HYDRIX: An X band radar to monitor atmospheric hazards for airports

HYDRIX: a polarimetric & Doppler X band weather radar

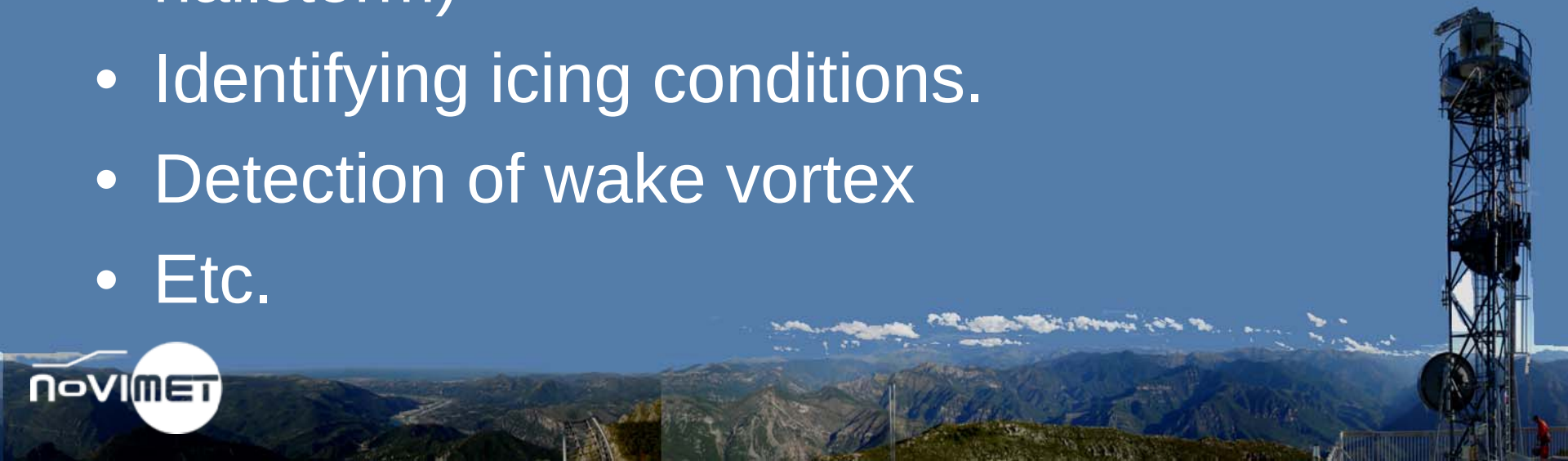
- ***Antenna***
  - offset feed, dual polarized H and V
  - size: 1.5x1.6 meter
  - beam width: 1.5° at 3 dB (one way)
  - first side lobe < –30 dB.
- ***Transmitter/Receiver***
  - Peak power 60 kW.
  - Pulse Length 0.5, 1 or 2 μs.
  - Simultaneous feed of H and V
  - Noise figure: 3.5 dB
- ***Measured parameters***
  - Radar reflectivity Z.
  - Differential phase ΦDP.
  - Correlation coefficient ρHV.
  - Differential reflectivity ZDR.
  - radial velocity V, variance σ^2V
- ***Performance***
  - Threshold: 0dBZ at 100km
  - Velocity span: ±24m/s
  - Range : 150 km
  - Wind resistance: 180km/h

ZPHI® software

- Correction for attenuation
  - Critical in severe weather at X band
- Accurate estimate of the precipitation
  - High resolution (25 ha), real time, stand alone
- Classification of radar echoes
  - Ground clutter
  - Sea clutter
  - Clear air echoes
  - Rain, Snow, Hail, Melting layer

