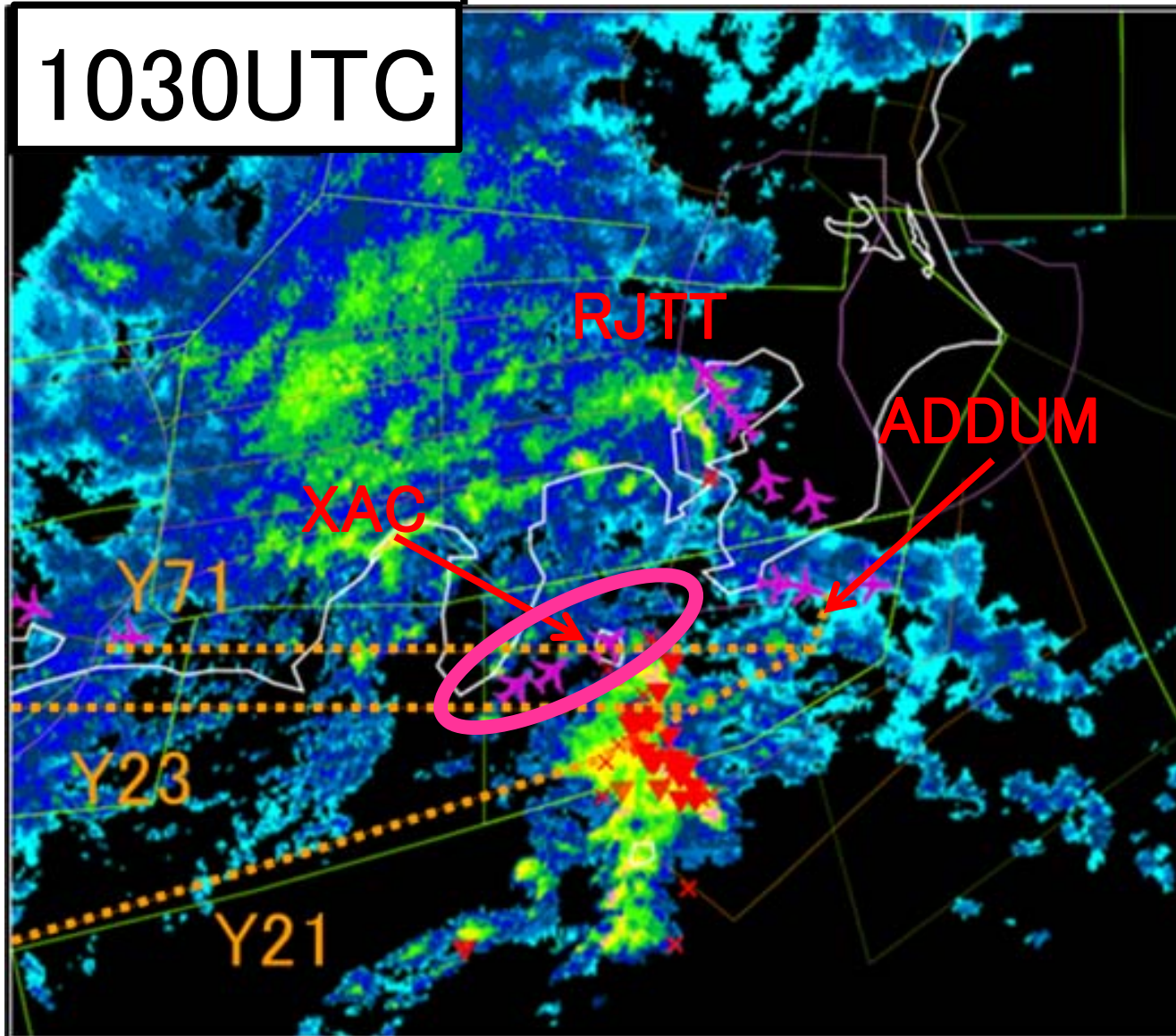
Case 3. CBs around the approach control area

The major air routes for aircrafts approaching to RJTT from west or south



The aircrafts approaching to RJTT from west or south use route Y21, Y23 or Y71 and go into the Tokyo approach control area via ADDUM.

