Towards the real time monitoring of wind hazards in the planetary boundary layer with a scanning doppler laser radar

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Understand the needs for developing better lidars

- Meteorology
- Air Quality
- Airport safety
- Wind energy

What quantities can measure ours lidars?
- Wind, Wind shears, Turbulence, Wake vortex
- Aerosols, Clouds, Ash

What are the specificities of our lidars?
- High spatial and temporal resolutions, high accuracy
Windcube200S Overview

- Windcube200S is a scanning Wind Doppler lidar based on the heterodyne principle.
Windcube200S on the shore in 2011

- Nice Côte d’Azur airport (MétéoFrance)
  #3 Airport in France
  Permanent deployment

- Paris Charles de Gaulle airport (SESAR)
  #1 Airport in France
  4 weeks campaign
Wind shears problematic overview

- Aircrafts maneuverability is the lowest during takeoff and landing phases
- On flight aircraft stability directly linked to topology of wind field
  - Wind gradients: negative
  - Micro-bursts: negative
  - Turbulence: negative

→ Need to accurately monitor the wind fields near airports
Some examples of wind fields measured by the Windcube200S

2 particular wind fields

- Transient wind in the planetary boundary layer
- Increase of low altitudes wind
Wake vortex problematic overview

- All aircrafts create wake vortices, whose the strength is linked to weight, wingspan, speed

- FAA specifies distance/time between two aircrafts for landing and takeoff

- Limitation of the landings / takeoffs during the rush hours

- Need to monitor wake vortices until their dissipation
Focus on Wake detection during Paris deployment

Goal: Detect and monitor wake vortices of small to heavy planes during takeoff and landing

Many issues:
- Predominant ground effect
- Lateral detection
- Large variety of take-off Trajectories
- Windcube located 700 meters from landing
- Real time monitoring
Wake of a heavy aircraft at Take-off
Wake of a heavy aircraft at landing
Summary and perspectives

• Windcube200S deployed on two airports
  – On-going Wake Vortex Data analysis
  – More results coming soon especially on wind shears

• Other potential applications of Windcube200S
  – Large site assessment for wind energy
  – Data assimilation for Weather forecasts and Meteorology researchs

• Many improvements of Windcube200S are planned so as to increase range for instance
Thank you