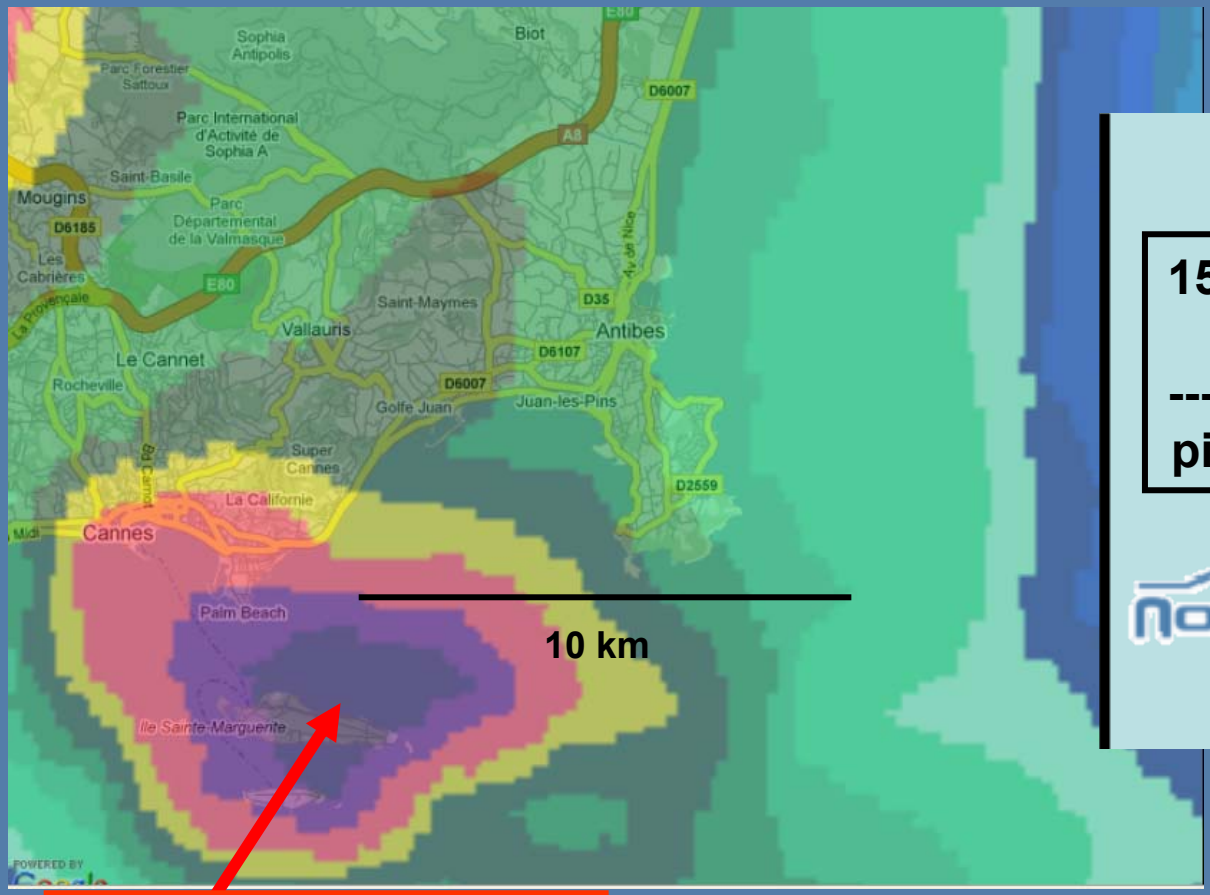
Possible airport applications of HYDRIX

- Runways flooding detection;
- Detection of dangerous wind shear for aircraft take off and landing;
- Monitoring of severe weather (as hailstorm)
- Identifying icing conditions.
- Detection of wake vortex
- Etc.



Intense raincell observed by HYDRIX®+ZPHI® approaching Cannes and Antibes

(rain rate in mm/h)



15/09/2009
13h45

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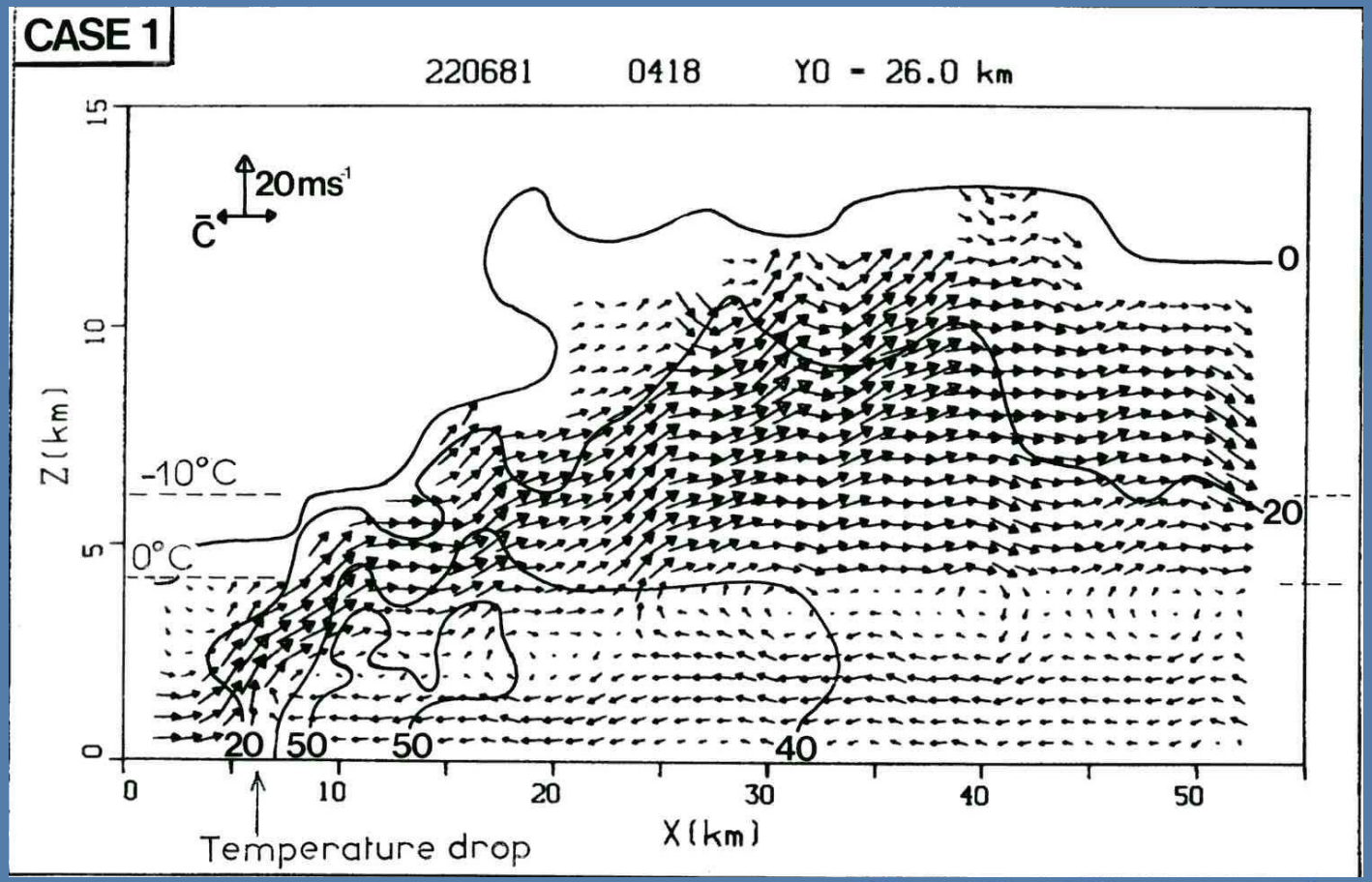
pixel 25ha

