

**Latest aviation applications of
LIDAR at the
Hong Kong International Airport**

Hong Kong Observatory

August 2011

Monitoring network



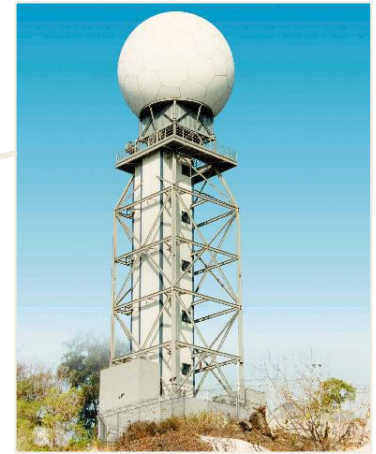
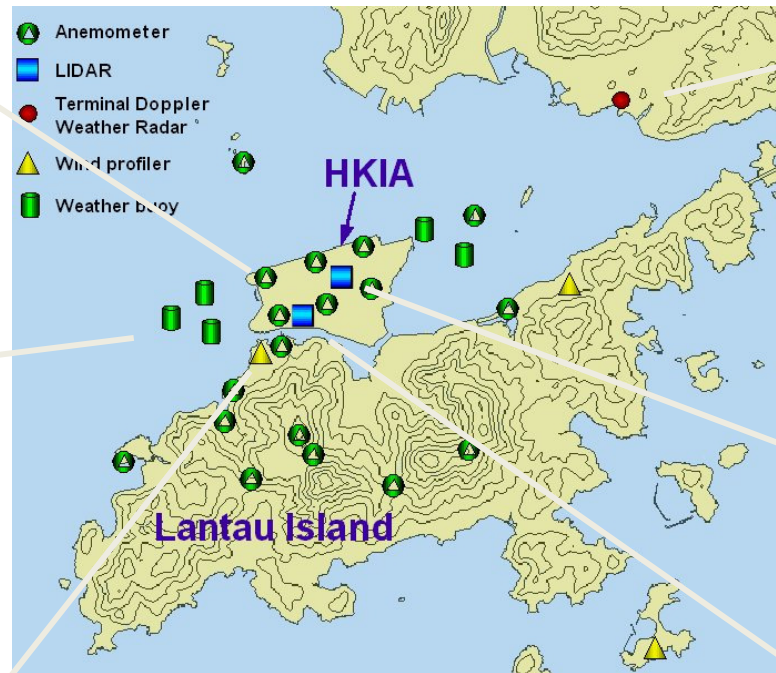
Anemometer



