



# ***UHF Wind Profiler Radar Applications in Aviation Support***





*La passion de la performance*







# OVERVIEW

- Low level winds
- All weather
- Turbulence
- Up – down drafts
- Wind shear
- Air masses
- Conclusion

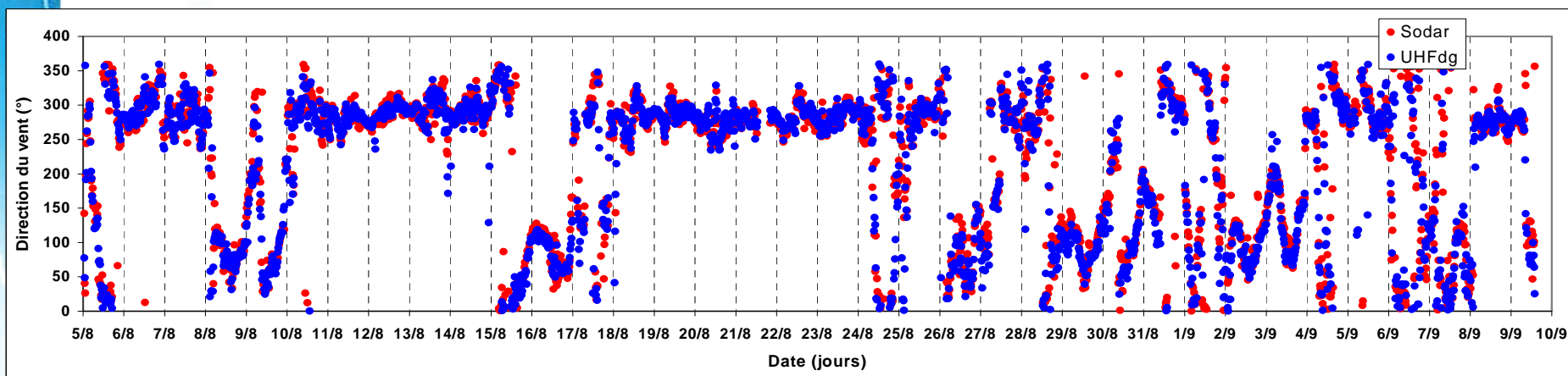
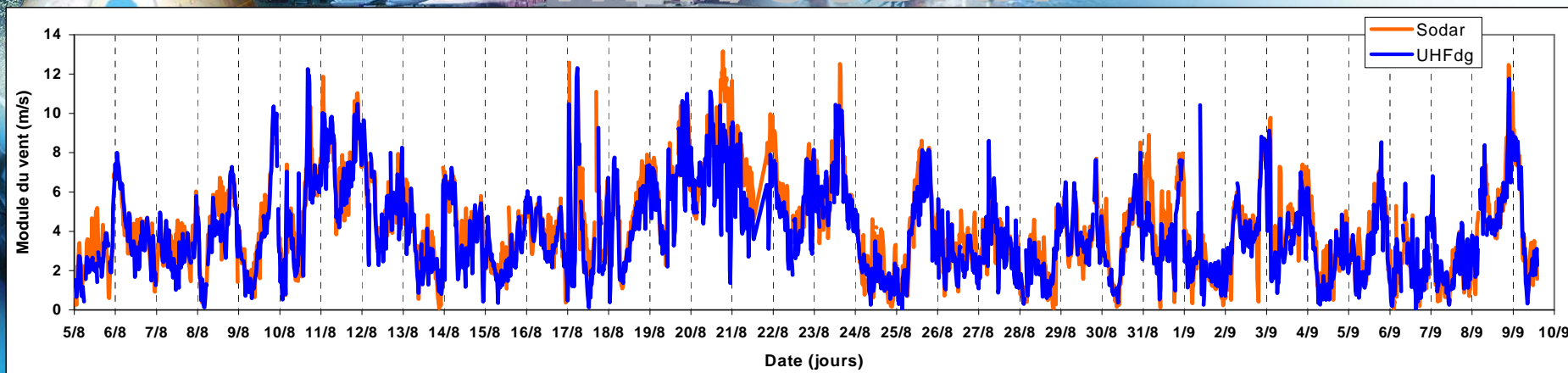



Degreane Horizon : the latest in Weather Observation Technology

WPR/SODAR

*La passion de la performance*

WPR/SODAR



WPR/SODAR comparison	Wind Speed (m/s)		Wind Direction (°)	
	Mean	SD	Mean	SD
 85 m	0.41	1.2	3	28

