The WMO Aviation Research & Demonstration Project (AvRDP) at Paris-CDG airport

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AvRDP focus points

- **Aviation Research Demonstration Project**
- Joint effort between **CAS/WWRP** and **CaeM**
- Research in **nowcasting and mesoscale modelling** to support the ASBU under the new GANP
- Demonstrate the **benefits of the MET information / aviation community**
- **6 airports**, namely Paris-CDG
Paris-CDG

- Paris-CDG
  Mid-latitude in Northern Hemisphere
  Inland
  4 runways
  66 million passengers in 2016

- Impacting weather for approach:
  Convection
  Wind

Wintry weather:
- fog and stratus clouds
- wintry precipitation
- frost
AvRDP at Paris-CDG

• Phase I:
  MET capability research on threatening weather elements

  2 IOPs for winter weather, visibility, and ceiling:
  - Winter 2015-16 (November-March)
  - Winter 2016-17 (November-March)

→ 2 reports / case studies

• Phase II:
  Translation of MET information → ATM-specific parameters
Observational Network at Paris-CDG

Surface observation data:

• 12 wind sensors
• 12 Runway Visual Range (RVR) sensors
• Conventional observation data: atmospheric and runway temperature, QNH, etc.

METARs

Doppler dual-pol Weather Radar

Satellite imagery

Lightning location data
Nowcasting/NWP facilities for Paris-CDG
AROME-France model

- mesoscale regional model
- non-hydrostatic
- 1.3x1.3km grid

8 runs a day

forecast ranges from +1h to +48h

**Parameters**: classical MET parameters + CAPE, cold precipitation, fog diagnosis, convection diagnosis, simulated radar reflectivity and IR, object-oriented nowcast of convection, etc.
AROME-PI model - nowcasting

local NWP model for nowcasting

Coverage and physics/microphysics: same as AROME-France

coupling model: AROME-France

24 runs a day

forecast ranges from +30min up to +180min (refresh. Rate 5min) + from +180min to +6h (r.r. 15min)

Parameters: mostly diagnoses
Statistical vehicle icing forecast

ANTIGEL

- Risk of vehicle icing
- Statistical model
- Inputs:
  - Forecaster-expertised
  - Surface temperature
  - Humidity
  - Wind
  - Nebulosity
- Forecast range: 30h

Display of an ANTIGEL forecast
CDM@CDG MET service

Collaborative Decision Making process community

Very high refreshment rate (~15 min)

User-tailored products
Runway forecast in CDM@CDG

Display of runway temperature and contaminants on the CDM@CDG tool

- Crucial for the ATM
- Good feedback from end-users
- On-going developments
AvRDP winter IOPs case studies at Paris-CDG

- Fog and stratus clouds
  December 29th, 2016
Fog and stratus clouds

- Low visibilities and/or ceilings
- Complex to forecast
- Low Visibility Procedures: visibility < 600m and/or ceiling < 200ft
- ~40% of airlines delays
Number of vehicle de-icing operations and prevailing visibility at Paris-CDG platform on December 29th, 2016.
Weather front analysis

Chart of weather front analysis for Europe on December 29th, 2016 at 12Z.
Temperature & Humidity profile

Chart of weather front analysis for Europe on December 29th, 2016 at 12Z.
De-icing operations

Number of vehicle de-icing operations and prevailing visibility at Paris-CDG platform on December 29th, 2016.
Impact on ATM

Forecast (dotted line) vs. actual (solid line) number of departures (top) and arrivals (bottom) at Paris-CDG platform on December 29th, 2016. Local time.
Nowcast – fog diagnosis

Fog diagnosis from the AROME-PI model on December, 29th at 08Z on the Synopsis tool

Run of 04Z

Run of 06Z

High refreshment rate = assimilate recent observations

→ accurate fog formation modelling

→ enhanced weather awareness
Aerogram in CDM@CDG

Weather predictions aerograms from the CDM@CDG tool updated on December, 29th 2016.

Valid at 06:05Z
Weather predictions aerograms from the CDM@CDG tool updated on December, 29th 2016.

Valid at 06:35Z
Conclusions & Perspectives

- AvRDP Phase I - Paris-CDG comes to an end
- Nowcast data → better weather awareness
  Runway temperature, contaminants, LVPs, etc.
- CDM@CDG → MET-ATM interactions / good feedback
- Further developments ongoing (diagnoses updates)

- Next step: AvRDP Phase II at Paris-CDG
Thank you