Weather buoy



Wind profiler



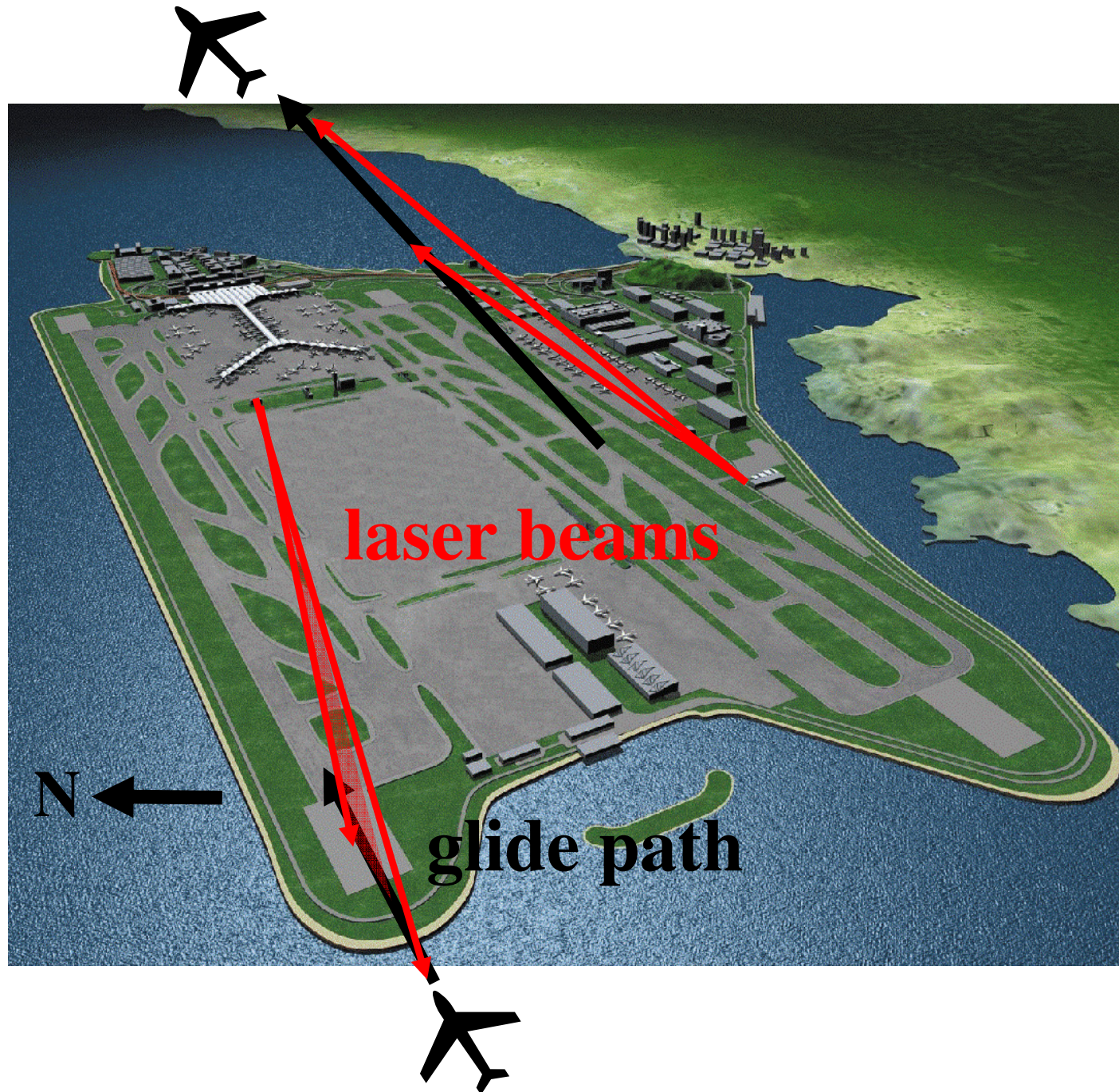
TDWR



2nd LIDAR

1st LIDAR

Schematic diagram of dual LIDAR operation



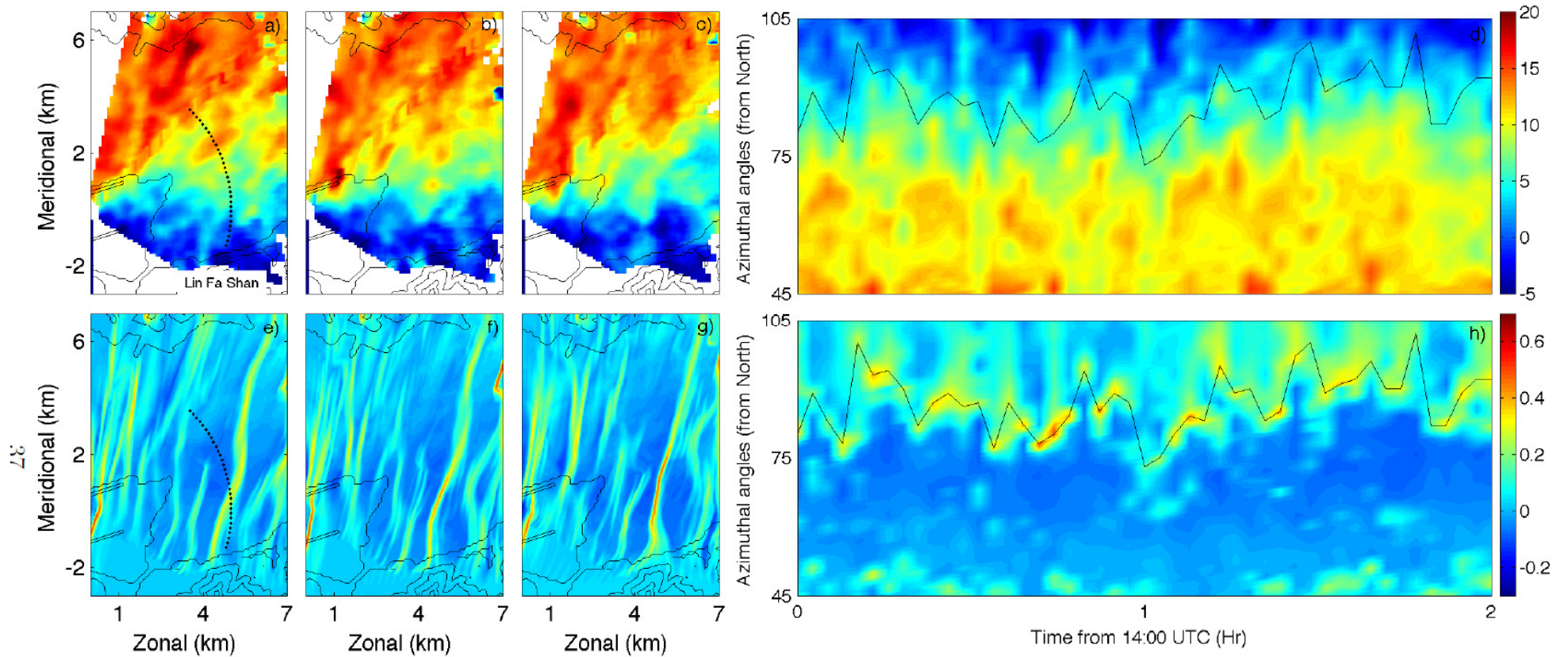
New developments

- Identification of Lagrangian coherent structures -> windshear alerting?
- Calculation of F-factor for windshear alerting