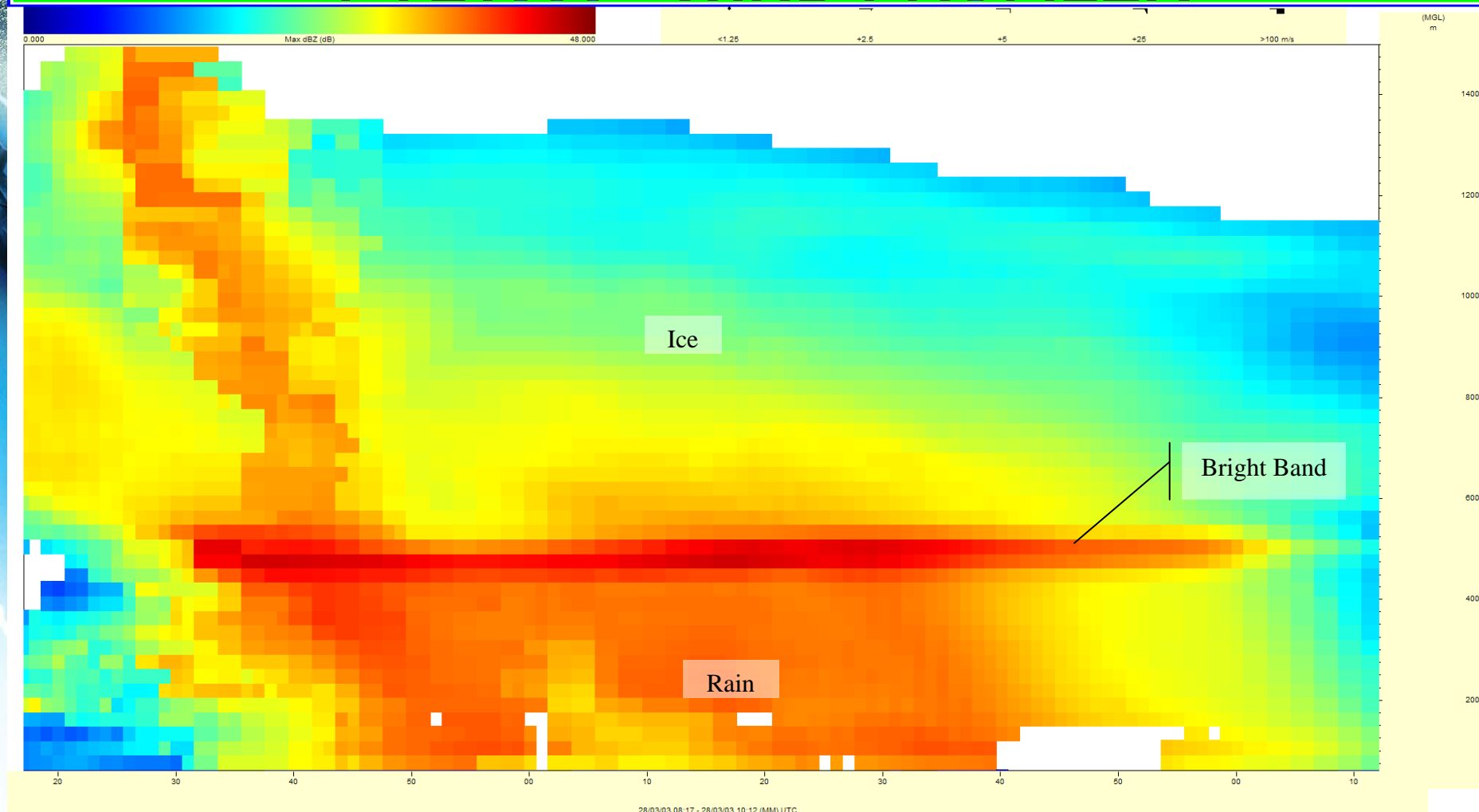
DEGREANE HORIZON

Degreane Horizon : the latest in Weather Observation Technology

Wind profilers

*La passion de la performance*

## PCL1300 - WIND PROFILER



28/03/03 08:17 - 28/03/03 10:12 (MM) UTC

off-line  
High Mode



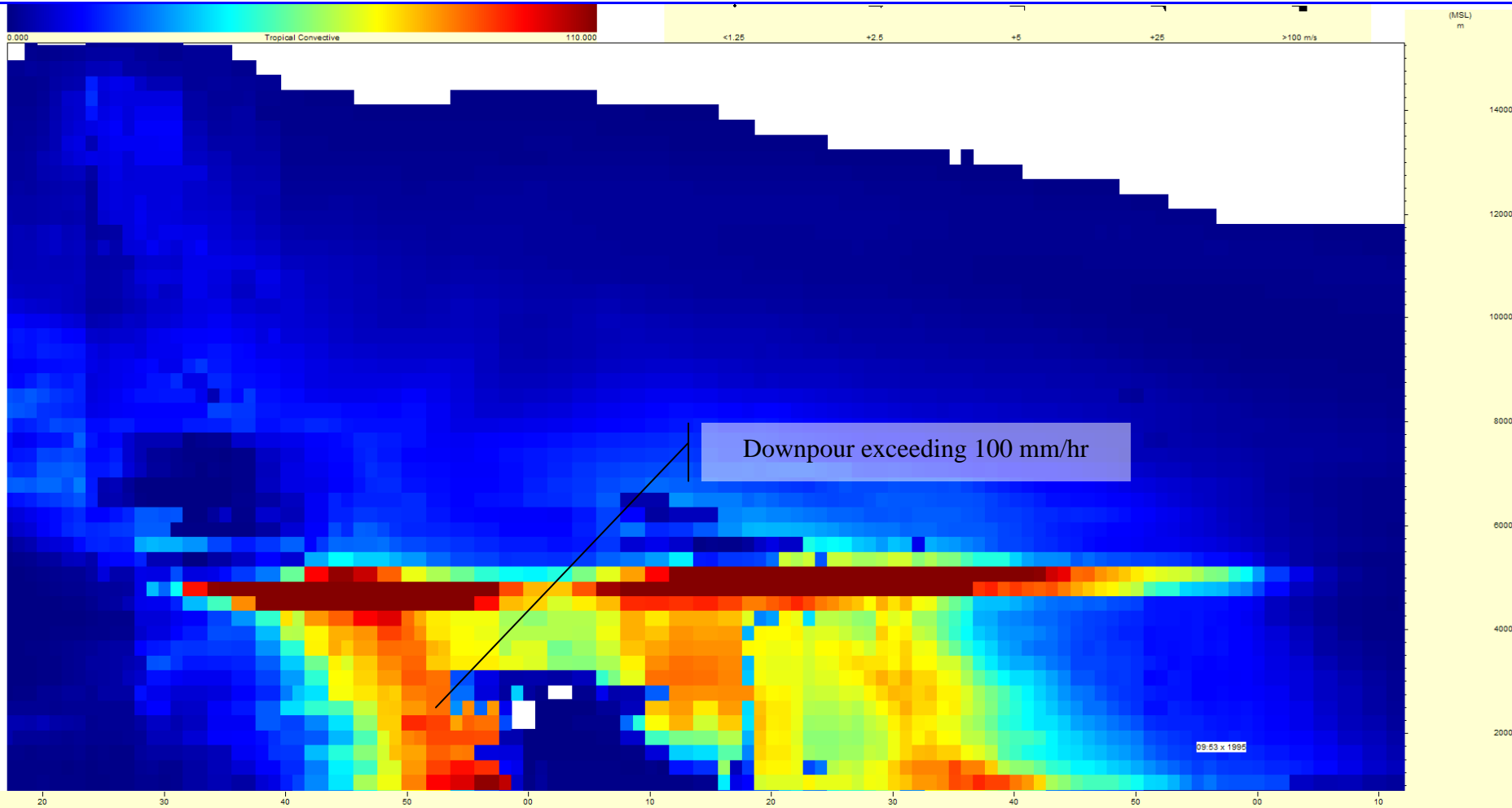
DEGREANE HORIZON

Degreane Horizon : the latest in Weather Observation Technology

Wind profilers

*La passion de la performance*

## PCL1300 - WIND PROFILER



28/03/03 08:17 - 28/03/03 10:12 (MM) UTC

off-line  
High Mode



DEGREANE HORIZON



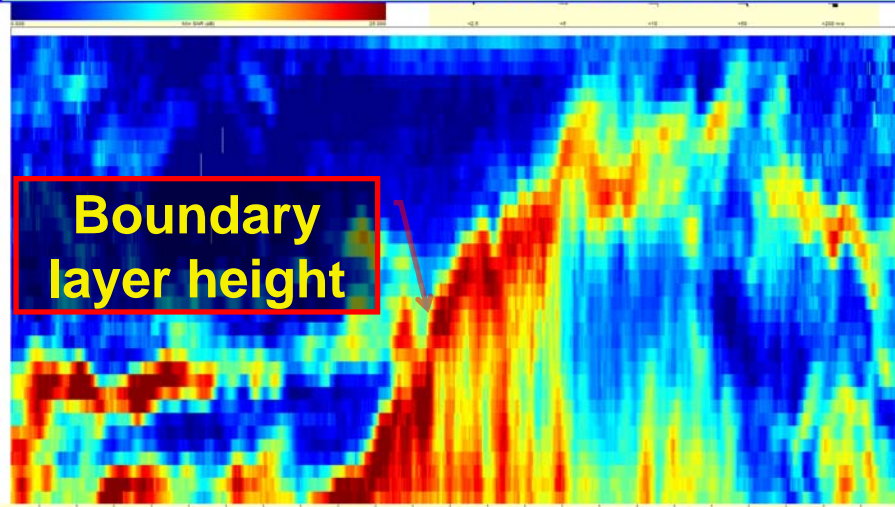
Degreane Horizon : the latest in Weather Observation Technology