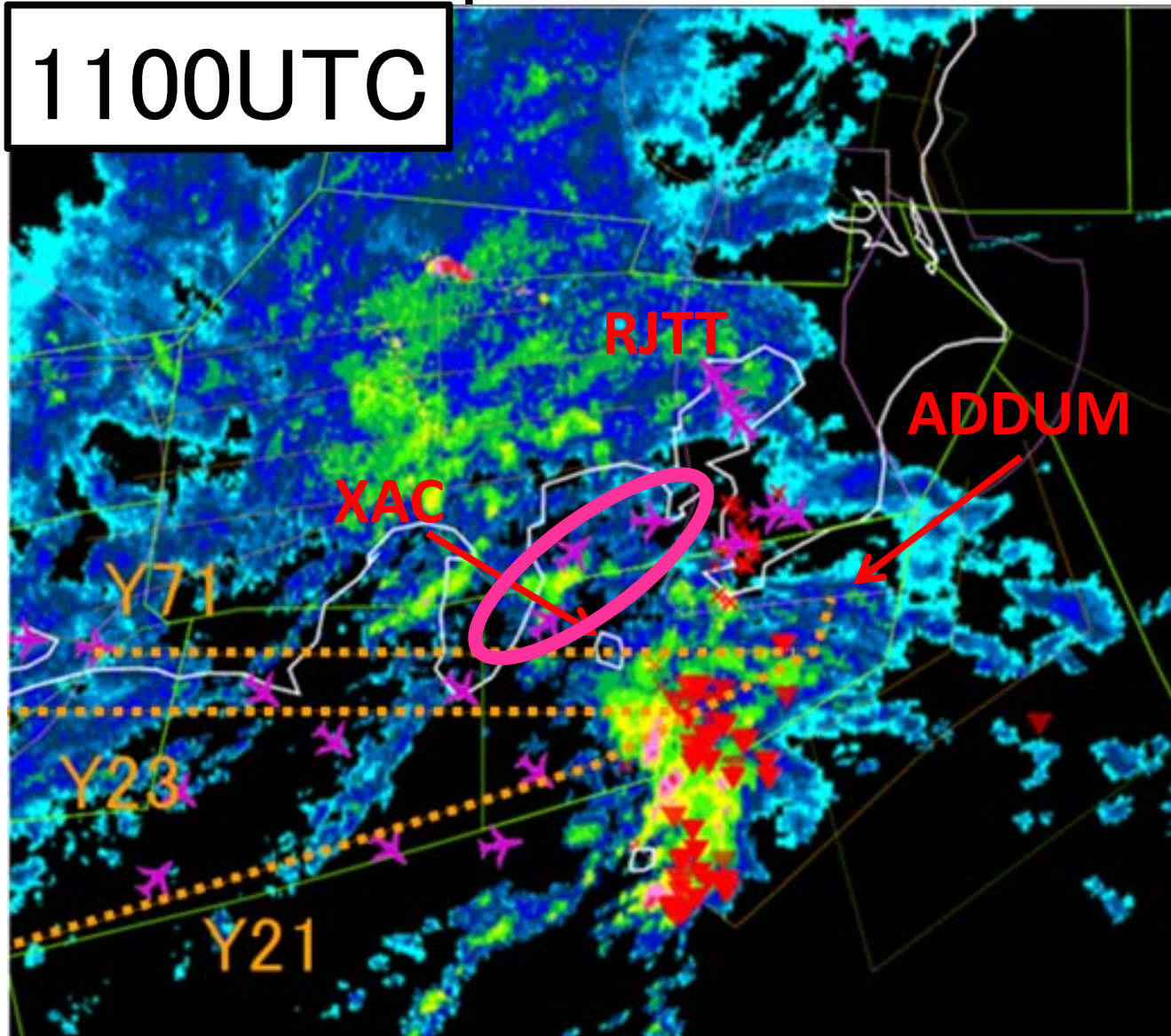
1 September 2014



Radar echo intensity, thunderstorm and the positions of aircrafts
Dotted orange line: air routes ▼: cloud to ground lightning