- Calculation of eddy dissipation rate (EDR)
- Applications of short-range LIDAR
- Refinement of visibility map algorithm

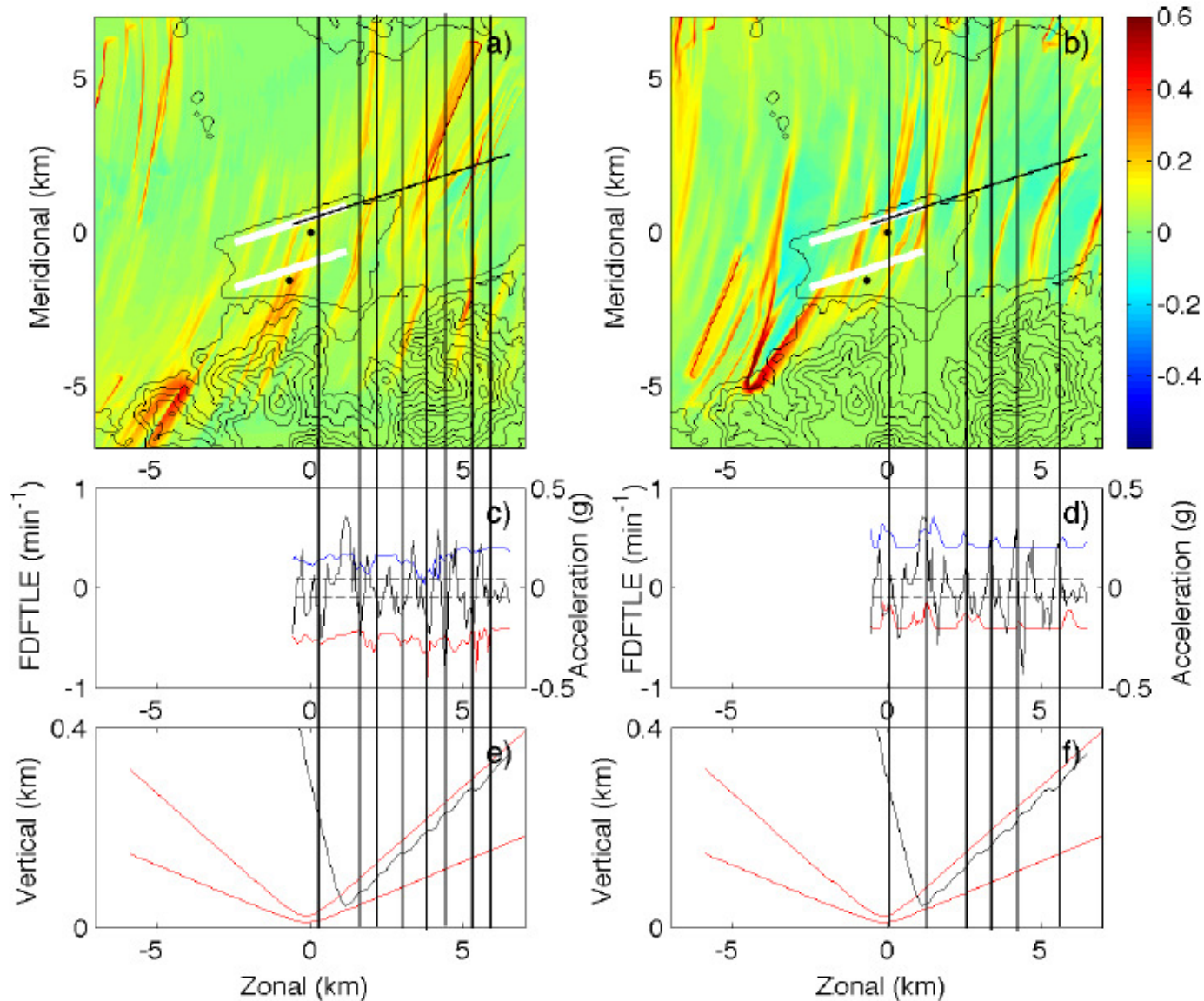
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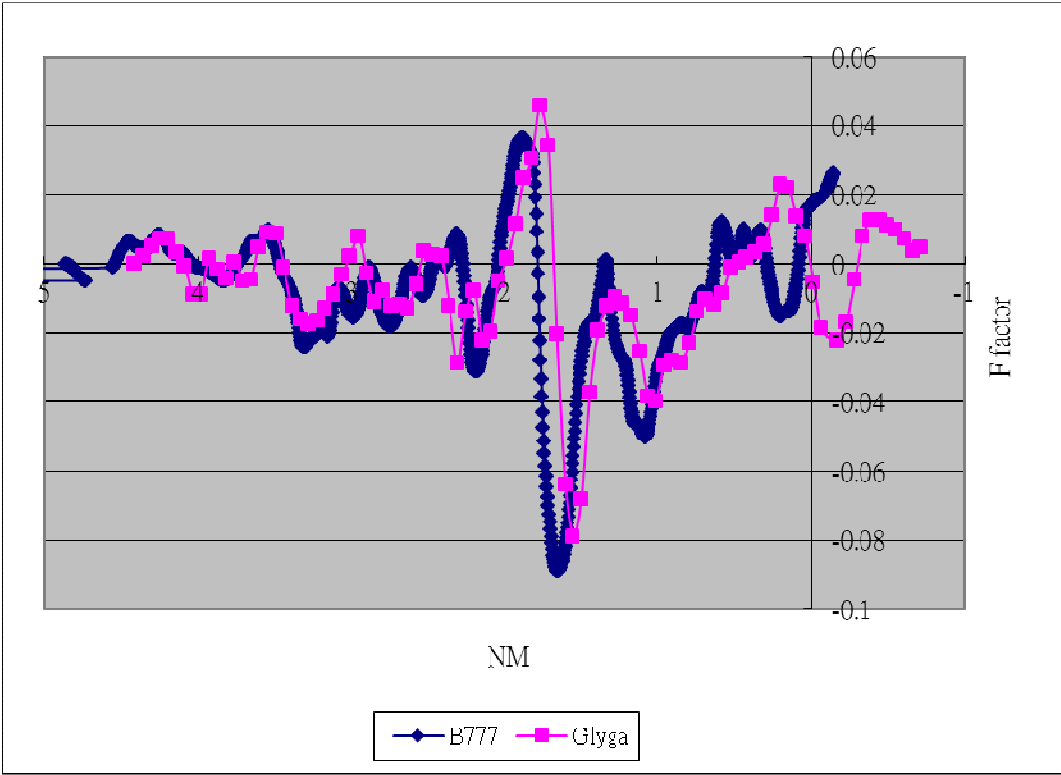
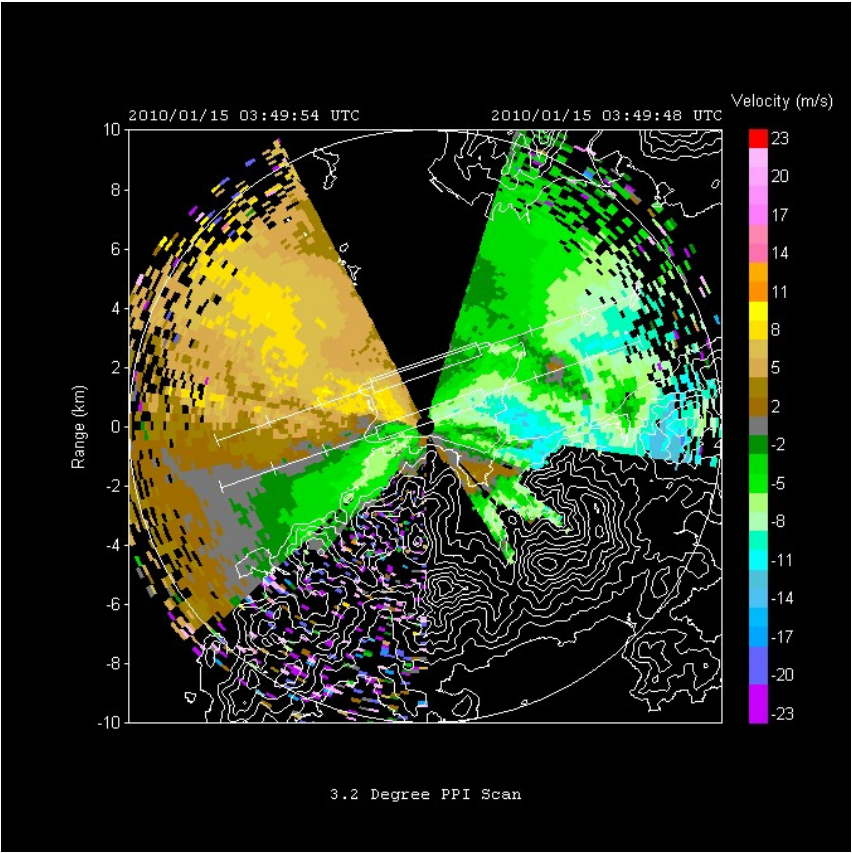
Convergence of airflow