Boundary Layer

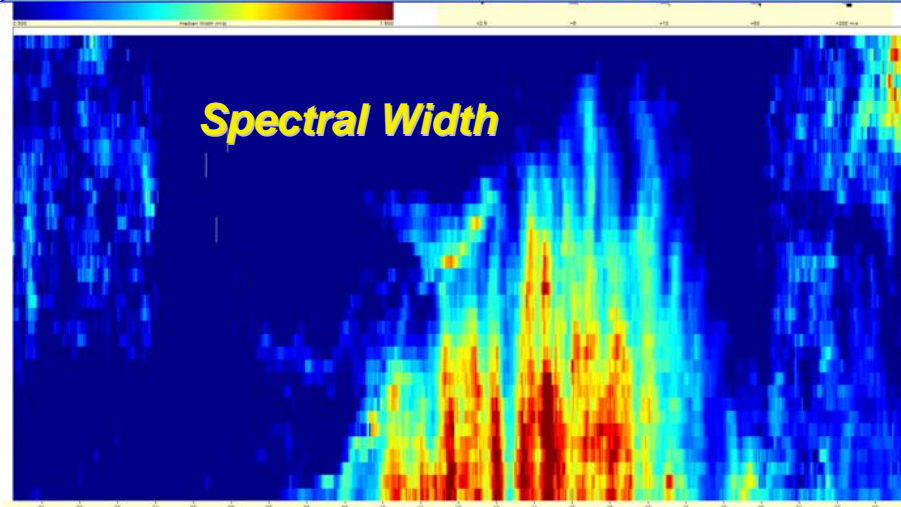
# Boundary Layer and Turbulence

*La passion de la performance*

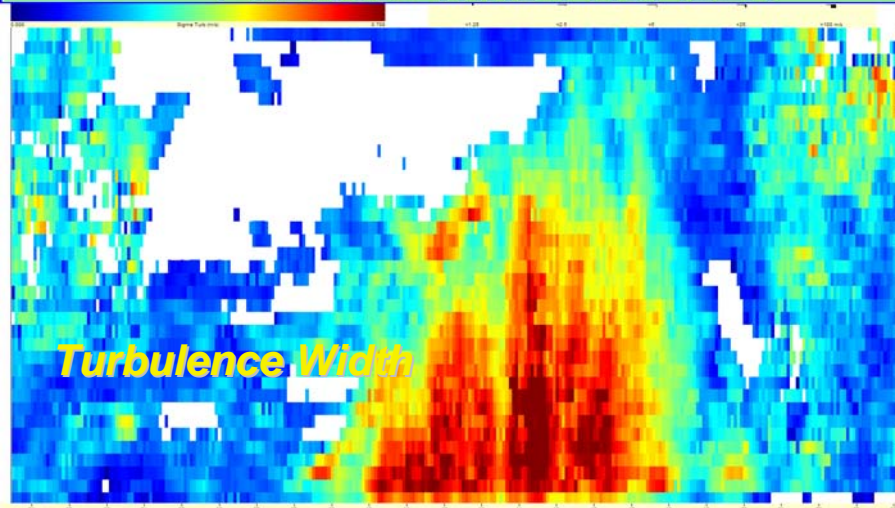
PCL1300 - WIND PROFILER



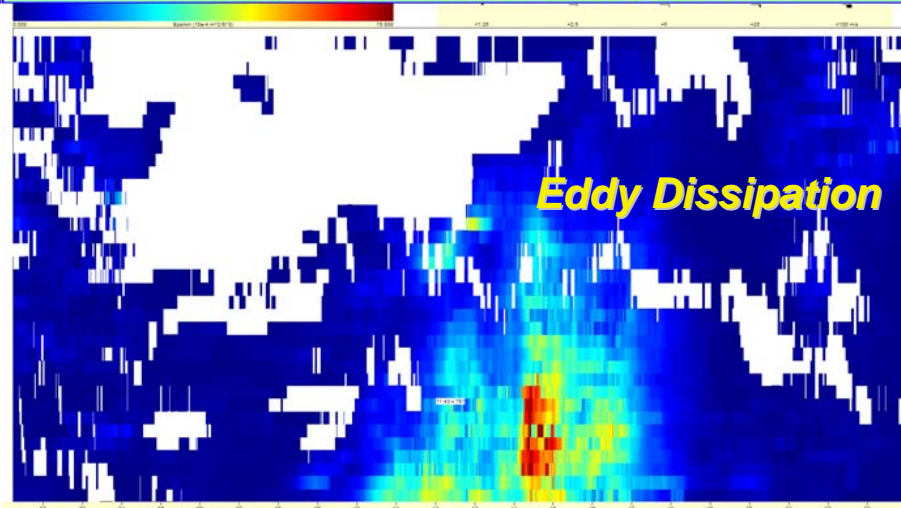
PCL1300 - WIND PROFILER



PCL1300 - WIND PROFILER



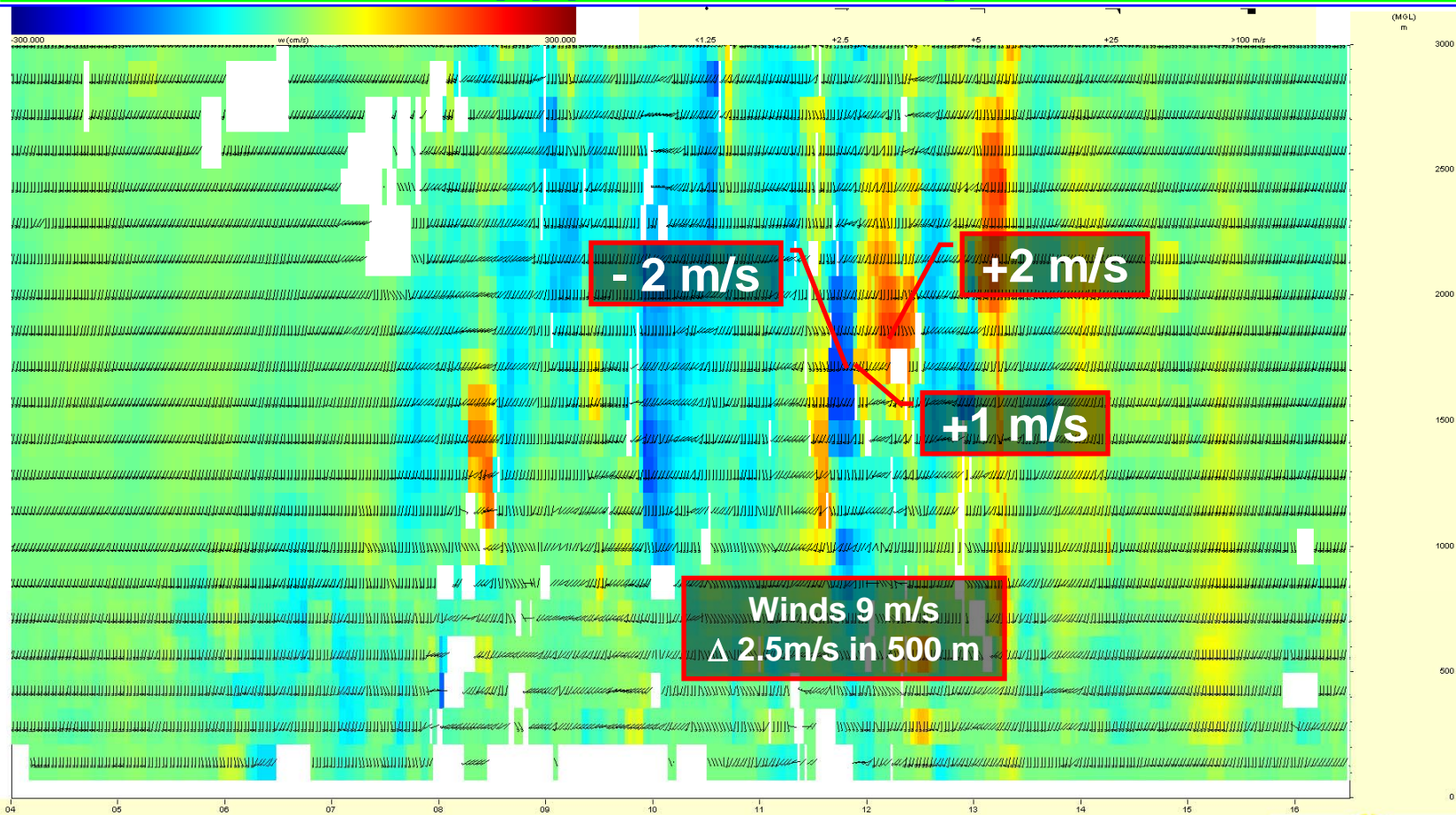
PCL1300 - WIND PROFILER





# UP-DOWNDRAFTS

## PCL1300 - WIND PROFILER



DEGREANE HORIZON



01/05/09 04:00 - 01/05/09 16:30 (HH) UTC

off-line  
High Mode