1 September 2014

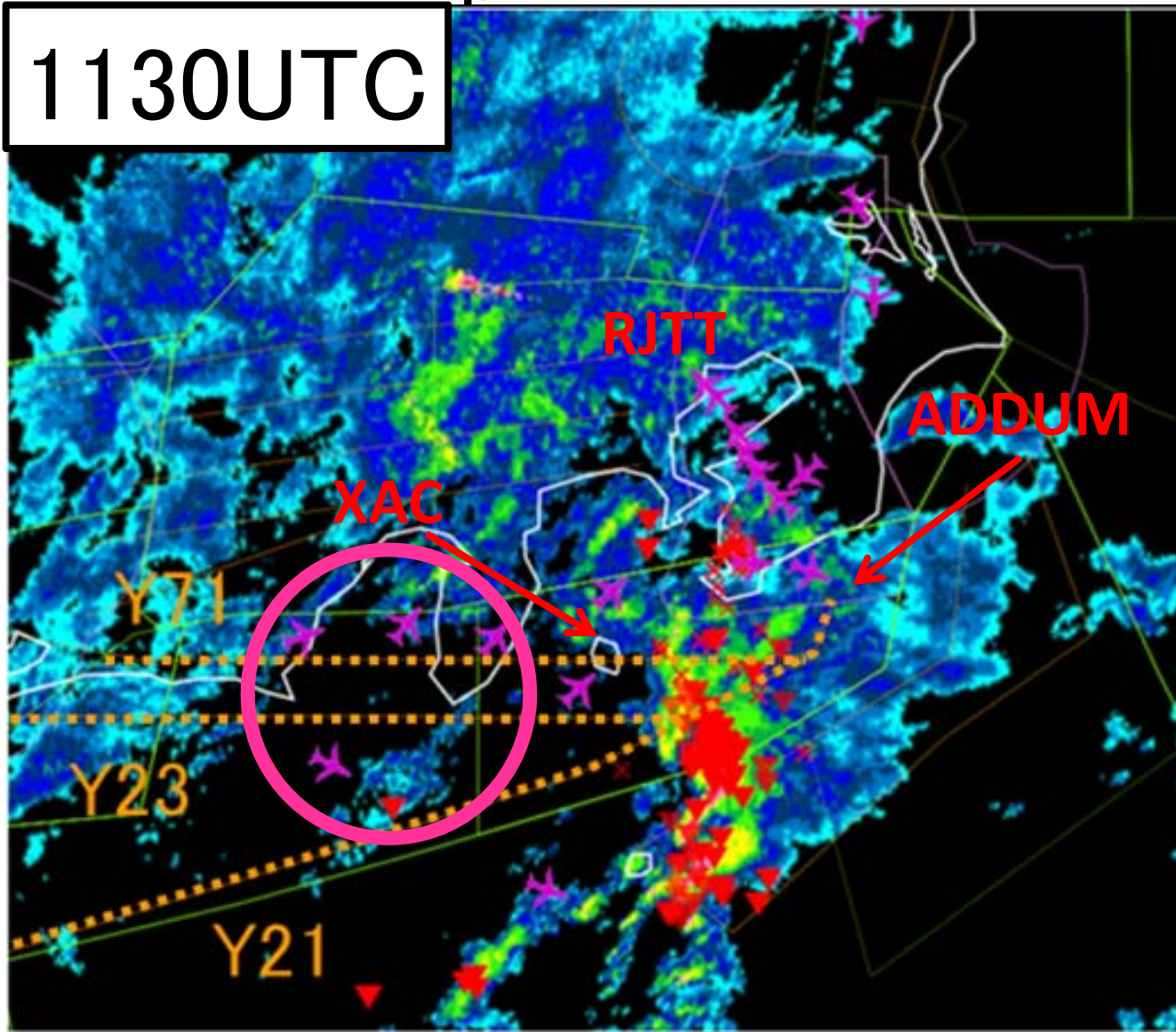
1100UTC



Radar echo intensity, thunderstorm and the positions of aircrafts
Dotted orange line: air routes ▼: cloud to ground lightning

