KNMI and aviation services

EASA
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Outline

1. KNMI and aviation services (in operational and research services)

2. Research program Knowledge for Climate for aviation (called Hotspot Schiphol)

3. Thunderstorm related issues regarding operations and research
KNMI was founded on 31 January 1854 by Prof. C.H.D. Buys Ballot (1817-1890)

KNMI is the National Meteorological Institute in the Netherlands for:
• weather (public, aviation, maritime),
• climate research (climatology and scenarios)
• seismology.
KNMI aviation services

- Amsterdam Flight Information Region,
- airports EHAM, EHRD, EHGG, EHBK
- VFR land and sea (platforms)
- METAR, TAF, SIGMET, LLFC land and sea
- Probability Forecast Schiphol
- Central Forecasting Office, if needed at EHAM/ATC
<table>
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<tr>
<th>Knowledge</th>
<th>Influence</th>
<th>10-30 yr</th>
<th>1-7 yr</th>
<th>3-36 hr</th>
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<td>Forecast RVR/TS (Harmonie)</td>
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<td>Snow</td>
<td>Design</td>
<td>Design</td>
<td>Planning</td>
<td>Safety</td>
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Aviation, climate and climate change
Climatology and Climate Scenarios Schiphol
Kennis voor Klimaat

Mission

In the program Kennis voor Klimaat the Amsterdam Airport Schiphol is defined as one of the hotspots in the Netherlands for adaptation to climate change.

The mission of this project is to update climatology of Schiphol and to investigate the impact of climate change.

www.kennisvoorklimaat.nl
www.knmi.nl/samenw/kbs
KNMI-Climate services

Global temperature rise
- G: +1°C
- G+: +1°C
- W: +2°C
- W+: +2°C

Change in air circulation patterns
- G: no
- G+: yes
- W: no
- W+: yes

Winter
- average temperature
  - G: +0,9°C
  - G+: +1,1°C
  - W: +1,8°C
  - W+: +2,3°C
- coldest winter day per year
  - G: +1,0°C
  - G+: +1,5°C
  - W: +2,1°C
  - W+: +2,9°C
- average precipitation amount
  - G: +4%
  - G+: +7%
  - W: +7%
  - W+: +14%
- number of wet days (≥0,1 mm)
  - G: 0%
  - G+: +1%
  - W: 0%
  - W+: +2%
- 10-day precipitation sum exceeded once in 10 years
  - G: +4%
  - G+: +6%
  - W: +8%
  - W+: +12%
- maximum average daily wind speed per year
  - G: 0%
  - G+: +2%
  - W: -1%
  - W+: +4%

Summer
- average temperature
  - G: +0,9°C
  - G+: +1,4°C
  - W: +1,7°C
  - W+: +2,8°C
- warmest summer day per year
  - G: +1,0°C
  - G+: +1,9°C
  - W: +2,1°C
  - W+: +3,8°C
- average precipitation amount
  - G: +3%
  - G+: -10%
  - W: +6%
  - W+: -19%
- number of wet days (≥0,1 mm)
  - G: -2%
  - G+: -10%
  - W: -3%
  - W+: -19%
- daily precipitation sum exceeded once in 10 years
  - G: +13%
  - G+: +5%
  - W: +27%
  - W+: +10%
- potential evaporation
  - G: +3%
  - G+: +8%
  - W: +7%
  - W+: +15%

Sea level
- absolute increase
  - G: 15-25 cm
  - G+: 15-25 cm
  - W: 20-35 cm
  - W+: 20-35 cm
Hotspot Schiphol

A. Windvisions: path measurement wind with scintillometer (WUR)

B. Impact: Improving capacity with high resolution non hydrostatic model, link to amdar, mode-S

C. Climatology and scenarios:
Visibility: frequency LVP decreases, local differences identified
Wind: climatology differences on local scale due to roughness
Precipitation: return times established, identification sea/land
Upper air: Reanalysis ERA-I useful, inversions

SOME EXAMPLES
Visibility (BZO-phases)
#hours per year

<2 km

<200 meter

%minutes <200 m 2003-2008
Wind measured and potential wind (Up) 
FFmean (m/s) 2007-2009 and cor. factor for Up

Local wind deviation
EHAM mainly due to roughness differences
Comparison OWEZ-ERA
iul2005-dec2009

Comparison windspeed 116 and 70 meter
ERA-Interim and OWEZ-Egmond

Figure 11. Comparing average windspeed per month from Noordzeewind and ERA-Interim. Windspeed in reanalysis is underestimated by 0.7 m/s (about 10%).
Comparison 2003-2005
at 00 and 12 UTC for the four seasons

ERA-HR-RDS-CAB
at 5, 50 and 95% windspeed

SPRING

SUMMER

AUTUMN

WINTER
Precipitation EHAM

Schiphol

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<th></th>
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<td>4</td>
<td>5</td>
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<td>4</td>
<td>6</td>
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<td>6</td>
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<td>1 x per 5 jaar</td>
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<td>1 x per 10 jaar</td>
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<td>1 x per 20 jaar</td>
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<td>21</td>
<td>27</td>
<td>32</td>
<td>36</td>
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<tr>
<td>1 x per 50 jaar</td>
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<td>26</td>
<td>32</td>
<td>38</td>
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<tr>
<td>1 x per 100 jaar</td>
<td>17</td>
<td>29</td>
<td>37</td>
<td>43</td>
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Lenderink: Tsea and NW-flow
Upper air results

Delta Temp from ICAO-SA 1989-2009
Thunderstorms

- Observations: sounding, synop/metar, Doppler-radar (hail), lightning
- Model: Hirlam, post-proces KOUW, indices
- Research: Atmospheric electricity (veenvds@knmi.nl)
- Products: Metar, TAF, sigmet, LLFC, AIL, guidance AAS/LVNL

KOUW: % risk > 1, 50 or 200 TS and # in 5 min
In wintertime (CB with low tops) risk AIL
Thunderstorm (TS): Poor climatology
- TS is related to charge distribution (graupel meets ice-chrystal)
- Electric forces can alter dynamics and precipitation in CB
- But during TS sudden precip-increase (intensity >200 mm/hr during seconds)
- Risk blue jet?
- Atm.electricity charging is computable

Experiment in HARMONIE (non hydrostatic):
- Model electric field, enhance ice chrystal growth on treshold (200kV/m)
- Compute when TS starts (400kV/m)
- Release of precip.intensity and dynamics
- Optimize TS/GR/FX/microburst-forecast
- Optimize climatology and effect of climate change
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<th>03</th>
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<tr>
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<td>Freezing precipitation (%)</td>
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**Wintertime: AIL**
Summary

- KNMI: NMS in Netherlands, strong relations with aviation
- Operations and research work in close harmony

- Research program: improving capacity, focus on climate(change)-proof decision-support in research Hotspot Schiphol
- Climatology and scenarios for local conditions and upper air

- Aviation needs ongoing research in climate and scenarios
- Thunderstorms: challenge for research

- HARMONIE: high resolution non hydrostatic modelling
- ICAO: stimulate climatology of TS and HR-research

Thank you, time for (some) questions

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