DEGREANE HORIZON



Degreane Horizon : the latest in Weather Observation Technology

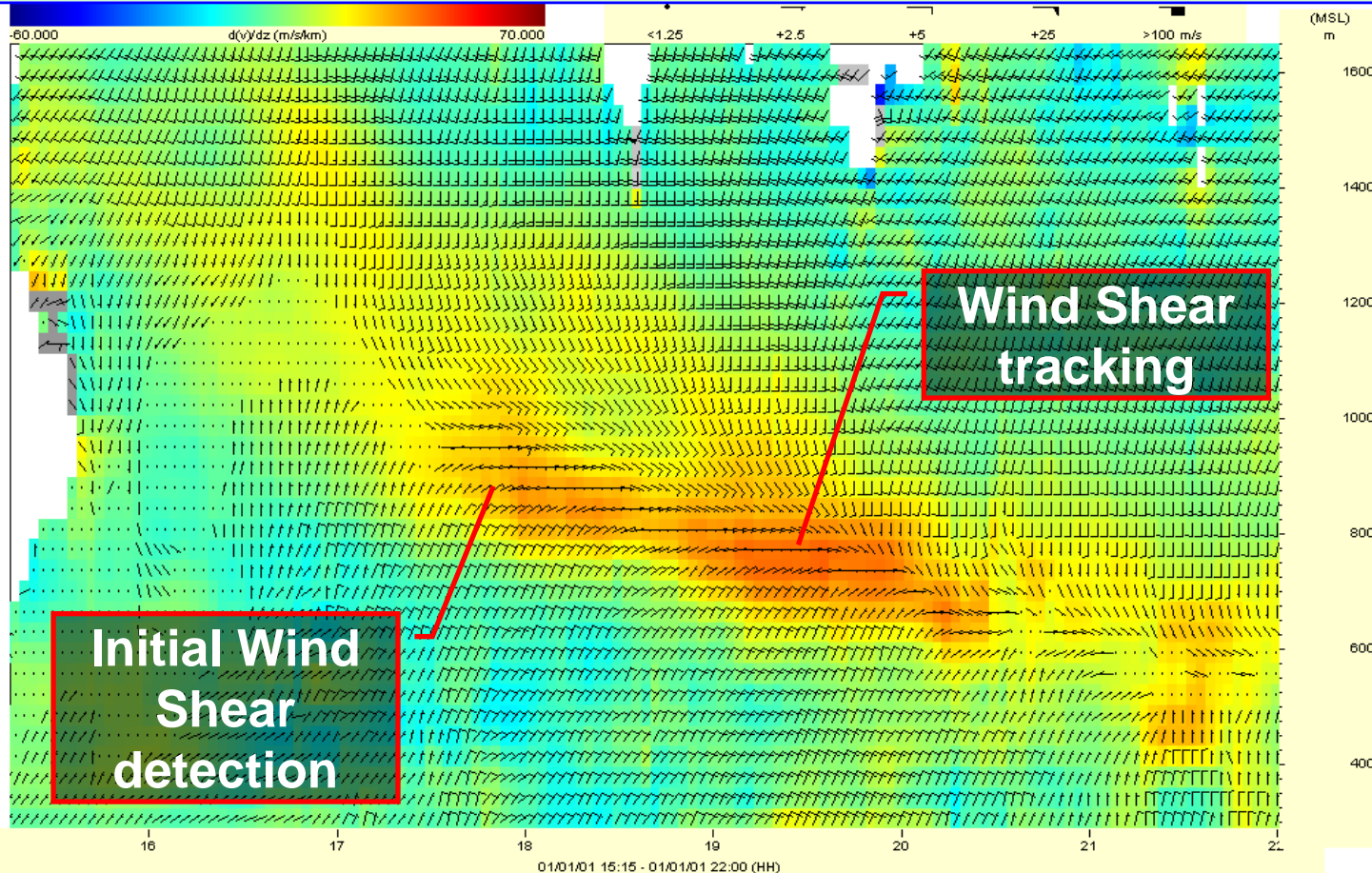
Wind profilers

# Wind Shear

*La passion de la performance*

DEGREWIND - PCL1300 : PCT

## PCL1300 - WIND PROFILER



**Wind Barb  
Display**  
(3 min. update)

Degreane

Exit Zoom Print Type

off-line  
High Mode

**de** DEGREANE  
HORIZON

DEGREANE HORIZON

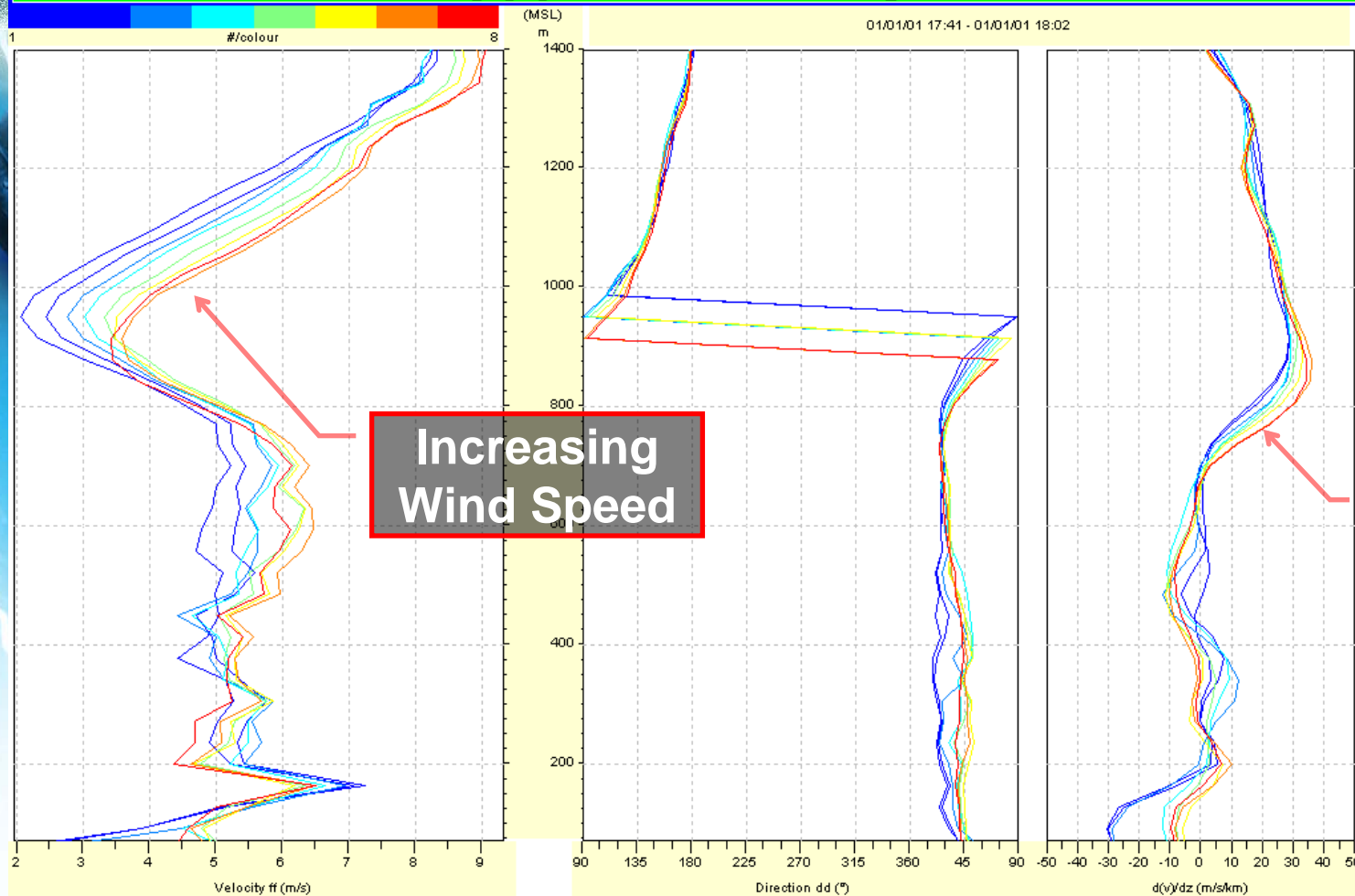
Degreane Horizon : the latest in Weather Observation Technology