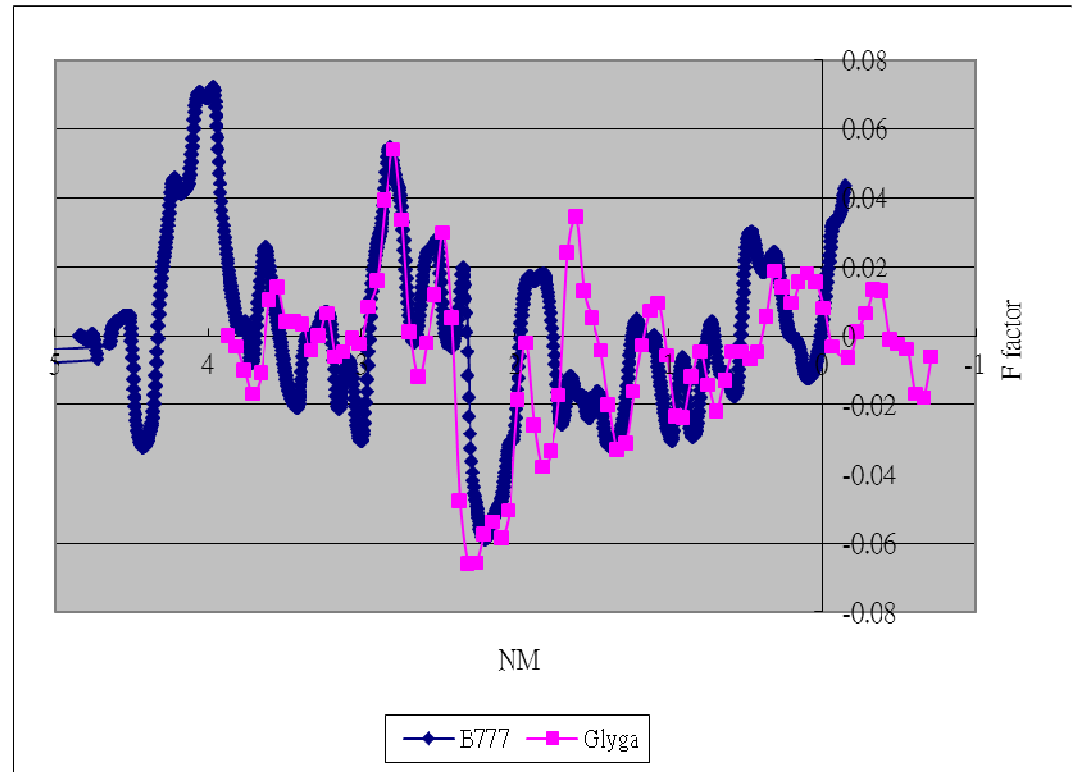
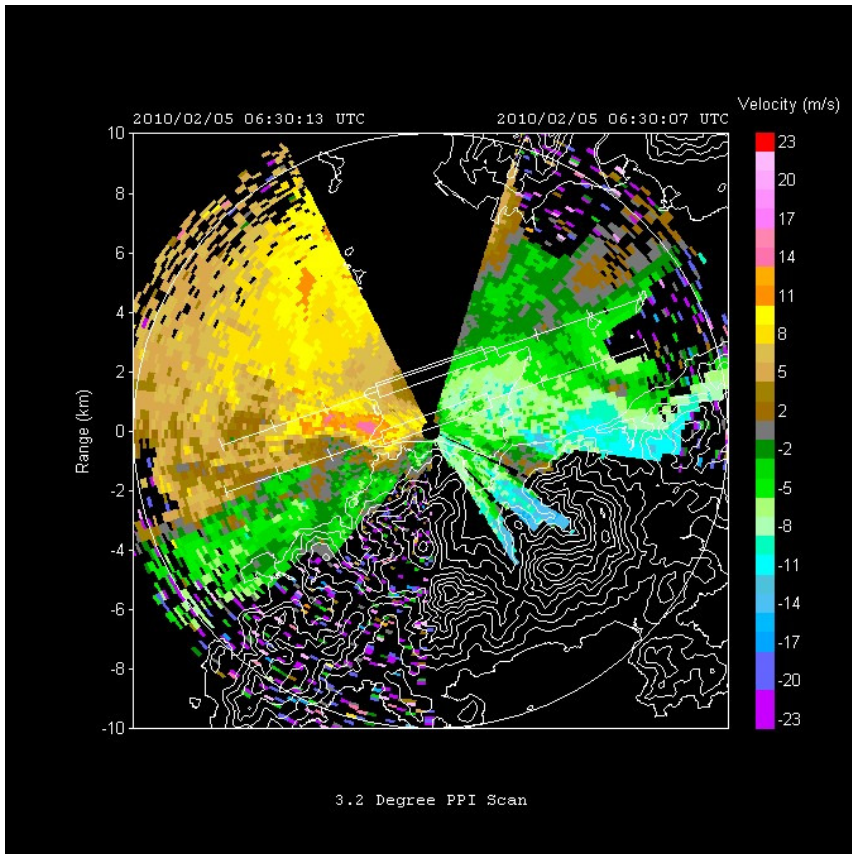
Correlation with aircraft data