Raincell > 200 mm/h

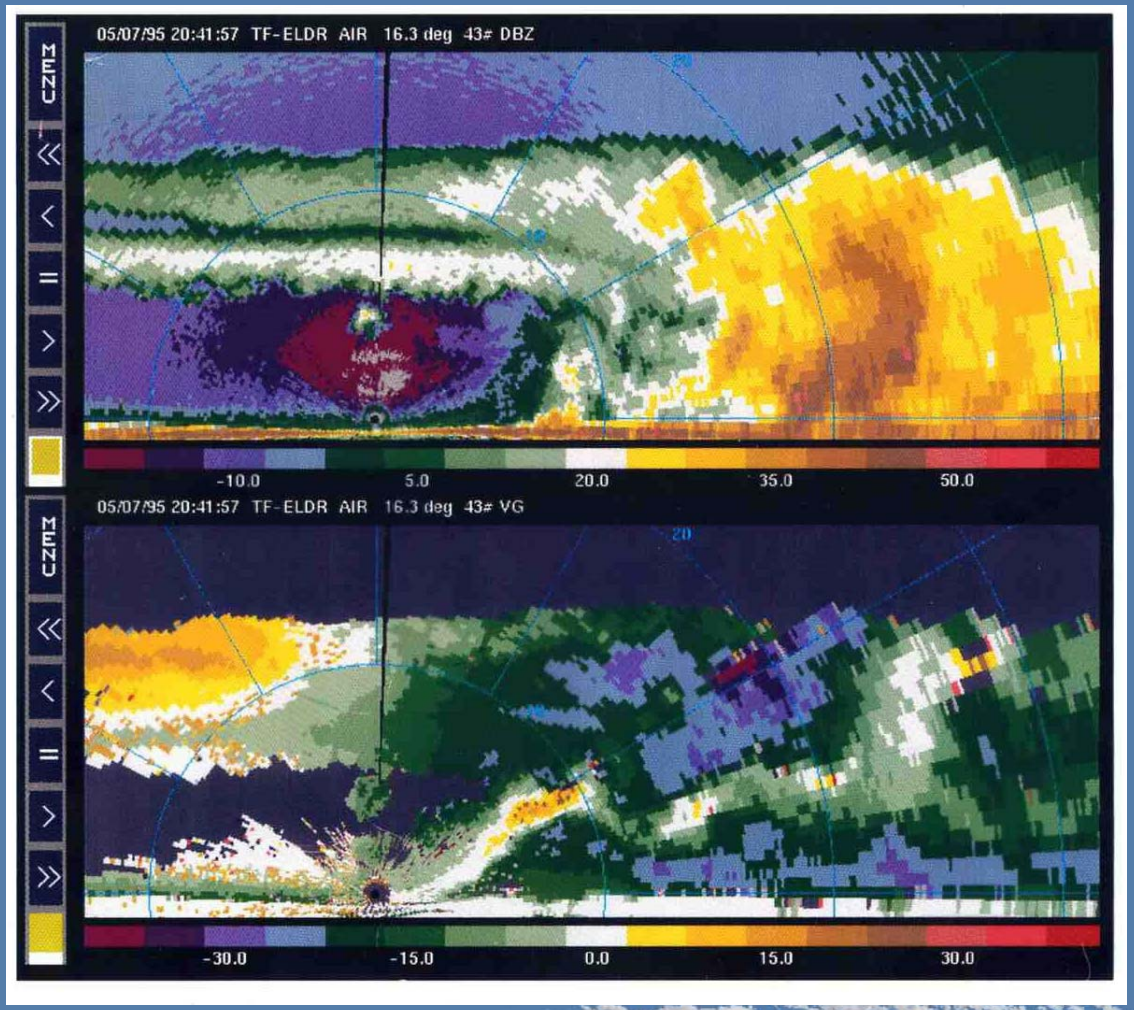
Vertical cross section of the 3D velocity field in a tropical squall line