Wind profilers

# Wind Shear

*La passion de la performance*

## PCL1300 - WIND PROFILER



## Profile Display

*(3 min. update)*

Wind Shear  
increasing and  
moving  
downward

Exit Zoom Print Type

off-line  
Low Mode



DEGREANE HORIZON



# Air mass mixing

Dryer or more  
stable air

## PCL1300 - WIND PROFILER

18:30 moves in and  
develops downward

### Cloud layer

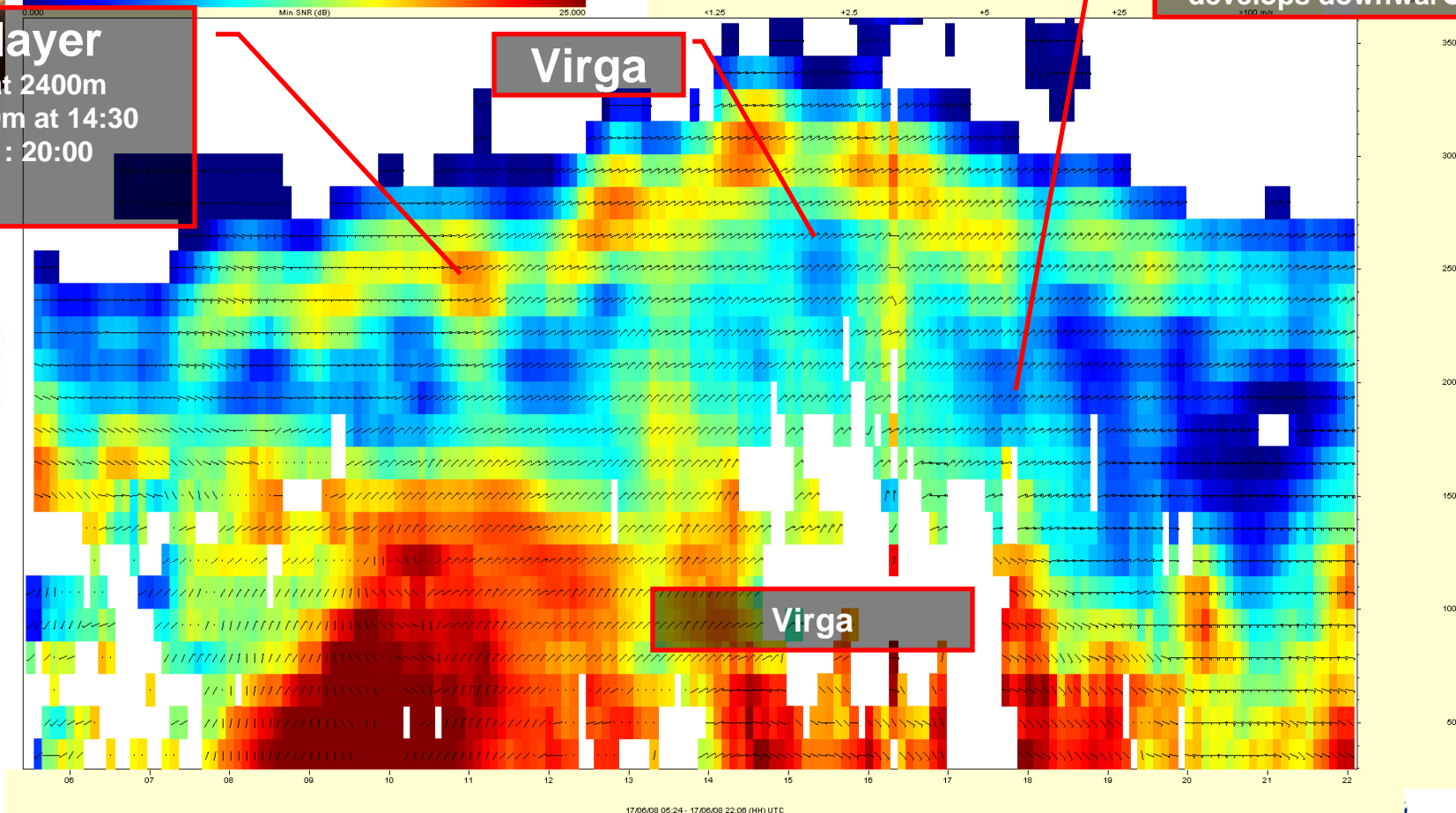
7:30-12:00 at 2400m  
Rising to 3100m at 14:30  
Dissipates : 20:00

Virga

Virga



DEGREANE HORIZON

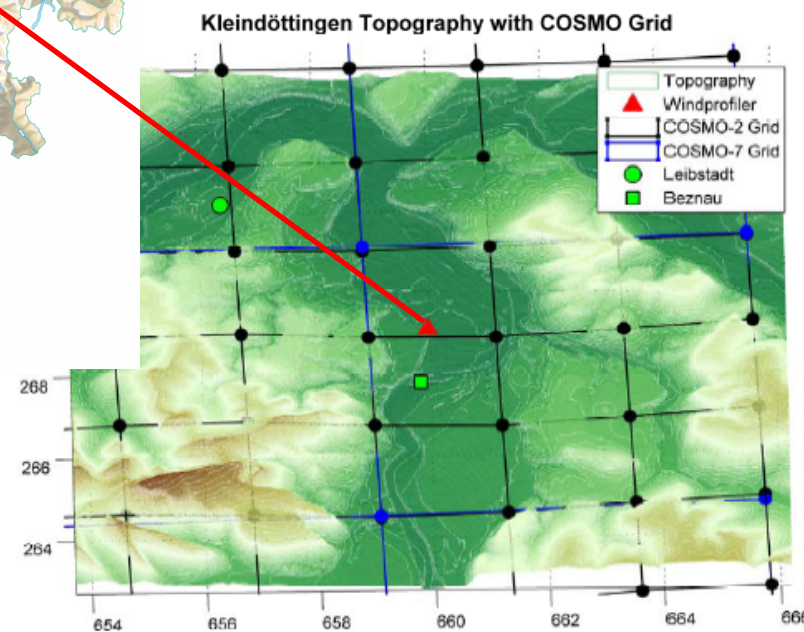
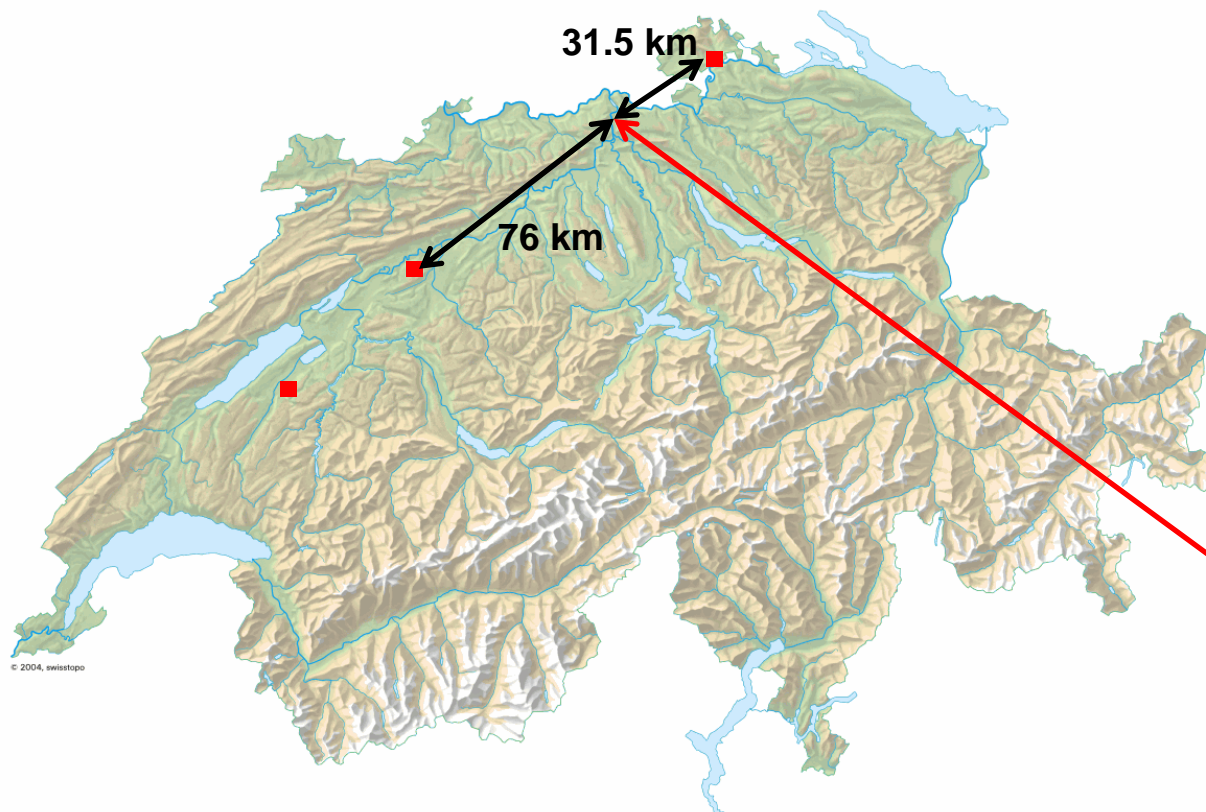