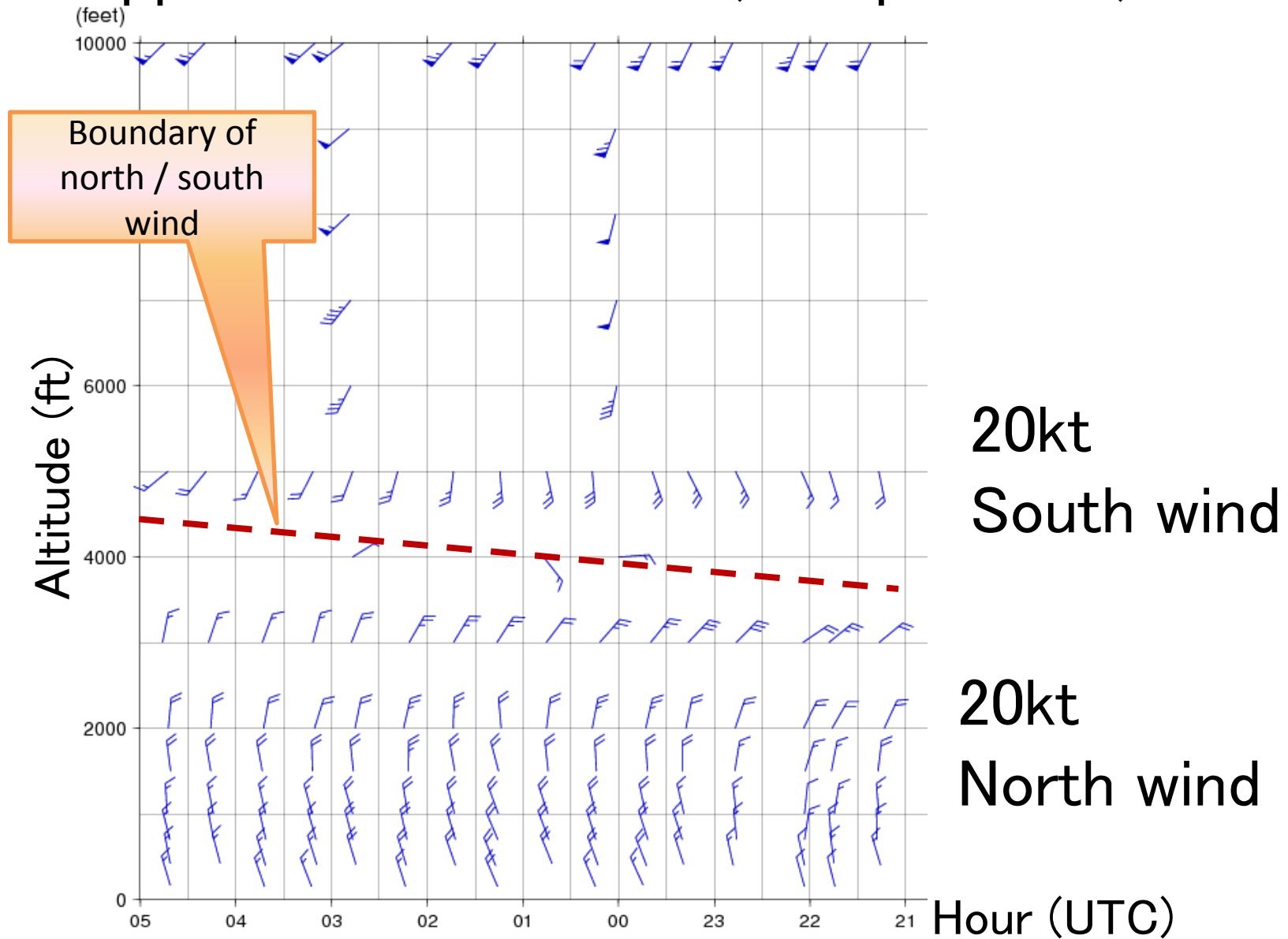
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