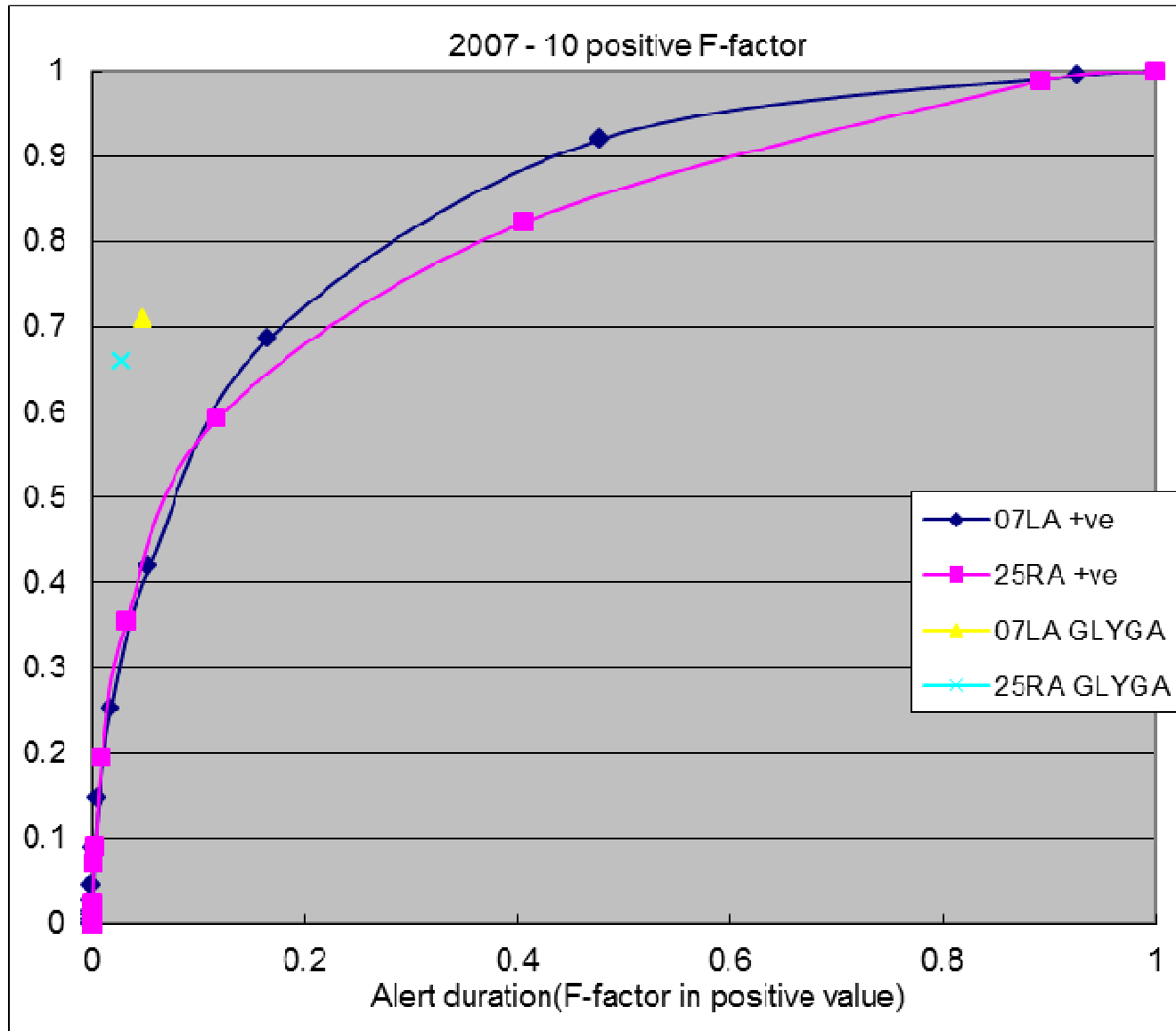
F-factor: sea breeze



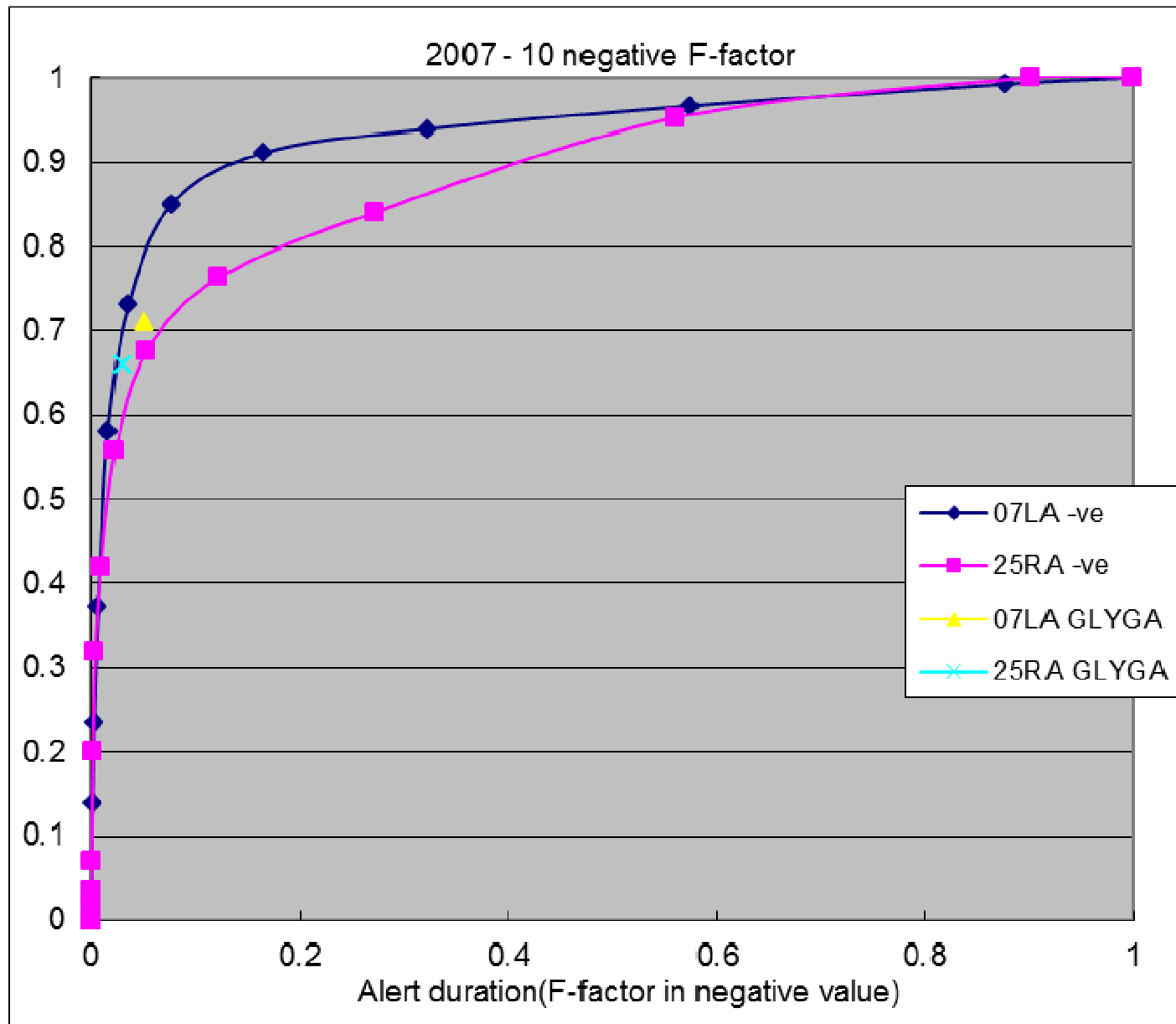
F-factor: terrain-disrupted airflow



F-factor performance



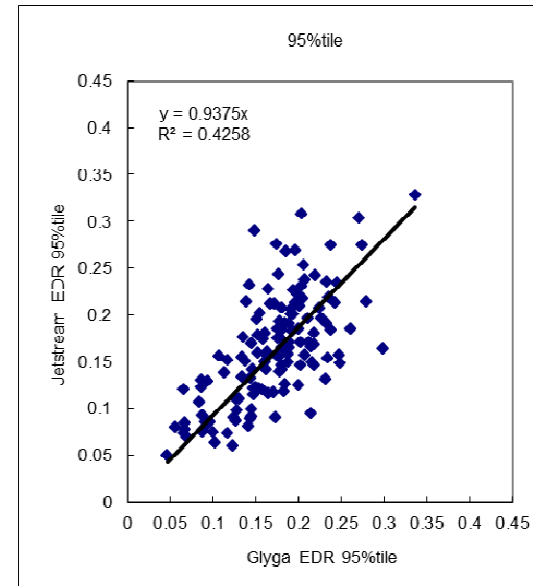
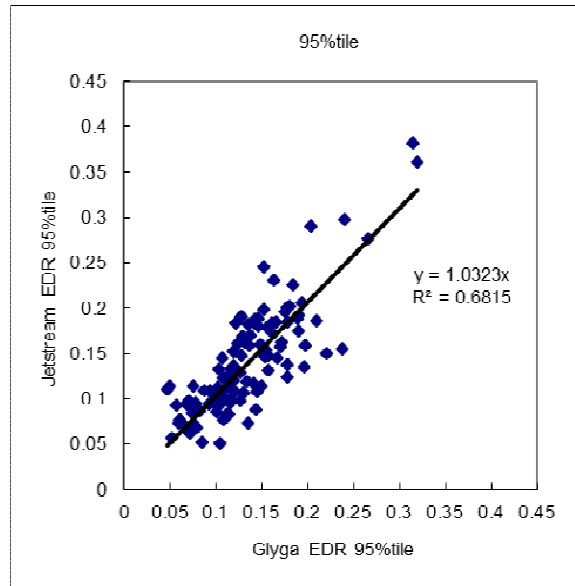
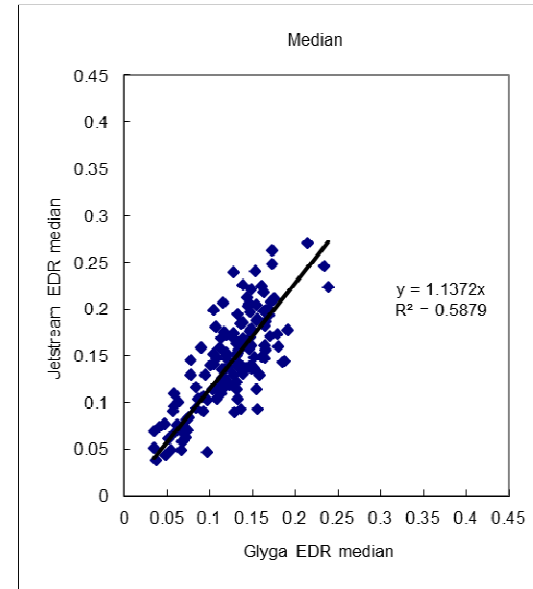
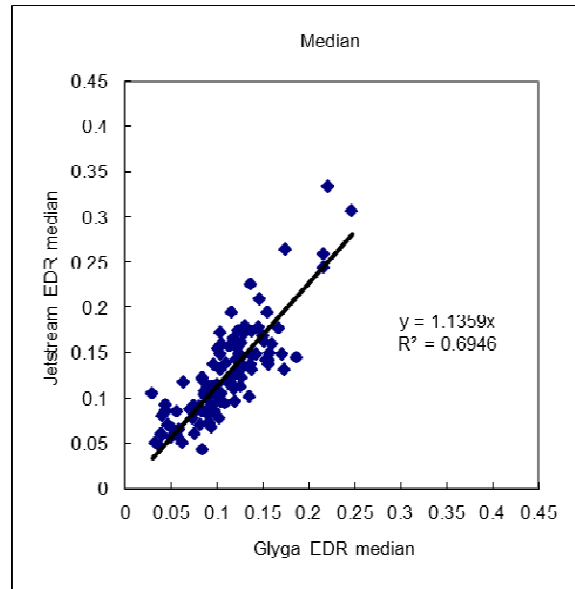
F-factor performance