off-line  
High Mode





# CN-MET



DEGREANE HORIZON



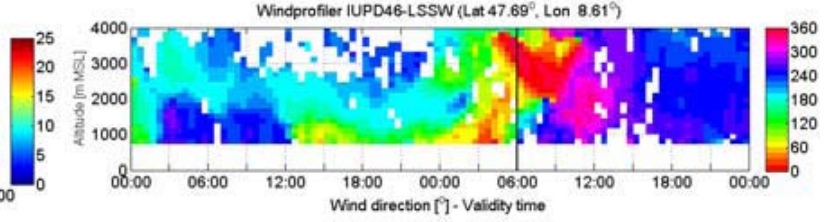
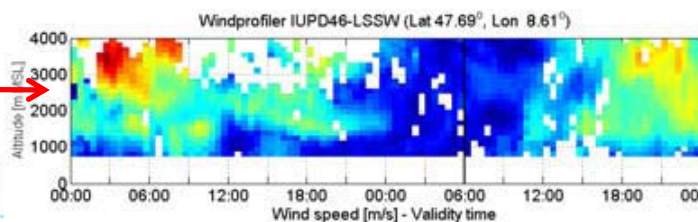
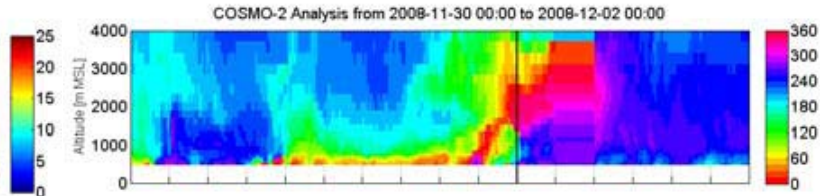
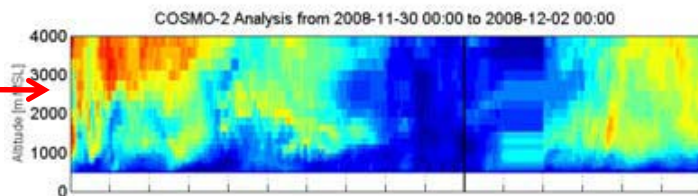
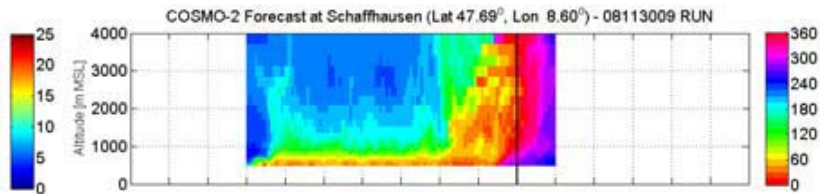
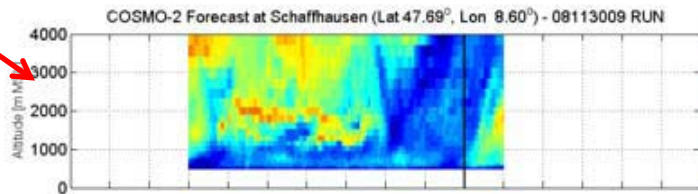
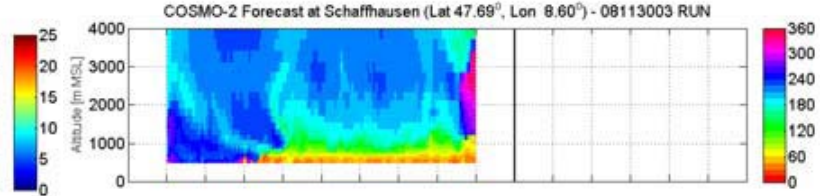
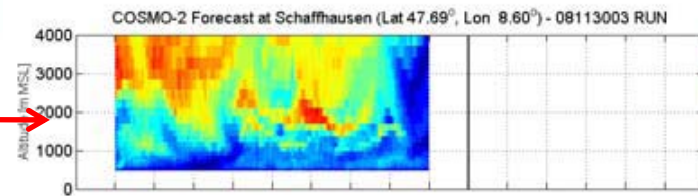
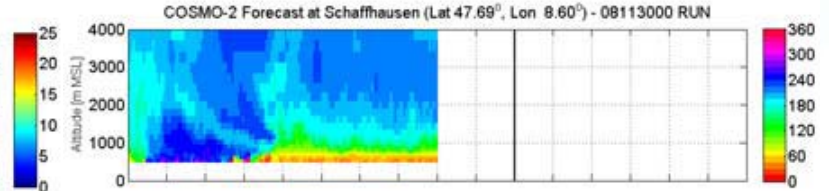
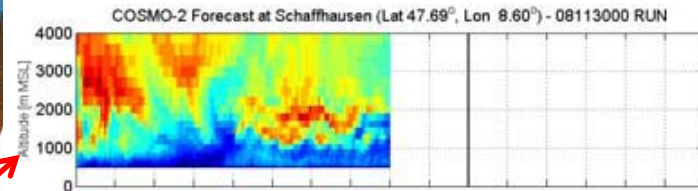
# COSMO-2 24H FORECASTS

24 Hr. Forecast  
Without WPR

24 Hr. Forecast  
With WPR

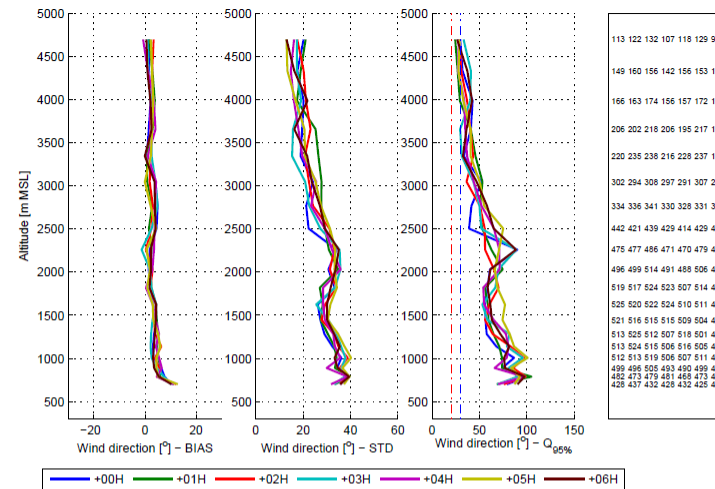
WPR

DEGREANE HORIZON

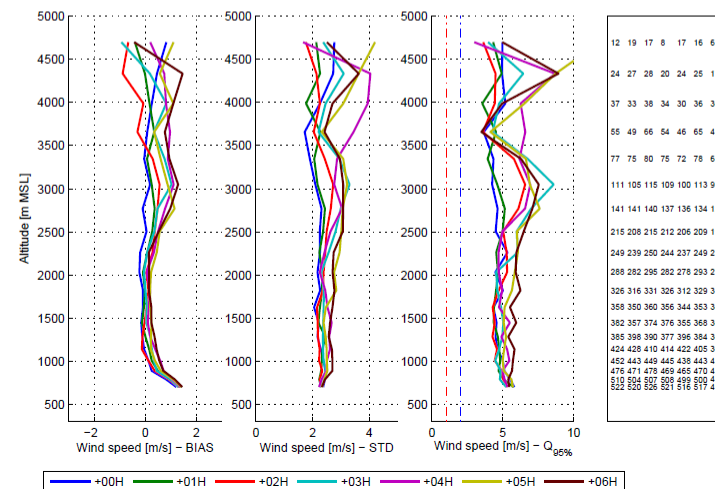


# MODEL VERIFICATION 31/76 KM

COSMO-2 (opr) Upper-air Verification at KDT (01 Aug 2008 00H – 31 Oct 2008 23H) – ff >= 2 m/s



COSMO-2 (opr) Upper-air Verification at KDT (01 Aug 2008 00H – 31 Oct 2008 23H) – ff >= 0 m/s