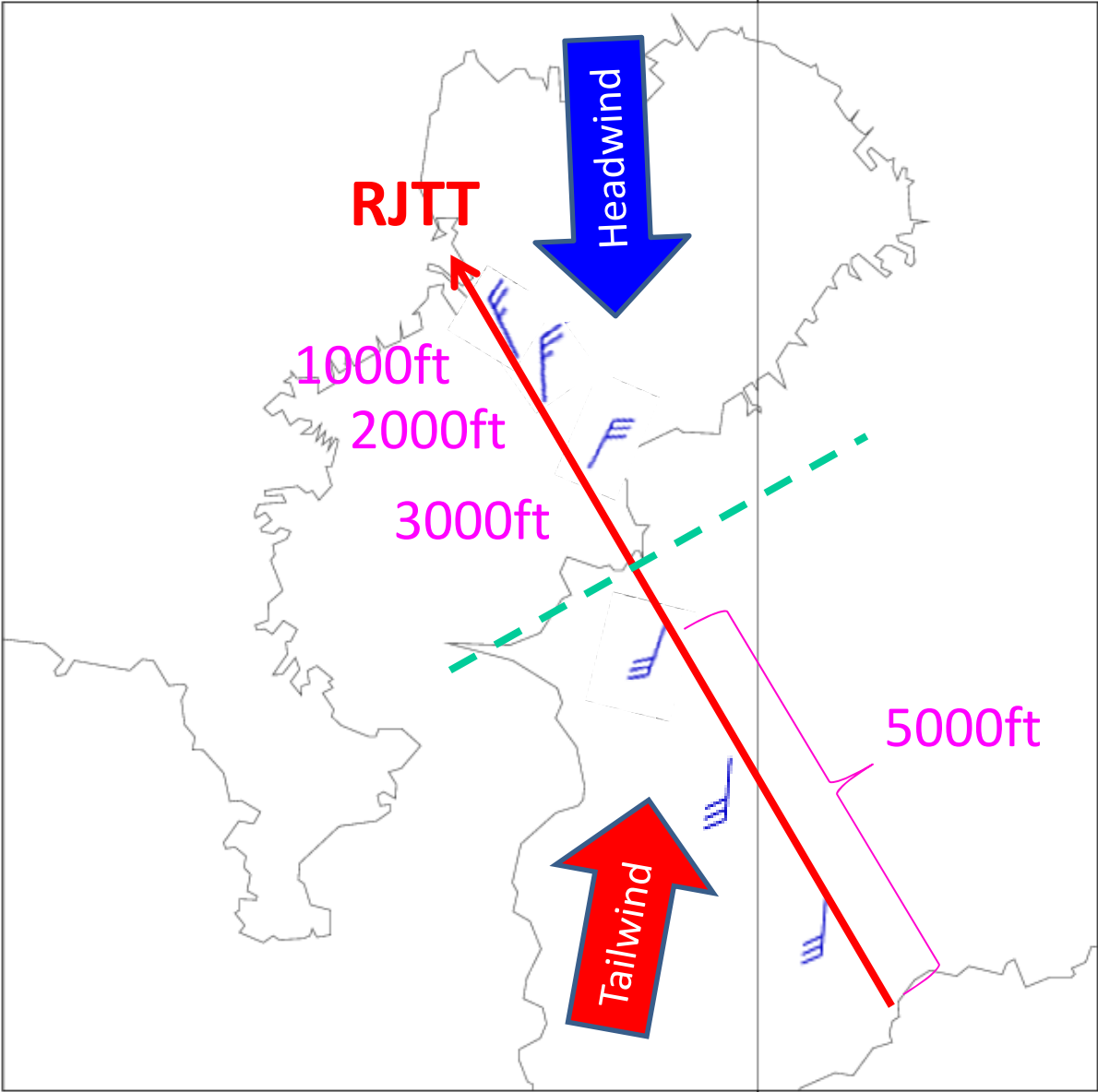