(3D wind field synthesis from a dual Doppler radar experiment)



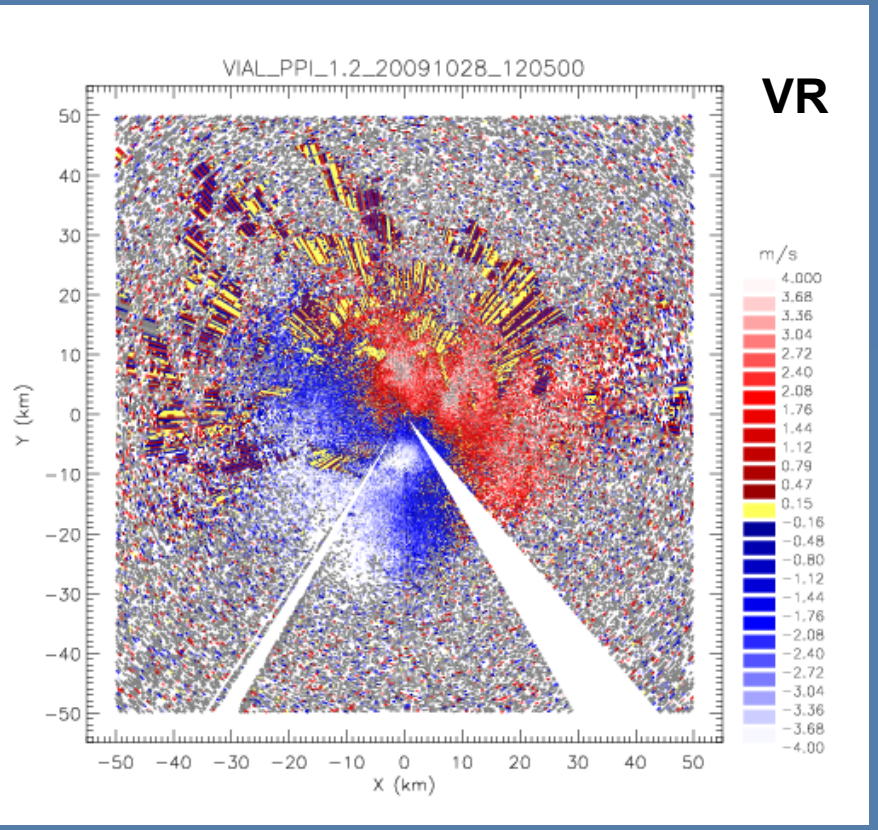
Gust front detection

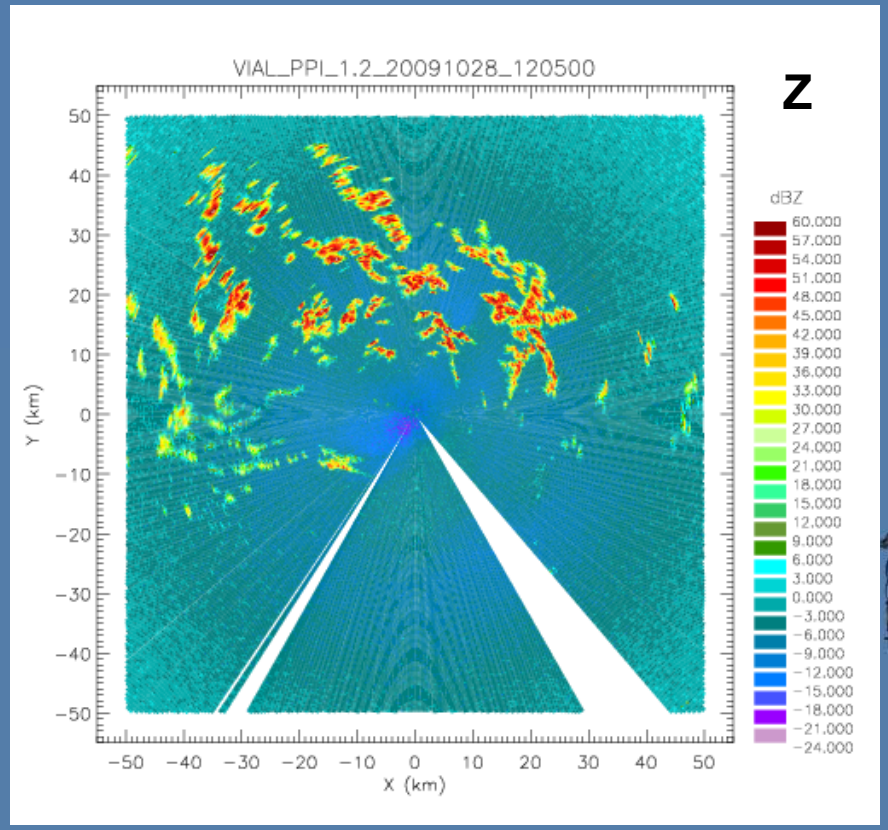
with ELDORA ASTRAIA airborne Doppler radar