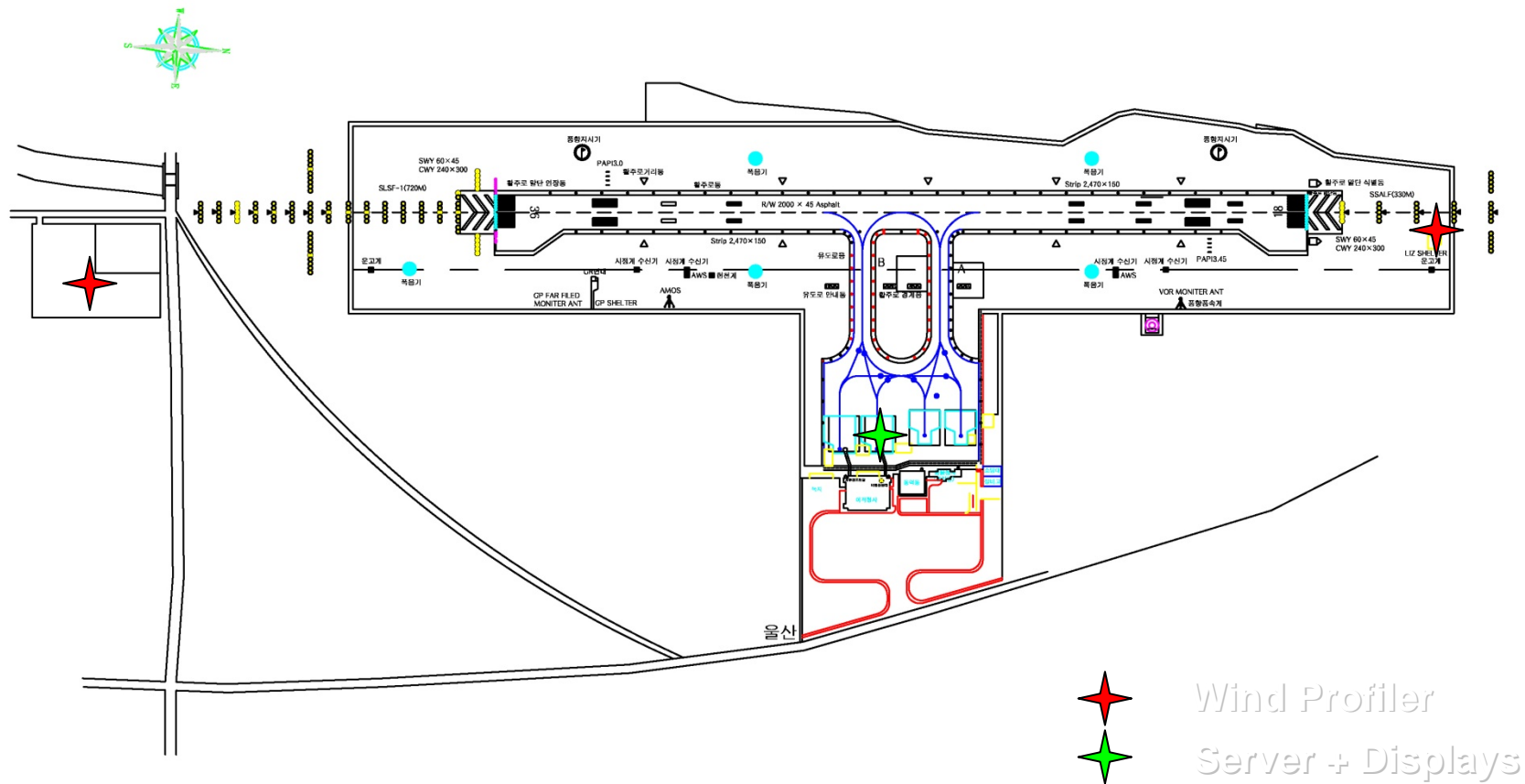
DEGREANE HORIZON



## Airport systems

**La passion de la performance**

# Korean Airports (3 and counting)

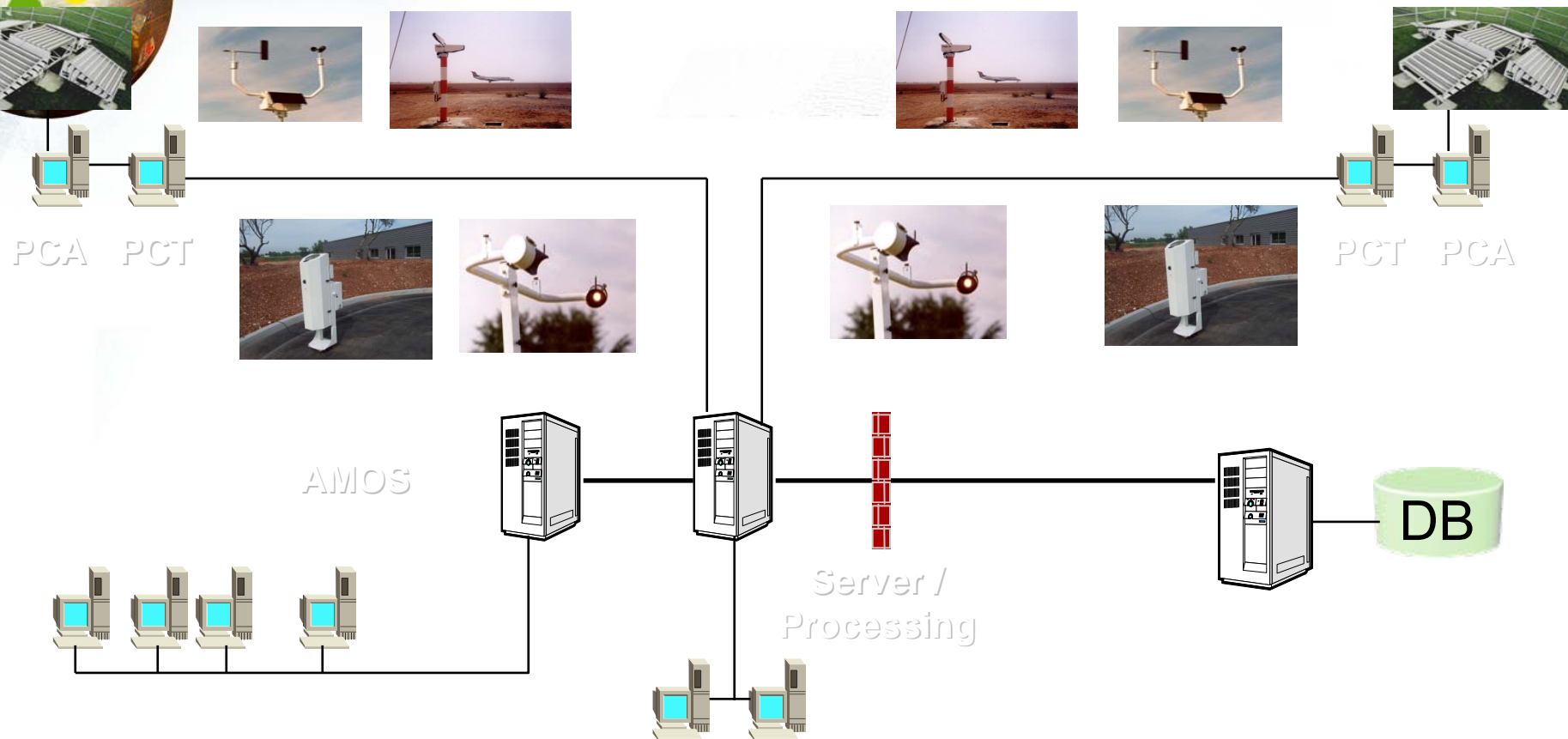


Degreeane Horizon : the latest in Weather Observation Technology

Airport systems

# Korean Airports (3 and counting)

*La passion de la performance*



End User Displays

Server/Processing: integrates all of the data into MUKLIMO (Microscale Urban CLimate Model)