Radar echo intensity, thunderstorm and the positions of aircrafts
Dotted orange line: air routes ▼: cloud to ground lightning

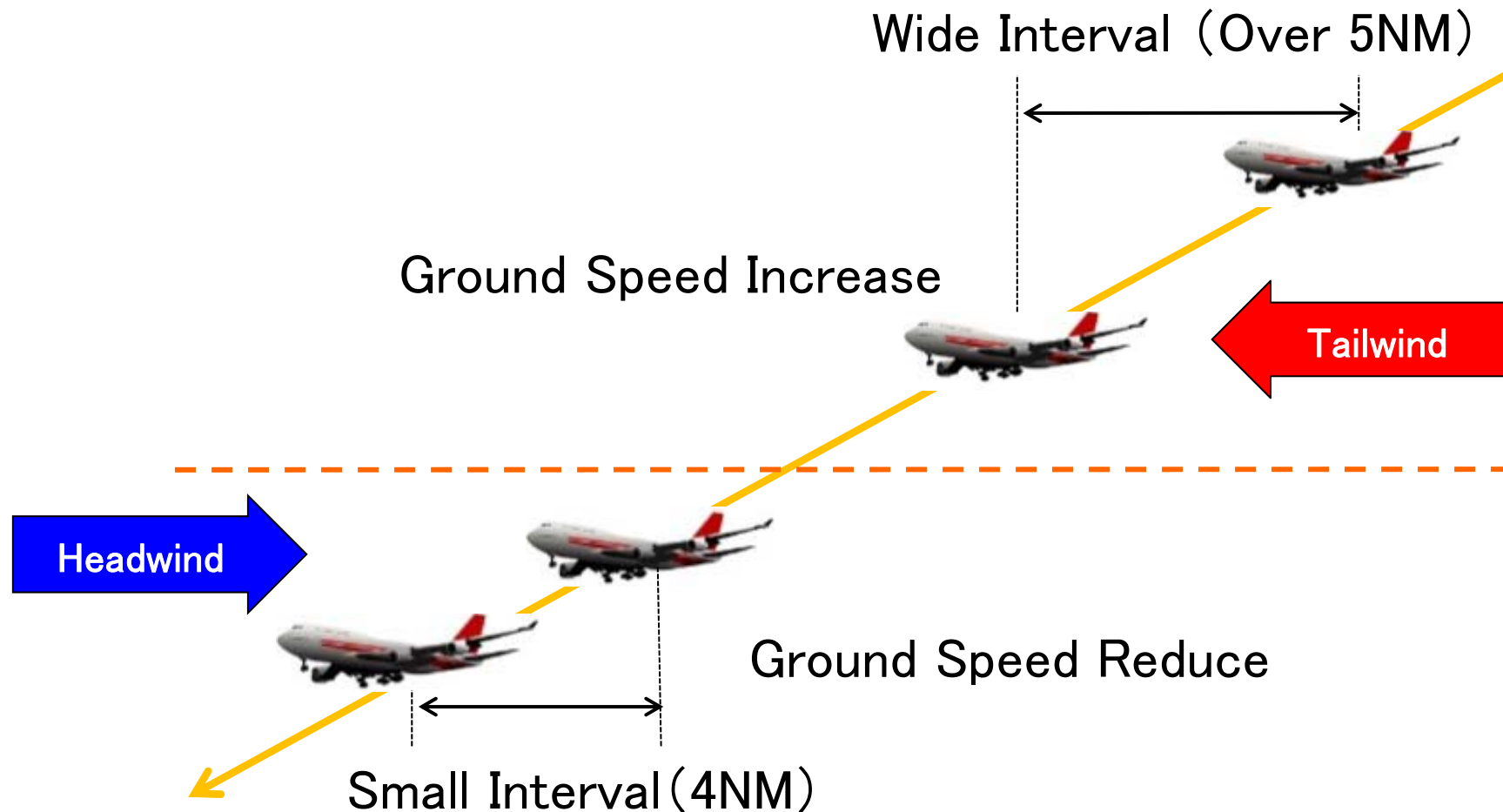
Case 4. Vertical wind change within the approach control area (21 April 2013)



The approach route of north wind operation and the wind observed at each altitude (02UTC 21st)



Model chart of how the separation narrowed due to the vertical wind change



If the wind changes suddenly from tailwind to headwind, the ground speed of aircrafts decreases and the separation becomes narrower.

Conclusion

Following knowledge on what types of weather phenomena affect ATM at congested airports can be derived

1. Weather conditions related to the operation limitations, such as cross wind limitation.
2. CBs within an approach control area.
(even if they are small-scale)
3. CBs around an approach control area.
(aircrafts have to avoid them)
4. The great differences in wind speed/direction around an airport. (enough separation is needed.)

Conclusion

- Both ATM officers and MET forecasters should pay attention to the occurrence of the weather phenomena listed above in a collaborative manner.
- For MET forecasters, it will be important to provide precise and accurate weather information on such phenomena in order to meet requirements from ATM officers and maintain safe and smooth air traffic flow.

Thank you for your attention.