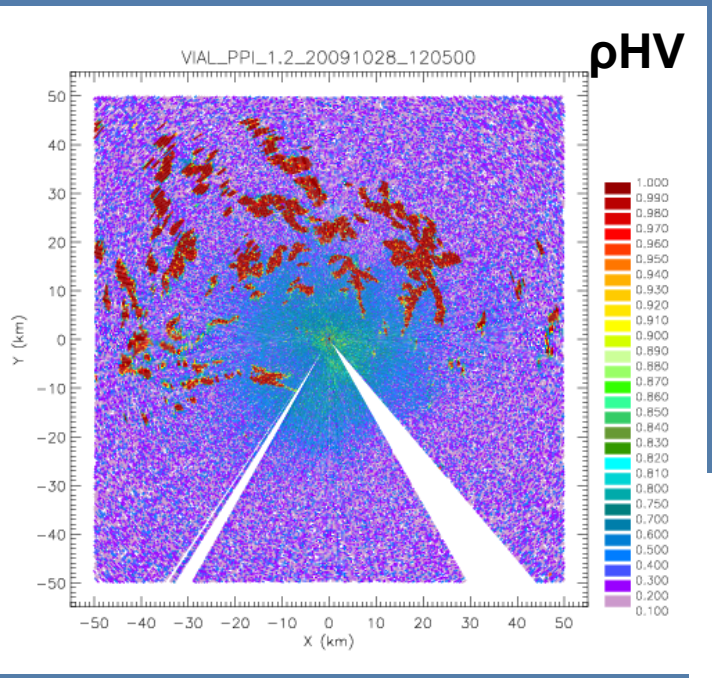
Clear air echoes at Mont Vial

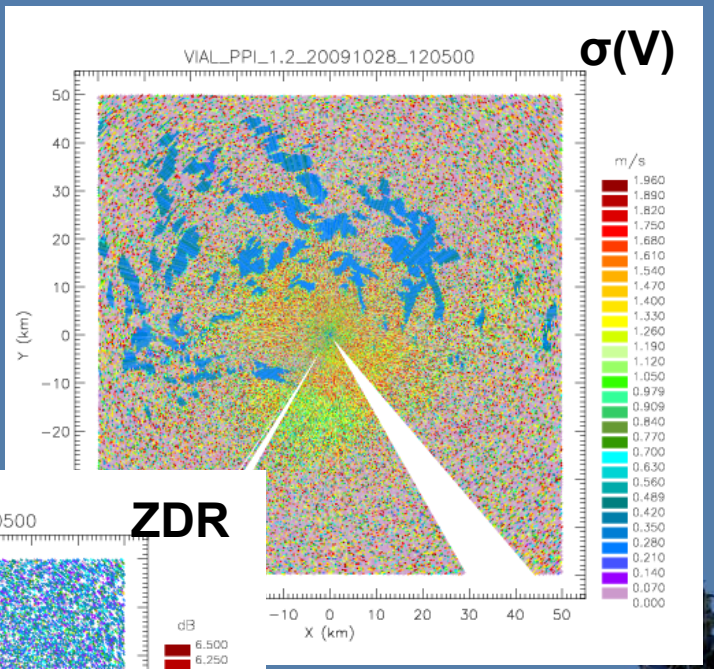
October 28 th 2009 at 12:00Z

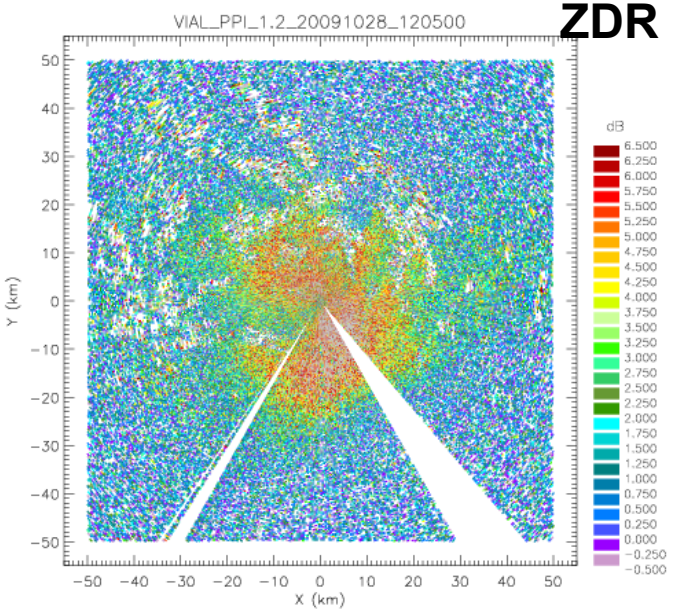


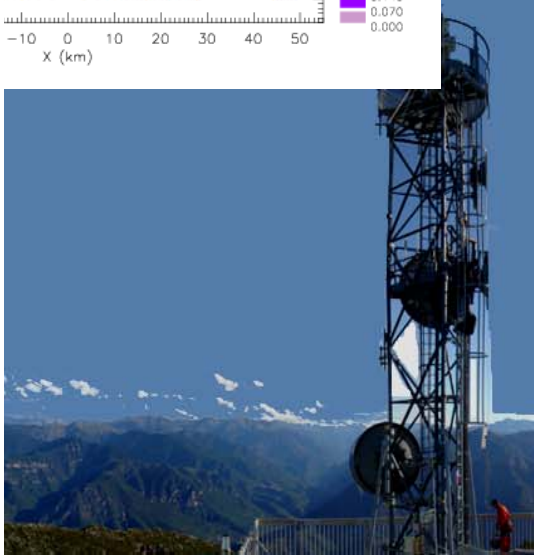


Polarimetric signature
of clear air echoes