DEGREANE HORIZON

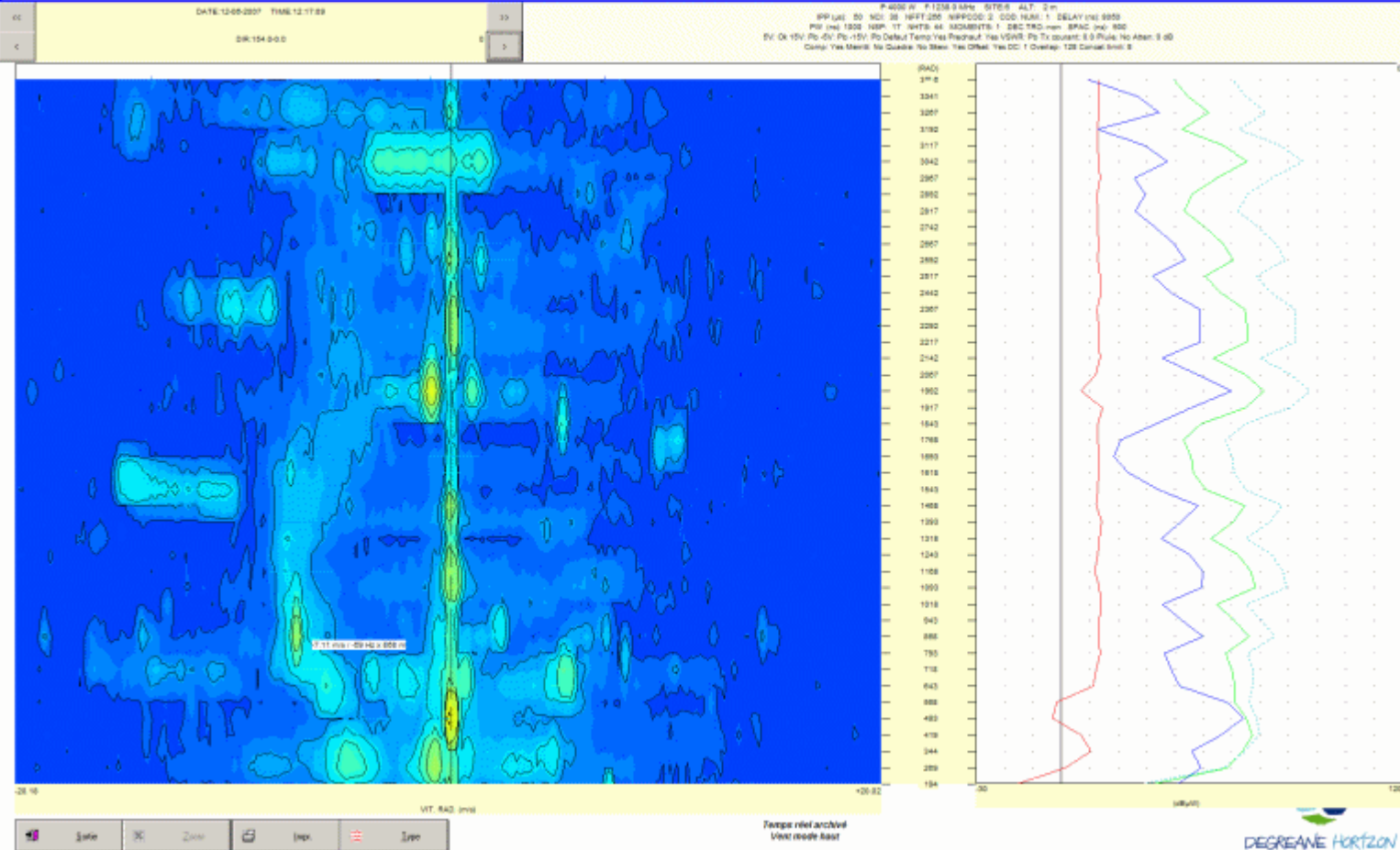






**Wide dynamic range: Jetski + wind**

## PCL1300 - WIND PROFILER



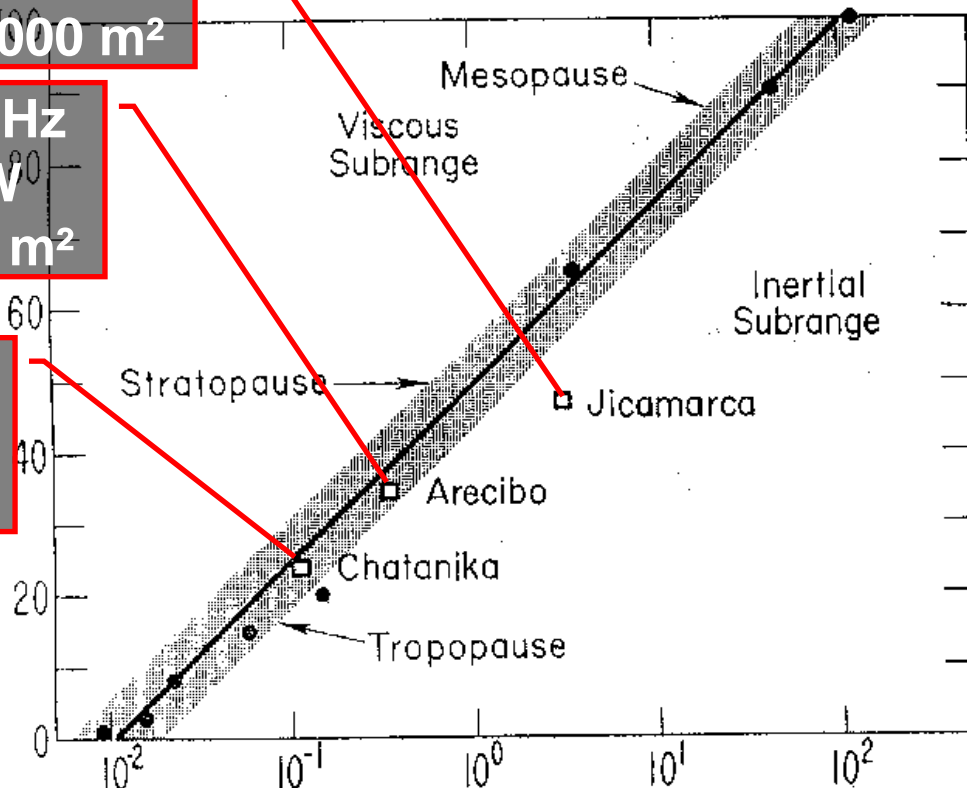


# Maximum Range

50 MHz  
6MW  
84000 m<sup>2</sup>

400 MHz  
3MW  
56000 m<sup>2</sup>

1290 MHz  
2MW  
240 m<sup>2</sup>



- Eléments proportionnels à  $\lambda$  :
  - taille antenne
  - prix
  - portée maximale
  - mesure la plus basse

- Eléments proportionnels à  $1/\lambda$  :
  - résolution
  - sensibilité aux précipitations, oiseaux...

Kolmogoroff Microscale (m/2 $\pi$  radians) ( $\cong \lambda$ )

A noter que la résolution verticale est inversement proportionnelle à l'altitude.





# CONCLUSION

- Operates under all conditions
  - Clear air (turbulence/not insects), torrentiel rains, buried under snow
- Provides a wide range of information
  - turbulence, wind shear, rainfall rate, bright band, boundary layer height ...
- Clear indication of cold dry / warm humid air mass interfaces
- With Rass: real time high resolution temperature profiles





# REFERENCES

*La passion de la performance*

- Sandra Jacoby-Koaly, B. Campistron, S. Bernard, B. Bénech, F. Arduin-Girard, J. Dessesns, E. Dupont and B. Carissimo, 2002: **Turbulent Dissipation Rate in the Boundary Layer via UHF Wind Profiler Doppler Spectral Width Measurements**, *Boundary Layer Meteorology*, **103**, pp 361-389
- Calpini Bertrand, 2008. **Surface and upper air recent developments in MeteoSwiss**. TECO 2008, 27-29 November, 2008, St. Petersburg, Russia.
- Hug Christophe, P. Kaufmann, D. Ruffieux. **Validation of the high resolution numerical weather prediction model COSMO-2 with independent wind profiler measurement data**. ISTP 2009.
- Ruffieux D., P. Huguenin, B. Calpini, Ch. Hug, O. Maier, 2009: **Ground-based remote sensing profiling and NWP model to manage nuclear power plants meteorological surveillance in Switzerland**, ISTP 2009.







*La passion de la performance*



DEGREANE HORIZON