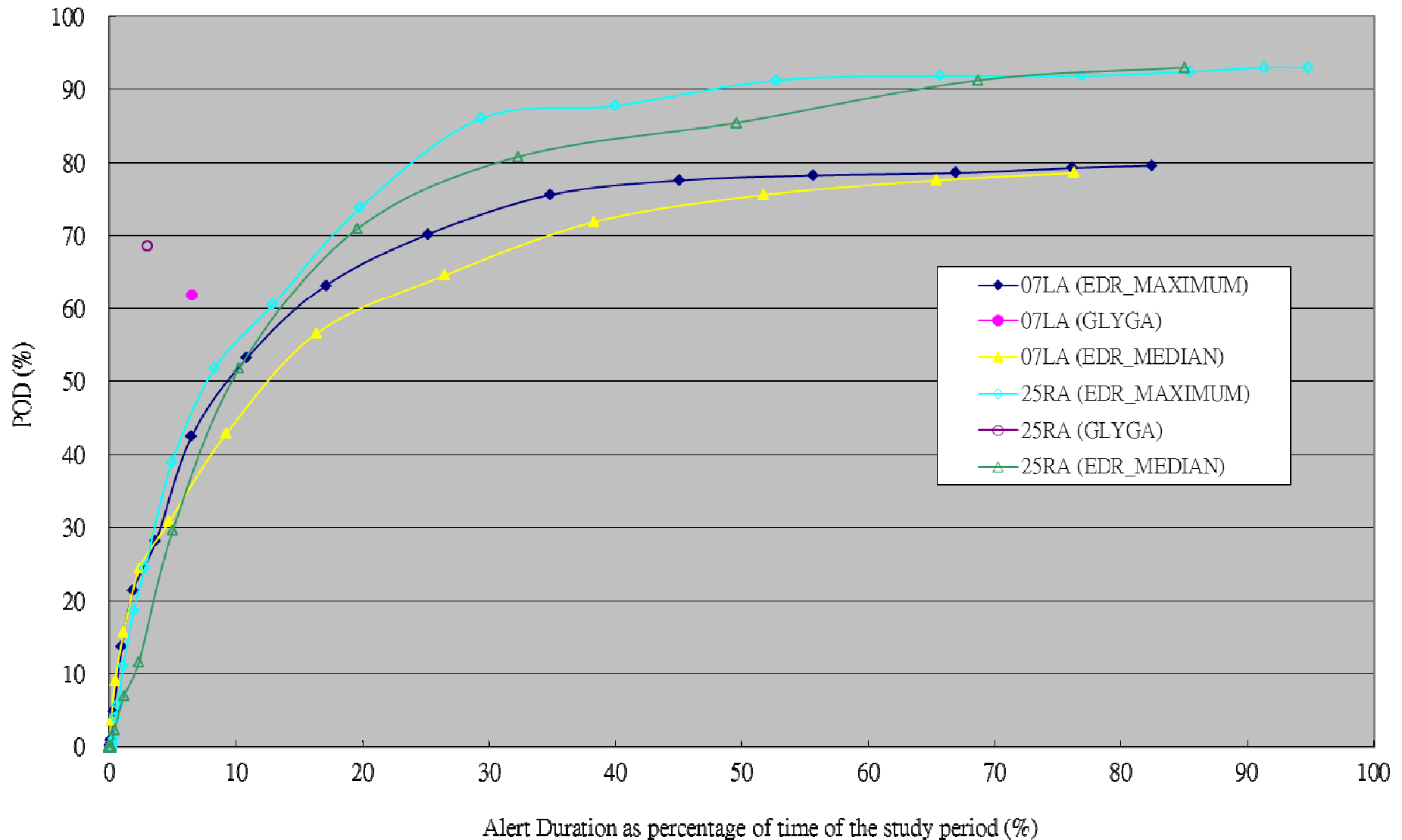
Instrumented aircraft



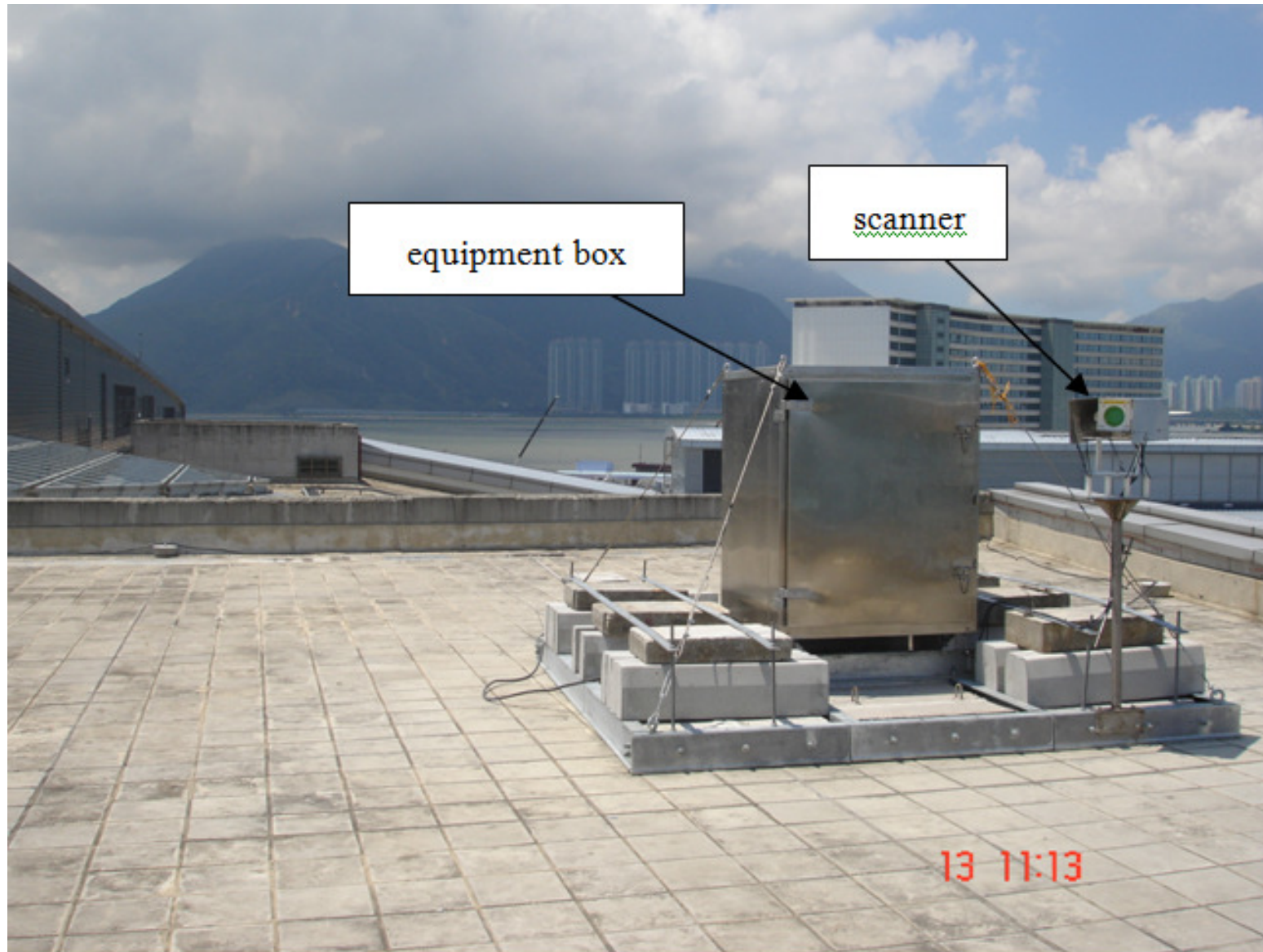
EDR comparison

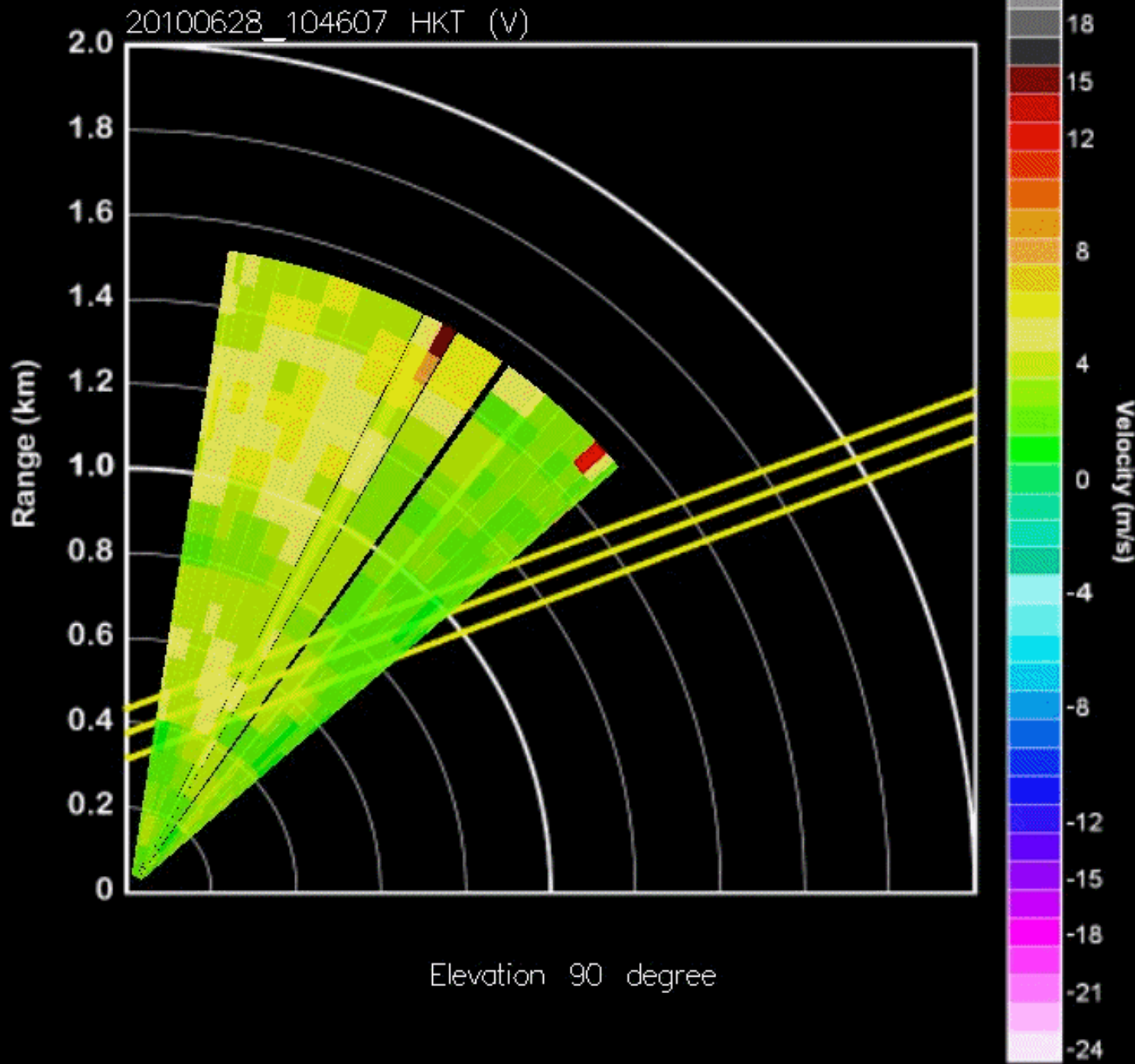


EDR performance in windshear



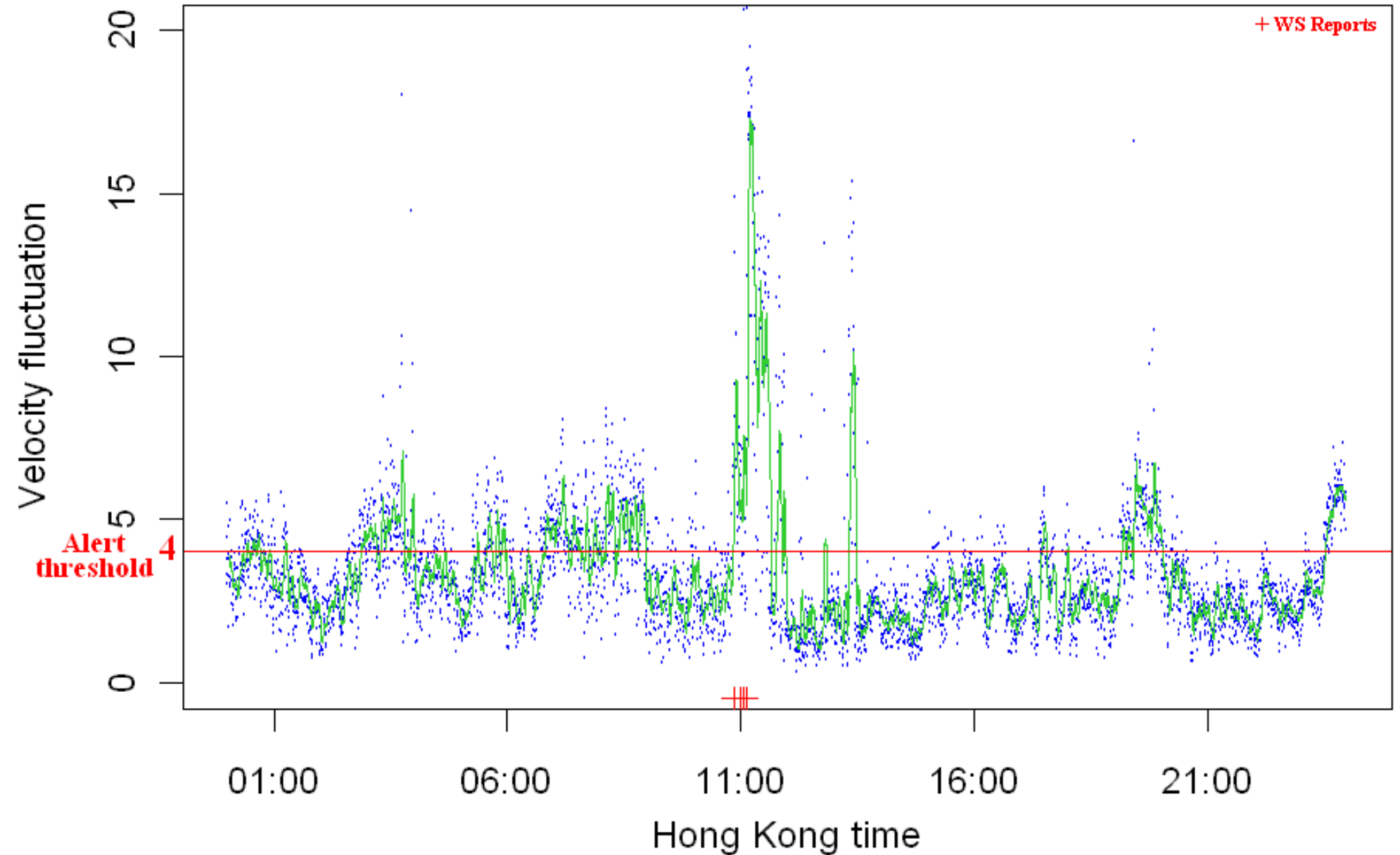
Short-range LIDAR at Asia World-Expo