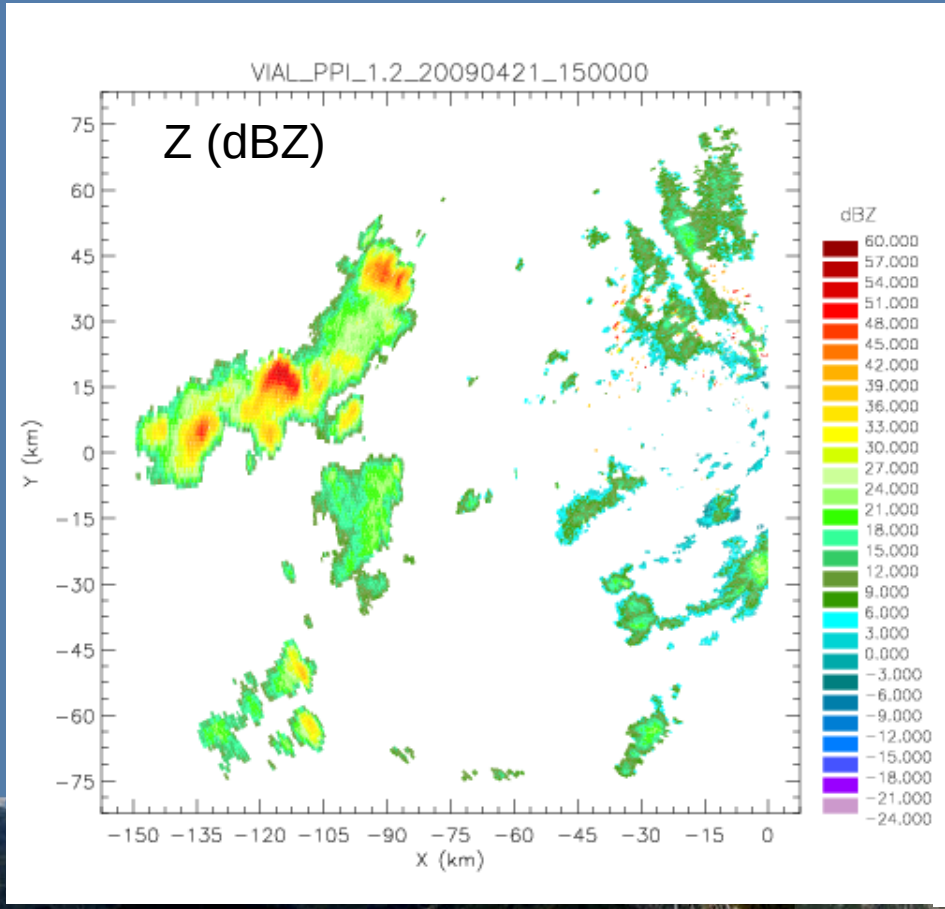


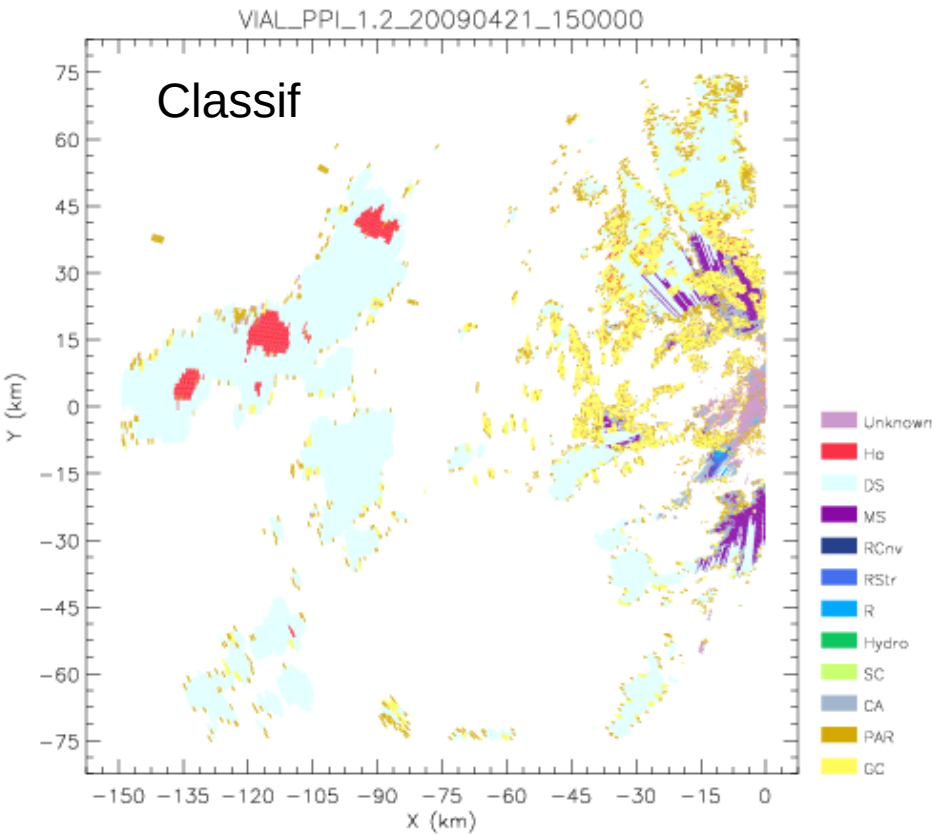
Radar detection of dry hail

Elevation 1.2°

Radar signal intensity du due to the precipitation

Classification of the precipitation:
Light blue = dry snow
Red = hail