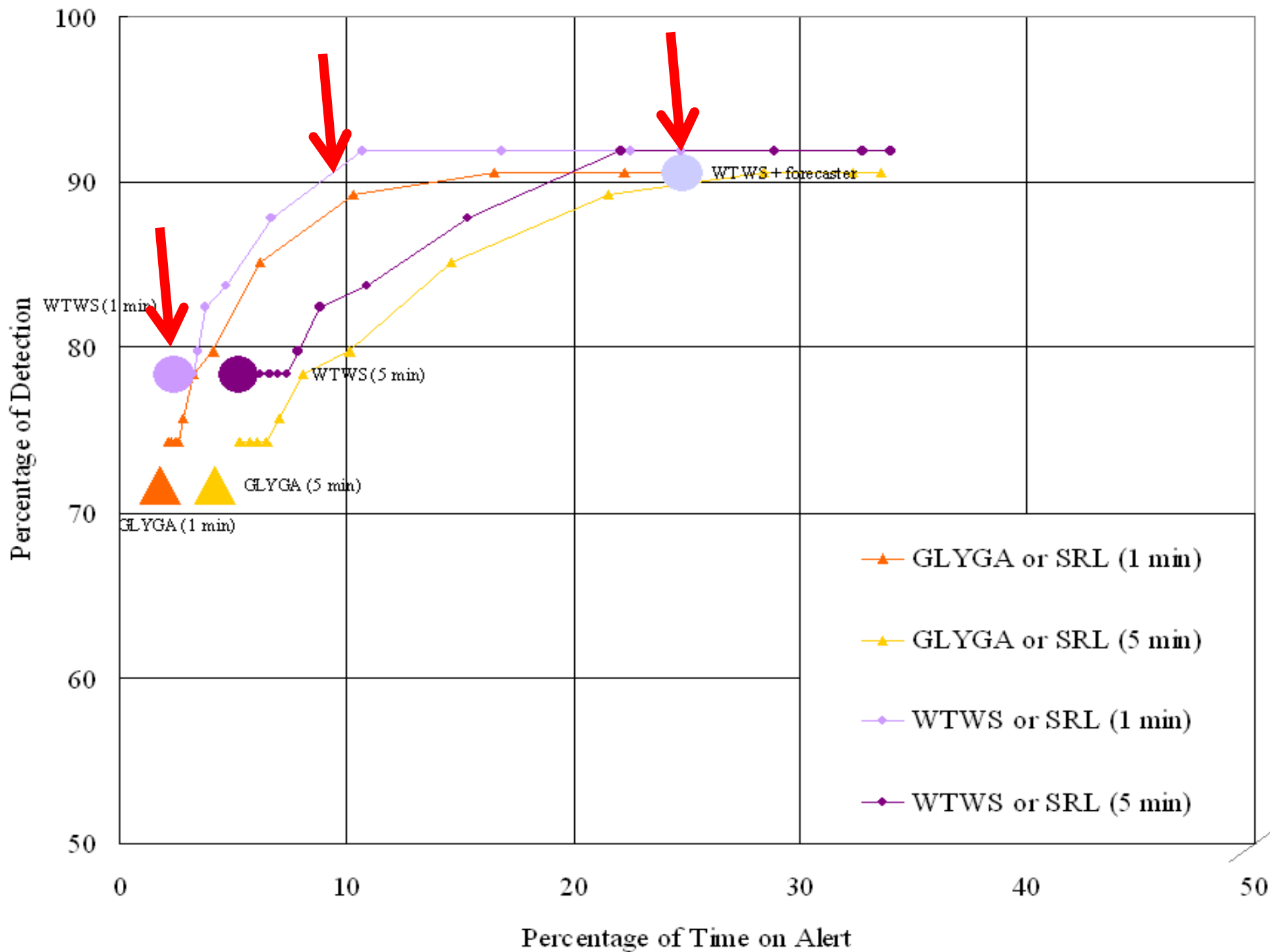


Windshear pilot report		
HKT	Aircraft Type	WTWS alert
10:51	B744	NO
10:59	B738	YES
11:03	A321	YES
11:07	A333	YES

June28 25RA

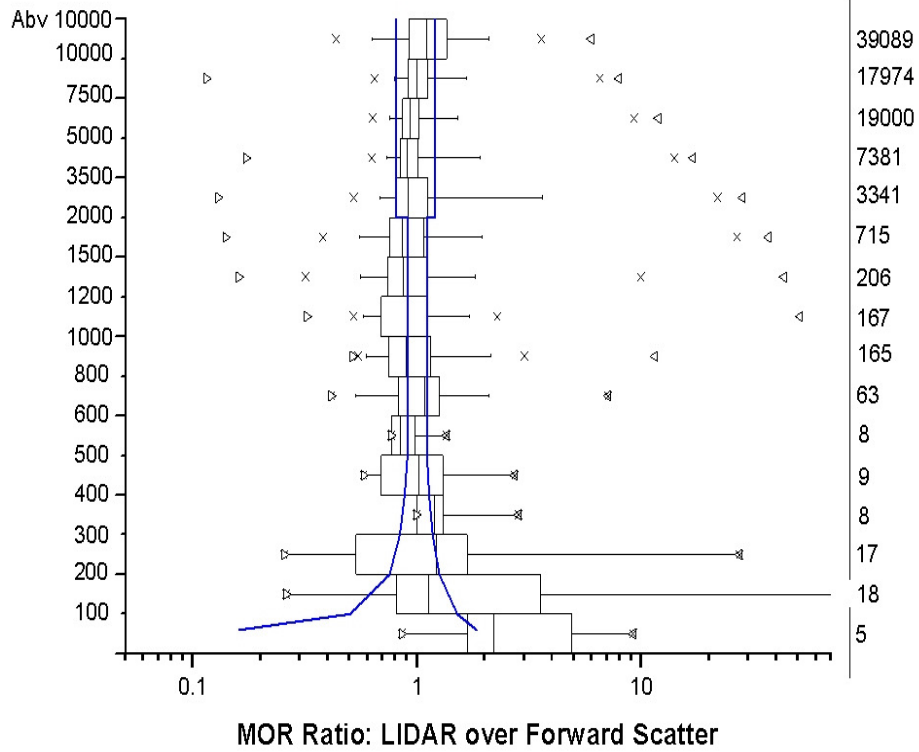


All WS cases are alerted by short-range LIDAR.

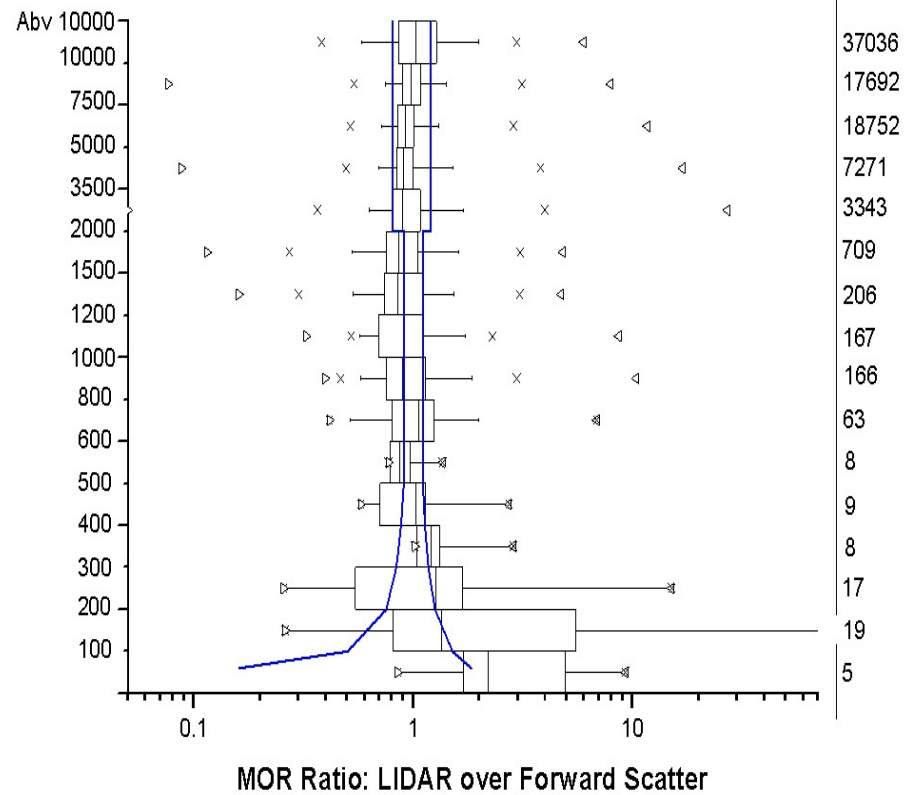


Box plots

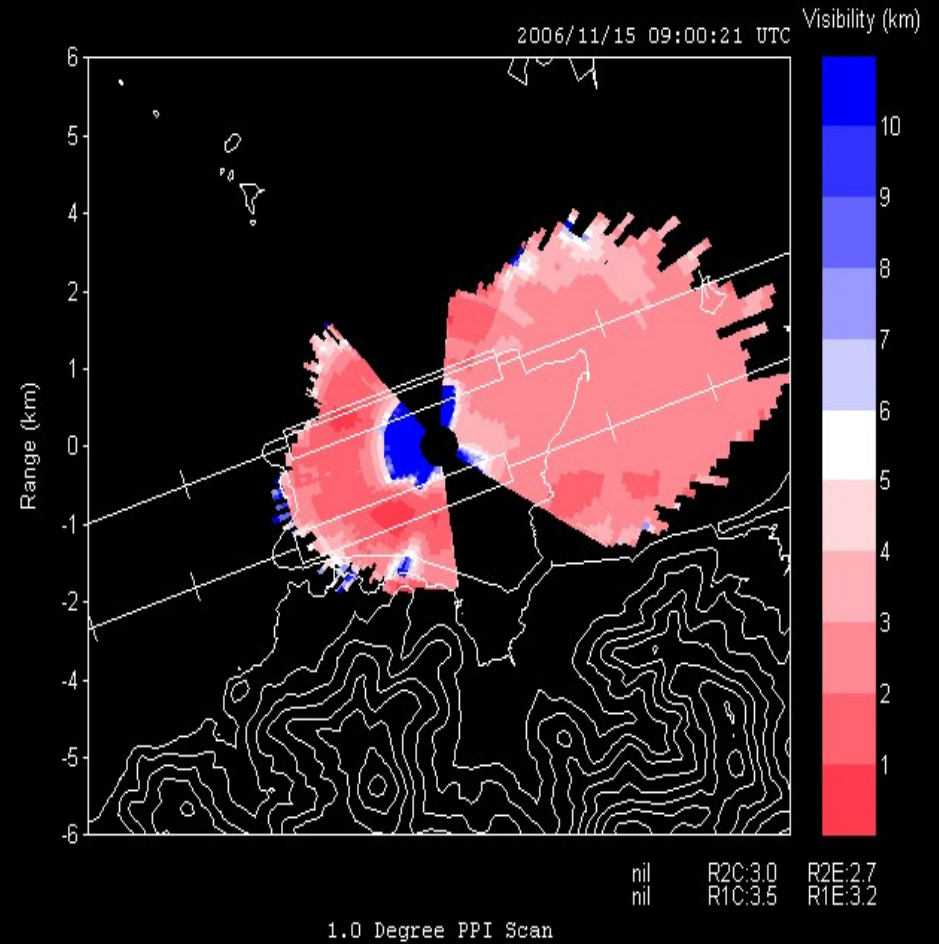
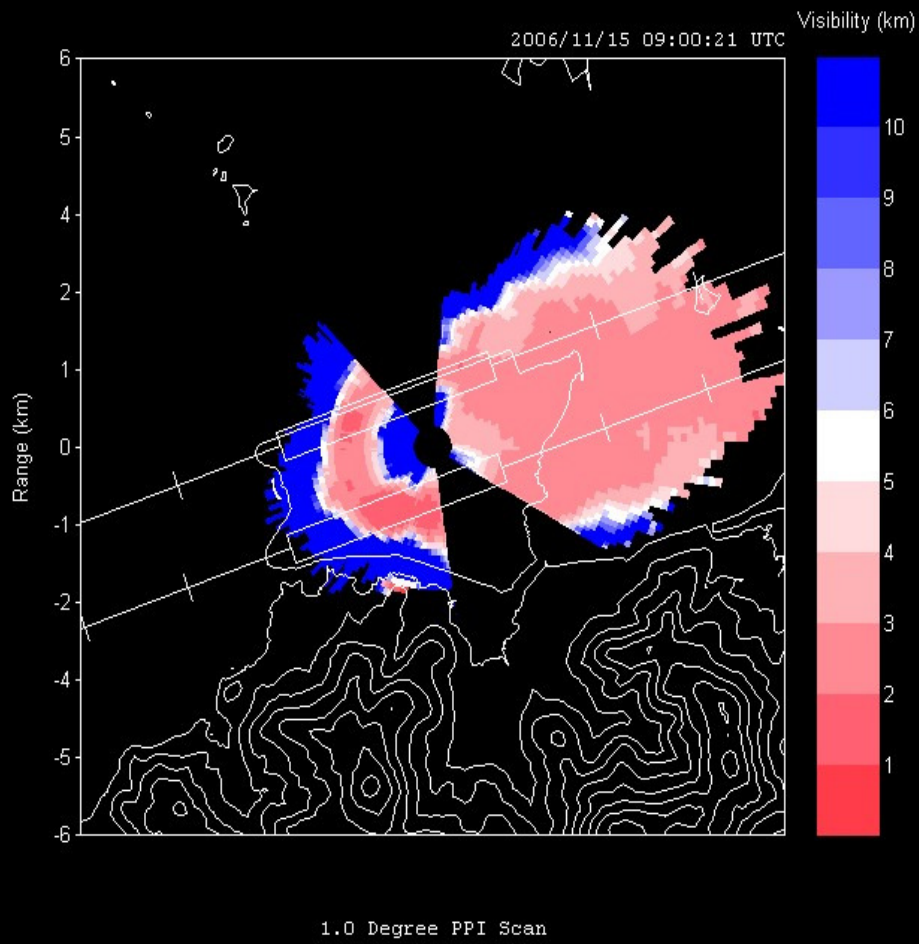
Dates: 2006/01/01 - 2006/12/31 Target: 1st LIDAR 1degree Scan (old version)
Reference: Forward Scatter - R2W Total No. of Cases: 88166



Dates: 2006/01/01 - 2006/12/31 Target: 1st LIDAR 1degree Scan (Sensor Adjusted)
Reference: Forward Scatter - R2W Total No. of Cases: 85471



Old vs new method



Work in progress

- Study of LIDAR-based F-factor in windshear alerting – using a larger sample, and departure flights
- Study of LIDAR-based EDR for turbulence alerting -> comparison with pilot reports
- Calculation of LIDAR EDR using spectral width approach
- Trials of short-range LIDAR in windshear alerting – over a longer period