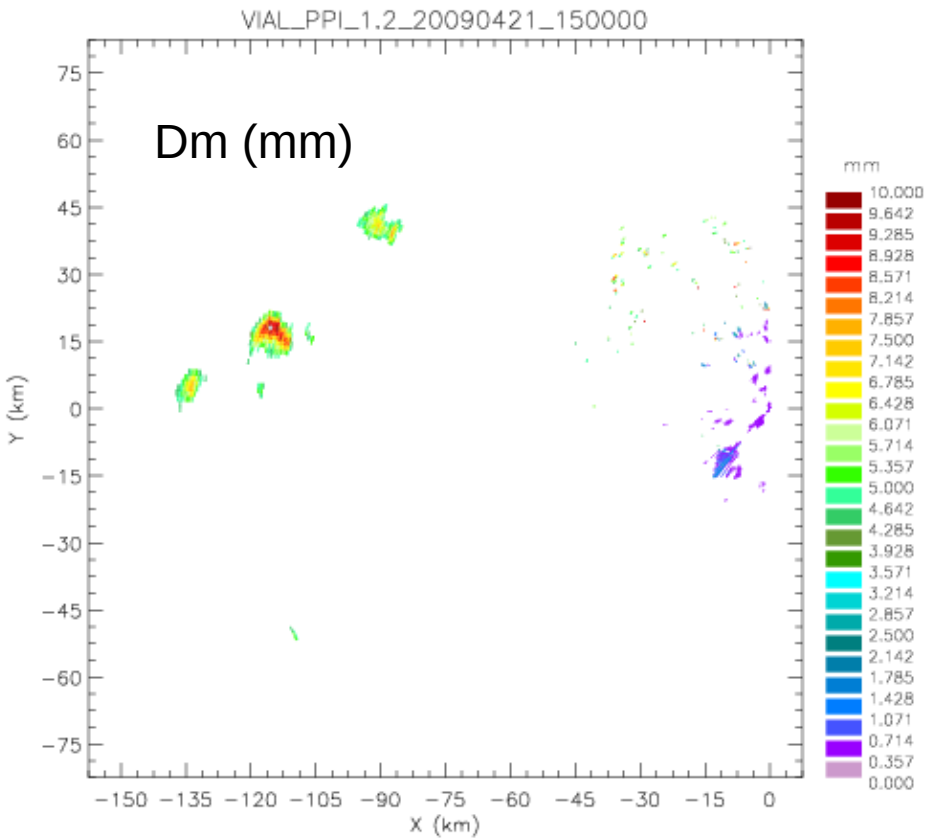




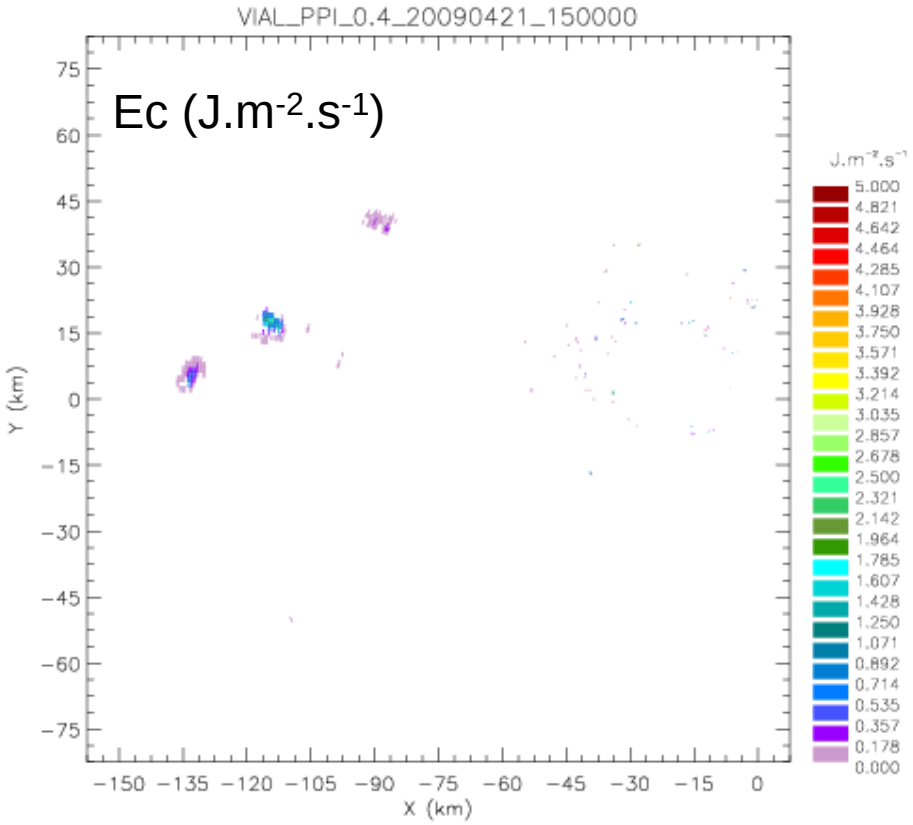
Quantitative characteristics of dry hail

Elevation 1.2°

Hailstone mean diameter

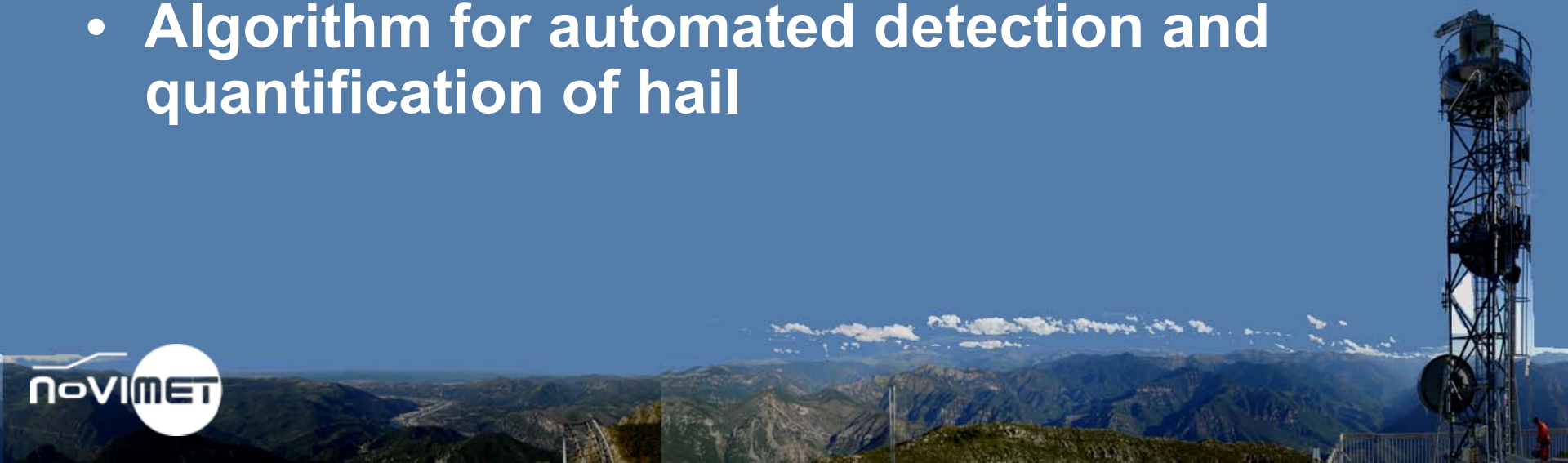


Hailstone mean kinetic energy



On going research

- Statistics for clear air echoes occurrence
- Algorithm for automated detection of wind shear
- Runways status (rain, snow)
- Detection of icing conditions
- Algorithm for automated detection and quantification of hail



Thank you for attention

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